STRUCTURE FOUNDATION REPORT
PROPOSED TORREY MEADOWS DRIVE OVERCROSSING AT STATE ROUTE 56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

Prepared for:

T.Y. Lin International
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March 24, 2015

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March 24, 2015
Project No. 20151065.001A

Mr. Jeff Burdick, P.E.
T.Y. Lin International
404 Camino Del Rio South, Suite 700
San Diego, California 92108

Subject: **Structure Foundation Report**
Proposed Torrey Meadows Drive Overcrossing at State Route 56
Post Mile 5.6, Caltrans District 11
San Diego, California

Dear Mr. Burdick:

Kleinfelder is pleased to present this Structure Foundation Report for the proposed Torrey Meadows Drive Overcrossing bridge project at State Route 56 in San Diego, California.

This report is to be used for foundation design for the proposed bridge.

We appreciate the opportunity to be of service on this project. Please do not hesitate to contact the undersigned if you have any questions, comments, or require additional information.

Respectfully submitted,

KLEINFELDER

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1 INTRODUCTION

1.1 GENERAL

California State Route 56 (SR-56) is a four lane highway that serves the northern communities of the City of San Diego. SR-56 runs approximately 9 miles from Interstate 5 (I-5) in the Carmel Valley neighborhood of San Diego to Interstate 15 (I-15). SR-56 serves as an important connector between I-5 and I-15, being the only east–west freeway between SR-78 and SR-52 in north San Diego County.

We understand that the project consists of the design of a 337-foot long overcrossing bridge to connect Torrey Meadows Drive over SR-56. The project is located in the Carmel Valley area of the City of San Diego, California as presented on Figure 1, Site Vicinity Map*.* Figure 2 presents the Site Plan along with existing conditions.

The bridge will consist of a two-span structure with a single bent within the existing median of SR-56. We understand that cast-in-place post-tensioned reinforced concrete box girder construction will be used. Some minor grading and paving may be required in the approach areas.

This report presents our evaluation of anticipated geologic and geotechnical conditions associated with the proposed bridge. Foundation recommendations are provided based on review of available reports and documents associated with the site.

This report has been prepared in general accordance with American Association of State Highway and Transportation Officials (AASHTO) Load & Resistance Factor Design (LRFD) Specifications, 6th Edition with amendments by California Department of Transportation [Caltrans] (Memo to Designers dated March 2014)

1.2 BACKGROUND REVIEW

Geologic and geotechnical literature reviewed for this study included reports, maps, and other documents prepared by the California Geological Survey, the U. S. Geological Survey and the City of San Diego. We have reviewed consultant reports and design drawings containing geologic and geotechnical geologic data for the Camino Ruiz/Camino Del Sur Undercrossing (#57-1083 L/R) located approximately 2,700 feet to the southwest and the McGonigle Creek Bridge (#57-1082) located approximately 650 feet to the northwest.

As-built plans for construction on SR-56 containing geologic data relevant to the site were also reviewed. Per the referenced as-built plans the proposed bridge site is located approximately at Station 100+15 of SR-56. The as-built plans for the Camino Del Sur Undercrossing and McGonigle Creek Bridge were present in the above referenced 2005 as-built plans.

A site reconnaissance was performed by a Kleinfelder engineering geologist as part of the background review.

Documents reviewed and referenced for this study are listed in Section 8 of this report.

Unless otherwise noted, elevation data presented in this report are in feet above Mean Sea Level (MSL) based on the National Geodetic Vertical Datum of 1929 (NGVD 29).

2 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 EXISTING FACILITIES

Existing bridges in the vicinity of the proposed bridge include the Camino Del Sur Undercrossing (Bridge No. 57-1083 R/L) located approximately 2,700 feet southeast of the proposed bridge. The existing McGonigle Creek Bridge (Bridge No. 57-1082 R/L) is located approximately 650 feet northwest of the proposed bridge. The northern bridge abutment will be located approximately 100 feet northeast of the westbound shoulder of SR-56. The southern bridge abutment will be located approximately 90 feet southwest of the eastbound shoulder of SR-56. The existing median and slope areas in the vicinity of the proposed bridge are unpaved. Fill was placed in the abutment areas as part of a mass grading operation for the residential subdivision developments in the area. We understand that the future construction of this bridge was foreseen during the original construction of SR-56 and the alignment of Torrey Meadows Drive was established to facilitate the construction of this bridge.

Other existing facilities in the vicinity include residential developments to the north and south of the proposed bridge site. In addition, existing water and sewer lines are located within the alignment on Torrey Meadows Drive. No utilities are expected to traverse the central portion of the bridge.

2.2 PROPOSED IMPROVEMENTS

Based on the General Plan sheets prepared by T.Y. Lin International, the proposed Torrey Meadows Drive Overcrossing Bridge will have a length of approximately 337 feet measured along the center line of Torrey Meadows Drive. The bridge will carry two lanes, one in northbound direction and the other in southbound direction. The bridge will consist of two spans constructed with cast-in-place post-tensioned concrete box girders. The span lengths will be approximately 168 ½ feet and will have a width of approximately 54 feet. The roadway will have a width of approximately 40 feet.

Abutments of the two-span structure were originally proposed to be supported on cast-in-drilled-hole (CIDH) concrete piles. However, foundations for south Abutment 1 could be supported on shallow foundations. The center bent (Bent 2) will have two columns supported by spread footings located within the existing median of SR-56.

Bridge deck elevations will range from approximately +361 feet at Abutment 3 (north abutment), to +359 feet at Abutment 1 (south abutment). The bridge alignment plan and profile is shown on project drawings included in Appendix B. Design recommendations for bridge approaches and pavements associated with the project are addressed in a separate Geotechnical Design Report.

3 METHODS OF STUDY

The methods of study included both intrusive field explorations consisting of drilled boreholes. In addition, laboratory testing of selected samples of encountered soils were performed.

3.1 FIELD INVESTIGATION

The field investigation consisted of the excavation of 5 hollow-stem-auger (HSA) borings performed between July 22 and 25, 2014. Exploration locations are presented on Figures 2 and 3. A detailed description of the exploration activities with corresponding borehole logs records are presented in Appendix B. A geologist or geotechnical engineer from Kleinfelder coordinated the field exploration activities, logging of the boreholes, and collected samples for further examination and laboratory testing. A log-of-test-borings (LOTB) sheet per Caltrans standards is presented in Appendix D. The field exploration program is described in Appendix B.

3.2 LABORATORY TESTING

The materials observed in the boreholes were visually classified and evaluated with respect to strength, swelling, compressibility, density, and moisture content. The material physical/mechanical properties and classifications were substantiated by performing selected laboratory tests. Laboratory testing performed consisted of the following tests:

- Moisture content
- Dry density
- Particle size distribution
- Atterberg limits
- Modified proctor compaction
- R-Value
- Direct shear tests
- pH
- Electrical resistivity
- Water soluble sulfate
- Water soluble chloride

Laboratory testing procedures and test results are provided in Appendix C.

4 SITE CONDITIONS

4.1 CLIMATE

The overall climate for San Diego is considered semi-arid with an average annual precipitation of approximately 10-inches. Precipitation records are available from the National Weather Service which date back to 1914. The site is located approximately 6 miles from the Pacific Ocean. Due to this relative close proximity to the ocean and bay, temperatures are cooler during the summer and warmer during the winter compared to the areas east of the site. The average monthly high ranges from 57 degrees in January to 76 degrees in August. The average low temperature ranges from 49 degrees in January to 67 in August. Annual precipitation generally increases as you move further east towards the foothills and mountains. Nearly 90 percent of the precipitation occurs between the months of November and April.

4.2 TOPOGRAPHY AND DRAINAGE

Prior to the construction of SR-56 and the adjacent residential northern and southern subdivisions, the site consisted of a northwest facing hillside on McGonigle Canyon dissected by two small northwest flowing tributary drainage features. The tributary drainages were filled during grading of these subdivisions and construction related activities of SR-56.

The existing ground surface elevation along the alignment is approximately +357 feet at the south abutment, approximately +335 feet near the center, and +361 feet at the north abutment.

Based on the current topographic maps for the project and our site reconnaissance, the existing topography descends slightly downward to the west. Each abutment has a graded slope descending toward the SR-56 centerline at an approximate inclination of 2:1 (horizontal to vertical). The south Abutment 1 and north Abutment 3 slopes are approximately 25 to 30 feet in height. It should be noted that Kleinfelder did not perform a precise survey of the geometry of these slopes.

4.3 MAN-MADE AND NATURAL FEATURES OF ENGINEERING AND CONSTRUCTION SIGNIFICANCE

Torrey meadows Drive Overcrossing involve the construction of a bridge over highway

SR-56. Construction of the overpass will not require any new cut/fill slopes, fill soils of significant thickness, approach embankments or retaining walls (with the exception of the bridge abutments).

The existing highway SR-56 is a fully developed and functional transportation corridor with drainage control, buried utilities, lane separation barriers, signage and landscaped slopes.

The existing residential street of Torrey Meadows Drive approaches the project site from both the northeast and the southwest. Both segments of Torrey Meadows Drive are paved and have buried utilities within and adjacent to them.

4.4 REGIONAL GEOLOGY

San Diego County resides within the Peninsular Ranges Geomorphic Province (California Geologic Survey (CGS), 2002; Norris and Webb, 1990). This geomorphic province encompasses an area that extends approximately 900 miles from the Transverse Ranges north of the Los Angeles Basin and south to the southern tip of Baja California, Mexico. It varies in width from approximately 30 to 100 miles (Norris and Webb, 1990) and is characterized by mountainous terrain on the east composed mostly of Mesozoic igneous and metamorphic rocks, and relatively low-lying coastal terraces (coastal plain) to the west underlain by late Cretaceous, Tertiary, and Quaternary age sedimentary rocks.

The coastal plain which encompasses the site ranges from approximately ¼ mile wide in northern San Diego County and up to approximately 14 miles wide in the central and southern county regions. It is underlain by relatively undeformed, near shore marine sedimentary rocks, deposited during intermittent intervals between late Mesozoic through Quaternary time. These sedimentary units are comprised of a westward thickening clastic wedge deposited on bedrock of Cretaceous to Jurassic age igneous and metamorphic rocks. They are divided into three packages of deposits based on their sequence and age of deposition. The oldest sequence consists of claystone, siltstone, sandstone, and conglomerate deposited during late Cretaceous time as an apparent submarine fan. These units crop out on Mt. Soledad in La Jolla, Point Loma and Carlsbad.

The second sequence of sediments was deposited during the Tertiary period (Eocene and Pliocene) within an embayment that stretched from at least northern San Diego County and into Mexico (Kennedy, 1975; Kennedy and Tan, 2008). The sediments consist of a variety of claystone, siltstone, sandstone and conglomerate. The third sequence is associated with Pleistocene marine terrace deposits and consists of weakly to moderately consolidate conglomerates, sandstone, siltstone and claystone.

The regional geologic map for the area by Kennedy (1975) shown on Figure 4, Regional Geologic Map, indicates the project site is underlain by material of the second sedimentary sequence consisting of Eocene-age Mission Valley Formation and possibly Eocene-age Stadium Conglomerate at the north abutment approach area. The slope areas near both bridge abutments are underlain by artificial fill.

4.5 REGIONAL FAULTING

Southern California is cut by a system of numerous active faults associated with the San Andreas Fault. The San Andreas fault delineates the boundary between two global tectonic plates consisting of the North American Plate on the east and the Pacific Plate on the west. The San Andreas fault stretches from the Gulf of California in Mexico along a northwest alignment through the desert region of Southern California up to Northern California, where it eventually trends offshore north of San Francisco. Right lateral slip movement along the plate boundary of the San Andreas fault is by far the most dominant factor controlling the seismicity throughout northern and southern California (Wallace, 1990; Weldon and Sieh, 1985). Within Southern California, the strain associated with the plate boundary movement extends well westward for up to 150 miles from the main San Andreas fault strand in the Imperial Valley to well offshore of San Diego (CDMG, 1999).

The major faults east of San Diego (from east to west) include the San Andreas Fault, the San Jacinto fault and the Elsinore fault (see Regional Fault Map and Earthquake Epicenters, Figure 5). Major faults west of San Diego include the Palos Verdes-Coronado Bank fault, the San Diego Trough fault, and the Santa Clemente fault (Kennedy and Welday, 1980). The dominant zone of faulting within the San Diego region is several faults associated with the Rose Canyon Fault Zone (RCFZ). Most of the seismic energy and associated fault displacement occurs along the fault structures closest to the plate boundary on the Elsinore, San Jacinto, and San Andreas faults, which account for up to 85% of the total displacement. The remaining 15% is accommodated across the various offshore faults and Rose Canyon fault. Studies within Rose Canyon (east of Mt. Soledad) have revealed fault strands that have clearly displaced Holocene soil horizons with slip rates from 1 to 2.4 mm/yr. (Lindvall et al., 1990, Lindvall and Rockwell, 1995, Rockwell, 2010).

The Rose Canyon fault is part of a more extensive fault zone that includes the Offshore Zone of Deformation and the Newport-Inglewood fault to the north, and several possible extensions southward, both onshore and offshore (Treiman, 1993). The Rose Canyon fault zone is made of predominantly right-lateral strike-slip faults that extend southwest-southeast through the San Diego metropolitan area. Various fault strands display strike slip, normal, oblique, or reverse components of displacement (Treiman, 1993). The fault zone extends offshore at La Jolla and continues north-northwest subparallel to the coastline. To the south in the San Diego downtown area the fault zone appears to splay out into a group of generally right-normal oblique faults extending into San Diego Bay (Treiman, 1993; Kennedy and Clarke, 1999).

4.6 LOCAL FAULTING

The local onshore portion of the RCFZ extends from La Jolla along a south-southeast alignment over Mt Soledad and along the general trend of Interstate 5 into downtown San Diego. Through downtown, the fault appears to branch and is expressed southward across San Diego Bay as three faults consisting of the Silver Strand fault, the Coronado fault and the Spanish Bight fault. The California Geologic Survey has designated portions of the fault zone in the Mount Soledad, Rose Canyon, Port of San Diego, Coronado, and downtown San Diego areas as active Earthquake Fault Zones. An active fault is a fault which has undergone movement within the last 11,000 years which spans the Holocene period. The closest active fault of this zone to the Torrey Meadows Drive Overcrossing site is located approximately 8 miles west.

Approximately 5,400 feet to the north and 5,600 to the east of the site are two un-named faults. These faults have been classified by the referenced City of San Diego Seismic Safety Study (2008) as *“Potentially Active, Inactive, Presumed Inactive or Activity Unknown*”. These faults are likely pre-Holocene in age and are likely related to an earlier incipient phase of development of the Rose Canyon Fault. Caltrans (2013) does not consider these faults as seismogenic for design purposes.

4.7 SUBSURFACE CONDITIONS

The subsurface conditions were appraised based on review of published geologic maps, the results of our field explorations, laboratory testing and visual on-site observations. A geologic section depicting conditions at the site is presented in Figure 6.

4.7.1 Artificial Fill

During construction of SR-56 and the adjacent subdivisions, fill was placed within the tributary drainage in the area below the proposed north bridge abutment. The grading on the north abutment area resulted in a west-facing fill slope which descends approximately 90 feet to the slope toe within the bottom of the drainage. Due to the lack of existing borings in this area or as-graded reports, it is unknown whether colluvium and/or alluvium were removed prior to placement of the fill. Extrapolation of native slopes suggests that the fill depth may be in the order of 60 to 65 feet at the north abutment/approach area (approximate project Station 14+00). Note that the fill thickness is estimated to be approximately 10 to 20 feet thick between proposed Stations 6+00 to 8+00. Fill thickness between Stations 15+00 to 16+00 is estimated to be up to approximately 80 feet and is expected to decrease to approximately 40 to 45 feet thick at Station 17+00. The estimated fill thickness at Station 18+00 is approximately 15 feet. See Figure 6 for graphical representations of fill thicknesses along the proposed bridge alignment.

Borehole A-14-003 located near southerly Abutment 1 encountered fill soils to a depth of 17 feet. The fill soils generally consisted of medium stiff to stiff sandy lean clay and loose to medium dense clayey sand. Blow counts ranged from 5 to 17 blows per foot (bpf).

Boreholes A-14-005 and A-14-006 near northerly Abutment 3 encountered fill soils to depths of 61 and 65 feet, respectively. Fine grained fill soils generally consisted of stiff to very stiff lean clay to sandy lean clay with gravel and sandy silt with blow counts ranging from 17 to 40 bpf. Granular fill soils generally consisted of medium dense to very dense silty to clayey sand little gravel with blow counts ranging from 21 to 86 bpf.

4.7.2 Mission Valley Formation

The geologic maps by Kennedy (1975) and Kennedy and Tan (2008) indicate that the project site is underlain by sandstone and claystone of the Eocene-age Mission Valley Formation. This unit is characteristically described as soft and friable sedimentary rock with the potential of having occasional cobble conglomerate beds. This unit is present at the ground surface at the central Bent 2 and below the fill soils at the north and south abutment locations.

The Mission Valley Formation encountered in the boreholes generally consisted of silty to clayey sandstone and sandy claystone. The color ranged from light brownish grey to dark reddish brown with variable levels of mica and iron staining. The material is highly weathered with weak to strong cementation associated with non-plastic to moderate plasticity. In the area of central Bent 2, borehole A-14-004 encountered a stiff layer of sandy lean clay at a depth of about 40 feet.

4.7.3 Stadium Conglomerate

Although not encountered in any of the borehole explorations, the Eocene-age Stadium Conglomerate is anticipated to underlie the Mission valley Formation below approximately elevation +300 feet MSL at the northern end of the site project limits. This unit typically consists of massive cobble conglomerate with a coarse grained sandstone matrix.

4.8 GROUNDWATER

Groundwater was not encountered within the depths of the borehole explorations performed. A search of the California Department of Water Resources website (http://www.water.ca.gov/waterdatalibrary) did not identify any state monitored wells located within the vicinity of the proposed structure. Based on previous experience in this area, the regional groundwater table depth is anticipated to be in excess of 100 feet below ground surface. However, it is possible that perched groundwater may be present near the bottom of the in-filled canyons. Groundwater levels are subject to seasonal fluctuations.

5 POTENTIAL GEOLOGIC HAZARDS

Potential geologic hazards evaluated include ground surface rupture, seismic shaking, tsunami, seiche and flood, liquefaction, seismic compaction, ground compressibility, slope stability and expansive soils.

5.1 CITY OF SAN DIEGO SEISMIC SAFETY STUDY

The referenced City of San Diego Seismic Safety Study, Geologic Hazards and Faults (2008), has designated the area of the south abutment as a Zone No. 52- "*Other level areas, gently sloping to steep terrain, favorable geologic structure, Low Risk".* The north abutment has been designated as a Zone No. 53 "*Level or sloping terrain, unfavorable geologic structure, Low to Moderate Risk".*

5.2 CALTRANS SEISMIC DESIGN PARAMETERS

Since the structure will be constructed within California Department of Transportation (Caltrans) right-of-way, it is anticipated that the structure will be designed in accordance with Caltrans seismic design criteria. Based on mapping by the California Geologic Survey (Bryant and Hart, 2007) and on the Caltrans ARS Online website (http://dap3.dot.ca.gov/ARS_Online Caltrans, 2013), the Rose Canyon Fault Zone (Del Mar section, fault database ID No. 401) is mapped approximately 8 miles west of the proposed structure and is the governing fault for deterministic seismic hazard analysis. For development of design ground motion parameters, Caltrans (2013) has assigned this fault as right-lateral strike slip dipping 90 degrees with a Maximum Moment Magnitude (M_{Max}) of 6.8. Additional fault characteristics are summarized in Table 1.

Our estimate of the shear wave velocity in the upper 100 feet (30 meters) (V_{S30}) for the site is based on USGS Earthquake Hazard website, and our field investigation. The site is not located within a California deep soil basin region as defined by Caltrans (2013). Site characteristics and governing fault parameters are summarized in Table 1.

Table 1. Site Characteristics and Governing Fault Parameters

Site Coordinates	Latitude = 32.9627 degrees, Longitude = -117.1604 degrees
Shear Wave Velocity, V_{s30}	1,340 ft/s (400 m/s)
Depth to V_s=1.0 km/s, Z1.0	Not Applicable (Not located in a basin)
Depth to V_s=2.5 km/s, Z2.5	Not Applicable (Not located in a basin)
Fault Name and Identification Number	Rose Canyon Fault Zone (Del Mar section), Identification Number. 401
Maximum Magnitude (M_{Max})	6.8
Fault Type	Right Lateral Strike Slip
Fault Dip	90 degrees
Dip Direction	Vertical
Bottom of Rupture Plane	5.0 miles (8 km)
Top of Rupture Plane (Ztor)	0 mile (0 km)
R_{RUP}[1]	8 miles (12.9 km)
R_{JB}[2]	8 miles (12.9 km)
R_X[3]	8 miles (12.9 km)
F_{norm}[4] **(1 for normal, 0 for others)**	0
F_{rev}[5] **(1 for reverse, 0 for others)**	0
Design Peak ground Acceleration (PGA)	0.32

Notes: V_{s30} = shear wave velocity in the upper 100 feet (30 meters);
[1] R_{RUP} = Closest distance from the site to the fault rupture plane.
[2] R_{JB} = Joyner-Boore distance; the shortest horizontal distance to the surface projection of the rupture area.
[3] R_X = Horizontal distance from the site to the fault trace or surface projection of the top of the rupture plane.
[4] F_{norm} = Faults identified as a Normal Fault in the Caltrans Fault Database.
[5] F_{rev} = Faults identified as a Reverse Fault in the Caltrans Fault Database.

The deterministic response spectrum was calculated using ARS Online and checked using the Caltrans Deterministic Spreadsheet (version dated February 21, 2012).

The probabilistic response spectrum was developed using ARS Online and compared with results from the 2009 USGS Interactive Deaggregation (Beta) website (USGS 2008) with V_{s30} = 1,340 ft/s (400 m/s) using the Caltrans Probabilistic Spreadsheet (version dated January 16, 2013).

The upper envelope of the deterministic and probabilistic spectral values determines the design response spectrum. The probabilistic spectral values were found to control the design response spectrum for the project site. The recommended acceleration and displacement design response spectra are presented graphically on Figure 8 and numerically on Figure 9.

5.3 GROUND SURFACE FAULT RUPTURE

Based on CGS (1991), a State of California active Earthquake Fault Zones (EFZ) is not present within or nearby the bridge site. As previously discussed in Section 4.6, the closest active fault that has been identified in the area of the proposed bridge is approximately 8 miles west of the site. Based on this data, the surface fault rupture hazard at the proposed site is considered very low.

5.4 LIQUEFACTION AND SEISMIC COMPACTION

Soil liquefaction is a phenomenon in which saturated, cohesionless soils lose stiffness and strength due to the build-up of excess pore water pressure during cyclic loading such as that induced by earthquakes. The primary factors affecting the liquefaction potential of a soil deposit are: 1) intensity and duration of earthquake shaking, 2) soil type and relative density, 3) overburden pressures, and 4) depth to groundwater. Soils most susceptible to liquefaction are saturated, loose sands, and low to non-plastic silts.

Based on the expected lack of significant groundwater and the predominance of dense sandstone (Mission Valley Formation) materials at the site, the liquefaction hazard at the site is expected to be nil. This should be confirmed in the final design through field exploration, laboratory testing and analysis.

Seismic compaction is a phenomenon in which loose, unsaturated sands tend to densify and settle during strong earthquake shaking. Our research into historical aerial photographs indicates that the residential subdivisions on both sides of SR-56 were constructed sometime around 2002 and 2003. Based on the standard of care and City of San Diego grading permit requirements in place during construction, it is anticipated the fill soils were compacted to a minimum of 90% relative compaction and loose native surficial soils were either removed or adequately compacted in-place prior to new fill placement. However, during the writing of this report no grading reports for these residential developments could be located. The condition of the fill will need to be verified as part of the planned geotechnical field investigation.

Based on the anticipated condition of the fill, we expect the seismic compaction hazard to be low to moderate. The sandstone materials present outside of the canyon fill have a low potential for seismic compaction.

5.5 SLOPE STABILITY

The north side of the project site is within a hillside area consisting of a manmade fill slope, and natural slopes. The south side appears to be comprised of a smaller fill slope and possible cut slopes. The existing natural slopes and cut slopes are comprised of the Mission Valley Formation. The existing slopes adjacent to the planned abutment areas have gradients of 2H:1V (or flatter) with heights on the order of 26 feet each. Evidence of instability in the existing slopes was not observed during the Kleinfelder site reconnaissance. The results of slope stability analyses for the abutment areas are presented in Section 6.1.

5.6 FLOODING AND SCOUR POTENTIAL

The flood hazard potential at the site was evaluated based on flood hazard maps available through the Federal Emergency Management Agency (FEMA) Map Service Center website. Based on review of FEMA Map No. 06073C1335G, flood hazard zones are not present along the bridge alignment. The proposed bridge will not cross over rivers, creeks, channels, or other water bodies. Therefore, the potential for scour is not considered a design issue.

5.7 SOIL CORROSIVITY POTENTIAL

Preliminary soil corrosivity screening was performed on six samples obtained from borings. The results of soil corrosivity are presented in Section 6.5.

6 CONCLUSIONS AND RECOMMENDATIONS

Geotechnical engineering conclusions and recommendations for the support of the structural elements associated of the proposed Torrey Meadows Drive Overcrossing are presented in the following sections. These recommendations are based on Kleinfelder's understanding of the project, and the results of Kleinfelder's field explorations and laboratory testing and professional judgment.

6.1 SLOPE STABILITY

6.1.1 Methodology

Limit equilibrium slope stability analyses were performed using the computer program Slope/W by Geo-Slope International (Version 8.12, 2012) for existing/permanent and temporary construction conditions that will be near Abutments 1 and 3. For our analyses it has been assumed that existing and permanent conditions will have essentially the same geometry and soil conditions.

Spencer's method of slices was used, which satisfies both moment and force equilibrium. The analysis employed circular and critical slip surface search routines. Slope stability analyses require assumptions, including development of soil strength parameters and geometry of subsurface conditions. These are developed based on results of field and laboratory investigations, review of existing published information, and previous experience in the site vicinity. The Mohr-Coulomb failure criteria were used to model the soil strengths.

Per Caltrans (2004), slopes should have a calculated static safety factor for temporary and long-term conditions in excess of 1.3 and 1.5, respectively. A minimum pseudo-static safety factor of 1.1 is also required.

Slope stability strength parameters are presented in Table 2. The results of slope stability analyses are described in the following sections of this report, presented in Table 3 and in Appendix E as Figures E-3 through E-14.

6.1.2 Abutment 1

The southerly Abutment 1 area has an existing slope approximately 26 feet high at a uniform inclination of about 2H:1V (Figure 7). The upper half of this slope consists of compacted fill soils. The lower half of the slope consists of an excavated cut into natural soils of the very dense Mission Valley Formation. No evidence of ground instability was observed during the field exploration phase of this investigation.

The slope stability analyses results for existing/permanent conditions indicate safety factors in excess of 1.5 and 1.1 for static and pseudo-static cases, respectively. For the pseudo-static case a seismic acceleration coefficient of 0.2 g was used.

It is anticipated that Abutment 1 will consist of a spread footing supported directly on the Mission Valley Formation. It is anticipated that the temporary excavation for construction in this area will consist extend approximately 15 feet below the existing ground surface. Analyses were performed for temporary slope inclinations of 1H:1V, 1½ H:1V, and 2H:1V. In all cases the calculated minimum safety factor is in excess of 1.3.

6.1.3 Abutment 3

The norther Abutment 3 area has an existing slope approximately 26 feet high at a maximum inclination of about 2½H:1V which consists of compacted fill soils in its entirety (Figure 7). The ground surface inclination decreases to about 3H:1V near the top and bottom of the slope. No evidence of ground instability was observed during the field exploration phase of this investigation.

The slope stability analyses results for existing/permanent conditions indicate safety factors in excess of 1.5 and 1.1 for static and pseudo-static cases, respectively. For the pseudo-static case a seismic acceleration coefficient of 0.2 g used.

It is anticipated that Abutment 3 will consist of a deep CIDH piers embedded into the Mission Valley Formation. It is anticipated that the temporary excavation for construction in this area will consist extend down approximately 15 feet below the existing ground surface. Analyses were performed for temporary slope inclinations of 1H:1V, 1½H:1V, and 2H:1V. In all cases the calculated minimum safety factor is in excess of 1.3.

Table 2. Summary of Soil Engineering Parameters Used in Slope Stability Analysis

GEOLOGIC UNIT	FRICTION ANGLE (DEGREES)	COHESION (PSF)	TOTAL UNIT WEIGHT (PCF)
Existing Fill (South Abutment 1)	32	200	115
Existing Fill (North Abutment 3)	36	400	130
Mission Valley Formation	34	600	125

Table 3. Results of Slope Stability Analysis

SLOPE AREA	EXISTING / PERMANENT CONDITIONS		TEMPORARY EXCAVATION (APPROX. 15 FEET DEEP)	
	STATIC SAFETY FACTOR	PSEUDO-STATIC SAFETY FACTOR	SLOPE INCLINATION (H:V)	STATIC SAFETY FACTOR
South Abutment 1 (entire slope)	3.25 (3.59)	2.09 (2.28)	1:1	1.78
			1½:1	2.18
			2:1	2.64
North Abutment 3	4.44	2.45	1:1	2.62
			1½:1	3.23
			2:1	3.75

6.2 FOUNDATION DESIGN RECOMMENDATIONS

6.2.1 General Considerations

The foundation recommendations provided in this section are based on the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, 6th Edition (2012) with amendments by Caltrans (2014c).

According to the Torrey Meadows Drive Overcrossing draft foundation plan prepared by T.Y. Lin International and dated October 24, 2014, the Torrey Meadows Drive Overcrossing will be supported on spread footings at Abutment 1 and Bents 2 L/R and CIDH piles at Abutment 3.

6.2.2 Abutment 1 and Bent 2 L/R Foundations

Abutment 1 and Bent 2 will be founded on undisturbed native Mission Valley Formation materials. The Strength and Service Limit design analysis for shallow foundations was completed per the AASHTO LRFD method. Resistance factors for shallow foundations were selected from Table 10.5.5.2.2-1 per the Caltrans Amendments. The footings can be designed for the bearing resistance listed in Table 4.

Table 4. Foundation Design Recommendations for Spread Footings (Abutment 1 and Bent 2 R/L)

SUPPORT LOCATION	FOOTING WIDTH (FT)		SERVICE PERMISSIBLE NET CONTACT STRESS (SETTLEMENT)	STRENGTH/ CONSTRUCTION FACTORED GROSS NOMINAL BEARING RESISTANCE	EXTREME EVENT FACTORED GROSS NOMINAL BEARING RESISTANCE
	L	B		$\phi_B = 0.45$	$\phi_B = 1.0$
Abutment 1	56	12	10 ksf (1 inch)	11 ksf	25 ksf
Bent 2 L and R	18	18	10 ksf (1 inch)	29 ksf	65 ksf
Abutment 3	CIDH Piles Recommended				

6.2.3 Abutment 3 Foundations

Cast-in-drilled-hole (CIDH) pile foundations are planned to be utilized at Abutment 3. The ground surface in the Abutment 3 area will not be changed. The following sections provide detailed recommendations.

6.2.3.1 *Vertical Load Resistance*

The strength and service limit site design analysis for drilled shafts was completed per the AASHTO LRFD method. Resistance factors for drilled shafts shall be selected from Table 10.5.5.2.4-1 per the California Amendments.

The factored shaft resistance, R_R, for strength limit state design was determined using the nominal shaft side resistance R_s, computed per Sections 10.8.3.5.2c and 10.8.3.5.2b, respectively, of the AASHTO LRFD Bridge Design Specifications – 6th edition, and the corresponding resistance factor, φ_{qs}, of 0.70 from Section 10.5.5.2.4 of the Caltrans Amendments. End bearing (or tip) resistance factor, φ_{qs}, of 0.50 was used from Section 10.5.5.2.4 of the Caltrans

Amendments. The soil parameters used for the vertical load resistance analyses are presented in Table 5.

The Strength Limit State axial resistance curve showing the factored axial resistance versus depth for a single CIDH pile is presented in Figures 10 and 11 for downward and uplift resistances, respectively. Settlements were estimated per Section 10.8.2.2 of AASHTO (2012) and the Caltrans (2014c) Amendments. Estimated total settlements of the abutment supported by CIDH piles due to the bridge dead and live load are estimated to be less than 1 inch. Static downdrag is not anticipated.

The Extreme Event 1 (earthquake case) axial resistance curves showing the axial resistance versus depth for a single CIDH pile are presented in Figures 12 and 13 for downward and uplift resistances, respectively. A resistance factor of 1.0 was used for both tension and compression per the Caltrans (2014c) Amendments. If the drilled shaft being designed is non-redundant, AASHTO recommends reducing the values of the resistance factors by 20 percent. Conversely, the structural engineer can increase the loads by 20 percent and then enter the provided axial resistance charts with the increased load. Based on the multiple CIDH piles located at the abutment, it is anticipated that the piles can be considered redundant. However, this should be evaluated by the bridge designer.

6.2.3.2 *Lateral Load Resistance*

Lateral load analysis and design of the piles will be performed by the structural designer using the geotechnical parameters presented in this report. Table 6 present recommended geotechnical parameters for static soil conditions for use within the LPILE soil-pile interaction computer program developed by Ensoft. Note that a soil resistance factor of 1.00 should be used in accordance with the Caltrans (2014b) Amendments (2014).

For closely spaced drilled shafts, the p-y curves developed using the recommended parameters should be adjusted using a P-multiplier, Pm, with the values determined per Section 10.7.2.4 of AASHTO (2012) and the Caltrans (2014b) Amendments.

Table 5. Drilled Shaft Static Axial Capacity Parameters

LAYER	SOIL TYPE	ELEVATION (FT)		UNIT WEIGHT Γ_T (PCF)	FRICTION ANGLE, Φ'	COHESION (PSF)	ADHESION FACTOR, A
		FROM	TO				
1	Sand (FHWA Spec.)	360	295	130	36	400	n/a
2	Sand (FHWA Spec.)	295	260	125	34	600	n/a

Notes: n/a = not applicable
Design groundwater was assumed to be at an elevation of +250 feet MSL.
Table pertains to pile design for Abutment 3 only.

Table 6. Soil Input Parameters for LPILE under Static Condition

LAYER	ELEVATION (FT)		P-Y CURVE	EFFECTIVE UNIT WEIGHT, Γ	FRICTION ANGLE, Φ'	UNDRAINED COHESION (PSF)	STRAIN FACTOR, ε_{50}	HORIZONTAL SUBGRADE REACTION MODULUS, K
	TOP	BOTT.		(PCF)	(DEG)			(PCI)
1	360	295	Sand (Reese)	130	36	n/a	n/a	90
2	295	260	Silt (cemented c-phi)	125	34	600	0.004	225

Notes: n/a = not applicable
Design groundwater was estimated to be at an elevation of +250 feet MSL.
Table pertains to pile design for Abutment 3 only.

6.2.3.3 *Estimated Fill Settlements*

Compacted fill soils typically increase in moisture and compress due to their own weight sometime during their lifetime. Experience has shown that the compression may be on the order of 0.2 percent of the fill thickness for granular soils and 0.5 percent of the fill thickness for clayey soils even when soils are compacted in accordance with local standards. Based on our experience with select fill materials that have been recommended for the project, these soils may undergo an ultimate compression on the order of 0.3 percent of the total fill depth. We estimate that compacted fills on the order of 65 feet thick will be subject to total long-term areal settlements of about 1.5 to 3 inches. Although some of this settlement has probably occurred because the fills were constructed several years ago, the remaining amount of settlement is still likely to be in excess of tolerable limits for the proposed bridge. CIDH pile foundation for Abutment 3 is therefore recommended. Excessive landscaping irrigation or leakages from tanks and pipes may contribute to increased settlements, hence routine active maintenance is recommended on any such system.

Competent formational materials at the Abutment 1 area are expected to have negligible settlement due to the placement of compacted fill soils.

6.3 RETAINING WALLS

This section presents design recommendations for the Caltrans Type 1 and Type 5 (possibly modified for special design conditions) retaining walls behind the abutments.

6.3.1 Lateral Earth Pressures

Standard Caltrans Type 1 and Type 5 retaining walls are designed with the following parameters:

- Total unit weight: 120 pcf
- Internal friction angle: 34°
- Horizontal seismic coefficient: 0.2 g
- Vertical seismic coefficient: 0.0 g
- Live load surcharge (horizontal component): 240 psf

Lateral earth pressures for Caltrans Type 1 and Type 5 retaining walls provided below are appropriate when new Caltrans Structure Backfill fill is present in the active zone. Retaining walls backfilled with Caltrans Structure Backfill should be designed to resist an active equivalent fluid earth pressure of 35 pcf for level backfill conditions (K_a=0.25). The active equivalent earth pressure assumes the wall is free to rotate at least 0.002 times the height of the wall to mobilize the active condition. Walls restrained against movement at the top should be designed for an at-rest equivalent fluid earth pressure of 55 pcf for level backfill conditions (K_0=0.45). For passive resistance of the structure, a nominal equivalent fluid weight of 500 pcf (K_p = 4.2) can be used 2 feet below ground surface at wall line. An allowable base friction value of 0.55 for soil against concrete can also be used in conjunction with the passive pressure.

Surcharge pressures (dead or live) should be added to the lateral pressures where such loads (e.g., traffic) may occur adjacent to the wall and should be estimated by multiplying the surcharge load by a coefficient of 0.25 or 0.45 for active (K_a) or at-rest

(K_0) conditions, respectively. As a minimum, we recommend that a traffic surcharge equivalent to 2 feet of soil backfill be assumed as a surcharge for the at-rest condition. For this condition a pressure of 120 psf may be assumed to act as a uniform horizontal pressure over the entire height of the retaining walls behind the abutments, H.

Seismic wall pressures are estimated using the Mononobe-Okabe method (AASHTO, 2012). The Design Earthquake peak ground acceleration (PGA) value of 0.33g was calculated for this site using Caltrans ARS Online (2013b). Based on the design peak horizontal ground acceleration of 0.33g, the resultant seismic force (in pounds) for each linear foot of wall can be estimated as $7.0*H^2$ within fill soils, where H is the height of the wall (in feet) above its base. The resultant seismic force acts at H/3 above the wall base. The seismic earth pressure has an upright triangular distribution. This dynamic incremental earth pressure should be added to the static earth pressure.

6.3.2 Drainage

Recommendations for the lateral earth pressures assume that walls have adequate drainage provisions to prevent the buildup of hydrostatic pressures in the soil backfill. The drainage system may be designed in accordance with Caltrans Standard Plan BO 3, Detail 3-1. Pervious backfill material shall consist of gravel, crushed gravel, crushed rock, natural sands, manufactured sand, or combinations thereof. Pervious backfill (other than sacked material at wall drain outlets) shall conform to the grading requirements in Section 19 of the Caltrans Standard Specifications. Sacked pervious backfill at wall drain outlets shall conform to the grading for 1½” x ¾” primary aggregate size specified in Section 90 of Caltrans Standard Specifications (Caltrans, 2010c). As an alternate, a geocomposite drain, as shown in Bridge Design Details page 6-22, may be used in lieu of the pervious backfill.

6.4 EARTHWORK AND GRADING

6.4.1 Soil Characteristics

Based on the field and laboratory data, the soils within the anticipated excavation depths generally consist of compacted fill soils and very dense and cemented soils of the Mission Valley Formation as described in Section 4.7.2. The excavation of these soils should be possible using moderate to strong effort with conventional heavy-duty grading and excavating equipment. Nevertheless, due to the cemented nature of the Mission Valley Formation, difficult excavation may be encountered during the CIDH excavation.

6.4.2 Site Preparation

Site preparation should be performed in accordance with Section 16 and 19 of the Caltrans Standard Specifications (Caltrans 2010c).

6.4.3 Excavation Sloping and Shoring

Temporary trench excavations should be laid back or shored in accordance with the U.S. Occupational Safety and Health Administration (OSHA), Caltrans, and any other applicable regulations. For planning purposes, fill soils can be considered OSHA Type C soil and the Mission Valley Formation OSHA Type B. The actual OSHA soil type should be determined by the contractor’s responsible person in the field at the time of construction. Type C soils should have 1½H:1V temporary construction excavation slopes. Type B soils should have 1:1 temporary construction excavation slopes. If stability of an excavation becomes questionable during construction, the excavation should be evaluated promptly by the geotechnical engineer.

The soil classifications presented in this report may be used for the planning of excavations and trench slopes in accordance with OSHA requirements or for the design of shoring and/or the use of trench boxes. Construction personnel should be aware that soil conditions may change rapidly if soil moisture conditions change or if soils that have been disturbed by previous excavations are encountered. Measures should be taken to protect construction personnel from raveling of trench sidewalls. If sloughing or free water is encountered, it may be necessary to reduce trench slopes beyond OSHA requirements or provide shoring. All excavations should comply with current OSHA safety requirements.

No surcharge loads, such as the weight of heavy equipment, should be placed within 10 feet from the top of excavations. Care should be taken during excavation to avoid removing support for any existing improvements, such as foundations, pavements, and buried utilities.

The contractor is responsible for selecting, designing, and constructing temporary shoring systems that adequately protect the existing structures, utilities, and other improvements. The contractor should be required to submit shoring plans to the geotechnical consultant and bridge engineer for review and comment at least two weeks prior to the beginning of construction. The shoring plans should clearly define construction sequencing, particularly the sequence of excavation and tieback installation, if needed.

6.4.4 Fills and Backfills

Any areas of loose or yielding soils should be overexcavated and replaced with compacted Structural Backfill in accordance with Caltrans Standard Specifications Section 19. Any soils that cannot be compacted, or are otherwise unsuitable for the planned use, should be excavated and disposed of from the project site. The exposed surface should be scarified and compacted to the specified density before placement of new fill. New fill placed on or adjacent to existing slopes should be properly benched into the existing fill in accordance with Caltrans Standard Specifications Section 19. Footing excavations for Abutment 1 and Bent 2 are intended to expose Mission Valley Formation. This formation should be undisturbed during excavation below the proposed footing. The geotechnical engineer should be called to verify the complete exposure of the formation within the footing excavations to verify compliance with design assumptions.

All earthwork should be performed in accordance with Caltrans Standard Specifications Section 19. All materials to be placed as fill should be free of vegetation, organics, debris, and other deleterious materials. All fill placed around foundations and behind walls should be placed in thin loose lifts, moisture-conditioned, and compacted to Caltrans Standard Specifications.

Embankments within 150 feet of bridge abutments should be considered structure approach fills and should conform to the Caltrans Standard Specifications as such. Materials with a dimension greater than 3 inches should not be used in structure approach fills. Abutment backfill shall be structural backfill according to Caltrans standard specifications. Expansive soils, defined as soils with Expansion Index greater than 50 and/or soils with Sand Equivalent less than 20, should be excluded from the bridge abutments as required by Caltrans guidelines. Expansion Index should be determined in accordance with ASTM D 4829. Sand Equivalent should be determined in accordance with California Test Method 217. Fills should be compacted to meet Caltrans specifications.

6.5 SOIL CORROSIVITY

Preliminary soil corrosivity screening on six samples obtained from borings to aid in the evaluation of attack to concrete and ferrous metals was performed. Laboratory test results for pH, minimum electrical resistivity, and soluble chloride and sulfate content are presented in Table 7 and included in Appendix C.

Table 7. Soil Corrosivity Test Results

BORING	DEPTH (FEET)	PH	SULFATE (PPM)	CHLORIDE (PPM)	MINIMUM RESISTIVITY (OHM-CM)
A-14-003	3.5	8.4	120	260	500
A-14-004	2.0	8.4	30	32	1100
A-14-005	2.5	8.6	150	160	460
A-14-005	66.5	8.0	350	110	420
A-14-006	13.5	8.8	120	420	350
A-14-006	76.5	7.4	150	1340	250

For reference, Caltrans (2012d) considers a site to be corrosive if one or more of the following conditions exist for the representative soil samples taken at the site: chloride concentration is 500 parts per million (ppm) or greater, sulfate concentration is 2,000 ppm or greater, or the pH is 5.5 or less.

With the exception of the soil sample from Boring A-14-006 at a depth of 76.5 feet in the Mission Valley Formation, the soils at the site may be considered non-corrosive with respect to sulfate and chloride content. The subject exception samples indicated a chloride content of 1,340 ppm which may be considered to have moderate attack potential.

The minimum resistivity tests performed indicated that the soil is considered to be corrosive to severely corrosive to buried unprotected metal objects. A commonly accepted correlation between soil resistivity and corrosivity towards unprotected ferrous metals (National Association of Corrosion Engineers, 1984) is provided in Table 8.

Table 8. Corrosion Potential based on Minimum Resistivity (NACE, 1984)

MINIMUM RESISTIVITY (OHM-CM)	CORROSION POTENTIAL
0 to 1,000	Severely Corrosive
1,000 to 2,000	Corrosive
2,000 to 10,000	Moderately Corrosive
Over 10,000	Mildly Corrosive

The preliminary corrosion tests are only an indicator of potential soil corrosivity for the sample tested. It is recommended that the corrosivity test results be reviewed and evaluated by the project designers considering the improvements and project lifespan requirements. Kleinfelder's scope-of-work does not include corrosion engineering and the purpose of the tests is only to provide a preliminary screening. Additional sampling and testing may be performed after completion of grading for the site improvements. A qualified corrosion engineer should be contacted to for detailed evaluation of corrosion potential with respect to construction materials at this site and review the proposed design.

7 LIMITATIONS

This report has been prepared for the exclusive use of T.Y. Lin International, and the project design team for specific application to the proposed Torrey Meadows Drive Overcrossing bridge project. It is intended solely for their use in the design of the project as described herein. It may not contain sufficient information for other uses or purposes of other parties. This report is presented with the understanding that a design-level Structure Foundation Report will be prepared for the subject project in the future.

The findings, conclusions, and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of the geotechnical profession practicing under similar conditions in the same geographic vicinity and at the time the services were performed. No warranty or guarantee, express or implied, is made. If any change (i.e., structure type, location, etc.) is implemented which materially alters the project, additional geotechnical services may be required, which could include revisions to the geotechnical recommendations presented herein.

Hazardous materials and solid waste evaluations performed by Kleinfelder Inc. (Kleinfelder) for this project are to be summarized in separate reports. Kleinfelder will assume no responsibility or liability whatsoever for any claim, damage, or injury which results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

This report may be used only by T.Y. Lin International, and the project design team, and only for the purposes stated within a reasonable time from its issuance, but in no event later than two years from the date of the report. Land or facility use, on and off-site conditions, regulations, design criteria, procedures, or other factors may change over time, which may require additional work. Any party other than the client who wishes to use this report shall notify Kleinfelder of such intended use. Based on the intended use of the report, Kleinfelder may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Kleinfelder from any liability resulting from the use of this report by any unauthorized party and client agrees to defend, indemnify, and hold Kleinfelder harmless from any claim or liability associated with such unauthorized use or non-compliance.

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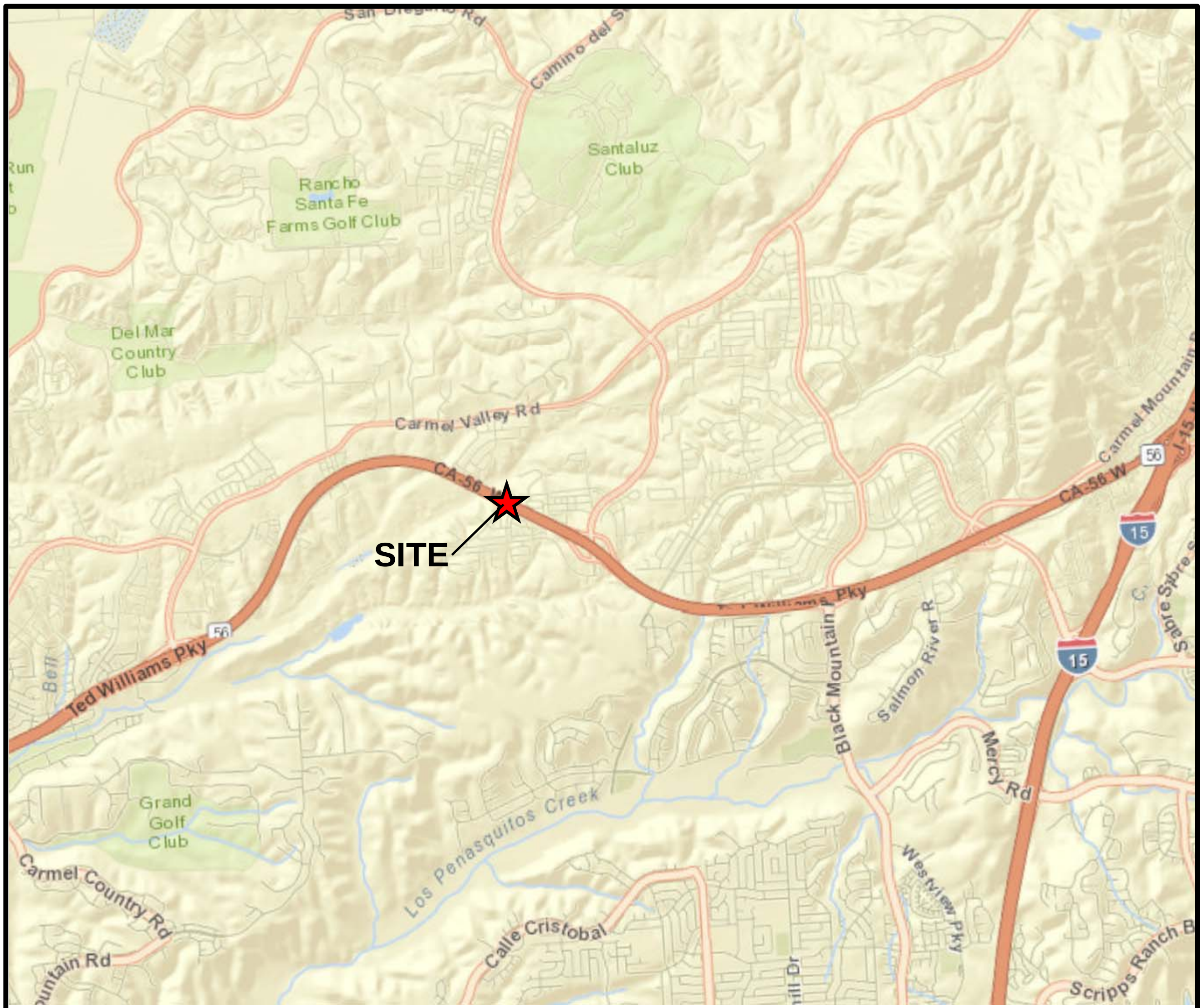
FIGURES



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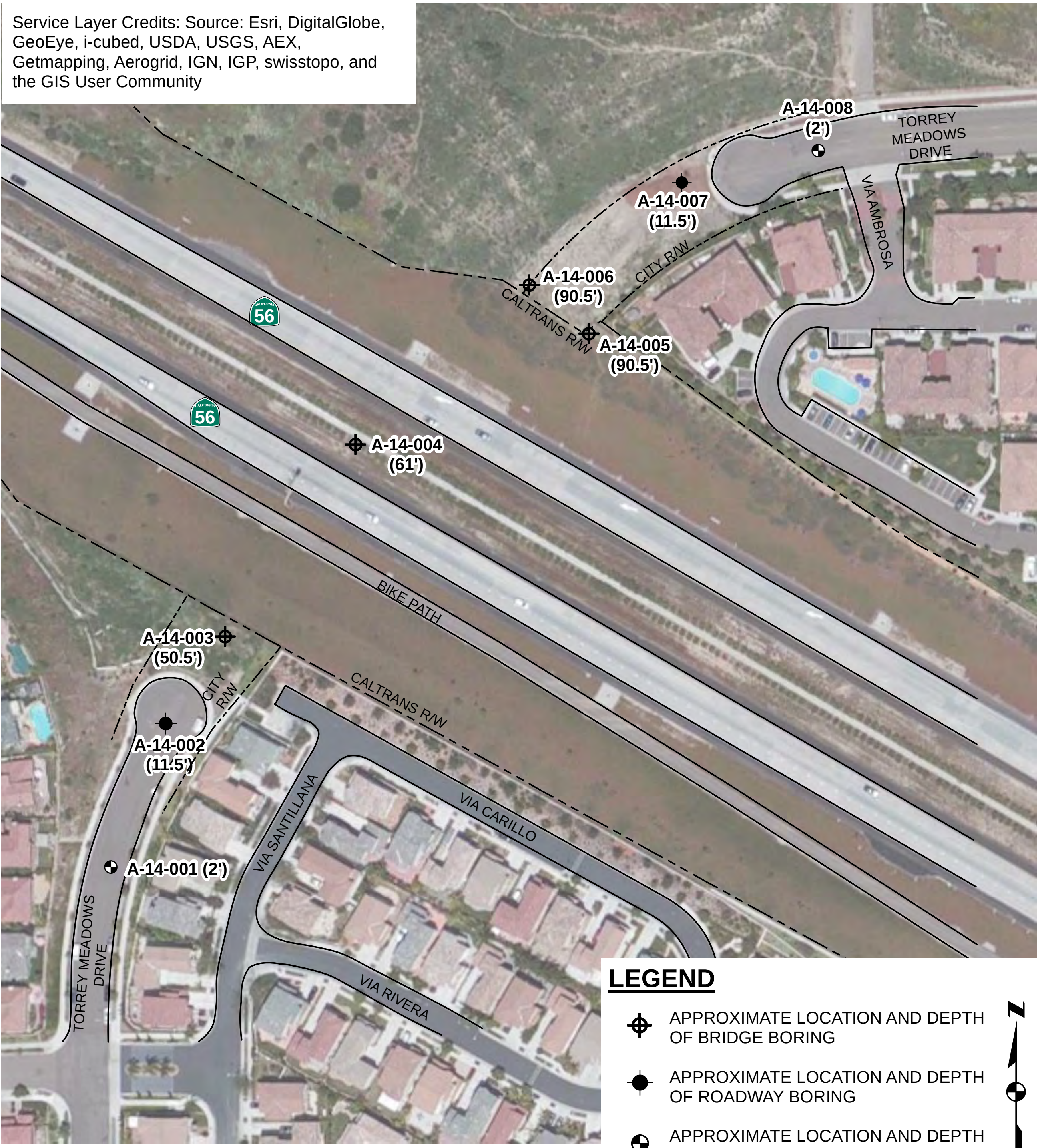
SITE VICINITY MAP

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

1



LEGEND

⌖ APPROXIMATE LOCATION AND DEPTH OF BRIDGE BORING

● APPROXIMATE LOCATION AND DEPTH OF ROADWAY BORING

◐ APPROXIMATE LOCATION AND DEPTH OF PAVEMENT CORE

N

150 75 0 150
Feet

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SITE PLAN
(EXISTING CONDITIONS)

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
2

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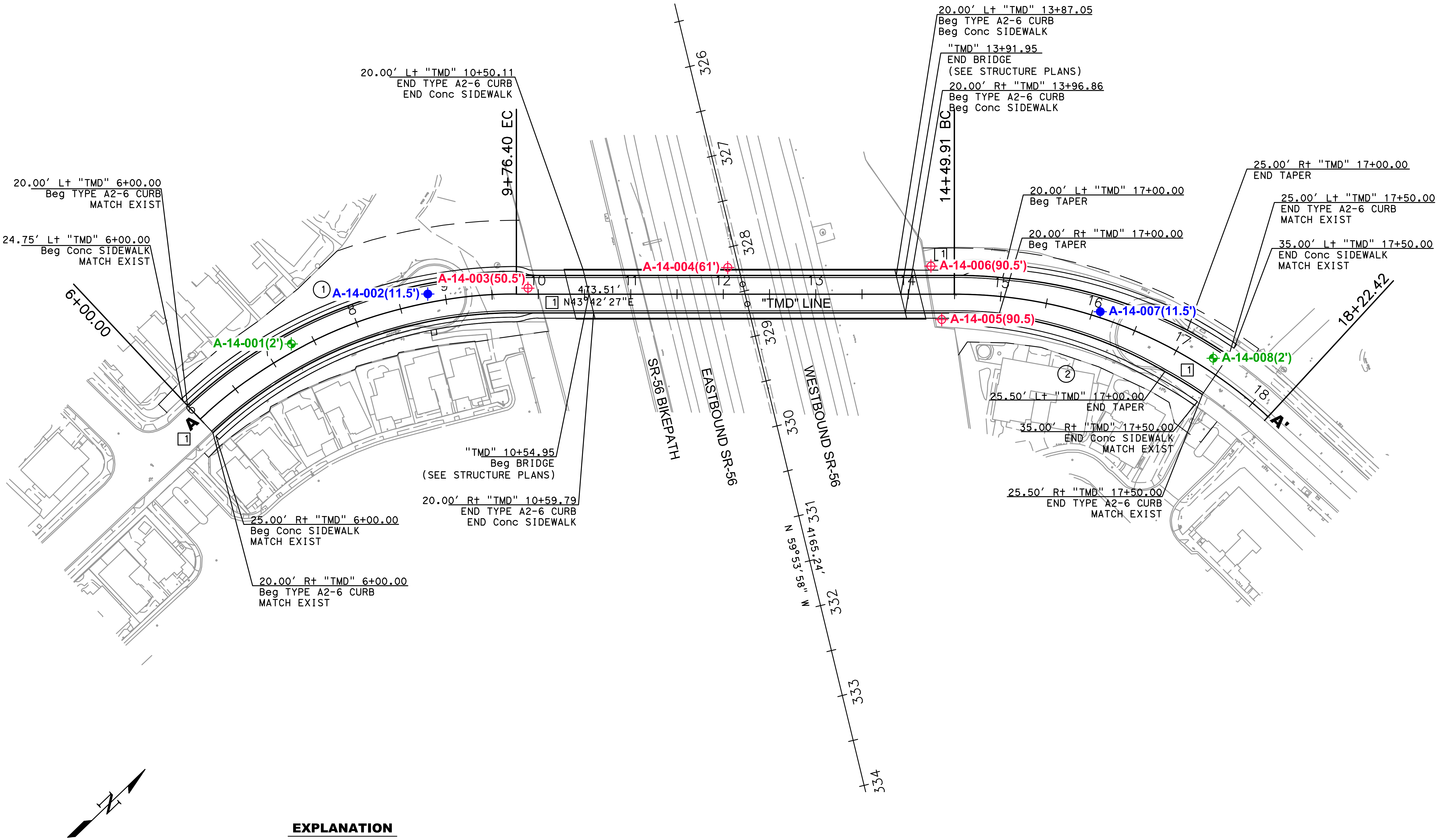

100 50 0 100

APPROXIMATE SCALE (feet)

EXPLANATION

⊕	APPROXIMATE LOCATION AND DEPTH OF BRIDGE BORING
●	APPROXIMATE LOCATION AND DEPTH OF ROADWAY BORING
⊕	APPROXIMATE LOCATION AND DEPTH OF PAVEMENT CORE
A ⊢⊣ A'	APPROXIMATE CROSS-SECTION LOCATION (FIGURE 6)

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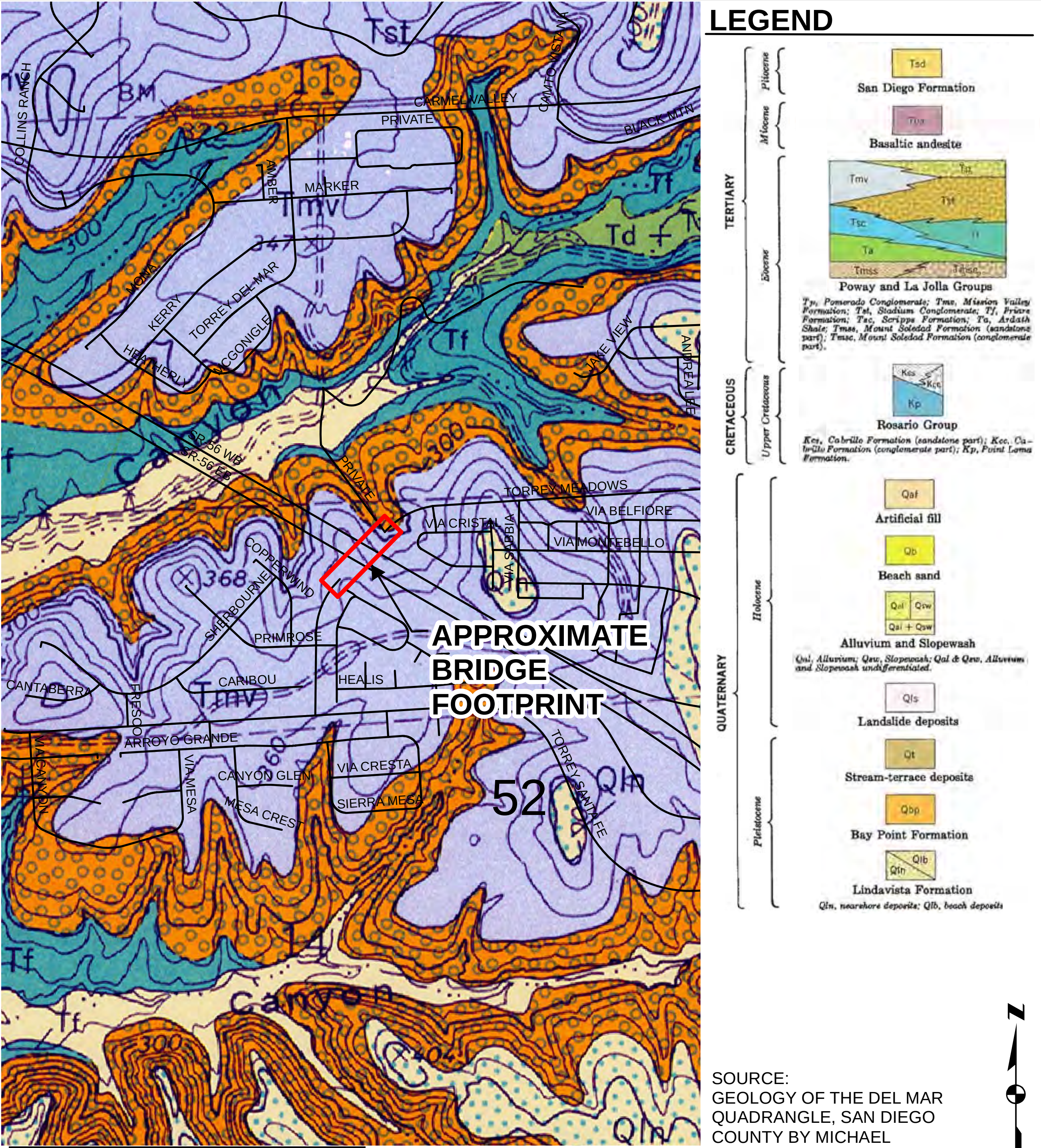
BORING LOCATION PLAN (PROPOSED IMPROVEMENTS)

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

3



SOURCE:
GEOLOGY OF THE DEL MAR QUADRANGLE, SAN DIEGO COUNTY BY MICHAEL P. KENNEDY, 1975

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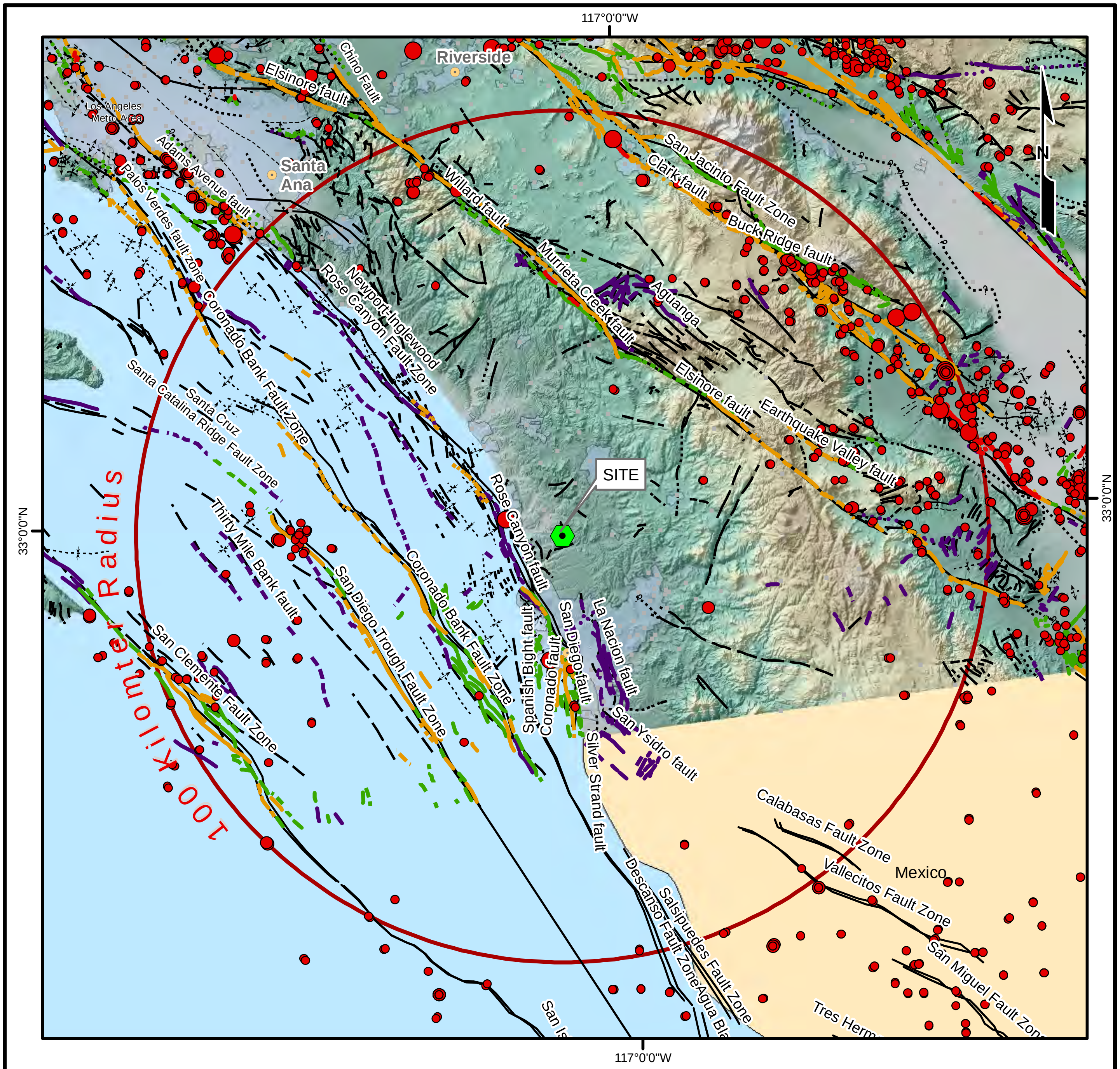
FILE NAME: 20151065_Geo.MXD

REGIONAL GEOLOGIC MAP

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
4

Path: J:_clients\TY_Lin\20151065.001A\20151065_Geo.mxd



Faulting Legend

Quaternary Faults (Bryant, 2005; USGS, 2009)

Historic displacement (< 200 years)
- Mapped Fault Location
- Dashed were Approximated
- Concealed

Holocene displacement (< 11,000 years)
- Mapped Fault Location
- Dashed were Approximated
- Concealed

Late Quaternary displacement (< 750,000 years)
- Mapped Fault Location
- Dashed were Approximated
- Concealed

Quaternary displacement (< 1,600,000 years)
- Mapped Fault Location
- Dashed were Approximated
- Concealed

Pre-Quaternary Geologic Structures (CGS, 2000)
- fault, approx. located
- fault, approx. located, queried
- fault, certain
- fault, concealed
- fault, concealed, queried
- fault, inferred, queried

ANSS Earthquakes

Magnitude
- ● 4.0 - 4.9
- ● 5.0 - 5.9
- ● 6.0 - 6.9
- ● 7.0 - 7.9
- ● 8.0 - 8.9

35 17.5 0 35
Kilometers

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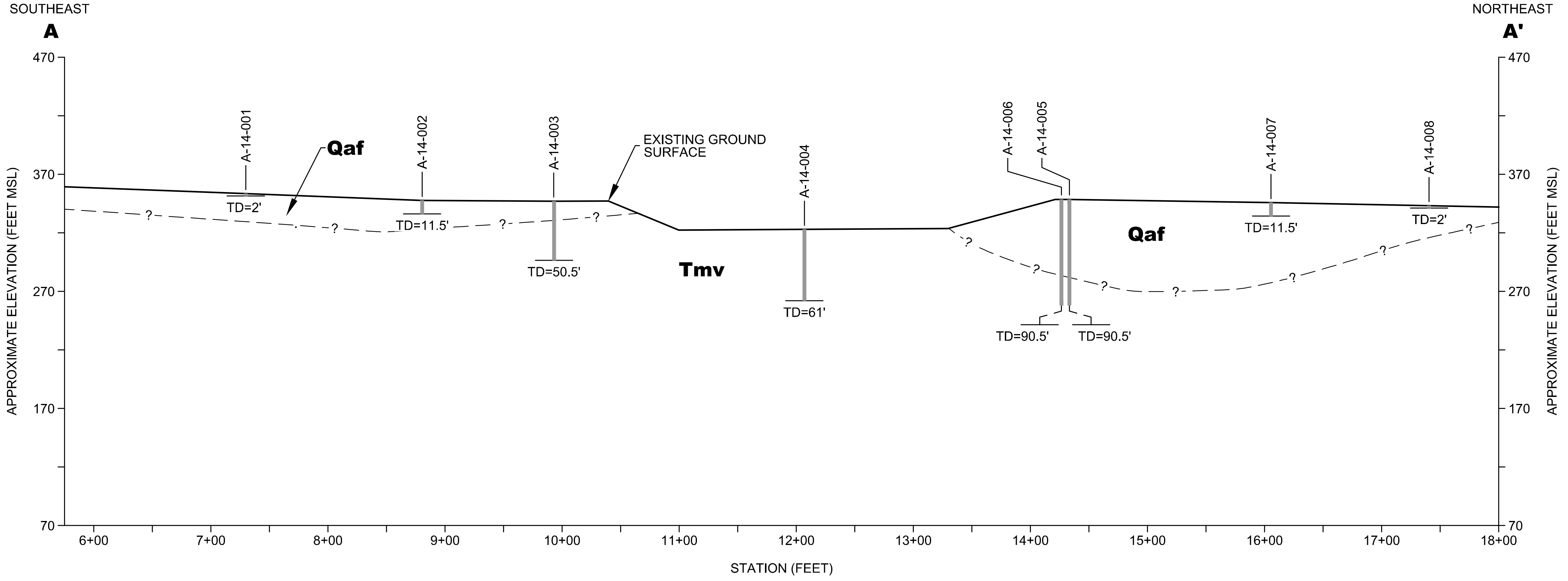
Bright People. Right Solutions.
www.kleinfelder.com

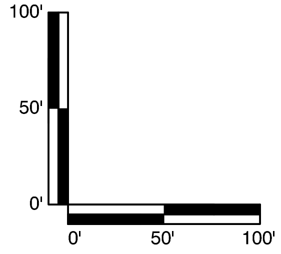
PROJECT NO.	20151065
DRAWN:	11/7/2014
DRAWN BY:	NP
CHECKED BY:	EK
FILE NAME:	20151065.MXD

REGIONAL FAULT MAP AND EARTHQUAKE EPICENTERS (1800 - APRIL 2014)

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56 POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
5





VERTICAL SCALE: 1" = 100'
HORIZONTAL SCALE: 1" = 100'

EXPLANATION

A-14-008	APPROXIMATE BORING ELEVATION
TD=90.5'	APPROXIMATE TEST DEPTH AND LENGTH OF BORING
—?—?—	APPROXIMATE LOCATION OF GEOLOGIC CONTACT
Qaf	ARTIFICIAL FILL
Tmv	MISSION VALLEY FORMATION

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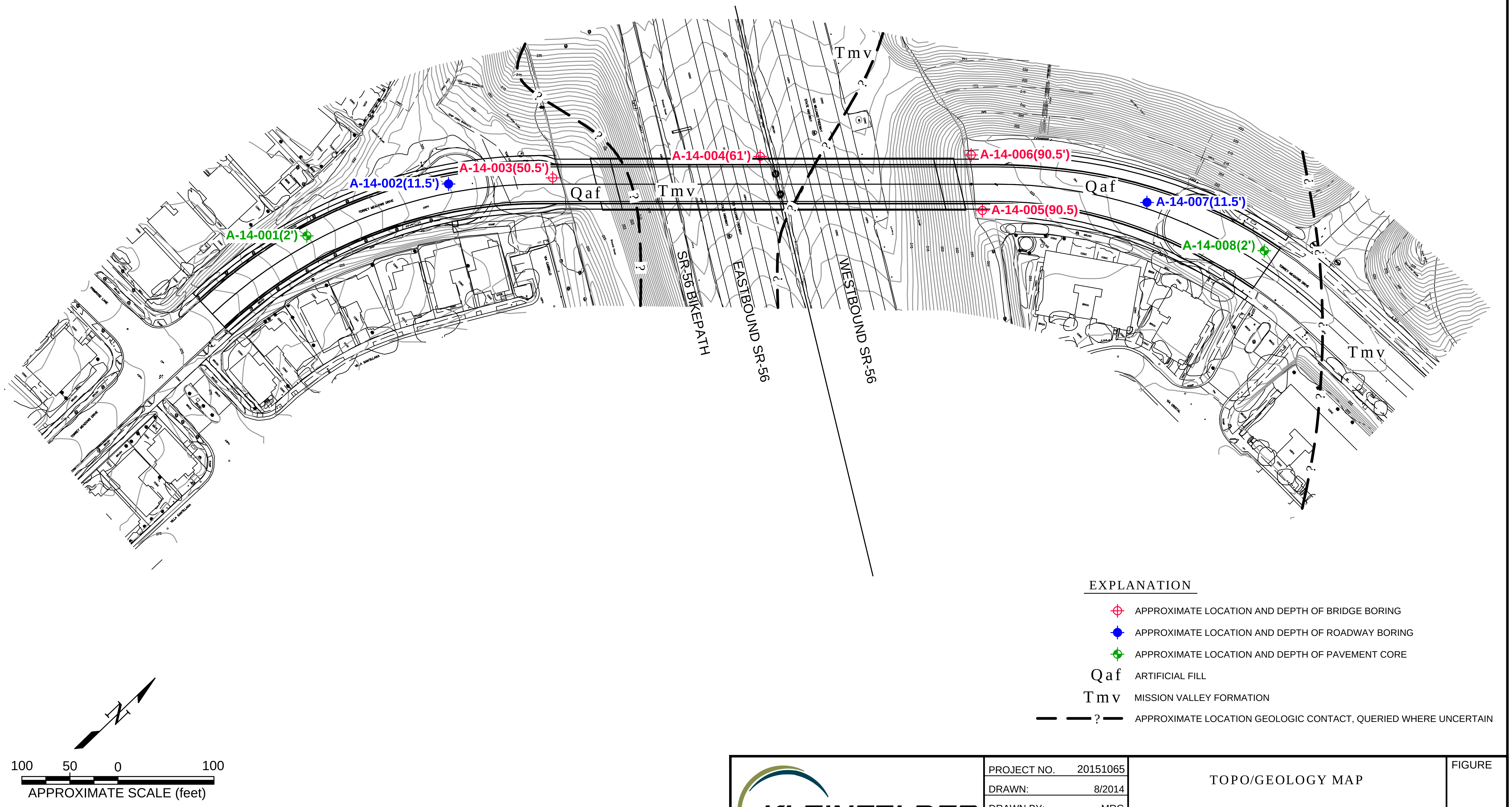
PROJECT NO.	20151065
DRAWN:	8/2014
DRAWN BY:	MRG
CHECKED BY:	EK
FILE NAME:	20151065p6_CS-A.dwg

CROSS-SECTION A-A'

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
6

PLOTTED: 07 Nov 2014, 10:02am, dfahney
CAD FILE: J:_clients\TY_Lin\20151065.001A\TorreyMdwsDr-OC_8-2014\ LAYOUT: 7
ATTACHED IMAGES: Images: td_Plate6_bottom.jpg Images: td_Plate6_top.jpg Images: td_Plate7_1of2.jpg Images: td_Plate7_2of2.jpg
ATTACHED XREFS:
LONG BEACH, CA



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PROJECT NO.	20151065
DRAWN:	8/2014
DRAWN BY:	MRG
CHECKED BY:	EK
FILE NAME:	20151065p7_TM.dwg

TOPO/GEOLOGY MAP

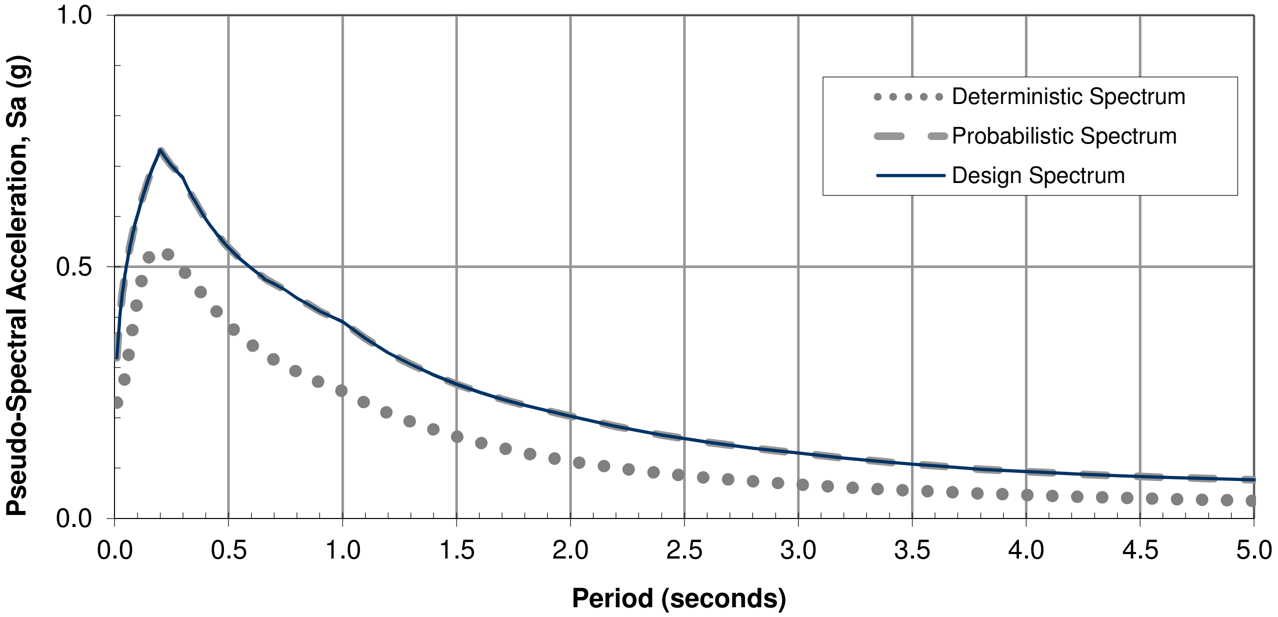
TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

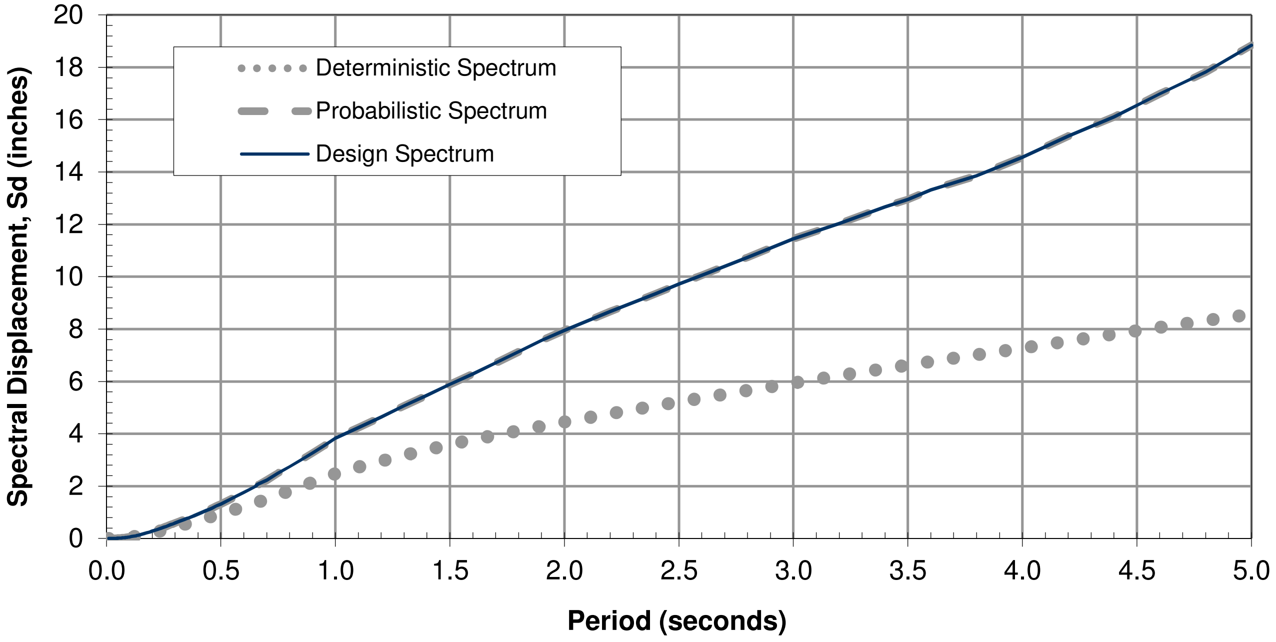
FIGURE
7

ATTACHED IMAGES:
ATTACHED XREFS: XRef: 1118TMD_Civil3D: XRef: 1118_aa05
LONG BEACH, CA CAD FILE: J:_clients\TY_Lin\20151065.001A\TorreyMdwsDr-OC_8-2014\ LAYOUT: Layout1 PLOTTED: 07 Nov 2014, 3:24pm, jpatay

SITE DATA

Latitude (degrees):	32.9628	Shear Wave Velocity, V_{s30}:	400 m/s
Longitude (degrees):	-117.1604	Depth to Vs = 1.0 km/s, $Z_{1.0}$:	NA
		Depth to Vs = 2.5 km/s, $Z_{2.5}$:	NA





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DESIGNED BY: EK	DATE 11/06/14	**PRELIMINARY DESIGN** **CALTRANS ARS CURVES**	FIGURE
DRAWN: EK	11/6/14		
CHECKED BY:		TORREY MEADOWS DRIVE OVERCROSSING AT SR-56 POST MILE 5.6, DISTRICT 11 SAN DIEGO, CALIFORNIA	**8**
T.Y. Lin International			

DESIGN ARS CURVE ORDINATES

Period (s)	Sa (g)	Sd (inches)
0.010	0.319	0.000
0.020	0.386	0.002
0.022	0.397	0.002
0.025	0.411	0.003
0.029	0.428	0.004
0.030	0.432	0.004
0.032	0.440	0.004
0.035	0.451	0.005
0.036	0.454	0.006
0.040	0.468	0.007
0.042	0.474	0.008
0.044	0.480	0.009
0.045	0.483	0.010
0.046	0.486	0.010
0.048	0.492	0.011
0.050	0.498	0.012
0.055	0.511	0.015
0.060	0.523	0.018
0.065	0.535	0.022
0.067	0.540	0.024
0.070	0.546	0.026
0.075	0.557	0.031
0.080	0.567	0.036
0.085	0.576	0.041
0.090	0.586	0.046
0.095	0.594	0.052
0.100	0.603	0.059
0.110	0.619	0.073
0.120	0.635	0.089
0.130	0.649	0.107
0.133	0.653	0.113
0.140	0.663	0.127
0.150	0.676	0.149
0.160	0.688	0.172
0.170	0.700	0.198
0.180	0.711	0.225
0.190	0.722	0.255
0.200	0.732	0.287
0.220	0.719	0.341
0.240	0.707	0.399
0.250	0.701	0.429
0.260	0.696	0.461
0.280	0.686	0.526
0.290	0.681	0.561
0.300	0.677	0.596
0.320	0.658	0.659
0.340	0.640	0.724
0.360	0.624	0.792
0.380	0.609	0.861
0.400	0.595	0.932
0.420	0.582	1.005
0.440	0.570	1.080
0.450	0.564	1.118
0.460	0.559	1.158
0.480	0.548	1.236
0.500	0.538	1.316
0.550	0.516	1.528
0.600	0.497	1.751
0.650	0.480	1.985
0.667	0.475	2.068
0.700	0.466	2.235
0.750	0.454	2.500
0.800	0.438	2.744
0.850	0.425	3.005
0.900	0.412	3.266
0.950	0.401	3.542
1.000	0.391	3.827
1.100	0.358	4.240
1.200	0.329	4.637
1.300	0.306	5.062
1.400	0.285	5.467
1.500	0.267	5.880
1.600	0.251	6.289
1.700	0.237	6.704
1.800	0.225	7.135
1.900	0.214	7.561
2.000	0.203	7.948
2.200	0.183	8.669
2.400	0.166	9.359
2.500	0.159	9.726
2.600	0.152	10.057
2.800	0.140	10.743
3.000	0.130	11.452
3.200	0.120	12.027
3.400	0.112	12.672
3.500	0.108	12.949
3.600	0.105	13.319
3.800	0.098	13.851
4.000	0.093	14.564
4.200	0.089	15.366
4.400	0.085	16.107
4.600	0.082	16.983
4.800	0.079	17.815
5.000	0.077	18.841

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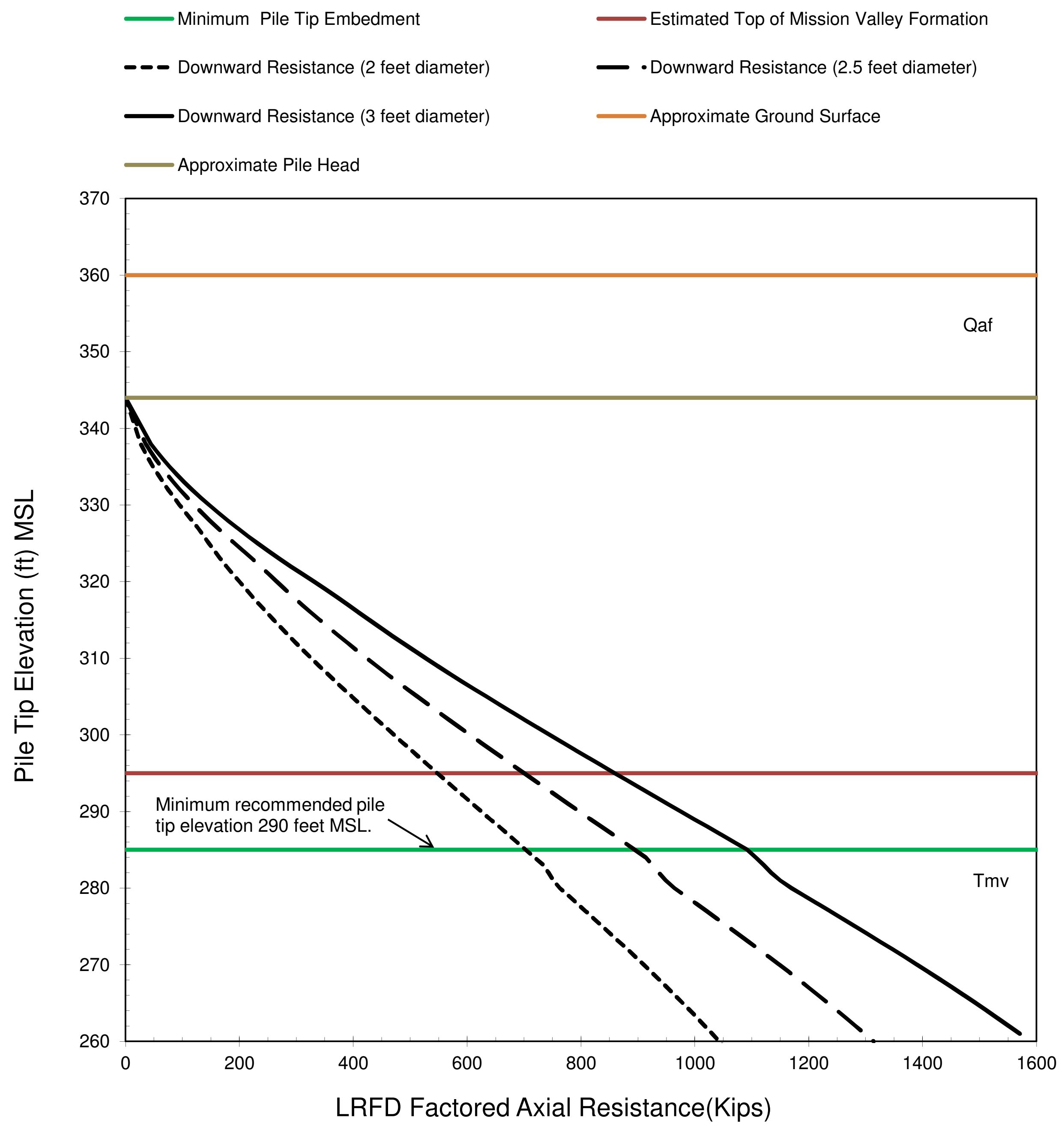
DESIGNED BY: EK
DATE 11/06/14
DRAWN: EK
11/6/14
CHECKED BY:
T.Y. Lin International

PRELIMINARY DESIGN
CALTRANS ARS TABLE

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
9



NOTES:

1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 0.5 and 0.7 used for end bearing and side friction, respectively.

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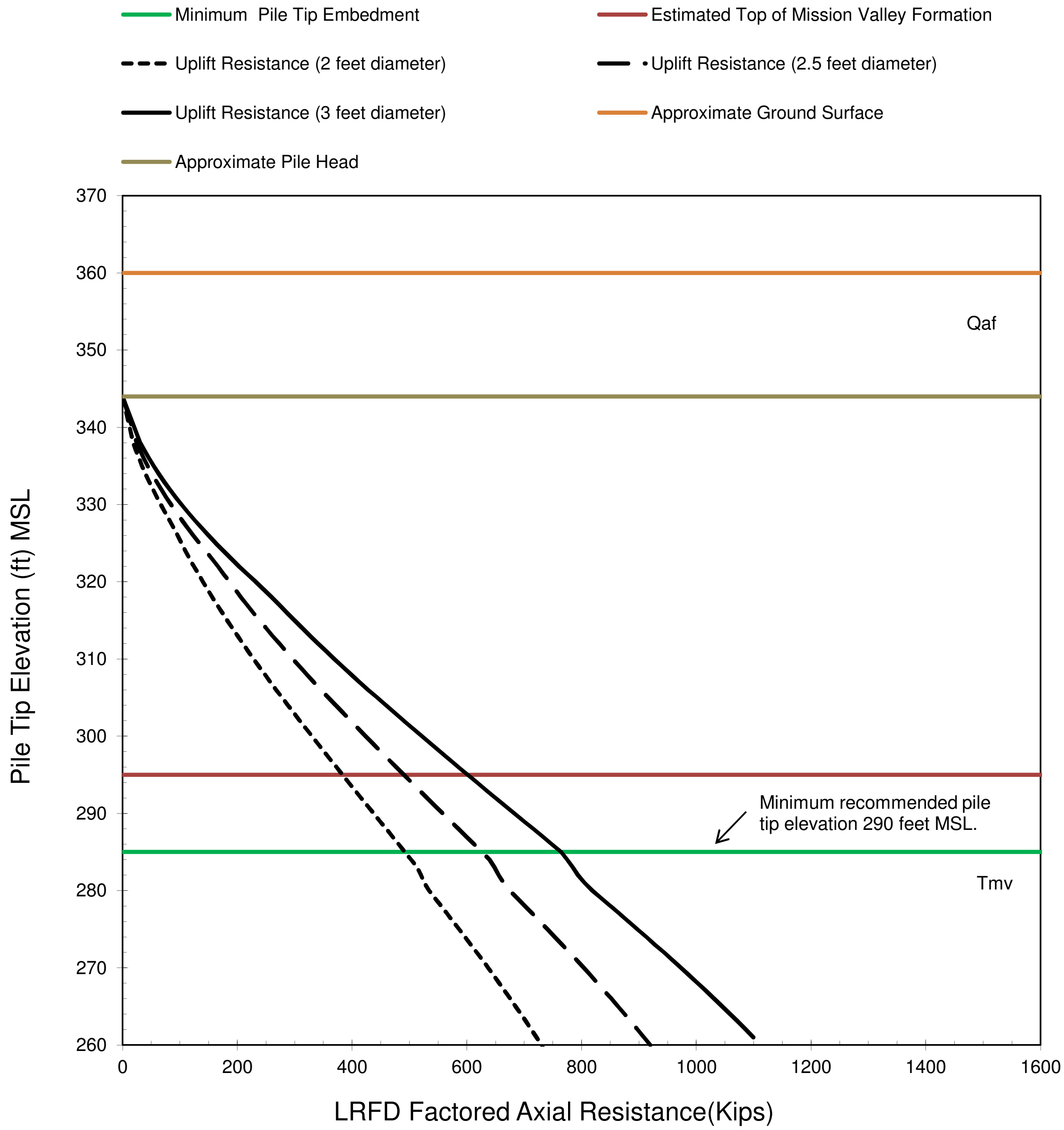
Project Number:	20151065
Date:	11/1/2014
Entry By:	EK
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
STRENGTH LIMIT STATE
ABUTMENT 3 - DOWNWARD

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

10



Minimum recommended pile tip elevation 290 feet MSL.

NOTES:
1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 0.5 and 0.7 used for end bearing and side friction, respectively.

KLEINFELDER
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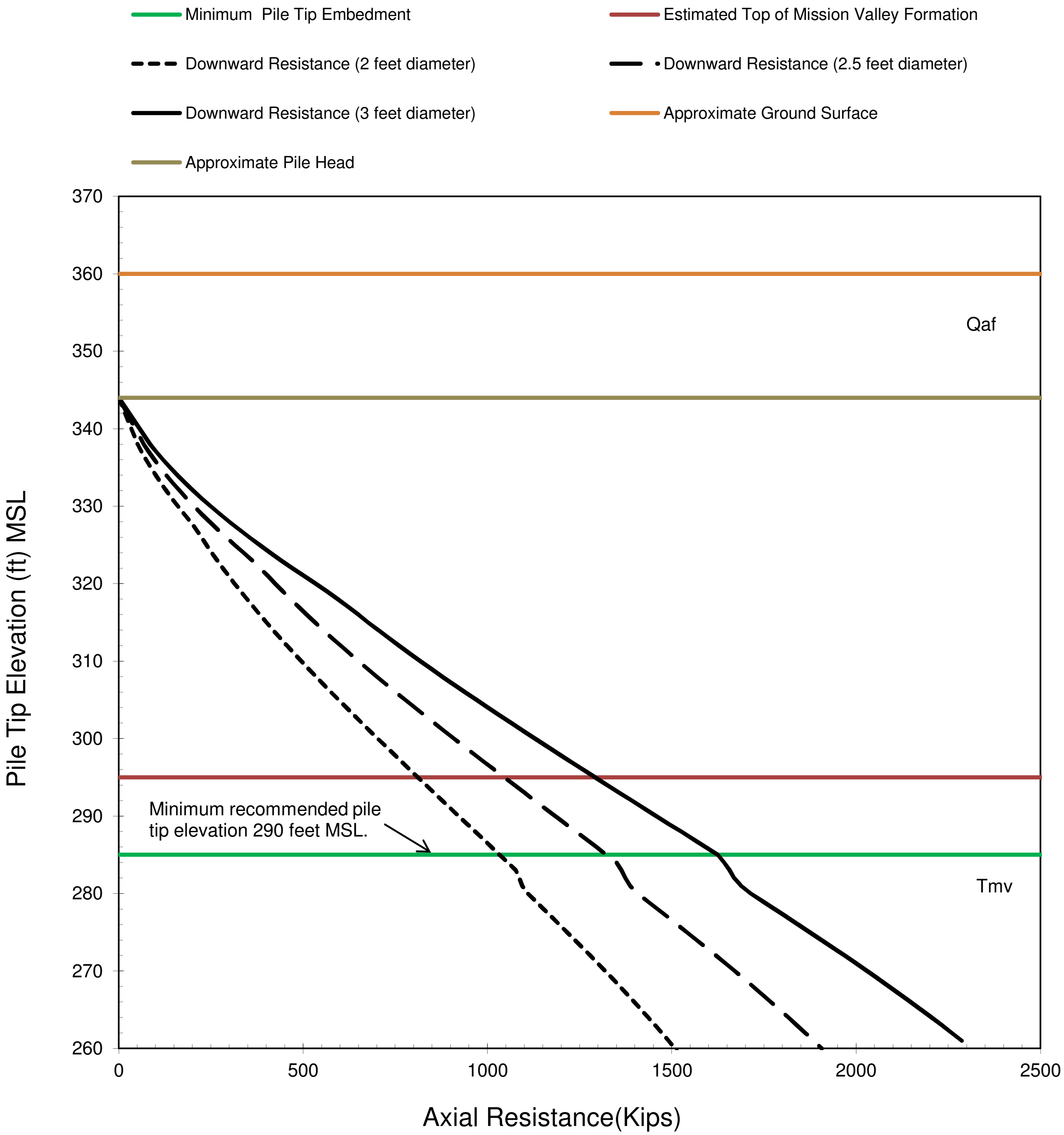
Project Number:	20151065
Date:	11/1/2014
Entry By:	EK
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
STRENGTH LIMIT STATE
ABUTMENT 3 - UPLIFT
TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
11



NOTES:
1. The resistance curves represent nominal (unfactored) axial resistance for single diameter CIDH piles
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 1.0 used for both end bearing and side friction.

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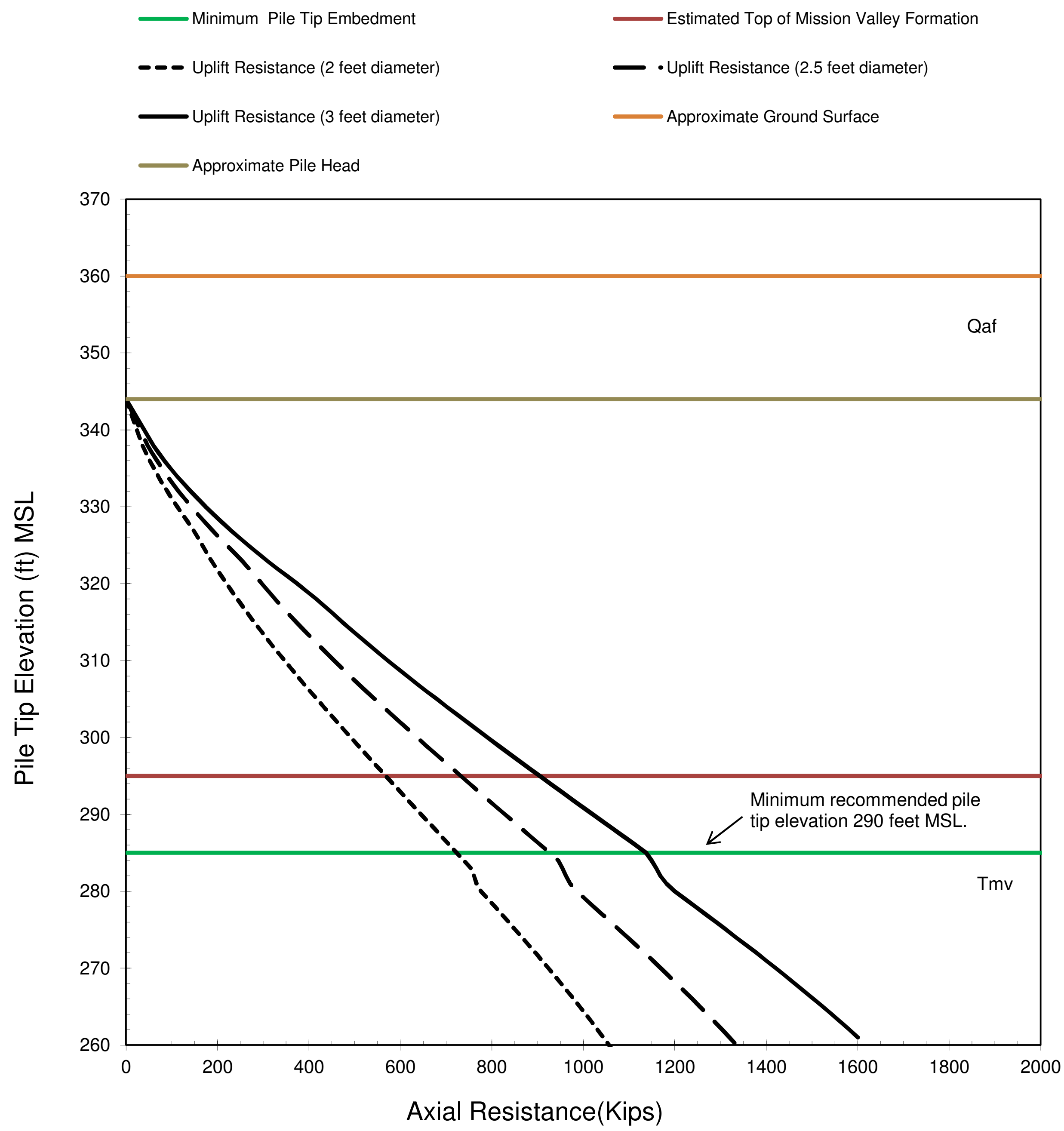
Project Number:	20151065
Date:	11/1/2014
Entry By:	EK
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
EXTREME EVENT CASE
ABUTMENT 3 - DOWNWARD

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

12



NOTES:

1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 1.0 used for both end bearing and side friction.

KLEINFELDER
Bright People. Right Solutions.

Project Number:	20151065
Date:	11/1/2014
Entry By:	EK
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
EXTREME EVENT CASE
ABUTMENT 3 - UPLIFT

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

13

APPENDIX A

AS BUILT AND PROPOSED IMPROVEMENT PLANS

APPENDIX A

AS-BUILT AND PROPOSED IMPROVEMENT PLANS

AS-BUILT PLANS

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	2.9/10.6	1	856

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

PROJECT PLANS FOR CONSTRUCTION ON
STATE HIGHWAY

IN SAN DIEGO COUNTY
IN SAN DIEGO
FROM CARMEL COUNTRY ROAD OVERCROSSING
TO CARMEL MOUNTAIN ROAD OVERCROSSING

To be supplemented by Standard Plans dated July, 1999

INDEX OF SHEETS

Sheet No.	Description
1	Title and Location Map
2-13	Typical Cross Sections
14	Key Map and Line Index
15-40	Layouts
41-100	Profiles
101-123	Construction Details
124-164	Temporary Water pollution Control Plans and Details
165-193	Erosion Control Plans
194-219	Contour Grading
220-348	Drainage Plans
349-351	Sanitary Sewer plans, Details and Quantities
352-410	Utility Plans
411-432	Stage Construction and Traffic Handling Plans, Details and Quantities
433-443	Detour Plans
444-445	Construction Area Signs
446-479	Pavement Delineation and Sign Plans, Details and Quantities
480-491	Summary of Quantities
492-502	Sign Plans
503-529	Sound Wall Plans
530-545	Highway Planting Plans
546-587	Electrical Plans
588-618	Revised Standard Plans

STRUCTURE PLANS

619-639	Carmel Valley Road UC Br No 57-1077R/L
640-668	Gonzales Creek Br No 57-1078R/L
669-691	Gonzales Creek (On-Ramp) Br No 57-1078K
692-711	Gonzales Creek (Off-Ramp) Br No 57-1078S
712-732	Camino Santa Fe OC Br No 57-1079
733-754	Rancho Santa Fe Farms OC Br No 57-1080
755-773	Vehicular Road UC Br No 57-1081R/L
774-823	McGonigle Creek Br No 57-1082R/L
824-852	Camino Ruiz UC Br No 57-1083R/L
853-856	Standard Details

THE STANDARD PLANS LIST APPLICABLE TO THIS CONTRACT IS INCLUDED IN THE NOTICE TO CONTRACTORS AND SPECIAL PROVISIONS BOOK.

LOCATION MAP

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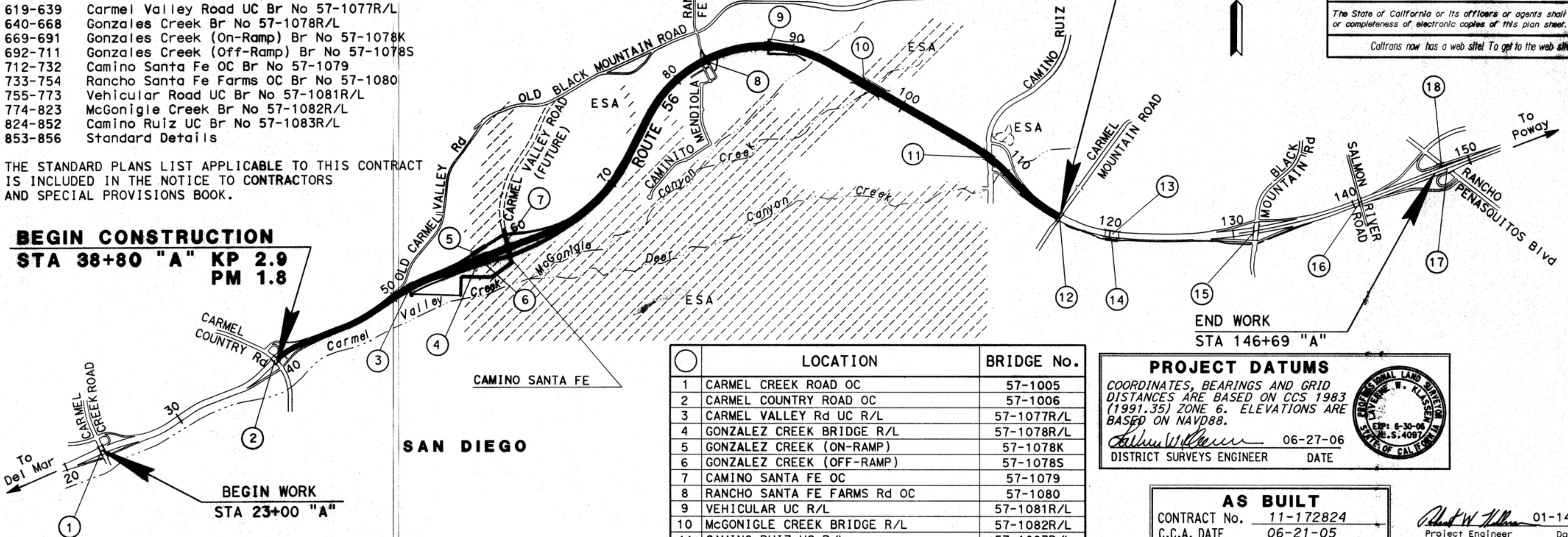
Caltrans now has a web site! To get to the web site, go to: http://www.dot.ca.gov

END CONSTRUCTION
STA 115+53 "A" KP 10.6
PM 6.6



BEGIN CONSTRUCTION
STA 38+80 "A" KP 2.9
PM 1.8

BEGIN WORK
STA 23+00 "A"

END WORK
STA 146+69 "A"

▨ ESA ENVIRONMENTALLY SENSITIVE AREA

○	LOCATION	BRIDGE No.
1	CARMEL CREEK ROAD OC	57-1005
2	CARMEL COUNTRY ROAD OC	57-1006
3	CARMEL VALLEY Rd UC R/L	57-1077R/L
4	GONZALEZ CREEK BRIDGE R/L	57-1078R/L
5	GONZALEZ CREEK (ON-RAMP)	57-1078K
6	GONZALEZ CREEK (OFF-RAMP)	57-1078S
7	CAMINO SANTA FE OC	57-1079
8	RANCHO SANTA FE FARMS Rd OC	57-1080
9	VEHICULAR UC R/L	57-1081R/L
10	McGONIGLE CREEK BRIDGE R/L	57-1082R/L
11	CAMINO RUIZ UC R/L	57-1083R/L
12	CARMEL MOUNTAIN Rd OC	———
13	PENASQUITOS OPEN SPACE BRIDGE R/L	———
14	PENASQUITOS OPEN SPACE BIKE BRIDGE	———
15	BLACK MOUNTAIN Rd OC	———
16	SALMON RIVER ROAD OC	———
17	RANCHO PENASQUITOS Blvd UC R/L	———
18	RANCHO PENASQUITOS Blvd UC	———

PROJECT DATUMS

COORDINATES, BEARINGS AND GRID DISTANCES ARE BASED ON CCS 1983 (1991.35) ZONE 6. ELEVATIONS ARE BASED ON NAVD88.

06-27-06
DISTRICT SURVEYS ENGINEER DATE

LAVERNE W. KLASSEN
EXP: 6-30-06
L.S. 4097

AS BUILT
CONTRACT No. 11-172824
C.C.A. DATE 06-21-05
R.E. NAME J.W.WILLIAMSON
John W Williamson 6/27/06
R.E. Signature for final approval of As-built information

Robert W Hillman 01-14-02
Project Engineer Date
Registered Civil Engineer

R.W.HILLMAN
No. 50572
Exp. 6-30-05
CIVIL

April 1, 2002
Plans Approval Date

The Contractor shall possess the Class (or classes) of license as specified in the ''Notice to Contractors''.

NO SCALE

PROJECT ENGINEER	DATE	PROJECT MANAGER	DATE
R.W. HILLMAN	XX-XX	C. SAVAGE	XX-XX

DUCED PLANS ORIGINAL IS IN MILLIMETERS 0 20 40 60 80

USERNAME => tbchar

Contract No. 11-172824
EA

LAST REVISION 01-14-02
DATE PLOTTED => 27-JUN-2006
TIME PLOTTED => 08:41

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	2.9/10.6	58	856

Robert W Hillman 01-11-02
REGISTERED CIVIL ENGINEER DATE

4-01-02
PLANS APPROVAL DATE

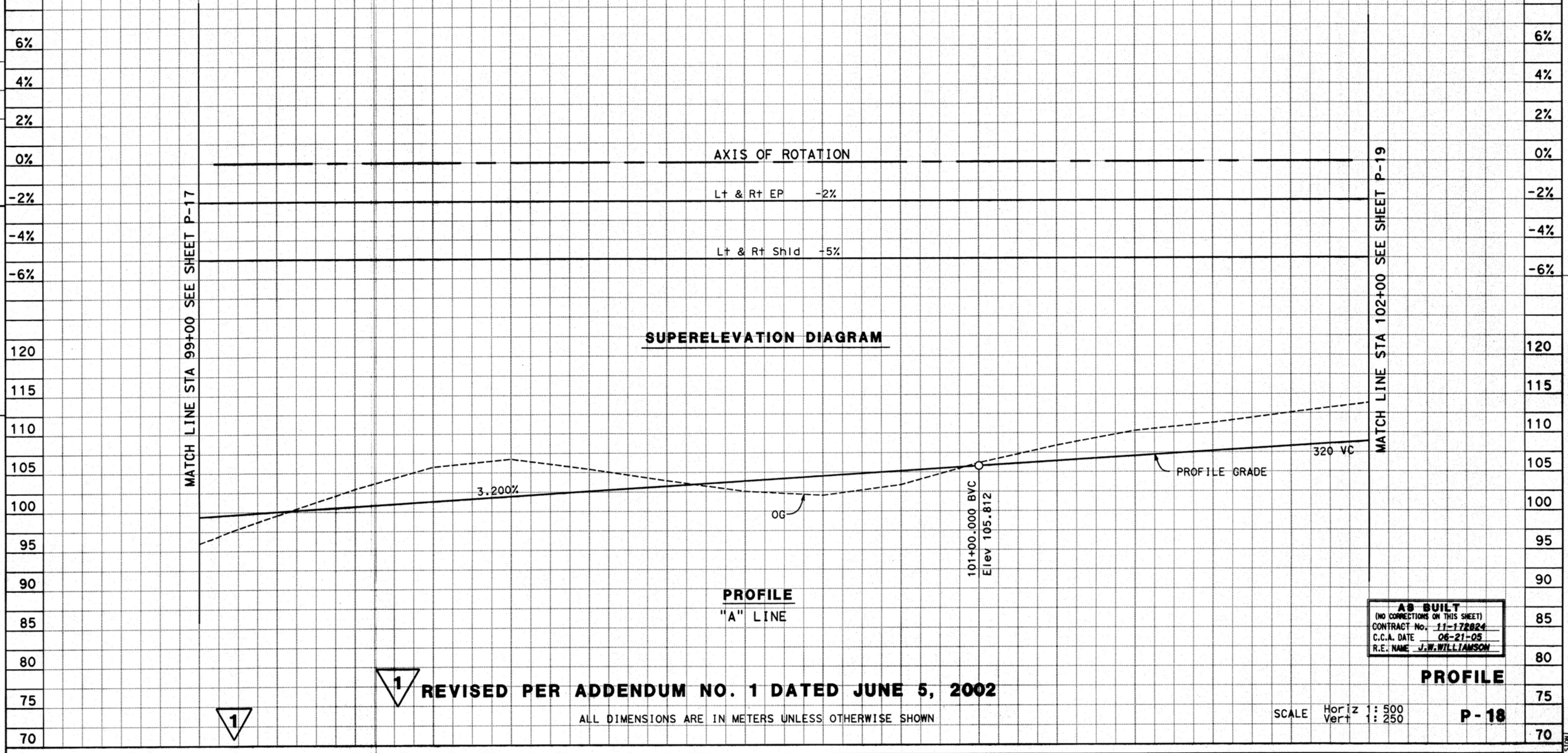
REGISTERED PROFESSIONAL ENGINEER
R.W. HILLMAN
No. 50572
Exp. 6-30-05
CIVIL
STATE OF CALIFORNIA

Caltrans Metric

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER
R.W. HILLMAN

CALCULATED/ DESIGNED BY
CHECKED BY
DATE
REVISED BY
DATE REVISED



SUPERELEVATION DIAGRAM

PROFILE

"A" LINE

1 **REVISED PER ADDENDUM NO. 1 DATED JUNE 5, 2002**

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

AS BUILT
(NO CORRECTIONS ON THIS SHEET)
CONTRACT No. 11-172824
C.C.A. DATE 06-21-05
R.E. NAME J.W.WILLIAMSON

PROFILE

SCALE Horiz 1: 500
Vert 1: 250

P-18

Station		99	+20	+40	+60	+80	100	+20	+40	+60	+80	101	+20	+40	+60	+80	102
m³	Exc	~~536~~	~~2563~~	~~5440~~	~~7331~~	~~7355~~	~~5834~~	~~4108~~	~~2602~~	~~1862~~	~~2335~~	~~4299~~	~~6820~~	~~8701~~	~~9772~~	~~10823~~	
	Emb	~~5026~~	~~2753~~	~~1070~~	~~0~~	~~129~~	~~985~~	~~2369~~	~~3115~~	~~2665~~	~~1307~~	~~283~~	~~45~~	~~0~~	~~0~~	~~0~~	

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS
0 20 40 60 80

USERNAME => tbchar
DGN FILE => b17282f018_ab.dgn

CU 11227

EA 172821

LAST REVISION 01-14-02
DATE PLOTTED => 25-MAY-2006
TIME PLOTTED => 09:31

REMOVE AND RECOMPACT AREA	
AREA NAME	DEPTH (m)
G-21A	1.3

1 REVISED PER ADDENDUM NO. 1 DATED JUNE 5, 2002

Caltrans Metric

DIST	COUNTY	ROUTE	KILOMETER POST TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	2.9/10.6	214	856

Robert W Hillman 01-14-02
REGISTERED CIVIL ENGINEER DATE

4-01-02
PLANS APPROVAL DATE

R.W. HILLMAN
No. 50572
Exp. 6-30-05
CIVIL

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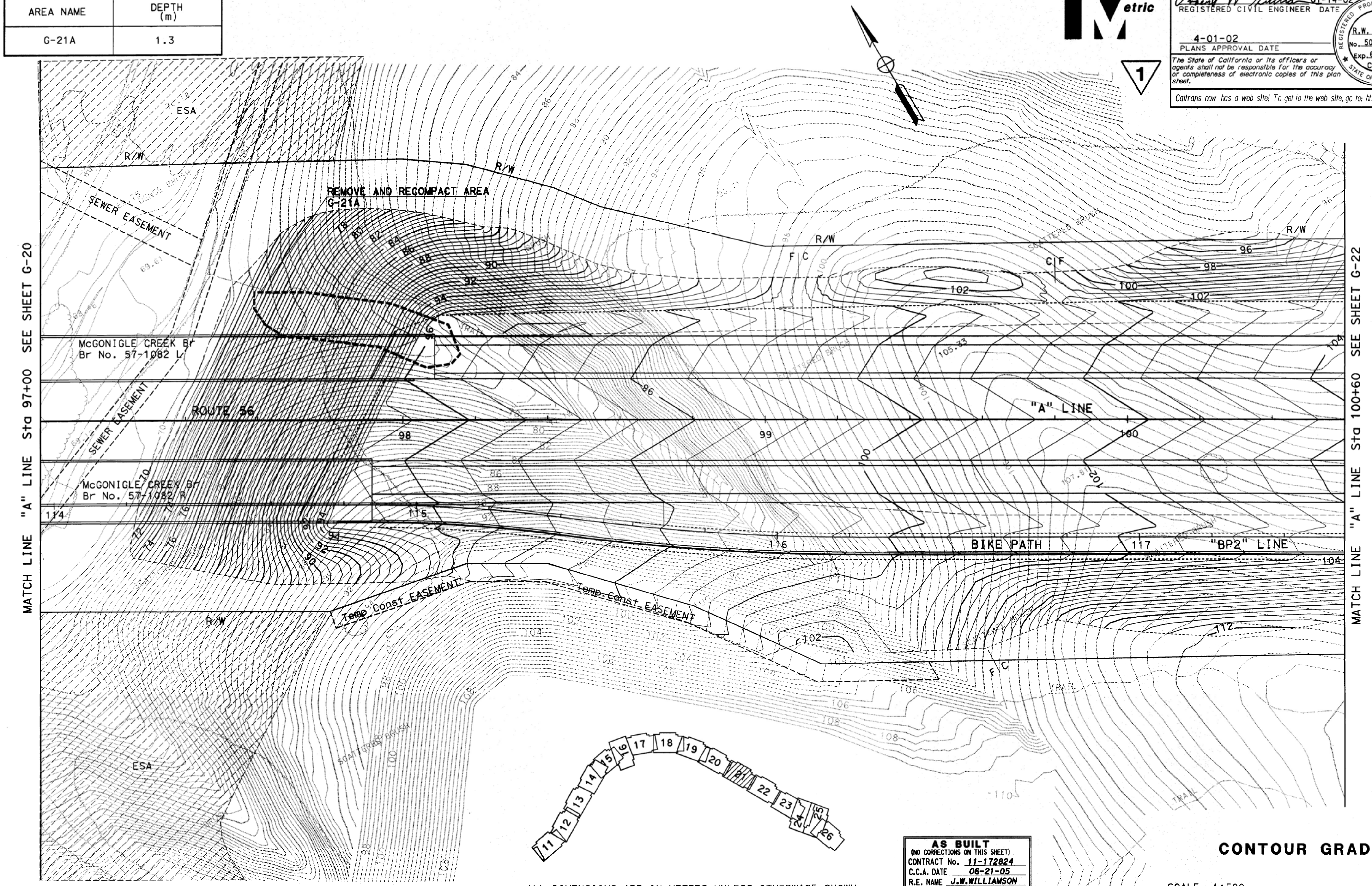


AS BUILT
(NO CORRECTIONS ON THIS SHEET)
CONTRACT No. 11-172824
C.C.A. DATE 06-21-05
R.E. NAME J.W.WILLIAMSON

THIS PLAN ACCURATE FOR CONTOUR GRADING WORK ONLY

ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SHOWN

CONTOUR GRADING

SCALE 1:500

G-21

FOR REDUCED PLANS ORIGINAL SCALE IS IN MILLIMETERS
0 20 40 60 80

USERNAME => tbchar
DGN FILE => b17282h021_ab.dgn

CU 11227

EA 172821

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION
Caltrans PROJECT DEVELOPMENT

PROJECT ENGINEER
R.W. HILLMAN

CALCULATED/DESIGNED BY
CHECKED BY

DATE REVISED BY
DATE REVISED

LAST REVISION 03-22-02

DATE PLOTTED => 01-JUN-2006
TIME PLOTTED => 11:37

PROPOSED PLANS

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

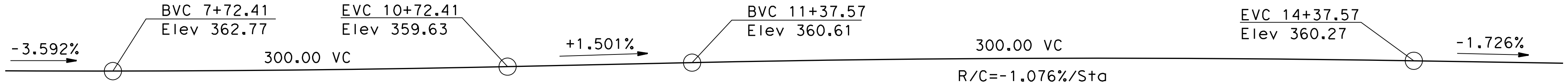
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

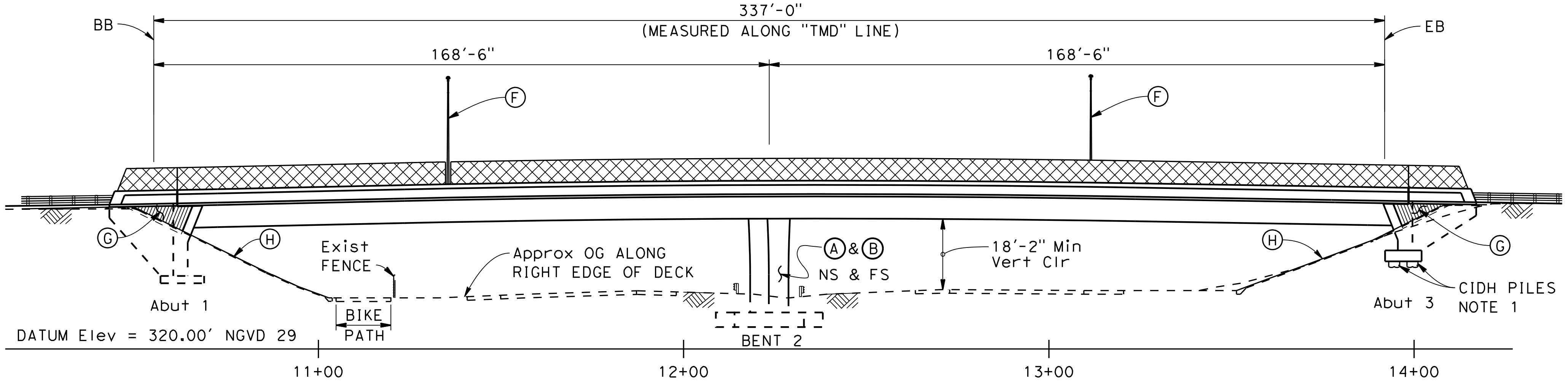
CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



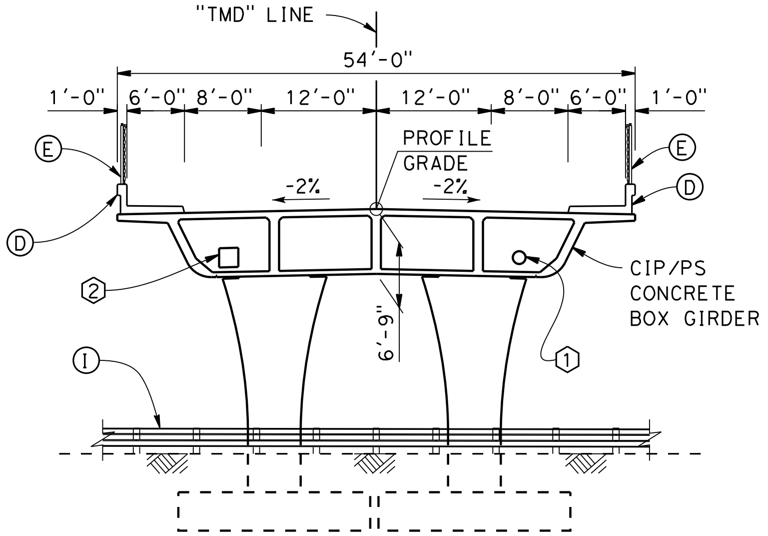
PROFILE GRADE

No Scale



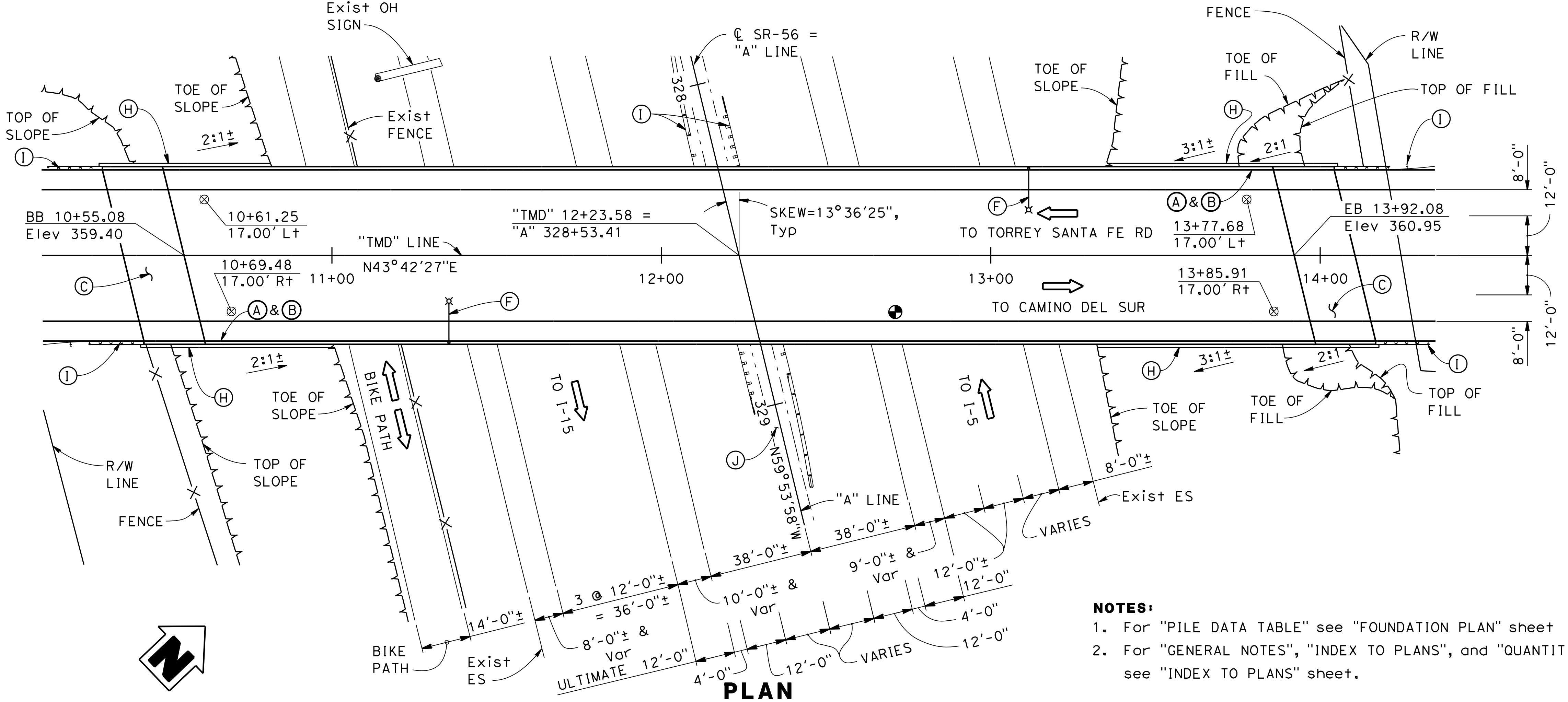
ELEVATION

1"=20'



TYPICAL SECTION

1"=10'



PLAN

1"=20'

NOTES:

1. For "PILE DATA TABLE" see "FOUNDATION PLAN" sheet
2. For "GENERAL NOTES", "INDEX TO PLANS", and "QUANTITIES", see "INDEX TO PLANS" sheet.

NOTES:

- Ⓐ Paint "TORREY MEADOWS DRIVE OC"
- Ⓑ Paint "BRIDGE NO. 57-1246"
- Ⓒ Structure Approach Type N
- Ⓓ Conc Barrier TYPE 26 (MOD)
- Ⓔ Chain Link Railing TYPE 7
- Ⓕ Electrolier
- Ⓖ Architectural Treatment
- Ⓗ Slope Paving (ROCK COBBLE)
- Ⓘ MGS
- Ⓙ Exist Concrete Ditch

UTILITIES:

- ① - 16" Dia Water Line (CITY OF SAN DIEGO)
- ② - Future utility opening

LEGEND:

- ⇨ Denotes Direction of Traffic
- ◕ Point of Min Vertical Clearance
- ⊗ Denotes Deck Access Opening

B7-11

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:48 PM

USERNAME => YWang

DESIGN OVERSIGHT	DESIGN	BY Emir Modarres	CHECKED	LOAD & RESISTANCE FACTOR DESIGN	LIVE LOADING: HL93 W/"LOW-BOY"; PERMIT DESIGN VEHICLE	
	DETAILS	BY Oscar Colcol	CHECKED	LAYOUT	BY Oscar Colcol	CHECKED Emir Modarres
SIGN OFF DATE	QUANTITIES	BY	CHECKED	SPECIFICATIONS	BY	PLANS AND SPECS COMPARED

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
GENERAL PLAN

DESIGN GENERAL PLAN SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES: ~~11/07/14~~ ~~12/17/14~~ 04/03/15

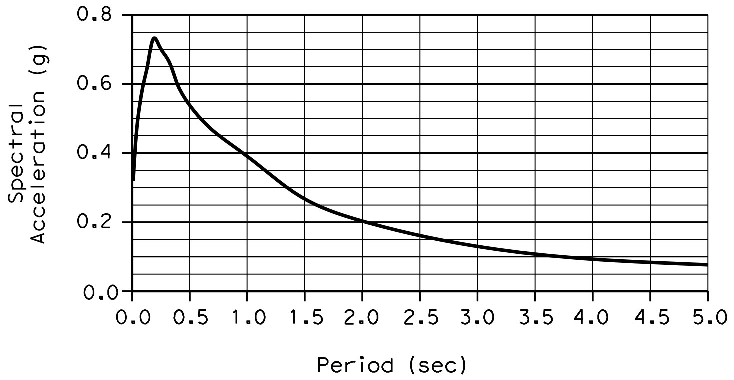
SHEET 1 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-a-gp01.dgn

GENERAL NOTES
LOAD AND RESISTANCE FACTOR DESIGN

DESIGN:	AASHTO LRFD Bridge Design Specifications, 6th Edition and the Caltrans Amendments Sixth Edition, dated March 2014.
SEISMIC DESIGN:	Caltrans Seismic Design Criteria (SDC), Version 1.7, dated April 2013
DEAD LOAD:	Includes 35 psf for future wearing surface
LIVE LOADING:	HL93 and Permit Design Load
SEISMIC LOADING:	SDC ARS Online 2.3.06
	Soil profile: V_S^{30} =1340 ft/sec
	Moment Magnitude: 6.8
	Peak Ground Acceleration: 0.320g

ARS Curve



REINFORCED CONCRETE: ASTM A706
f_y = 60 ksi
f'_c = 3.6 ksi, SEE "CONCRETE STRENGTH AND TYPE LIMITS"
n = 8

PRESTRESSED CONCRETE: See "PRESTRESSING NOTES" on "GIRDER LAYOUT" sheet.

CONCRETE STRENGTH AND TYPE LIMITS

No Scale

LEGEND:

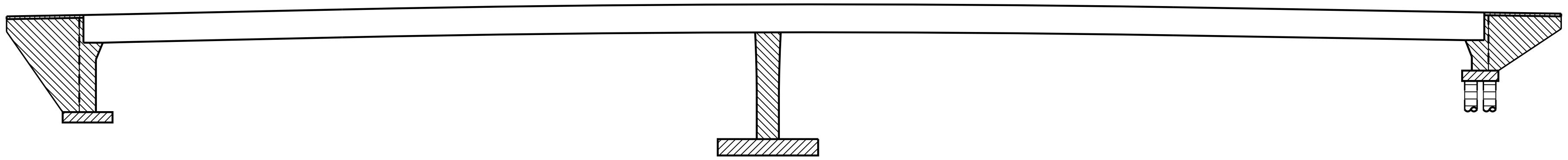
☐ - Structural Concrete, Bridge (4000 psi @ 28 days)

▨ - Structural Concrete, Bridge (3600 psi @ 28 days)

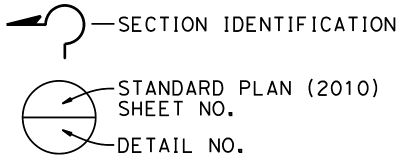
▨ - Structural Concrete, Bridge Footing (3600 psi @ 28 days)

▥ - Structural Concrete, Approach Slab

▤ - Structural Concrete, CIDH Piles (3,600 psi @ 28 days)



PLAN SYMBOLS



STANDARD PLANS
(DATED 2010)

	A10A	ABBREVIATIONS (SHEET 1 OF 2)
RSP	A10B	ABBREVIATIONS (SHEET 2 OF 2)
	A10C	LINES AND SYMBOLS (SHEET 1 OF 3)
	A10D	LINES AND SYMBOLS (SHEET 2 OF 3)
	A10E	LINES AND SYMBOLS (SHEET 2 OF 3)
	A62C	LIMITS OF PAYMENT FOR EXCAVATION AND BACKFILL BRIDGE
	B0-1	BRIDGE DETAILS
	B0-3	BRIDGE DETAILS
	B0-5	BRIDGE DETAILS
	B0-13	BRIDGE DETAILS
	B7-1	BOX GIRDER DETAILS
	B7-10	UTILITY OPENING - BOX GIRDER
	B7-11	UTILITY DETAILS
RSP	B8-5	CAST-IN-PLACE PRESTRESSED GIRDER DETAILS
	B11-52	CHAIN LINK RAILING TYPE 7
RSP	B11-54	CONCRETE BARRIER TYPE 26
RSP	B11-56	CONCRETE BARRIER TYPE 736
	ES-6A	ELECTRICAL SYSTEM (LIGHTING STANDARD, TYPES 15 AND 21)
	ES-6B	ELECTRICAL SYSTEMS (ELECTROLIER ANCHORAGE AND GROUTING FOR TYPES 15 AND 21, BARRIER RAIL MOUNTED)

INDEX TO BRIDGE PLANS

SHEET NO.	TITLE
1	GENERAL PLAN
2	INDEX TO PLANS
3	DECK CONTOURS
4	FOUNDATION PLAN
5	ABUTMENT 1 LAYOUT
6	ABUTMENT 3 LAYOUT
7	ABUTMENT DETAILS NO. 1
8	ABUTMENT DETAILS NO. 2
9	BENT LAYOUT
10	BENT DETAILS NO. 1
11	BENT DETAILS NO. 2
12	TYPICAL SECTION
13	GIRDER LAYOUT
14	GIRDER DETAILS
15	MISCELLANEOUS DETAILS
16	RAILING & BARRIER DETAILS
17	ARCHITECTURAL TREATMENT DETAILS
18	SLOPE PAVING (ROCK COBBLE)
19	STRUCTURE APPROACH TYPE N
20	STRUCTURE APPROACH DRAINAGE DETAILS
21	STRIP JOINT SEAL ASSEMBLY MAXIMUM MOVEMENT RATING = 4"
22	LOG OF TEST BORINGS NO. 1 OF 4
23	LOG OF TEST BORINGS NO. 2 OF 4
24	LOG OF TEST BORINGS NO. 3 OF 4
25	LOG OF TEST BORINGS NO. 4 OF 4

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:49 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY Emir Modarres	CHECKED
DETAILS	BY Yihong Wang	CHECKED
QUANTITIES	BY	CHECKED

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
INDEX TO PLANS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES				SHEET	OF
04/03/15				2	25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-b-itp01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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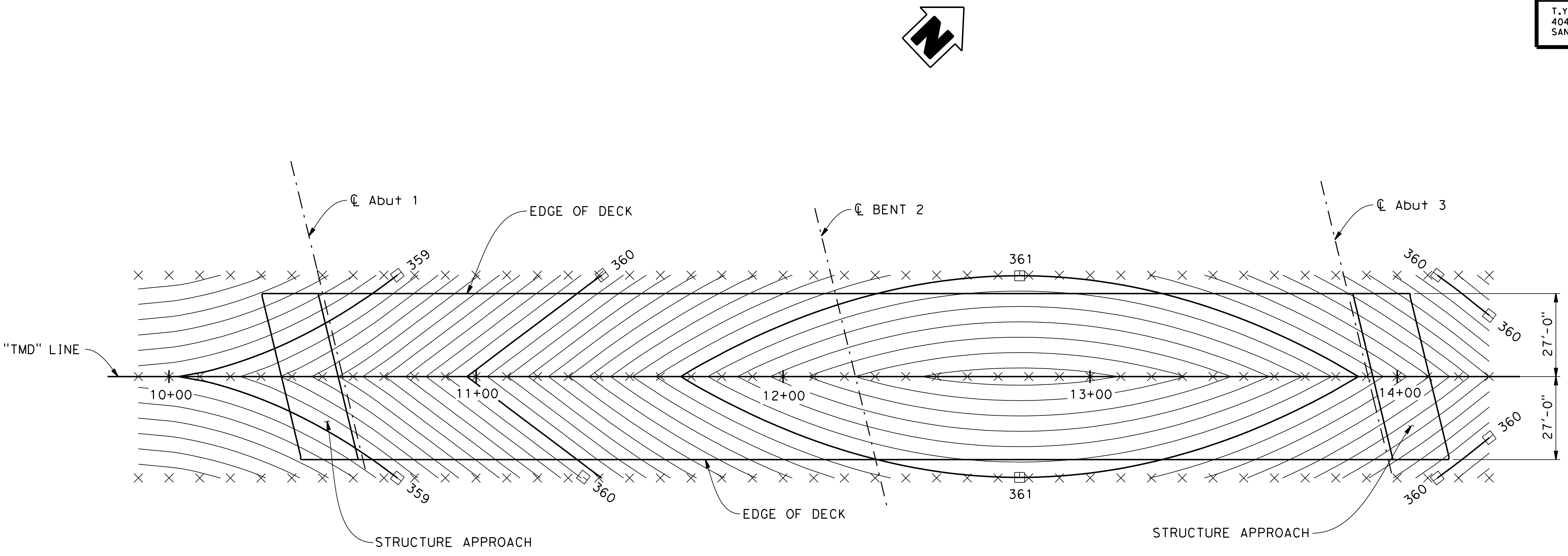
CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



PLAN

1"=20'-0"

NOTES:

1. Contour interval = 0.10 Ft.
2. Contours do not include camber.
3. X - Indicates 10' intervals.
4. ☐ - Indicates even foot contour.

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:50 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

DECK CONTOURS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES 04/03/15

SHEET 3 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-d-dc01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

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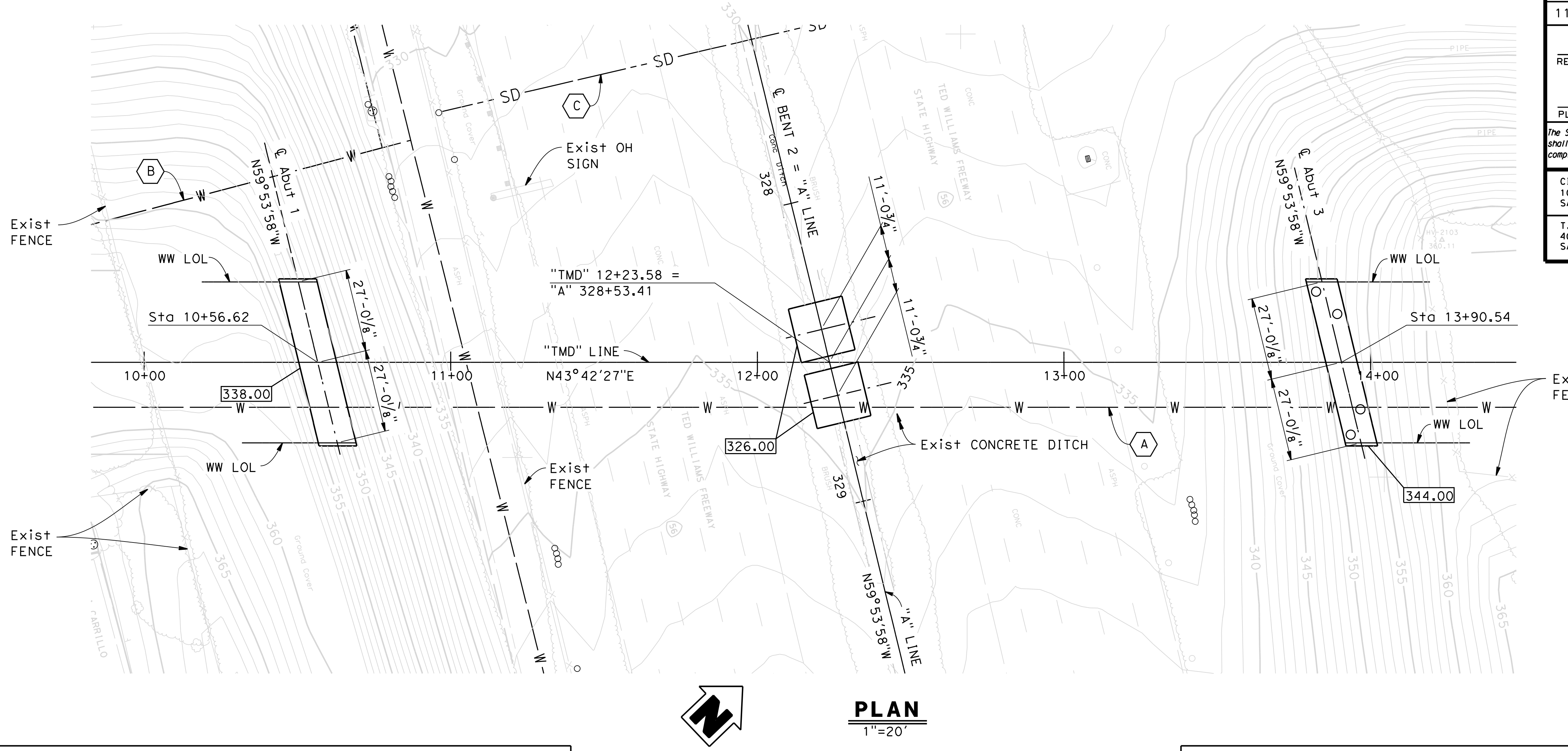


PLAN

1"=20'

SPREAD FOOTING DATA TABLE

Support Location	**Service** Permissible Net Contact stress (Settlement) (Ksf)	**Strength/Construction** Factored Gross Nominal Bearing Resistance φb = 0.45 (Ksf)	**Extreme Event** Factored Gross Nominal Bearing Resistance φb = 1.00 (Ksf)
Abutment 1	TBD	TBD	N/A
Bent 2 L	TBD	TBD	TBD
Bent 2 R	TBD	TBD	TBD

LEGEND:

XXX.XX	- Indicates bottom of footing elevation
○	- Indicates XXX Piles, not all piles shown

UTILITIES:

- Ⓐ 16" Dia Water Line (CITY OF SAN DIEGO)
- Ⓑ 24" Recycled Water (CITY OF SAN DIEGO)
- Ⓒ 24" Storm Drain (CITY OF SAN DIEGO)

PILE DATA TABLE

Location	Pile Type	Nominal Resistance (kips)		Design Tip Elev. (ft)	Specified Tip Elev. (ft)
		Compression	Tension		
Abutment 3	36" CIDH	XX.X	0	+XX.X (a) +XX.X (c) +XX.X (d)	+XX.X

NOTE:

1. Design tip elevations are controlled by: (a) Compression; (b) Tension; (c) Settlement; (d) Lateral Load.

BENCHMARK:

DESCRIPTION:	Brass pin located in southwest curb return of Carmel Mountain Rd. and Black Mountain Rd.
ELEVATION:	538.805 feet NGVD 29

GEOTECHNICAL PROFESSIONAL APPROVAL DATE

65% UNCHECKED DETAILS

TIME PLOTTED => 4:00:51 PM
DATE PLOTTED => 3/20/2015
USERNAME => YWang

X DESIGN OVERSIGHT	SCALE: AS SHOWN	VERT.DATUM NGVD 29	HORZ.DATUM NAD 83	DESIGN	BY Emir Modarres	CHECKED
X SIGN OFF DATE	PHOTOGRAMMETRY AS OF: 01/06/10	ALIGNMENT TIES		DETAILS	BY Oscar Colcol	CHECKED
	SURVEYED BY Forrest Youngs	DRAFTED BY		QUANTITIES	BY	CHECKED
	FIELD CHECKED BY	CHECKED BY				

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
FOUNDATION PLAN

FOUNDATION PLAN SHEET (ENGLISH) (REV. 03/14/12)

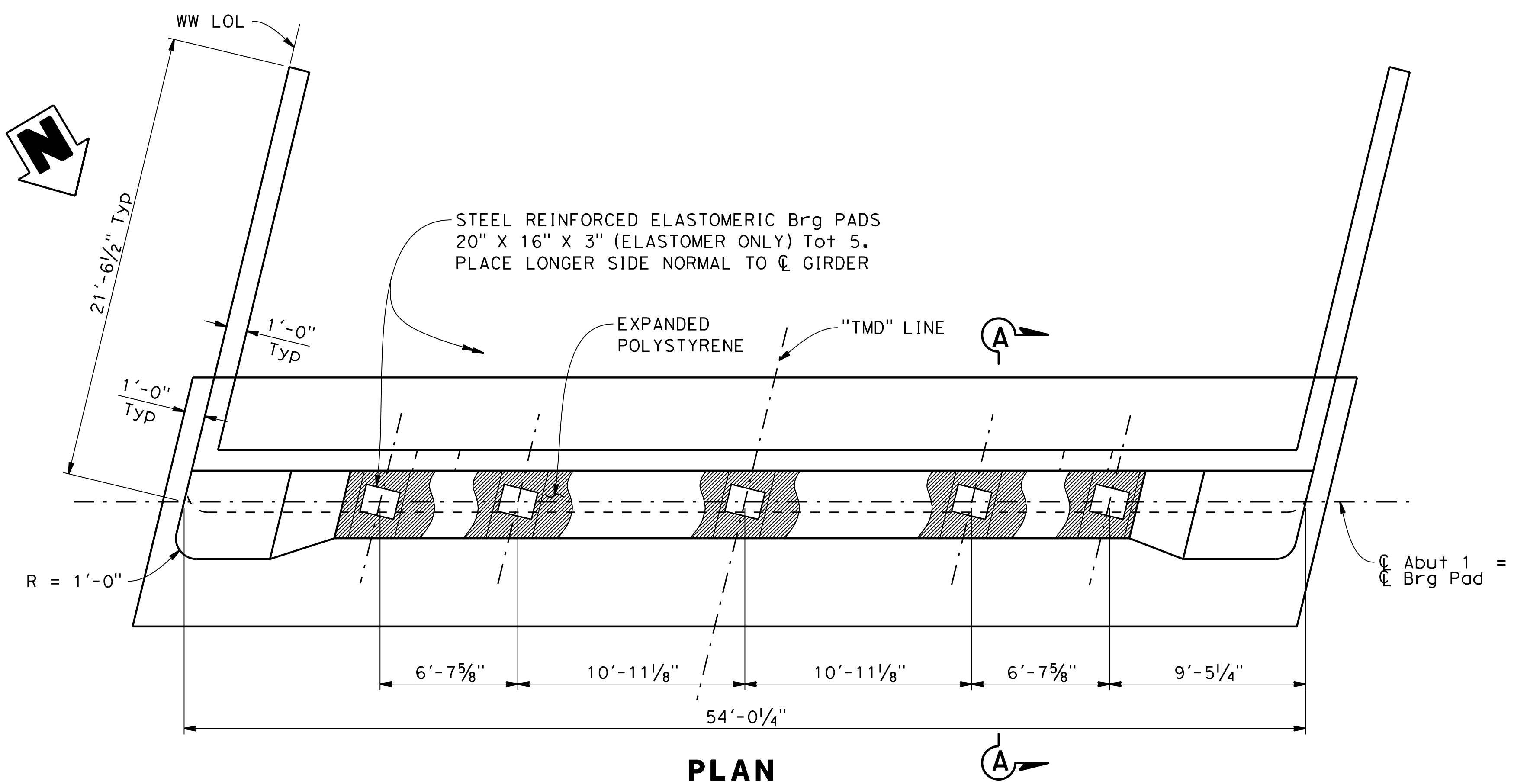
ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

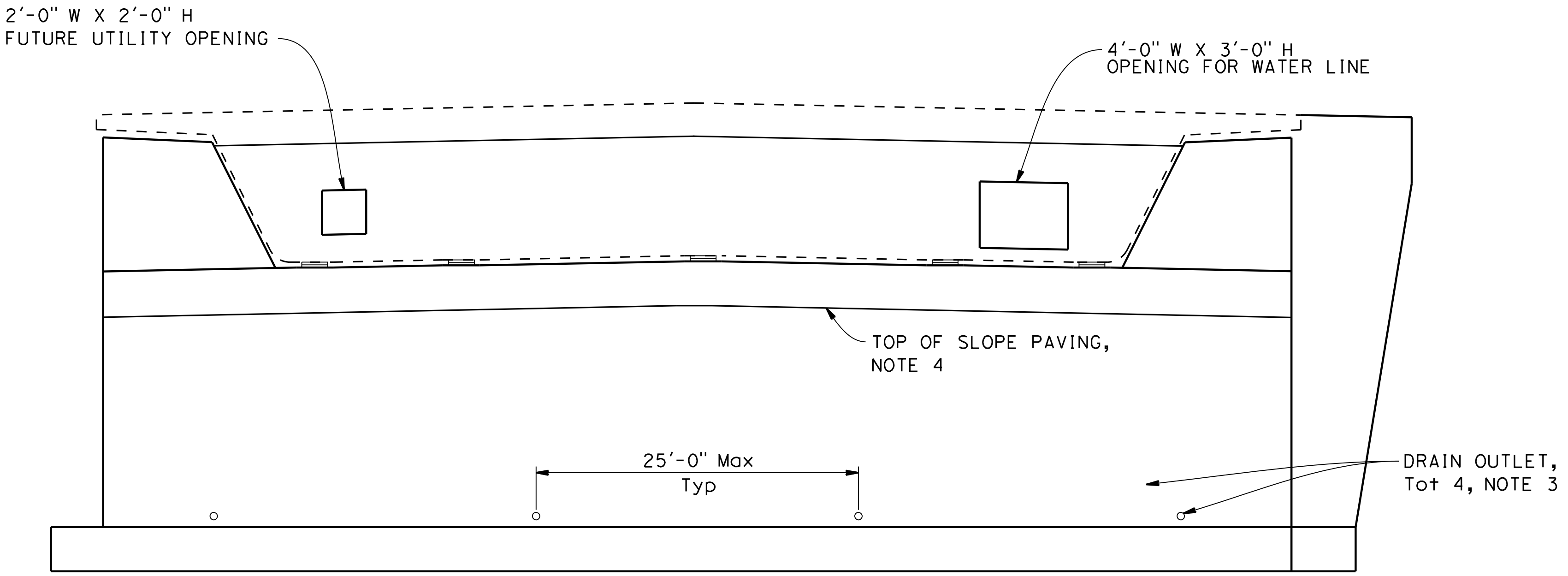
REVISION DATES				SHEET	OF
~~11/07/14~~	~~12/17/14~~	04/03/15		4	25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-e-fdpl01.dgn



PLAN

¼"=1'-0"

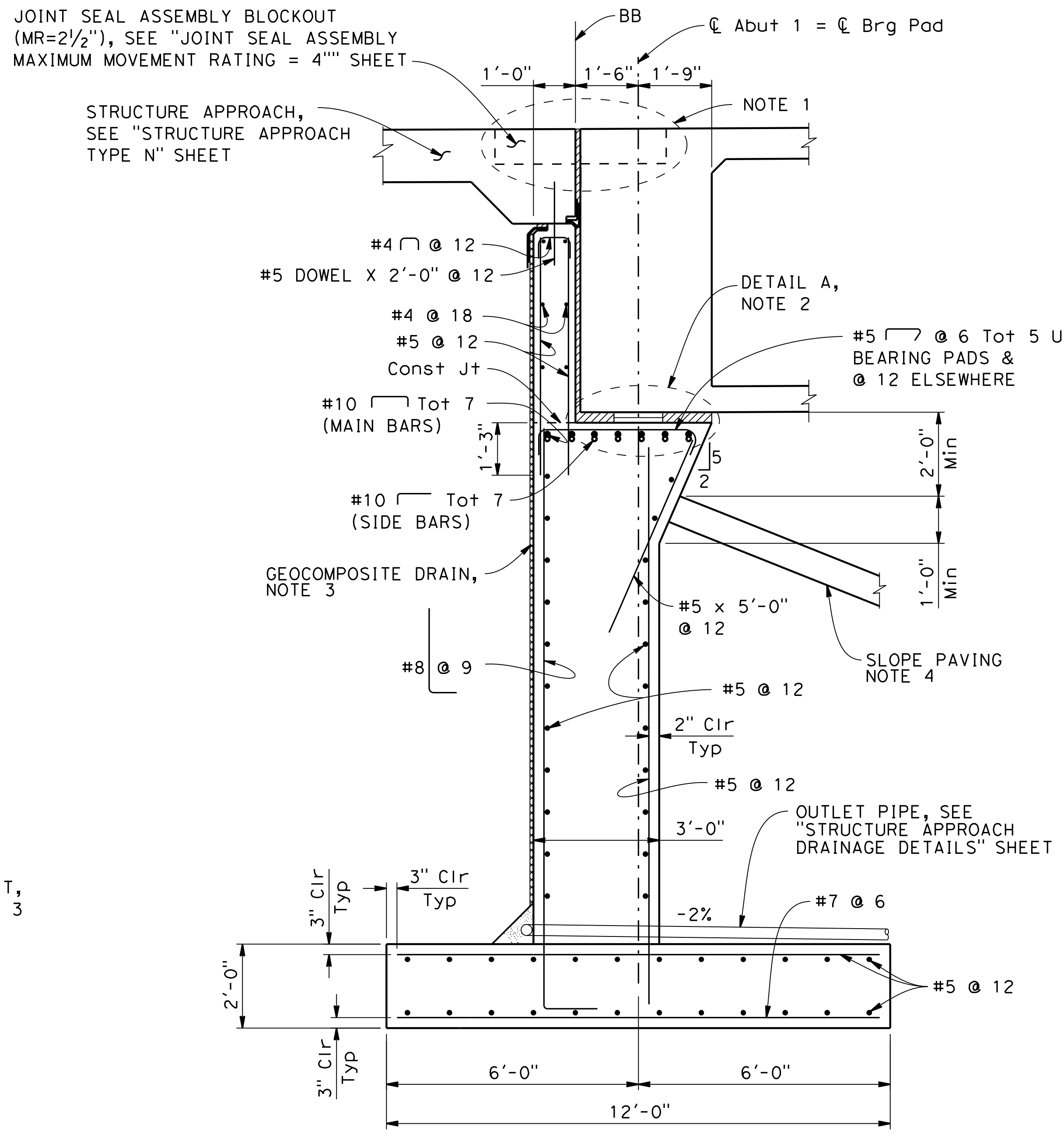


ELEVATION

¼"=1'-0"

NOTES:

1. For "JOINT PROTECTION DETAIL", see "ABUTMENT DETAILS NO. 2" sheet.
2. For "DETAIL A", see "ABUTMENT DETAILS NO. 2" sheet.
3. For drain outlet and geocomposite drain details, see " STRUCTURE APPROACH DRAINAGE DETAILS" sheet.
4. For slope paving details, see "SLOPE PAVING (ROCK COBBLE)" sheet.



SECTION A-A

½"=1'-0"

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:152 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN BY Emir Modarres CHECKED
DETAILS BY Yihong Wang CHECKED
QUANTITIES BY CHECKED

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
ABUTMENT 1 LAYOUT

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 04/03/15

SHEET 5 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-f-a01_lo1.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

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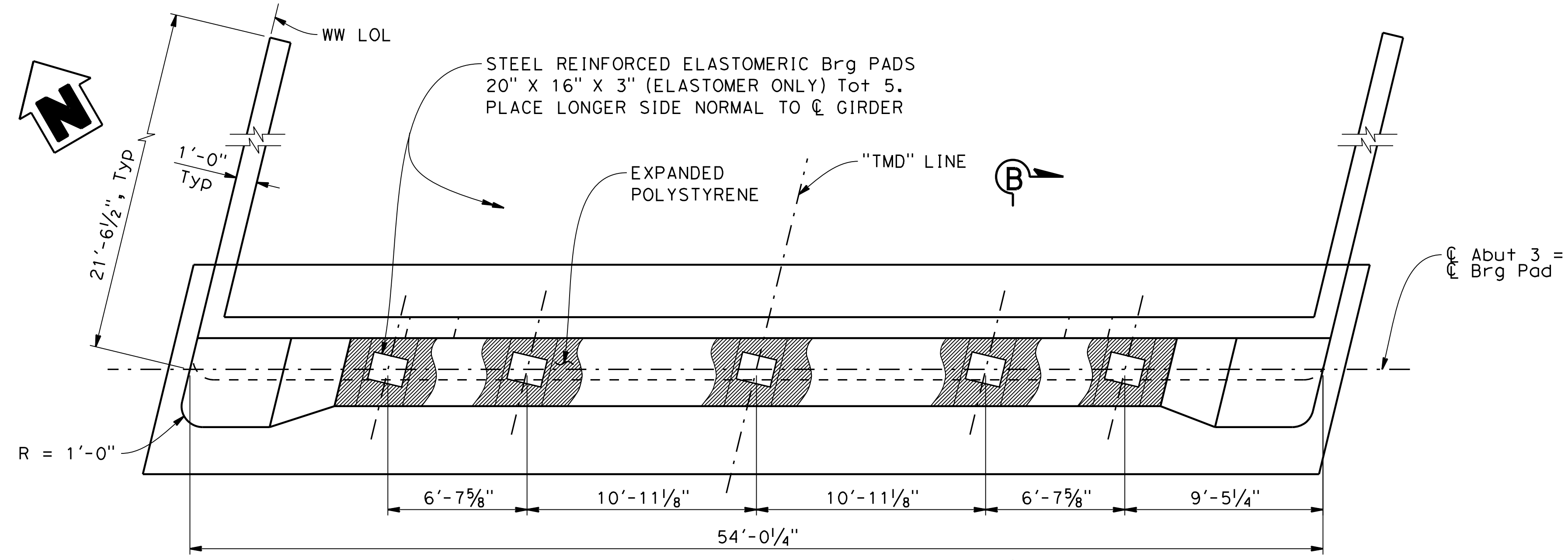
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

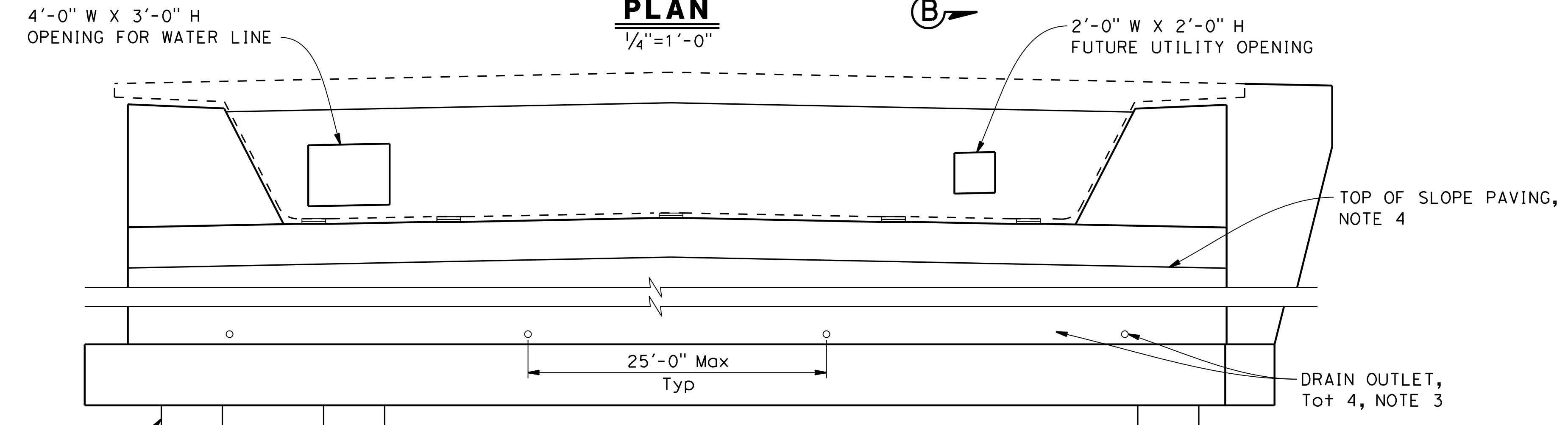
NOTES:

1. For "JOINT PROTECTION DETAIL", see "ABUTMENT DETAILS NO. 2" sheet.
2. For "DETAIL A", see "ABUTMENT DETAILS NO. 2" sheet.
3. For drain outlet and geocomposite drain details, see " STRUCTURE APPROACH DRAINAGE DETAILS" sheet.
4. For slope paving details, see "SLOPE PAVING (ROCK COBBLE)" sheet.
5. For piles details, see "ABUTMENT DETAILS NO. 1" sheet.



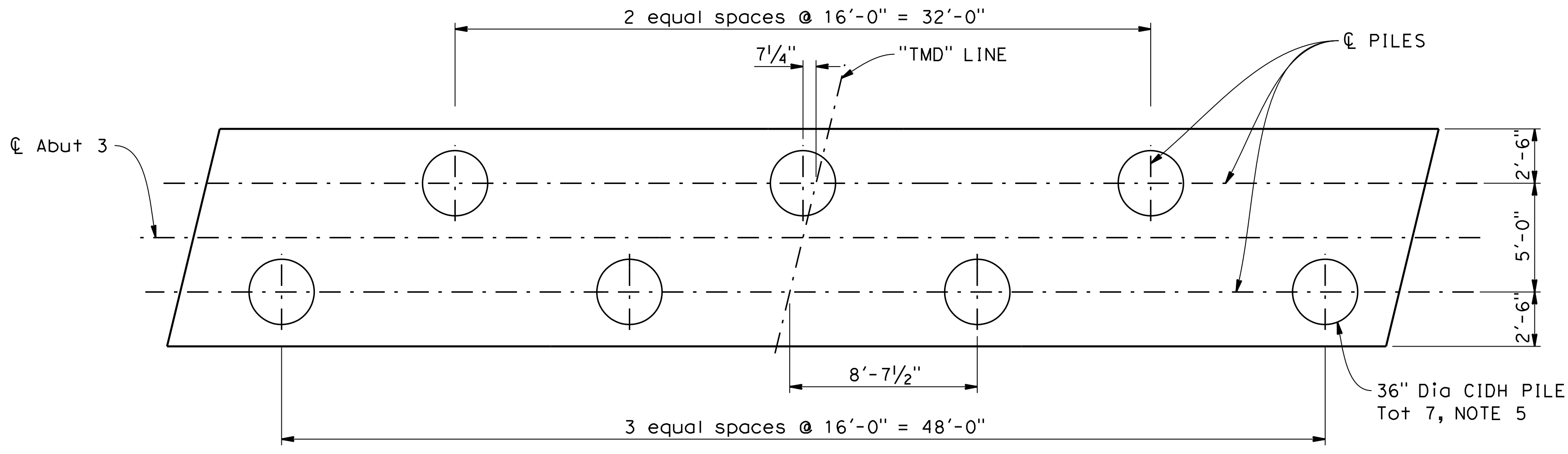
PLAN

¼"=1'-0"



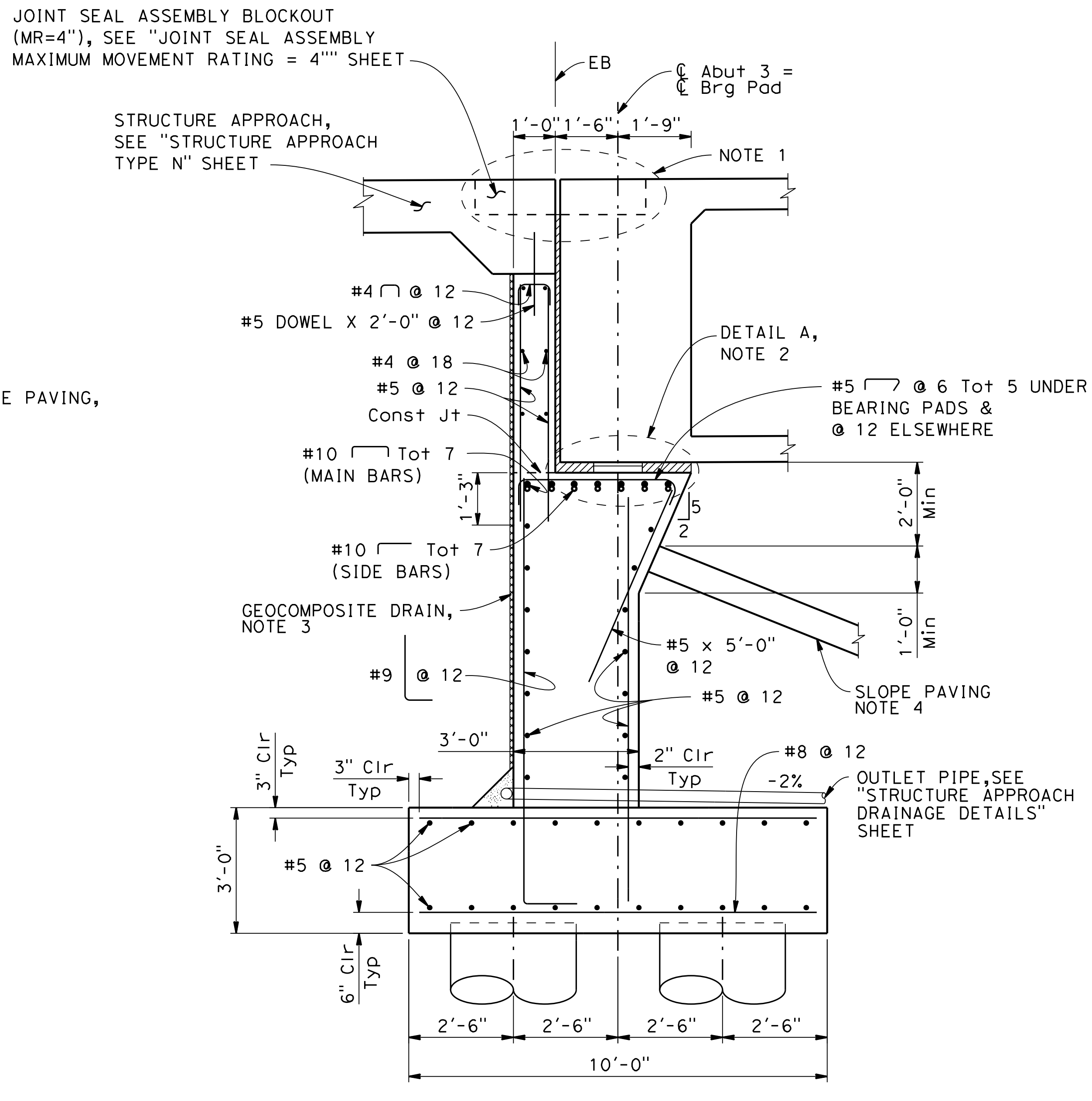
ELEVATION

¼"=1'-0"



FOOTING PLAN

¼"=1'-0"



SECTION B-B

½"=1'-0"

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:53 PM
USERNAME => YWang

DESIGN	BY Emir Modarres	CHECKED	
DETAILS	BY Yihong Wang	CHECKED	
QUANTITIES	BY	CHECKED	

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

ABUTMENT 3 LAYOUT

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES 04/03/15

SHEET 6 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-f-a01_lo2.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

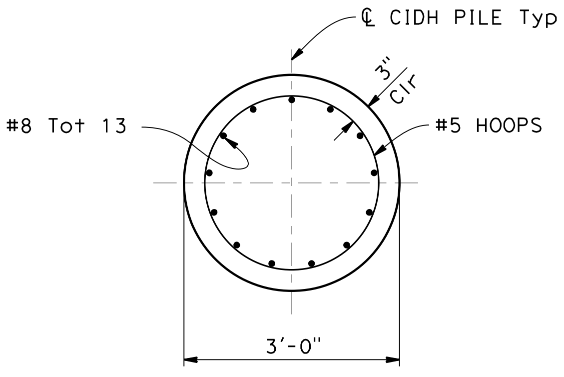
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

No.
Exp.
CIVIL

CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

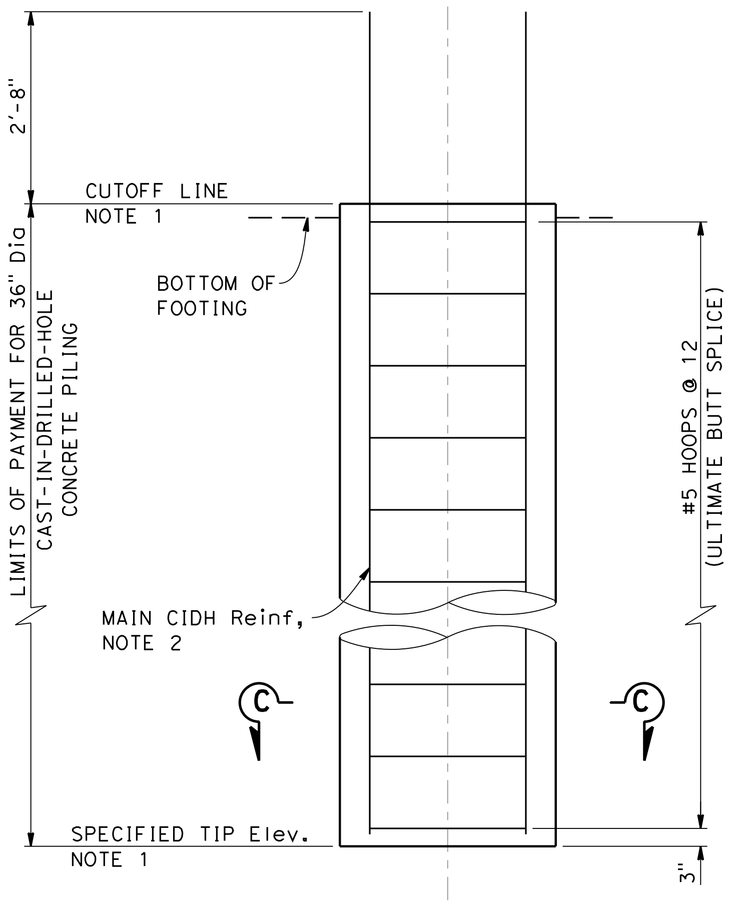


SECTION C-C

¾"=1'-0"

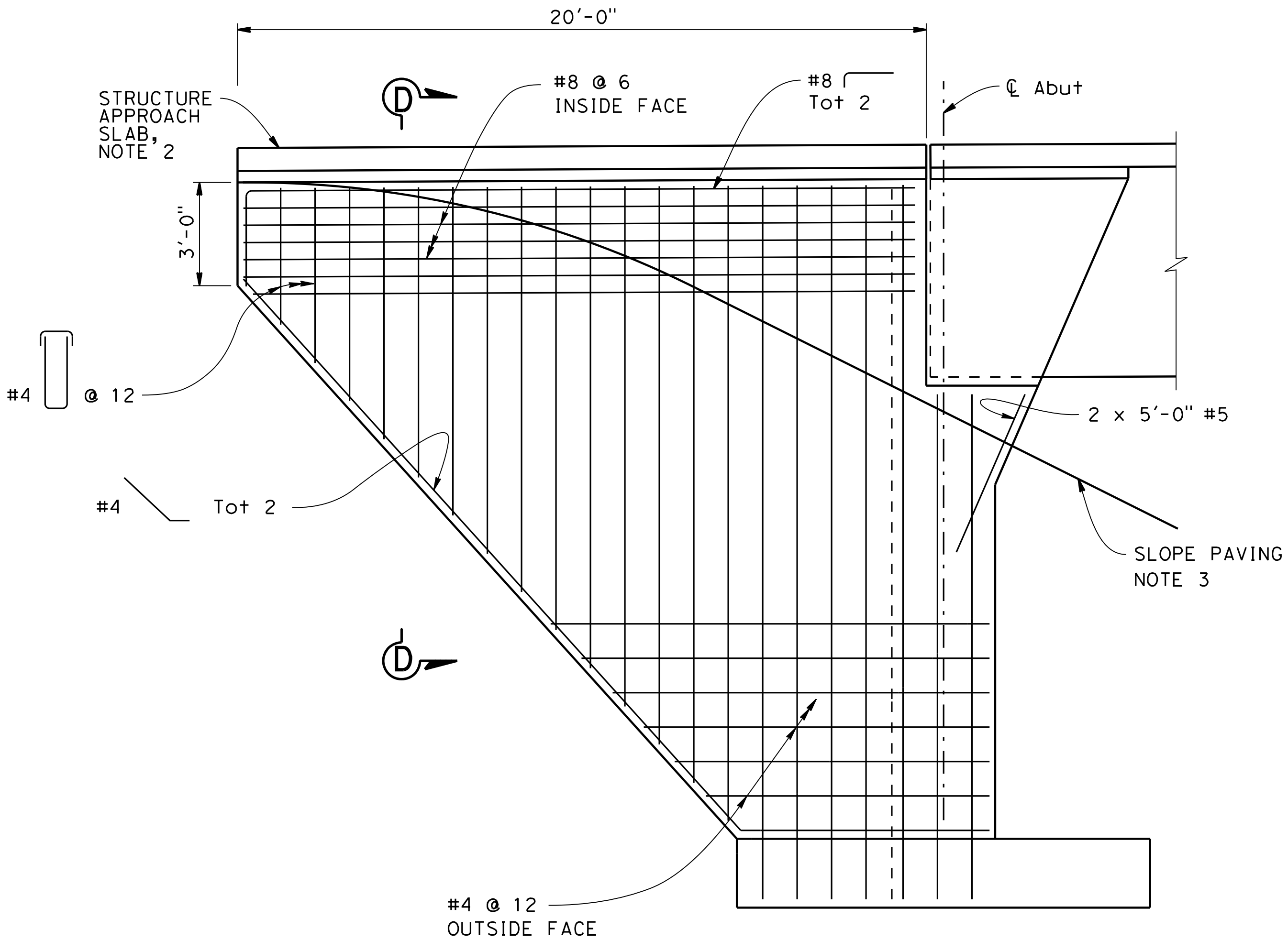
NOTES:

1. For cut-off and specified tip elevations, see "FOUNDATION PLAN" sheet.
2. See "STRUCTURE APPROACH TYPE N" sheet.
3. See "SLOPE PAVING (ROCK RUBBLE)" sheet.
4. See "STRUCTURE APPROACH DRAINAGE DETAILS" sheet.



CIDH PILE DETAIL

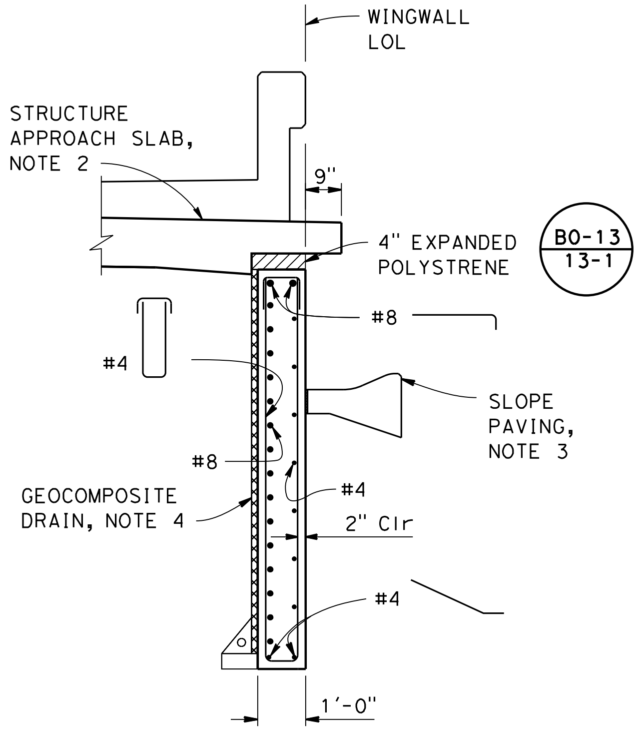
¾"=1'-0"



WINGWALL ELEVATION

⅜"=1'-0"

NOTE: Abutment 1 shown, Abutment 3 similar



SECTION D-D

½"=1'-0"

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:54 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

ABUTMENT DETAILS NO. 1

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 7 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-f-a01dt01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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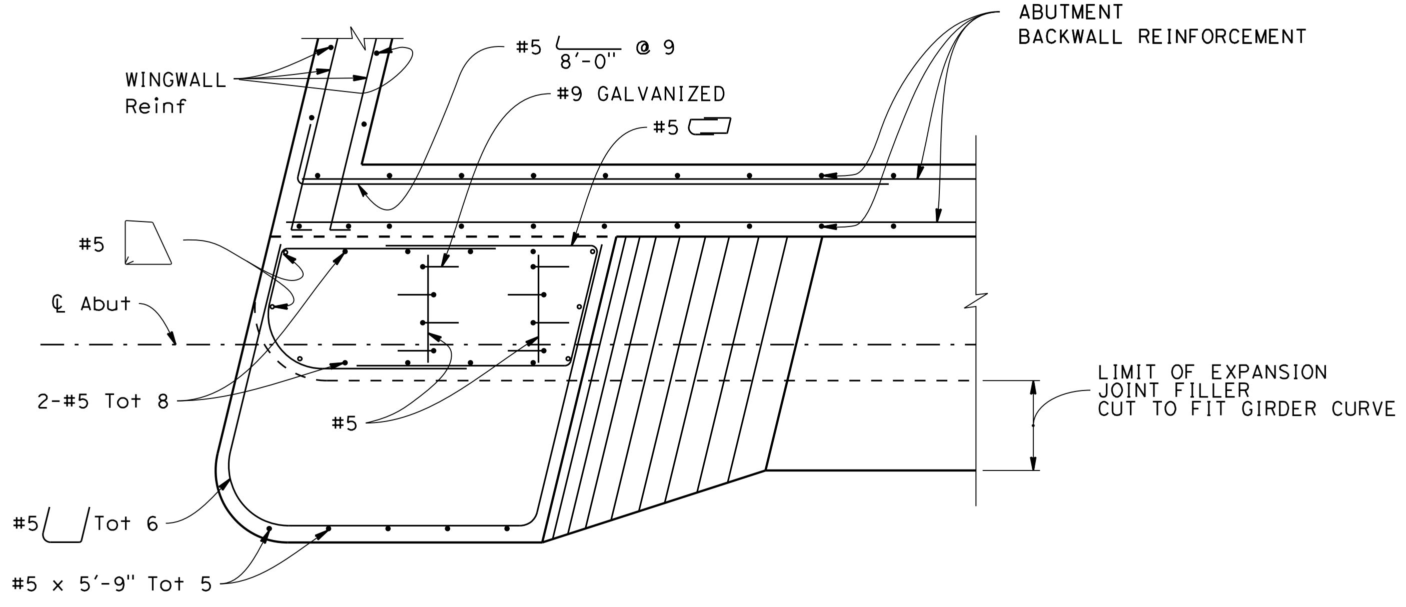
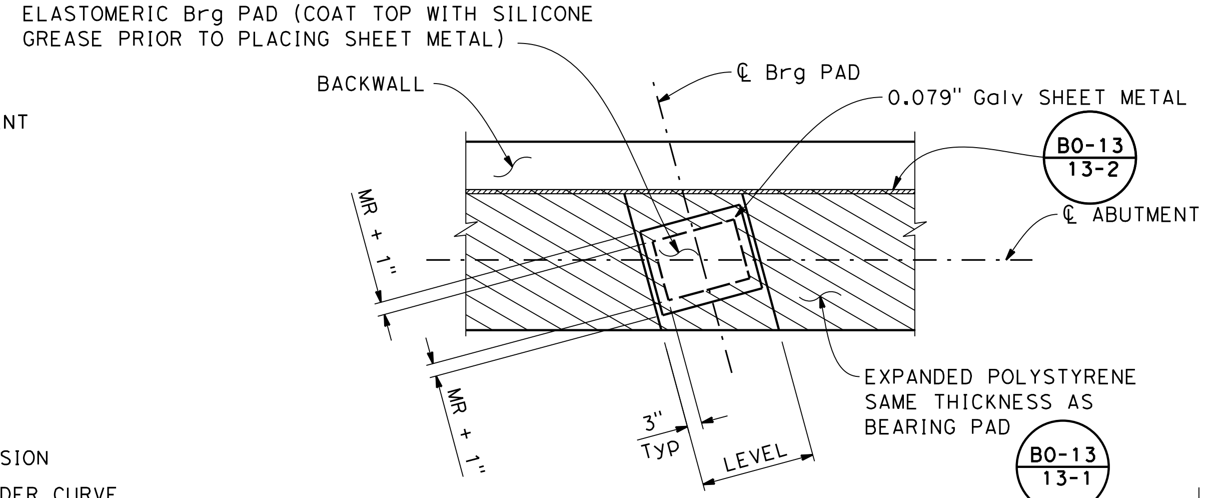
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

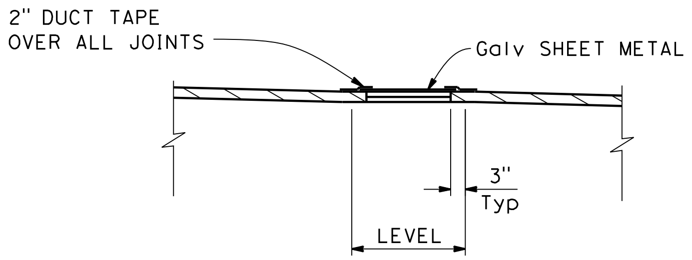


SECTION E-E

¾"=1'-0"



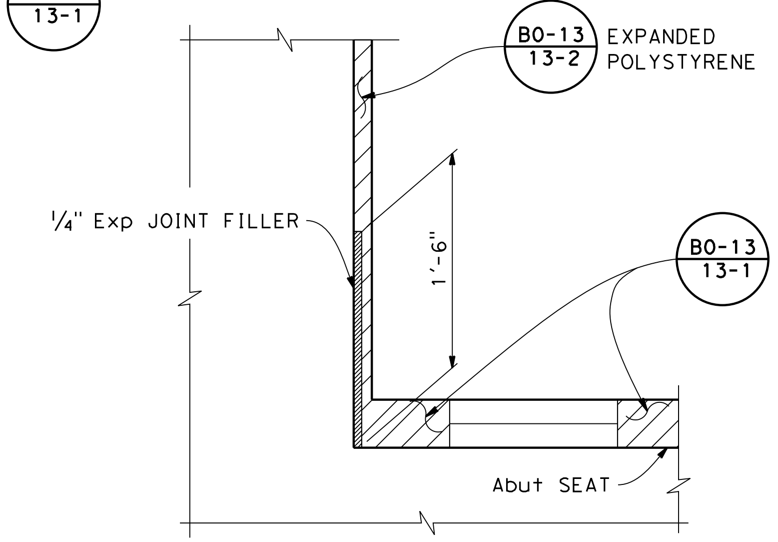
PLAN



ELEVATION

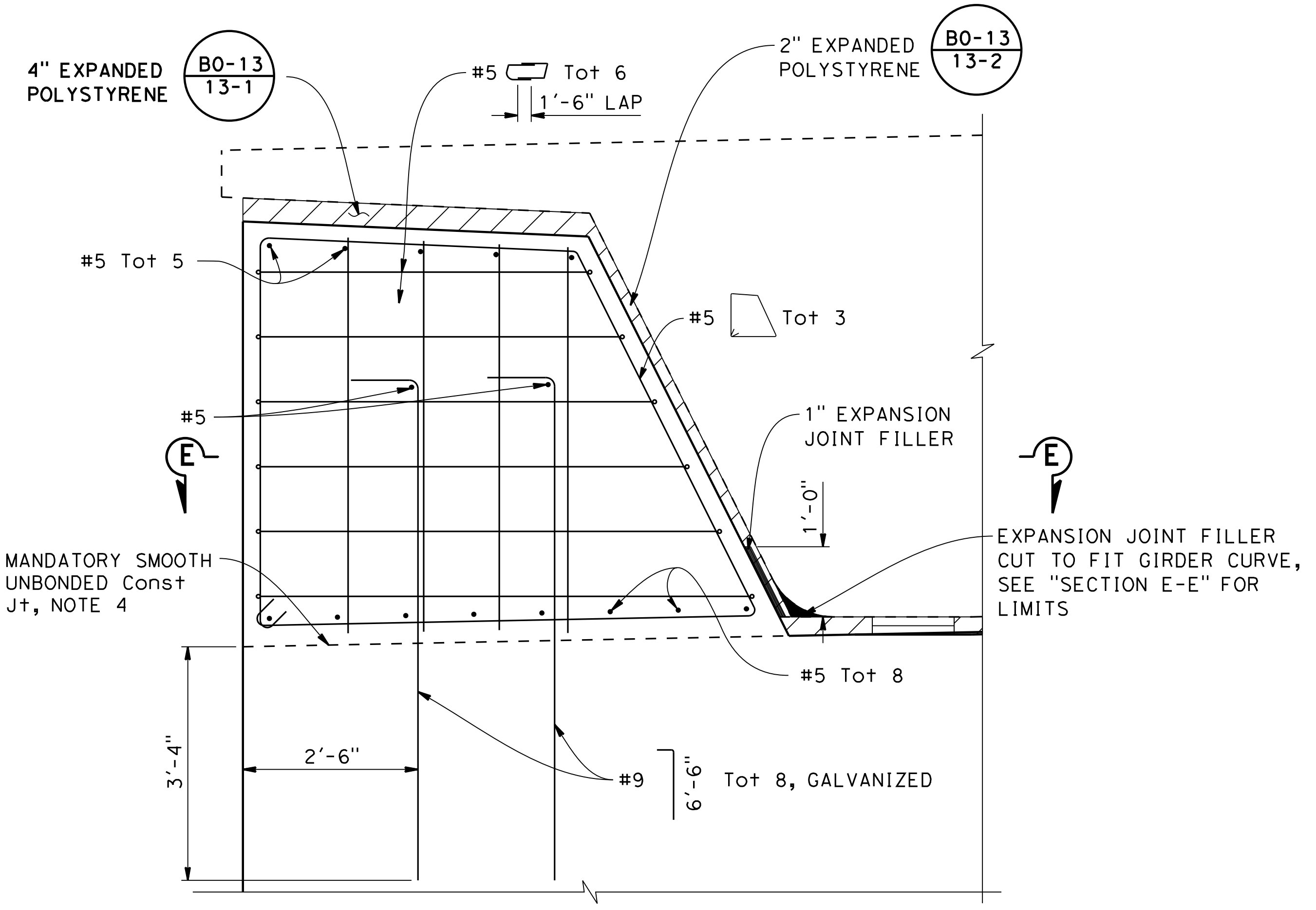
BEARING SEAT DETAILS

No Scale



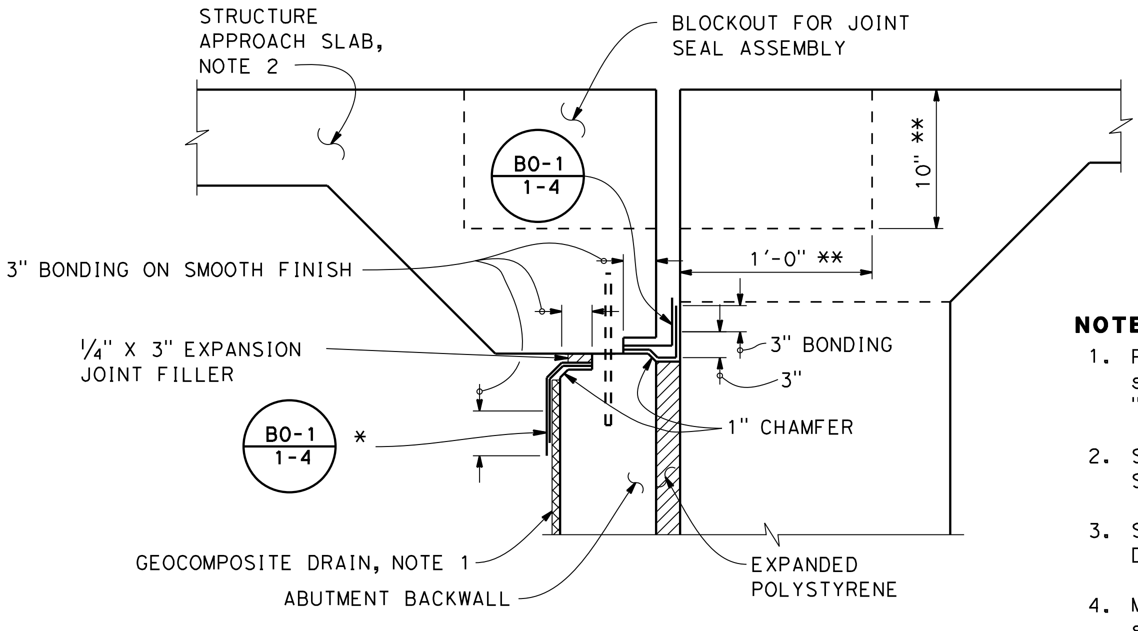
DETAIL A

No Scale



SHEAR KEY ELEVATION

¾"=1'-0"



* - PLACE PRIOR TO BACKFILLING THE ABUTMENT BACKWALL

** - VERIFY WITH JOINT SEAL MANUFACTURER

JOINT PROTECTION DETAIL

No Scale

NOTES:

1. For location of "DETAIL A", see "ABUTMENT 1 LAYOUT" & "ABUTMENT 3 LAYOUT" sheets.
2. See "STRUCTURE APPROACH SLAB TYPE N" sheet.
3. See "STRUCTURE APPROACH DRAINAGE DETAILS" sheet.
4. Mandatory construction joint with smooth finished surface and lined with 15 pound building paper.

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:55 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

ABUTMENT DETAILS NO. 2

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 8 OF 25

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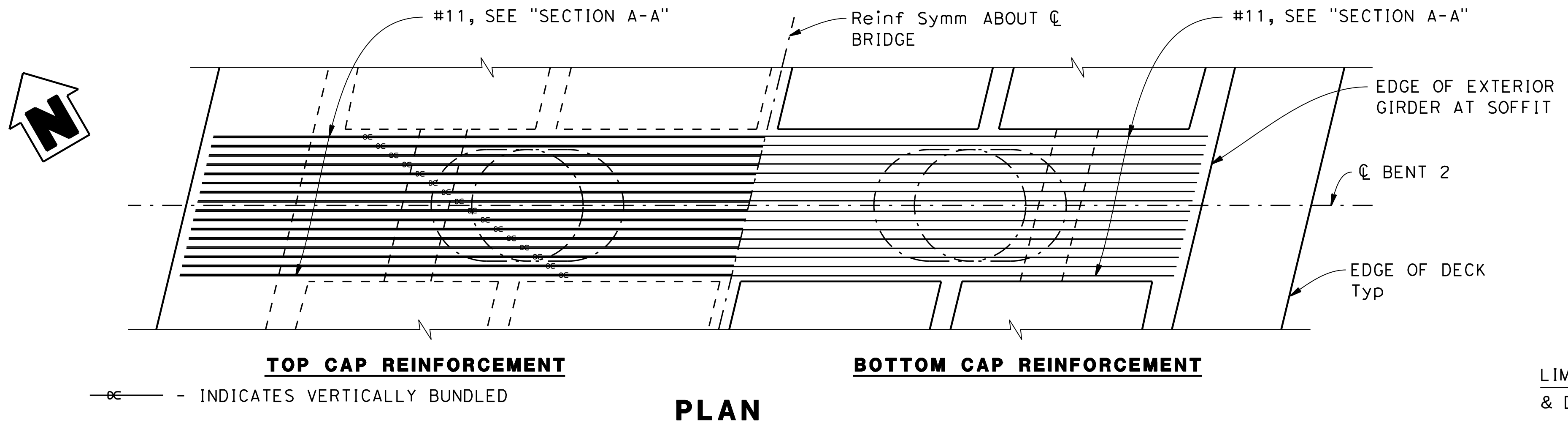
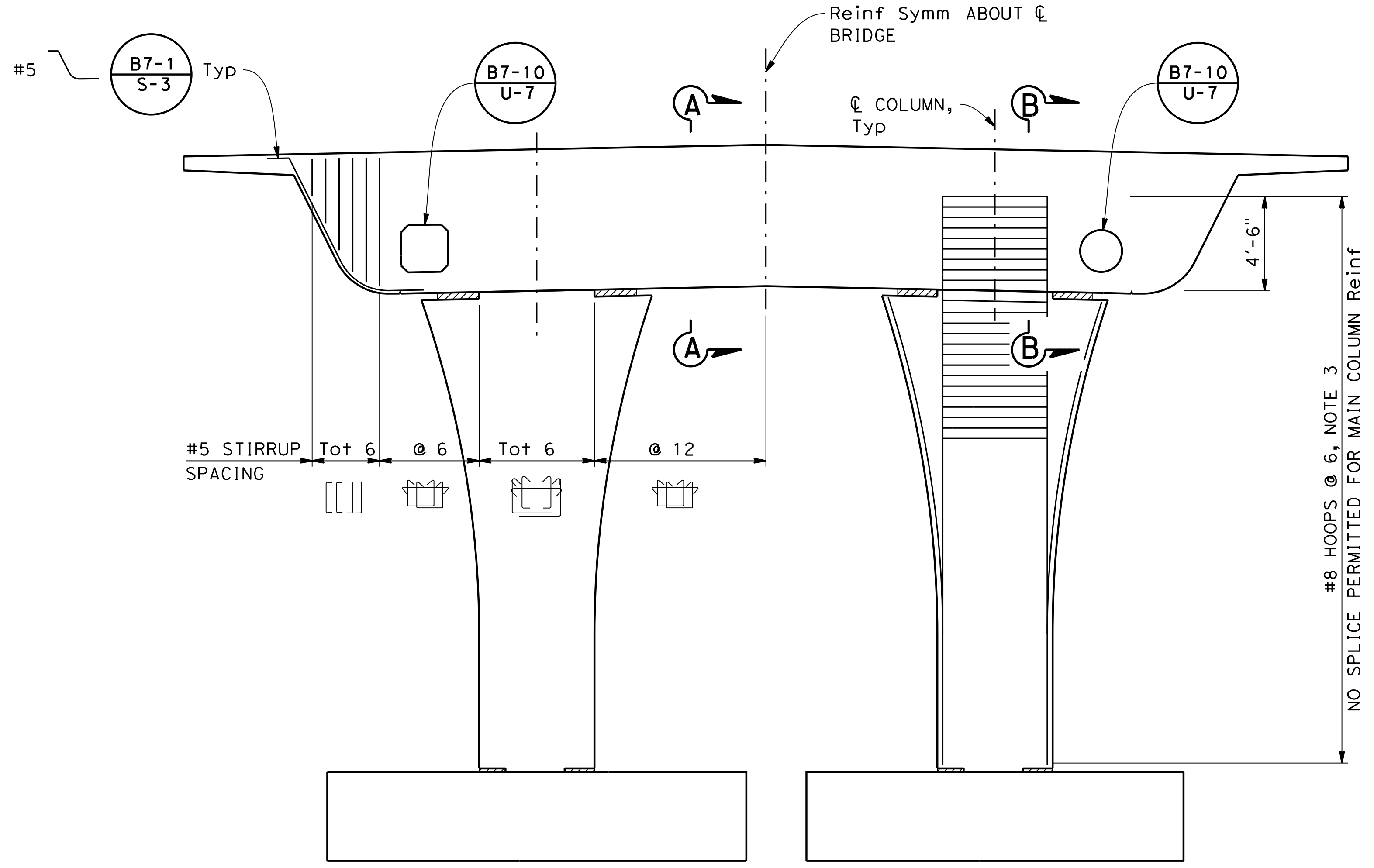


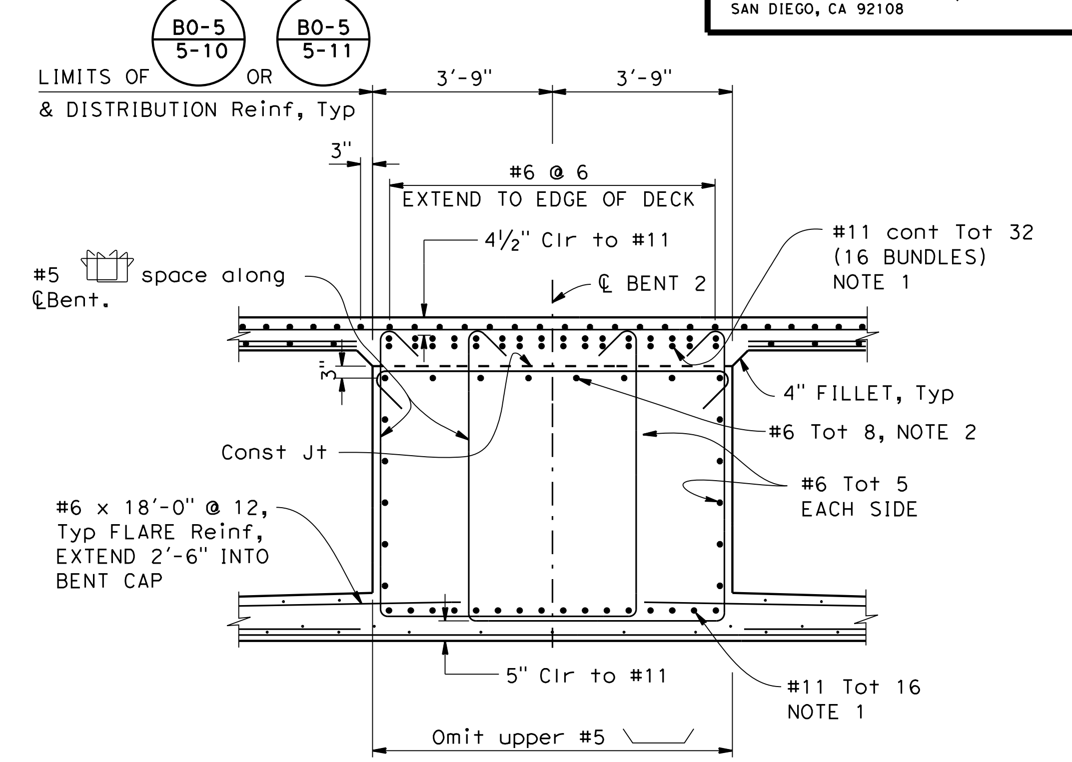
PLAN
1/4"=1'-0"



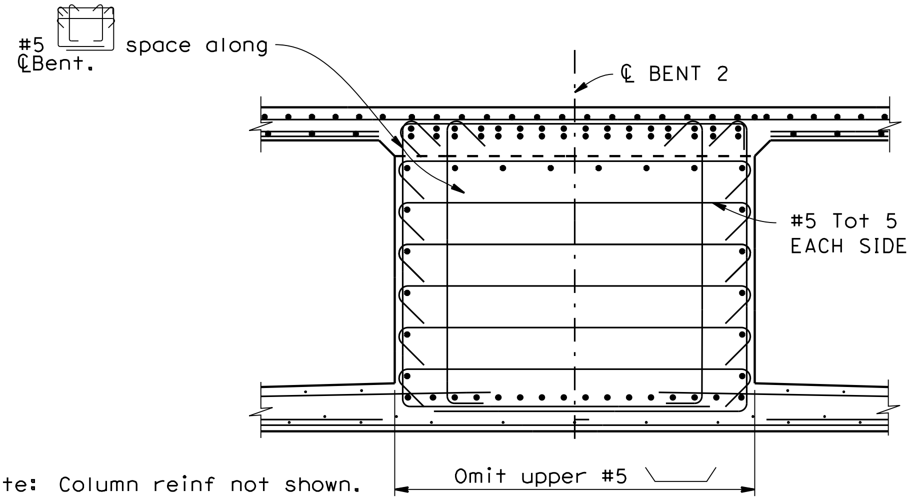
ELEVATION
1/4"=1'-0"

NOTES:

1. Only "Service Splice" allowed.
2. Reinforcement may be adjusted to clear prestressing ducts.
3. All hoops are ultimate butt spliced continuous.
4. For footing details, see "BENT DETAILS NO. 1" sheet.
5. For flare details, see "BENT DETAILS NO. 2" sheet.



SECTION A-A
1/2"=1'-0"



Note: Column reinf not shown.

SECTION B-B
1/2"=1'-0"

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

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	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO.
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POST MILES
5.60

TORREY MEADOWS DRIVE OC
BENT LAYOUT

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES
04/03/15

SHEET 9 OF 25

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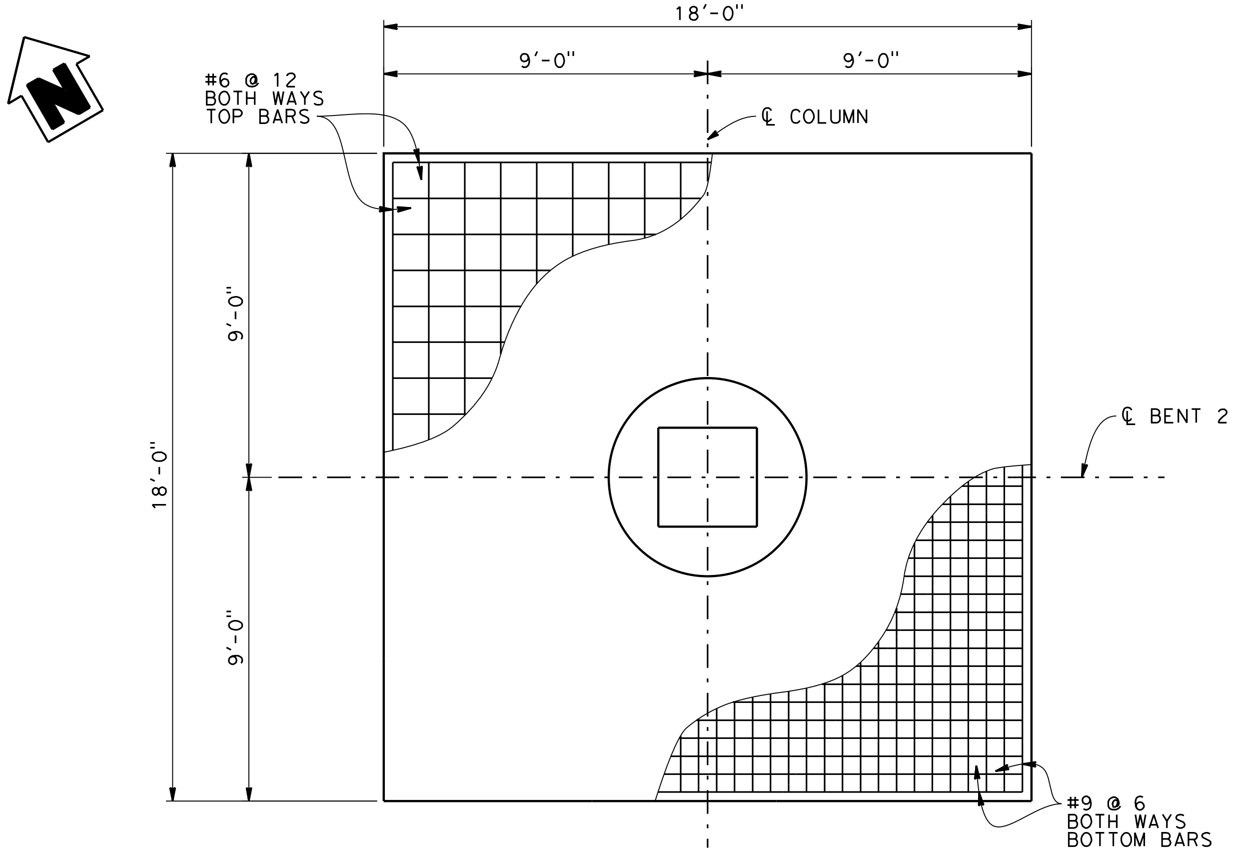
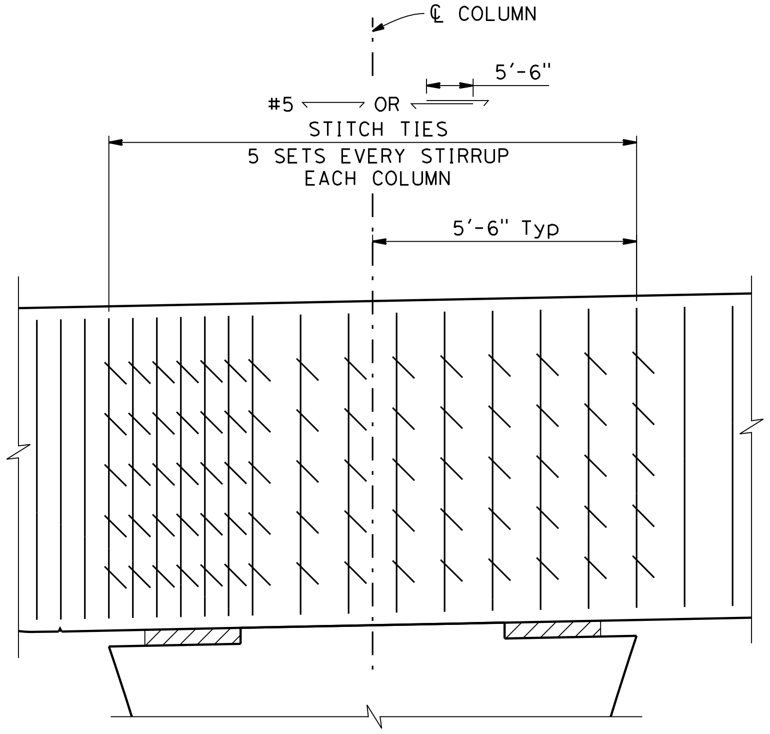


FOOTING PLAN

3/8"=1'-0"

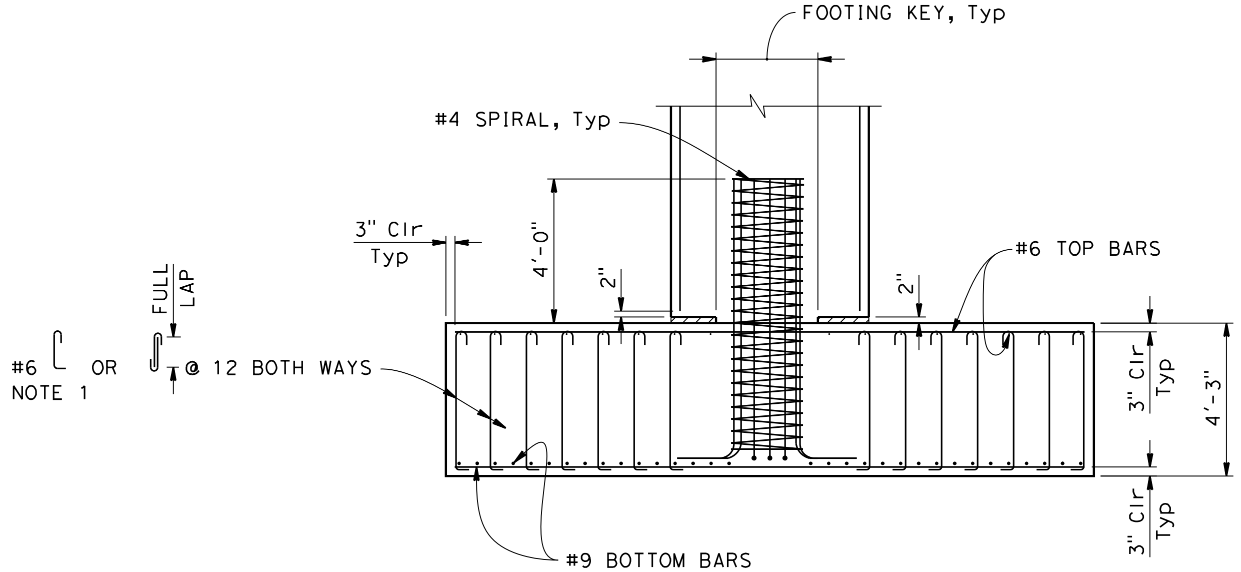


STITCH TIE DETAIL

1/2"=1'-0"

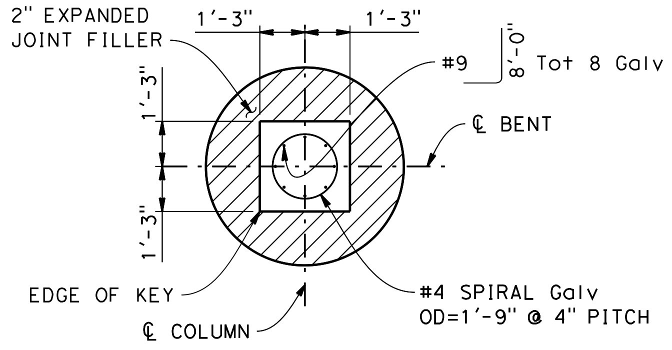
NOTE:

1. Hook around top & bottom mat bars. Omit beneath column key and within 6" edge of column key.



ELEVATION

3/8"=1'-0"



KEY DETAIL

3/8"=1'-0"

65% UNCHECKED DETAILS

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USERNAME => YWang

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SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

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Jared Cole
PROJECT ENGINEER

BRIDGE NO.
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POST MILES
5.60

TORREY MEADOWS DRIVE OC

BENT DETAILS NO. 1

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES
FOR REDUCED PLANS
0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 10 OF 25

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
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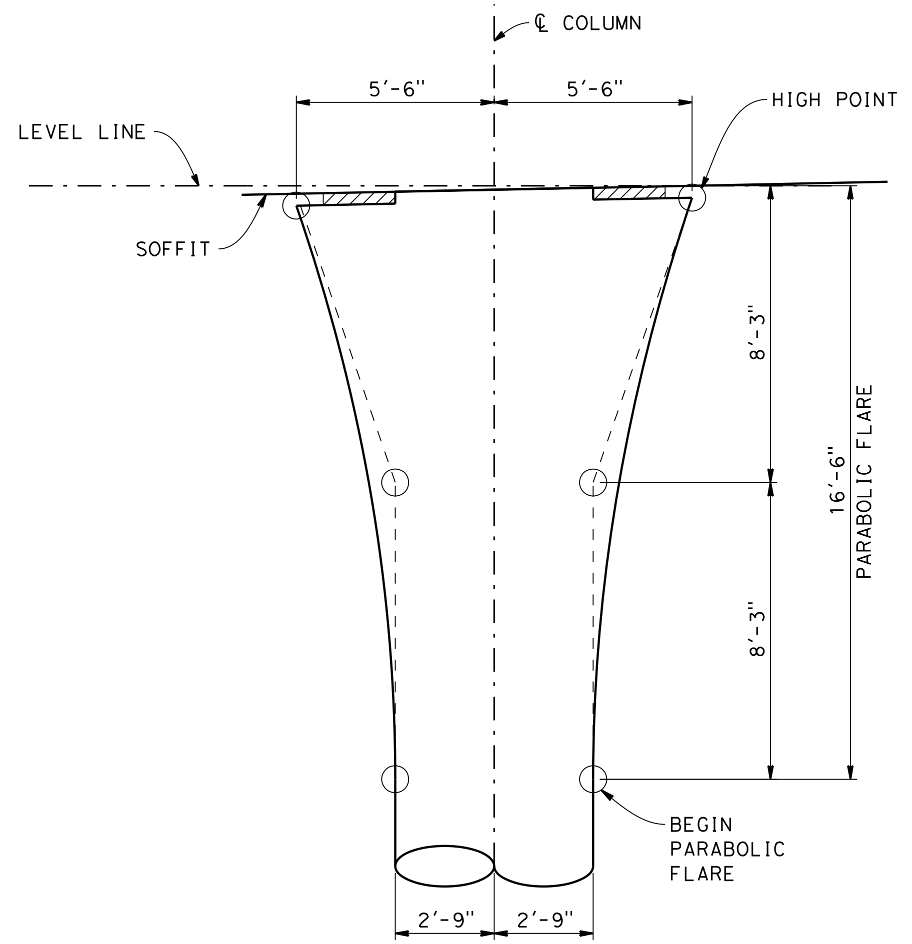
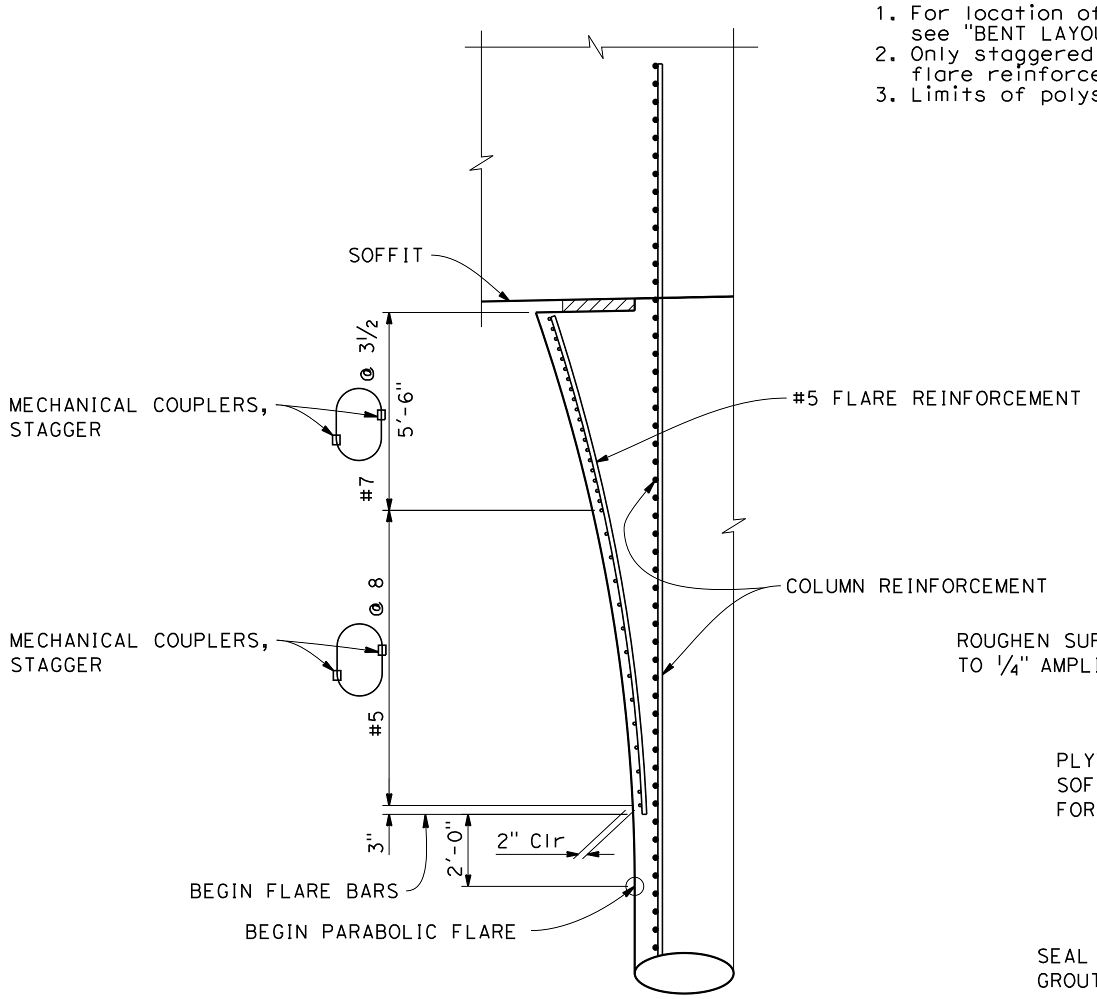
NOTES:

1. For location of "SECTION C-C" and "SECTION D-D", see "BENT LAYOUT" sheet.
2. Only staggered service splice may be used for flare reinforcement.
3. Limits of polystyrene and hardboard removal.



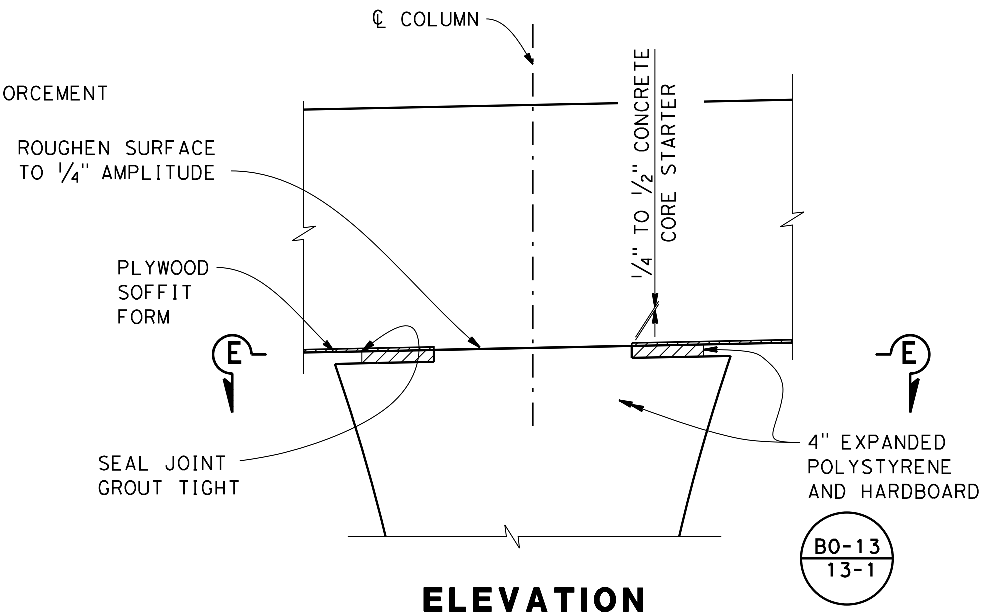
FLARE DETAIL

⅜"=1'-0"



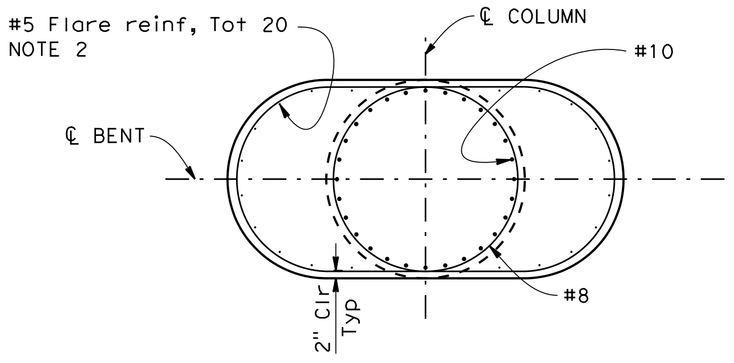
FLARE TIE DETAIL

⅜"=1'-0"



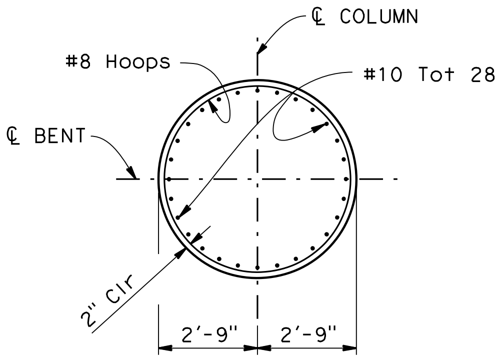
ELEVATION

⅜"=1'-0"



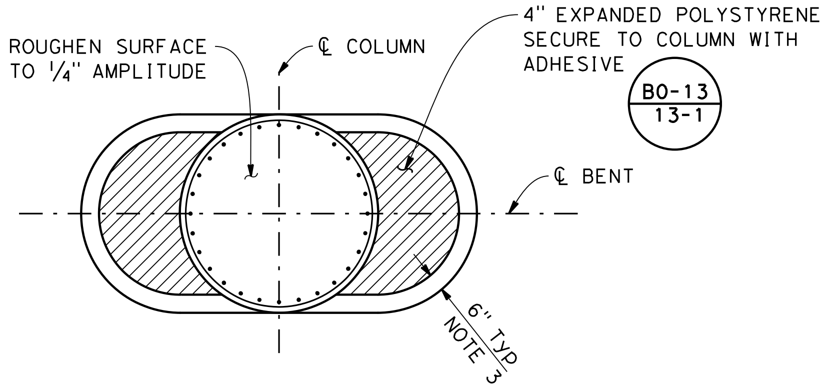
SECTION C-C

⅜"=1'-0"



SECTION D-D

⅜"=1'-0"



SECTION E-E

⅜"=1'-0"

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:57 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY Emir Modarres	CHECKED
DETAILS	BY Yihong Wang	CHECKED
QUANTITIES	BY	CHECKED

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DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

BENT DETAILS NO. 2

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 11 OF 25

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
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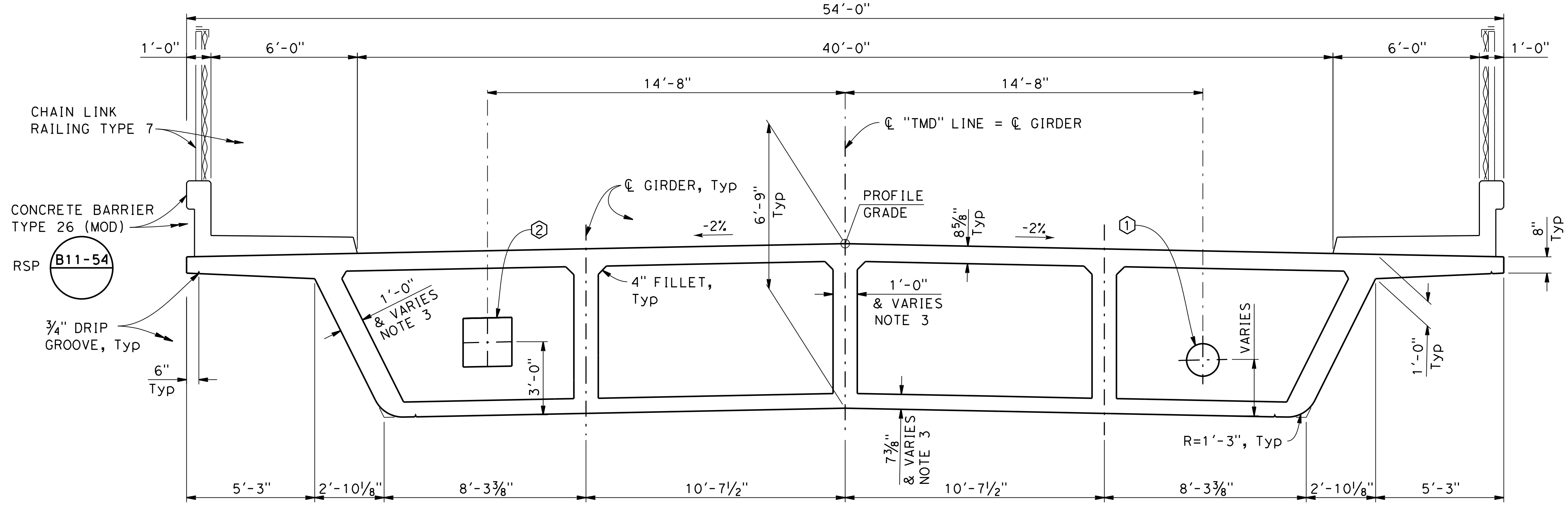
SAN DIEGO, CA 92108

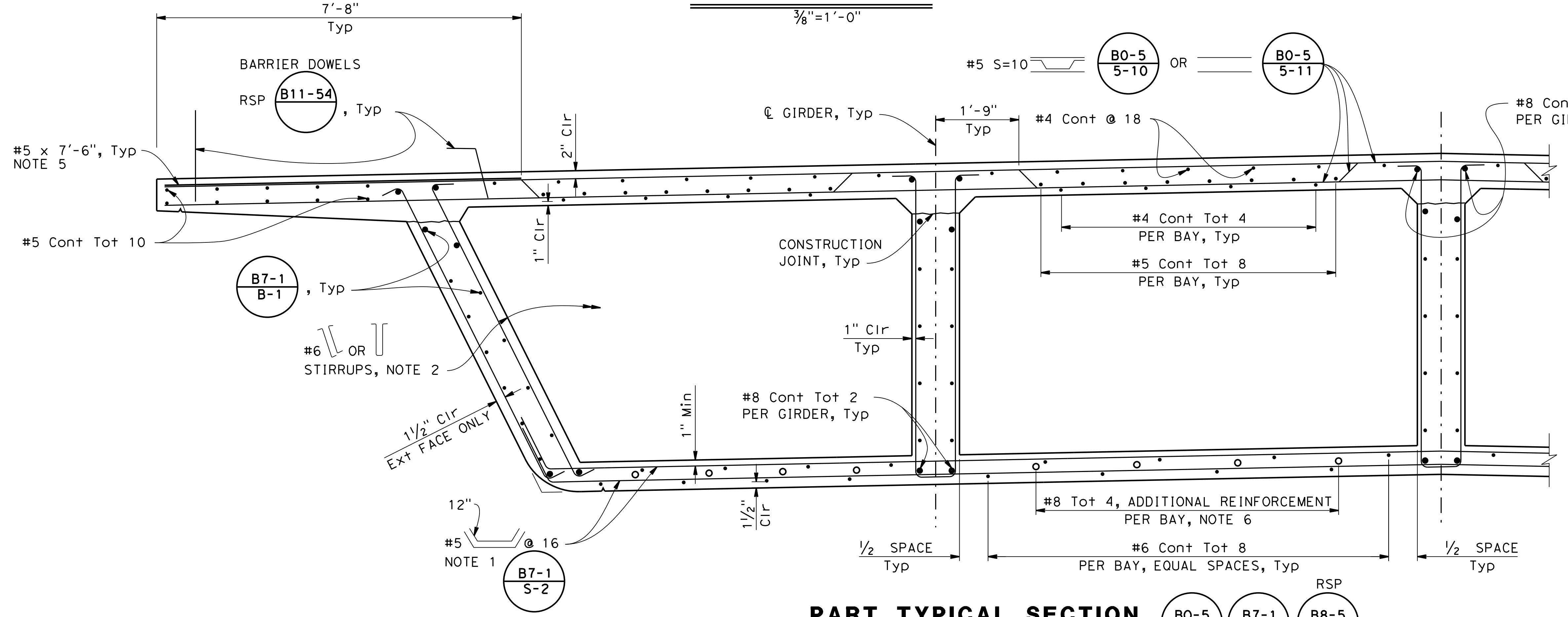


TYPICAL SECTION

⅜"=1'-0"

NOTES:

1. Place normal to ℄ bent and space along "TMD" Line.
2. For girder stirrup spacing, see "LONGITUDINAL SECTION" on "GIRDER LAYOUT" sheet.
3. For girder flare, soffit slab flare and girder thickness, see "GIRDER LAYOUT" sheet.
4. No splice is allowed within 20'-0" of either side of ℄ Bent and ℄ Spans.
5. Additional top transverse deck reinforcement shall be placed in the overhang for a distance of 5ft on either side of expansion joints. This additional reinforcement shall be bundled with alternating top transverse bar.
6. For additional reinforcement limits, see "GIRDER DETAILS" sheet.



UTILITIES:

① - 16" Dia Water Line in 18" Casing (City of San Diego)

② - 2'-0" x 2'-0" Future utility opening

PART TYPICAL SECTION

B0-5 B7-1 RSP B8-5

¾"=1'-0"

65% UNCHECKED DETAILS

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USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY Emir Modarres	CHECKED	
DETAILS	BY Yihong Wang	CHECKED	
QUANTITIES	BY	CHECKED	

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

TYPICAL SECTION

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES 04/03/15

SHEET 12 OF 25

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
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REGISTERED CIVIL ENGINEER DATE

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SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108

PRESTRESSING NOTES

Pjack = 14,000 kips

270 ksi Low Relaxation Strand:

Total Number of Girders = 5
Anchor set = ⅜ in.

Friction Curvature Coefficient : μ = 0.15 (1/rad)
Friction Wobble Coefficient : K = 0.0002 (1/ft)

Distribution of prestress force (Pjack) between girders shall not exceed the ratio of 10:9.

Concrete: f'c = 4.0 ksi @ 28 days
f'ci = 3.6 ksi @ time of stressing

Contractor shall submit elongation calculations based on initial stress at ☒ = 0.8776 times jacking stress.

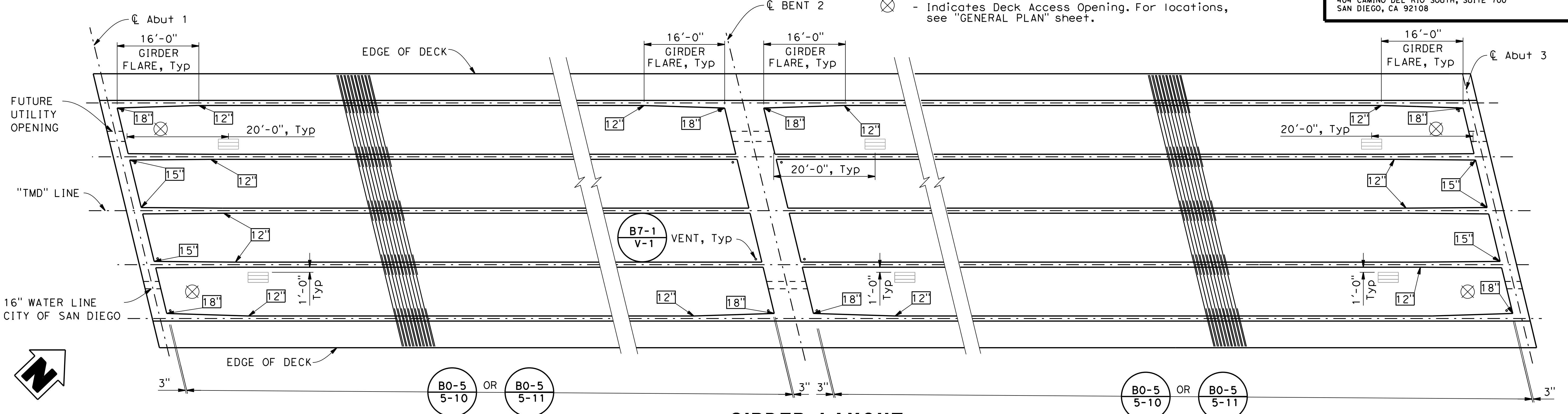
One end stressing shall be performed at either Abutment.

NOTE:

For "END DIAPHRAGM", see "GIRDER DETAILS" sheet.

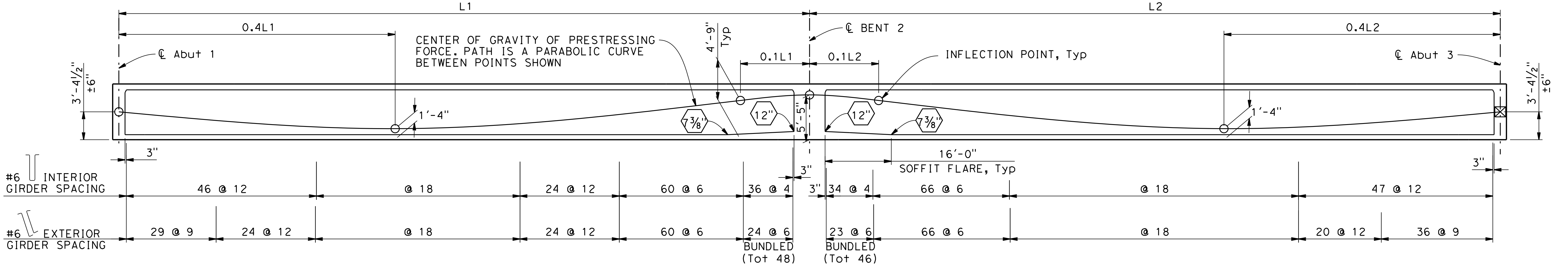
LEGEND:

- ⬡ - Indicates soffit slab thickness
- ▭ - Indicates girder stem width
- ☒ - Indicates theoretical point of no movement for one end stressing
- ▤ - Indicates 2' x 4' Soffit Grate. For details, see "SOFFIT OPENING DETAILS" on "MISCELLANEOUS DETAILS" sheet.
- ⊗ - Indicates Deck Access Opening. For locations, see "GENERAL PLAN" sheet.



GIRDER LAYOUT

1"=10'



LONGITUDINAL SECTION

No Scale

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:00:59 PM USERNAME => YWang

DESIGN OVERSIGHT

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	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

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DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

GIRDER LAYOUT

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 13 OF 25

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DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
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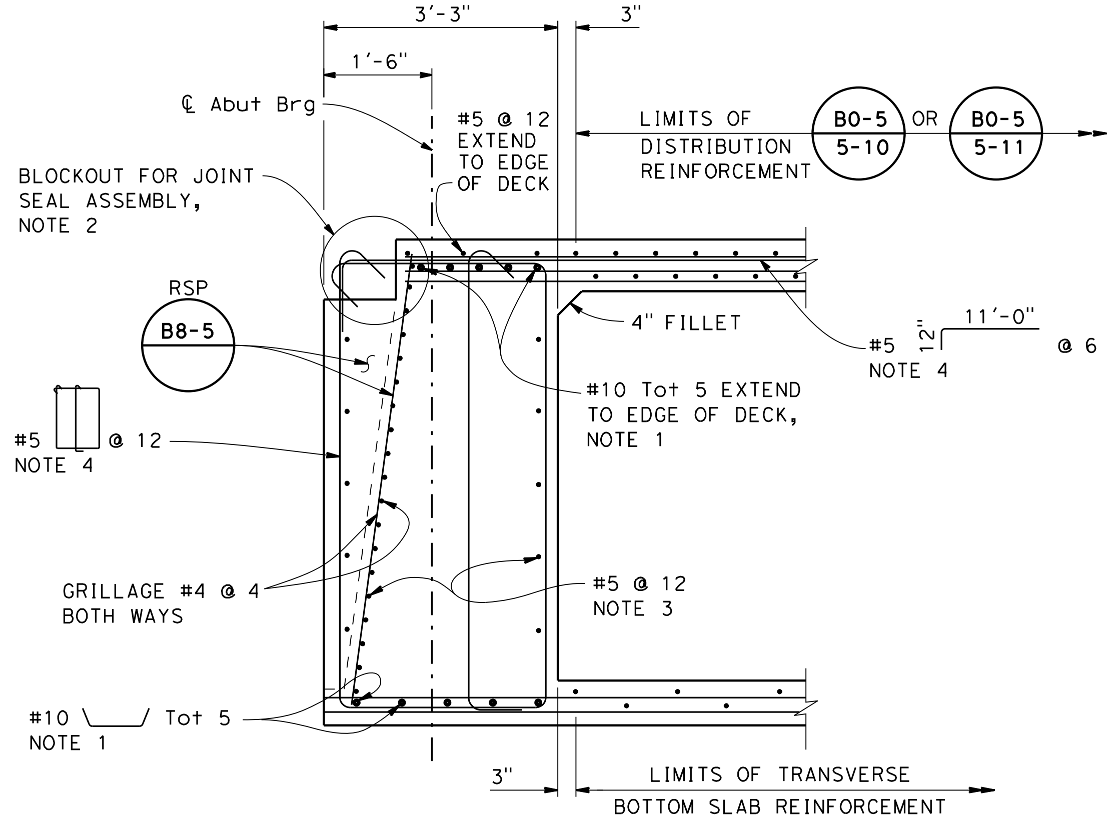
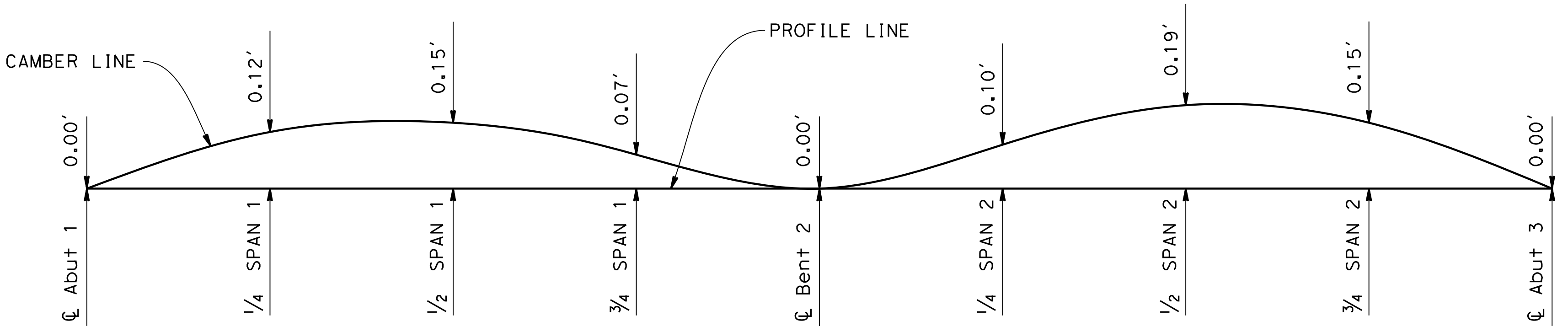


END DIAPHRAGM

¾"=1'-0"

NOTES:

1. Place parallel to ℄ abutment and space equally.
2. See "JOINT SEAL ASSEMBLY MAXIMUM MOVEMENT RATING = 4" " sheet.
3. Bars may be spliced or bent to clear prestress anchorage as directed by the Engineer.
4. Place parallel to ℄ Girders and space along ℄ Abutment.

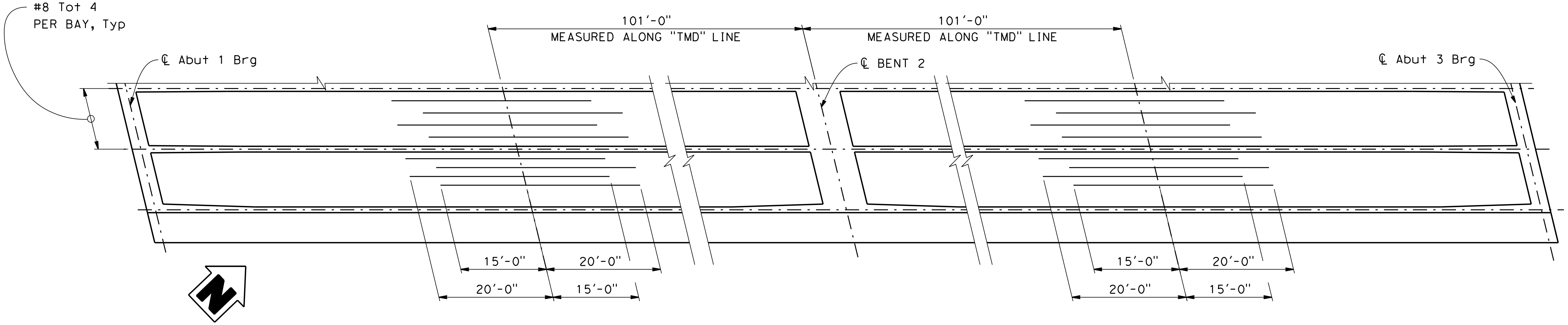


CAMBER DIAGRAM

No Scale

NOTES:

1. Does not include allowance for falsework settlement.
2. Camber valves shown above are based on stressing at Abutment 1 end.



ADDITIONAL BOTTOM SLAB REINFORCEMENT

1"=10'

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015   TIME PLOTTED => 4:00:59 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

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STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

GIRDER DETAILS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0   CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 04/03/15

SHEET 14 OF 25

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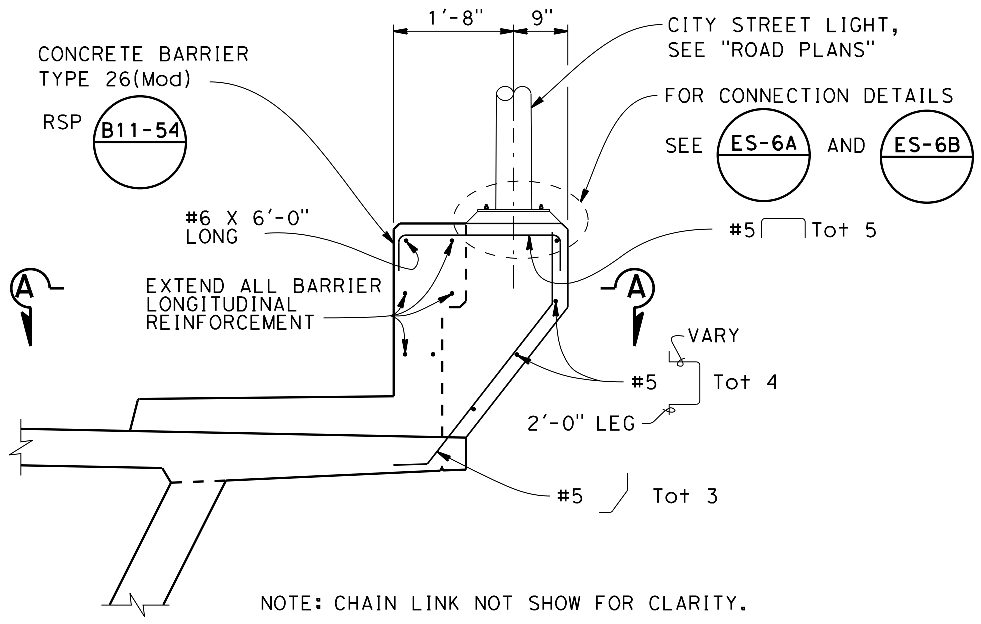
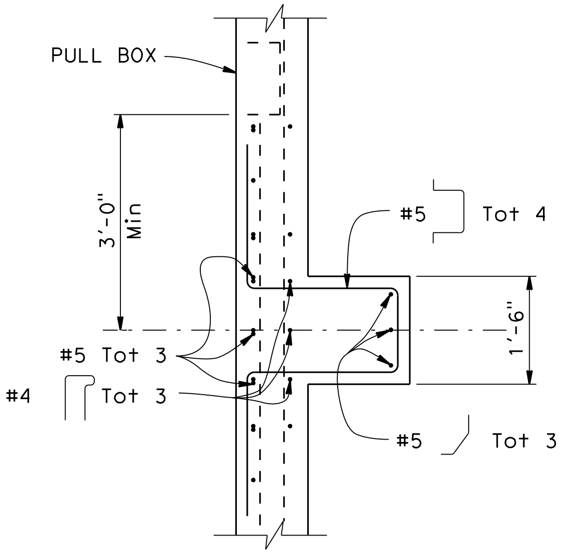
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



NOTE: CHAIN LINK NOT SHOW FOR CLARITY.

ELEVATION

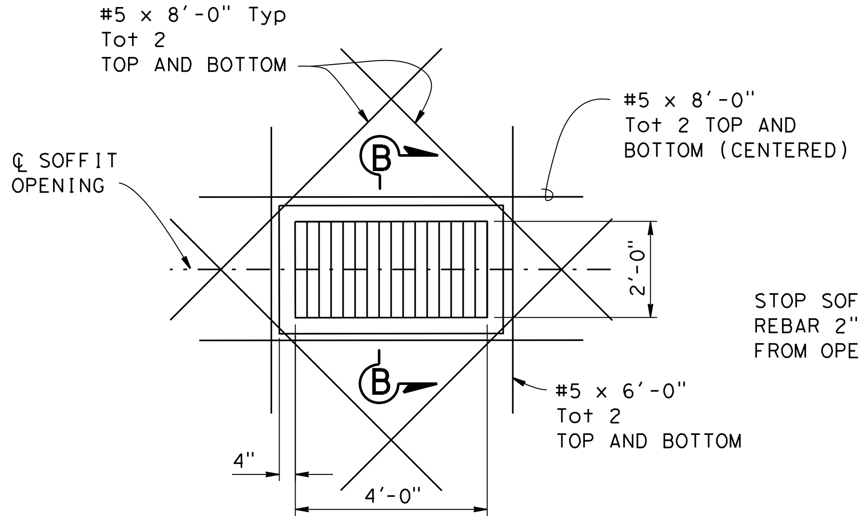


SECTION A-A

PEDESTAL DETAILS

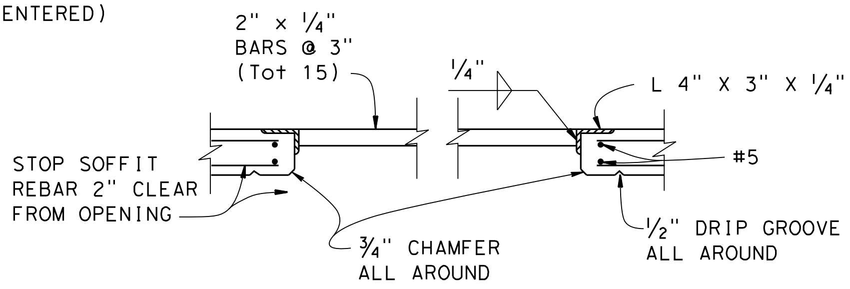
NO SCALE

NOTE: For details not shown, see RSP B11-56 ES-6A ES-6B



PLAN

½"=1'-0"



SECTION B-B

1"=1'-0"

SOFFIT GRATE DETAILS

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:01:00 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
MISCELLANEOUS DETAILS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES 04/03/15

REVISION DATES

SHEET 15 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-m-miscdt01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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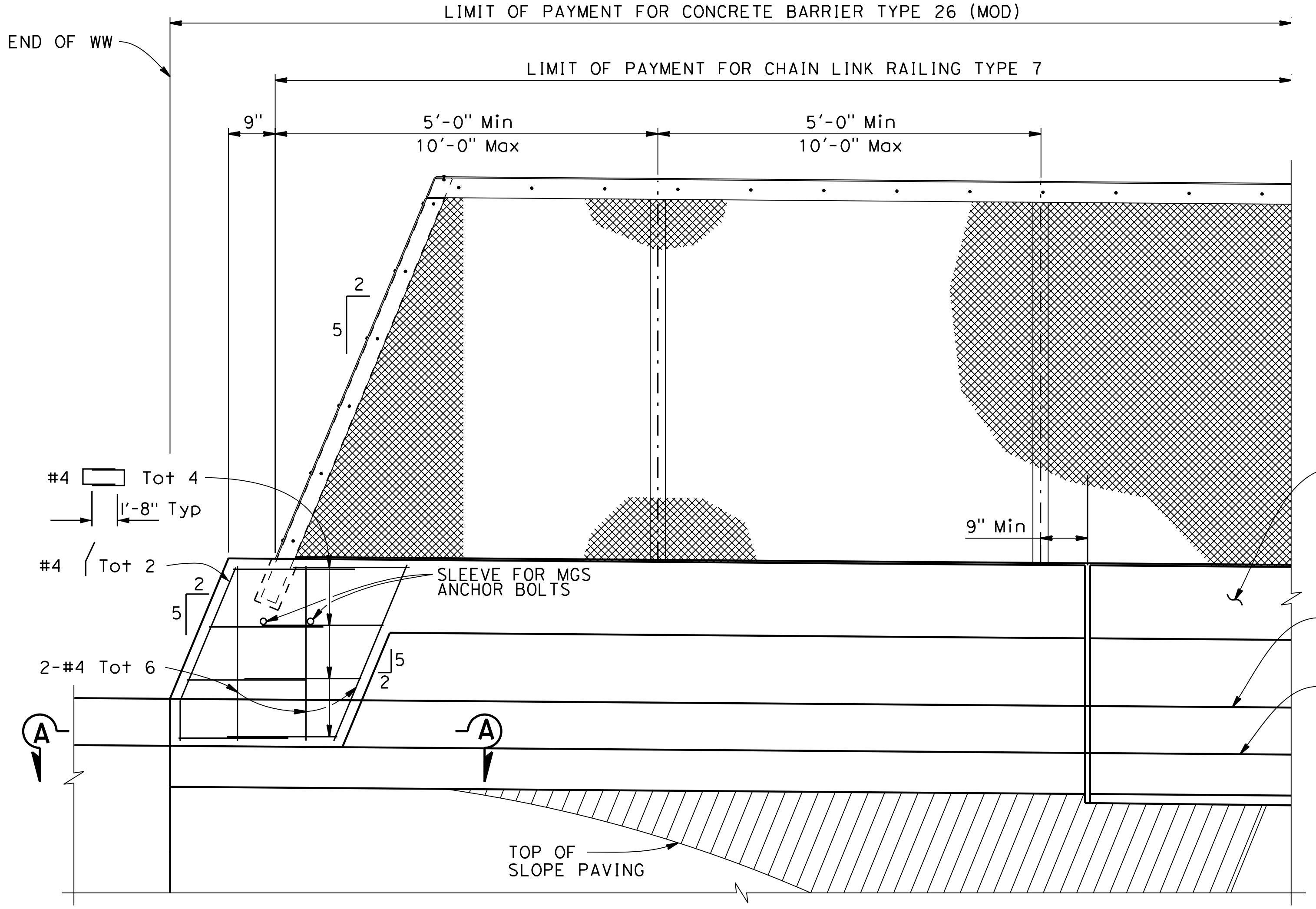
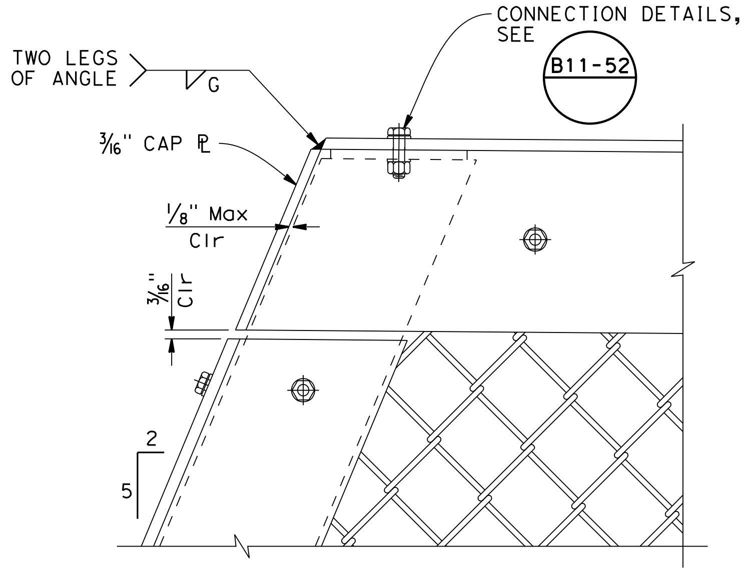
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



CONCRETE BARRIER TYPE 26 (MOD) PART ELEVATION

¾"=1'-0"

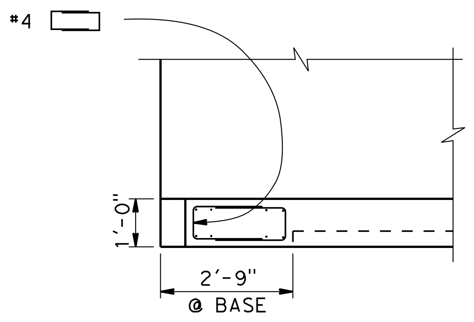


END POST ELEVATION

½"=1'-0"

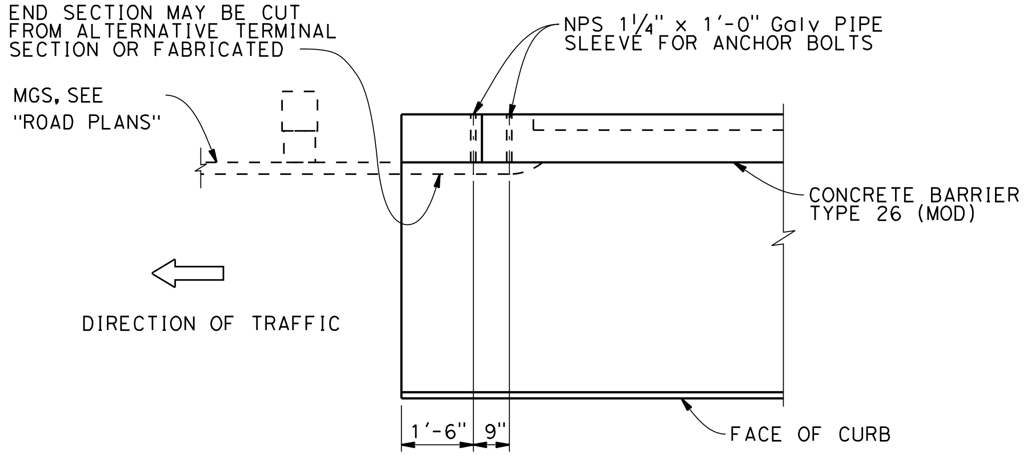
NOTES:

1. For Concrete Barrier Type 26 (MOD) Details not shown, see RSP B11-54
2. For Chain Link Railing Type 7 Details not shown, see B11-52



SECTION A-A

½"=1'-0"



END BARRIER DETAIL

½"=1'-0"

65% UNCHECKED DETAILS

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USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
RAILING & BARRIER DETAILS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES → 04/03/15

REVISION DATES

SHEET 16 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-n-brdt01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER　DATE

PLANS APPROVAL DATE

No.
Exp.
CIVIL

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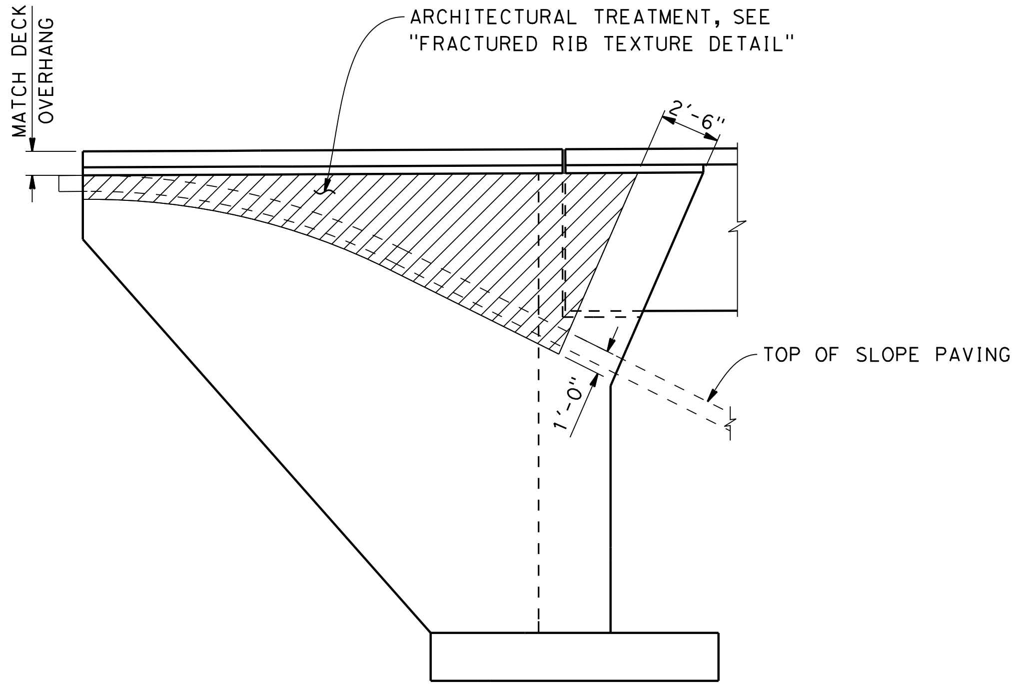
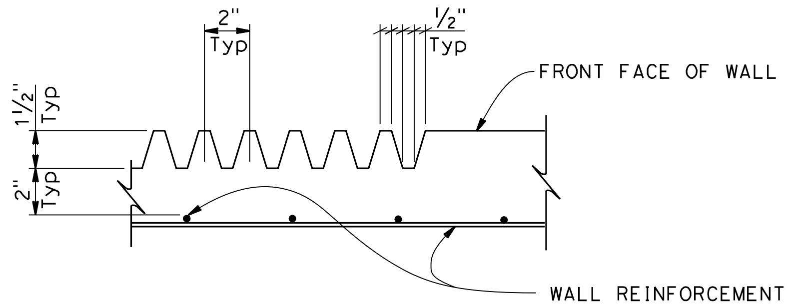
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



ABUTMENT ARCHITECTURAL TREATMENT

No Scale

NOTE: ABUTMENT 1 SHOWN, ABUTMENT 3 SIMILAR.



FRACTURED RIB TEXTURE DETAIL

No Scale

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015　TIME PLOTTED => 4:01:01 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY Emir Modarres	CHECKED
DETAILS	BY Yihong Wang	CHECKED
QUANTITIES	BY	CHECKED

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

ARCHITECTURAL TREATMENT DETAILS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS　0　1　2　3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0　CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES: 04/03/15

SHEET 17 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-o-archdt01.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
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Exp.
CIVIL
STATE OF CALIFORNIA

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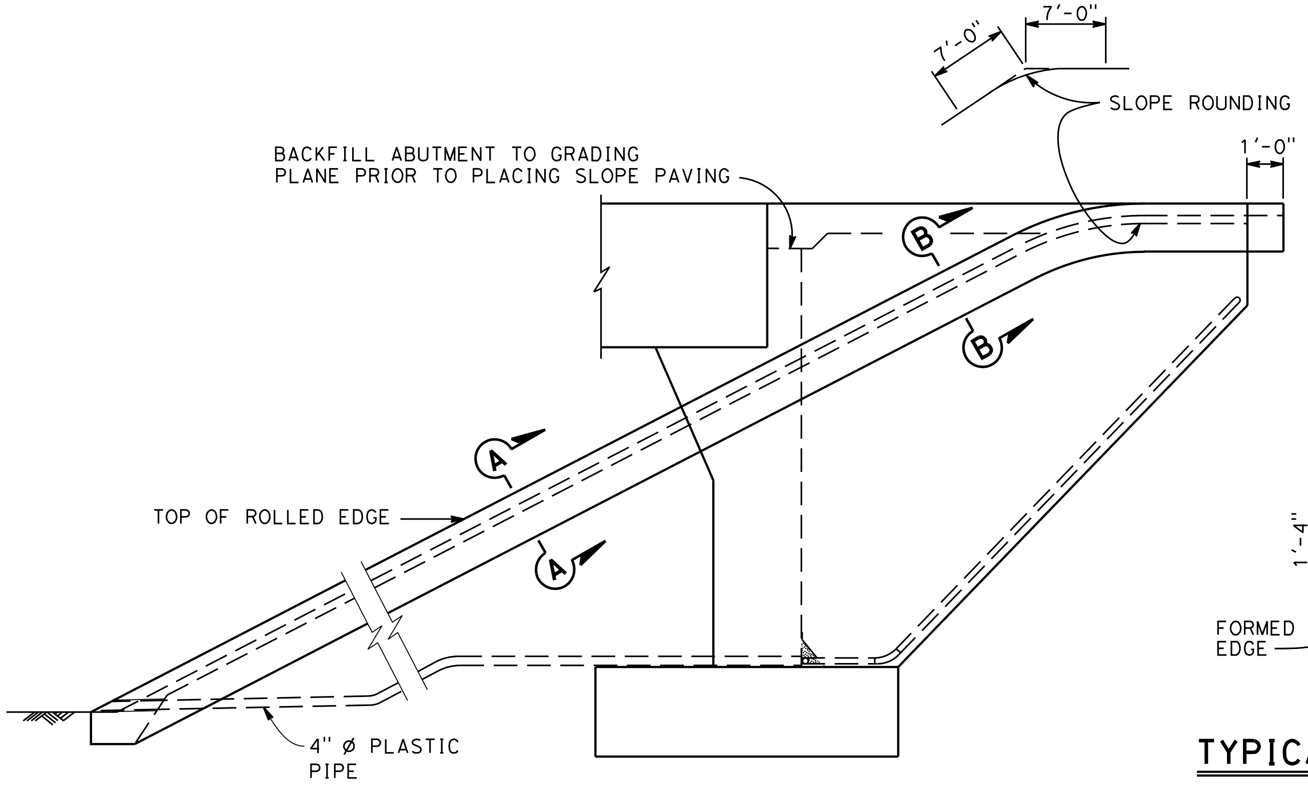
SAN DIEGO, CA 92101

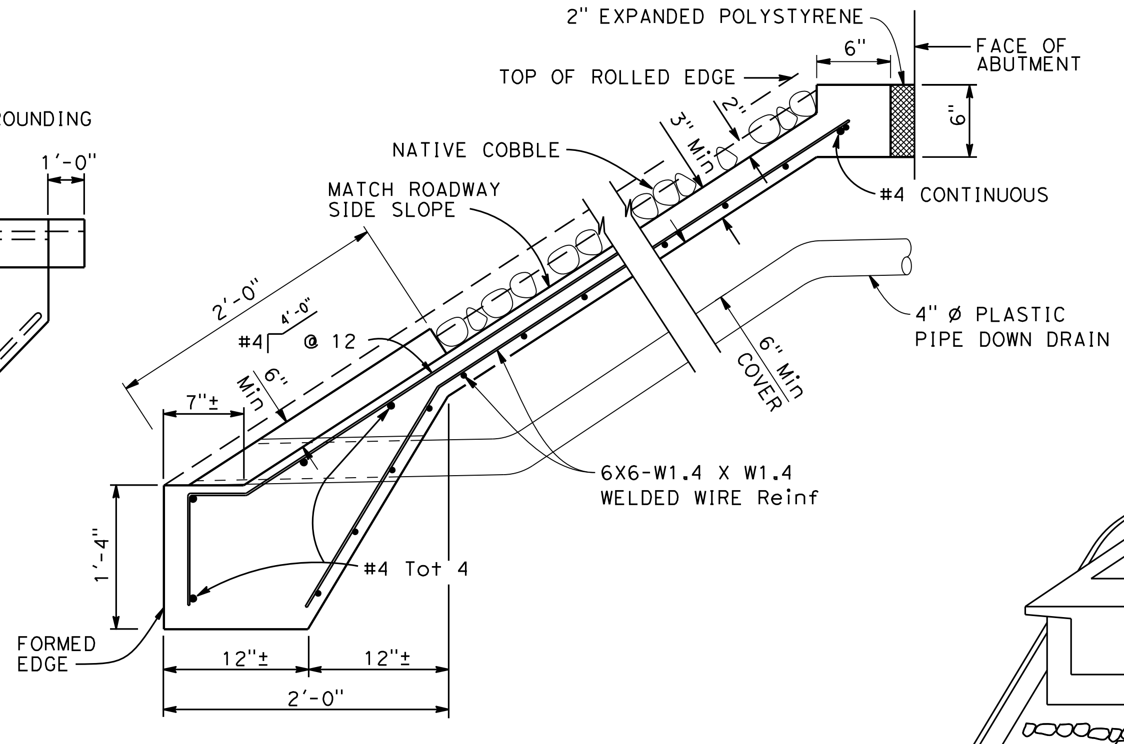
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



NOTE: ABUTMENT 3 SHOWN, ABUTMENT 1 SIMILAR

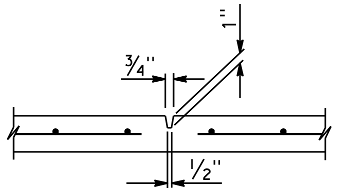
WINGWALL ELEVATION

NO SCALE

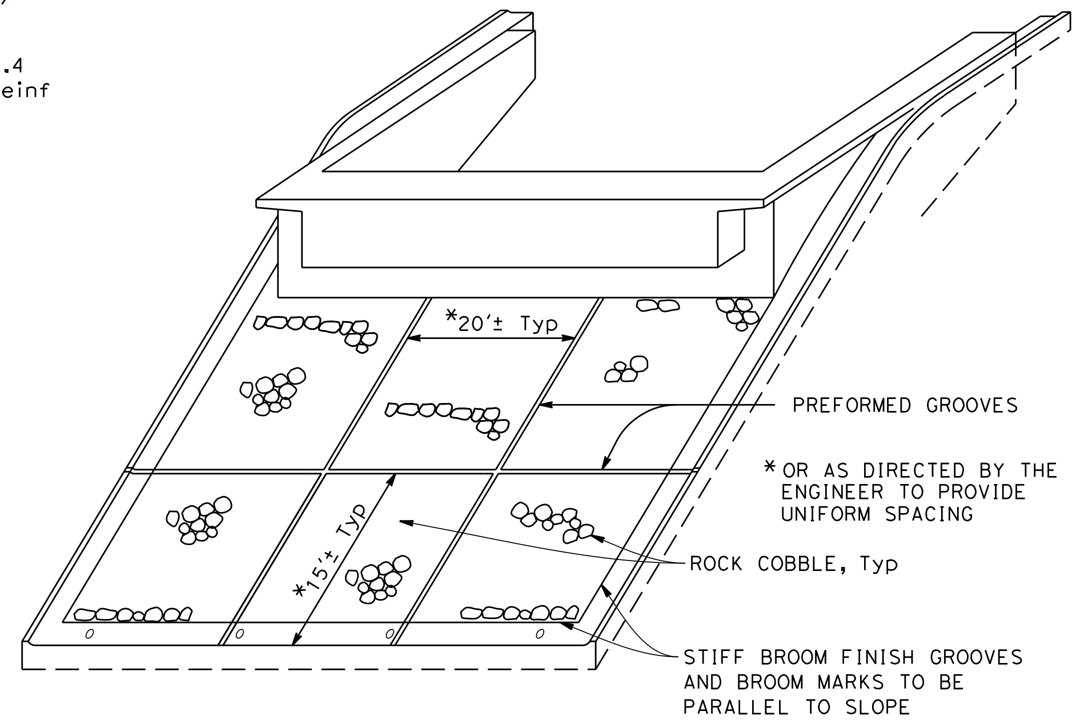


TYPICAL SECTION - CONCRETE PAVING

NO SCALE

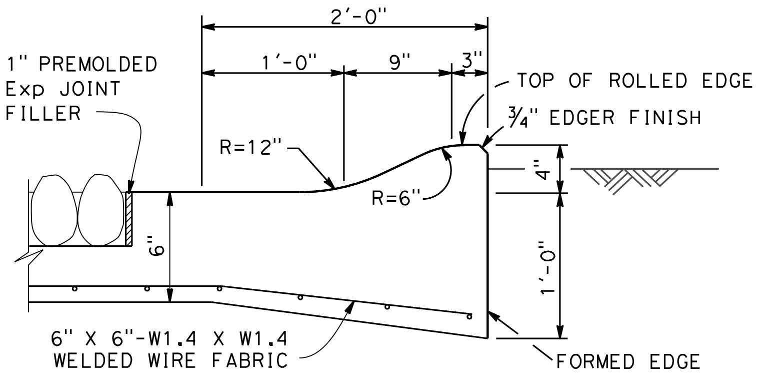


PREFORMED GROOVE



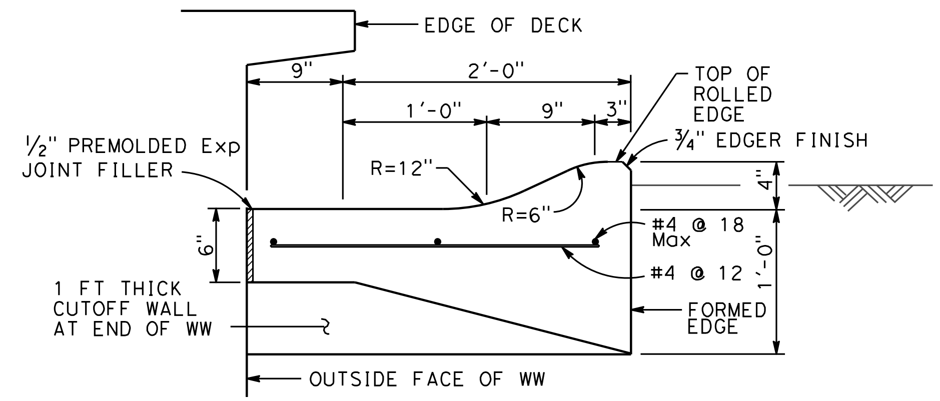
PICTORIAL VIEW OF TYPICAL INSTALLATION

NO SCALE



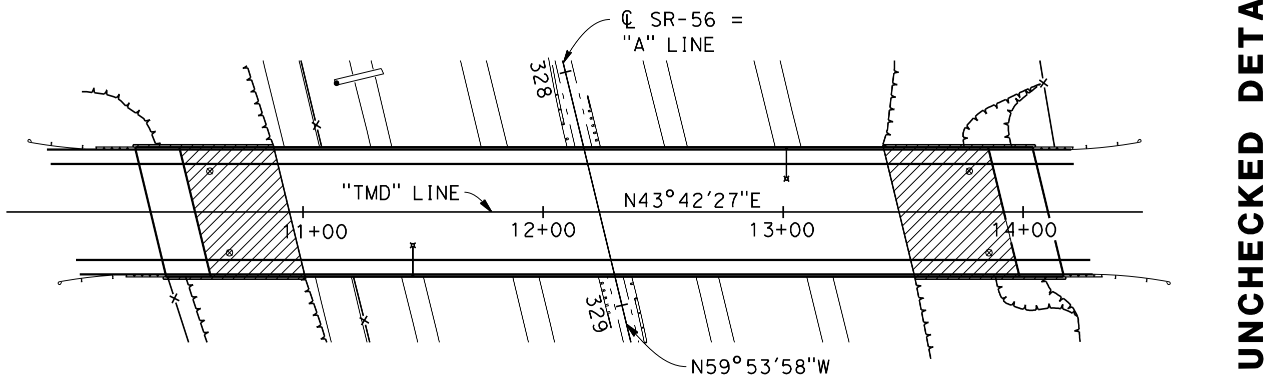
SECTION A-A

NO SCALE



SECTION B-B

NO SCALE



LIMITS OF SLOPE PAVING

NO SCALE

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:01:02 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

DESIGN	BY Emir Modarres	CHECKED	
DETAILS	BY Yihong Wang	CHECKED	
QUANTITIES	BY	CHECKED	

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
SLOPE PAVING (ROCK COBBLE)

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES →

REVISION DATES 04/03/15

SHEET 18 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-r-miscdt03.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

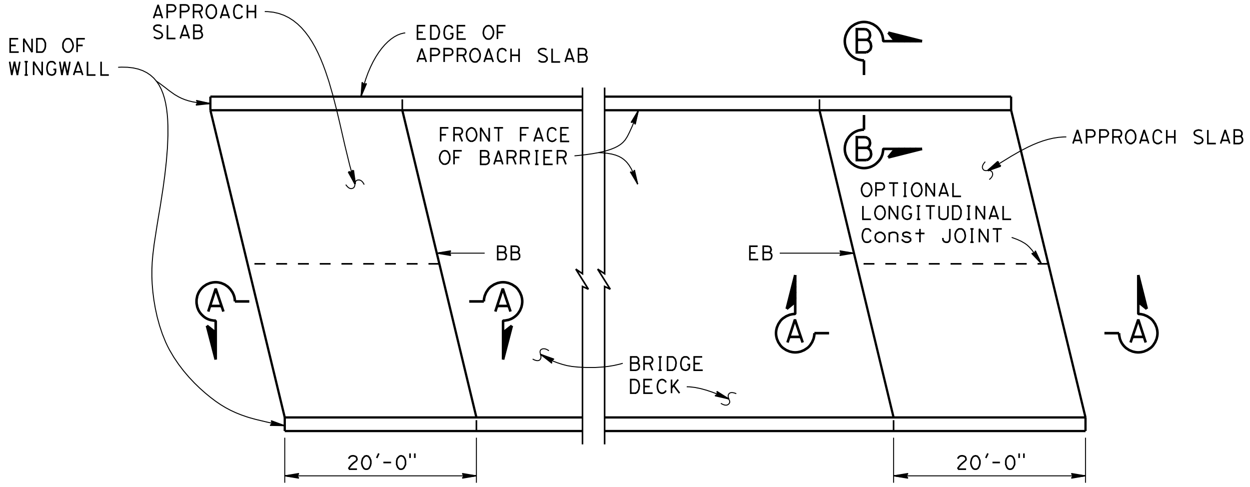
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER No. Exp. CIVIL STATE OF CALIFORNIA

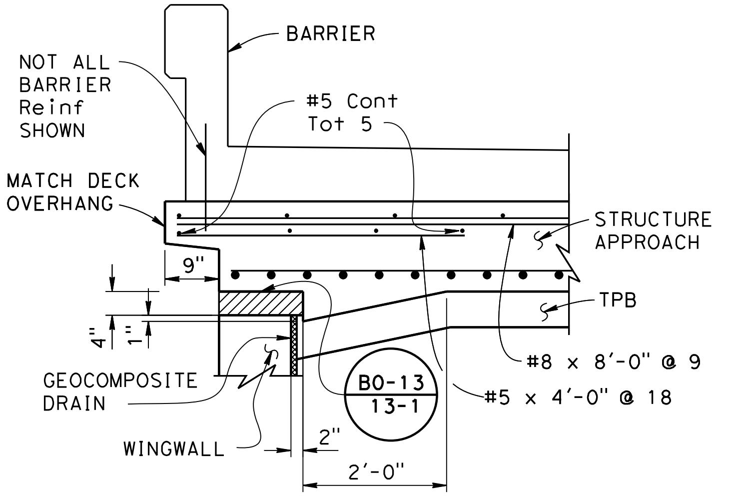
CITY OF SAN DIEGO
1010 SECOND AVENUE, SUITE 1100
SAN DIEGO, CA 92101

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



PLAN

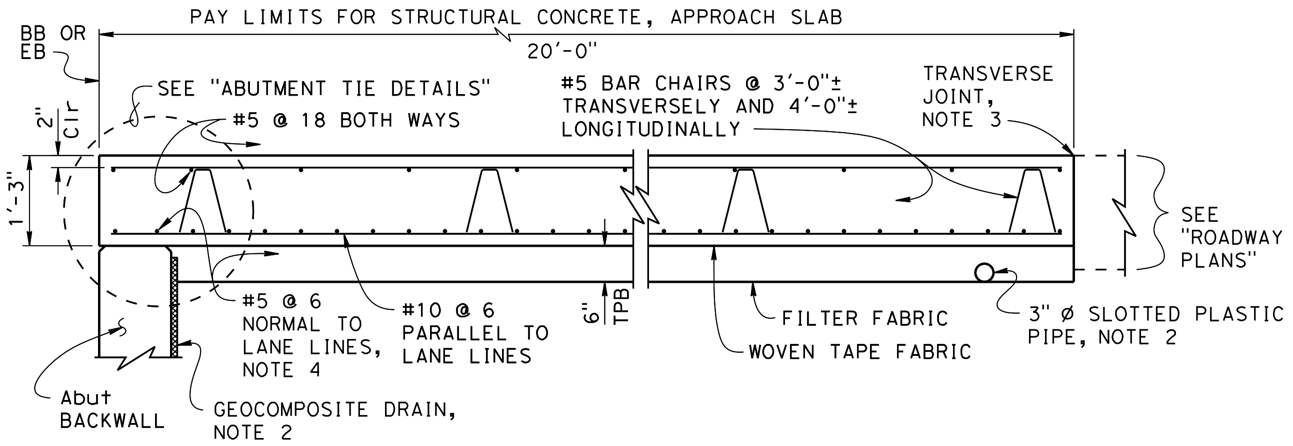
1" = 10'



▨ Indicates Expanded Polystyrene, remove after concrete is placed.

SECTION B-B

¾" = 1'-0"

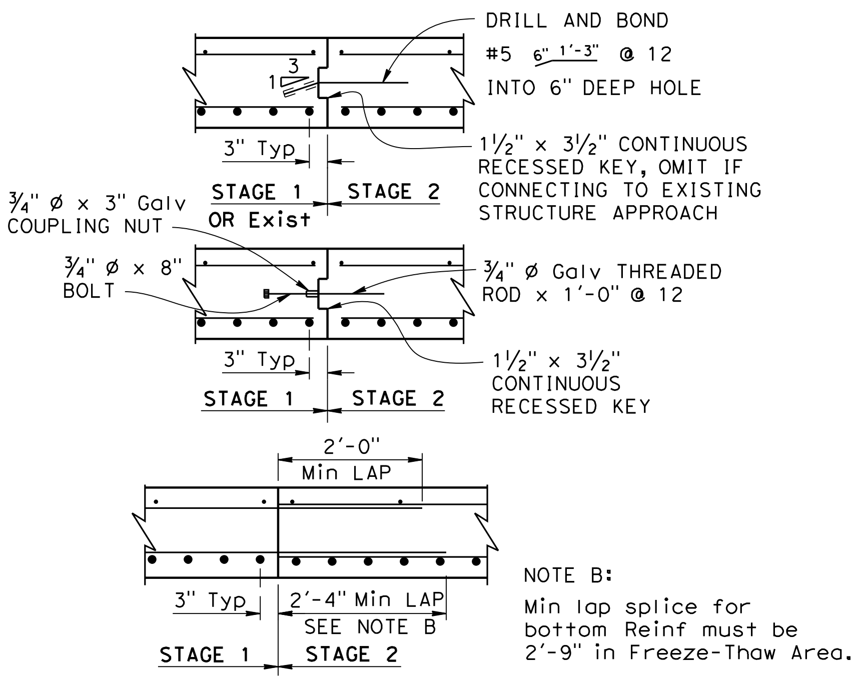


SECTION A-A

¾" = 1'-0"

NOTES:

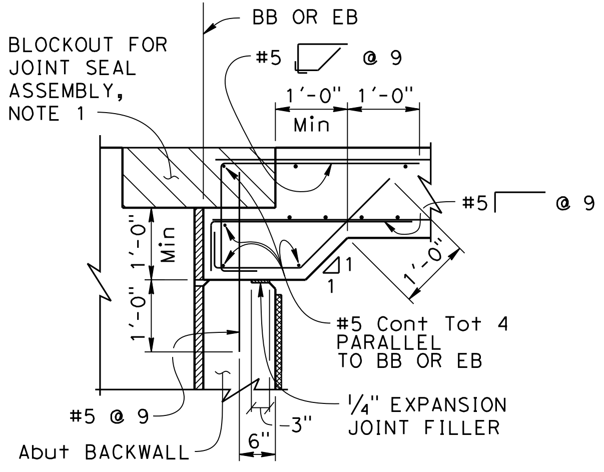
1. For joint protection details, blockout dimensions for joint seal assembly, and other details not shown, see other plan sheets. Haunch reinforcement placed for joint seal assembly blockout must be normal to BB or EB and spaced to avoid joint seal assembly anchorage.
2. For drainage details, see "STRUCTURE APPROACH DRAINAGE DETAILS" sheet.
3. Transverse Joint must be a minimum of 5'-0" from an existing or constructed weakened plane joint in approach PCC roadway pavement. Refer to Standard Plans P10 and P14.
4. At the Contractor's option, approach slab transverse reinforcement may be placed parallel to BB or EB. Spacing of transverse reinforcement is measured along ℄ roadway.



NOTE B:
Min lap splice for bottom Reinf must be 2'-9" in Freeze-Thaw Area.

LONGITUDINAL CONSTRUCTION JOINT ALTERNATIVES

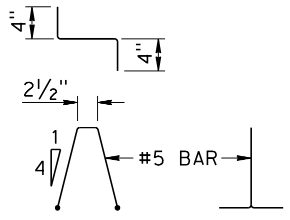
¾" = 1'-0"



MR > 2"

ABUTMENT TIE DETAILS

¾" = 1'-0"



BAR CHAIR DETAIL

1" = 1'-0"

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:01:03 PM
USERNAME => YWang

DESIGN	BY Emir Modarres	CHECKED	
DETAILS	BY Yihong Wang	CHECKED	
QUANTITIES	BY	CHECKED	

DESIGN OVERSIGHT

SIGN OFF DATE

PREPARED FOR THE STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC
STRUCTURE APPROACH TYPE N

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES → REVISION DATES 04/03/15

SHEET 19 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-r-sasd.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	5.60		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
No.
Exp.
CIVIL
STATE OF CALIFORNIA

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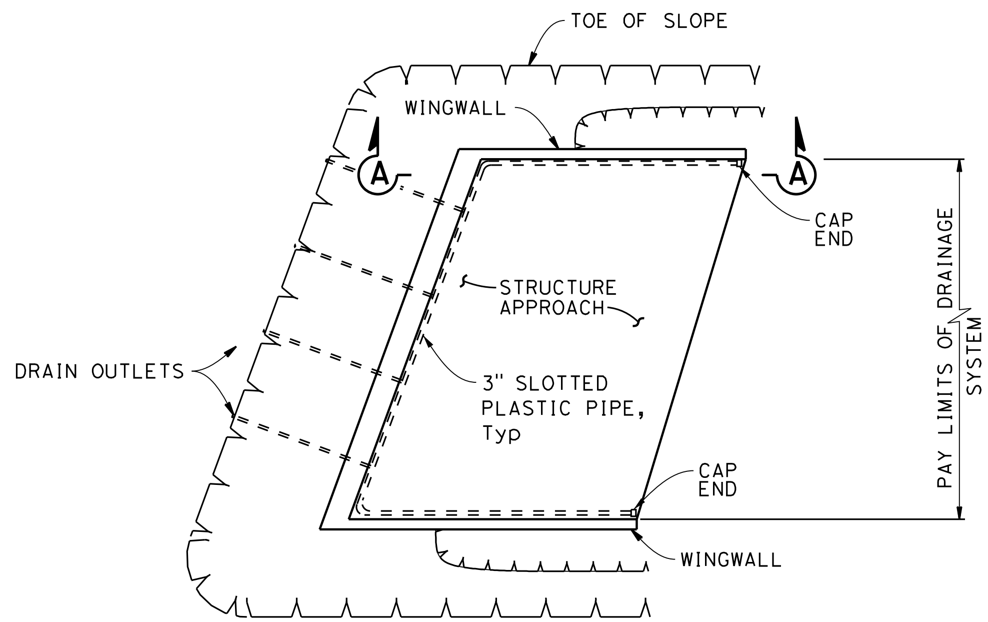
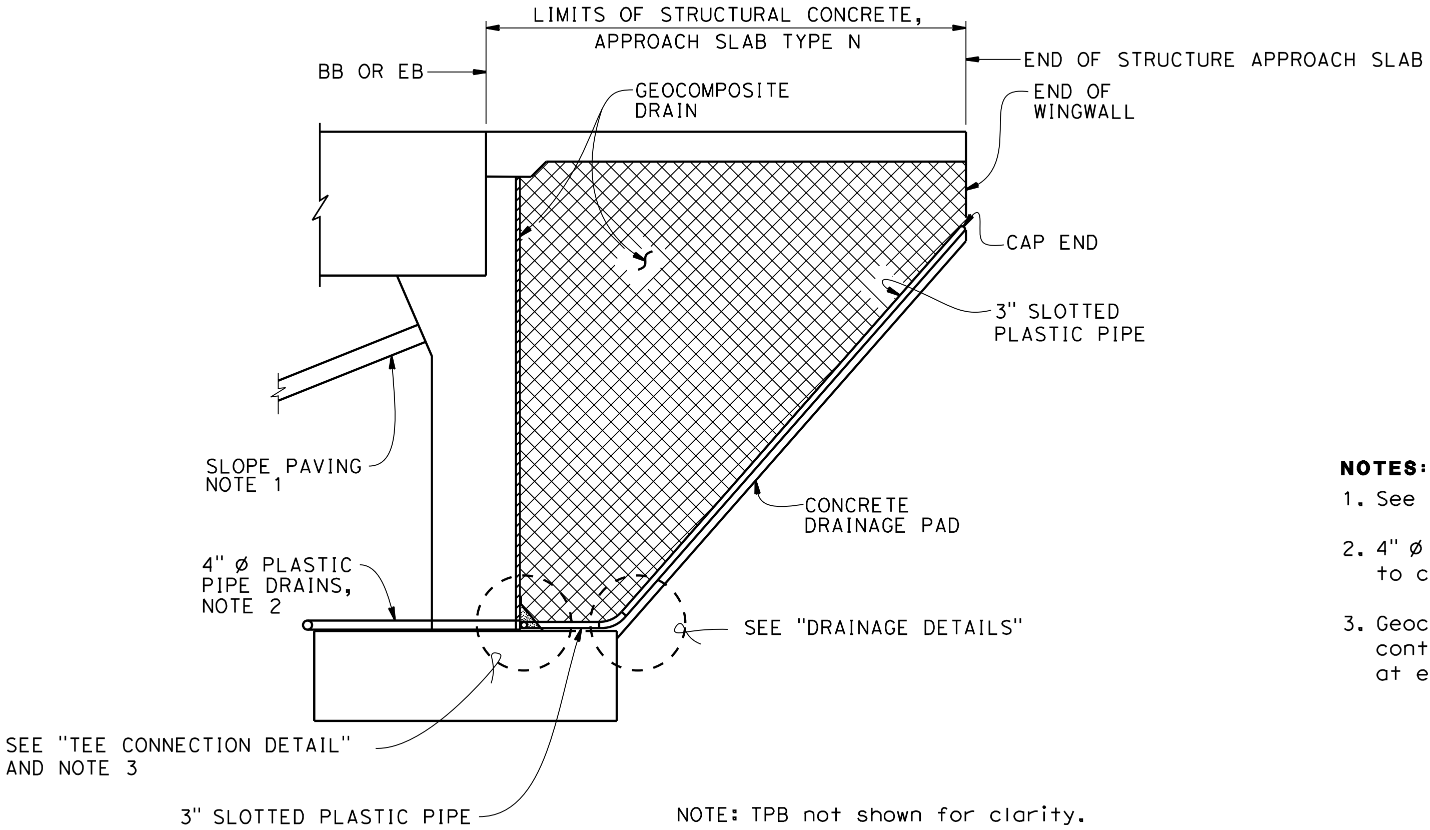
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92108



TYPICAL PLAN

No Scale



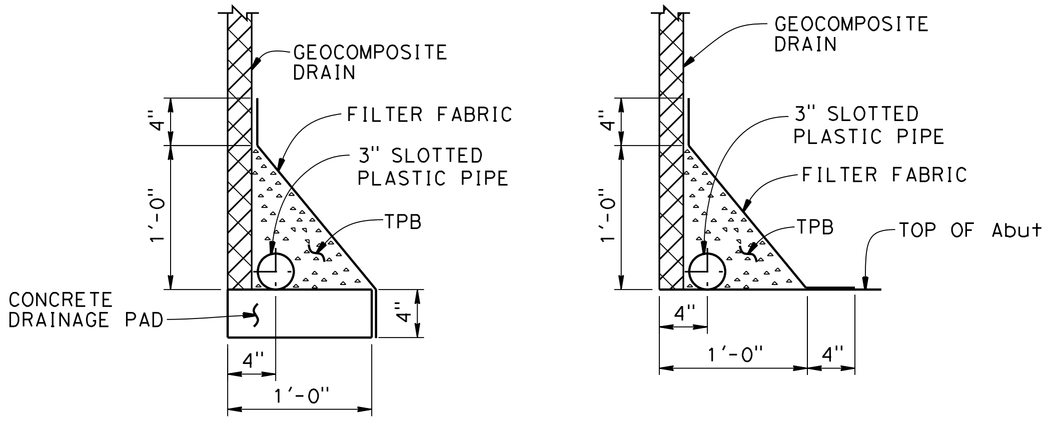
NOTE: TPB not shown for clarity.

SECTION A-A

NO SCALE

NOTES:

1. See "SLOPE PAVING (ROCK COBBLE)" sheet.
2. 4" ø plastic pipe drains at 25′ max center to center.
3. Geocomposite drain and 3" ø slotted plastic pipe continuous behind abutment. Provide Tee connection at each 4" ø drain.

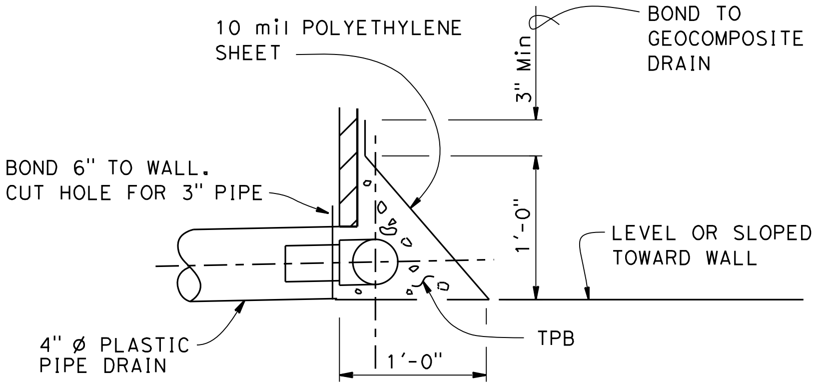


WITHOUT FOOTING

WITH FOOTING

DRAINAGE DETAILS

1½" = 1′-0"



TEE CONNECTION DETAIL

No Scale

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:01:04 PM

USERNAME => YWang

DESIGN OVERSIGHT

SIGN OFF DATE

	BY	CHECKED
DESIGN	Emir Modarres	
DETAILS	Yihong Wang	
QUANTITIES		

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

Jared Cole
PROJECT ENGINEER

BRIDGE NO. 57-1246
POST MILES 5.60

TORREY MEADOWS DRIVE OC

STRUCTURE APPROACH DRAINAGE DETAILS

DESIGN DETAIL SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 20 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-s-sadd.dgn

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
11	SD	56	5.60	X	X

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

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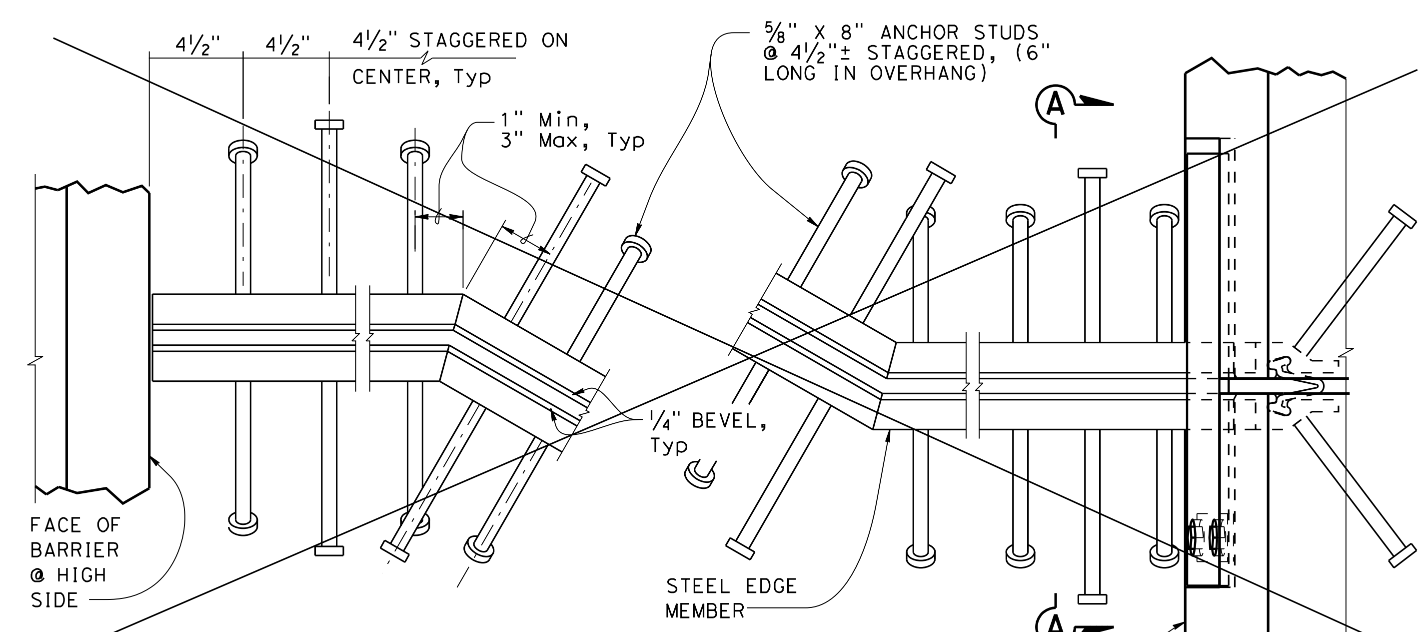
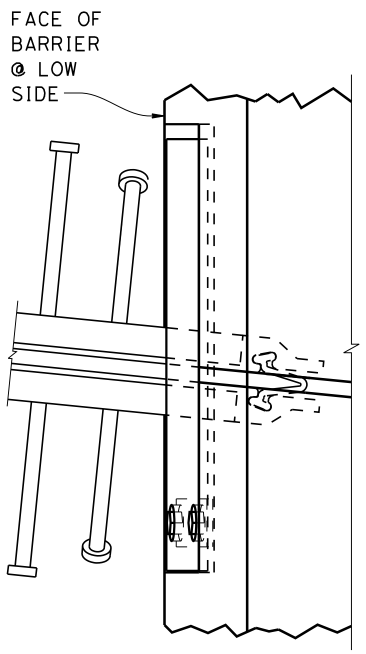
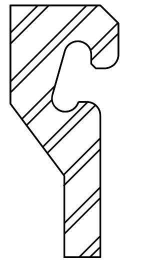
No.
Exp.
CIVIL
STATE OF CALIFORNIA



PLAN
SKEW > 20° ◇2



PLAN
SKEW ≤ 20°



SCHEMATIC STEEL EDGE MEMBER

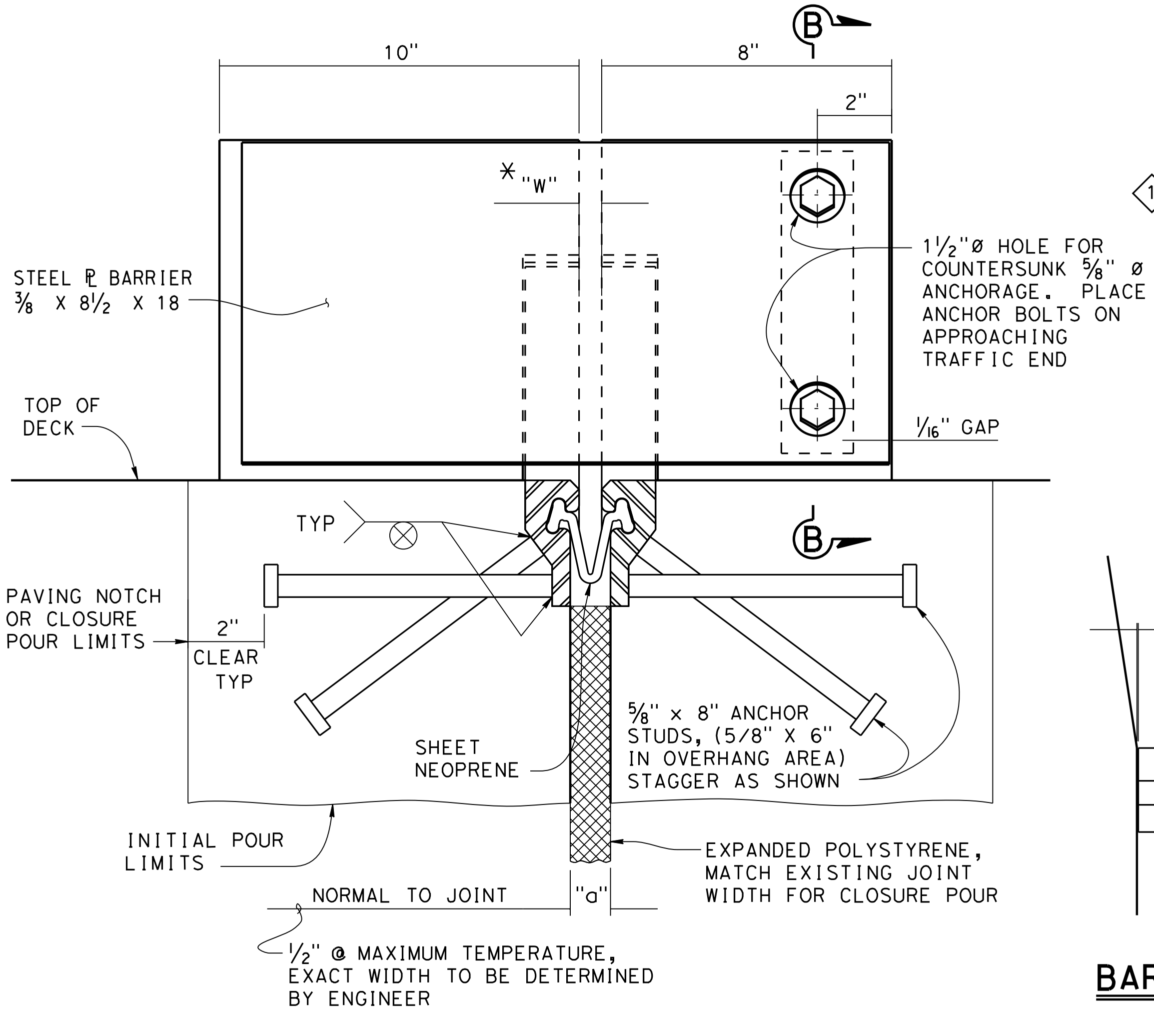
NOTES:

1. Alternatively, fillet or complete penetration welds may be used at anchor studs.
2. Alternate types of anchor studs may be permitted subject to the authorization by the Engineer.
3. ◇2 ~~Joint seal assembly to be used in conjunction with closure pour. (See other sheets for limits). Closure pour shall not be placed until final deck surface is within the tolerances specified.~~
4. Use joint at crown of roadway, at any change in traverse slope in deck and at changes in horizontal direction. Place other joints at or near lanes. All metal parts to be painted or galvanized after fabrication.
5. Sheet Neoprene shall be fabricated in one continuous piece and shall be fabricated to bend around corners. Field splices of the neoprene are not allowed.
6. Insert assembly or expansion anchorage for ⅝" x 1¾" bolts. Use installation bolts extended ½" minimum past nut and coat with bond breaker, after concrete has cured, remove installation bolts, install HS bolts and sheet neoprene.
7. Sidewalk Detail similar to Barrier Detail on low side at both sides if the roadway is crowned or if the difference in elevation between the ends of the seal is 0.5' or less.
8. a_c, a_s, are the thermal expansion coefficients for concrete and steel respectively.
9. Anchor studs shall conform to ASTM 108.

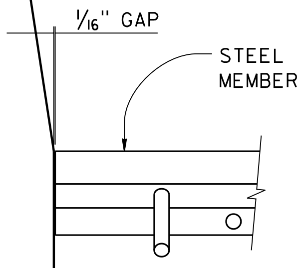
	JOINT INFORMATION			"a" DIMENSIONS		
	LOCATION	MOVEMENT RATING (MR)	SKEW	WINTER	SPRING & FALL	SUMMER
◇1	Abut 1	2½"	13°36'25"	1½"	1⅛"	¾"
	Abut 3	2½"	13°36'25"	1½"	1⅛"	¾"

* TO SET MINIMUM JOINT OPENING "W"

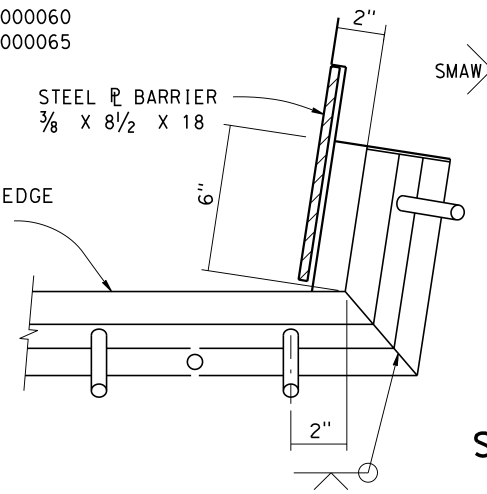
$$"W" = \begin{cases} \tfrac{1}{2}"+[(\text{Max Str temperature in }^\circ F)-(\text{actual Str temperature in }^\circ F)]*(a_c \text{ or } a_s)(12)(\text{contributory L in feet}) \\ \tfrac{1}{2}" \text{ Minimum} \\ a_c = 0.0000060 \\ a_s = 0.0000065 \end{cases}$$



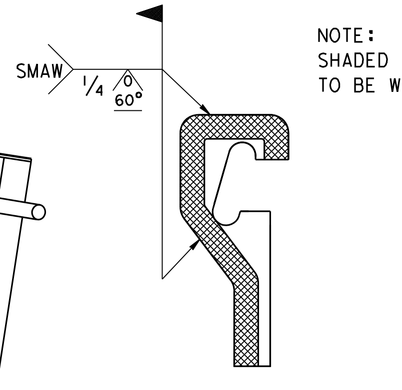
SECTION A-A



BARRIER DETAIL HIGH SIDE

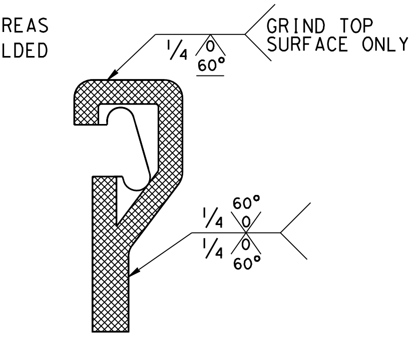


BARRIER DETAIL LOW SIDE

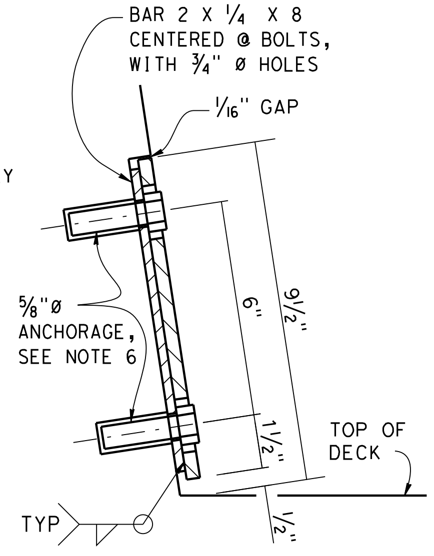


SCHEMATIC FIELD WELD DETAIL

NOTE:
SHADED AREAS TO BE WELDED



SCHEMATIC SHOP WELD DETAIL



SECTION B-B

NO SCALE

65% UNCHECKED DETAILS

DATE PLOTTED => 3/20/2015 TIME PLOTTED => 4:01:04 PM

USERNAME => YWang

TORREY MEADOWS DRIVE OC
STRIP JOINT SEAL ASSEMBLY
MAXIMUM MOVEMENT RATING = 4"

STANDARD DRAWING
FILE NO. **xs8-010**
APPROVAL DATE July 2014

◇1 Table Modified
◇2 Deleted Notes/Details

STATE OF
CALIFORNIA
DEPARTMENT OF TRANSPORTATION

DIVISION OF ENGINEERING SERVICES

BRIDGE NO. 57-1246
POST MILE 5.60

DS OSD 2147A (ENGLISH STANDARD DRAWING "XS" BORDER REV. (02-02-11)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: 2761
PROJECT NUMBER & PHASE: 1114000049-0 CONTRACT NO.: 11-40460

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES 04/03/15

SHEET 21 OF 25

FILE => P:\1100\1118 - Torrey Meadows Drive OC at SR-56\500_Design\520_Structures\521_CADD\dgn\57-1246-t-jntdt01.dgn

APPENDIX B

FIELD EXPLORATION

APPENDIX B

FIELD EXPLORATION

The subsurface exploration program included drilling and sampling five hollow stem auger borings for subsurface characterization purposes. The field explorations were performed between July 22 and 25, 2014. Prior to any subsurface exploration, Kleinfelder notified Underground Service Alert (USA) was notified to clear proposed boring locations of conflicts with utilities. The service of Cable Pipe and Leak, a private utility locator, was retained to perform additional utility locating. The borings were advanced by Pacific Drilling and Cascade Drilling utilizing truck mounted drill rigs. The borings were advanced to depths ranging from approximately 2 to 90½ feet below the existing ground surface.

The first five feet of the boreholes were advanced by manual hand augering, and the material encountered in this initial penetration was collected in a large plastic bag. Additional relatively undisturbed soil samples were obtained from the borings using either a Standard Penetration Test (SPT) sampler (2-inch O.D., 1.5 inches I.D.) or California sampler (3-inch O.D., 2.4 inches I.D.) driven a total of 18-inches (or until practical refusal) into the undisturbed soil at the bottom of the boring. The soil samples were returned to Kleinfelder's laboratory for testing. The in-situ drive samples were driven 18 inches into the soil using a 140 pound automatic hammer falling 30 inches in general accordance with ASTM D1586. The total number of hammer blows required to drive the sampler the final 12 inches is termed the "N" value and is recorded on the Logs of Borings. Blow counts shown on the Log of Borings have not been adjusted for the effects of overburden pressure, input driving energy, rod length, sampler size, or boring diameter. Borings were drilled at the site to obtain relatively undisturbed drive samples and SPT blow counts in the fill and weakly cemented materials.

Borings were logged by a Kleinfelder geologist or geotechnical engineer using methods outlined in the Unified Soil Classification System (USCS) and general procedures established in ASTM D 2488. Boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Selected bulk, disturbed, and intact samples were retrieved from the borings, sealed, and transported to Kleinfelder's laboratory for further evaluation. Logs of Borings are presented in Appendix B. Logs of Borings describe the earth materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the general location, boring number, drilling date, and drilling subcontractor.

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- ▽ First Water Level Reading (during drilling)
- ▼ Static Water Level Reading (short-term)
- ▼ Static Water Level Reading (long-term)

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REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
11	San Diego	SR-56	5.6	

PROJECT OR BRIDGE NAME
Torrey Meadows Drive Overcrossing at SR-56

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	Cj	7-28-14	1 of 3

gINT FILE: U:\project Files\20151065.001a - Torrey Meadows Drive Bridge\gint\torrey Meadows- Updated.gpj R:KLF_STANDARD_GINT_LIBRARY_2014.GLB [CALTRANS BR KEY P1_SOIL]

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	Pocket Penetrometer (tsf)	Torvane (tsf)	Field Approximation
Very Soft	< 0.25	< 0.25	< 0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	0.25 - 0.50	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	0.50 - 1.0	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	1.0 - 2.0	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	2.0 - 4.0	1.0 - 2.0	Readily indented by thumbnail
Hard	> 4.0	> 4.0	> 2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
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

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptors and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

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REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
11	San Diego	SR-56	5.6	

PROJECT OR BRIDGE NAME
Torrey Meadows Drive Overcrossing at SR-56

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	Cj	7-28-14	2 of 3

ROCK GRAPHIC SYMBOLS

⊠	IGNEOUS ROCK
☰	SEDIMENTARY ROCK
⬚	METAMORPHIC ROCK

BEDDING SPACING

Descriptor	Thickness or Spacing
Massive	> 10 ft
Very thickly bedded	3 to 10 ft
Thickly bedded	1 to 3 ft
Moderately bedded	3-5/8 inches to 1 ft
Thinly bedded	1-1/4 to 3-5/8 inches
Very thinly bedded	3/8 inch to 1-1/4 inches
Laminated	< 3/8 inch

WEATHERING DESCRIPTORS FOR INTACT ROCK

	Diagnostic Features					
	Chemical Weathering-Discoloration-Oxidation		Mechanical Weathering and Grain Boundary Conditions	Texture and Solutioning		
Descriptor	Body of Rock	Fracture Surfaces		Texture	Solutioning	General Characteristics
Fresh	No discoloration, not oxidized	No discoloration or oxidation	No separation, intact (tight)	No change	No solutioning	Hammer rings when crystalline rocks are struck.
Slightly Weathered	Discoloration or oxidation is limited to surface of, or short distance from, fractures; some feldspar crystals are dull	Minor to complete discoloration or oxidation of most surfaces	No visible separation, intact (tight)	Preserved	Minor leaching of some soluble minerals may be noted	Hammer rings when crystalline rocks are struck. Body of rock not weakened.
Moderately Weathered	Discoloration or oxidation extends from fractures usually throughout; Fe-Mg minerals are "rusty"; feldspar crystals are "cloudy"	All fracture surfaces are discolored or oxidized	Partial separation of boundaries visible	Generally preserved	Soluble minerals may be mostly leached	Hammer does not ring when rock is struck. Body of rock is slightly weakened.
Intensely Weathered	Discoloration or oxidation throughout; all feldspars and Fe-Mg minerals are altered to clay to some extent; or chemical alteration produces in situ disaggregation (refer to grain boundary conditions)	All fracture surfaces are discolored or oxidized; surfaces are friable	Partial separation, rock is friable; in semi-arid conditions, granitics are disaggregated	Altered by chemical disintegration such as via hydration or argillation	Leaching of soluble minerals may be complete	Dull sound when struck with hammer; usually can be broken with moderate to heavy manual pressure or by light hammer blow without reference to planes of weakness such as incipient or hairline fractures or veinlets. Rock is significantly weakened.
Decomposed	Discolored of oxidized throughout, but resistant minerals such as quartz may be unaltered; all feldspars and Fe-Mg minerals are completely altered to clay		Complete separation of grain boundaries (disaggregated)	Resembles a soil; partial or complete remnant rock structure may be preserved; leaching of soluble minerals usually complete		Can be granulated by hand. Resistant minerals such as quartz may be present as "stringers" or "dikes".

Note: Combination descriptors (such as "slightly weathered to fresh") are used where equal distribution of both weathering characteristics is present over significant intervals or where characteristics present are "in between" the diagnostic feature. However, combination descriptors should not be used where significant identifiable zones can be delineated. Only two adjacent descriptors shall be combined. "Very intensely weathered" is the combination descriptor for "decomposed to intensely weathered".

RELATIVE STRENGTH OF INTACT ROCK

Descriptor	Uniaxial Compressive Strength (psi)
Extremely Strong	> 30,000
Very Strong	14,500 - 30,000
Strong	7,000 - 14,500
Medium Strong	3,500 - 7,000
Weak	700 - 3,500
Very Weak	150 - 700
Extremely Weak	< 150

ROCK HARDNESS

Descriptor	Criteria
Extremely Hard	Specimen cannot be scratched with pocket knife or sharp pick; can only be chipped with repeated heavy hammer blows
Very hard	Specimen cannot be scratched with pocket knife or sharp pick; breaks with repeated heavy hammer blows
Hard	Specimen can be scratched with pocket knife or sharp pick with heavy pressure; heavy hammer blows required to break specimen
Moderately Hard	Specimen can be scratched with pocket knife or sharp pick with light or moderate pressure; breaks with moderate hammer blows
Moderately Soft	Specimen can be grooved 1/6 in. with pocket knife or sharp pick with moderate or heavy pressure; breaks with light hammer blow or heavy hand pressure
Soft	Specimen can be grooved or gouged with pocket knife or sharp pick with light pressure, breaks with light to moderate hand pressure
Very Soft	Specimen can be readily indented, grooved, or gouged with fingernail, or carved with pocket knife; breaks with light hand pressure

CORE RECOVERY CALCULATION (%)

$$\frac{\Sigma \text{ Length of the recovered core pieces (in.)}}{\text{Total length of core run (in.)}} \times 100$$

RQD CALCULATION (%)

$$\frac{\Sigma \text{ Length of intact core pieces > 4 in.}}{\text{Total length of core run (in.)}} \times 100$$

FRACTURE DENSITY

Descriptor	Criteria
Unfractured	No fractures
Very Slightly Fractured	Lengths greater 3 ft
Slightly Fractured	Lengths from 1 to 3 ft, few lengths outside that range
Moderately Fractured	Lengths mostly in range of 4 in. to 1 ft, with most lengths about 8 in.
Intensely Fractured	Lengths average from 1 in. to 4 in. with scattered fragmented intervals with lengths less than 4 in.
Very Intensely Fractured	Mostly chips and fragments with few scattered short core lengths

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REPORT TITLE
BORING RECORD LEGEND

DIST.	COUNTY	ROUTE	POSTMILE	EA
11	San Diego	SR-56	5.6	

PROJECT OR BRIDGE NAME
Torrey Meadows Drive Overcrossing at SR-56

BRIDGE NUMBER	PREPARED BY	DATE	SHEET
N/A	Cj	7-28-14	3 of 3

gINT FILE: U:\project Files\20151065.001a - Torrey Meadows Drive Bridge\gint\torrey Meadows- Updated.gpj R:KLF_STANDARD_GINT_LIBRARY_2014.GLB [CALTRANS BR KEY P3_ROCK]

LOGGED BY **EK**	BEGIN DATE **7-25-14**	COMPLETION DATE **7-25-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96168° / 117.16129°**	HOLE ID **A-14-001**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 7+30**	SURFACE ELEVATION **~364.2 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **soil cuttings**			GROUNDWATER READINGS — DURING DRILLING **Not Applicable** — AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **2.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
364.00	0	■	ASPHALT CONCRETE (10").	▩	1										
		▩	AGGREGATE BASE (2").												
363.00	1	▨	LEAN CLAY (CL); greenish gray; moist; medium plasticity (ARTIFICIAL FILL (QAF)).	▩	2										
362.00	2		Bottom of borehole at 2.0 ft bgs Locations and elevations were approximated from projects topographic maps.												
361.00	3														
360.00	4														
359.00	5														
358.00	6														
357.00	7														
356.00	8														
355.00	9														
	10														

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REPORT TITLE **BORING RECORD**			HOLE ID **A-14-001**	
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 1**

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LOGGED BY **EK**	BEGIN DATE **7-25-14**	COMPLETION DATE **7-25-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96207° / 117.16113°**	HOLE ID **A-14-002**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 8+80**	SURFACE ELEVATION **~358.8 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **soil cuttings**			GROUNDWATER READINGS — DURING DRILLING **Not Applicable** — AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **11.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		ASPHALT CONCRETE (8").												
			AGGREGATE BASE (3").												
			SANDY LEAN CLAY (CL); stiff; dark brown to light brownish gray; moist; low plasticity; fine-coarse grained sand, trace fine-grained gravel (ARTIFICIAL FILL (QAF)).		1					15	110				M, UW, PA, PI Additional tests: Seive Analysis, Atterberg Limits, Modified Proctor, R-Value
					2	10 12 19	31	100							
355.00															
	5		LEAN CLAY (CL); firm; light brownish gray (2.5Y - 6/2); moist; low to medium plasticity.		3	6 7 12	19	100							
350.00															
	10		broken piece of cobble in sampler.		4	16 17 19	36	100							
			Bottom of borehole at 11.5 ft bgs Locations and elevations were approximated from projects topographic maps.												
345.00															
	15														
340.00															
	20														
335.00															
	25														
330.00															
	30														
325.00															
	35														

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-002**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 1**

PLOTTED: 11/06/2014 08:37 AM BY: ekoprulu

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gINT TEMPLATE: R:KLF_STANDARD_GINT_LIBRARY_2014.GLB [CLIENT_CALTRANS BORING RECORD MET/ENG]

PLOTTED: 11/06/2014 08:37 AM BY: ekoprulu

LOGGED BY **EK**	BEGIN DATE **7-25-14**	COMPLETION DATE **7-25-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96230° / 117.16089°**	HOLE ID **A-14-003**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 9+80**	SURFACE ELEVATION **~358.0 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **bentonite**			GROUNDWATER READINGS — DURING DRILLING **Not Applicable** — AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **50.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY LEAN CLAY (CL); brown (7.5 YR - 5/3) to dark brown (7.5 YR - 3/4); moist; low plasticity; fine-coarse grained sand, some fine-grained gravel (ARTIFICIAL FILL (QAF)).		1										Additional tests: Corrosion
355.00															
	5		CLAYEY SAND (SC); medium dense; light brownish gray (2.5 Y - 6/2); moist; low plasticity; fine-coarse grained sand.		2	8 8 9	17	100		11	104	PP=>4.5			M, UW, PA, PI Additional tests: Seive Analysis, Atterberg Limits
350.00															
	10		CLAYEY SAND (SC); loose; light brownish gray (2.5 Y - 6/2),; moist; non-plastic; fine-coarse grained sand, some caliche.		3	3 2 3	5	77							Drilling gets hard @ 11-12'
345.00															
	15		.		4	5 6 8	14	89		12	102				M, UW
			(MISSION VALLEY FORMATION (TMV)).												
340.00															
	20		SANDY CLAYSTONE; hard; light brownish gray (2.5 Y - 6/2); moist; non-plastic; fine-coarse grained sand , micaceous, weak cementation, highly weathered.		5	14 22 32	54	100							
335.00			hard; becomes reddish brown to light brownish gray; moist; moderate cementation, moderately weathered.												
	25				6	50/5"	50/5"	100		20	108				M, UW, PA Additional tests: Seive Analysis
			SILTY SANDSTONE; very dense; becomes brownish gray (2.5 Y - 6/2); moist; increase in sand content.												
330.00															
	30				7	11 23 38	61	100							very hard drilling from 31-33'
325.00															
	35														

(continued)

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-003**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**	DATE **7-28-14**	SHEET **1 of 2**	

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gINT TEMPLATE: R:KLF_STANDARD_GINT_LIBRARY_2014.GLB [CLIENT_CALTRANS BORING RECORD MET/ENG]

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	35		very dense; becomes gray (N6/); moist; fine-coarse grained sand, weak cementation, highly weathered.	⧗	8	20 50/5"	50/5"	100		13	107				M, UW, PA Additional tests: Seive Analysis, Direct Shear
320.00															
	40		.	☒	9	24 42 50/5"	92/11"	100							
315.00															
	45		becomes finer grained sand, iron-oxide staining.	⧗	10	50/6"	50/6"	100		31	97				M, UW, PA Additional tests: Seive Analysis
310.00															
	50		broken pieces of strongly cemented pieces.	☒	11	50/3"	50/3"	100							
			Bottom of borehole at 50.5 ft bgs Locations and elevations were approximated from projects topographic maps.												
305.00															
	55														
300.00															
	60														
295.00															
	65														
290.00															
	70														
285.00															
	75														

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-003**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **2 of 2**

LOGGED BY **EK**	BEGIN DATE **7-22-14**	COMPLETION DATE **7-22-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96279° / 117.16049°**	HOLE ID **A-14-004**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 12+10**	SURFACE ELEVATION **~333.8 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **bentonite**			GROUNDWATER READINGS · DURING DRILLING **Not Applicable** · AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **61.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		CLAYEY SAND (SC); light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-medium grained sand, some rootlets (MISSION VALLEY FORMATION (TMV)).												
				▨	1										Additional tests: Corrosion
330.00															
	5		CLAYEY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-medium grained sand, weak cementation, highly weathered.	⧗	2	20 37 47	84	100		10	116				M, UW
															Drilling gets hard @ 7'
325.00															
	10		becomes micaceous, increase in fines content.	⧖	3	16 24 34	58	100							
320.00															
	15		becomes moderately cemented, intermixed colors of light brownish gray (2.5YR - 6/2) to brown (7.5 YR - 5/3).	⧗	4	30 50/5"	50/5"	100		14	104				M, UW, PA Additional tests: Seive Analysis, Direct Shear
315.00															Some rig shatter @ 18'
	20		becomes coarser grained, fine-coarse grained sand, abundent iron-oxide staining.	⧖	5	19 50/2"	50/2"	66							Added water to hole to ease drilling conditions @ 20'
310.00															
	25		light brownish gray (2.5Y - 6/2); fine to coarser grained sand, abundant mica flakes.	⧗	6	20 50/4"	50/4"	100		13	109				M, UW
305.00															
	30		CLAYEY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous, moderately cemented highly weathered.	⧖	7	40 25 35	60	100							
300.00															
	35														

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-004**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 2**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	35		becomes strongly cemented.		8	27 50/3"	50/3"	83		13	110				Additional tests: Seive Analysis M, UW Drilling gets hard from 35'-37'
295.00															
	40		SANDY LEAN CLAYSTONE; stiff; dark reddish brown (2.5 YR - 3/3); moist; low to medium plasticity; fine grained sand, laminated w/ lenses of gray SM .25" to .5" thick, micaceous.		9	11 15 21	36	100				PP=1.5-2			
290.00															
	45		hard; dark gray; moist; low to medium plasticity; fine-grained sand, moderate cementation, highly weathered, micaceous.		10	47 50/3"	50/3"	100		14	97	PP=3-4			Drilling gets hard from 44'-45' M, UW Additional tests: Seive Analysis, Atterberg Limits
285.00															
	50		SILTY SANDSTONE; very dense; dark gray; moist; non-plastic; fine-coarse grained sand, moderately cemented, highly weathered, micaceous.		11	17 36 38	74	100							
280.00															
	55		gray (N6/); becomes weakly cemented, fine-coarse grained, increase in sand content.		12	50/6"	50/6"	66							
275.00															
	60		becomes gray (N6/); fine-coarse grained sand.		13	40 50/5"	50/5"	100							
			Bottom of borehole at 61.0 ft bgs Locations and elevations were approximated from projects topographic maps.												
270.00															
	65														
265.00															
	70														
260.00															
	75														

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REPORT TITLE **BORING RECORD**			HOLE ID **A-14-004**	
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **2 of 2**

LOGGED BY **EK**	BEGIN DATE **7-24-14**	COMPLETION DATE **7-24-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96314° / 117.15983°**	HOLE ID **A-14-005**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 14+30**	SURFACE ELEVATION **~360.8 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **bentonite**			GROUNDWATER READINGS — DURING DRILLING **Not Applicable** — AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **90.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
360.00	0		SANDY CLAY with GRAVEL (CL); yellowish brown (10YR - 5/6); moist; low plasticity; fine-coarse grained sand, angular to subrounded gravel (ARTIFICIAL FILL (QAF)).	▨	1										Additional tests: Corrosion
355.00	5		CLAYEY SAND (SC); dense; light brownish gray (2.5Y - 6/2) to yellowish brown (10YR - 5-6); moist; low plasticity; fine-grained sand, some rootlets.	⧓	2	12 20 27	47	100							Additional tests: Sieve Analysis -200
			SILTY SAND to SANDY SILT (SM); firm; light brownish gray (2.5Y - 6/2); moist; low plasticity; fine-grained sand, pieces of broken gravel in sampler, trace coarse grained sand.												
350.00	10			⧖	3	7 9 13	22	100							
			CLAYEY SAND (SC); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous.												
345.00	15			⧓	4	10 23 28	51	100							Additional tests: Sieve Analysis -200
340.00	20		SANDY SILT (ML); firm; brown (7.5 YR - 5/3) to H brownish gray (2.5Y - 6/2); moist; non-plastic to low plasticity; fine-medium grained sand.	⧖	5	6 8 12	20	100							
			SILTY SAND (SM); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous.												
335.00	25			⧓	6	11 21 32	53	66		15	114				M, UW Additional tests: Sieve Analysis -200, Direct Shear
			CLAYEY SAND (SC); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous.												
330.00	30			⧖	7	6 9 12	21	100							
															easier drilling effort between 30' and 35'
	35														

(continued)

REPORT TITLE **BORING RECORD**				HOLE ID **A-14-005**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 3**

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
325.00	35		SILTY SAND (SM); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, pockets of dark brown CLAY throughout, trace of angular gravel.		8	8 17 34	51	89							
320.00	40		pockets of dark brown and gray CLAY throughout.		9	6 10 13	23	77							
315.00	45		no recovery.			9 13 17	30	NR							easier drilling effort between 40' and 50'
			CLAYEY SAND (SC); dense; light brownish gray to dark browin; moist; low plasticity; intermixed material and color with varying thicknesses, trace gravel.												
310.00	50				10	12 24 40	64	89							Additional tests: Sieve Analysis -200, Atterberg Limits
			CLAYEY SAND (SC); medium dense; dark brown (7.5YR - 3/4); moist; low plasticity; fine-coarse grained sand, trace fine-coarse grained gravel, angular to rounded, 3" thick black colored organic smelling CLAY, few pockets of gray Silty SAND.												
305.00	55				11	11 20 17	37	83							
															Drilling gets hard @ 57'
			decrease in sand content.												
300.00	60				12	17 38 48	86	44				PP=4			Additional tests: Sieve Analysis -200, Atterberg Limits
			CLAYSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; low plasticity; fine-grained sand, abundent reddish brown iron oxide staining, micaceous, weak cementation, highly weathered (MISSION VALLEY FORMATION (TMV)).												
295.00	65		.		13	10 16 20	36	100				PP=3			Additional tests: Corrosion
			decrease in sand content.												
290.00	70				14	50/3"	50/3"	100				PP=>4.5			Added water to hole to ease drilling @ 71'
			SILTY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2) with yellow mottling; moist; non-plastic; fine-coarse grained sand, weak cementation, highly weathered.												
285.00	75				15	36 50/3"	50/3"	100							Drilling gets very hard @ 73'

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REPORT TITLE **BORING RECORD**			HOLE ID **A-14-005**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**
EA			
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**			
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**	DATE **7-28-14**	SHEET **2 of 3**

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
			SILTY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2) with yellow mottling; moist; non-plastic; fine-coarse grained sand, weak cementation, highly weathered.												
280.00	80		iron-oxide staining throughout.	☒	16	50/6"	50/6"	100							
															Hard drilling @ 81'
275.00	85		.	⧗	17	50/6"	50/6"	100		14	110				M, UW Additional tests: Sieve Analysis -200, Direct Shear
270.00	90		increase in sand content.	⧗	18	50/5"	50/5"	100							
			Bottom of borehole at 90.5 ft bgs Locations and elevations were approximated from projects topographic maps.												
265.00	95														
260.00	100														
255.00	105														
250.00	110														
245.00	115														

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REPORT TITLE **BORING RECORD**			HOLE ID **A-14-005**	
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **3 of 3**

LOGGED BY **EK**

BEGIN DATE **7-23-14**

COMPLETION DATE **7-23-14**

BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96325° / 117.16004°**

HOLE ID **A-14-006**

DRILLING CONTRACTOR **Pacific Drilling**

BOREHOLE LOCATION (Offset, Station, Line) **Sta 14+20**

SURFACE ELEVATION **~360.1 ft**

DRILLING METHOD **Hollow Stem Auger**

DRILL RIG **Diedrich D-50**

BOREHOLE DIAMETER **6 in**

SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**

SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**

HAMMER EFFICIENCY, ERi **83%**

BOREHOLE BACKFILL AND COMPLETION **bentonite**

GROUNDWATER READINGS DURING DRILLING **Not Applicable** AFTER DRILLING (DATE) **Not Applicable**

TOTAL DEPTH OF BORING **90.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY CLAY with GRAVEL (CL); brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand and gravel, angular to subangular gravel (ARTIFICIAL FILL (QAF)).	▨	1										
355.00	5		LEAN CLAY with GRAVEL (CL); stiff; brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand, fine-grained gravel, pockets of light brownish gray sand.	⧗	2	9 12 23	35	100		16	113	PP=1.5			M, UW, PA, PI Additional tests: Sieve Analysis, Atterberg Limits
350.00	10														
			SANDY LEAN CLAY (CL); firm; light brownish gray (2.5Y - 6/2) to brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand.	⧖	3	9 10 11	21	100				PP=1			Additional tests: Corrosion
345.00	15		CLAYEY SAND (SC); dense; brown (7.5YR - 5/3); moist; medium to high plasticity; some rootlets.	⧗	4	13 17 35	52	100		12	121				Additional tests: Sieve Analysis, Atterberg Limits M, UW, PA, PI
			SILTY SAND (SM); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous.												
340.00	20		SANDY LEAN CLAY (CL); stiff; brown (7.5YR - 5/3); moist; low to medium plasticity; fine-coarse grained sand, fine-grained gravel, broken pieces of caliche.	⧖	5	11 13 15	28	100				PP=1.5-2			
335.00	25		CLAYEY SAND (SC); medium dense; brown (7.5YR - 5/3); moist; non-plastic; fine-coarse grained sand. fine-grained gravel, micaceous.	⧗	6	9 11 15	26	100		13	115				M, UW
330.00	30		SANDY LEAN CLAY (CL); firm; gray (6N/); moist; low plasticity; fine-coarse grained sand, some rootlets, trace of fine-grained gravel.	⧖	7	6 8 9	17	100				PP=1-1.5			
	35														

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REPORT TITLE **BORING RECORD**

HOLE ID **A-14-006**

DIST. **11**

COUNTY **San Diego**

ROUTE **SR-56**

POSTMILE **5.6**

EA

PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**

BRIDGE NUMBER **N/A**

PREPARED BY **C Johnson**

DATE **7-28-14**

SHEET **1 of 3**

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ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	35		SILTY SAND (SM); dense; gray (6N/); moist; low plasticity; increase in moisture content and sand content.												Sampler bouncing, drilled 2' more to re-sample DS
				⧗	8	10 17 35	52	100		15	114				Additional tests: Sieve Analysis, Atterberg Limits, Direct Shear M, UW, PA, PI
320.00	40		CLAYEY SAND (SC); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic to low plasticity; fine-coarse grained sand, micaceous.	⧖	9	7 11 14	25	100							
315.00	45		SANDY LEAN CLAY (CL); firm; brown (7.5YR - 5/3) to dark brown (7.5YR - 3/4); moist; low plasticity; intermixxed coloration, fine-coarse grained sand, trace coarse grained gravel, concretion inside half of sampler.	⧗	10	11 17 32	49	100		15	117				M, UW
310.00	50		LEAN CLAY (CL); firm; dark brown (7.5YR - 3/4) to black; moist; medium plasticity; trace fine-coarse grained sand, organic smell, abundent rootlets.	⧖	11	11 12 15	27	77				PP=1.5			
305.00	55		CLAYEY SAND (SC); medium dense; brown (7.5YR - 5/3) to yellowish brown (10YR - 5/6); moist; low plasticity; fine-coarse grained sand, micaceous.	⧗	12	8 14 18	32	66		16	110				Additional tests: Sieve Analysis M, UW, PA
300.00	60		becomes gray (6N/) to light gray-brown (2.5Y - 4/2).	⧖	13	9 10 13	23	100							
295.00	65		SILTY SANDSTONE; very dense; gray (6N/) with abundant reddish brown iron-oxide; moist; low plasticity; fine-grained sand, weakly cemented, highly weathered (MISSION VALLEY FORMATION (TMV)).	⧗	14	27 50/4"	50/4"	100		12	114	PP=>4			Additional tests: Sieve Analysis, Atterberg Limits M, UW, PA, PI
290.00	70		no recovery.												Very hard layer (concretion @ 70')
285.00	75			⧖	15	14 17 50/5"	67/11"	100							Additional tests: Corrosion

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REPORT TITLE **BORING RECORD**			HOLE ID **A-14-006**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**
EA			
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**			
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**	DATE **7-28-14**	SHEET **2 of 3**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
			CLAYEY SANDSTONE; very dense; reddish brown, gray, yellowish brown, laminated with layers of 1/4" thick; moist; non-plastic; moderate cementation,highly weathered, abundant sulfur and iron-oxide staining.												
280.00	80		no recovery.												
275.00	85		SILTY SANDSTONE; very dense; gray (6N/) with orange/reddish brown mottling; moist; non-plastic; fine-coarse grained sand, micaceous, moderate cementation, highly weathered.	⧗	16	50/6"	50/6"	100		13	115				Additional tests: Sieve Analysis, Atterberg Limits M, UW, PA, PI
270.00	90		becomes moderately cemented.	☒	17	50/5"	50/5"	100							
			Bottom of borehole at 90.5 ft bgs Locations and elevations were approximated from projects topographic maps.												
265.00	95														
260.00	100														
255.00	105														
250.00	110														
245.00	115														

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REPORT TITLE
BORING RECORD
HOLE ID
A-14-006
DIST.
11
COUNTY
San Diego
ROUTE
SR-56
POSTMILE
5.6
EA
PROJECT OR BRIDGE NAME
Torrey Meadows Drive Overcrossing at SR-56
BRIDGE NUMBER
N/A
PREPARED BY
C Johnson
DATE
7-28-14
SHEET
3 of 3

LOGGED BY **EK**	BEGIN DATE **7-25-14**	COMPLETION DATE **7-25-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96352° / 117.15948°**	HOLE ID **A-14-007**
DRILLING CONTRACTOR **Pacific Drilling**			BOREHOLE LOCATION (Offset, Station, Line) **Sta 16+10**	SURFACE ELEVATION **~357.5 ft**
DRILLING METHOD **Hollow Stem Auger**			DRILL RIG **Diedrich D-50**	BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**			SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**	HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **soil cuttings**			GROUNDWATER READINGS DURING DRILLING **Not Applicable** AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **11.5 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0		SANDY LEAN CLAY (CL); firm; brown (7.5YR - 5/3); moist; non-plastic; fine-coarse grained sand, some pockets of Lean CLAY, piece of broken rock in sampler (ARTIFICIAL FILL (QAF)).	▨	1					14	105				M, UW Additional tests: Seive Analysis, Atterberg Limits, Modified Proctor, R-Value
355.00				⧗	2	14 15 40	55	77							
	5		SILTY SAND (SM); very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, trace of fine-grained gravel.	⧖	3	9 7 11	18	89							
350.00															
	10		decrease in fines content.	⧗	4	13 12 10	22	66							
345.00			Bottom of borehole at 11.5 ft bgs Locations and elevations were approximated from projects topographic maps.												
	15														
340.00															
	20														
335.00															
	25														
330.00															
	30														
325.00															
	35														

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-007**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 1**

PLOTTED: 11/06/2014 08:38 AM BY: ekoprulu

LOGGED BY **EK** BEGIN DATE **7-25-14** COMPLETION DATE **7-25-14**	BOREHOLE LOCATION (Lat/Long or North/East and Datum) **32.96365° / 117.15907°**		HOLE ID **A-14-008**
DRILLING CONTRACTOR **Pacific Drilling**	BOREHOLE LOCATION (Offset, Station, Line) **Sta 17+40**		SURFACE ELEVATION **~355.0 ft**
DRILLING METHOD **Hollow Stem Auger**	DRILL RIG **Diedrich D-50**		BOREHOLE DIAMETER **6 in**
SAMPLER TYPE(S) AND SIZE(S) (ID) **SPT (1.5"), CAL (2.4")**	SPT HAMMER TYPE **Auto; 140 lbs / 30-inch drop**		HAMMER EFFICIENCY, ERi **83%**
BOREHOLE BACKFILL AND COMPLETION **soil cuttings**	GROUNDWATER READINGS DURING DRILLING **Not Applicable**	AFTER DRILLING (DATE) **Not Applicable**	TOTAL DEPTH OF BORING **2.0 ft**

ELEVATION (ft)	DEPTH (ft)	Material Graphics	DESCRIPTION	Sample Location	Sample Number	Blows per 6 in.	Blows per foot	Recovery (%)	RQD (%)	Moisture Content (%)	Dry Unit Weight (pcf)	Shear Strength (tsf)	Drilling Method	Casing Depth	Remarks
	0	■	ASPHALT CONCRETE (6").												
		▨	AGGREGATE BASE (8").	▨	1										
354.00	1														
		▨	SANDY LEAN CLAY (CL); brown to dark brown; moist; low to medium plasticity (ARTIFICIAL FILL (QAF)).	▨	2										
353.00	2		Bottom of borehole at 2.0 ft bgs Locations and elevations were approximated from projects topographic maps.												
352.00	3														
351.00	4														
350.00	5														
349.00	6														
348.00	7														
347.00	8														
346.00	9														
	10														

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REPORT TITLE **BORING RECORD**				HOLE ID **A-14-008**
DIST. **11**	COUNTY **San Diego**	ROUTE **SR-56**	POSTMILE **5.6**	EA
PROJECT OR BRIDGE NAME **Torrey Meadows Drive Overcrossing at SR-56**				
BRIDGE NUMBER **N/A**	PREPARED BY **C Johnson**		DATE **7-28-14**	SHEET **1 of 1**

gINT FILE: U:\project Files\20151065.001a - Torrey Meadows Drive Bridge\gint\torrey Meadows- Updated.gpj
gINT TEMPLATE: R:KLF_STANDARD_GINT_LIBRARY_2014.GLB [CLIENT_CALTRANS BORING RECORD MET/ENG]

APPENDIX C

LABORATORY TESTING

APPENDIX C

LABORATORY TESTING

GENERAL

The materials observed in the borings were visually classified and evaluated with respect to strength, swelling, compressibility, compaction density, and moisture content. Material physical/mechanical properties and classifications were substantiated by performing selected laboratory tests. Testing was performed in general accordance with procedures outlined by the American Society for Testing and Materials (ASTM) and the California Department of Transportation (Caltrans).

CLASSIFICATION

Soils were visually described and classified in accordance with the Unified Soil Classification System (USCS) in accordance with ASTM D2487 and/or ASTM D2488. Soil classifications are indicated on the boring logs in Appendix B.

MOISTURE AND DENSITY DETERMINATIONS

Natural moisture content and dry density tests were performed on relatively undisturbed samples in accordance with ASTM D2216 and D7263. These results are presented in the table shown on Figures C-1 through C-2 and on the boring logs.

GRAIN SIZE DISTRIBUTION

Twelve sieve analyses were performed on selected samples from the site to evaluate grain size distribution and to aid in soil classification. The tests were performed in general accordance with ASTM D422. Results of the tests are presented on Figures C-3 through C-18.

ATTERBERG LIMITS

Atterberg limits tests were performed on selected soil samples to assist in classification. Testing was performed in general accordance with ASTM D4318. Test results are presented on Figures C-19 through C-24.

COMPACTION TESTS

Selected soil samples were tested for compaction characteristics in accordance with ASTM Standard Test Method D1557 (modified Proctor). The results are presented on Figures C-25 and C-26.

DIRECT SHEAR

Direct shear testing was performed on three undisturbed and inundated soil samples and tested for shear strength and cohesion values in accordance with ASTM D3080. The results are presented on Figures C-27 through C-31.

R-VALUE TEST

Resistance value (R-value) tests were performed on selected bulk soil samples to evaluate pavement support characteristics of the near-surface onsite soils. R-value testing was performed in accordance with ASTM Test Method D2844. The test results are summarized in Table C-1 below and on Figures C-32 and C-33.

Table C-1
R-value Test Results

BORING ID	DEPTH (FEET)	R-VALUE	SOIL DESCRIPTION
A-14-002	1 to 2	11	Sandy lean CLAY (CL)
A-14-007	0 to 2	6	Sandy lean CLAY (CL)

AGGRESIVITY

Selected soil samples were tested by Clarkson Laboratory and Supply Inc. to evaluate the soil corrosion potential. Soil pH was determined in accordance with California Test (CT) 643. Minimum electrical resistivity tests were performed on in accordance with AASHTO test T288-12. The water soluble sulfate and water soluble chloride contents of the selected samples were evaluated in accordance with CT 417 and CT 422, respectively. Kleinfelder's boring logs and the test results should be reviewed by a qualified corrosion engineer to evaluate the general soil corrosion potential with respect to construction materials to evaluate whether further testing is warranted. The results are presented on Figures C-34 and C-39.

APPENDIX C

Laboratory Testing

Date Tested : 8/4-6/2014

Boring #	Sample #	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	Description
A-14-002	1	1-2	-	14.6%	brown sandy clay with recycled asphalt
A-14-003	2	5-6.5	104.2	10.6%	light brownish gray clayey sand
A-14-003	4	15-16.5	102.3	12.3%	light brown clayey sand
A-14-003	6	25-26.5	108.3	19.5%	yellowish brown sandy lean clay
A-14-003	8	35-36	107.4	13.4%	white silty sand
A-14-003	10	45-45.5	97.3	30.6%	light yellowish brown silty sand
A-14-004	2	5-6.5	116.4	9.8%	light yellowish brown silty sand
A-14-004	4	15-16	104.2	13.6%	light olive brown clayey sand
A-14-004	6	25-26	109.4	13.5%	light brown silty sand
A-14-004	8	35-36	110.3	12.5%	light olive brown clayey sand
A-14-004	10	45-46	96.8	13.7%	gray sandy lean clay
A-14-005	2	5-6.5	-	10.2%	light olive clayey sand
A-14-005	4	15-16.5	-	12.7%	olive brown clayey sand
A-14-005	6	25-26.5	113.9	15.0%	olive brown clayey sand
A-14-005	8	35-36.5	-	14.6%	brown clayey sand
A-14-005	10	50-51.5	-	15.1%	brown clayey sand
A-14-005	12	60-61.5	-	13.2%	yellowish brown clayey sand
A-14-005	15	75-76	-	15.0%	yellow clayey sand

Performed in General Accordance with ASTM D7263 and D2216

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JOB NUMBER: 20151065 DATE: 28-Oct-14

Dry Density and Moisture Content

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-1

Date Tested : 8/4-6/2014

Boring #	Sample #	Depth (ft)	Dry Density (pcf)	Moisture Content (%)	Description
A-14-005	17	85-86.5	110.3	14.5%	brownish yellow clayey sand
A-14-006	2	5-6.5	112.8	16.0%	brown lean clay with sand
A-14-006	4	15-16.5	121.4	12.1%	light olive brown clayey sand
A-14-006	6	25-26.5	114.9	12.9%	light olive brown clayey sand
A-14-006	8	37-38.5	114.5	15.5%	yellowish brown silty sand
A-14-006	10	45-46.5	117.5	15.0%	yellowish brown sandy clay with 1 1/2" gravel
A-14-006	12	55-56.5	109.8	16.0%	brown clayey sand
A-14-006	14	65-66	114.2	11.9%	white silty sand
A-14-006	16	85-85.5	114.6	13.1%	very light brown silty sand
A-14-007	1	0-2	-	14.5%	light brown sandy lean clay

Performed in General Accordance with ASTM D7263 and D2216

KLEINFELDER
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CHECKED BY: Uly/J. Co TECH: Uly/CW
JOB NUMBER: 20151065 DATE: 28-Oct-14

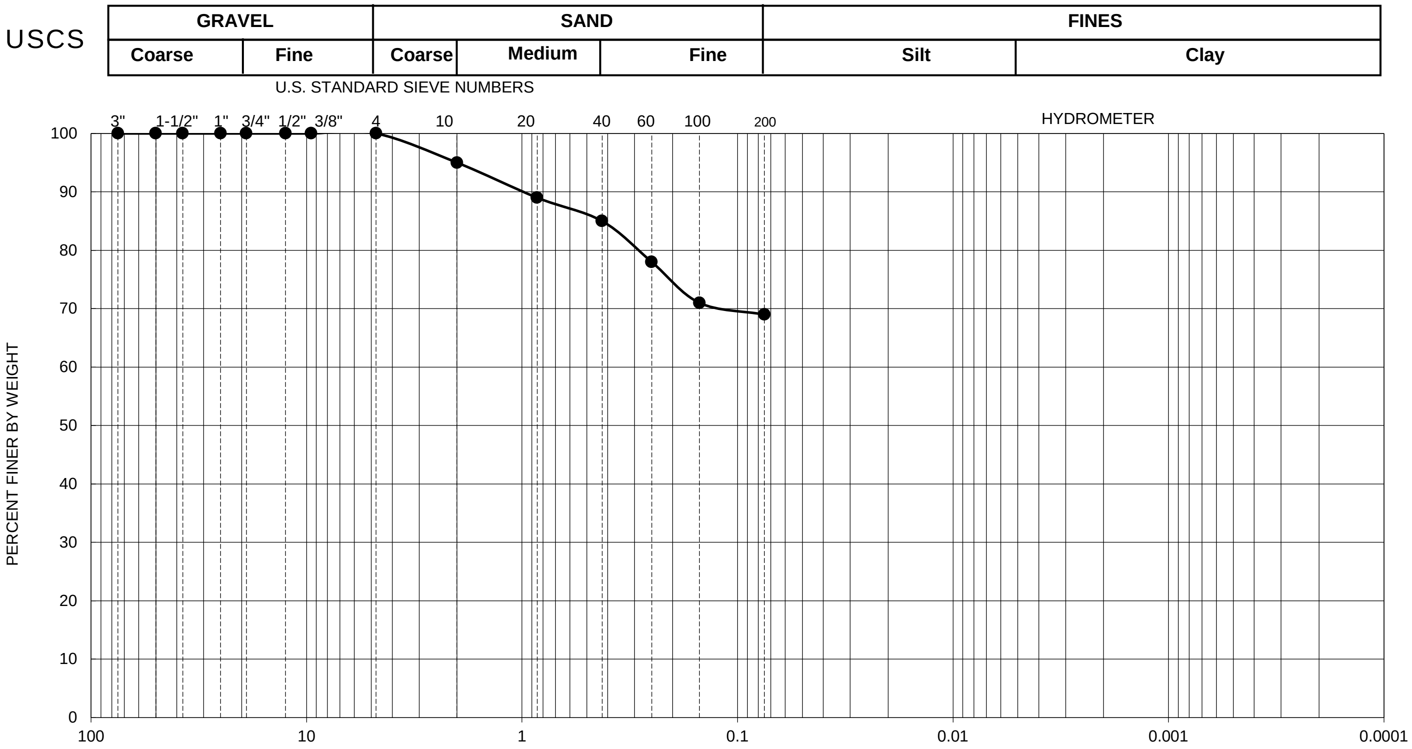
Dry Density and Moisture Content

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-2

Date Tested: 8/1/2014



GRAIN SIZE IN MILLIMETERS

Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-002	1	1-2	69.0	CL

Sample Description	sandy lean CLAY; brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	95
	No. 20	0.85 mm	89
	No. 40	0.425 mm	85
	No. 60	0.25 mm	78
	No 100	0.15 mm	71
	No 200	.075 mm	69.0

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

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Project No.	20151065	Date: 28-Oct-14

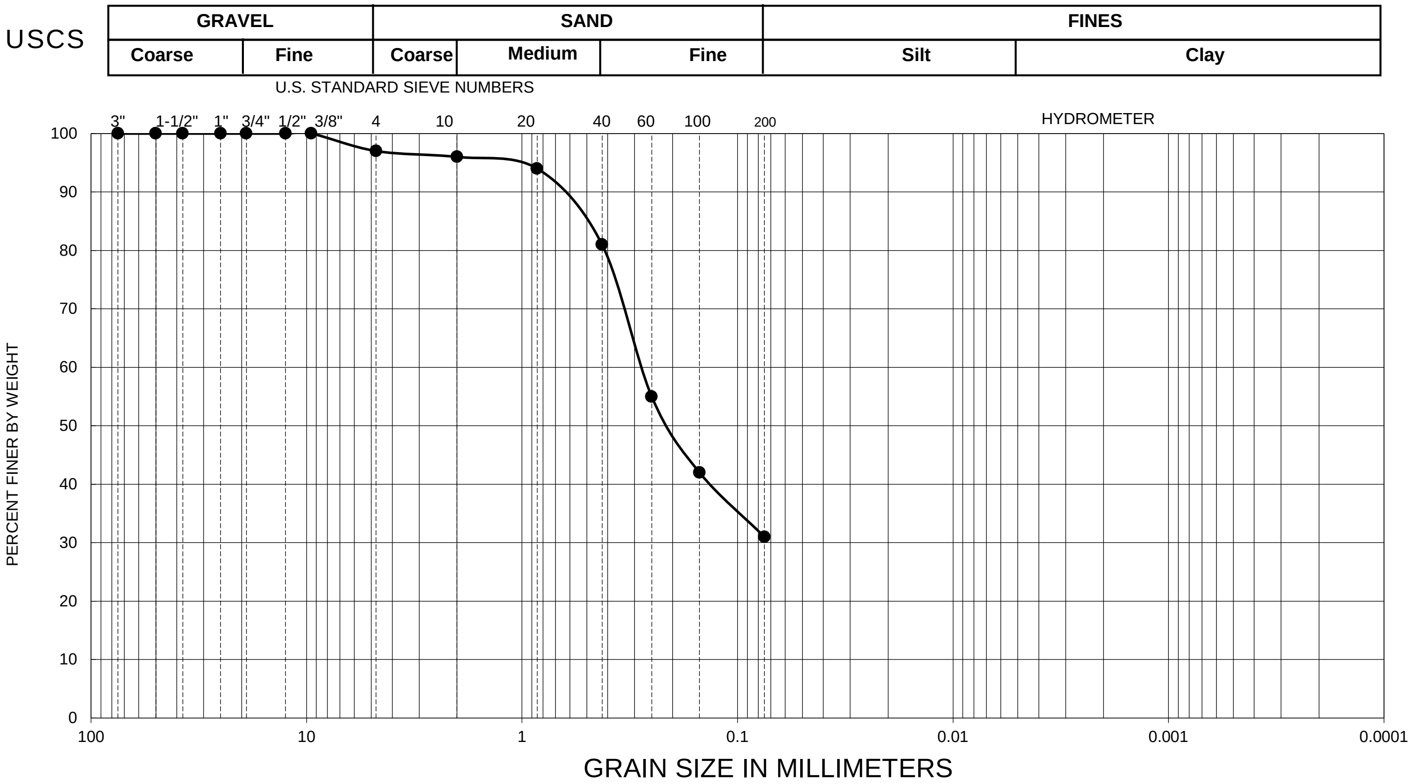
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-3

Date Tested: **8/8/2014**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
A-14-003	2	5-6.5	31.0	SC

Sample Description	clayey SAND; light brownish gray

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	97
	No. 10	2.0 mm	96
	No. 20	0.85 mm	94
	No. 40	0.425 mm	81
	No. 60	0.25 mm	55
	No 100	0.15 mm	42
	No 200	.075 mm	31.0

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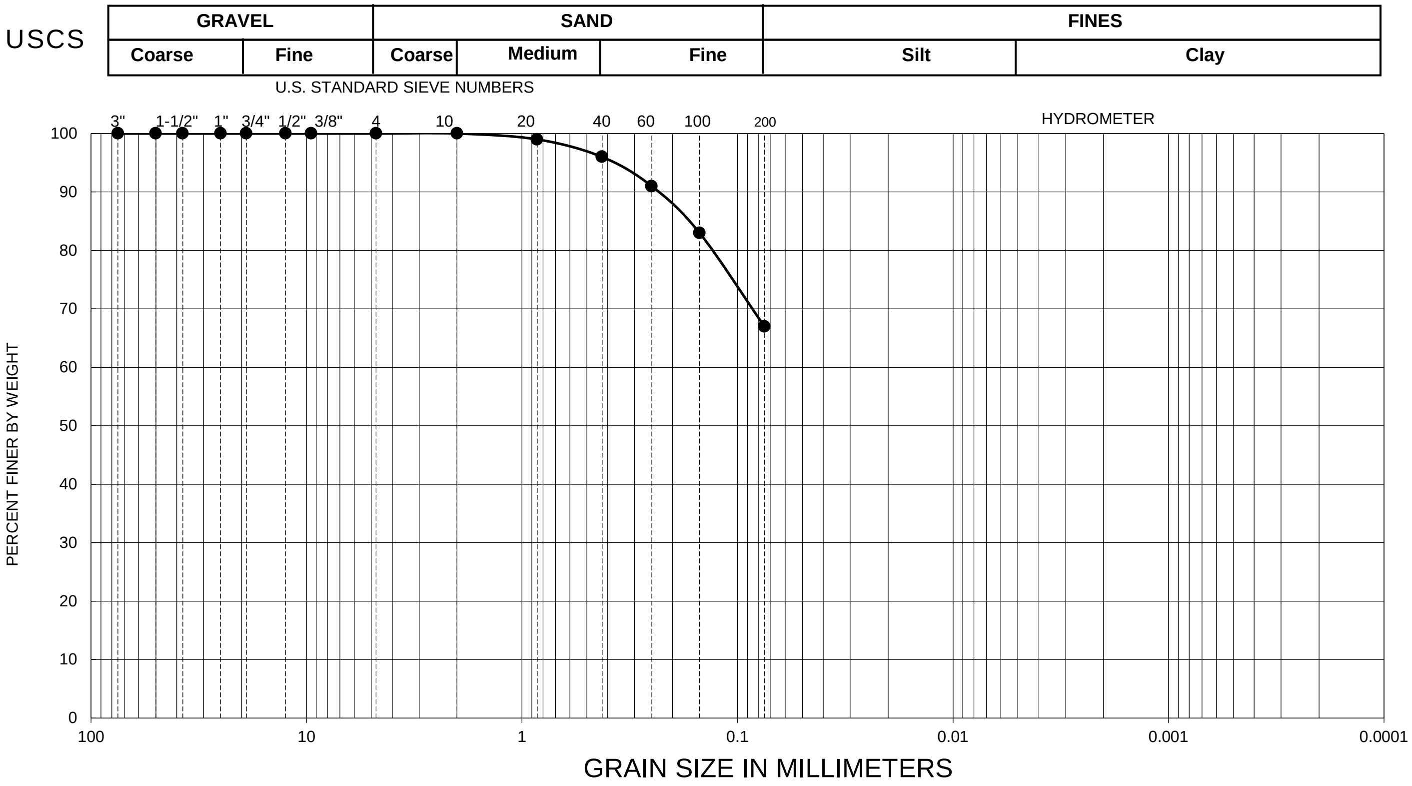
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE
C-4

Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

Date Tested: **8/8/2014**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
A-14-003	6	25-26.5	67.0	CL

Sample Description	sandy lean CLAY; yellowish brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	99
	No. 40	0.425 mm	96
	No. 60	0.25 mm	91
	No 100	0.15 mm	83
	No 200	.075 mm	67.0

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SIEVE ANALYSIS

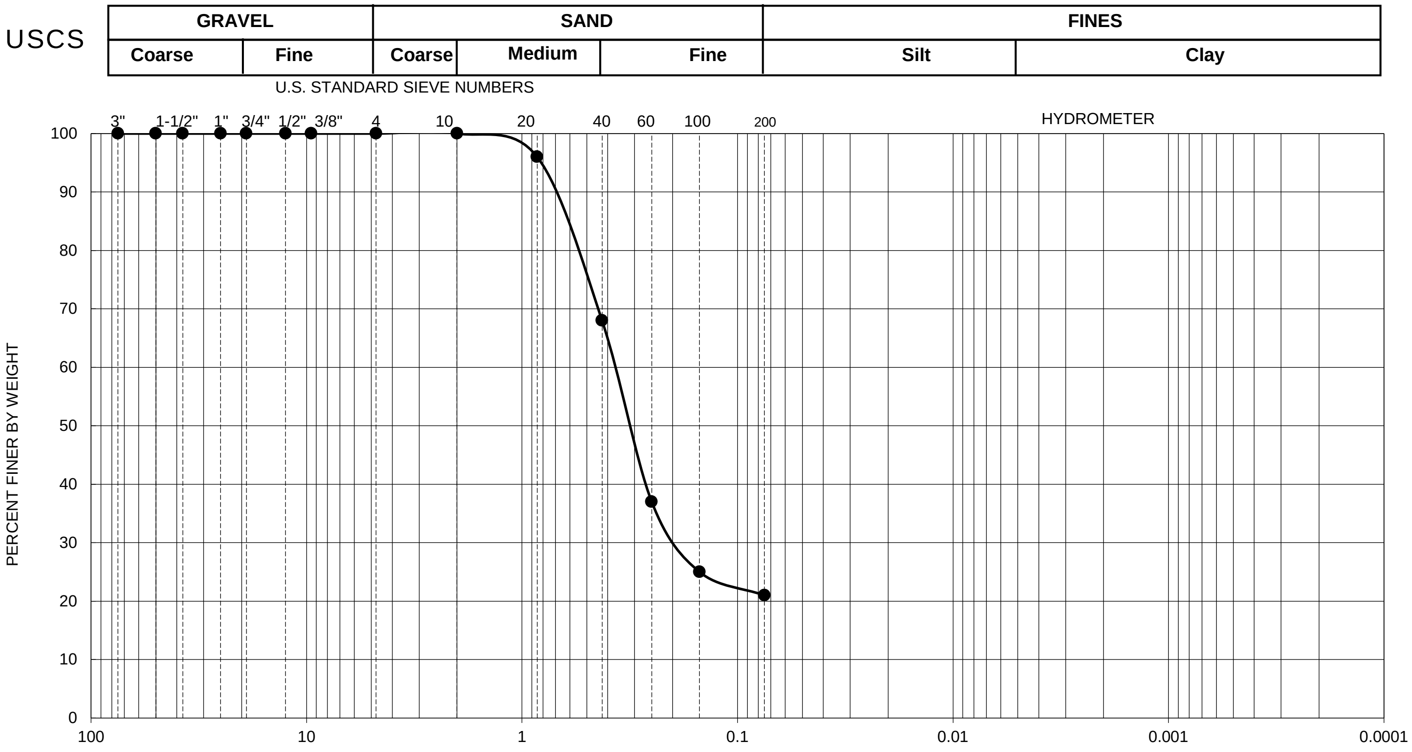
TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-5

Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

Date Tested: **8/8/2014**



GRAIN SIZE IN MILLIMETERS

Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-003	8	35-36	21.0	SM

Sample Description	Silty SAND; white

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	96
	No. 40	0.425 mm	68
	No. 60	0.25 mm	37
	No 100	0.15 mm	25
	No 200	.075 mm	21.0

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Project No.	20151065	Date: 28-Oct-14

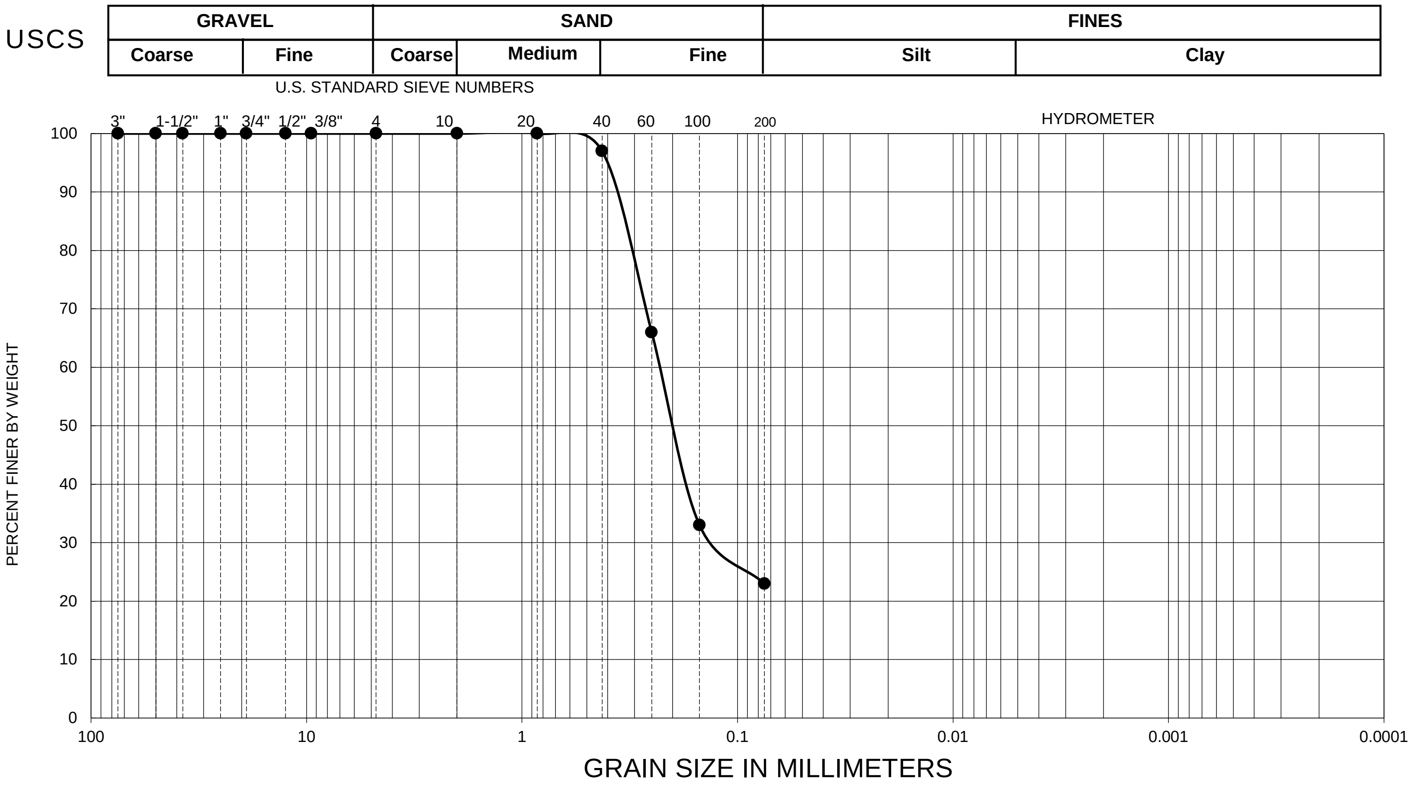
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-6

Date Tested: **8/8/2014**



Boring No.	**Sample No.**	**Depth (ft)**	**Passing 200 (%)**	**USCS Classification**
A-14-003	10	45-45.5	23.0	SM

Sample Description	silty SAND; light yellowish brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	100
	No. 40	0.425 mm	97
	No. 60	0.25 mm	66
	No 100	0.15 mm	33
	No 200	.075 mm	23.0

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Project No.	20151065	Date: 28-Oct-14

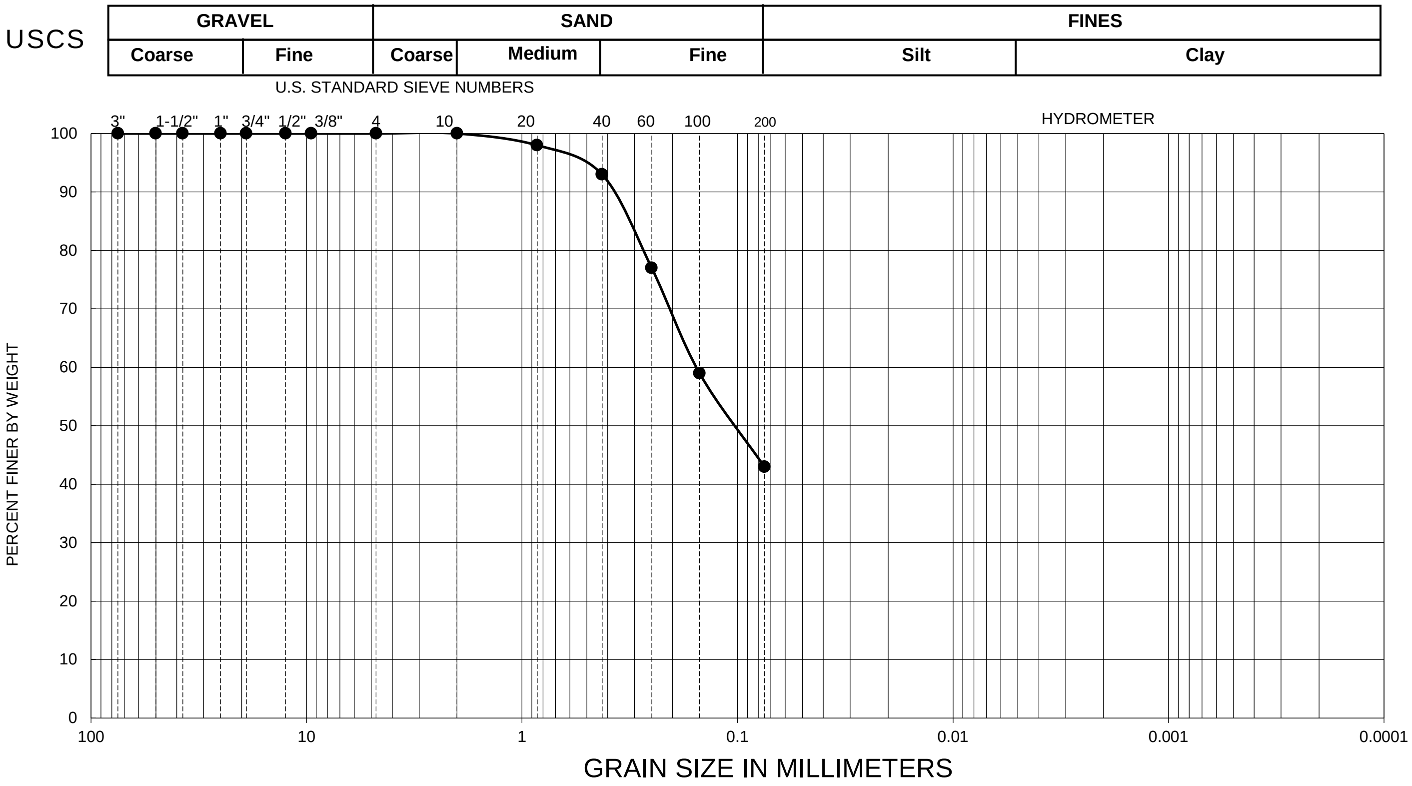
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-7

Date Tested: **8/6/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-004	4	15-16	43.0	SC

Sample Description	clayey SAND; light olive brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	98
	No. 40	0.425 mm	93
	No. 60	0.25 mm	77
	No 100	0.15 mm	59
	No 200	.075 mm	43.0

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Project No.	20151065	Date: 28-Oct-14	

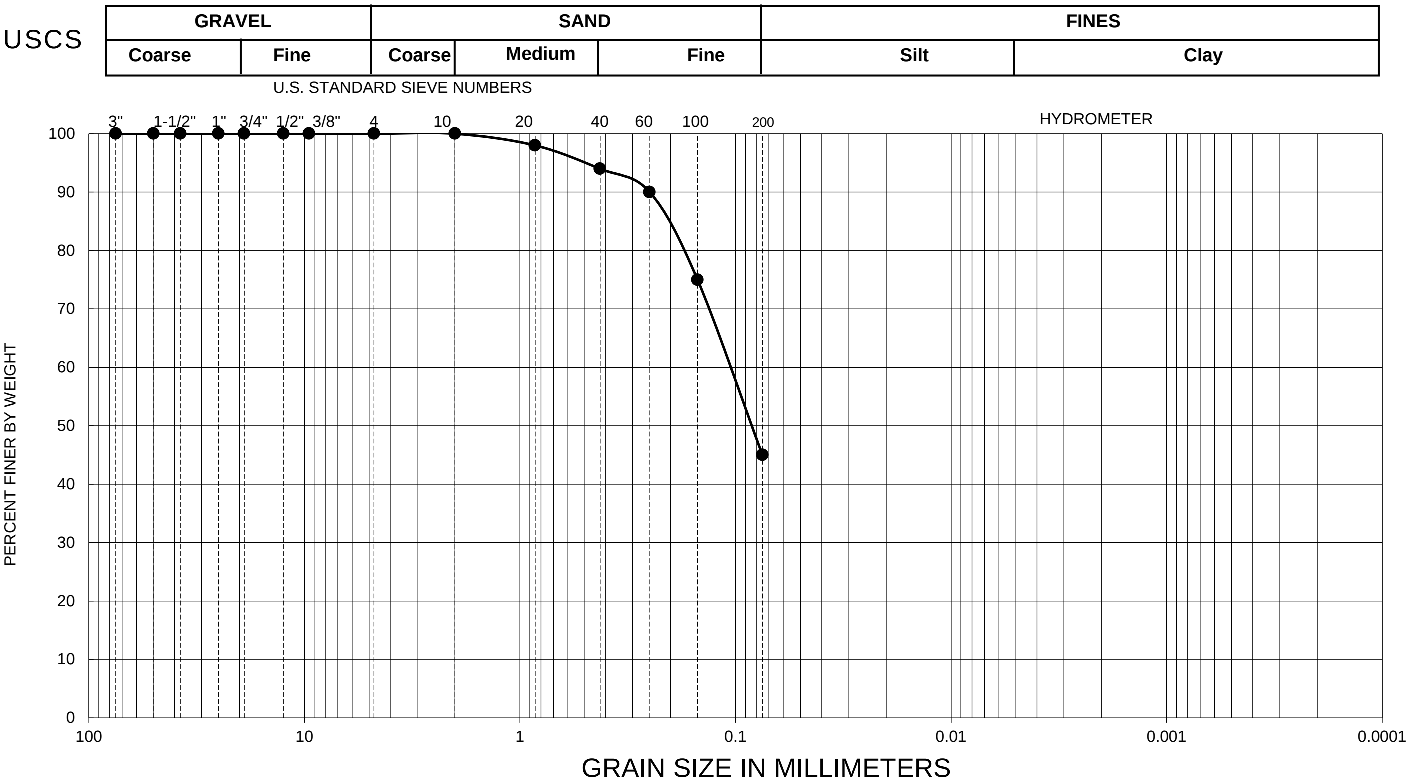
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-8

Date Tested: **8/8/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-004	8	35-36	45	SC

Sample Description	clayey SAND; light olive

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	98
	No. 40	0.425 mm	94
	No. 60	0.25 mm	90
	No 100	0.15 mm	75
	No 200	.075 mm	45.0

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Project No.	20151065	Date: 28-Oct-14

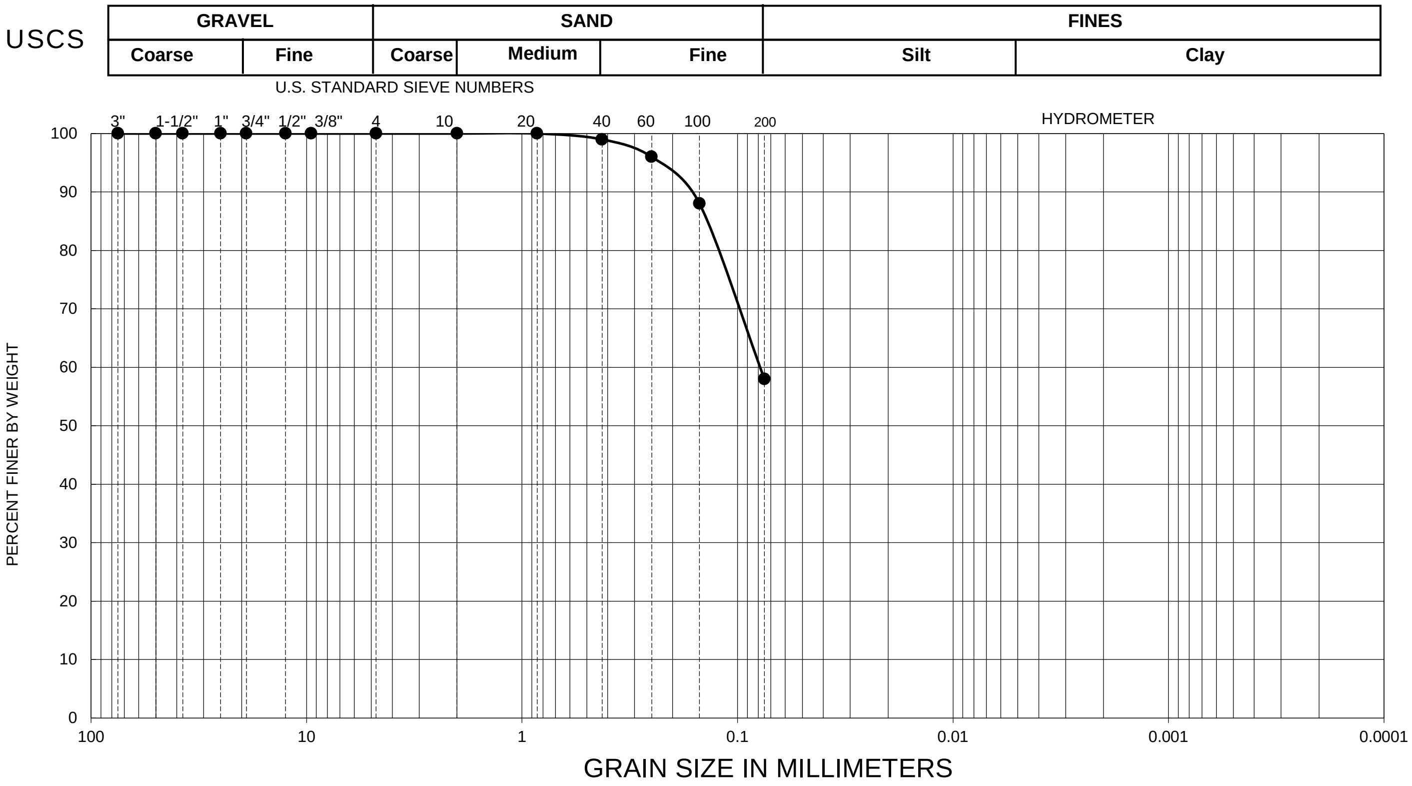
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-9

Date Tested: **8/8/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-004	10	45-46	58	CL

Sample Description	sandy lean CLAY; gray

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	100
	No. 40	0.425 mm	99
	No. 60	0.25 mm	96
	No 100	0.15 mm	88
	No 200	.075 mm	58.0

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Project No.	20151065	Date: 28-Oct-14

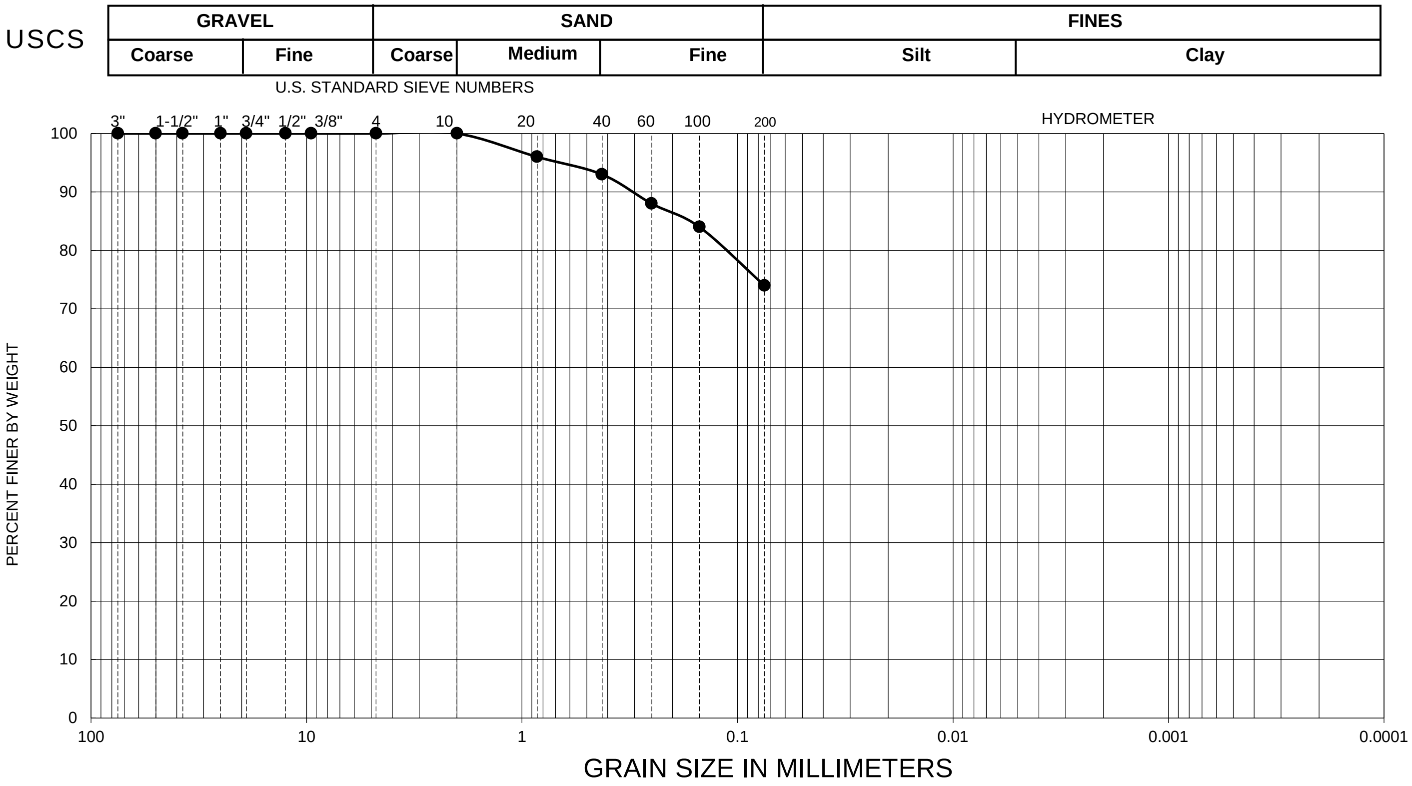
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-10

Date Tested: **8/12/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	2	5-6.5	74.0	CL

Sample Description	lean CLAY with sand; brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	96
	No. 40	0.425 mm	93
	No. 60	0.25 mm	88
	No 100	0.15 mm	84
	No 200	.075 mm	74.0

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Project No.	20151065	Date: 28-Oct-14

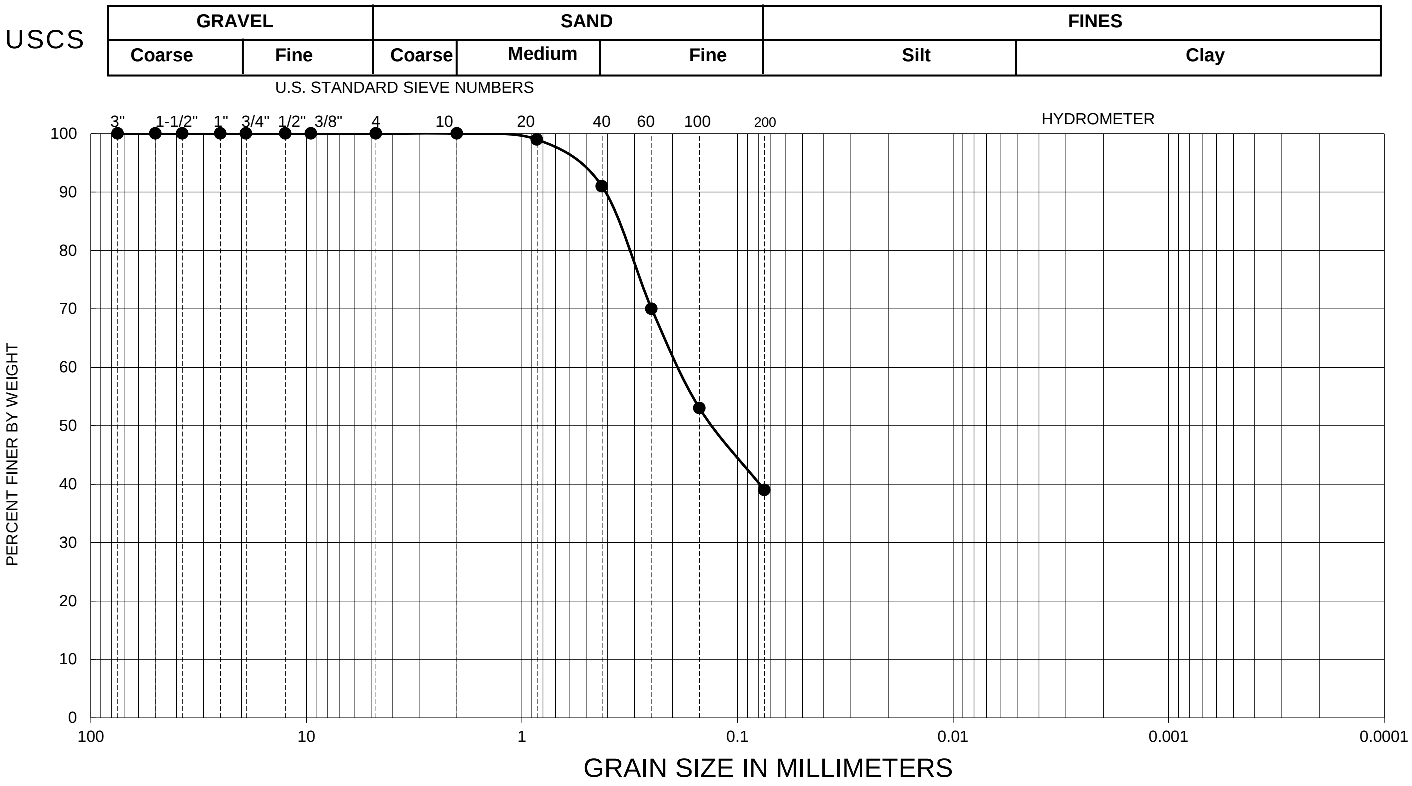
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-11

Date Tested: **8/12/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	4	15-16.5	39	SC

Sample Description	clayey SAND; light olive brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	99
	No. 40	0.425 mm	91
	No. 60	0.25 mm	70
	No 100	0.15 mm	53
	No 200	.075 mm	39

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

KLEINFELDER
Bright People. Right Solutions.

SIEVE ANALYSIS

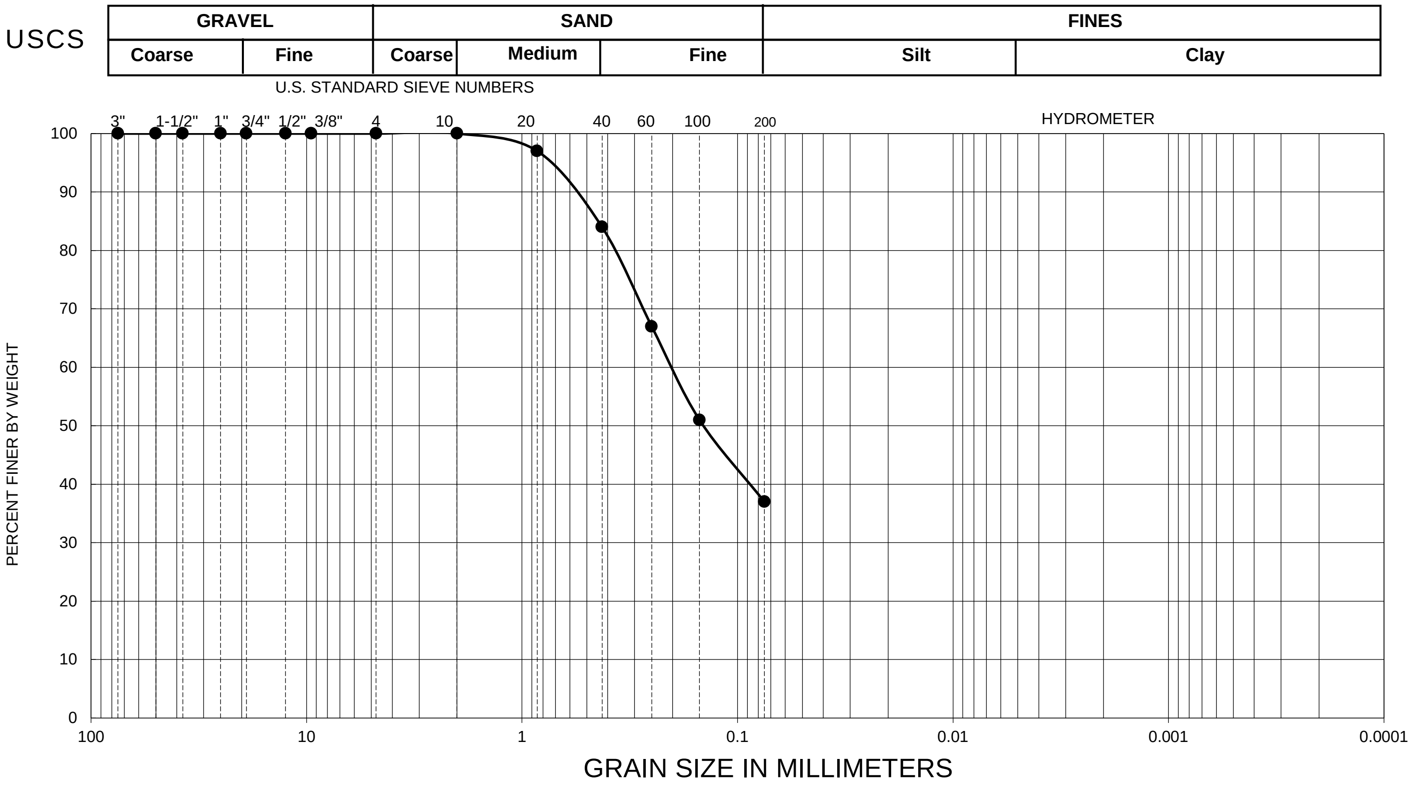
FIGURE

C-12

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

Date Tested: **8/12/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	8	37-38.5	37	SM

Sample Description	yellowish brown Silty sand

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	97
	No. 40	0.425 mm	84
	No. 60	0.25 mm	67
	No 100	0.15 mm	51
	No 200	.075 mm	37

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

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Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

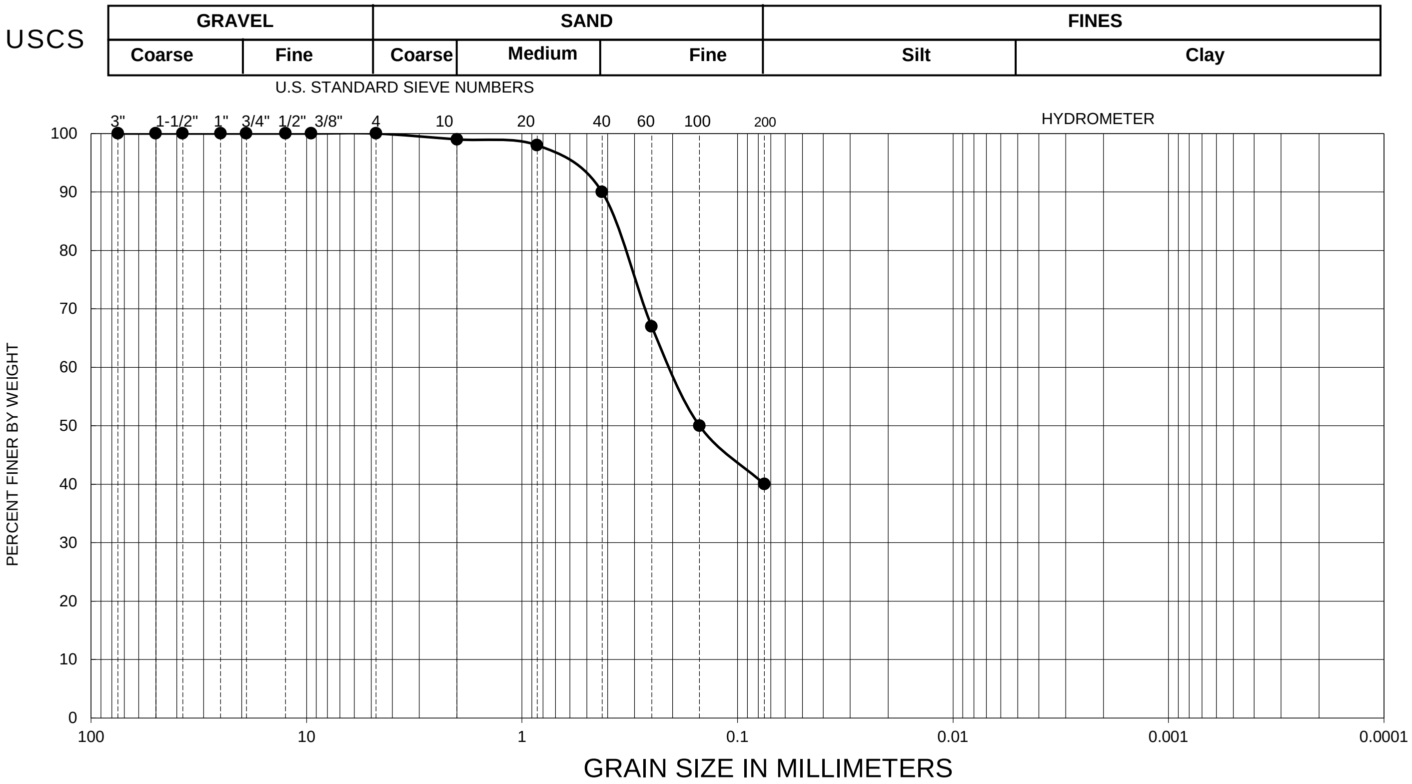
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-13

Date Tested: 8/12/2014



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	12	55-56.5	40	SC

Sample Description	clayey SAND; brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	99
	No. 20	0.85 mm	98
	No. 40	0.425 mm	90
	No. 60	0.25 mm	67
	No 100	0.15 mm	50
	No 200	.075 mm	40

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

KLEINFELDER
Bright People. Right Solutions.

Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

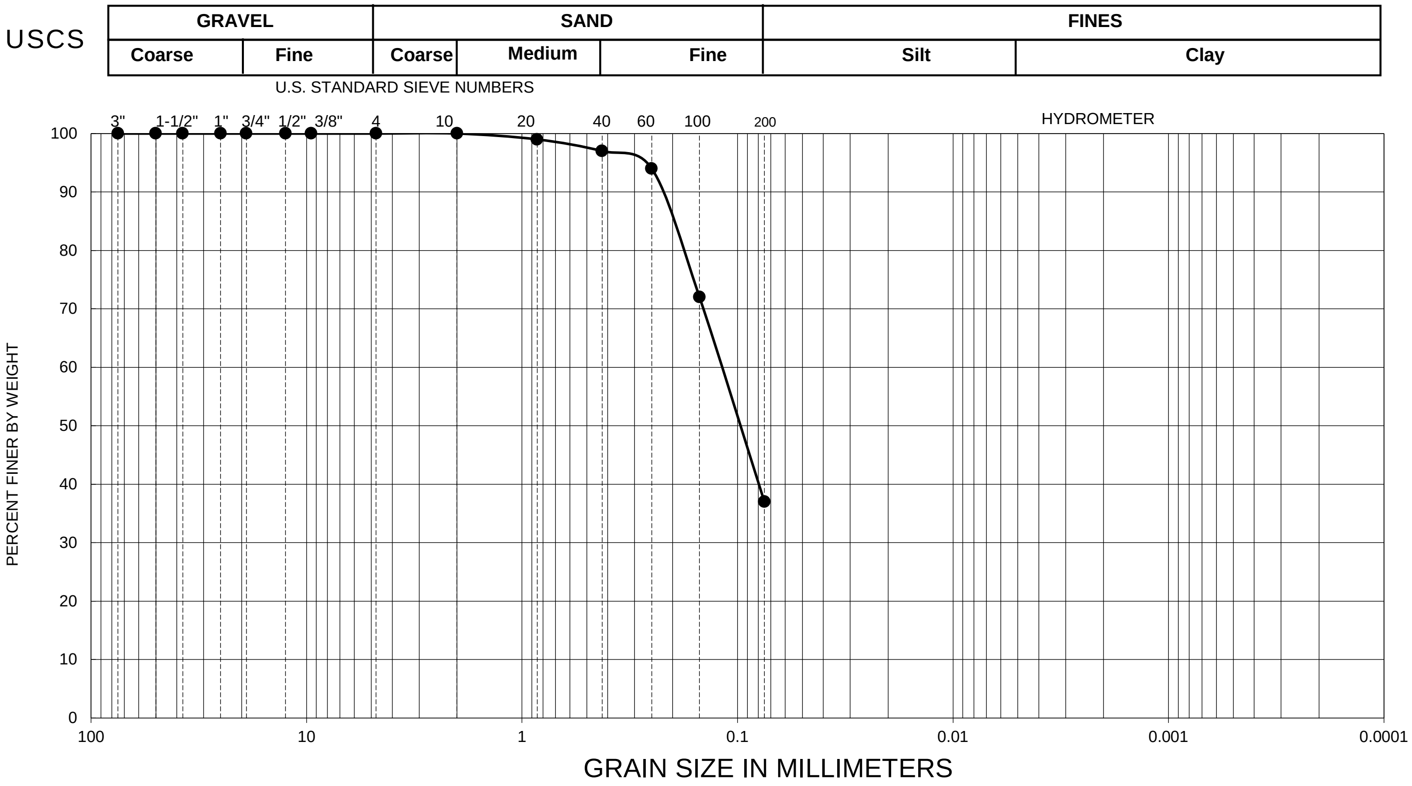
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-14

Date Tested: **8/12/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	14	65-66	37	SM

Sample Description	silty SAND; white

Sieve Analysis	Sieve Size		% Passing
	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	100
	No. 20	0.85 mm	99
	No. 40	0.425 mm	97
	No. 60	0.25 mm	94
	No 100	0.15 mm	72
	No 200	.075 mm	37

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

KLEINFELDER
Bright People. Right Solutions.

Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

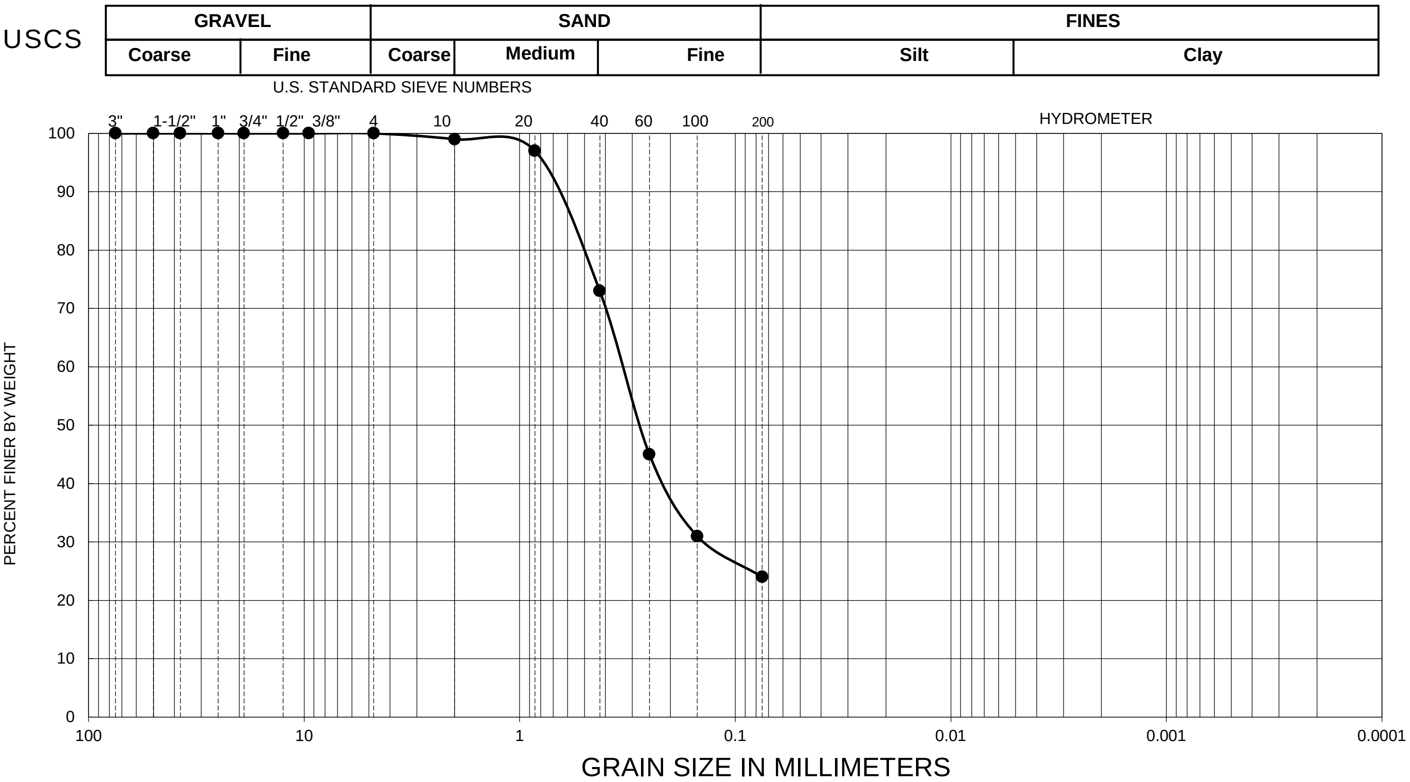
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-15

Date Tested: **8/12/2014**



Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-006	16	85-85.5	24	SM

Sample Description	silty SAND; very light brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	99
	No. 20	0.85 mm	97
	No. 40	0.425 mm	73
	No. 60	0.25 mm	45
	No 100	0.15 mm	31
	No 200	.075 mm	24

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

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Checked by:	Uly P.	Tech: CW
Project No.	20151065	Date: 28-Oct-14

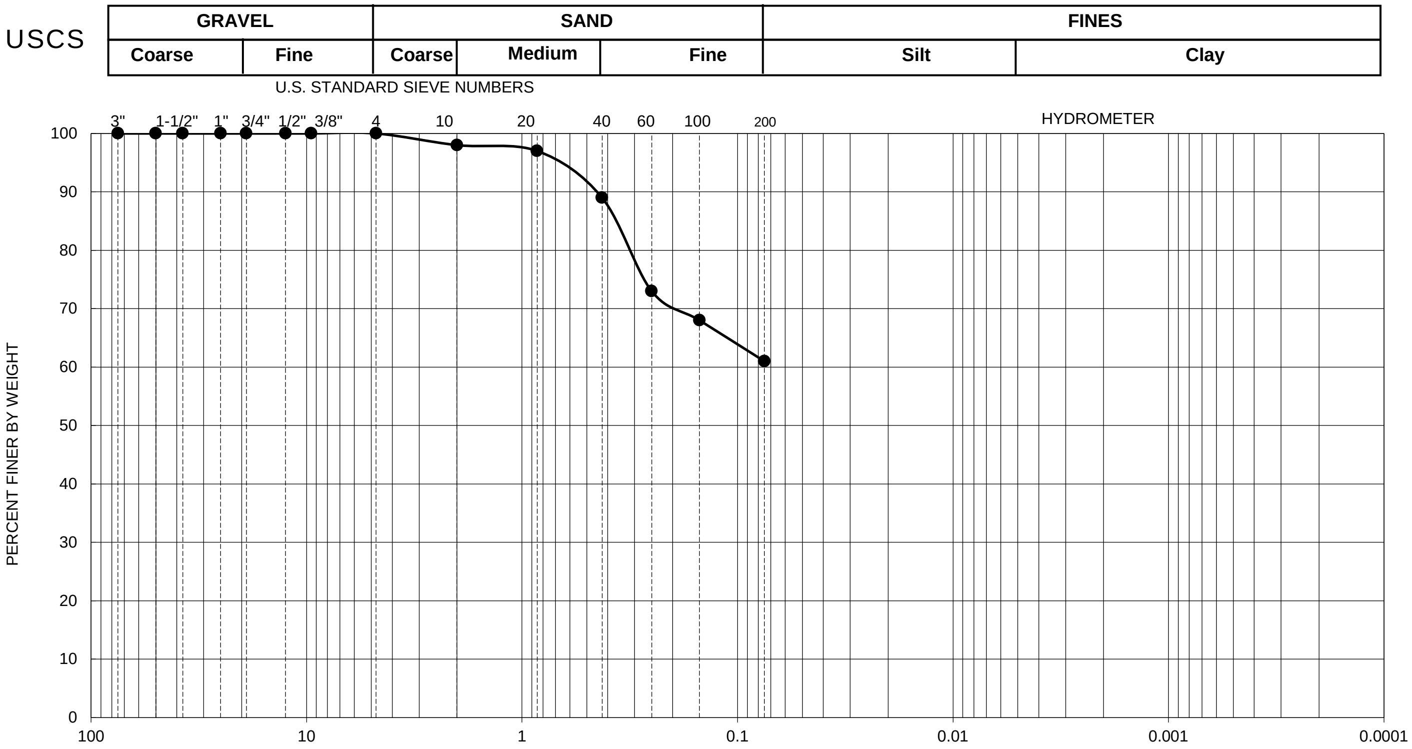
SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE

C-16

Date Tested: 8/6/2014



GRAIN SIZE IN MILLIMETERS

Boring No.	Sample No.	Depth (ft)	Passing 200 (%)	USCS Classification
A-14-007	1	0-2	61.0	CL

Sample Description	sandy lean CLAY; light brown

	Sieve Size		% Passing
Sieve Analysis	3"	75 mm	100
	2"	50 mm	100
	1.5"	37.5 mm	100
	1"	25 mm	100
	3/4"	19 mm	100
	1/2"	12.5 mm	100
	3/8"	9.5 mm	100
	No. 4	4.75 mm	100
	No. 10	2.0 mm	98
	No. 20	0.85 mm	97
	No. 40	0.425 mm	89
	No. 60	0.25 mm	73
	No 100	0.15 mm	68
	No 200	.075 mm	61.0

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 422

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SIEVE ANALYSIS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE
C-17

Checked by:	J. Co	Tech: Uly
Project No.	20151065	Date: 28-Oct-14

Date Tested 8/6-11/2014

Boring No		**A-14-005**	**A-14-005**	**A-14-005**
Sample No.		2	4	6
Depth, ft.		5-6.5	15-16.5	25-26.5
Original Dry Mass of sample, g	B	265.9	192.3	292.9
Dry Mass of Sample After Washing,g	C	198.3	134.2	215.4
Material Finer than a 75 um (No 200), %	A	**25.4**	**30.2**	**26.5**
Description		light olive clayey sand	olive brown clayey sand	olive brown silty sand

Boring No		**A-14-005**	**A-14-005**	**A-14-005**
Sample No.		10	12	17
Depth, ft.		50-51.5	60-61.5	85-86.5
Original Dry Mass of sample, g	B	181.5	204.5	301.1
Dry Mass of Sample After Washing,g	C	110.3	127.4	227.0
Material Finer than a 75 um (No 200), %	A	**39.2**	**37.7**	**24.6**
Description		brown clayey sand	yellowish brown clayey sand	brownish yellow clayey sand

A = [(B-C)/B] x 100

TEST PERFORMED IN ACCORDANCE WITH ASTM D 1140

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SIEVE ANALYSIS
Materials Finer than 75 um (No 200) Sieve

FIGURE

C-18

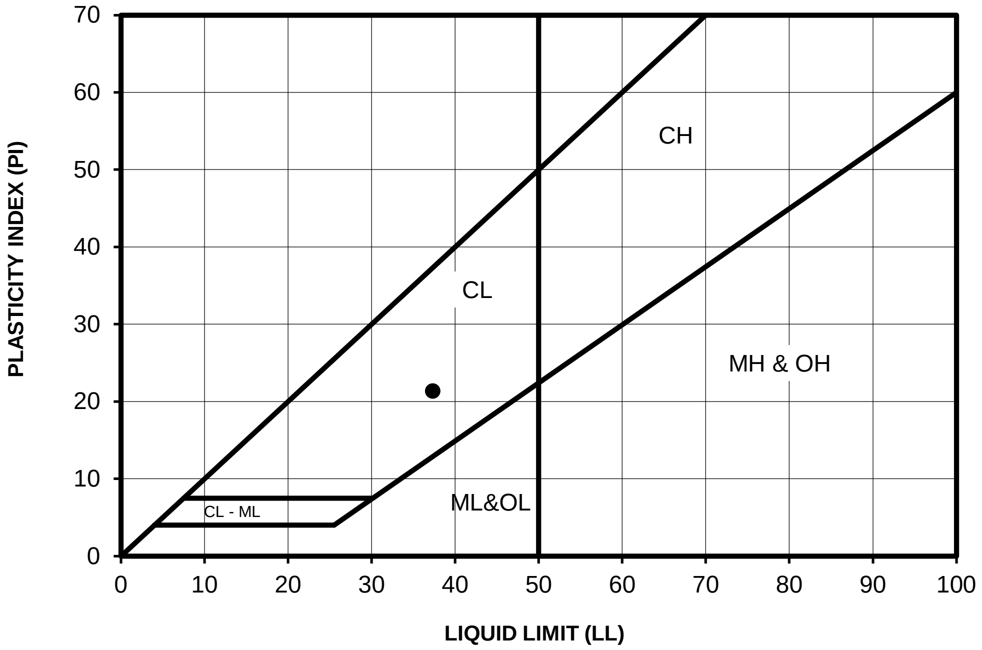
TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

CHECKED BY: Uly Tech CW

JOB NUMBER: 20151065 DATE: 28-Oct-14

Date Tested : 8/6/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-002-1	1-2'	37	16	21	CL	CL
■							
◆							
○							
□							
△							
+							
◇							



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

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ATTERBERG LIMITS

FIGURE

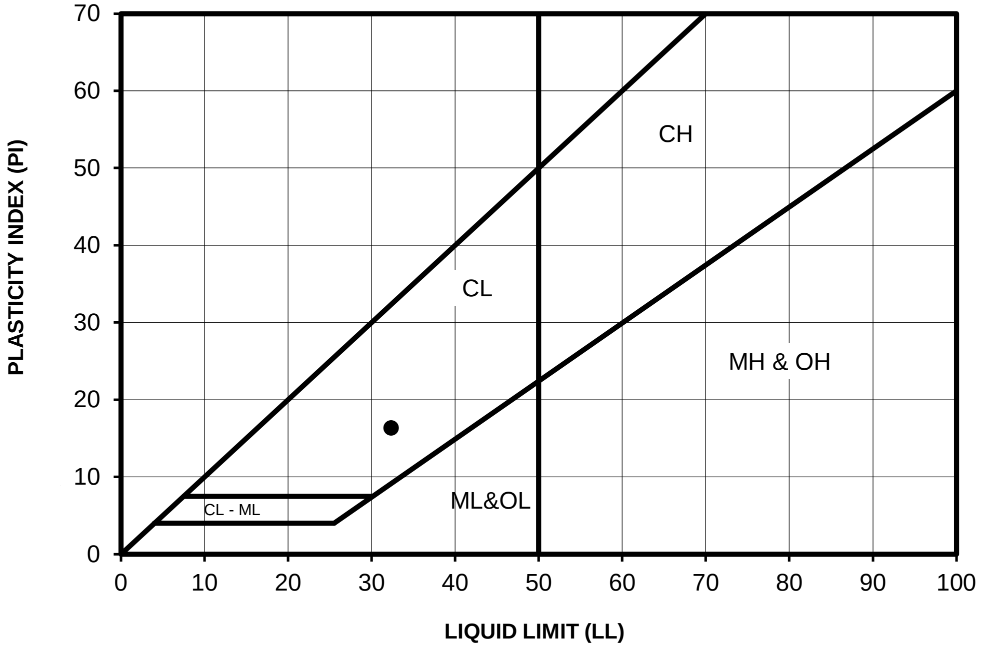
C-19

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

CHECKED BY: J. Co	TECH: Uly
PROJECT NO: 20151065	3-Nov-14

Date Tested : 8/9/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-003-2	5-6.5'	32	16	16	CL	SC
■							
◆							
○							
□							
△							
+							
◇							



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

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ATTERBERG LIMITS

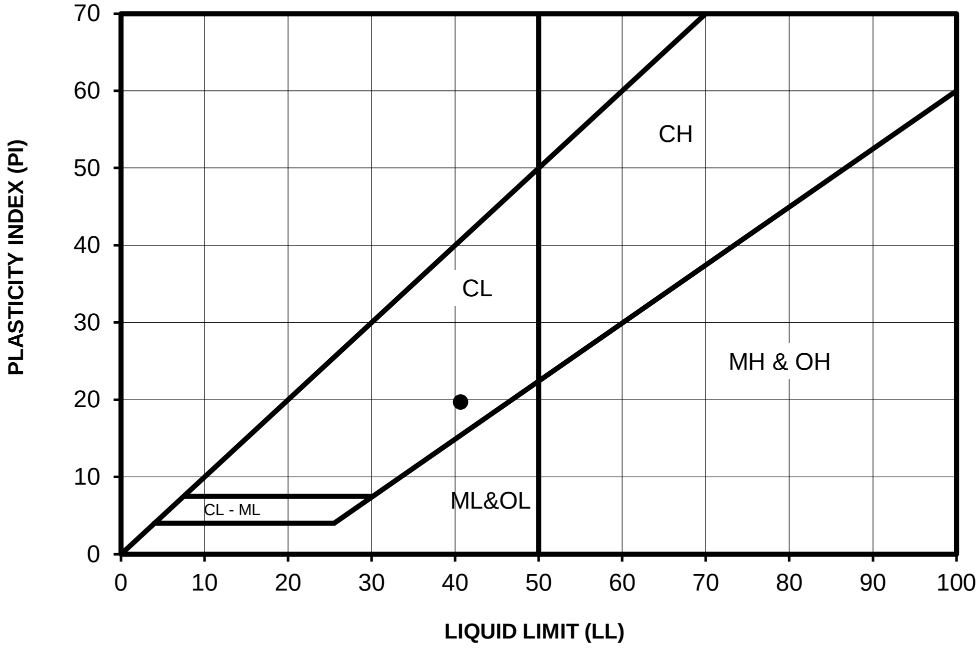
TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

FIGURE
C-20

CHECKED BY: J. Co	TECH: Uly
PROJECT NO: 20151065	3-Nov-14

Date Tested : 8/9/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-004-10	45-46	41	21	20	CL	CL
■							
◆							
○							
□							
△							
+							
◇							



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

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ATTERBERG LIMITS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

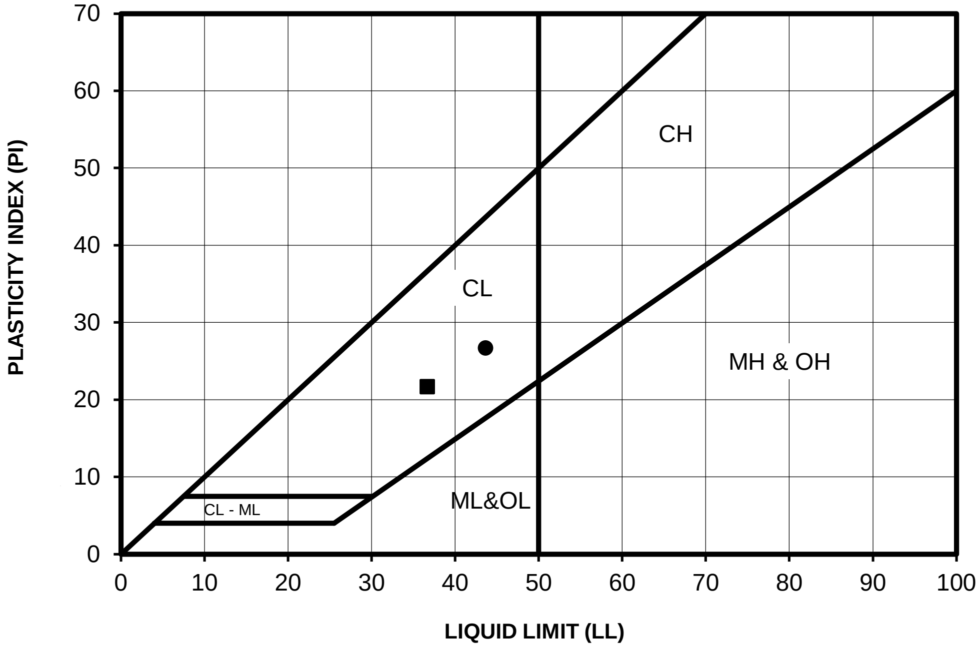
FIGURE

C-21

CHECKED BY: Uly P.	TECH: CW
PROJECT NO: 20151065	3-Nov-14

Date Tested : 8/10/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-005-10	50-51.5	44	17	27	CL	
■	A-14-005-12	60-61.5	37	15	22	CL	
◆							
○							
□							
△							
+							
◇							



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ATTERBERG LIMITS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

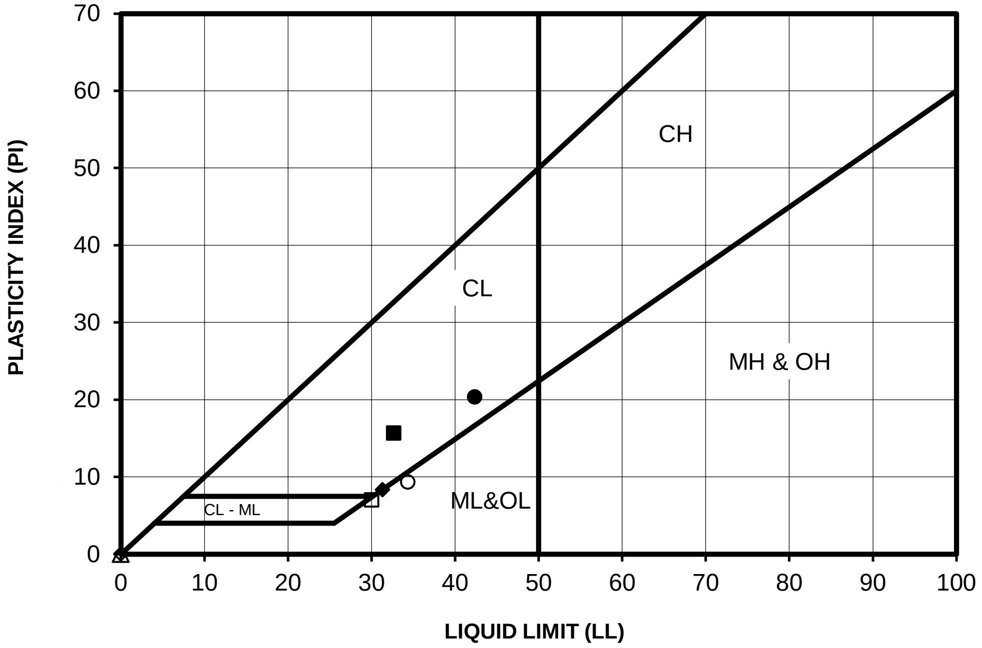
FIGURE

C-22

CHECKED BY: Uly P.
TECH: CW
PROJECT NO: 20151065
3-Nov-14

Date Tested : 8/11-12/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-006-2	5-6.5	42	22	20	CL	CL
■	A-14-006-4	15-16.5	33	17	16	CL	SC
◆	A-14-006-8	37-38.5	31	23	8	ML	SM
○	A-14-006-14	65-66	34	25	9	ML	SM
□	A-14-006-16	85-85.5	30	23	7	ML	SM
△							
+							
◇							



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ATTERBERG LIMITS

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

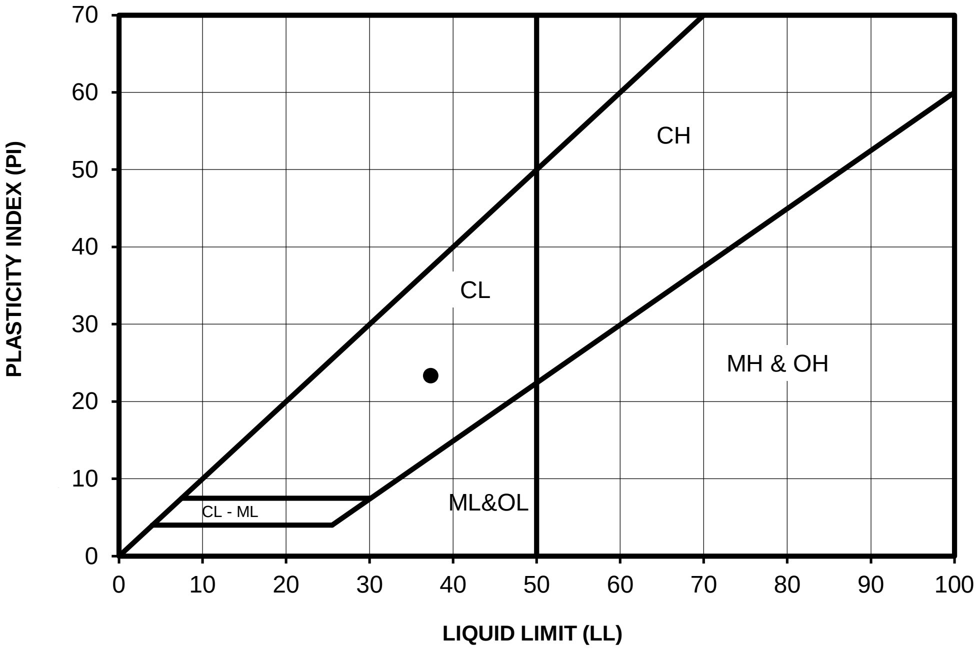
FIGURE

C-23

CHECKED BY: J. Co
TECH: Uly
PROJECT NO: 20151065
3-Nov-14

Date Tested : 8/6/2014

SYMBOL	SAMPLE NAME	DEPTH (ft)	LL	PL	PI	USCS CLASSIFICATION (Minus No. 40 Sieve Fraction)	USCS (Entire Sample)
●	A-14-007-1	0-2'	37	14	23	CL	
■							
◆							
○							
□							
△							
+							
◇							



PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4318

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ATTERBERG LIMITS

FIGURE

C-24

TORREY MEADOWS DRIVE OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CA

CHECKED BY: J. Co | TECH: Uly
PROJECT NO: 20151065 | 3-Nov-14

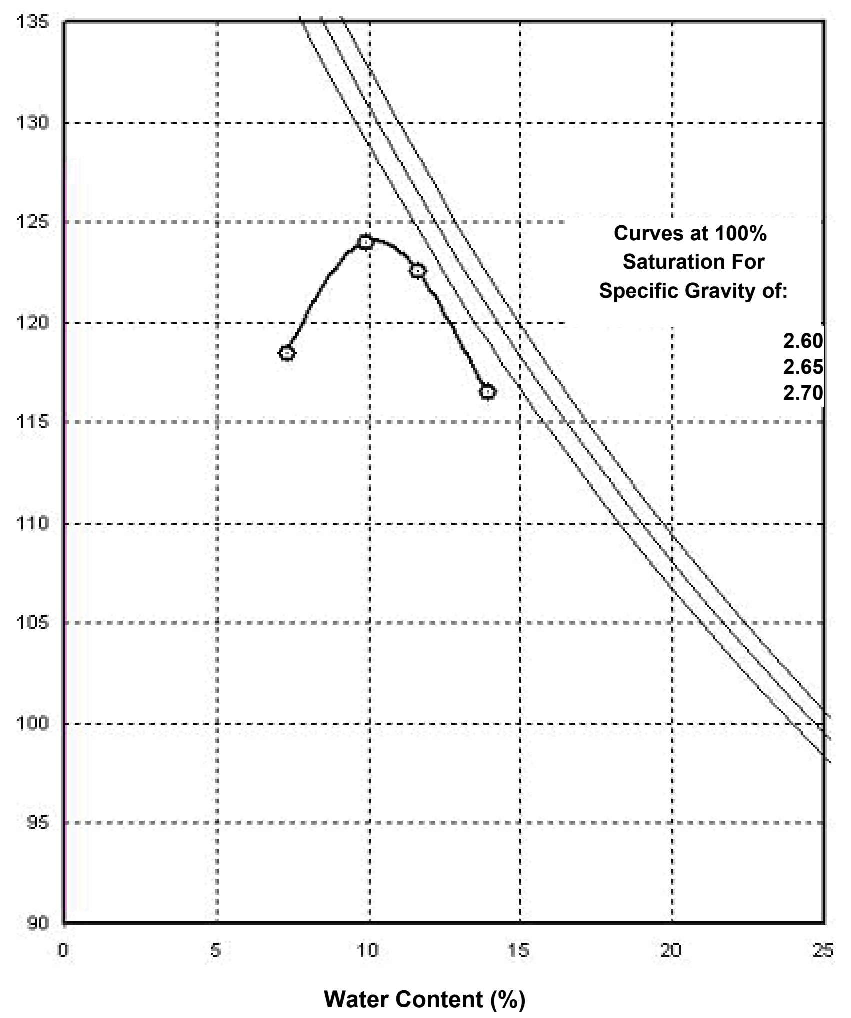
5015 Shoreham Place
San Diego, CA 92122
Phone: (858) 320-2000 Fax: (858) 320-2001

Laboratory Compaction Characteristics of Soil Using Modified Effort ASTM D 1557

Report To:

Report Date:	8/12/2014
Project No.:	20151065.001A
Project:	Torrey Meadows Drive Overcrossing
Task:	05-000L Laboratory Testis

TEST RESULTS



Sample No.: SD_20151065.002.1

Date Sampled: 7/25/2014

Sample Location:

A-14-002-1 at 1-2'

Material Description:

Sandy Lean CLAY (CL)

Compaction Test Method:

ASTM D 1557 Method A

Maximum Dry Unit Weight (pcf): 124.1

Optimum Water Content (%): 10.2

Remarks:

Reviewed on 8/12/2014 by:

Ulysses Panuncialman
Laboratory Manager

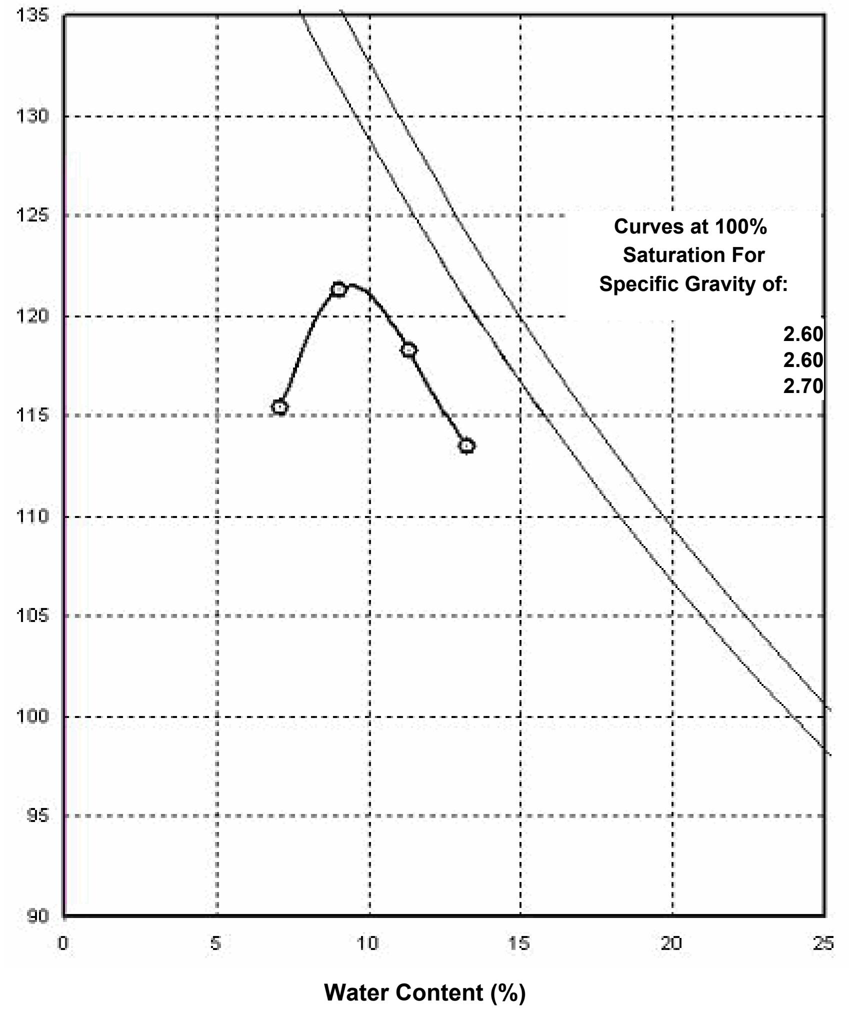
5015 Shoreham Place
San Diego, CA 92122
Phone: (858) 320-2000 Fax: (858) 320-2001

Laboratory Compaction Characteristics of Soil Using Modified Effort ASTM D 1557

Report To:

Report Date: 8/12/2014
Project No.: 20151065.001A
Project: Torrey Meadows Drive Overcrossing
Task: 05-000L Laboratory Testis

TEST RESULTS



Sample No.: SD_20151065.007.1
Date Sampled: 7/25/2014
Sample Location:
A-14-007-1 at 0-2'

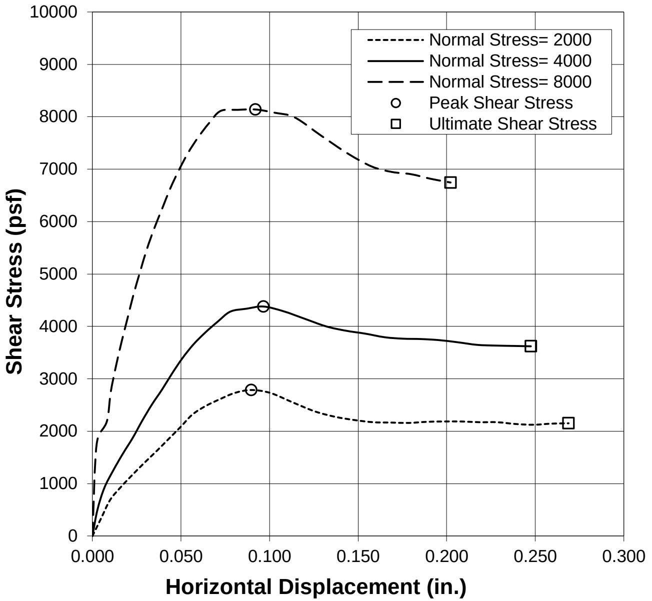
Material Description:
Sandy Lean CLAY (CL)

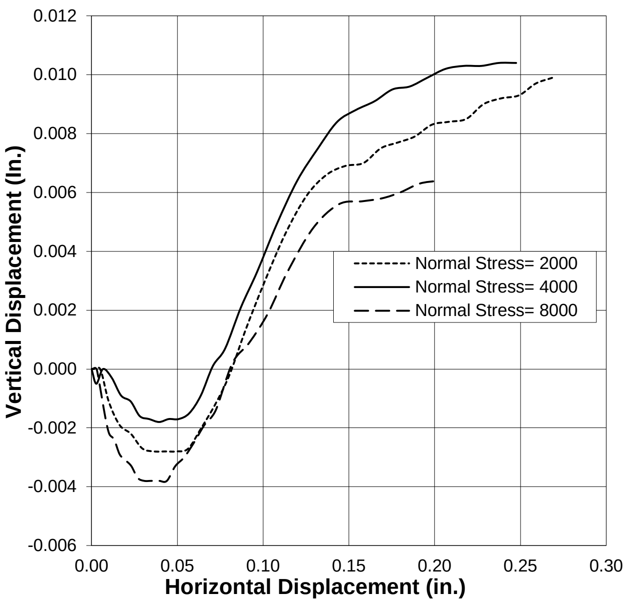
Compaction Test Method:
ASTM D 1557 Method A
Maximum Dry Unit Weight (pcf): 121.5
Optimum Water Content (%): 9.4

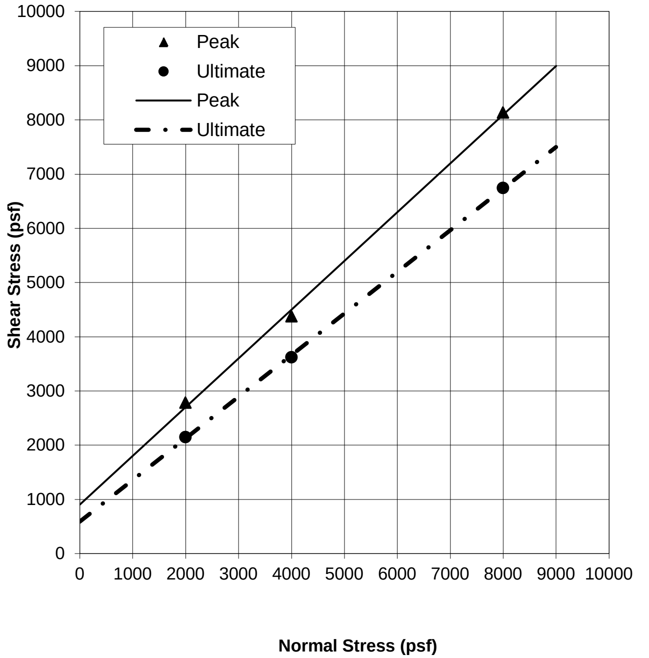
Remarks:

Reviewed on 8/12/2014 by:

Ulysses Panuncialman
Laboratory Manager







Specimen Number		1	2	3	4
Initial	Water Content, %	13.1	12.8	14.1	na
	Dry Density, pcf	106.7	105.0	110.5	na
	Saturation, %	65.5	60.9	78.5	na
	Void Ratio	0.521	0.546	0.469	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	1.00	1.00	1.00	na
Preshear	Water Content, %	19.0	17.7	15.4	na
	Dry Density, pcf	108.5	111.0	116.4	na
	Saturation, %	100.0	99.9	101.6	na
	Void Ratio	0.495	0.461	0.393	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	0.983	0.945	0.949	na
After	Water Content, %	22.5	19.1	17.1	na

Normal Stress, psf	2000	4000	8000	na
Peak Shear Stress, psf	2787	4380	8139	na
Horz. Displ. at Peak Shear Stress, in.	0.090	0.096	0.092	na
Ultimate Shear Stress, psf	2152	3621	6746	na
Horz. Displ. at Ultimate Shear Stress, in.	0.269	0.247	0.202	na
Strain Rate, in./min.	0.0071	0.0071	0.0071	na
	c, psf	**ϕ, deg.**	**Tan ϕ**	
Peak	907	42.0	0.90	na
Ultimate	590	37.5	0.77	na

LL:	nm	PL:	nm	PI:	nm	G_S:	2.60	Assumed

Test Conditions: Undisturbed / Inundated

Sample Description: Silty SAND (SM)

Boring:	A-14-003
Sample:	8
Depth, ft:	35-36
Test Date:	8/5/14

Remarks: nm = not measured, na = not applicable

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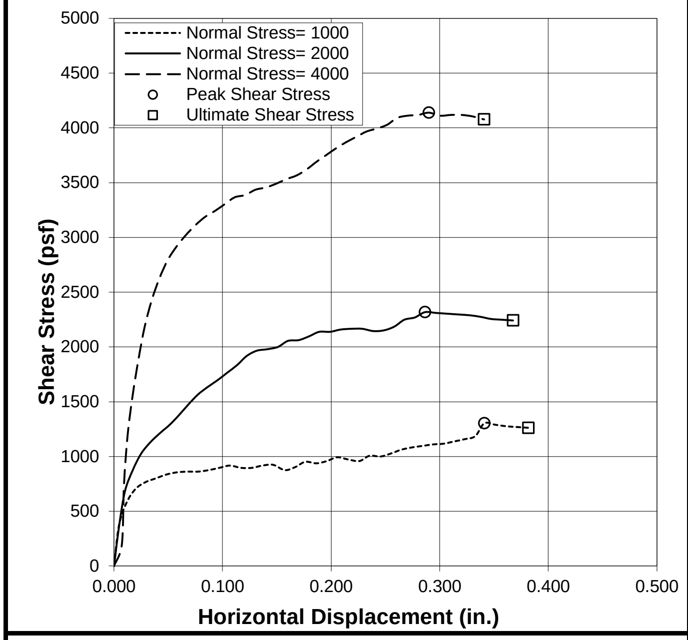
PROJECT NO.	20151065
TESTED BY:	ULY P.
CHECKED BY:	J. Co
DATE:	8/14/2014
REVISED:	

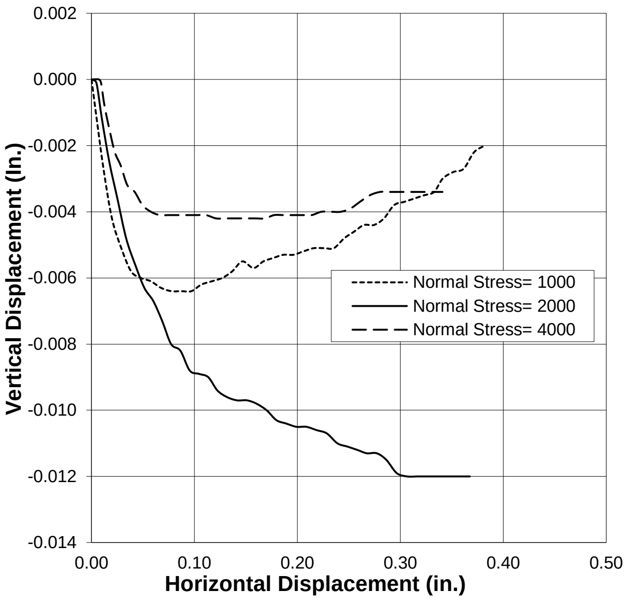
DIRECT SHEAR TEST ASTM D3080

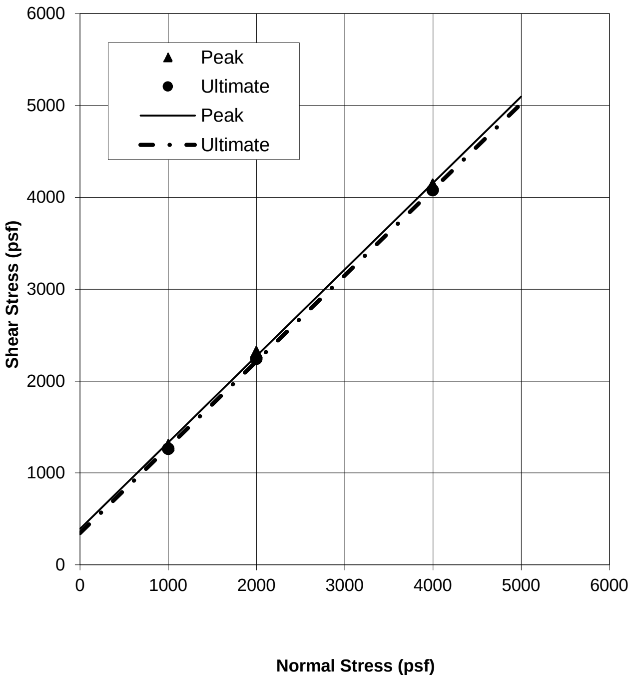
Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-27







LL:	nm	PL:	nm	PI:	nm	G_S:	2.60	Assumed

Test Conditions: Remolded / Inundated

Sample Description: Clayey SAND (SC)

Specimen Number		1	2	3	4
Initial	Water Content, %	13.8	13.6	13.3	na
	Dry Density, pcf	104.4	100.7	107.5	na
	Saturation, %	64.8	57.8	67.8	na
	Void Ratio	0.555	0.611	0.509	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	1.00	1.00	1.00	na
Preshear	Water Content, %	20.7	21.2	17.2	na
	Dry Density, pcf	105.7	104.9	112.2	na
	Saturation, %	100.8	100.7	100.3	na
	Void Ratio	0.535	0.546	0.447	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	0.987	0.960	0.959	na
After	Water Content, %	21.6	20.4	19.4	na

Normal Stress, psf	1000	2000	4000	na
Peak Shear Stress, psf	1304	2318	4139	na
Horz. Displ. at Peak Shear Stress, in.	0.341	0.286	0.290	na
Ultimate Shear Stress, psf	1262	2242	4077	na
Horz. Displ. at Ultimate Shear Stress, in.	0.382	0.368	0.341	na
Strain Rate, in./min.	0.0047	0.0047	0.0047	na
	c, psf	**ϕ, deg.**	**Tan ϕ**	
Peak	393	43.2	0.94	na
Ultimate	345	43.1	0.94	na

Boring:	A-14-004
Sample:	4
Depth, ft:	15-16
Test Date:	8/6/14

Remarks: nm = not measured, na = not applicable

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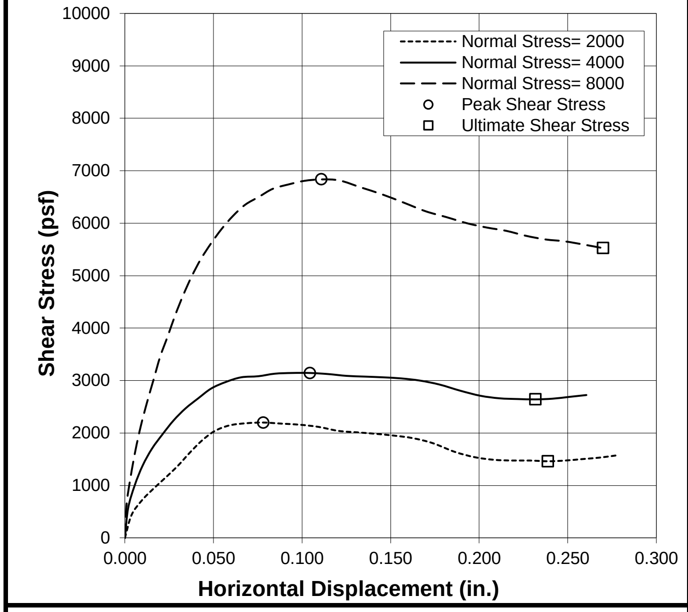
PROJECT NO.	20151065
TESTED BY:	ULY P.
CHECKED BY:	J. Co
DATE:	8/14/2014
REVISED:	

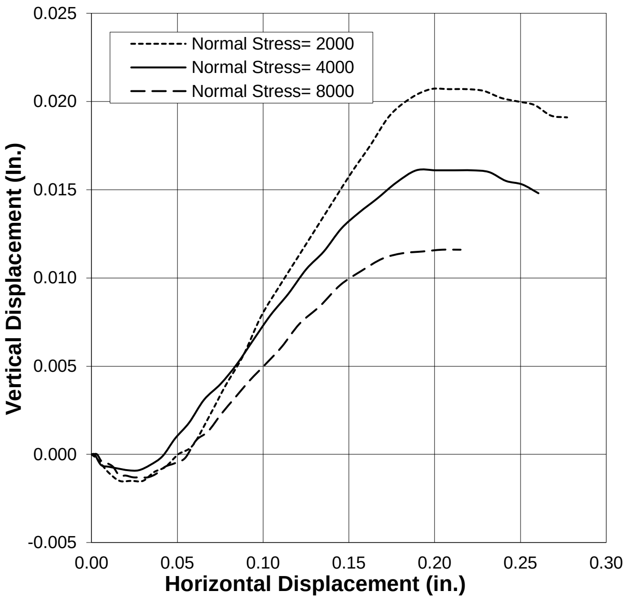
DIRECT SHEAR TEST ASTM D3080

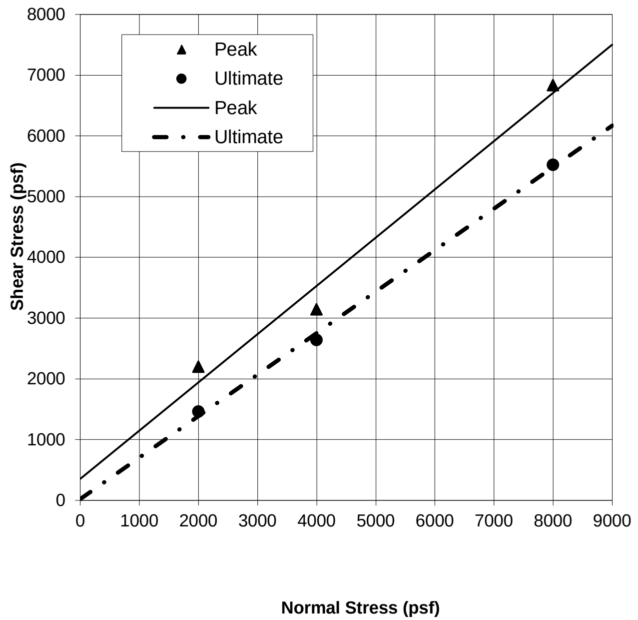
Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-28







Specimen Number		1	2	3	4
Initial	Water Content, %	14.9	15.5	14.5	na
	Dry Density, pcf	115.4	113.1	113.3	na
	Saturation, %	91.4	88.7	83.4	na
	Void Ratio	0.433	0.462	0.460	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	1.00	1.00	1.00	na
Preshear	Water Content, %	16.3	16.9	15.5	na
	Dry Density, pcf	115.6	118.2	119.5	na
	Saturation, %	100.0	112.1	107.1	na
	Void Ratio	0.431	0.399	0.384	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	0.999	0.957	0.948	na
After	Water Content, %	18.5	17.9	17.1	na

Normal Stress, psf	2000	4000	8000	na
Peak Shear Stress, psf	2200	3145	6836	na
Horz. Displ. at Peak Shear Stress, in.	0.078	0.104	0.111	na
Ultimate Shear Stress, psf	1462	2642	5525	na
Horz. Displ. at Ultimate Shear Stress, in.	0.239	0.232	0.270	na
Strain Rate, in./min.	0.0095	0.0095	0.0095	na
	c, psf	**ϕ, deg.**	**Tan ϕ**	
Peak	355	38.5	0.80	na
Ultimate	21	34.4	0.68	na

LL:	nm	PL:	nm	PI:	nm	G_S:	2.65	Assumed

Test Conditions: Undisturbed / Inundated

Sample Description: Silty SAND (SM)

Boring:	A-14-005
Sample:	6
Depth, ft:	25-26.5
Test Date:	8/7/14

Remarks: nm = not measured, na = not applicable

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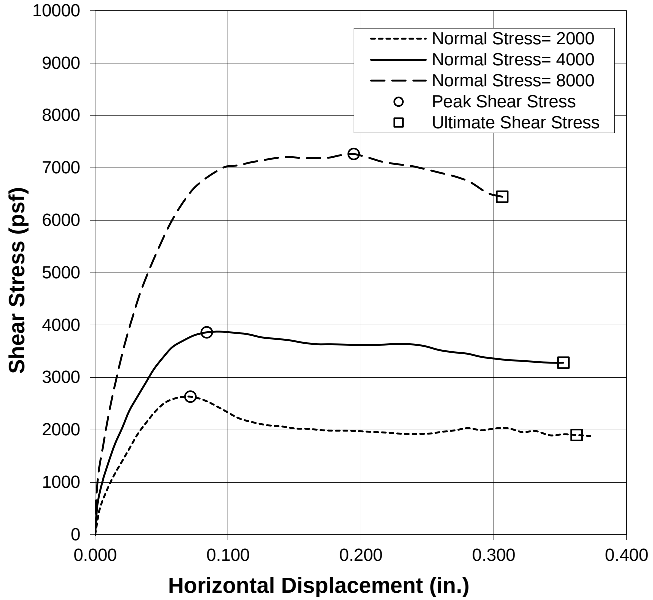
PROJECT NO.	20151065
TESTED BY:	ULY P.
CHECKED BY:	J. Co
DATE:	8/14/2014
REVISED:	

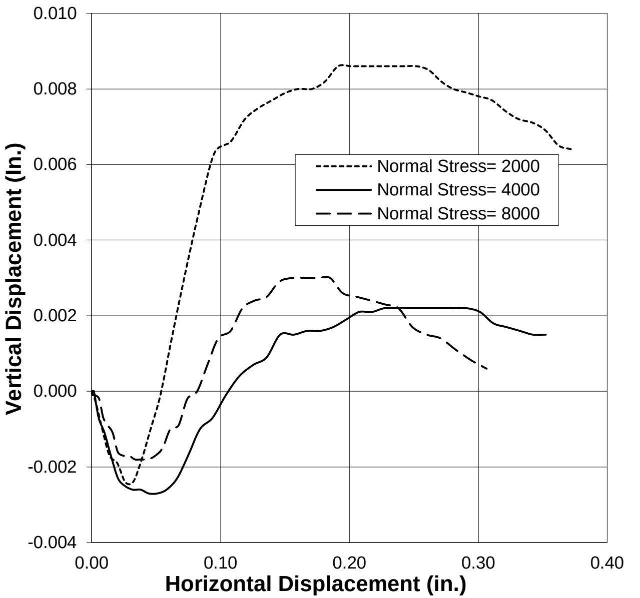
DIRECT SHEAR TEST ASTM D3080

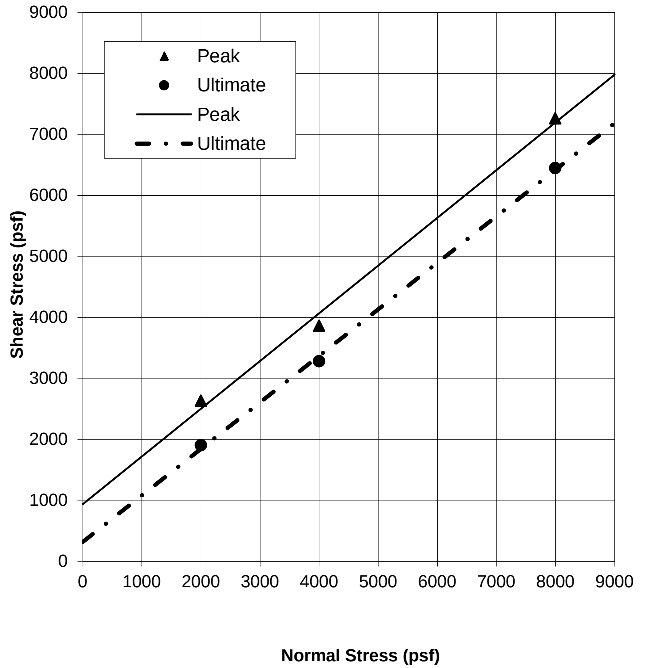
Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-29







	Specimen Number	1	2	3	4
Initial	Water Content, %	15.0	14.3	14.0	na
	Dry Density, pcf	109.6	108.0	113.2	na
	Saturation, %	81.4	74.1	84.2	na
	Void Ratio	0.480	0.502	0.433	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	1.00	1.00	1.00	na
Preshear	Water Content, %	17.5	17.1	15.7	na
	Dry Density, pcf	111.9	113.7	117.9	na
	Saturation, %	101.2	104.4	108.5	na
	Void Ratio	0.450	0.427	0.376	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	0.980	0.950	0.960	na
After	Water Content, %	18.4	19.2	17.5	na

Normal Stress, psf	2000	4000	8000	na
Peak Shear Stress, psf	2635	3863	7263	na
Horz. Displ. at Peak Shear Stress, in.	0.072	0.084	0.195	na
Ultimate Shear Stress, psf	1904	3283	6450	na
Horz. Displ. at Ultimate Shear Stress, in.	0.362	0.352	0.307	na
Strain Rate, in./min.	0.0118	0.0118	0.0118	na
	c, psf	**ϕ, deg.**	**Tan ϕ**	
Peak	935	38.0	0.78	na
Ultimate	321	37.3	0.76	na

LL:	nm	PL:	nm	PI:	nm	G_S:	2.60	Assumed

Test Conditions: Undisturbed / Inundated

Sample Description: Clayey SAND (SC)

Boring:	A-14-005
Sample:	17
Depth, ft:	85-86.5
Test Date:	8/8/14

Remarks: nm = not measured, na = not applicable

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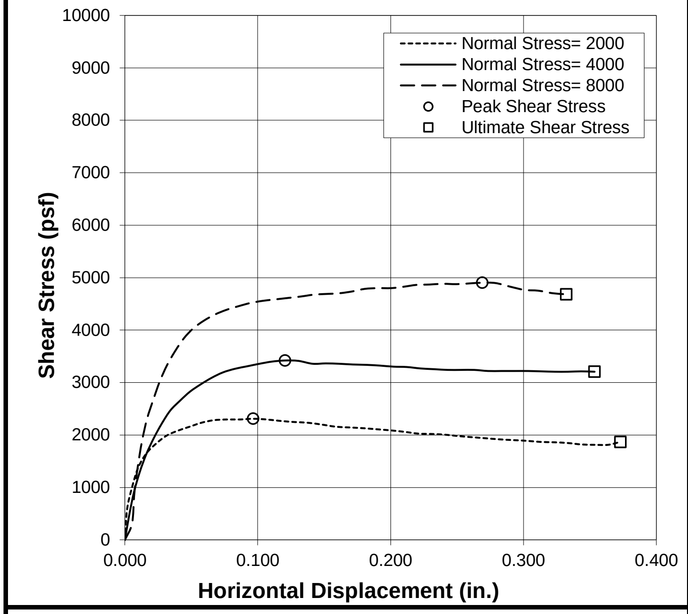
PROJECT NO.	20151065
TESTED BY:	ULY P.
CHECKED BY:	J.Co
DATE:	8/14/2014
REVISED:	

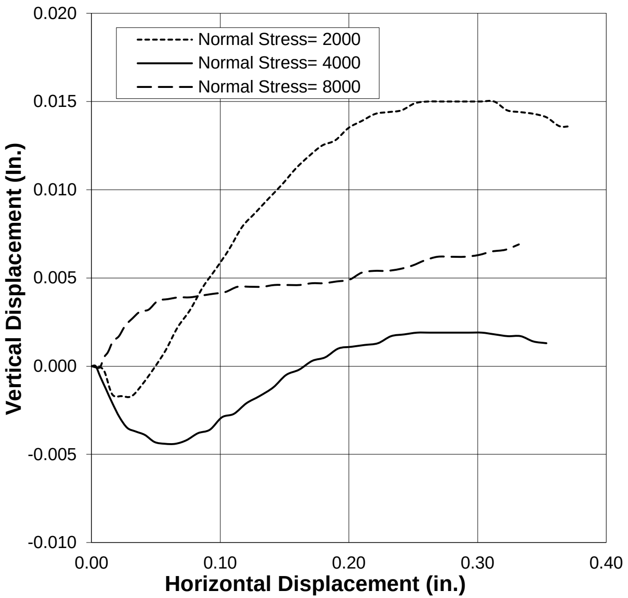
DIRECT SHEAR TEST ASTM D3080

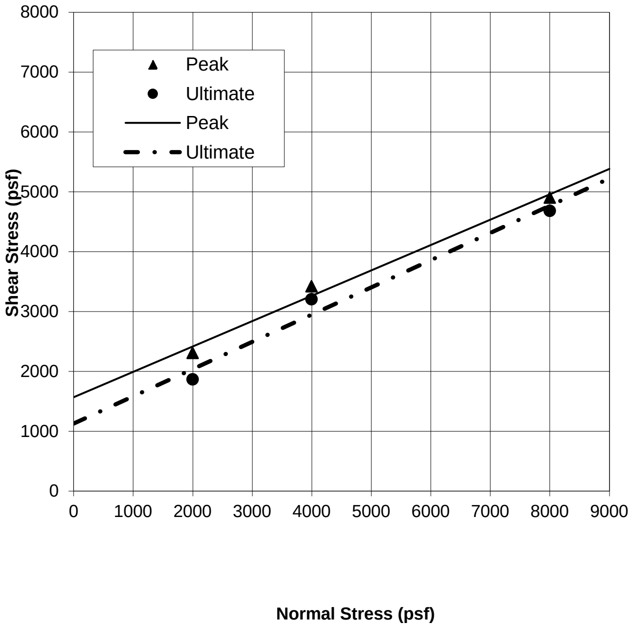
Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-30







Specimen Number		1	2	3	4
Initial	Water Content, %	10.8	19.5	17.6	na
	Dry Density, pcf	110.6	107.8	110.8	na
	Saturation, %	58.0	97.0	94.9	na
	Void Ratio	0.495	0.533	0.492	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	1.00	1.00	1.00	na
Preshear	Water Content, %	19.2	20.2	18.8	na
	Dry Density, pcf	111.4	111.4	114.8	na
	Saturation, %	104.8	110.3	113.1	na
	Void Ratio	0.485	0.484	0.440	na
	Diameter, in	2.39	2.39	2.39	na
	Height, in	0.994	0.968	0.965	na
After	Water Content, %	21.7	20.0	18.8	na

Normal Stress, psf	2000	4000	8000	na
Peak Shear Stress, psf	2311	3421	4904	na
Horz. Displ. at Peak Shear Stress, in.	0.096	0.120	0.269	na
Ultimate Shear Stress, psf	1869	3208	4684	na
Horz. Displ. at Ultimate Shear Stress, in.	0.373	0.353	0.332	na
Strain Rate, in./min.	0.0071	0.0071	0.0071	na
	c, psf	**ϕ, deg.**	**Tan ϕ**	
Peak	1569	22.9	0.42	na
Ultimate	1131	24.5	0.46	na

LL:	nm	PL:	nm	PI:	nm	G_S:	2.65	Assumed

Test Conditions: Undisturbed / Inundated

Sample Description: Clayey SAND (SC)

Boring:	A-14-006
Sample:	12
Depth, ft:	55-59.5
Test Date:	8/11/14

Remarks: nm = not measured, na = not applicable

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PROJECT NO.	20151065
TESTED BY:	ULY P.
CHECKED BY:	J. Co
DATE:	8/14/2014
REVISED:	

DIRECT SHEAR TEST ASTM D3080

Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-31

Boring No.	Sample No.	Depth	Description	Date Tested
A-14-002	1	1-2'	Sandy Lean CLAY (CL)	8/4-5/2014

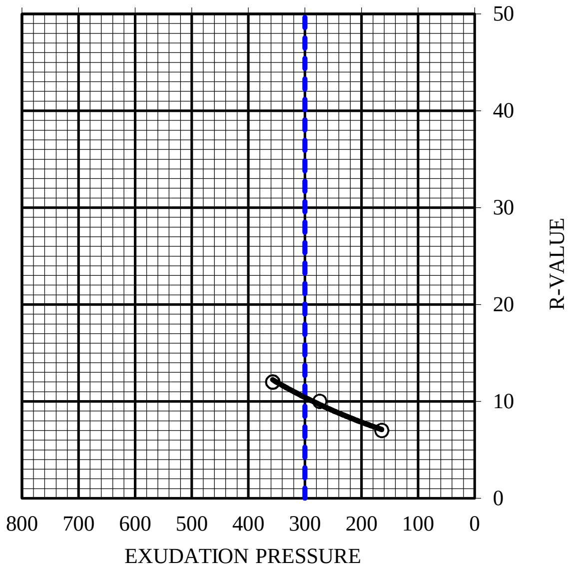
TEST SPECIMEN				
MOLD NO.	5	4	3	
FOOT PRESSURE, psi	**100**	**80**	**50**	
INITIAL MOISTURE, %	14.5	14.5	14.5	
"AS-IS" WEIGHT, g	1200	1200	1200	
DRY WEIGHT, g	1048.0	1048.0	1048.0	
WATER ADDED, ml	**15**	**30**	**50**	
COMPACTION MOISTURE, %	15.9	17.4	19.3	
HEIGHT OF BRIQUETTE, in.	**2.5**	**2.52**	**2.6**	
WEIGHT BRIQUETTE/MOLD,	**3182.6**	**3192.3**	**3183.3**	
WEIGHT OF MOLD, g	**2107.9**	**2113**	**2105.4**	
WEIGHT OF BRIQUETTE, g	1074.7	1079.3	1077.9	
DRY DENSITY, pcf	112.5	110.7	105.4	
STABILOMETER, 1000 lbs	**55**	**54**	**62**	
2000lbs	**134**	**135**	**146**	
DISPLACEMENT, in	**3.58**	**3.95**	**3.95**	
EXUDATION LOAD, lbs	**4485**	**3439**	**2063**	
EXUDATION PRESSURE, psi	357.1	273.8	164.3	
R-VALUE	12	10	6	
CORRECTED R-VALUE	12	10	7	
DIAL READING, END	0.0395	0.0210	0.0300	
DIAL READING, START	0.0400	0.0200	0.0300	
DIFFERENCE	-0.0005	0.0010	0.0000	
EXPANSION PRESSURE, PSF	0.0	43.7	0.0	

INITIAL MOISTURE	
WET WEIGHT, g	749.1
DRY WEIGHT, g	654.2
WEIGHT OF WATER	
WEIGHT OF SAMPLE	
MOISTURE CONTENT %	14.5

R-VALUE: **11**

Location:

Limitations: Pursuant to applicable codes, the results presented in this report are for the exclusive use of the client and the registered design professional in responsible charge. The results apply only to the samples tested. If changes to the specification were made and not communicated to Kleinfelder, Kleinfelder assumes no responsibility for pass/fail statements (meets/did not meet), if provided. This report may not be reproduced, except in full, without written approval of Kleinfelder.



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PROJECT NO. 20151065
TESTED BY: ULY P.
CHECKED BY: J. Co
DATE: 8/15/2015
REVISED:

R-Value (ASTM D2844)

Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-32

Boring No.	Sample No.	Depth	Description	Date Tested
A-14-007	1	0-2'	Sandy Lean CLAY (CL)	8/6-7/2014

TEST SPECIMEN				
MOLD NO.	3	4	5	
FOOT PRESSURE, psi	**60**	**50**	**40**	
INITIAL MOISTURE, %	14.3	14.3	14.3	
"AS-IS" WEIGHT, g	1200	1200	1200	
DRY WEIGHT, g	1050.1	1050.1	1050.1	
WATER ADDED, ml	**30**	**50**	**90**	
COMPACTION MOISTURE, %	17.1	19.0	22.8	
HEIGHT OF BRIQUETTE, in.	**2.51**	**2.55**	**2.55**	
WEIGHT BRIQUETTE/MOLD,	**3172.2**	**3171.2**	**3141.1**	
WEIGHT OF MOLD, g	**2105.4**	**2113**	**2107.9**	
WEIGHT OF BRIQUETTE, g	1066.8	1058.2	1033.2	
DRY DENSITY, pcf	110.1	105.7	100.0	
STABILOMETER, 1000 lbs	**54**	**60**	**68**	
2000lbs	**137**	**140**	**152**	
DISPLACEMENT, in	**3.38**	**3.34**	**4.38**	
EXUDATION LOAD, lbs	**6877**	**5317**	**2967**	
EXUDATION PRESSURE, psi	547.5	423.3	236.2	
R-VALUE	11	10	3	
CORRECTED R-VALUE	11	10	3	
DIAL READING, END	0.0296	0.0298	0.0394	
DIAL READING, START	0.0300	0.0300	0.0400	
DIFFERENCE	-0.0004	-0.0002	-0.0006	
EXPANSION PRESSURE, PSF	0.0	0.0	0.0	

INITIAL MOISTURE	
WET WEIGHT, g	580.5
DRY WEIGHT, g	508.0
WEIGHT OF WATER	
WEIGHT OF SAMPLE	
MOISTURE CONTENT %	14.3

R-VALUE:	**6**
Location:	

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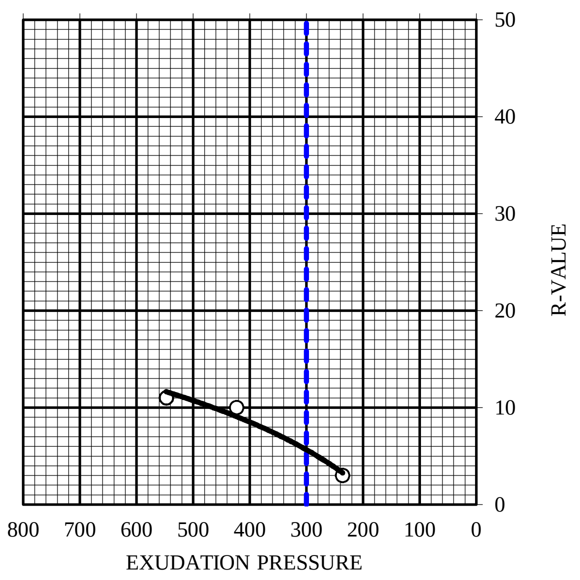

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PROJECT NO. 20151065
TESTED BY: ULY P.
CHECKED BY: J. Co
DATE: 8/15/2015
REVISED:

R-Value (ASTM D2844)

Torrey Meadows Drive Overcrossing at SR-56
Post Mile 5.6, District 11
San Diego, California

PLATE

C-33

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

CLARKSON LABORATORY AND SUPPLY INC.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: August 12, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-3 Customers Phone: 831-4600
Fax: 831-4619
Sample Designation:

One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-003
Sample #: 1
Depth: 0.5-3.5'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.4

Water Added (ml)	Resistivity (ohm-cm)
10	2200
5	800
5	550
5	500
5	510
5	540

23 years to perforation for a 16 gauge metal culvert.
30 years to perforation for a 14 gauge metal culvert.
41 years to perforation for a 12 gauge metal culvert.
53 years to perforation for a 10 gauge metal culvert.
64 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate	Calif. Test 417	0.012% (120 ppm)
Water Soluble Chloride	Calif. Test 422	0.026% (260 ppm)

Laura Torres

Laura Torres
LT/ram

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

CLARKSON LABORATORY AND SUPPLY INC.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: August 12, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-1 Customers Phone: 831-4600
Fax: 831-4619
Sample Designation:

One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-004
Sample #: 1
Depth: 0-2'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.4

Water Added (ml)	Resistivity (ohm-cm)
10	2300
5	1500
5	1100
5	1100
5	1200
5	1500

32 years to perforation for a 16 gauge metal culvert.
41 years to perforation for a 14 gauge metal culvert.
57 years to perforation for a 12 gauge metal culvert.
73 years to perforation for a 10 gauge metal culvert.
89 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417	0.003% (30 ppm)
Water Soluble Chloride Calif. Test 422	0.003% (32 ppm)

Laura Torres

Laura Torres
LT/ram

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

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ANALYTICAL AND CONSULTING CHEMISTS

Date: August 12, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-2 Customers Phone: 831-4600
Fax: 831-4619
Sample Designation:

One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-005
Sample #: 1
Depth: 0-2.5'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.6

Water Added (ml)	Resistivity (ohm-cm)
10	2200
5	1100
5	550
5	470
5	460
5	470
5	510
5	

22 years to perforation for a 16 gauge metal culvert.
29 years to perforation for a 14 gauge metal culvert.
40 years to perforation for a 12 gauge metal culvert.
51 years to perforation for a 10 gauge metal culvert.
62 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.015% (150 ppm)

Water Soluble Chloride Calif. Test 422 0.016% (160 ppm)

Laura Torres
Laura Torres
LT/ram

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

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350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: August 14, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-5 Customers Phone: 831-4600
Fax: 831-4619

Sample Designation:

One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-005
Sample #: 13
Depth: 65-66.5'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.0

Water Added (ml)	Resistivity (ohm-cm)
10	2100
5	1100
5	800
5	490
5	420
5	430
5	470

21 years to perforation for a 16 gauge metal culvert.
28 years to perforation for a 14 gauge metal culvert.
39 years to perforation for a 12 gauge metal culvert.
49 years to perforation for a 10 gauge metal culvert.
60 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417 0.035% (350 ppm)

Water Soluble Chloride Calif. Test 422 0.011% (110 ppm)

Laura Torres

Laura Torres
LT/ram

LABORATORY REPORT

Telephone (619) 425-1993   Fax 425-7917   Established 1928

CLARKSON LABORATORY AND SUPPLY INC.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: August 12, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:
--
Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-4   Customers Phone: 831-4600
Fax: 831-4619
Sample Designation:
--
One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-006
Sample #: 3
Depth: 12-13.5'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 8.8

Water Added (ml)	Resistivity (ohm-cm)
10	2000
5	1100
5	550
5	370
5	350
5	370
5	380

20 years to perforation for a 16 gauge metal culvert.
26 years to perforation for a 14 gauge metal culvert.
36 years to perforation for a 12 gauge metal culvert.
46 years to perforation for a 10 gauge metal culvert.
56 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417	0.012% (120 ppm)
Water Soluble Chloride Calif. Test 422	0.042% (420 ppm)

Laura Torres
Laura Torres
LT/ram

LABORATORY REPORT

Telephone (619) 425-1993 Fax 425-7917 Established 1928

CLARKSON LABORATORY AND SUPPLY INC.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
ANALYTICAL AND CONSULTING CHEMISTS

Date: August 14, 2014
Purchase Order Number: PROJECT#20151065.001A
Sales Order Number: 23461
Account Number: KLE
To:

Kleinfelder Inc.
550 West C Street Ste 1200
San Diego, CA 92101
Attention: Uly Panuncialman

Laboratory Number: SO5371-6 Customers Phone: 831-4600
Fax: 831-4619
Sample Designation:

One soil sample received on 08/08/16 at 1:00pm,
marked as follows:
Project: Torrey Meadows Drive Overcrossing
Project #: 20151065.001A
Boring #: A-14-006
Sample #: 15
Depth: 75-76.5'
Date Shipped: 08/08/14

Analysis By California Test 643, 1999, Department of Transportation Division of Construction, Method for Estimating the Service Life of Steel Culverts.

pH 7.4

Water Added (ml)	Resistivity (ohm-cm)
10	1600
5	670
5	350
5	250
5	260
5	270
5	

17 years to perforation for a 16 gauge metal culvert.
23 years to perforation for a 14 gauge metal culvert.
31 years to perforation for a 12 gauge metal culvert.
40 years to perforation for a 10 gauge metal culvert.
48 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate Calif. Test 417	0.015% (150 ppm)
Water Soluble Chloride Calif. Test 422	0.134% (1340 ppm)

Laura Torres

Laura Torres
LT/ram

APPENDIX D
LOG OF TEST BORINGS (LOTBs)

APPENDIX D

Log of Test Borings (LOTBs)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL

X
DATE

Moises Arzamendi
No. 2275
Exp. 06/30/15

PLANS APPROVAL DATE

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T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92101

KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

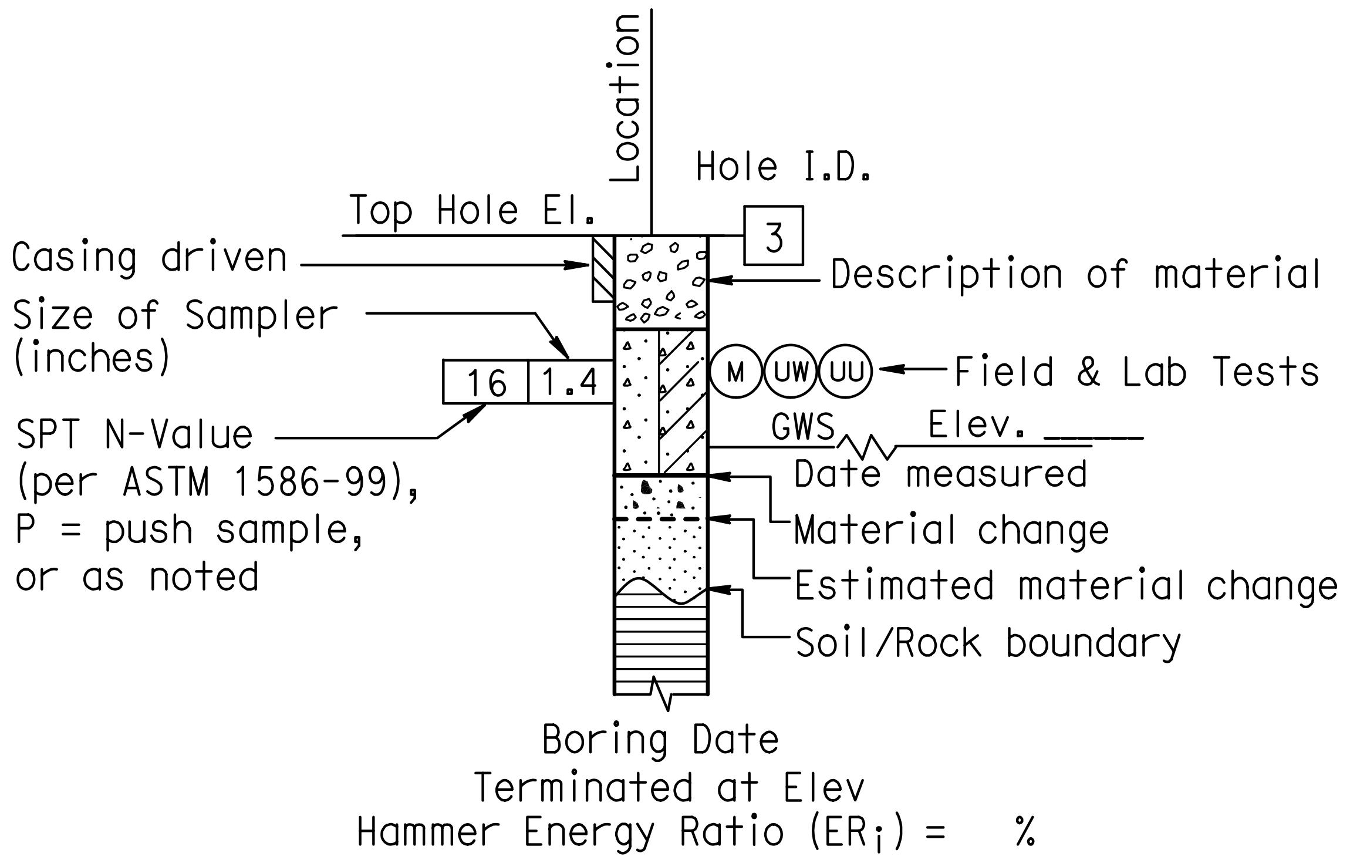
BOREHOLE IDENTIFICATION

Symbol	Hole Type	Description
Size	A	Auger Boring (hollow or solid stem bucket)
Size	R RW RC P	Rotary drilled boring (conventional) Rotary drilled with self-casing wire-line Rotary core with continuously-sampled, self-casing wire-line Rotary percussion boring (air)
Size	R	Rotary drilled diamond core
Size	HD HA	Hand driven (1-inch soil tube) Hand Auger
●	D	Dynamic Cone Penetration Boring
▲	CPT	Cone Penetration Test (ASTM D 5778)
⬚	O	Other (note on LOTB)

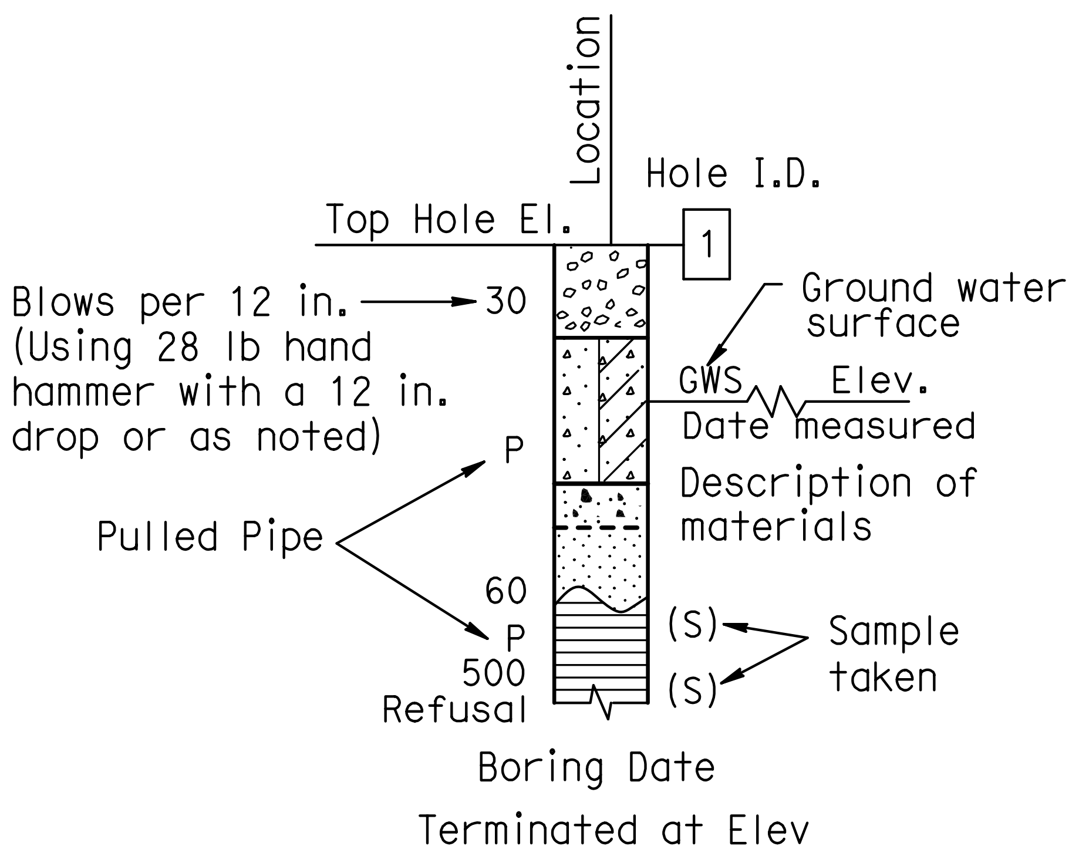
Note: Size in inches.

CONSISTENCY OF COHESIVE SOILS

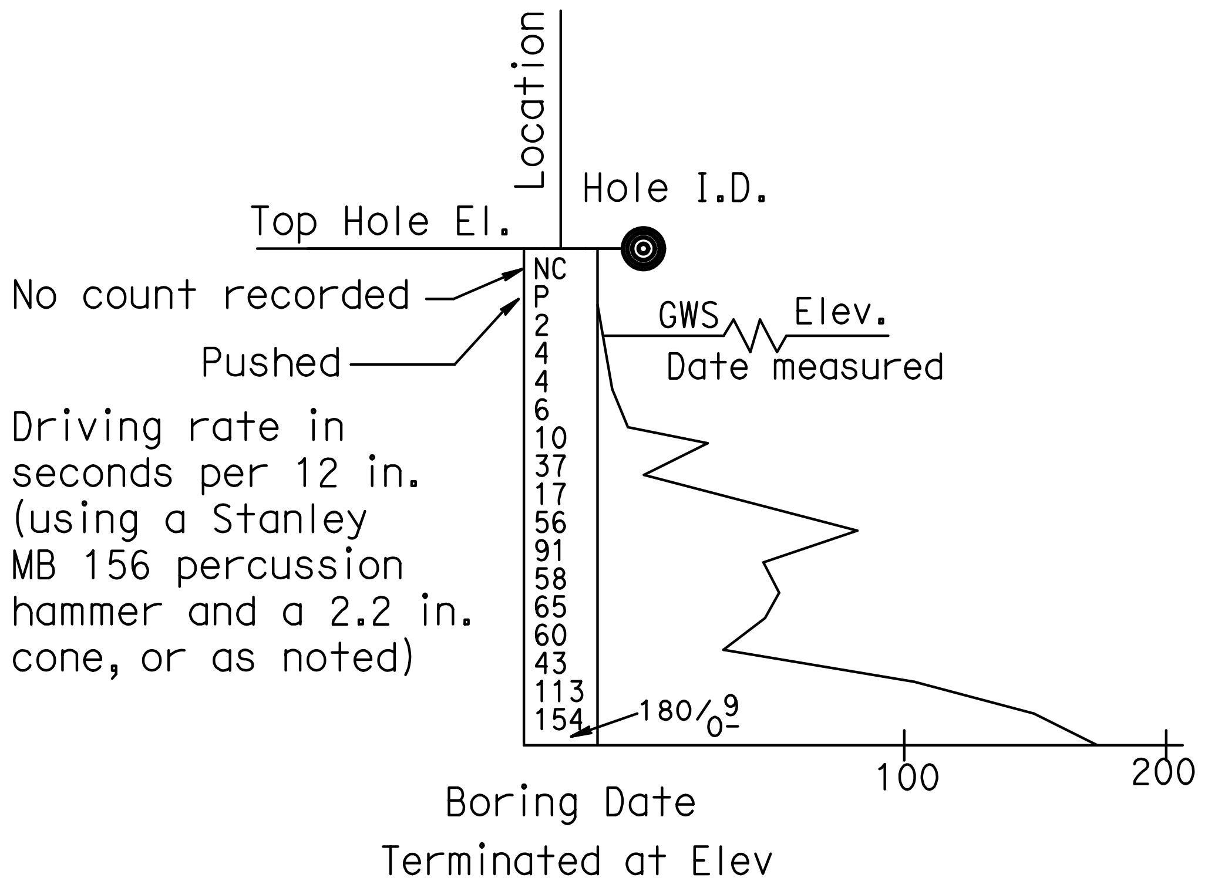
Description	Shear Strength (tsf)	Pocket Penetrometer Measurement, PP, (tsf)	Torvane Measurement, TV, (tsf)	Vane Shear Measurement, VS, (tsf)
Very Soft	Less than 0.12	Less than 0.25	Less than 0.12	Less than 0.12
Soft	0.12 - 0.25	0.25 - 0.5	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.5	0.5 - 1	0.25 - 0.5	0.25 - 0.5
Stiff	0.5 - 1	1 - 2	0.5 - 1	0.5 - 1
Very Stiff	1 - 2	2 - 4	1 - 2	1 - 2
Hard	Greater than 2	Greater than 4	Greater than 2	Greater than 2



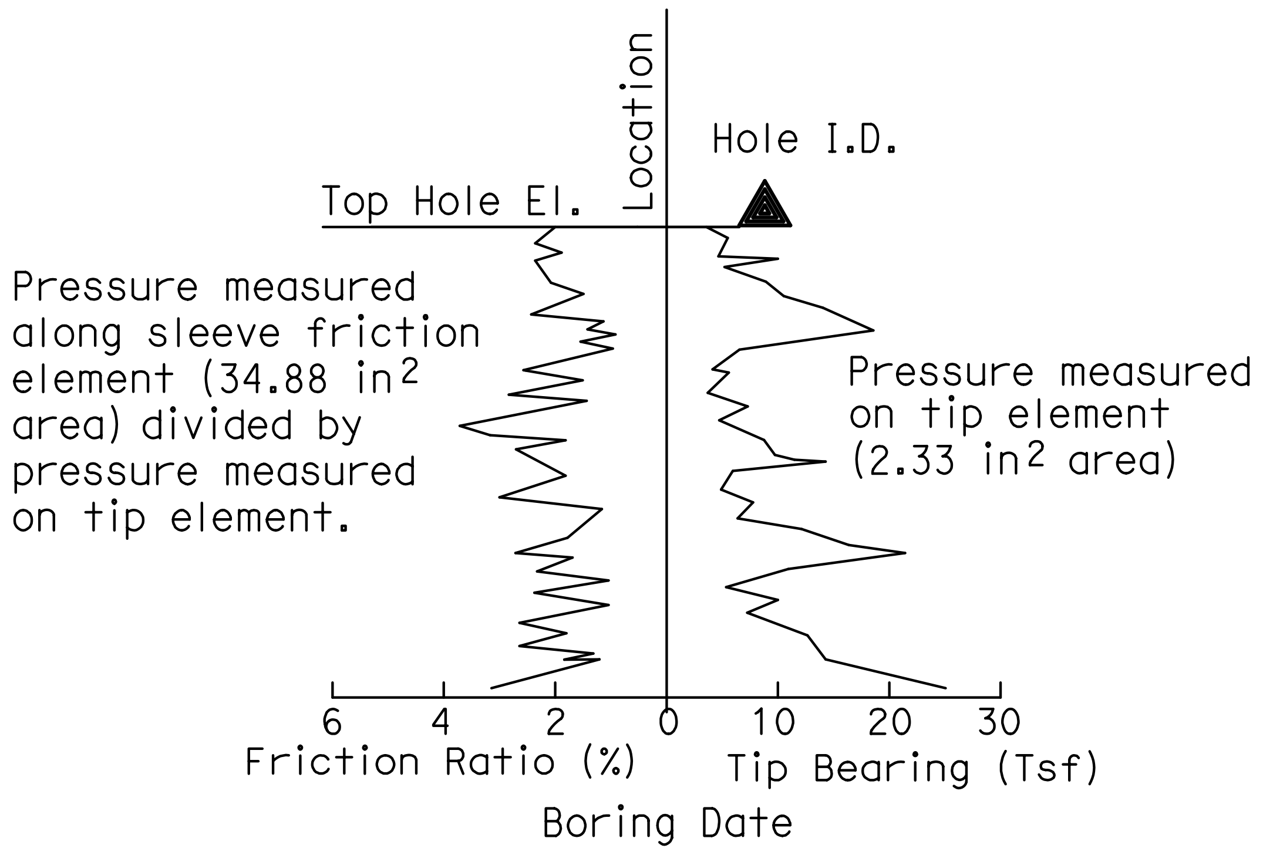
ROTARY BORING



HAND BORING



DYNAMIC CONE PENETRATION BORING



CONE PENETRATION TEST (CPT) BORING

------ DESIGN OVERSIGHT X SIGN OFF DATE	DRAWN BY	D. FAHRNEY	E. KOPRULU FIELD INVESTIGATION BY:
	CHECKED BY	M. ARZAMENDI	DATE: 07/22/14 TO 07/25/14

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO. 57-XXXX
POST MILES XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS - SOIL LEGEND 1

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES X

SHEET -- OF --

FILE => $REQUEST

USERNAME => $USER
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

REFERENCE: CALTRANS SOIL & ROCK LOGGING, CLASSIFICATION, AND PRESENTATION MANUAL (2010)

GROUP SYMBOLS AND NAMES

Graphic/Symbol		Group Names	Graphic/Symbol		Group Names
▨	GW	Well-graded GRAVEL Well-graded GRAVEL with SAND	▨	CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
▨	GP	Poorly-graded GRAVEL Poorly-graded GRAVEL with SAND			
▨	GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND	▨	CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
▨	GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)			
▨	GP-GM	Poorly-graded GRAVEL with SILT Poorly-graded GRAVEL with SILT and SAND	▨	ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
▨	GP-GC	Poorly-graded GRAVEL with CLAY (or SILTY CLAY) Poorly-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)			
▨	GM	SILTY GRAVEL SILTY GRAVEL with SAND	▨	OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
▨	GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND			
▨	GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND	▨	OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
▨	SW	Well-graded SAND Well-graded SAND with GRAVEL			
▨	SP	Poorly-graded SAND Poorly-graded SAND with GRAVEL	▨	CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
▨	SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL			
▨	SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	▨	MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
▨	SP-SM	Poorly-graded SAND with SILT Poorly-graded SAND with SILT and GRAVEL			
▨	SP-SC	Poorly-graded SAND with CLAY (or SILTY CLAY) Poorly-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)	▨	OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
▨	SM	SILTY SAND SILTY SAND with GRAVEL			
▨	SC	CLAYEY SAND CLAYEY SAND with GRAVEL	▨	OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY ORGANIC elastic SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
▨	SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL			
▨	PT	PEAT	▨	OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND
▨		COBBLES COBBLES and BOULDERS BOULDERS			

FIELD AND LABORATORY TESTING

C	Consolidation (ASTM D 2435)
CL	Collapse Potential (ASTM D 5333)
CP	Compaction Curve (CTM 216)
CR	Corrosivity Testing (CTM 643, CTM 422, CTM 417)
CU	Consolidated Undrained Triaxial (ASTM D 4767)
DS	Direct Shear (ASTM D 3080)
EI	Expansion Index (ASTM D 4829)
M	Moisture Content (ASTM D 2216)
OC	Organic Content-% (ASTM D 2974)
P	Permeability (CTM 220)
PA	Particle Size Analysis (ASTM D 422)
PI	Plasticity Index (AASHTO T 90) Liquid Limit (AASHTO T 89)
PL	Point Load Index (ASTM D 5731)
PM	Pressure Meter
R	R-Value (CTM 301)
SE	Sand Equivalent (CTM 217)
SG	Specific Gravity (AASHTO T 100)
SL	Shrinkage Limit (ASTM D 427)
SW	Swell Potential (ASTM D 4546)
UC	Unconfined Compression-Soil (ASTM D 2166) Unconfined Compression-Rock (ASTM D 2938)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850)
UW	Unit Weight (ASTM D 4767)

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL

X
DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
Moises Arzamendi
No. 2275
Exp. 06/30/15
GEOTECHNICAL
STATE OF CALIFORNIA

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T.Y. LIN INTERNATIONAL
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SAN DIEGO, CA 92101

KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

APPARENT DENSITY OF COHESIONLESS SOILS

Description	SPT N_{60} (Blows / 12 in.)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Greater than 50

MOISTURE

Description	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Description	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5% - 10%
Little	15% - 25%
Some	30% - 45%
Mostly	50% - 100%

PARTICLE SIZE

Description		Size (in.)
Boulder		Greater than 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		Less than 1/300

TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

DESIGN OVERSIGHT
X
SIGN OFF DATE

DRAWN BY D. FAHRNEY
CHECKED BY M. ARZAMENDI

E. KOPRULU
FIELD INVESTIGATION BY:
DATE: 07/22/14 TO 07/25/14

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO. 57-XXXX
POST MILES XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS - SOIL LEGEND 2

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES X
SHEET --
OF --

FILE => $REQUEST

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL

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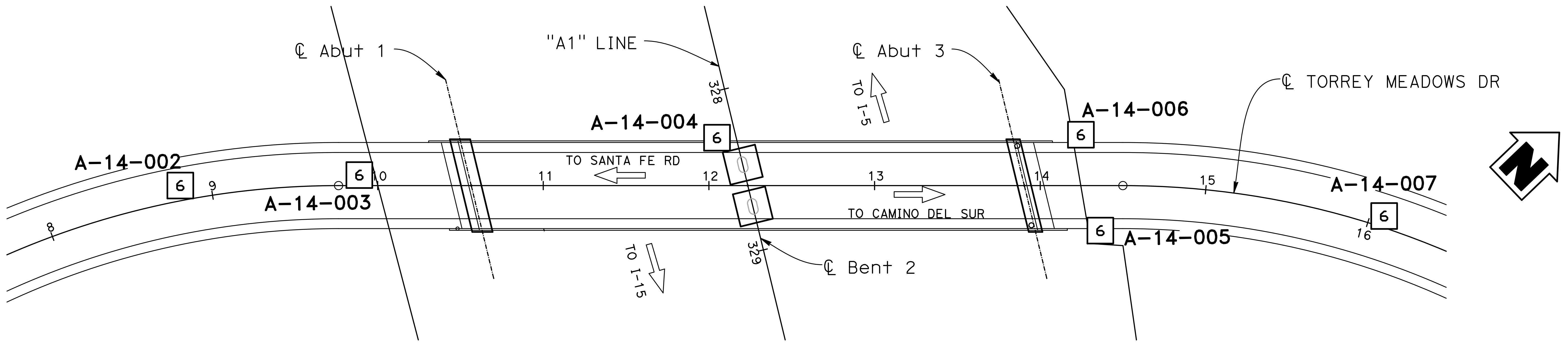
SAN DIEGO, CA 92101

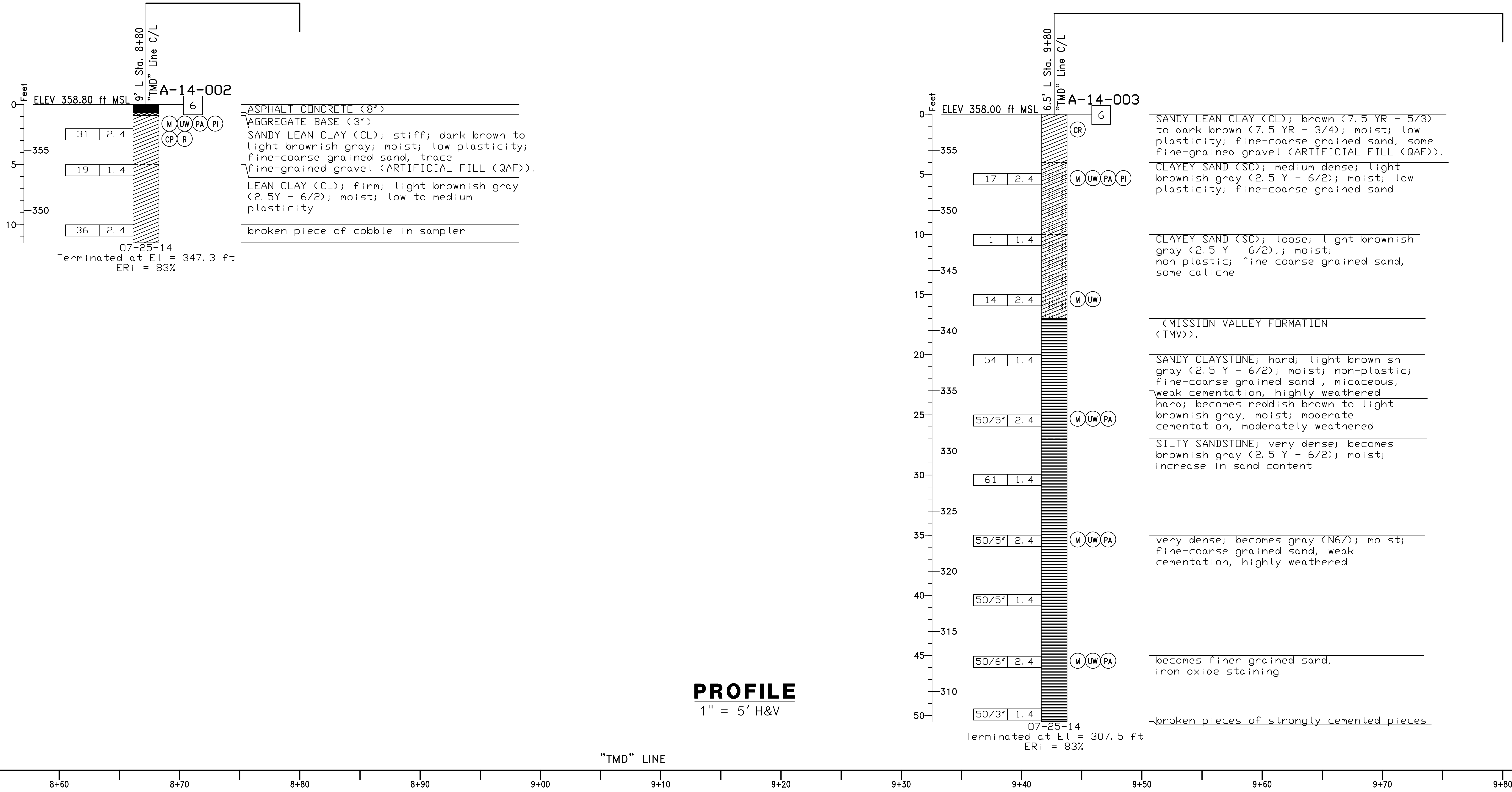
KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

NOTES:

1. THE ELEVATIONS SHOWN HEREON ARE BASED ON PROJECT DATUM NGVD 29.
2. 1.4-INCH DIAMETER SAMPLES WERE TAKEN USING A STANDARD PENETRATION TEST (SPT) SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (ID) OF 1.4 INCHES AND AN OUTSIDE DIAMETER (OD) OF 2.0 INCHES
3. 2.4-INCH DIAMETER RING SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN ID OF 2.4 INCHES AND AN OD OF 3.0 INCHES.
4. ALL DRIVE SAMPLES WERE DRIVEN WITH 140 LB HAMMER WITH A FALLING HEIGHT OF 30 INCHES.



PLAN
1" = 50'



A-14-002:

ASPHALT CONCRETE (8")

AGGREGATE BASE (3")

SANDY LEAN CLAY (CL); stiff; dark brown to light brownish gray; moist; low plasticity; fine-coarse grained sand, trace fine-grained gravel (ARTIFICIAL FILL (QAF)).

LEAN CLAY (CL); firm; light brownish gray (2. 5Y - 6/2); moist; low to medium plasticity

broken piece of cobble in sampler

A-14-003:

SANDY LEAN CLAY (CL); brown (7. 5 YR - 5/3) to dark brown (7. 5 YR - 3/4); moist; low plasticity; fine-coarse grained sand, some fine-grained gravel (ARTIFICIAL FILL (QAF)).

CLAYEY SAND (SC); medium dense; light brownish gray (2. 5 Y - 6/2); moist; low plasticity; fine-coarse grained sand

CLAYEY SAND (SC); loose; light brownish gray (2. 5 Y - 6/2),; moist; non-plastic; fine-coarse grained sand, some caliche

(MISSION VALLEY FORMATION (TMV)).

SANDY CLAYSTONE; hard; light brownish gray (2. 5 Y - 6/2); moist; non-plastic; fine-coarse grained sand , micaceous, weak cementation, highly weathered

hard; becomes reddish brown to light brownish gray; moist; moderate cementation, moderately weathered

SILTY SANDSTONE; very dense; becomes brownish gray (2. 5 Y - 6/2); moist; increase in sand content

very dense; becomes gray (N6/); moist; fine-coarse grained sand, weak cementation, highly weathered

becomes finer grained sand, iron-oxide staining

broken pieces of strongly cemented pieces

PROFILE
1" = 5' H&V

DESIGN OVERSIGHT
X
SIGN OFF DATE

DRAWN BY D. FAHRNEY
CHECKED BY M. ARZAMENDI

E. KOPRULU
FIELD INVESTIGATION BY:
DATE: 07/22/14 TO 07/25/14

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO. 57-XXXX
POST MILES XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
X				--	--

FILE => $REQUEST

TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL X DATE

Moises Arzamendi No. 2275 Exp. 06/30/15 GEOTECHNICAL

PLANS APPROVAL DATE

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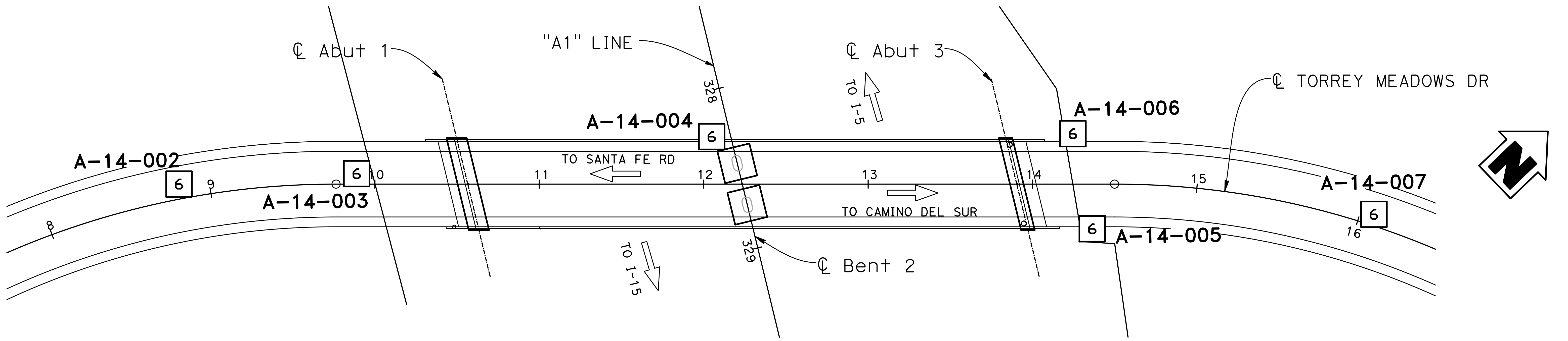
T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92101

KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

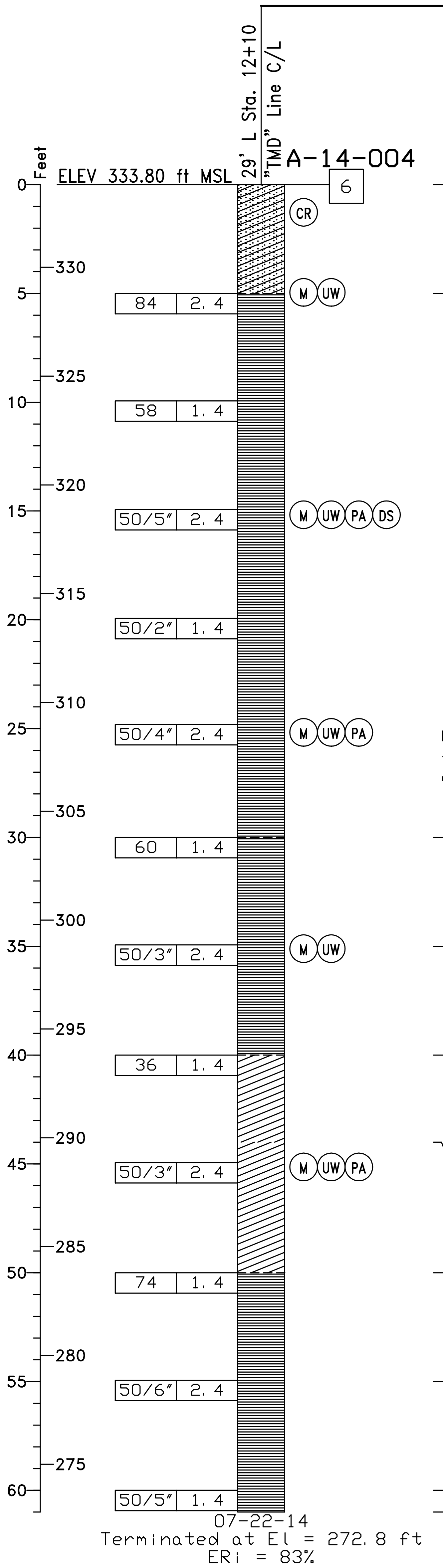
NOTES:

1. THE ELEVATIONS SHOWN HEREON ARE BASED ON PROJECT DATUM NGVD 29.
2. 1.4-INCH DIAMETER SAMPLES WERE TAKEN USING A STANDARD PENETRATION TEST (SPT) SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (ID) OF 1.4 INCHES AND AN OUTSIDE DIAMETER (OD) OF 2.0 INCHES
3. 2.4-INCH DIAMETER RING SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN ID OF 2.4 INCHES AND AN OD OF 3.0 INCHES.
4. ALL DRIVE SAMPLES WERE DRIVEN WITH 140 LB HAMMER WITH A FALLING HEIGHT OF 30 INCHES.



PLAN

1" = 50'



CLAYEY SAND (SC); light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-medium grained sand, some rootlets (MISSION VALLEY FORMATION (TMV)).

CLAYEY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-medium grained sand, weak cementation, highly weathered

becomes micaceous, increase in fines content

becomes moderately cemented, intermixed colors of light brownish gray (2.5YR - 6/2) to brown (7.5 YR - 5/3)

becomes coarser grained, fine-coarse grained sand, abundent iron-oxide staining

light brownish gray (2.5Y - 6/2); fine to coarser grained sand, abundant mira flakes

CLAYEY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous, moderately cemented highly weathered

becomes strongly cemented

SANDY LEAN CLAY (CL); stiff; dark reddish brown (2.5 YR - 3/3); moist; low to medium plasticity; fine grained sand, laminated w/ lenses of gray SM .25" to .5" thick, micaceous

hard; dark gray; moist; low to medium plasticity; fine-grained sand, moderate cementation, highly weathered, micaceous

SILTY SANDSTONE; very dense; dark gray; moist; non-plastic; fine-coarse grained sand, moderately cemented, highly weathered, micaceous

gray (N6/); becomes weakly cemented, fine-coarse grained, increase in sand content

becomes gray (N6/); fine-coarse grained sand

07-22-14
Terminated at El = 272.8 ft
ERi = 83%

PROFILE

1" = 5' H&V

DESIGN OVERSIGHT
X
SIGN OFF DATE

DRAWN BY D. FAHRNEY
CHECKED BY M. ARZAMENDI

E. KOPRULU
FIELD INVESTIGATION BY:
DATE: 07/22/14 TO 07/25/14

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO. 57-XXXX
POST MILES XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS 0 1 2 3

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES X

SHEET -- OF --

FILE => $REQUEST

TIME PLOTTED => $TIME
DATE PLOTTED => $DATE
USERNAME => $USER

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL
X
DATE

Moises Arzamendi
No. 2275
Exp. 06/30/15
GEOTECHNICAL

PLANS APPROVAL DATE

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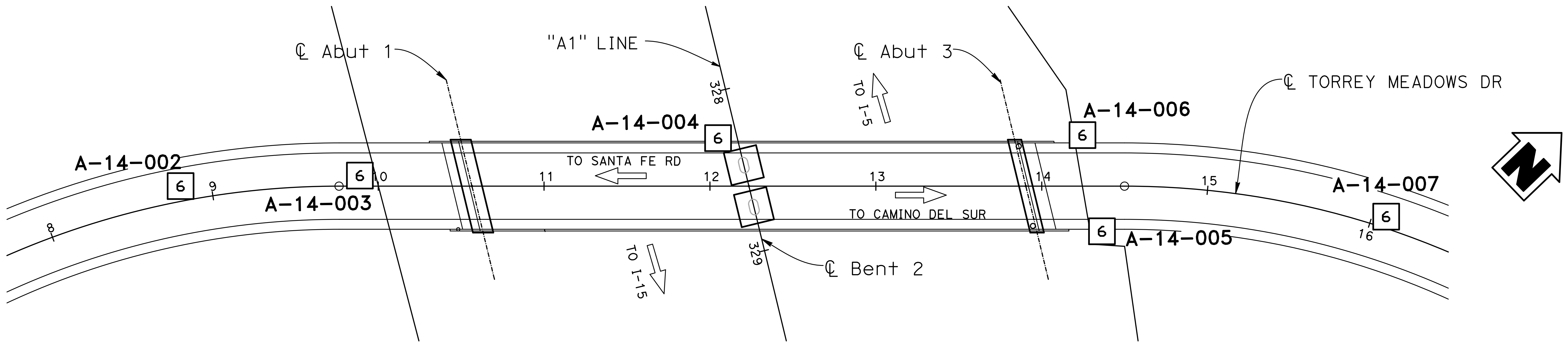
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92101

KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

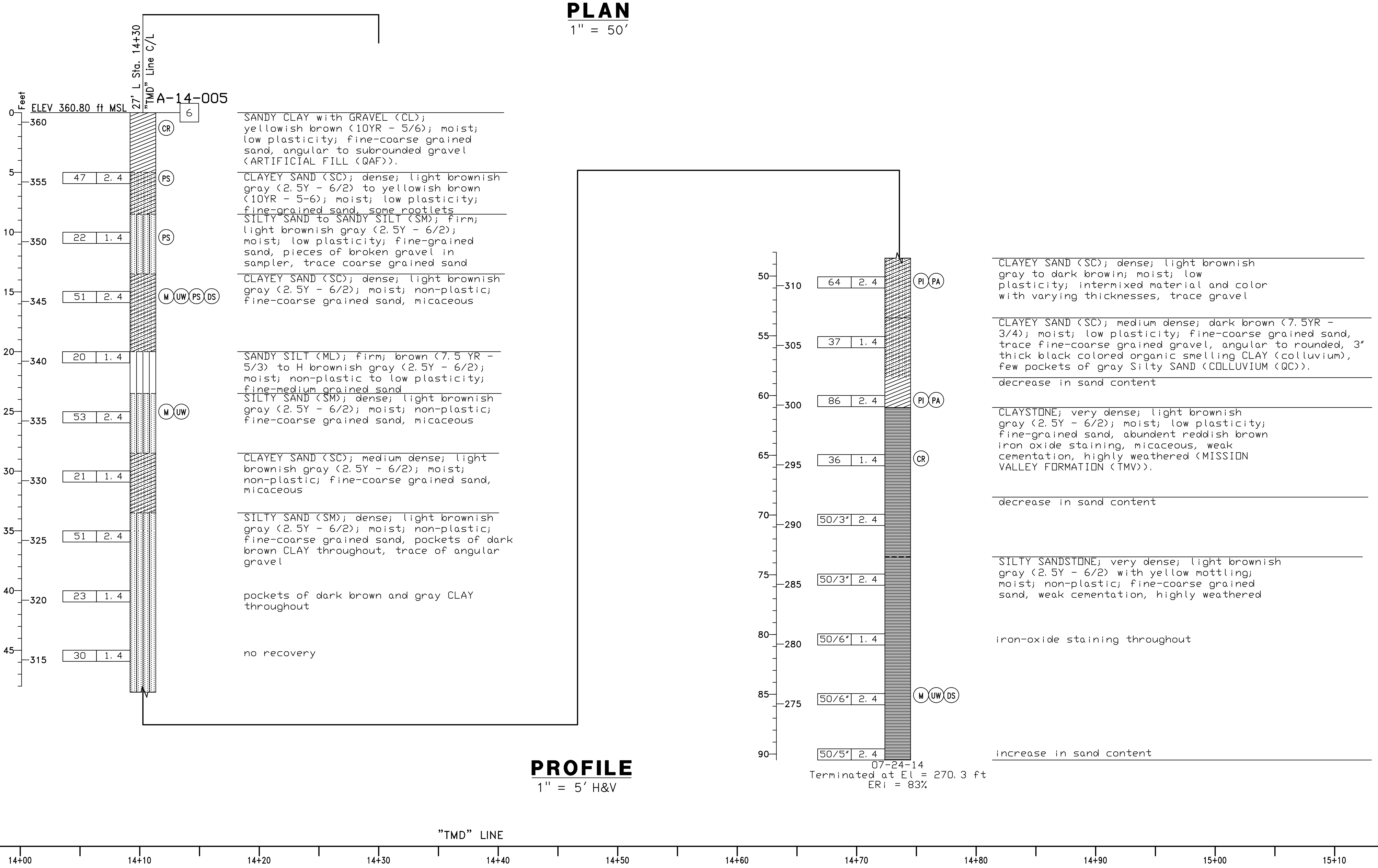
NOTES:

1. THE ELEVATIONS SHOWN HEREON ARE BASED ON PROJECT DATUM NGVD 29.
2. 1.4-INCH DIAMETER SAMPLES WERE TAKEN USING A STANDARD PENETRATION TEST (SPT) SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (ID) OF 1.4 INCHES AND AN OUTSIDE DIAMETER (OD) OF 2.0 INCHES
3. 2.4-INCH DIAMETER RING SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN ID OF 2.4 INCHES AND AN OD OF 3.0 INCHES.
4. ALL DRIVE SAMPLES WERE DRIVEN WITH 140 LB HAMMER WITH A FALLING HEIGHT OF 30 INCHES.



PLAN

1" = 50'



SANDY CLAY with GRAVEL (CL); yellowish brown (10YR - 5/6); moist; low plasticity; fine-coarse grained sand, angular to subrounded gravel (ARTIFICIAL FILL (QAF)).

CLAYEY SAND (SC); dense; light brownish gray (2.5Y - 6/2) to yellowish brown (10YR - 5-6); moist; low plasticity; fine-grained sand, some rootlets

SILTY SAND to SANDY SILT (SM); firm; light brownish gray (2.5Y - 6/2); moist; low plasticity; fine-grained sand, pieces of broken gravel in sampler, trace coarse grained sand

CLAYEY SAND (SC); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous

SANDY SILT (ML); firm; brown (7.5 YR - 5/3) to H brownish gray (2.5Y - 6/2); moist; non-plastic to low plasticity; fine-medium grained sand

SILTY SAND (SM); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous

CLAYEY SAND (SC); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous

SILTY SAND (SM); dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, pockets of dark brown CLAY throughout, trace of angular gravel

pockets of dark brown and gray CLAY throughout

no recovery

CLAYEY SAND (SC); dense; light brownish gray to dark browin; moist; low plasticity; intermixed material and color with varying thicknesses, trace gravel

CLAYEY SAND (SC); medium dense; dark brown (7.5YR - 3/4); moist; low plasticity; fine-coarse grained sand, trace fine-coarse grained gravel, angular to rounded, 3" thick black colored organic smelling CLAY (colluvium), few pockets of gray Silty SAND (COLLUVIUM (QC)).

decrease in sand content

CLAYSTONE; very dense; light brownish gray (2.5Y - 6/2); moist; low plasticity; fine-grained sand, abundent reddish brown iron oxide staining, micaceous, weak cementation, highly weathered (MISSION VALLEY FORMATION (TMV)).

decrease in sand content

SILTY SANDSTONE; very dense; light brownish gray (2.5Y - 6/2) with yellow mottling; moist; non-plastic; fine-coarse grained sand, weak cementation, highly weathered

iron-oxide staining throughout

increase in sand content

07-24-14
Terminated at El = 270.3 ft
ERi = 83%

PROFILE

1" = 5' H&V

DESIGN OVERSIGHT
X
SIGN OFF DATE

DRAWN BY: D. FAHRNEY
CHECKED BY: M. ARZAMENDI

E. KOPRULU
FIELD INVESTIGATION BY:
DATE: 07/22/14 TO 07/25/14

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO.
57-XXXX
POST MILES
XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES
REVISION DATES
X
SHEET --
OF --

FILE => $REQUEST

USERNAME => $USER
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
11	SD	56	XX.X	--	--

GEOTECHNICAL PROFESSIONAL　　X DATE

PLANS APPROVAL DATE

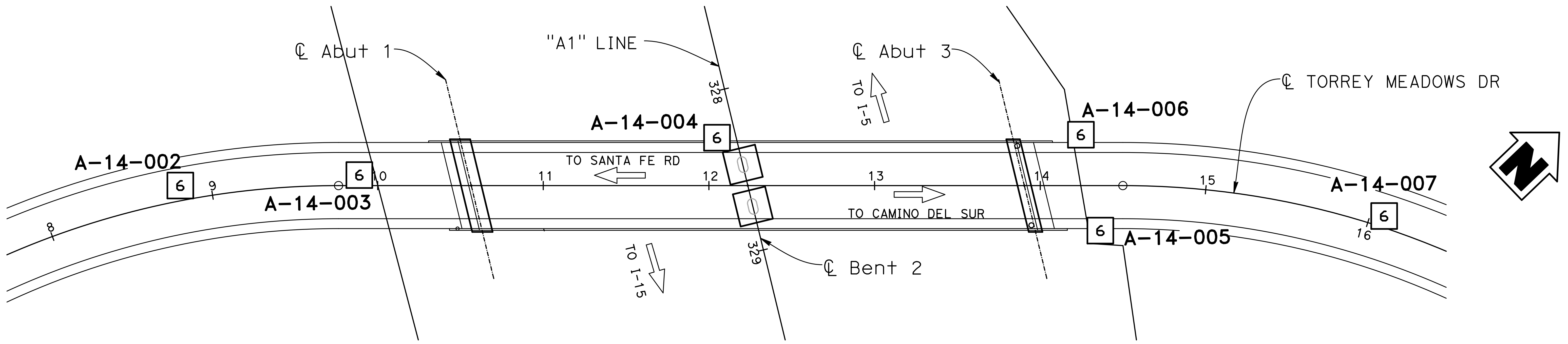
REGISTERED PROFESSIONAL ENGINEER
Moises Arzamendi
No. 2275
Exp. 06/30/15
GEOTECHNICAL
STATE OF CALIFORNIA

T.Y. LIN INTERNATIONAL
404 CAMINO DEL RIO SOUTH, SUITE 700
SAN DIEGO, CA 92101

KLEINFELDER
550 WEST C STREET, SUITE 1200
SAN DIEGO, CA 92101

NOTES:

1. THE ELEVATIONS SHOWN HEREON ARE BASED ON PROJECT DATUM NGVD 29.
2. 1.4-INCH DIAMETER SAMPLES WERE TAKEN USING A STANDARD PENETRATION TEST (SPT) SPLIT BARREL SAMPLER WITH AN INSIDE DIAMETER (ID) OF 1.4 INCHES AND AN OUTSIDE DIAMETER (OD) OF 2.0 INCHES
3. 2.4-INCH DIAMETER RING SAMPLES WERE TAKEN USING A CALIFORNIA SPLIT BARREL SAMPLER WITH AN ID OF 2.4 INCHES AND AN OD OF 3.0 INCHES.
4. ALL DRIVE SAMPLES WERE DRIVEN WITH 140 LB HAMMER WITH A FALLING HEIGHT OF 30 INCHES.



PLAN

1" = 50'

A-14-006

SANDY CLAY with GRAVEL (CL); brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand and gravel, angular to subangular gravel (ARTIFICIAL FILL (QAF)).

LEAN CLAY with GRAVEL (CL); stiff; brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand, fine-grained gravel, pockets of light brownish gray sand

SANDY LEAN CLAY (CL); firm; light brownish gray (2.5Y - 6/2) to brown (7.5YR - 5/3); moist; low plasticity; fine-coarse grained sand

CLAYEY SAND (SC); dense; brown (7.5YR - 5/3); moist; medium to high plasticity; some rootlets

SILTY SAND (SM); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, micaceous

SANDY LEAN CLAY (CL); stiff; brown (7.5YR - 5/3); moist; low to medium plasticity; fine-coarse grained sand, fine-grained gravel, broken pieces of caliche

CLAYEY SAND (SC); medium dense; brown (7.5YR - 5/3); moist; non-plastic; fine-coarse grained sand. fine-grained gravel, micaceous

SANDY LEAN CLAY (CL); firm; gray (6N/); moist; low plasticity; fine-coarse grained sand, some rootlets, trace of fine-grained gravel

SILTY SAND (SM); dense; gray (6N/); moist; low plasticity; increase in moisture content and sand content

CLAYEY SAND (SC); medium dense; light brownish gray (2.5Y - 6/2); moist; non-plastic to low plasticity; fine-coarse grained sand, micaceous

SANDY LEAN CLAY (CL); firm; brown (7.5YR - 5/3) to dark brown (7.5YR - 3/4); moist; low plasticity; intermixxed coloration, fine-coarse grained sand, trace coarse grained gravel, concretion inside half of sampler

LEAN CLAY (CL); firm; dark brown (7.5YR - 3/4) to black; moist; medium plasticity; trace fine-coarse grained sand, organic smell, abundent rootlets

CLAYEY SAND (SC); medium dense; brown (7.5YR - 5/3) to yellowish brown (10YR - 5/6); moist; low plasticity; fine-coarse grained sand, micaceous

becomes gray (6N/) to light gray-brown (2.5Y - 4/2)

SILTY SANDSTONE; very dense; gray (6N/) with abundant reddish brown iron-oxide; moist; low plasticity; fine-grained sand, weakly cemented, highly weathered (MISSION VALLEY FORMATION (TMV)).

no recovery

CLAYEY SANDSTONE; very dense; reddish brown, gray, yellowish brown, laminated with layers of 1/4" thick; moist; non-plastic; moderate cementation, highly weathered, abundant sulfur and iron-oxide staining

no recovery

SILTY SANDSTONE; very dense; gray (6N/) with orange/reddish brown mottling; moist; non-plastic; fine-coarse grained sand, micaceous, moderate cementation, highly weathered

becomes moderately cemented

A-14-007

SANDY LEAN CLAY (CL); firm; brown (7.5YR - 5/3); moist; non-plastic; fine-coarse grained sand, some pockets of Lean CLAY, piece of broken rock in sampler

SILTY SAND (SM); very dense; light brownish gray (2.5Y - 6/2); moist; non-plastic; fine-coarse grained sand, trace of fine-grained gravel

decrease in fines content

PROFILE

1" = 5' H&V

------ DESIGN OVERSIGHT X SIGN OFF DATE	DRAWN BY	D. FAHRNEY	E. KOPRULU FIELD INVESTIGATION BY: DATE: 07/22/14 TO 07/25/14
	CHECKED BY	M. ARZAMENDI	

GS GEOTECHNICAL LOG OF TEST BORINGS SHEET (ENGLISH) (REV. 03/14/12)

ORIGINAL SCALE IN INCHES FOR REDUCED PLANS
0 1 2 3

PREPARED FOR THE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

X
PROJECT ENGINEER

BRIDGE NO.
57-XXXX
POST MILES
XX.X

TORREY MEADOWS DRIVE OC
LOG OF TEST BORINGS

UNIT: ----
PROJECT NUMBER & PHASE: -------
CONTRACT NO.: ---------

DISREGARD PRINTS BEARING EARLIER REVISION DATES

REVISION DATES				SHEET	OF
X				--	--

FILE => $REQUEST

USERNAME => $USER
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME

APPENDIX E

CALCULATIONS & ANALYSIS

APPENDIX E

Calculations and Analysis

2013 Caltrans Seismic Design ARS

Calculations Package

Calculation Performed:

2013 Caltrans Seismic Design ARS

Project Name	**Torrey Meadows Drive Overcrossing**
Project Number	**20151065**
Client	TY Lin International
Originator	Eren Koprulu
Calculation Type	☐Hand Calculation ☒MS Excel ☒Other Computer Program
Checker	
Checker's comments	
Checker's Signature	

Procedure:

Objective	To develop preliminary ARS curves in accordance with 2013 Caltrans Seismic Design standards for the Torrey Meadows Drive Overcrossing at SR-56
Given	V_{s30} = 400 m/s based on correlations of blow counts to Vs.
Equation/Formula Used	Excel spreadsheets were used (attached). Spreadsheets were developed by Kleinfelder or Caltrans.
Assumptions	V_{s30} (Fill) = 316 m/s based on correlations of blow counts to V_s. V_{s30} (Tmv) = 500 m/s based on correlations of blow counts to V_s. Average of the two V_{s30} was used in the analysis.
Reference:	Caltrans ARS online, Appendix B of Caltrans Seismic Design Criteria (version 1.6), and USGS deaggregations (from website)
Calculations	Calculations were performed in Kleinfelder approved spreadsheets as shown in the attached documents.
Attached documents	1. Design ARS curves 2. Deterministic Probabilistic curves 3. ARS online results
Results	Attached

Vs30 Calculations

PROJECT: Torrey Meadows Drive OC
PROJECT NO. 20151065.001A DATE: 11/5/2014
SUBJECT: Estimation of Vs30 PEFORMED BY: E. Koprulu
(65 feet Fill) REVIEWED BY:

OBJECTIVE: Estimate shear wave velocity (Vs) on a layer-by-layer basis, then compute average shear wave velocity in the upper 30 meters (100 feet), Vs30. Calcluations is performed in accordance with Caltrans (2012) methods.

GIVEN: Boring data not available. Blow counts are estimated based on previous experience in simular materials.

EQUATIONS USED: See summary of equations on page 2 which are excerpted from Caltrans (2012).

ASSUMPTIONS: Indicate any assumptions.

Sampler	$C_{sampler}$
Cal	0.60
Mod Cal	0.75
SPT	1.00

Sampler Correction Coef's:

$N_{60} = N^*C_{sampler}{}^*C_{ER}$

where $C_{ER} = ER_{hmr}/60\%$

$ER_{hmr} =$ 75%

Enter Depth (0 to 100 ft only); wheter below GW; Material Type; N, Su, qt or Vs; and Sampler Type in the Table:

Depth to (ft)		γ_{tot}	**Below**	**Thkns**	**Material Type for**	**N, Su, qt or Vs**		**Samler**	N_{60}	**Vs**	**Vs**	D_i/V_{si}
Top	**Bot.**	**(pcf)**	**GW?**	**D, (ft)**	**Vs Correlation**	**(bpf, psf, tsf or ft/s)**		**Type**	**(bpf)**	**(m/s)**	**(ft/s)**	
0	5	120	No	5	Cohesive; N =	30	blows/ft	SPT	37.5	194	636	0.00787
5	10	120	No	5	Cohesive; N =	35	blows/ft	Cal	26.3	214	701	0.00713
10	15	120	No	5	Cohesive; N =	21	blows/ft	SPT	26.3	232	762	0.00656
15	20	120	No	5	Cohesionless Sand; N =	52	blows/ft	Cal	39.0	241	791	0.00632
20	25	120	No	5	Cohesive; N =	28	blows/ft	SPT	35.0	273	897	0.00557
25	30	120	No	5	Cohesionless Sand; N =	26	blows/ft	Cal	19.5	251	823	0.00608
30	35	120	No	5	Cohesive; N =	17	blows/ft	SPT	21.3	259	849	0.00589
35	40	120	No	5	Cohesionless Sand; N =	52	blows/ft	Cal	39.0	289	946	0.00528
40	45	120	No	5	Cohesionless Sand; N =	25	blows/ft	SPT	31.3	291	954	0.00524
45	50	120	No	5	Cohesive; N =	49	blows/ft	Cal	36.8	313	1,025	0.00488
50	55	120	No	5	Cohesive; N =	27	blows/ft	SPT	33.8	312	1,022	0.00489
55	60	120	No	5	Cohesionless Sand; N =	32	blows/ft	Cal	24.0	305	999	0.00500
60	65	120	No	5	Cohesionless Sand; N =	23	blows/ft	SPT	28.8	316	1,037	0.00482
65	70	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
70	75	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
75	80	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
80	85	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
85	90	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
90	95	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
95	100	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300

(Maximum number of depth intervals is 22)

Avg. V_s of soil profile, $V_{s(d)}$:

$d = \Sigma D =$ 100 feet

$V_{s(d)} = d/[\Sigma(D_i/V_{si})]$

$V_{s(d)} =$ 1,036 feet/sec

$V_{s(d)} =$ 316 m/sec

Average V_s in upper 30 meters:

$V_{s30} = (1.45-0.015^*d)^*V_{s(d)}$

$V_{s30} =$ 1,036 ft/sec

$V_{s30} =$ 316 m/sec

Site Class = D

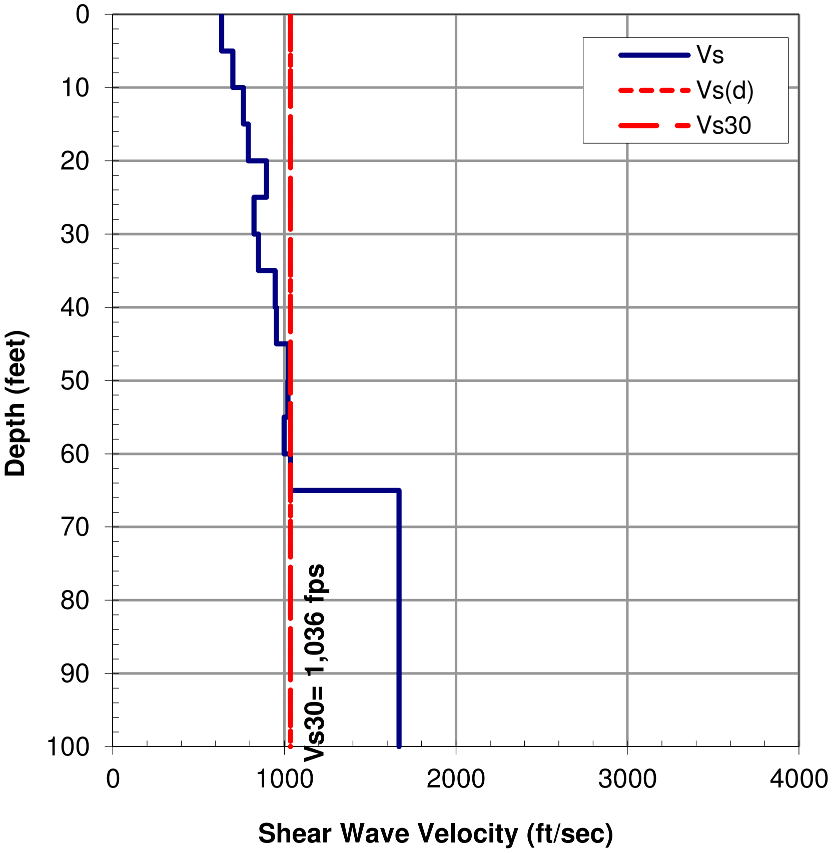
REFERENCES:

Caltrans (2012). *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations*, Caltrans Division of Engineering Services, Geotechnical Services .

PROJECT: Torrey Meadows Drive OC
PROJECT NO. 20151065.001A DATE: 11/5/2014
SUBJECT: Estimation of Vs30 PEFORMED BY: E. Koprulu
(65 feet Fill) REVIEWED BY:

KLEINFELDER
Bright People. Right Solutions.

PLOT OF RESULTS



Material Type	Equation (Vs in m/s)	
Cohesionless Sand (N) :	$V_S = \exp(4.045 + 0.096(\ln(N_{60})) + 0.236(\ln(\sigma'_v))$	(N60<=100)
Cohesionless Silt (N) :	$V_S = \exp(3.783 + 0.178(\ln(N_{60})) + 0.231(\ln(\sigma'_v))$	(N60<=100)
Cohesionless (CPT qt) :	$V_S = 277\,(q_t)^{0.13}(\sigma'_{vo})^{0.27}$ (qt and σ'$_{v0}$ in MPa)	
Cohesive (Su) :	$V_S = 203\,(S_u / p_a)^{0.475}$ (Su and pa in same units)	
Cohesive (CPT qt) :	$V_S = 1.75\,(q_t)^{0.627}$	
Cohesive (N) :	$V_S = \exp(3.996 + 0.230(\ln(N_{60})) + 0.164(\ln(\sigma'_v))$	(N60>=3)
Young Sedimentary Rock (N) :	$V_S = 109\,(N_{60})^{0.319}$	(Vs<=560 m/s)
User Defined Vs :	*Vs = user defined Vs value in ft/sec*	

Note that the xsheet automatically converts units as-needed before the equations are applied.

PROJECT: Torrey Meadows Drive OC
PROJECT NO. 20151065.001A DATE: 11/5/2014
SUBJECT: Estimation of Vs30 PEFORMED BY: E. Koprulu
(0 feet Fill) REVIEWED BY:

KLEINFELDER
Bright People. Right Solutions.

OBJECTIVE: Estimate shear wave velocity (Vs) on a layer-by-layer basis, then compute average shear wave velocity in the upper 30 meters (100 feet), Vs30. Calcluations is performed in accordance with Caltrans (2012) methods.

GIVEN: Boring data not available. Blow counts are estimated based on previous experience in simular materials.

EQUATIONS USED: See summary of equations on page 2 which are excerpted from Caltrans (2012).

ASSUMPTIONS: Indicate any assumptions.

Sampler	$C_{sampler}$
Cal	0.60
Mod Cal	0.75
SPT	1.00

Sampler Correction Coef's:

$N_{60} = N^*C_{sampler}{}^*C_{ER}$

where $C_{ER} = ER_{hmr}/60\%$

ER_{hmr}= 75%

Enter Depth (0 to 100 ft only); wheter below GW; Material Type; N, Su, qt or Vs; and Sampler Type in the Table:

Depth to (ft)		**γ_{tot}**	**Below**	**Thkns**	**Material Type for**	**N, Su, qt or Vs**		**Samler**	**N_{60}**	**Vs**	**Vs**	**D_i/V_{si}**
Top	**Bot.**	**(pcf)**	**GW?**	**D, (ft)**	**Vs Correlation**	**(bpf, psf, tsf or ft/s)**		**Type**	**(bpf)**	**(m/s)**	**(ft/s)**	
0	5	125	No	5	Young Sedimentary Rock; N =	50	blows/ft	SPT	62.5	408	1,337	0.00374
5	10	120	No	5	Young Sedimentary Rock; N =	84	blows/ft	Cal	63.0	409	1,341	0.00373
10	15	120	No	5	Young Sedimentary Rock; N =	58	blows/ft	SPT	72.5	427	1,402	0.00357
15	20	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	Cal	75.0	432	1,417	0.00353
20	25	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300
25	30	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	Cal	75.0	432	1,417	0.00353
30	35	120	No	5	Young Sedimentary Rock; N =	60	blows/ft	SPT	75.0	432	1,417	0.00353
35	40	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	Cal	75.0	432	1,417	0.00353
40	45	120	No	5	Young Sedimentary Rock; N =	36	blows/ft	SPT	45.0	367	1,204	0.00415
45	50	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	Cal	75.0	432	1,417	0.00353
50	55	120	No	5	Young Sedimentary Rock; N =	74	blows/ft	SPT	92.5	462	1,515	0.00330
55	60	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	Cal	75.0	432	1,417	0.00353
60	65	120	No	5	Young Sedimentary Rock; N =	100	blows/ft	SPT	125.0	509	1,668	0.00300

(Maximum number of depth intervals is 22)

Avg. V_s of soil profile, $V_{s(d)}$:

d=ΣD= 65 feet

$V_{s(d)} = d/[\Sigma(D_i/V_{si})]$

$V_{s(d)}$ = 1,424 feet/sec

$V_{s(d)}$ = 434 m/sec

Average V_s in upper 30 meters:

$V_{s30} = (1.45-0.015^*d)^*V_{s(d)}$

V_{s30} = 1,641 ft/sec

V_{s30} = 500 m/sec

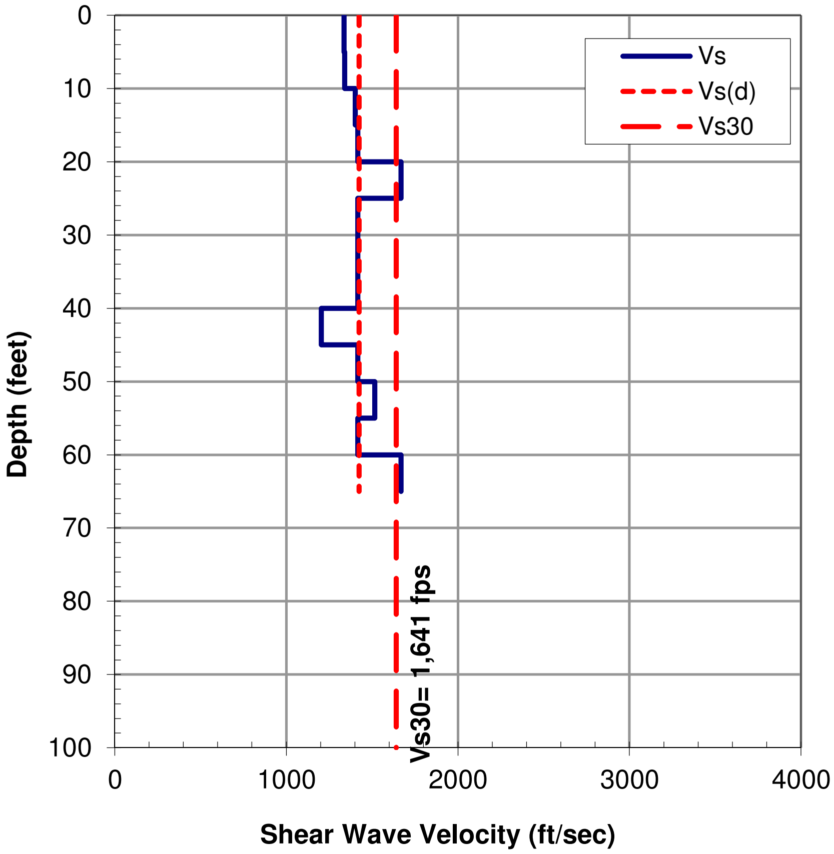
Site Class = C

REFERENCES:

Caltrans (2012). *Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations*, Caltrans Division of Engineering Services, Geotechnical Services .

PROJECT: Torrey Meadows Drive OC
PROJECT NO. 20151065.001A DATE: 11/5/2014
SUBJECT: Estimation of Vs30 PEFORMED BY: E. Koprulu
(0 feet Fill) REVIEWED BY:

PLOT OF RESULTS



Material Type **Equation (Vs in m/s)**

Cohesionless Sand (N) : $V_S = \exp(4.045 + 0.096(\ln(N_{60})) + 0.236(\ln(\sigma'_v))$ (N60<=100)

Cohesionless Silt (N) : $V_S = \exp(3.783 + 0.178(\ln(N_{60})) + 0.231(\ln(\sigma'_v))$ (N60<=100)

Cohesionless (CPT qt) : $V_S = 277\,(q_t)^{0.13}(\sigma'_{vo})^{0.27}$ (qt and σ'_{v0} in MPa)

Cohesive (Su) : $V_S = 203\,(S_u / p_a)^{0.475}$ (Su and pa in same units)

Cohesive (CPT qt) : $V_S = 1.75\,(q_t)^{0.627}$

Cohesive (N) : $V_S = \exp(3.996 + 0.230(\ln(N_{60})) + 0.164(\ln(\sigma'_v))$ (N60>=3)

Young Sedimentary Rock (N) : $V_S = 109\,(N_{60})^{0.319}$ (Vs<=560 m/s)

User Defined Vs : *Vs = user defined Vs value in ft/sec*

Note that the xsheet automatically converts units as-needed before the equations are applied.

ARS Online Results

SITE DATA (ARS Online Version 2.3.06)

Shear Wave Velocity, V_{S30}:	400 m/s
Latitude:	32.962700
Longitude:	-117.160400
Depth to Vs = 1.0 km/s:	N/A
Depth to Vs = 2.5 km/s:	N/A

DETERMINISTIC

Rose Canyon fault zone (Del Mar section)

Fault ID:	401
Maximum Magnitude (MMax):	6.8
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	8.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	12.93 km
Rjb:	12.93 km
Rx:	12.93 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA(Final Spectrum)
0.01	0.230	1.000	1.000	0.230
0.05	0.292	1.000	1.000	0.292
0.1	0.435	1.000	1.000	0.435
0.15	0.519	1.000	1.000	0.519
0.2	0.537	1.000	1.000	0.537
0.25	0.518	1.000	1.000	0.518
0.3	0.493	1.000	1.000	0.493
0.4	0.438	1.000	1.000	0.438
0.5	0.385	1.000	1.000	0.385
0.6	0.332	1.000	1.040	0.345
0.7	0.292	1.000	1.080	0.315
0.85	0.246	1.000	1.140	0.280
1	0.211	1.000	1.200	0.254
1.2	0.175	1.000	1.200	0.210
1.5	0.136	1.000	1.200	0.164
2	0.095	1.000	1.200	0.114
3	0.056	1.000	1.200	0.068
4	0.039	1.000	1.200	0.047
5	0.029	1.000	1.200	0.035

Rose Canyon fault zone (San Diego section)

Fault ID:	405
Maximum Magnitude (MMax):	6.8
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	8.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	15.10 km
Rjb:	15.10 km
Rx:	14.10 km
Fnorm:	0
Frev:	0

Period	SA(Base Spectrum)	Basin Factor	Near Fault Factor (Applied)	SA(Final Spectrum)
0.01	0.204	1.000	1.000	0.204
0.05	0.259	1.000	1.000	0.259
0.1	0.388	1.000	1.000	0.388
0.15	0.464	1.000	1.000	0.464
0.2	0.479	1.000	1.000	0.479
0.25	0.460	1.000	1.000	0.460
0.3	0.438	1.000	1.000	0.438
0.4	0.387	1.000	1.000	0.387
0.5	0.339	1.000	1.000	0.339
0.6	0.292	1.000	1.040	0.304
0.7	0.257	1.000	1.079	0.277
0.85	0.216	1.000	1.139	0.246
1	0.186	1.000	1.198	0.222
1.2	0.153	1.000	1.198	0.184
1.5	0.120	1.000	1.198	0.143
2	0.083	1.000	1.198	0.100
3	0.049	1.000	1.198	0.059
4	0.034	1.000	1.198	0.041
5	0.026	1.000	1.198	0.031

Rose Canyon fault zone (Oceanside section)

Fault ID:	396
Maximum Magnitude (MMax):	6.8
Fault Type:	SS
Fault Dip:	90 Deg
Dip Direction:	V
Bottom of Rupture Plane:	11.00 km
Top of Rupture Plane(Ztor):	0.00 km
Rrup	16.87 km
Rjb:	16.87 km
Rx:	7.57 km
Fnorm:	0
Frev:	0

Period	**SA(Base Spectrum)**	**Basin Factor**	**Near Fault Factor (Applied)**	**SA(Final Spectrum)**
0.01	0.187	1.000	1.000	0.187
0.05	0.236	1.000	1.000	0.236
0.1	0.355	1.000	1.000	0.355
0.15	0.426	1.000	1.000	0.426
0.2	0.439	1.000	1.000	0.439
0.25	0.421	1.000	1.000	0.421
0.3	0.400	1.000	1.000	0.400
0.4	0.353	1.000	1.000	0.353
0.5	0.309	1.000	1.000	0.309
0.6	0.266	1.000	1.033	0.274
0.7	0.233	1.000	1.065	0.248
0.85	0.196	1.000	1.114	0.219
1	0.168	1.000	1.163	0.196
1.2	0.139	1.000	1.163	0.162
1.5	0.109	1.000	1.163	0.126
2	0.076	1.000	1.163	0.088
3	0.045	1.000	1.163	0.052
4	0.031	1.000	1.163	0.036
5	0.023	1.000	1.163	0.027

PROBABILISTIC

Probabilistic Model
USGS Seismic Hazard Map(2008) 975 Year Return Period

Period	**SA(Base Spectrum)**	**Basin Factor**	**Near Fault Factor (Applied)**	**SA(Final Spectrum)**
0.01	0.319	1.000	1.000	0.319
0.05	0.498	1.000	1.000	0.498
0.1	0.603	1.000	1.000	0.603
0.15	0.676	1.000	1.000	0.676
0.2	0.732	1.000	1.000	0.732
0.25	0.701	1.000	1.000	0.701
0.3	0.677	1.000	1.000	0.677
0.4	0.595	1.000	1.000	0.595
0.5	0.538	1.000	1.000	0.538
0.6	0.478	1.000	1.040	0.497
0.7	0.432	1.000	1.080	0.466
0.85	0.372	1.000	1.140	0.425
1	0.326	1.000	1.200	0.391
1.2	0.275	1.000	1.200	0.329
1.5	0.222	1.000	1.200	0.267
2	0.170	1.000	1.200	0.203

3	0.108	1.000	1.200	0.130
4	0.077	1.000	1.200	0.093
5	0.064	1.000	1.200	0.077

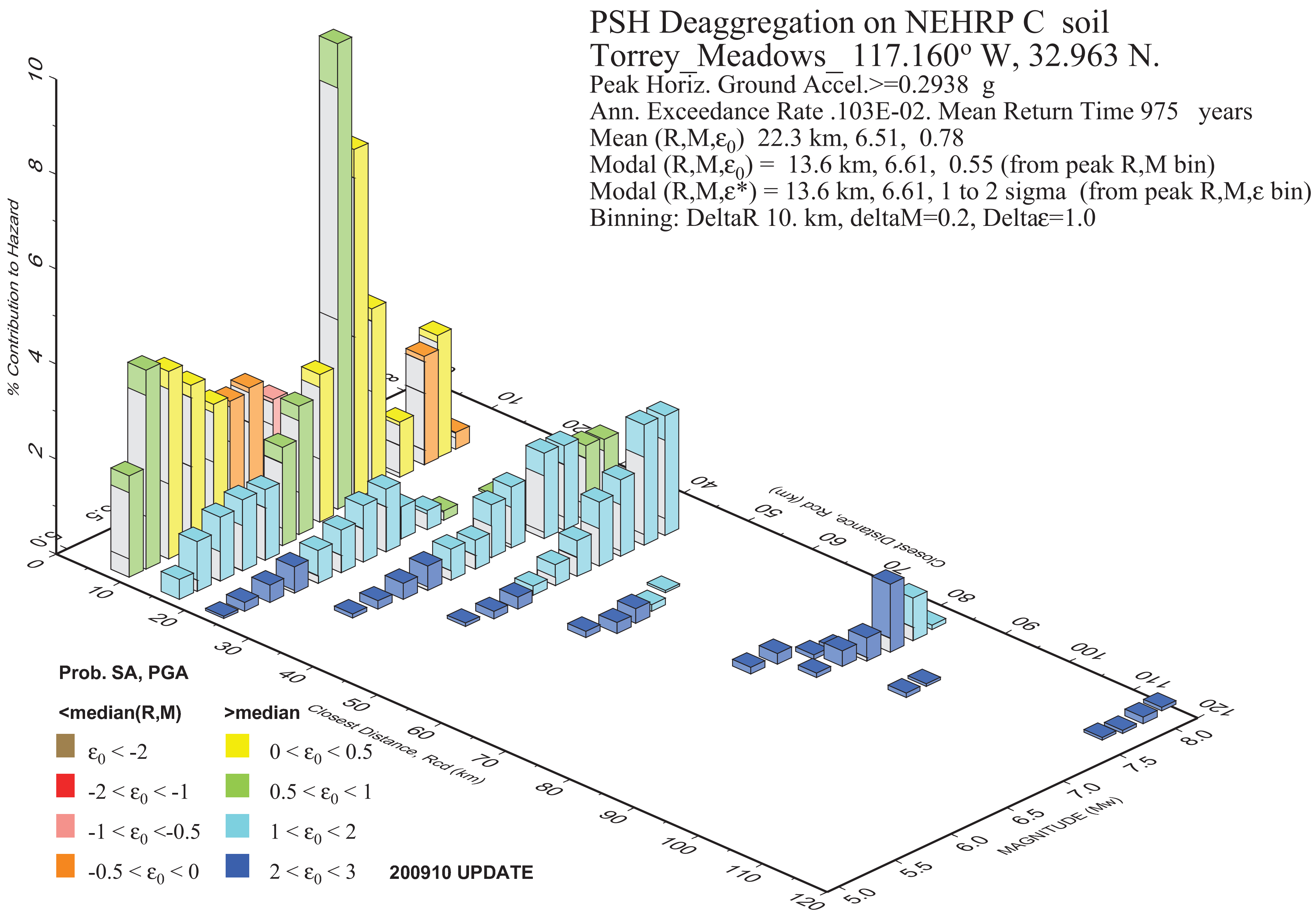
MINIMUM DETERMINISTIC SPECTRUM

Period	SA
0.01	0.223
0.05	0.284
0.1	0.426
0.15	0.507
0.2	0.523
0.25	0.501
0.3	0.475
0.4	0.420
0.5	0.362
0.6	0.307
0.7	0.267
0.85	0.221
1	0.187
1.2	0.152
1.5	0.116
2	0.079
3	0.045
4	0.031
5	0.023

Envelope Data

Period	SA
0.01	0.319
0.05	0.498
0.1	0.603
0.15	0.676
0.2	0.732
0.25	0.701
0.3	0.677
0.4	0.595
0.5	0.538
0.6	0.497
0.7	0.466
0.85	0.425
1	0.391
1.2	0.329
1.5	0.267
2	0.203
3	0.130

4	0.093
5	0.077



PSH Deaggregation on NEHRP C soil
Torrey_Meadows_ 117.160° W, 32.963 N.
Peak Horiz. Ground Accel.>=0.2938 g
Ann. Exceedance Rate .103E-02. Mean Return Time 975 years
Mean (R,M,ε_0) 22.3 km, 6.51, 0.78
Modal (R,M,ε_0) = 13.6 km, 6.61, 0.55 (from peak R,M bin)
Modal (R,M,ε*) = 13.6 km, 6.61, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0

GMT 2014 Nov 7 01:51:31 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 400. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

PSH Deaggregation on NEHRP C soil

Torrey_Meadows_ 117.160° W, 32.963 N.

SA period 0.30 sec. Accel.>=0.6234 g

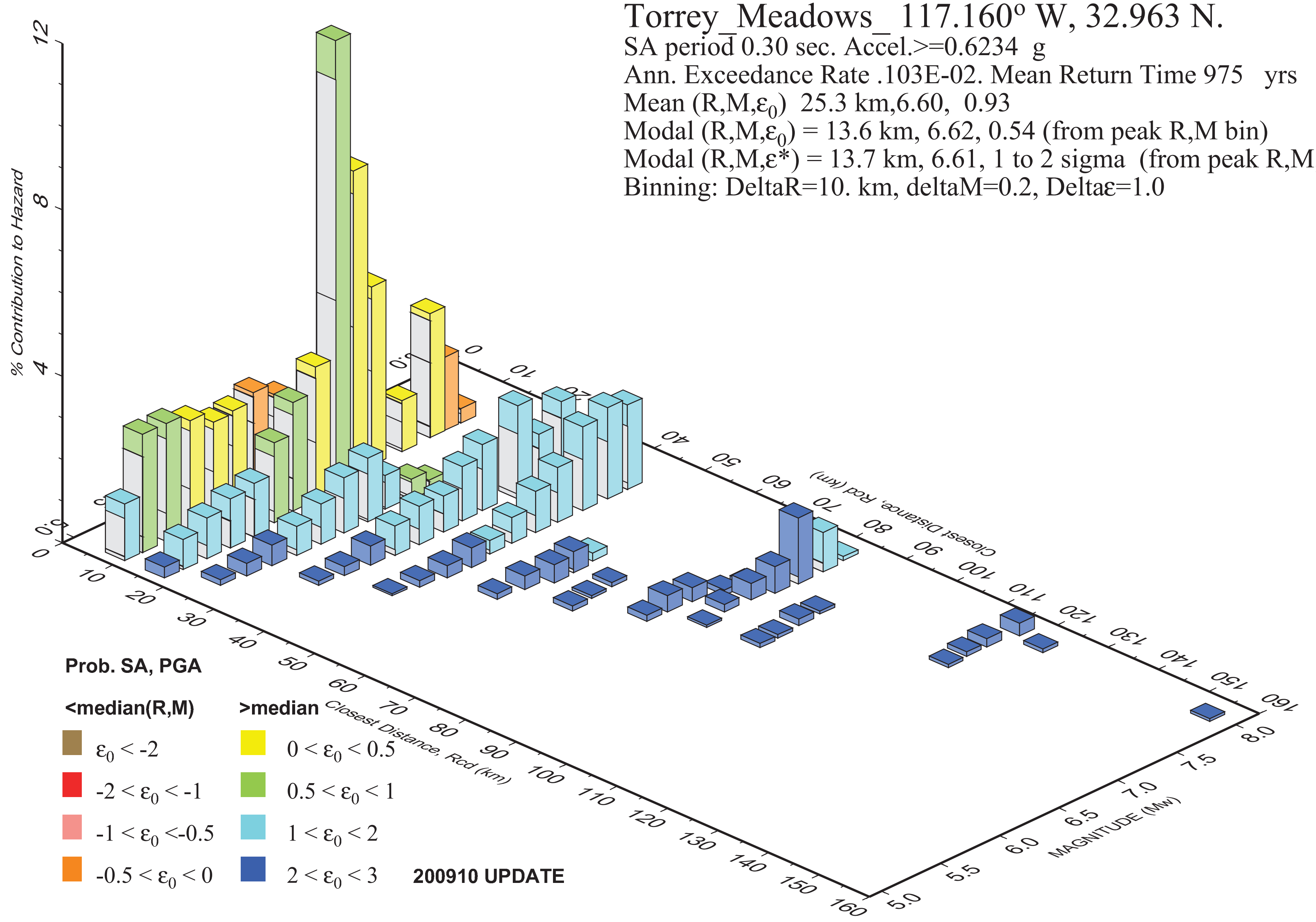
Ann. Exceedance Rate .103E-02. Mean Return Time 975 yrs

Mean (R,M,ε_0) 25.3 km,6.60, 0.93

Modal (R,M,ε_0) = 13.6 km, 6.62, 0.54 (from peak R,M bin)

Modal (R,M,ε^*) = 13.7 km, 6.61, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Nov 7 01:56:00 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 400. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil

Torrey_Meadows_ 117.160° W, 32.963 N.

SA period 1.00 sec. Accel.>=0.3059 g

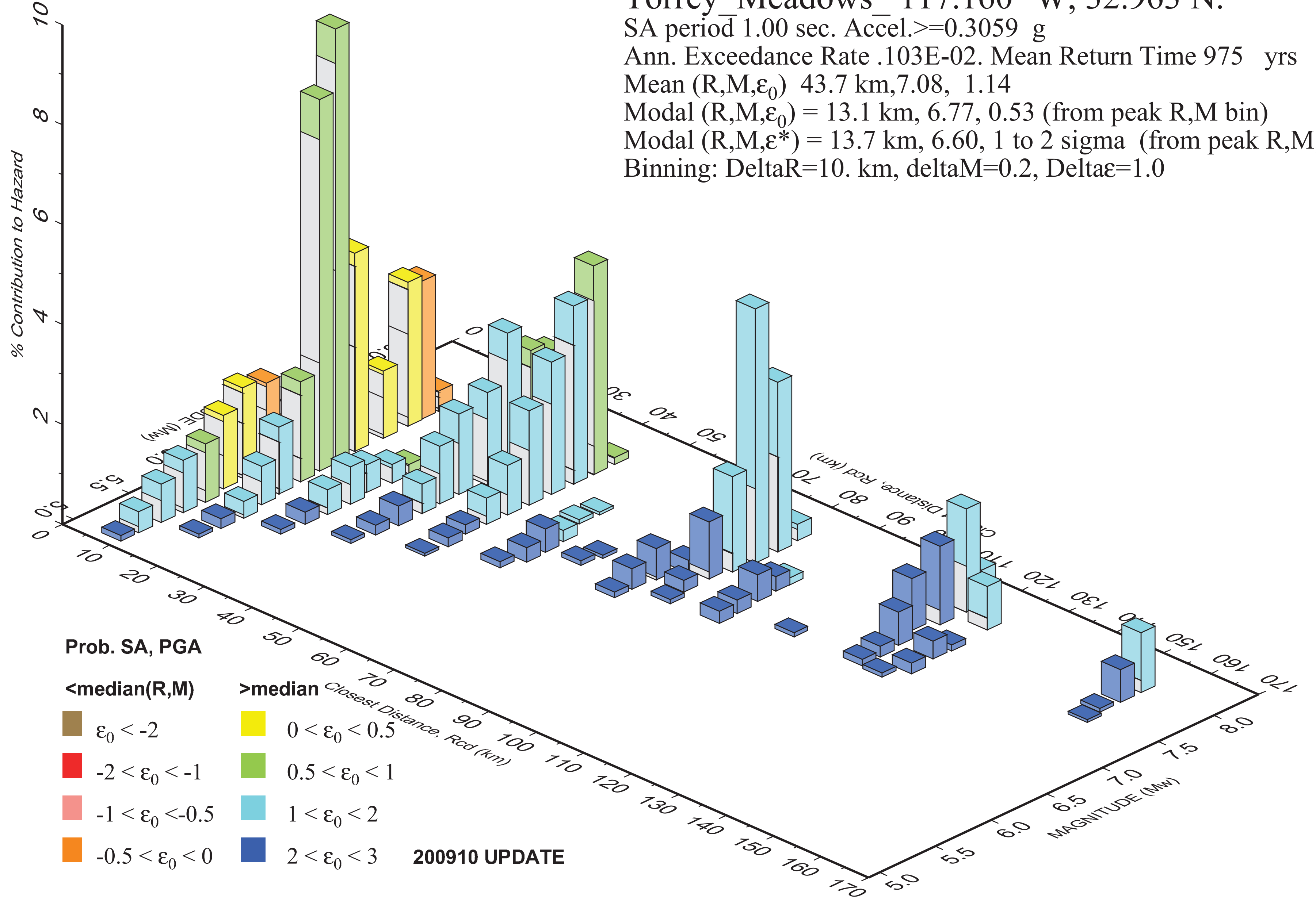
Ann. Exceedance Rate .103E-02. Mean Return Time 975 yrs

Mean (R,M,ε_0) 43.7 km,7.08, 1.14

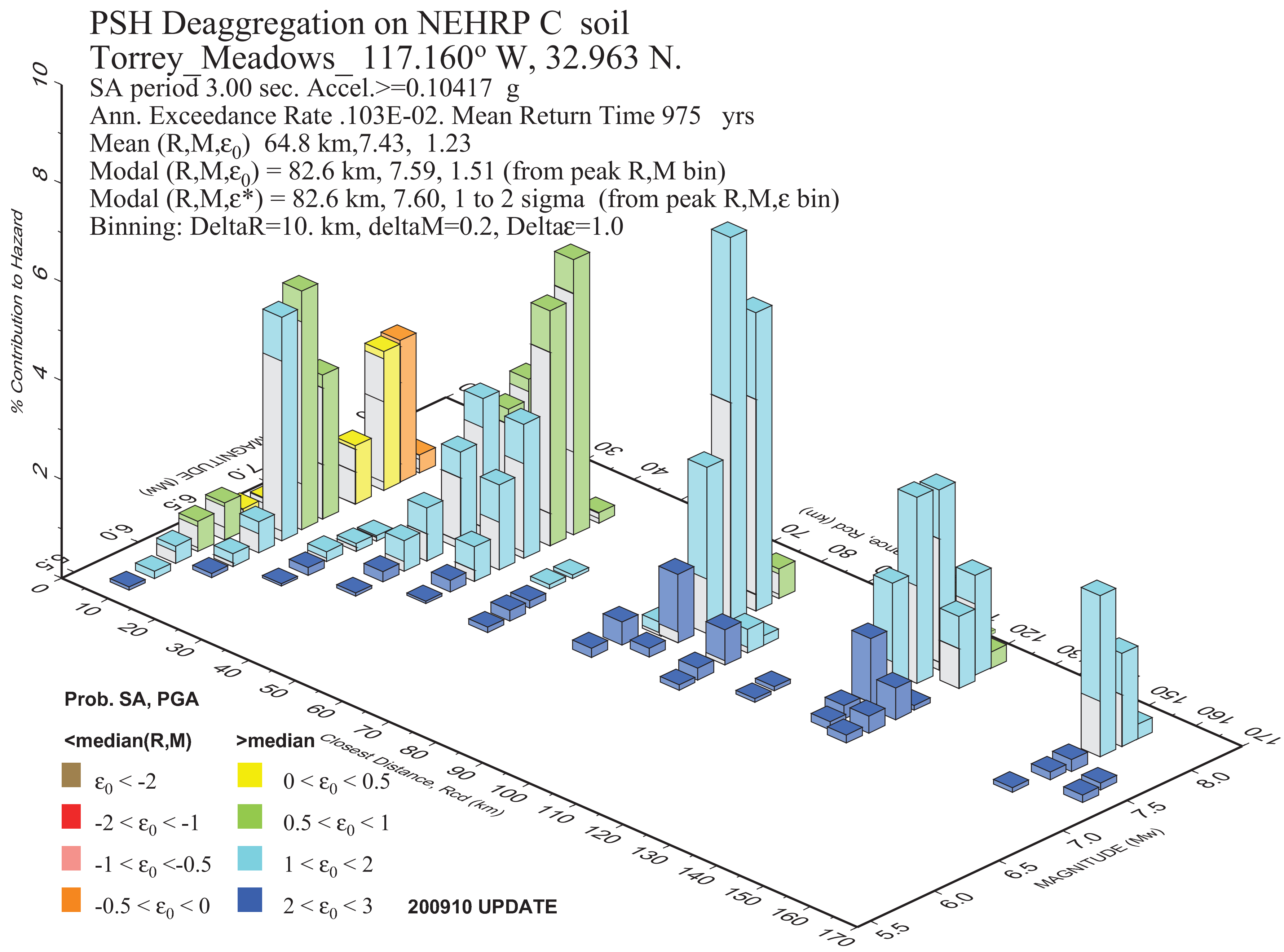
Modal (R,M,ε_0) = 13.1 km, 6.77, 0.53 (from peak R,M bin)

Modal (R,M,ε^*) = 13.7 km, 6.60, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Nov 7 02:17:39 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 400. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted



PSH Deaggregation on NEHRP C soil

Torrey_Meadows_ 117.160° W, 32.963 N.

SA period 3.00 sec. Accel.>=0.10417 g

Ann. Exceedance Rate .103E-02. Mean Return Time 975 yrs

Mean (R,M,ε_0) 64.8 km,7.43, 1.23

Modal (R,M,ε_0) = 82.6 km, 7.59, 1.51 (from peak R,M bin)

Modal (R,M,ε*) = 82.6 km, 7.60, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0

GMT 2014 Nov 7 02:18:46 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 400. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

Deterministic and Probabilistic Curves

Comparison of ARS Curves

CY-CB Model Inputs

Fault

Magnitude	6.8	(5 to 8.5)
F_{RV}	0	(input 1 = Reverse)
F_{NM}	0	(input 1 = Normal)
Dip (degree)	90	(1 to 90)
Z_{TOR} (km)	0	

Distance

R_{RUP} (km)	12.9	
R_{JB} (km)	12.9	
R_x (km)	12.9	
Hanging Wall?	☐ Yes?	
Near-Field Factor?	☐ Yes?	<--ALERT

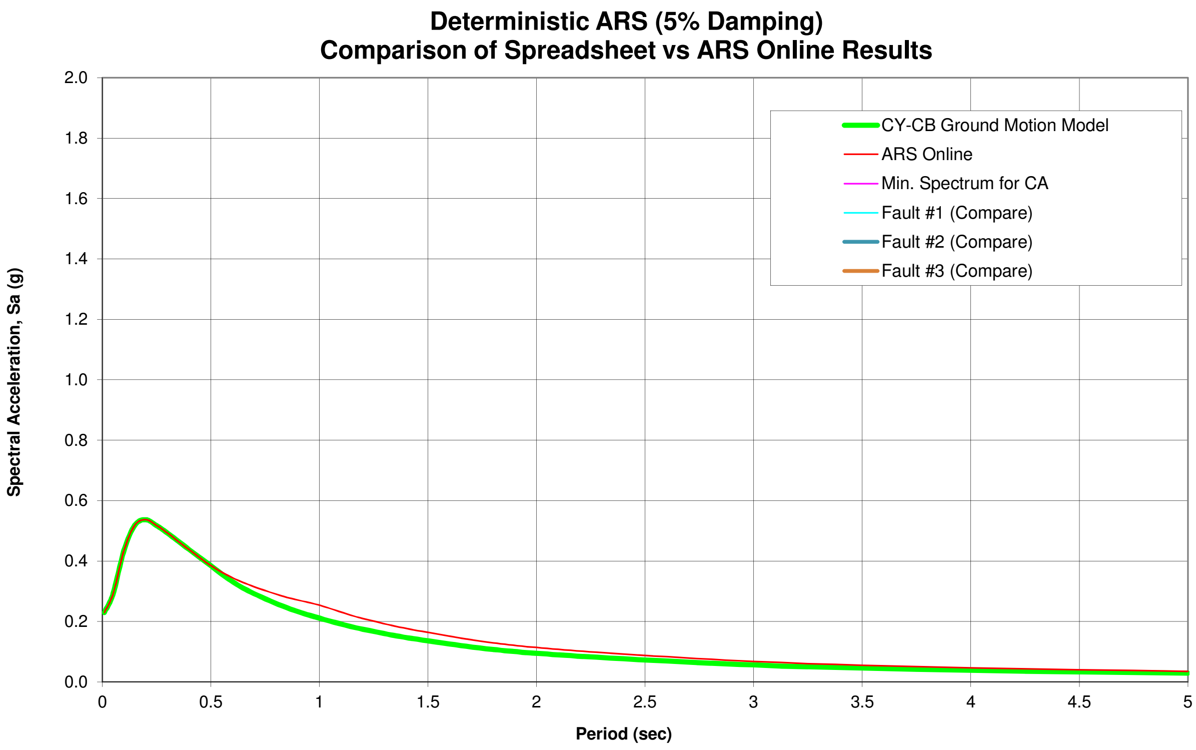
Site

V_{S30} (m/sec)	400	(150 to 1500 m/s)
$Z_{1.0}$ (m)	0	(0 - No Basin)
$Z_{2.5}$ (km)	0	(0 - No Basin)
No. Cal. Basin?	☐ Yes ?	(Check only for sites located within a Basin)
So. Cal. Basin?	☐ Yes ?	

Analysis

ARS Online vs CY-CB Spreadsheet Results

MAX. % Diff. = 21%



Graph legend titles can be changed with green cells

CY-CB Ground Motion Model

T (sec)	Spectral Acceleration, S(a)
0.010	0.23004
0.050	0.29201
0.100	0.43525
0.150	0.51895
0.200	0.53712
0.250	0.51746
0.300	0.49287
0.400	0.43821
0.500	0.38476
0.600	0.33180
0.700	0.29193
0.850	0.24587
1.000	0.21117
1.200	0.17454
1.500	0.13600
2.000	0.09466
3.000	0.05614
4.000	0.03870
5.000	0.02916

Place ARS Online Deterministic Data Into Cells Located Below

T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.23	1	1	0.23	0%
0.05	0.292	1	1	0.292	0%
0.1	0.435	1	1	0.435	0%
0.15	0.519	1	1	0.519	0%
0.2	0.537	1	1	0.537	0%
0.25	0.518	1	1	0.518	0%
0.3	0.493	1	1	0.493	0%
0.4	0.438	1	1	0.438	0%
0.5	0.385	1	1	0.385	0%
0.6	0.332	1	1.04	0.345	4%
0.7	0.292	1	1.08	0.315	8%
0.85	0.246	1	1.14	0.28	14%
1	0.211	1	1.2	0.254	20%
1.2	0.175	1	1.2	0.21	20%
1.5	0.136	1	1.2	0.164	21%
2	0.095	1	1.2	0.114	20%
3	0.056	1	1.2	0.068	21%
4	0.039	1	1.2	0.047	21%
5	0.029	1	1.2	0.035	20%

For Comparsion Plots of Minimum Spectra, ECSZ or other Faults (into the graph above), copy data from each CY-CB Result (A33:B51) then "Paste Special - Values" into cells below

Min. Spectrum for CA		Fault #1 (Compare)		Fault #2 (Compare)		Fault #3 (Compare)	
T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)

Comparison of ARS Curves

CY-CB Model Inputs

Fault

Magnitude 6.8 (5 to 8.5)

F_{RV} 0 (input 1 = Reverse)

F_{NM} 0 (input 1 = Normal)

Dip (degree) 90 (1 to 90)

Z_{TOR} (km) 0

Distance

R_{RUP} (km) 16.9

R_{JB} (km) 16.9

R_x (km) 7.6

Hanging Wall? ☐ Yes?

Near-Field Factor? ☐ Yes? <--ALERT

Site

V_{S30} (m/sec) 340 (150 to 1500 m/s)

$Z_{1.0}$ (m) 0 (0 - No Basin)

$Z_{2.5}$ (km) 0 (0 - No Basin)

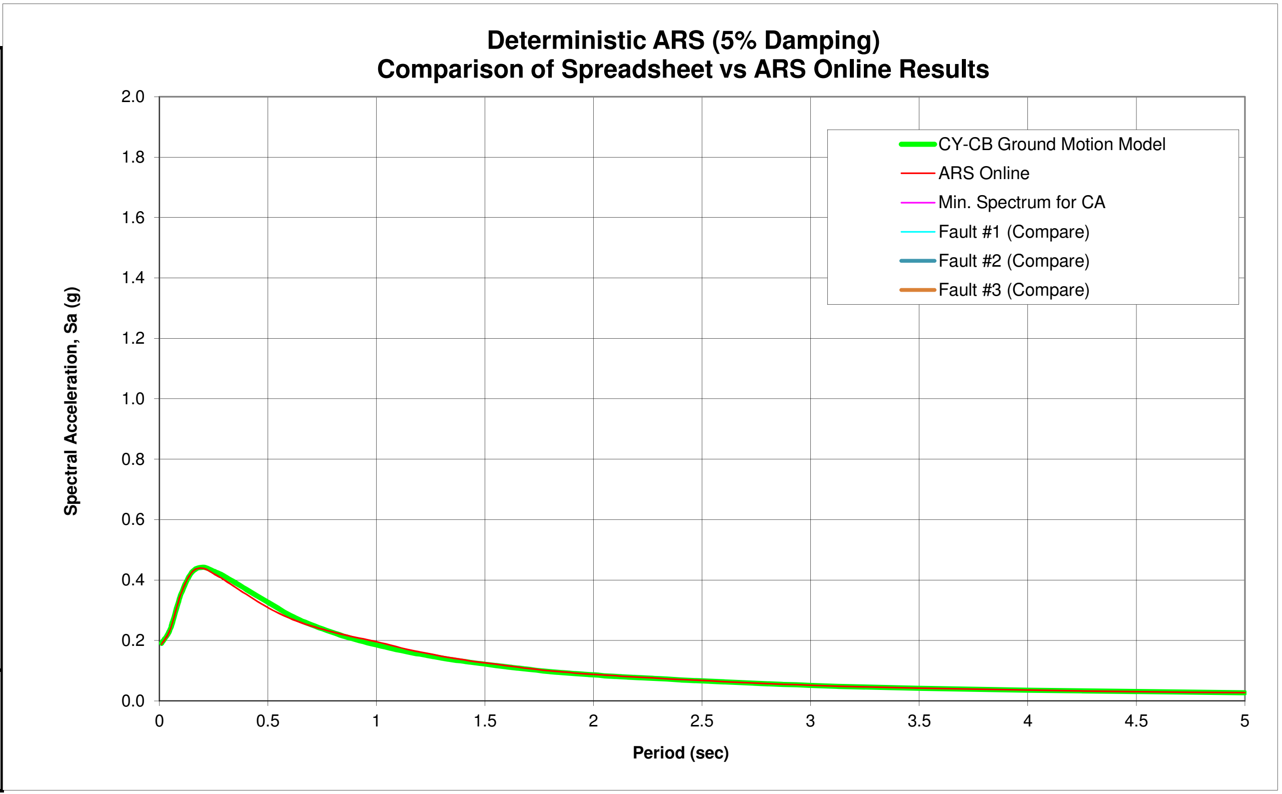
No. Cal. Basin? ☐ Yes ? (Check only for sites located within a Basin)

So. Cal. Basin? ☐ Yes ?

Analysis

ARS Online vs CY-CB Spreadsheet Results

MAX. % Diff. = 6%



Graph legend titles can be changed with green cells

CY-CB Ground Motion Model	
T (sec)	Spectral Acceleration, S(a)
0.010	0.19046
0.050	0.23722
0.100	0.35298
0.150	0.42520
0.200	0.44243
0.250	0.42985
0.300	0.41286
0.400	0.36940
0.500	0.32731
0.600	0.28474
0.700	0.25238
0.850	0.21438
1.000	0.18538
1.200	0.15459
1.500	0.12185
2.000	0.08591
3.000	0.05141
4.000	0.03552
5.000	0.02680

Place	ARS Online	Deterministic Data Into Cells Located Below			
T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.187	1	1	0.187	2%
0.05	0.236	1	1	0.236	1%
0.1	0.355	1	1	0.355	1%
0.15	0.426	1	1	0.426	0%
0.2	0.439	1	1	0.439	1%
0.25	0.421	1	1	0.421	2%
0.3	0.4	1	1	0.4	3%
0.4	0.353	1	1	0.353	4%
0.5	0.309	1	1	0.309	6%
0.6	0.266	1	1.033	0.274	4%
0.7	0.233	1	1.065	0.248	2%
0.85	0.196	1	1.114	0.219	2%
1	0.168	1	1.163	0.196	6%
1.2	0.139	1	1.163	0.162	5%
1.5	0.109	1	1.163	0.126	3%
2	0.076	1	1.163	0.088	2%
3	0.045	1	1.163	0.052	1%
4	0.031	1	1.163	0.036	1%
5	0.023	1	1.163	0.027	1%

For Comparsion Plots of Minimum Spectra, ECSZ or other Faults (into the graph above), copy data from each CY-CB Result (A33:B51) then "Paste Special - Values" into cells below

Min. Spectrum for CA		Fault #1 (Compare)		Fault #2 (Compare)		Fault #3 (Compare)	
T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)

Comparison of ARS Curves

CY-CB Model Inputs

Fault

Magnitude	6.8	(5 to 8.5)
F_{RV}	0	(input 1 = Reverse)
F_{NM}	0	(input 1 = Normal)
Dip (degree)	90	(1 to 90)
Z_{TOR} (km)	0	

Distance

R_{RUP} (km)	15.1	
R_{JB} (km)	15.1	
R_x (km)	14.1	
Hanging Wall?	☐ Yes?	
Near-Field Factor?	☐ Yes?	<--ALERT

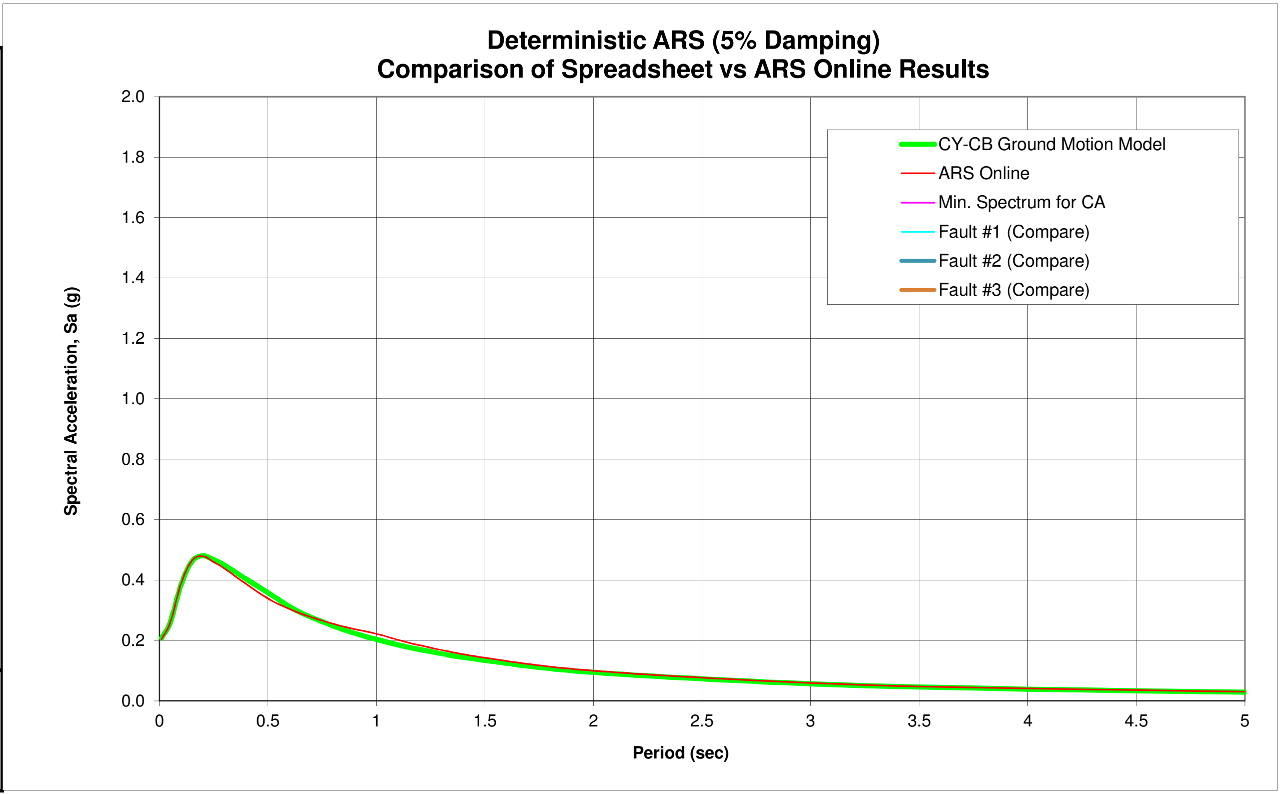
Site

V_{S30} (m/sec)	340	(150 to 1500 m/s)
$Z_{1.0}$ (m)	0	(0 - No Basin)
$Z_{2.5}$ (km)	0	(0 - No Basin)
No. Cal. Basin?	☐ Yes ?	(Check only for sites located within a Basin)
So. Cal. Basin?	☐ Yes ?	

Analysis

ARS Online vs CY-CB Spreadsheet Results

MAX. % Diff. = 9%



Graph legend titles can be changed with green cells

CY-CB Ground Motion Model

T (sec)	Spectral Acceleration, S(a)
0.010	0.20780
0.050	0.25884
0.100	0.38364
0.150	0.46118
0.200	0.48037
0.250	0.46733
0.300	0.44928
0.400	0.40339
0.500	0.35819
0.600	0.31199
0.700	0.27679
0.850	0.23538
1.000	0.20370
1.200	0.16998
1.500	0.13406
2.000	0.09458
3.000	0.05662
4.000	0.03911
5.000	0.02948

Place ARS Online Deterministic Data Into Cells Located Below

T (sec)	Base S(a)	Basin Factor	Near Fault Factor	Final Adj. S(a)	Diff. (%)
0.01	0.204	1	1	0.204	2%
0.05	0.259	1	1	0.259	0%
0.1	0.388	1	1	0.388	1%
0.15	0.464	1	1	0.464	1%
0.2	0.479	1	1	0.479	0%
0.25	0.46	1	1	0.46	2%
0.3	0.438	1	1	0.438	3%
0.4	0.387	1	1	0.387	4%
0.5	0.339	1	1	0.339	5%
0.6	0.292	1	1.04	0.304	3%
0.7	0.257	1	1.079	0.277	0%
0.85	0.216	1	1.139	0.246	5%
1	0.186	1	1.198	0.222	9%
1.2	0.153	1	1.198	0.184	8%
1.5	0.12	1	1.198	0.143	7%
2	0.083	1	1.198	0.1	6%
3	0.049	1	1.198	0.059	4%
4	0.034	1	1.198	0.041	5%
5	0.026	1	1.198	0.031	5%

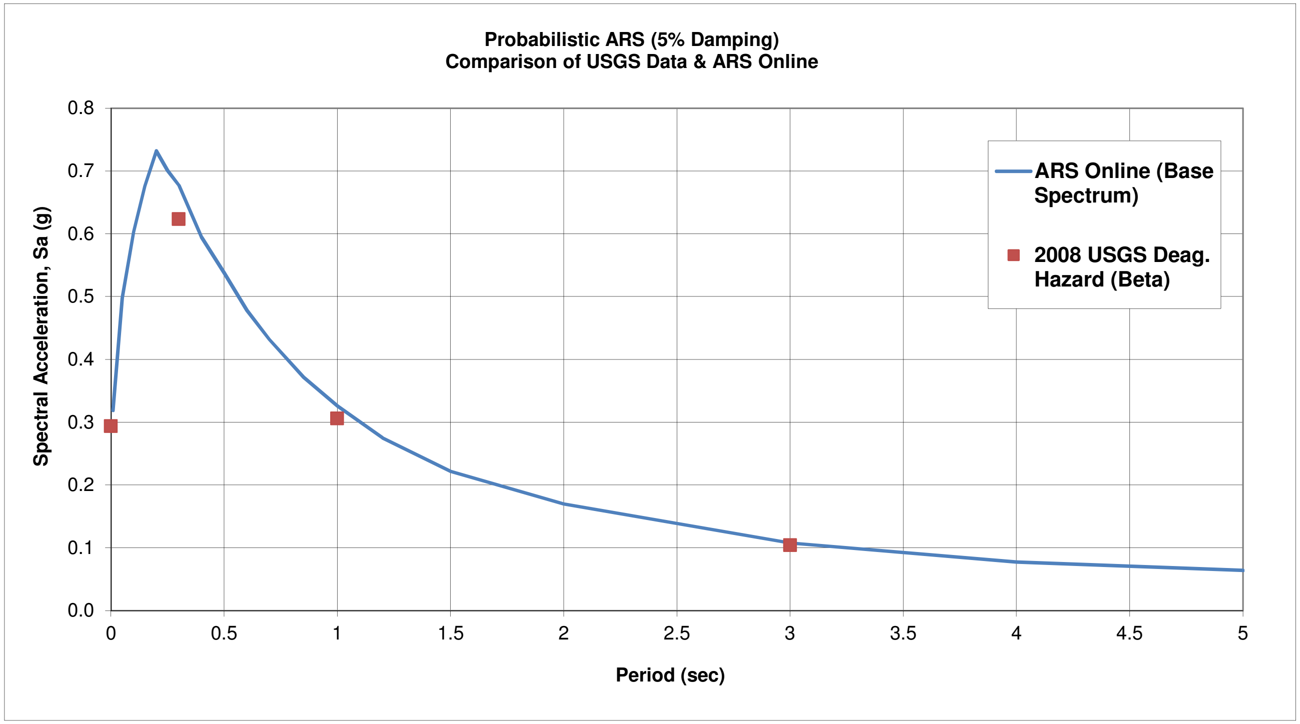
For Comparsion Plots of Minimum Spectra, ECSZ or other Faults (into the graph above), copy data from each CY-CB Result (A33:B51) then "Paste Special - Values" into cells below

Min. Spectrum for CA		Fault #1 (Compare)		Fault #2 (Compare)		Fault #3 (Compare)	
T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)	T (sec)	S (a)

Comparison spreadsheet of the 2008 USGS Probabilistic Seismic Hazard Data and ARS Online Probabilistic Data

- This spreadsheet facilitates a data check of the ARS Online base spectrum vs the USGS Data. This spreadsheet does not perform a deaggregation.

- Spectral acceleration points may be obtained from USGS Website at https://geohazards.usgs.gov/deaggint/2008/



Place ARS Online Probabilistic Data Here
(Use 19 Period Data Option in ARS Online)

T (sec)	Base Spectrum S(a)	Basin Factor	Near Fault Factor	Final Adj. Spectrum S(a)
0.01	0.319	1	1	0.319
0.05	0.498	1	1	0.498
0.1	0.603	1	1	0.603
0.15	0.676	1	1	0.676
0.2	0.732	1	1	0.732
0.25	0.701	1	1	0.701
0.3	0.677	1	1	0.677
0.4	0.595	1	1	0.595
0.5	0.538	1	1	0.538
0.6	0.478	1	1.04	0.497
0.7	0.432	1	1.08	0.466
0.85	0.372	1	1.14	0.425
1	0.326	1	1.2	0.391
1.2	0.275	1	1.2	0.329
1.5	0.222	1	1.2	0.267
2	0.17	1	1.2	0.203

Input USGS Deaggregation Hazard Data for a Exceedance Probability of 5% in 50yr

Period (sec)	INPUT USGS Deagg. Spec Accel	ARS Online Base Sa(g)	% Difference (bet. USGS & ARS Online)
0	0.2938	0.319	7.9%
0.3	0.6234	0.677	7.9%
1	0.3059	0.326	6.2%
3	0.10417	0.108	3.5%

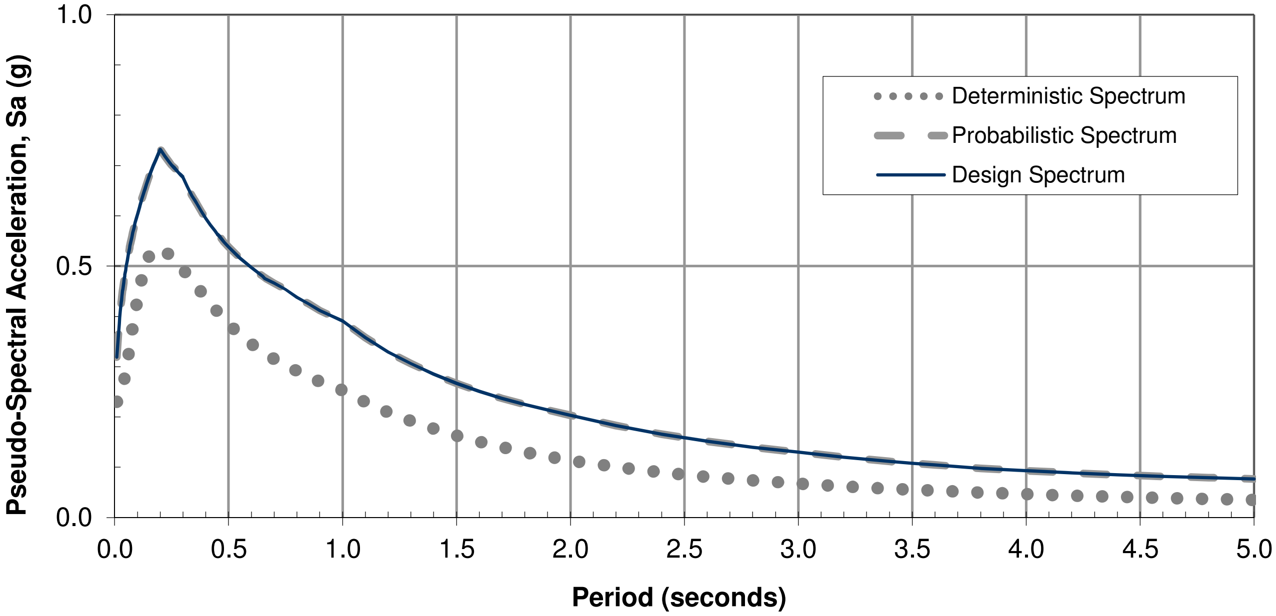
Max % Difference = 7.9%

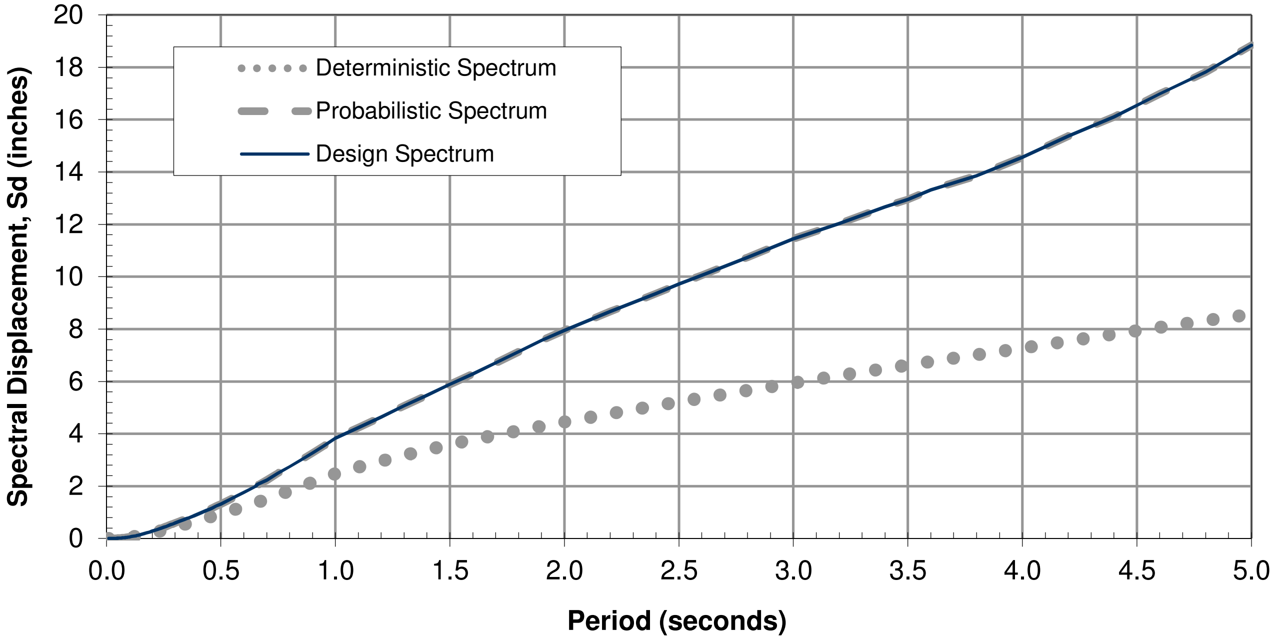
3	0.108	1	1.2	0.13
4	0.077	1	1.2	0.093
5	0.064	1	1.2	0.077

Design ARS Curves

SITE DATA

Latitude (degrees):	32.9628	Shear Wave Velocity, V_{s30}:	400 m/s
Longitude (degrees):	-117.1604	Depth to Vs = 1.0 km/s, $Z_{1.0}$:	NA
		Depth to Vs = 2.5 km/s, $Z_{2.5}$:	NA





KLEINFELDER
Bright People. Right Solutions.

DESIGNED BY: EK	DATE 11/06/14	**PRELIMINARY DESIGN** **CALTRANS ARS CURVES**	FIGURE
DRAWN: EK	11/6/14		
CHECKED BY:		TORREY MEADOWS DRIVE OVERCROSSING AT SR-56 POST MILE 5.6, DISTRICT 11 SAN DIEGO, CALIFORNIA	**E-1**
T.Y. Lin International			

DESIGN ARS CURVE ORDINATES

Period (s)	Sa (g)	Sd (inches)
0.010	0.319	0.000
0.020	0.386	0.002
0.022	0.397	0.002
0.025	0.411	0.003
0.029	0.428	0.004
0.030	0.432	0.004
0.032	0.440	0.004
0.035	0.451	0.005
0.036	0.454	0.006
0.040	0.468	0.007
0.042	0.474	0.008
0.044	0.480	0.009
0.045	0.483	0.010
0.046	0.486	0.010
0.048	0.492	0.011
0.050	0.498	0.012
0.055	0.511	0.015
0.060	0.523	0.018
0.065	0.535	0.022
0.067	0.540	0.024
0.070	0.546	0.026
0.075	0.557	0.031
0.080	0.567	0.036
0.085	0.576	0.041
0.090	0.586	0.046
0.095	0.594	0.052
0.100	0.603	0.059
0.110	0.619	0.073
0.120	0.635	0.089
0.130	0.649	0.107
0.133	0.653	0.113
0.140	0.663	0.127
0.150	0.676	0.149
0.160	0.688	0.172
0.170	0.700	0.198
0.180	0.711	0.225
0.190	0.722	0.255
0.200	0.732	0.287
0.220	0.719	0.341
0.240	0.707	0.399
0.250	0.701	0.429
0.260	0.696	0.461
0.280	0.686	0.526
0.290	0.681	0.561
0.300	0.677	0.596
0.320	0.658	0.659
0.340	0.640	0.724
0.360	0.624	0.792
0.380	0.609	0.861
0.400	0.595	0.932
0.420	0.582	1.005
0.440	0.570	1.080
0.450	0.564	1.118
0.460	0.559	1.158
0.480	0.548	1.236
0.500	0.538	1.316
0.550	0.516	1.528
0.600	0.497	1.751
0.650	0.480	1.985
0.667	0.475	2.068
0.700	0.466	2.235
0.750	0.454	2.500
0.800	0.438	2.744
0.850	0.425	3.005
0.900	0.412	3.266
0.950	0.401	3.542
1.000	0.391	3.827
1.100	0.358	4.240
1.200	0.329	4.637
1.300	0.306	5.062
1.400	0.285	5.467
1.500	0.267	5.880
1.600	0.251	6.289
1.700	0.237	6.704
1.800	0.225	7.135
1.900	0.214	7.561
2.000	0.203	7.948
2.200	0.183	8.669
2.400	0.166	9.359
2.500	0.159	9.726
2.600	0.152	10.057
2.800	0.140	10.743
3.000	0.130	11.452
3.200	0.120	12.027
3.400	0.112	12.672
3.500	0.108	12.949
3.600	0.105	13.319
3.800	0.098	13.851
4.000	0.093	14.564
4.200	0.089	15.366
4.400	0.085	16.107
4.600	0.082	16.983
4.800	0.079	17.815
5.000	0.077	18.841

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DESIGNED BY: EK
DATE 11/06/14
DRAWN: EK
11/6/14
CHECKED BY:
T.Y. Lin International

PRELIMINARY DESIGN
CALTRANS ARS TABLE

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE
E-2

Abutment Earth Pressures

Calculations Package

Calculation Performed:

Earth Pressures

Project Name	**Torrey Meadows Drive Overcrossing**
Project Number	**20151065**
Client	TY Lin International
Originator	John Co
Calculation Type	☐Hand Calculation ☒MS Excel ☐Other Computer Program
Checker	E. Koprulu
Checker's comments	
Checker's Signature	

Procedure:

Objective	To estimate earth pressures for Torrey Meadows Overpassing South and North Abutment Walls and Retaining Walls
Given	1. c’ = 0° and phi’ = 34° based on new fill requirements
Equation/Formula Used	Coulomb, log-spiral, and Mononobe-Okabe equations (see attached calculations for full equations).
Assumptions	n/a
Reference:	Caltrans Bridge Design Specifications (BDS) Chapter 5, August 2004.
Calculations	Calculations were performed in Kleinfelder approved spreadsheets as shown in the attached documents.
Attached documents	Calculations on spreadsheets are attached.
Results	See Attached spreadsheets

PROJECT: Torrey Meadows Overcrossing - Bridge North Fill
PROJECT NO. 20151065 DATE: 10/30/2014
SUBJECT: Earth Pressures for Fill PERFORMED BY: JC
At-rest, Active, Passive and Seismic REVIEWED BY: EK

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OBJECTIVE: To determine the coefficient of active lateral earth pressure, ka, using Coulomb Theory, and Mononobe-Okabe seismic earth pressure.

REFERENCE:
Caltans Bridge Design Specifications (BDS) Chapter 5, August 2004

INPUT SOIL PARAMETERS:

Material Description : Backfill

friction angle, ϕ'_f = 34 (degrees)
cohesion, c = 0 psf
unit weight, γ_s = 120 pcf
soil-wall friction, δ = 24 (degrees)

Buoyant unit weight, γ_B = 57.6 pcf ($=\gamma_s-\gamma_w$)

Wall Geometry:
θ = 90 (degrees)
θ_2 = 0 (degrees)

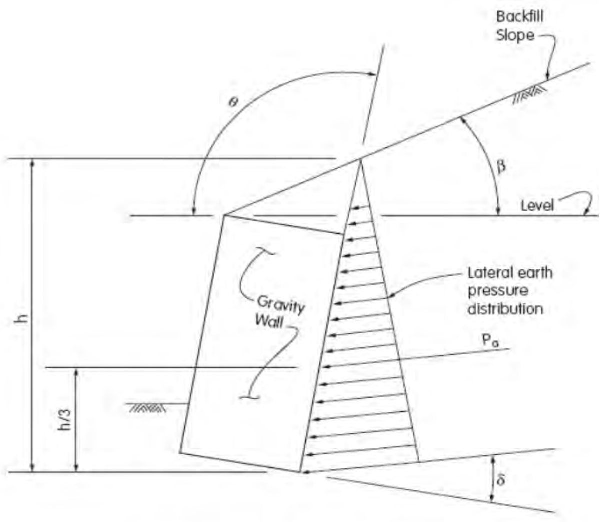


Figure 5.5.5.3-1 Notation for Coulomb Active Lateral Earth Pressure

EQUATIONS FOR EARTH PRESSURE COEFFICIENTS:

At-Rest Earth Pressure Coef.:

$$k_o=(1-\sin\phi'_f)(1+\sin\beta)$$ (BDS Equation 5.5.5.2-1)

Note: use BDS Eqn. 5.5.5.2-2 for OC soil

Active Earth Pressure Coef.:

$$k_a=\frac{\sin^2(\Theta+\phi'_f)}{\Gamma\left[\sin^2\Theta\sin(\Theta-\delta)\right]}\qquad \Gamma=\left[1+\left(\frac{\sin(\phi'_f+\delta)\sin(\phi'_f-\beta)}{\sin(\theta-\delta)\sin(\theta+\beta)}\right)^{0.5}\right]^2$$ (BDS Eqn's 5.5.5.3-1&2)

Note: Eqn. 5.5.5.3-1 is the same as Rankine k_a when $\delta = 0$

Effective Fluid Unit Weight:
$EFW_{ka} = \gamma_s * k_a$
$EFW_{k0} = \gamma_s * k_0$

CALCULATED STATIC ACTIVE AND AT REST EARTH PRESSURE VALUES:

				Active Pressures		**At-Rest Pressures**	
Slope (H:V)	β (deg)	β (rad)	Γ	k_a	EFW_{ka} (lb/ft^3)	k_0	EFW_{k0} (lb/ft^3)
level	0	0.000	2.960	**0.254**	**30.5**	**0.441**	**52.9**

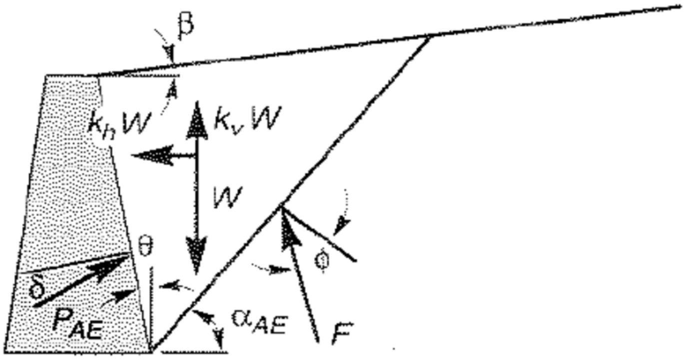
PROJECT: Torrey Meadows Overcrossing - Bridge North Fill
PROJECT NO. 20151065 DATE: 10/30/2014
SUBJECT: Earth Pressures for Fill PERFORMED BY: JC
At-rest, Active, Passive and Seismic REVIEWED BY: EK

MONONOBE-OKABE SEISMIC EARTH PRESSURES:

PGA = 0.33 g's

k_h = 1/2*PGA = 0.166
k_v = 0.000

Reference:
Kramer, S.L., 1996, *Geotechnical Earthquake Engineering*, Prentice Hall, NJ, pp. 478-481



$\psi = \arctan(k_h/(1-k_v))$
ψ = 0.1645 (radians)

$$K_{AE}=\frac{\cos^2(\phi-\psi-\theta_2)}{\cos\psi\cos^2\theta_2\cos(\psi+\theta_2+\delta)}\times\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\psi-\beta)}{\cos(\delta+\psi+\theta_2)\cos(\beta-\theta_2)}}\right]^{-2}$$

$$\boxed{\phi \geq \beta + \psi}$$

$\Delta k_{ae} = k_{AE} - k_a$

$\Delta P_{ae} = 1/2 * \gamma_s * \Delta k_{ae} * H^2$

Slope (H:V)	β (deg)	 (rad)	k_a	k_{AE}	Δk_{ae}	**ΔP_{ae}** (lb/ft)	**$EFW_{\Delta Kae}$** (pcf)
level	0	0.000	0.254	0.369	0.115	**6.9*H^2**	**7.0**

ΔP_{ae} = is a line load applied at 2/3*H or distributed as an inverted triangular distribution over H

PROJECT: Torrey Meadows Overcrossing - Bridge North Fill
PROJECT NO. 20151065 DATE: 10/30/2014
SUBJECT: Earth Pressures for Fill PERFORMED BY: JC
At-rest, Active, Passive and Seismic REVIEWED BY: EK

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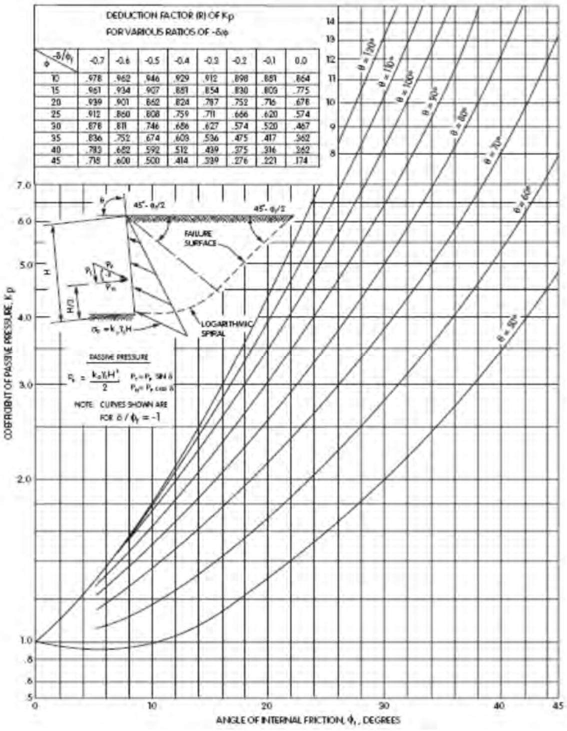
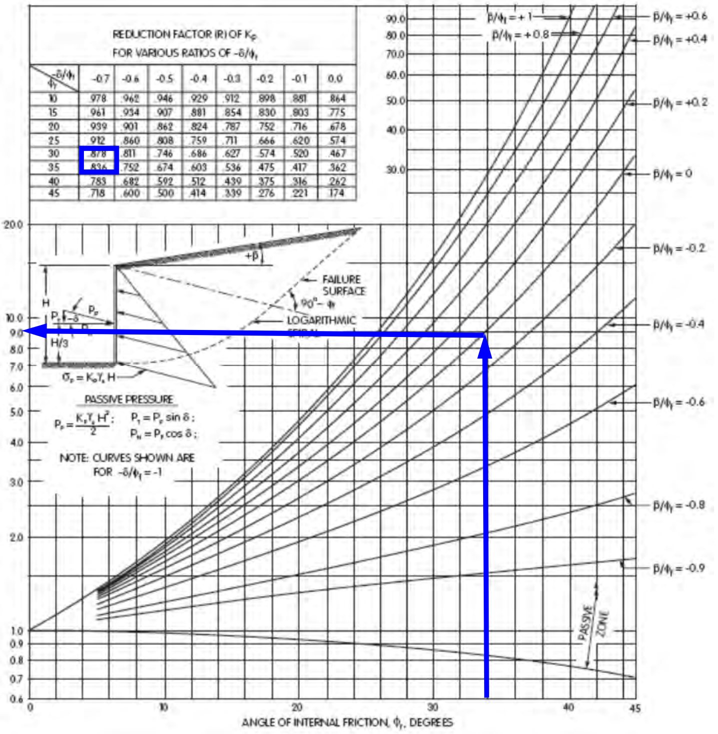
PASSIVE LATERAL EARTH PRESSURE COEFFICIENT, k_p

Use Caltrans charts for log-spirol



BDS Figure 5.5.5.4-1 - Sloping Wall and Level Backfill



φf \ -δ/φf	-0.7	-0.6	-0.5	-0.4	-0.3	-0.2	-0.1	0.0
10	.978	.962	.946	.929	.912	.898	.881	.864
15	.961	.934	.907	.881	.854	.830	.803	.775
20	.939	.901	.862	.824	.787	.752	.716	.678
25	.912	.860	.808	.759	.711	.666	.620	.574
30	.878	.811	.746	.686	.627	.574	.520	.467
35	.836	.752	.674	.603	.536	.475	.417	.362
40	.783	.682	.592	.512	.439	.375	.316	.262
45	.718	.600	.500	.414	.339	.276	.221	.174

BDS Figure 5.5.5.4-2 - Vertical Wall with Sloping Backfill

$\delta/\phi'_f =$ 0.71 beta/phi 0

CALCULATED EARTH PRESSURE VALUES (Above GW):

						Passive Pressure		
Slope (H:V)	β (deg)	β (rad)	β/ϕ'_f	un-reduced k_p	**Reduction Factor, R**	k_p	EFW_{kp} (lb/ft^3)	Design Rec. (lb/ft^3)
level	0	0.000	0.00	8.9	0.82	**7.30**	**875.8**	**500**

allowable with FS=1.5: 584

Bearing Resistance

Calculations Package

Calculation Performed:

LRFD Bearing Resistance

Project Name	**Torrey Meadows Drive Overcrossing**
Project Number	**20151065**
Client	TY Lin International
Originator	John Co
Calculation Type	☐Hand Calculation ☒MS Excel ☐Other Computer Program
Checker	Moi Arzamendi
Checker's comments	
Checker's Signature	

Procedure:

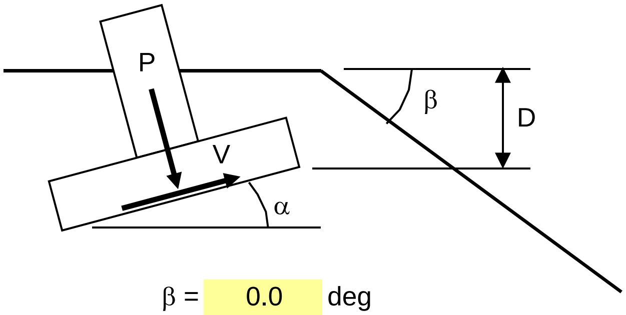
Objective	To estimate earth pressures for Torrey Meadows Overpassing South and North Abutment Walls and Retaining Walls
Given	1. Torrey Meadows Drive Overcrossing Soil Strength Parameters
Equation/Formula Used	Vesic's bearing capacity formula and Kleinfelder approved spreadsheet.
Assumptions	South Existing Fill: friction angle of 32 degrees and cohesion of 200 psf. North Existing Fill: friction angle of 36 degrees and cohesion of 400 psf for. Mission Valley Formation: friction angle of 34 degrees and cohesion of 600 psf.
Reference:	Caltrans Bridge Design Specifications (BDS) Chapter 5, August 2004.
Calculations	Calculations were performed in Kleinfelder approved spreadsheets as shown in the attached documents.
Attached documents	Calculations on spreadsheets are attached.
Results	Results are shown attached.

PROJECT: Torrey Meadows Drive Overcrossing at SR-56
PROJECT NO. 20151065 DATE: 3/23/2015
SUBJECT: Bearing capacity calculation PEFORMED BY: JC
Bent 2 REVIEWED BY: MA

OBJECTIVE: Perform bearing capacity calculation. Calculations assumes no groundwater present.

INPUT SOIL PARAMETERS:

Unit weight, γ_m = 125 pcf
Friction angle, ϕ = 34 deg
Cohesion, c = 600 psf
Average Blow Count, N = 50



FOOTING DIMENSIONS:

Footing width, B = 18 feet
Footing Length, L = 18 feet
Footing depth, D = 9 feet

β = 0.0 deg
α = 0 deg

VESIC BEARING CAPACITY FORMULA:

$q_{ult} = cN_cs_cd_ci_cb_cg_c + \sigma'_{zD}N_qs_qd_qi_qb_qg_q + 0.5\gamma'BN_\gamma s_\gamma i_\gamma b_\gamma g_\gamma$ (Eq. 6.13, p. 183, Coduto 2001)

shape factors:

$s_c = 1+(B/L)*(Nq/Nc)$ = 1.698
$s_q = 1+(B/L)\tan\phi$ = 1.675
$s_\gamma = 1-0.4(B/L)$ = 0.600

depth factors:

k = (D/B) for D/B<=1 or = tan-1(D/B) for D/B>1 = 0.50
$d_c = 1+0.4k$ 1.20
$d_q = 1+2*k*\tan\phi(1-\sin\phi)^2$ = 1.13
d_γ = 1.00

base inclination factors:

b_c = 1.0
b_q = 1.0
b_γ = 1.0

ground inclination factors:

$g_c = 1-\beta/147$ 1.00
$g_q = (1-\tan\beta)^2$ = 1.00
$g_\gamma = g_q$ = 1.00

load inlclination factors:

i_c = 1.0
i_q = 1.0
i_γ = 1.0

Bearing factors:

$Nq = e^{\pi\tan\phi}*\tan^2(45+\phi/2)$ Nq = 29.44

$Nc = (Nq-1)/\tan\phi$ Nc = 42.16

$Ng = 2(Nq+1)\tan\phi$ Ng = 41.06

Reference:
Coduto, D.P., 2001, *Foundation Design, Principles and Practices*, Prentice Hall

$\sigma'_z = \gamma*D$ = 1125 psf (for no groundwater)

q_{ult} = 142,001 psf

Design Rec.= **65** **ksf**

29.25

FS = 2.2

qall = qult/FS = 64,546 psf

Design Rec.= **29** **ksf**

For SAND: approximate bearing pressure to produce 1 inch of settlement:

q1inch = 0.2*N = 10 tsf
= 20000 psf

Design Rec.= **10** **ksf**

PROJECT: Torrey Meadows Drive Overcrossing at SR-56
PROJECT NO. 20151065 DATE: 3/23/2015
SUBJECT: Bearing capacity calculation for South Abutment 1
PEFORMED BY: JC
REVIEWED BY: MA

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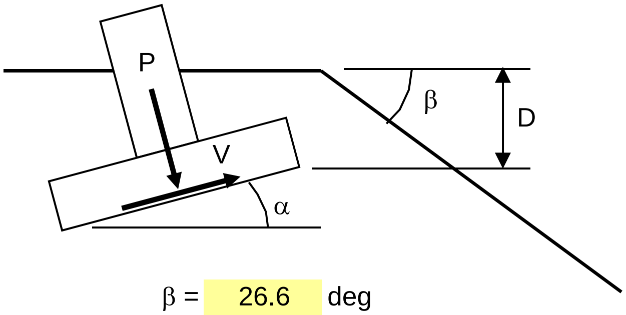
OBJECTIVE: Perform bearing capacity calculation. Calculations assumes no groundwater present.

INPUT SOIL PARAMETERS:

Unit weight, γ_m = 125 pcf
Friction angle, ϕ = 34 deg
Cohesion, c = 600 psf
Average Blow Count, N = 50



FOOTING DIMENSIONS:

Footing width, B = 12 feet
Footing Length, L = 56 feet
Footing depth, D = 10 feet

β = 26.6 deg
α = 0 deg

VESIC BEARING CAPACITY FORMULA:

$q_{ult} = cN_c s_c d_c i_c b_c g_c + \sigma'_{zD} N_q s_q d_q i_q b_q g_q + 0.5\gamma' B N_\gamma s_\gamma i_\gamma b_\gamma g_\gamma$ (Eq. 6.13, p. 183, Coduto 2001)

shape factors:

$s_c = 1+(B/L)*(Nq/Nc) =$ 1.150
$s_q = 1+(B/L)\tan\phi =$ 1.145
$s_\gamma = 1-0.4(B/L) =$ 0.914

depth factors:

k = (D/B) for D/B<=1 or = tan-1(D/B) for D/B>1 = 0.83
$d_c = 1+0.4k$ 1.33
$d_q = 1+2*k*\tan\phi(1-\sin\phi)^2 =$ 1.22
$d_\gamma =$ 1.00

base inclination factors:

$b_c =$ 1.0
$b_q =$ 1.0
$b_\gamma =$ 1.0

ground inclination factors:

$g_c = 1-\beta/147$ 0.82
$g_q = (1-\tan\beta)^2 =$ 0.25
$g_\gamma = g_q =$ 0.25

load inlclination factors:

$i_c =$ 1.0
$i_q =$ 1.0
$i_\gamma =$ 1.0

Bearing factors:

$Nq = e^{\pi\tan\phi}*\tan^2(45+\phi/2)$ Nq = 29.44

$Nc = (Nq-1)/\tan\phi$ Nc = 42.16

$Ng = 2(Nq+1)\tan\phi$ Ng = 41.06

Reference:
Coduto, D.P., 2001, *Foundation Design, Principles and Practices*, Prentice Hall

$\sigma'_z = \gamma*D =$ 1250 psf (for no groundwater)

$q_{ult} =$ 51,570 psf

Design Rec.= **25** **ksf**

FS = 2.2

qall = qult/FS = 23,441 psf

Design Rec.= **11** **ksf**

For SAND: approximate bearing pressure to produce 1 inch of settlement:

q1inch = 0.2*N = 10 tsf
= 20000 psf

Design Rec.= **10** **ksf**

Slope Stability Analyses

Calculations Package

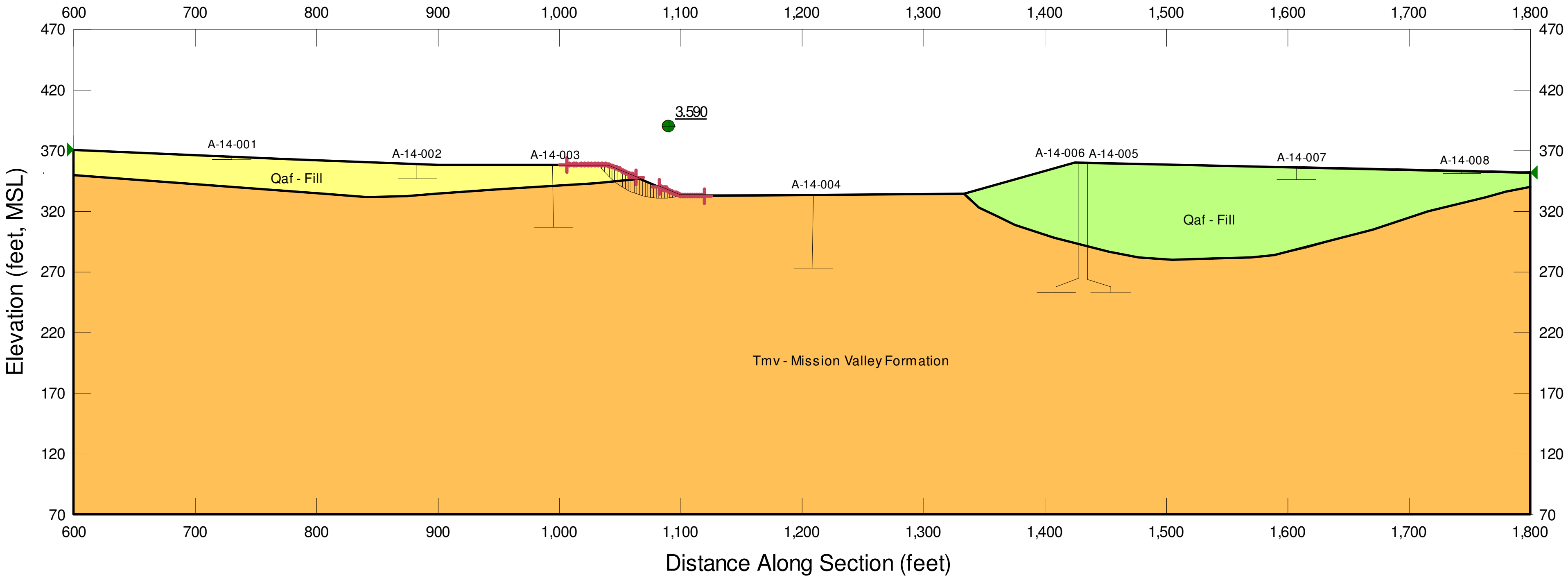
Calculation Performed:

Slope Stability

Project Name	**Torrey Meadows Drive Overcrossing**
Project Number	**20151065**
Client	TY Lin International
Originator	Moises Arzamendi
Calculation Type	☐Hand Calculation ☐MS Excel ☒Other Computer Program
Checker	Eren Koprulu
Checker's comments	
Checker's Signature	Eren Koprulu

Procedure:

Objective	To evaluate the stability of north and south abutments at Torrey Meadows Dr OC during static and seismic events.
Given	1. Explorations: A-14-003, A-14-005, and A-14-006 2. Slope dimensions through existing topographic maps. 3. Design response spectrum developed per Caltrans ARS (see Caltrans ARS calc package) 4. V_{s30} is approximately 340 m/s (see Shear Wave Velocity Profile calc package)
Equation/Formula Used	• SLOPE/W and spencer's method type of analysis. • Site period, Ts = 4H/Vs for circular failure surfaces
Assumptions	1. Strength parameters for soil conditions found at this site are presented in the Strength Parameters New fill soil parameters are based on Caltrans guidelines
Reference:	• Geostudio, SLOPE/W, 2012 • Caltrans ARS Online V. 2.3.06
Calculations	Calculations were performed using SLOPE/W, 2012 software
Attached documents	1. Summary of slope stability results. 2. SLOPE/W PDF outputs of slope failures.
Results	1. See attached.



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DRAWN BY: M. Arzamendi	10/14
CHECKED BY: E. Koprulu	10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

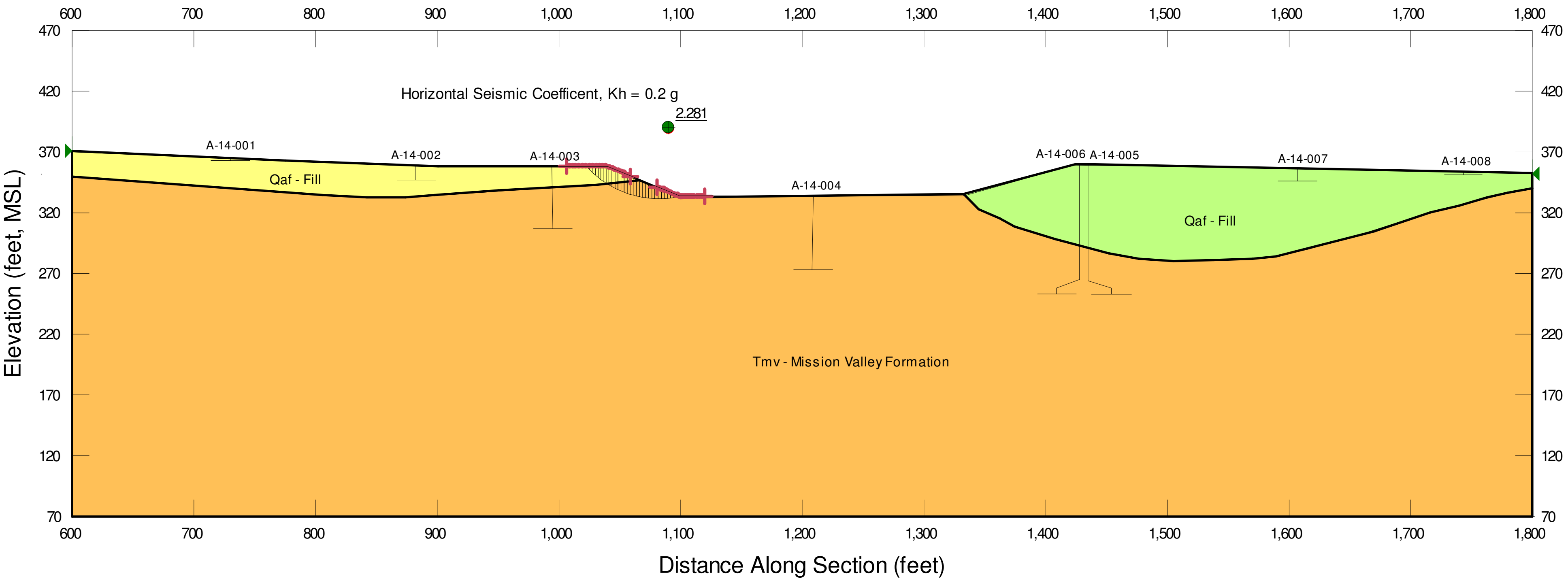
SLOPE STABILITY ANALYSES
SOUTH ABUTMENT 1
Existing / Permanent Conditions
Static

SCALE
AS SHOWN

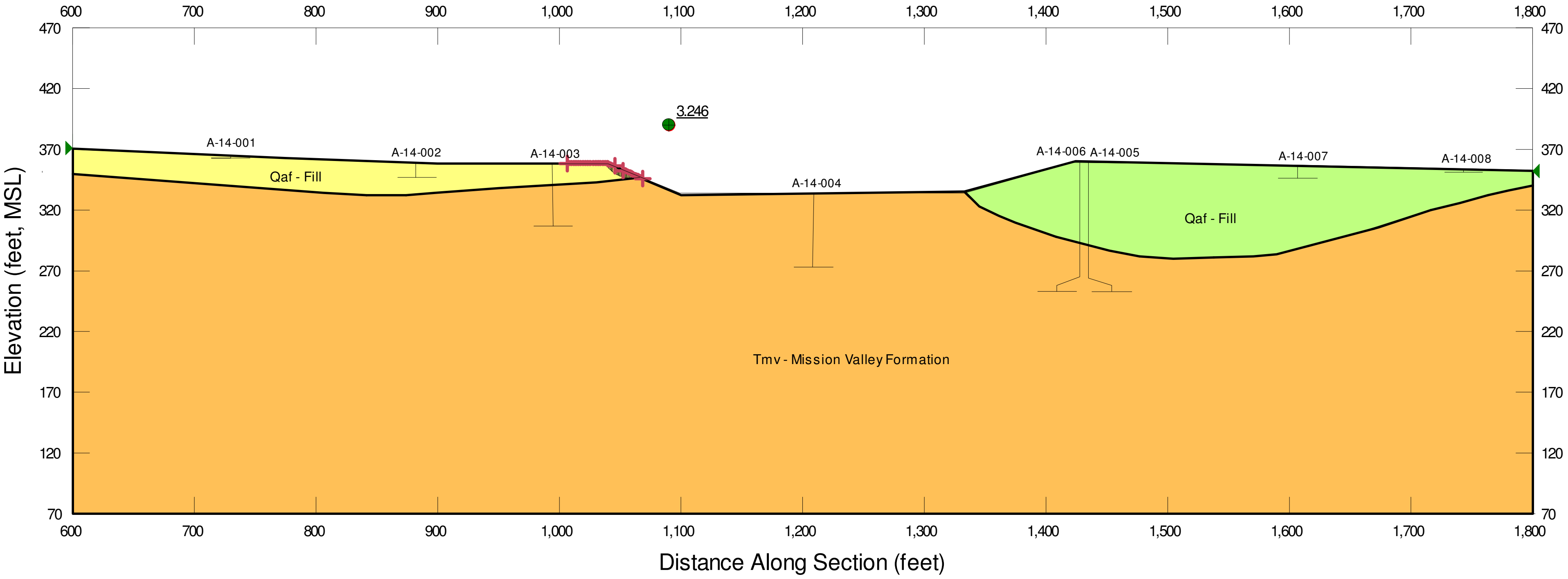
SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-3



KLEINFELDER Bright People. Right Solutions.	DESIGNED BY: M. Arzamendi	DATE 10/14	TORREY MEADOWS DRIVE OVERCROSSING AT SR-56, POST MILE 5.6, DISTRICT 11 SAN DIEGO, CALIFORNIA	SCALE AS SHOWN
	DRAWN BY: M. Arzamendi	10/14		SANDAG CONTRACT NO.
	CHECKED BY: E. Koprulu	10/14	SLOPE STABILITY ANALYSES SOUTH ABUTMENT 1 Existing / Permanent Conditions Pseudo Static	DRAWING NO.
				FIGURE NO. E-4



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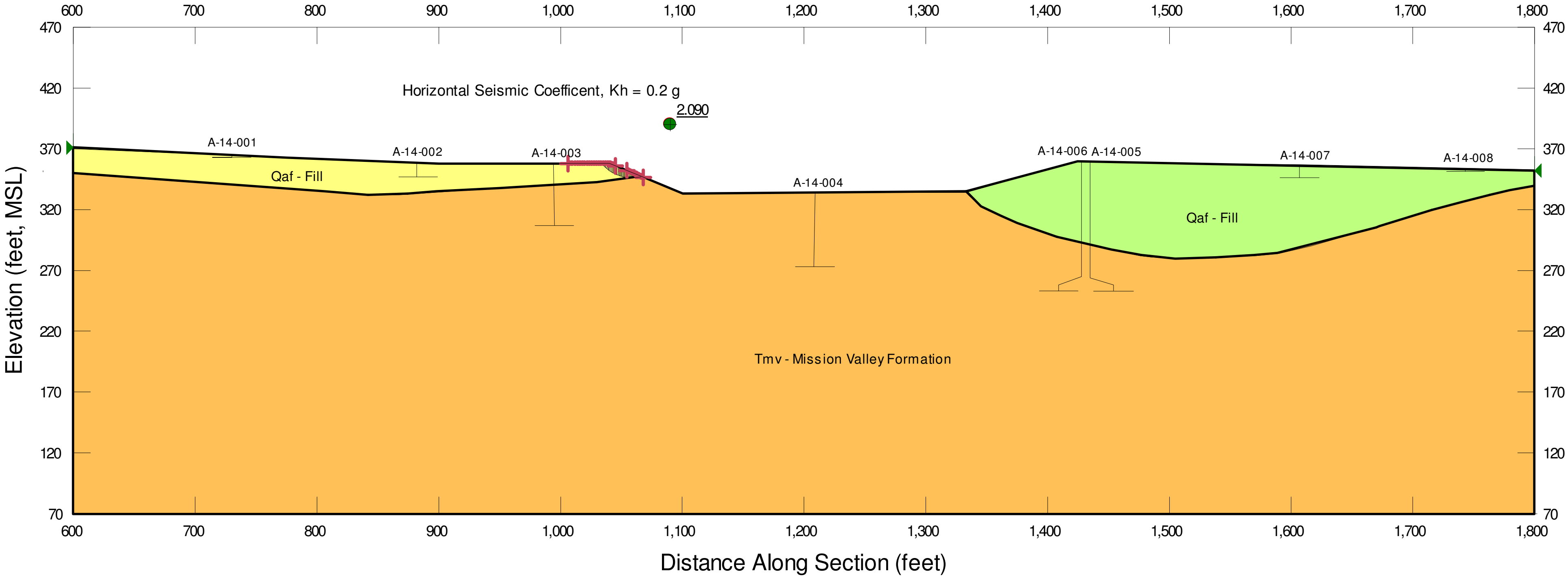
DRAWN BY: M. Arzamendi	10/14			
CHECKED BY: E. Koprulu	10/14	SLOPE STABILITY ANALYSES SOUTH ABUTMENT 1 Existing / Permanent Conditions Static (upper slope only)	SANDAG CONTRACT NO.	
			DRAWING NO.	FIGURE NO. E-5



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DRAWN BY: M. Arzamendi
10/14
CHECKED BY: E. Koprulu
10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

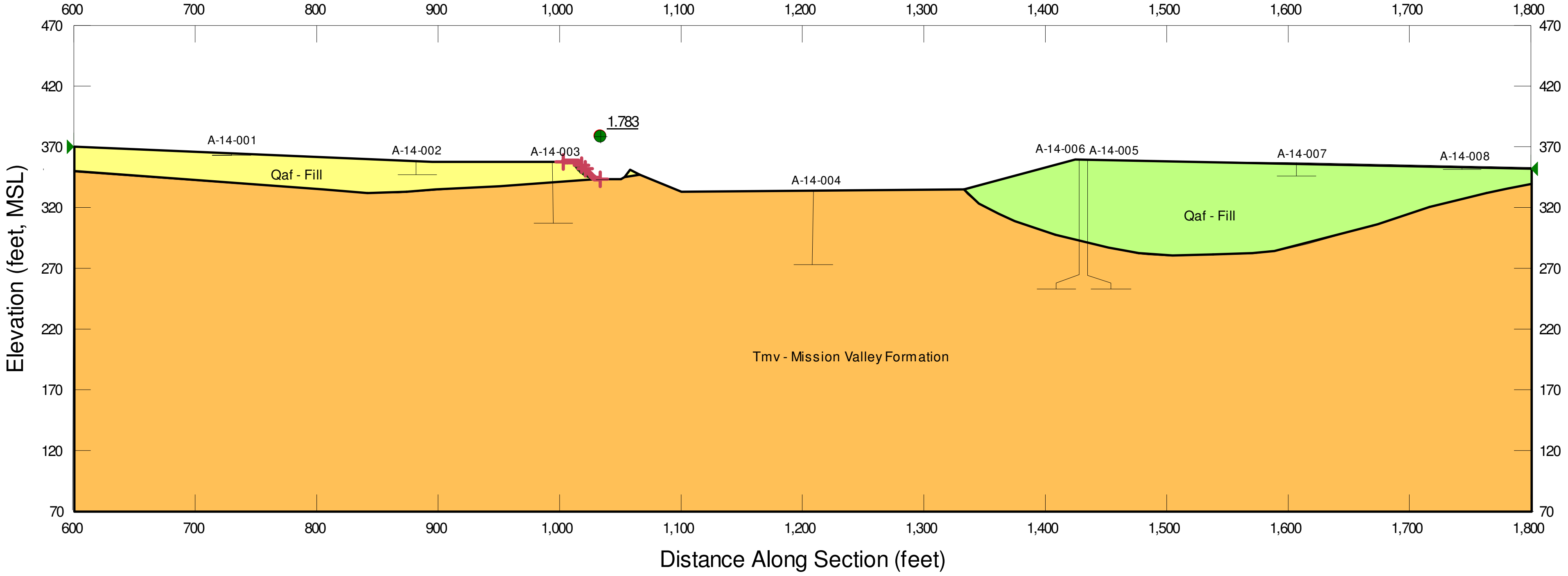
SLOPE STABILITY ANALYSES
SOUTH ABUTMENT 1
Existing / Permanent Conditions
Pseudo Static (upper slope only)

SCALE
AS SHOWN

SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-6



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CHECKED BY: E. Koprulu	10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

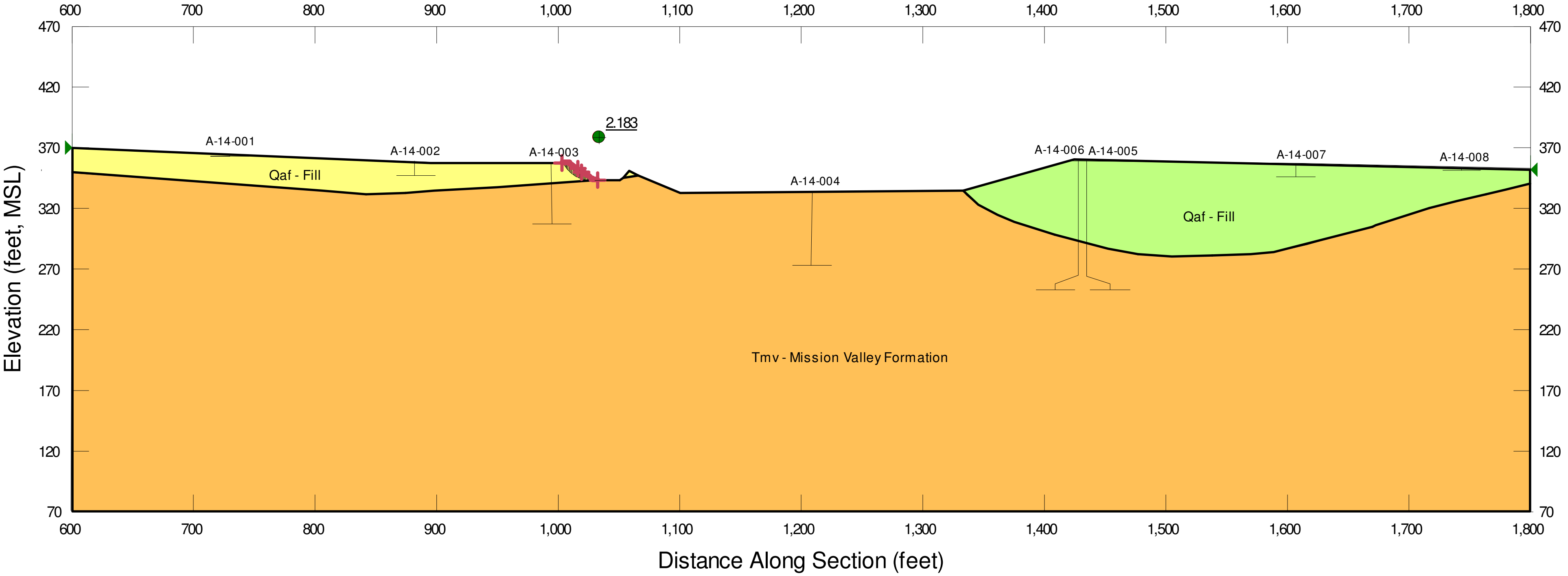
SLOPE STABILITY ANALYSES
SOUTH ABUTMENT 1
Temporary Conditions
1H:1V Slope - Static

SCALE
AS SHOWN

SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-7



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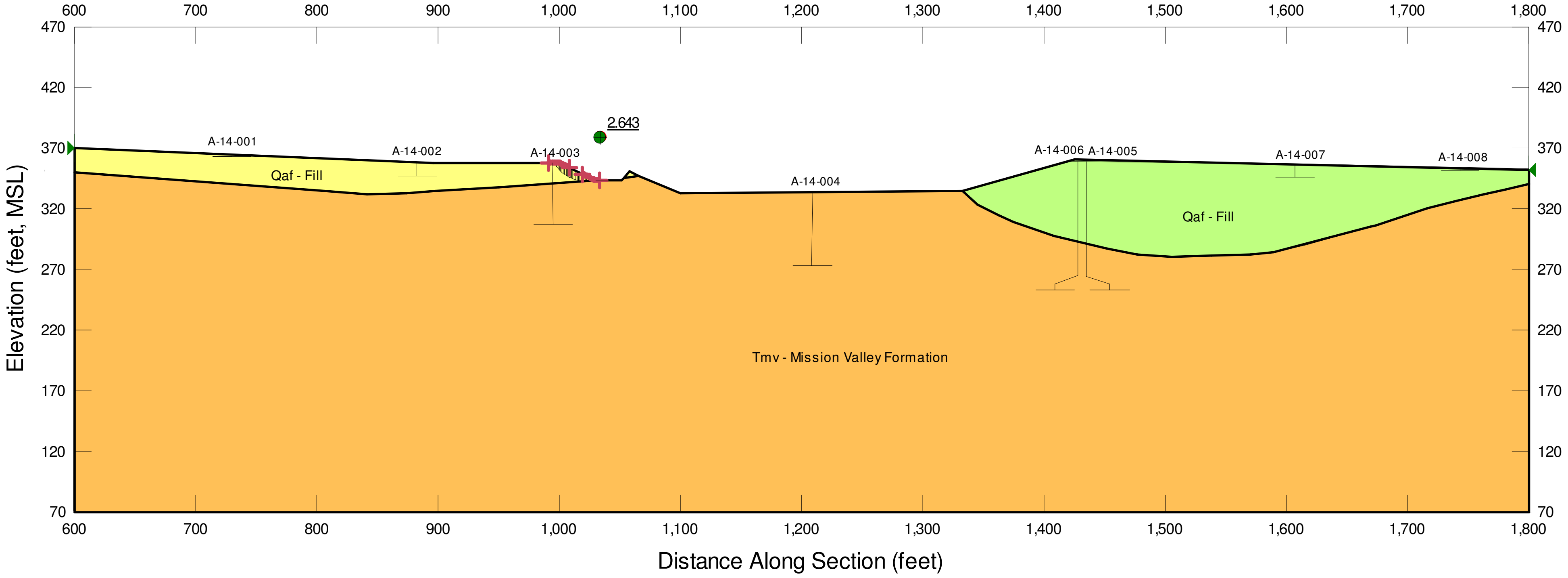
DRAWN BY: M. Arzamendi	10/14			
CHECKED BY: E. Koprulu	10/14	SLOPE STABILITY ANALYSES SOUTH ABUTMENT 1 Temporary Conditions 1-1/2H:1V Slope - Static	SANDAG CONTRACT NO.	
			DRAWING NO.	FIGURE NO. E-8



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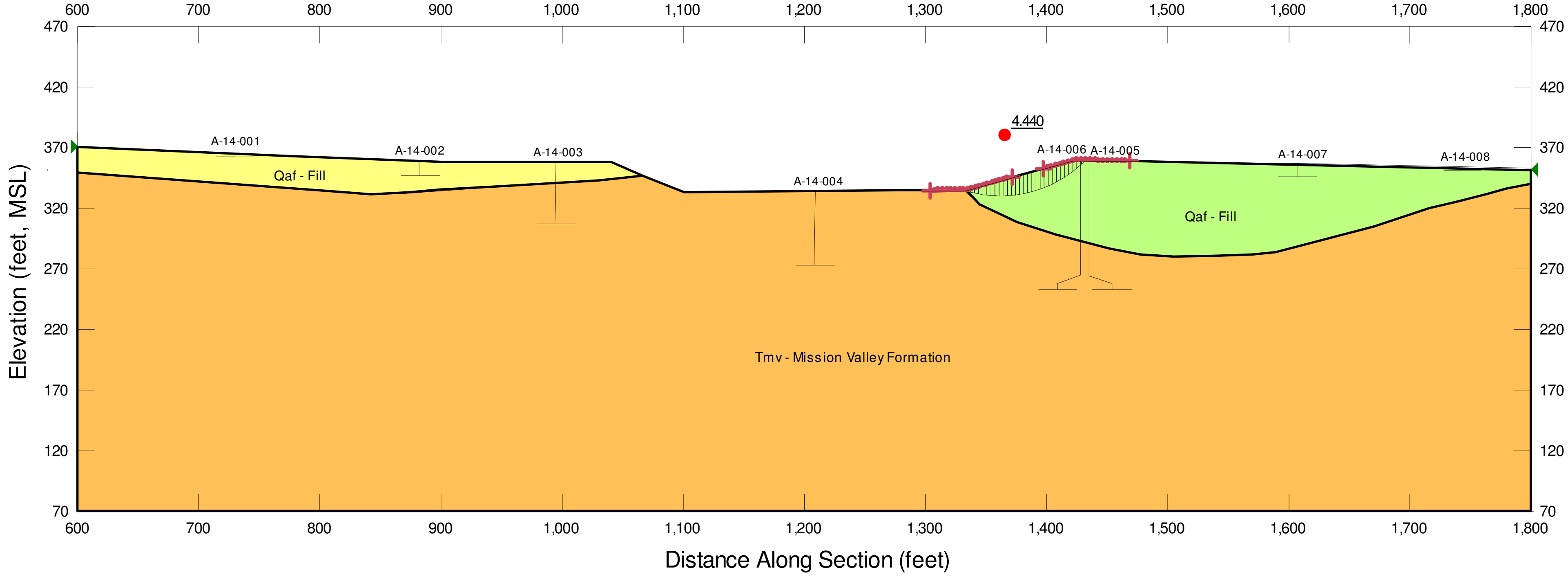
DRAWN BY: M. Arzamendi	10/14			
CHECKED BY: E. Koprulu	10/14	SLOPE STABILITY ANALYSES SOUTH ABUTMENT 1 Temporary Conditions 2H:1V Slope - Static	SANDAG CONTRACT NO.	
			DRAWING NO.	FIGURE NO. E-9



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DRAWN BY: M. Arzamendi	10/14
CHECKED BY: E. Koprulu	10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

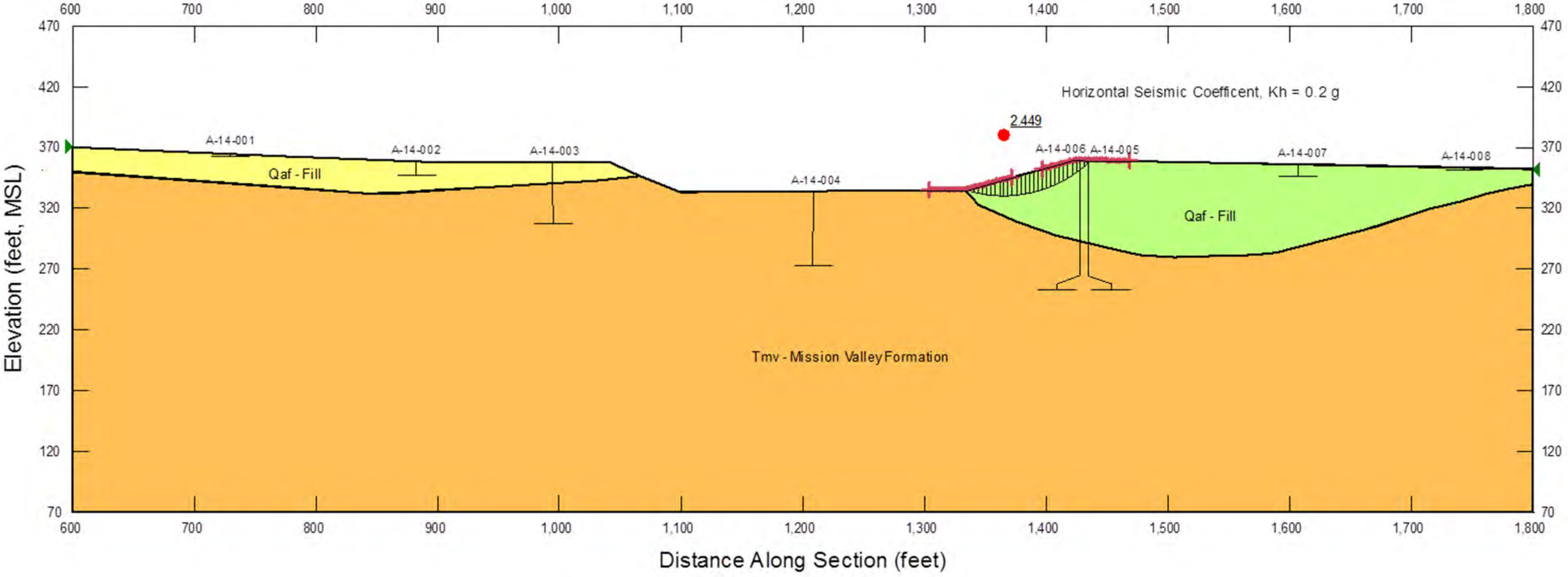
SLOPE STABILITY ANALYSES
NORTH ABUTMENT 3
Existing / Permanent Conditions
Static

SCALE
AS SHOWN

SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-10



KLEINFELDER
Bright People. Right Solutions.

DESIGNED BY:
M. Arzamendi
DATE
10/14

DRAWN BY:
M. Arzamendi
10/14

CHECKED BY:
E. Koprulu
10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

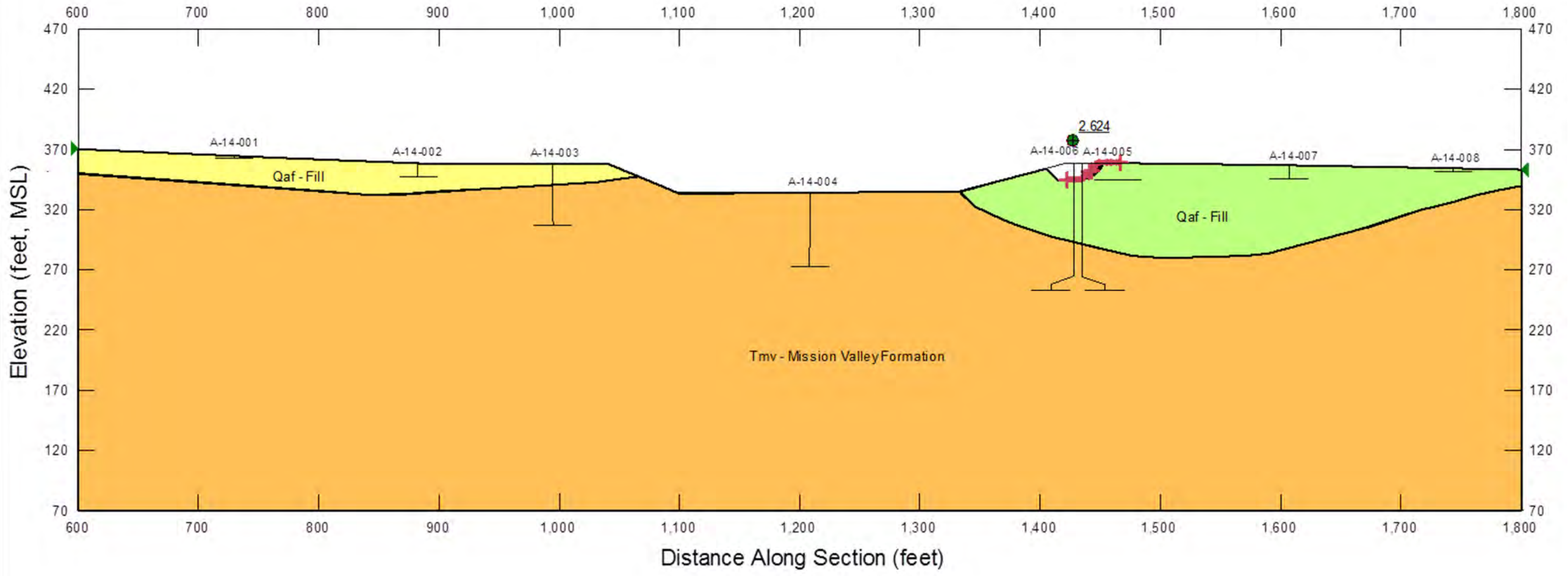
SLOPE STABILITY ANALYSES
NORTH ABUTMENT 3
Existing / Permanent Conditions
Pseudo Static

SCALE
AS SHOWN

SANDAG CONTRACT NO.

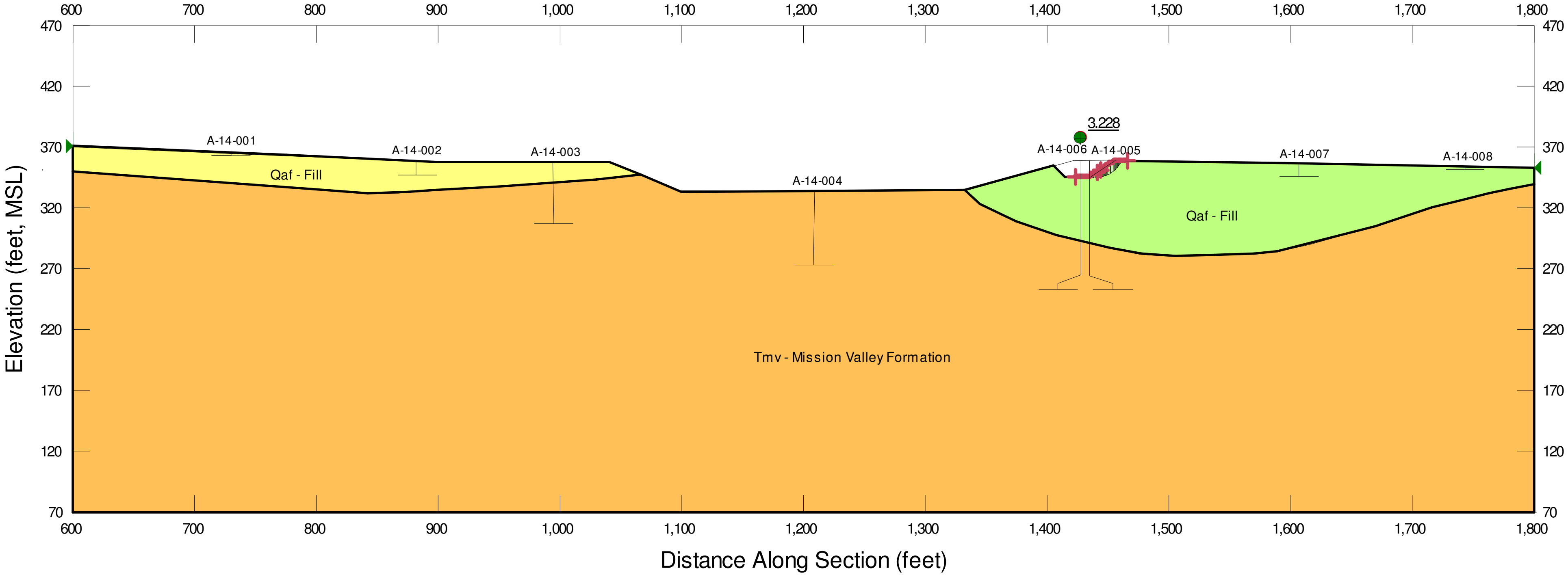
DRAWING NO.

FIGURE NO.
E-11



KLEINFELDER
Bright People. Right Solutions.

DESIGNED BY: M. Arzamendi	DATE 10/14	TORREY MEADOWS DRIVE OVERCROSSING AT SR-56, POST MILE 5.6, DISTRICT 11 SAN DIEGO, CALIFORNIA	SCALE AS SHOWN	
DRAWN BY: M. Arzamendi	10/14			
CHECKED BY: E. Koprulu	10/14	SLOPE STABILITY ANALYSES NORTH ABUTMENT 3 Temporary Conditions 1H:1V Slope - Static	SANDAG CONTRACT NO.	
			DRAWING NO.	FIGURE NO. E-12



KLEINFELDER
Bright People. Right Solutions.

DESIGNED BY: M. Arzamendi
DATE 10/14
DRAWN BY: M. Arzamendi
10/14
CHECKED BY: E. Koprulu
10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

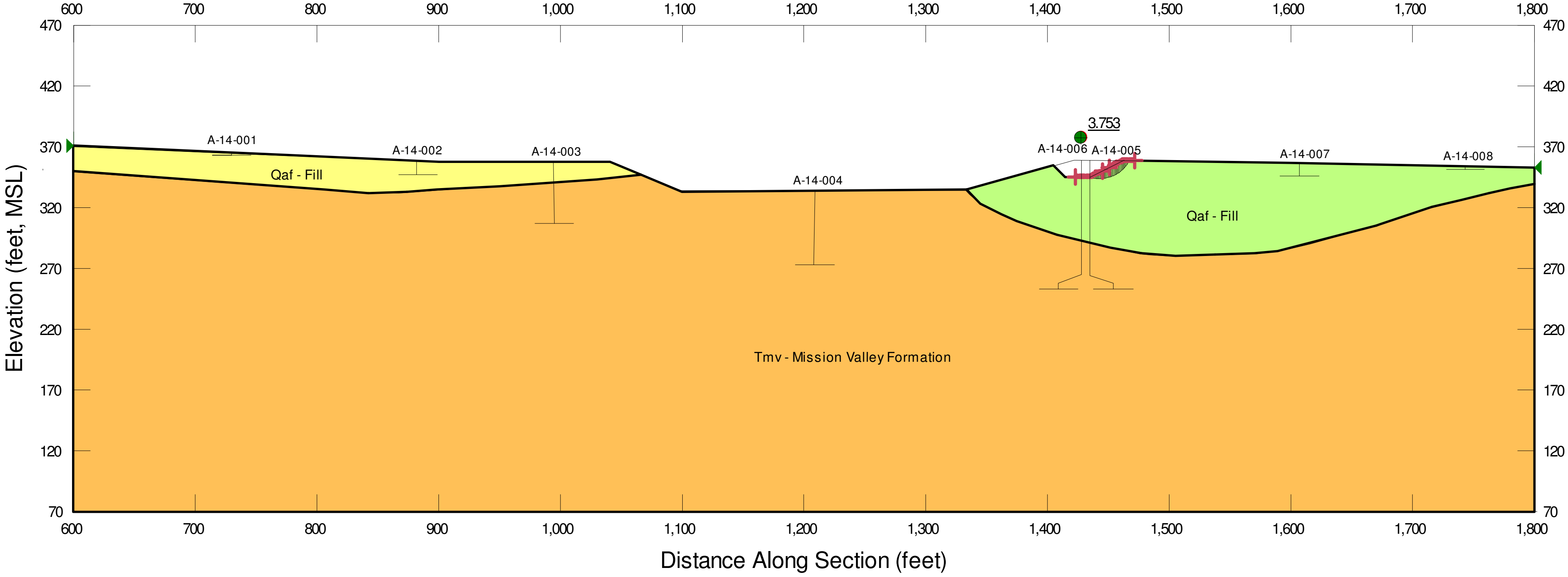
SLOPE STABILITY ANALYSES
NORTH ABUTMENT 3
Temporary Conditions
1-1/2H:1V Slope - Static

SCALE
AS SHOWN

SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-13



KLEINFELDER
Bright People. Right Solutions.

DESIGNED BY: M. Arzamendi	DATE 10/14
DRAWN BY: M. Arzamendi	10/14
CHECKED BY: E. Koprulu	10/14

TORREY MEADOWS DRIVE OVERCROSSING
AT SR-56, POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

SLOPE STABILITY ANALYSES
NORTH ABUTMENT 3
Temporary Conditions
2H:1V Slope - Static

SCALE
AS SHOWN

SANDAG CONTRACT NO.

DRAWING NO.

FIGURE NO.
E-14

Pile Foundation Design

Axial Pile Foundation Design

Calculations Packages

Calculation Performed:

BRIDGE FOUNDATION ANALYSIS

Project Name	**Torrey Meadows Drive Overcrossing Project**
Project Number	**20151065**
Client	T.Y. Lin International
Originator	Eren Koprulu
Calculation Type	☐Hand Calculation ☐MS Excel ☒Other Computer Program (Shaft 2012 – Ensoft)
Checker	Moises Arzamendi, P.E, G.E
Checker's comments	
Checker's Signature	

Procedure:

Objective	To evaluate CIDH Pile capacities for the proposed bridge.
Given	1. Bridge Geometry 2. Pile diameters (2, 2.5, 3 feet)
Calculations	The calculations were performed with software Shaft. SHAFT 2012 is a special-purpose program based on rational procedures for analyzing a drilled shaft under axial loading. The program is used to compute settlement of the top and base of the shaft as a function of axial loading, along with the distribution of axial load along the length of the shaft.
Assumptions	1. The resistance curves represent LRFD factored axial resistance for single CIDH piles. 2. The resistance curves include skin friction and end bearing. 3. The uplift CIDH pile resistance curve does not include the pile dead weight. 4. The design groundwater is assumed to be at elevation +250 feet MSL.
References:	AASHTO guidelines for pile capacity and design.
Attached documents	Input parameters for Abut3.
Results	Results are presented on Plates 10 through 13.
Additional Notes	None

Input Parameters for SHAFT LRFD Analysis

Project: **Torrey Meadows Dr. OC** By: EK Date: 10/28/2014
Subject: CIDH (Extreme Event) for Abutment 3 (North Abutment) Reviewed by: MA Date:

Primary Given and Assumptions:
Pile head elevation = Elev. + 344.0 ft
Design ground surface is assumed = Elev. + 344.0 ft
Deisgn groundwater is assumed = Elev. + 250.0 ft

DRILLED SHAFT PROPERTIES

Shaft Diameter:	2, 2.5, or 3	ft
Ratio of Base Diameter to Shaft Diameter :	0	(straight) Shaft
Angle of Bell w/ Respect to Vertical :	0	degree
Length of Upper Exclusive Zone w/o Skin Friction (Lue):	5	
Length of Bottom Portion of Shaft w/o Skin Friction (Lle):	0	ft
Modulus of Elasticity of 24-inch/30-inch/36-inch Shaft :	3,600	ksi
Uplift Reduction Factor:	0.70	

SOIL LAYER DATA

Layer	Soil Type	Depth at Bottom (ft)		γ_t (pcf)			S_u	α	LRFD Resistance Factor (Side Friction)	LRFD Resistance Factor (End Bearing)
		From	To		ϕ' (deg)	Cohesion (psf)	(psf)			
1	Sand (Fill)	0	65	130	36	400	na	na	1.00	1.00
2	Sand (Sandstone)	65	90	125	34	600	na	na	1.00	1.00

LOAD DATA

No specific loads are provided at the moment. The axial capacity curves are rather provided to elevation 260 feet (i.e., 10 feet embedment into Tmv).

RESULTS

Recommended minimum shaft tip elevation = 290 ft

Reference: 1. AASHTO LRFD Bridge Construction Specifications, 3rd Edition, 2010 Interim Revisions
2. Fellenius, B.H. 2004, Unified Design of Piled Foundations with Emphasis on Settlement Analysis. Honoring George G. Goble - Current Practice and Future Trends in Deep Foundations, Geo-Institute Geo-TRANS Conference, Los Angeles, Jly 27-30, Edited by J.A. DiMaggio and M.H. Hussein. ASCE Geotechnical Special Publication, GSP 125, pp. 253-275.
3. California Amendments to the AASHTO LRFD Bridge Design Specifications - Fourth Edition, Caltrans, 2011

Input Parameters for SHAFT LRFD Analysis

Project: **Torrey Meadows Dr. OC** By: EK Date: 10/28/2014
Subject: CIDH (Static Case) for Abutment 3 (North Abutment) Reviewed by: MA Date:

Primary Given and Assumptions:
Pile head elevation = Elev. + 344.0 ft
Design ground surface is assumed = Elev. + 344.0 ft
Deisgn groundwater is assumed = Elev. + 250.0 ft

DRILLED SHAFT PROPERTIES

Shaft Diameter:	2, 2.5, or 3	ft
Ratio of Base Diameter to Shaft Diameter :	0	(straight) Shaft
Angle of Bell w/ Respect to Vertical :	0	degree
Length of Upper Exclusive Zone w/o Skin Friction (Lue):	5	
Length of Bottom Portion of Shaft w/o Skin Friction (Lle):	0	ft
Modulus of Elasticity of 24-inch/30-inch/36-inch Shaft :	3,600	ksi
Uplift Reduction Factor:	0.70	

SOIL LAYER DATA

		Depth at Bottom (ft)					S_u		LRFD Resistance Factor	LRFD Resistance Factor
Layer	**Soil Type**	**From**	**To**	**γ_t (pcf)**	**ϕ' (deg)**	**Cohesion (psf)**	**(psf)**	**α**	**(Side Friction)**	**(End Bearing)**
1	Sand (Fill)	0	65	130	36	400	na	na	0.70	0.50
2	Sand (Sandstone)	65	90	125	34	600	na	na	0.70	0.50

LOAD DATA

No specific loads are provided at the moment. The axial capacity curves are rather provided to elevation 260 feet (i.e., 10 feet embedment into Tmv).

RESULTS

Recommended minimum shaft tip elevation = 290 ft

Reference: 1. AASHTO LRFD Bridge Construction Specifications, 3rd Edition, 2010 Interim Revisions
2. Fellenius, B.H. 2004, Unified Design of Piled Foundations with Emphasis on Settlement Analysis. Honoring George G. Goble - Current Practice and Future Trends in Deep Foundations, Geo-Institute Geo-TRANS Conference, Los Angeles, Jly 27-30, Edited by J.A. DiMaggio and M.H. Hussein. ASCE Geotechnical Special Publication, GSP 125, pp. 253-275.
3. California Amendments to the AASHTO LRFD Bridge Design Specifications - Fourth Edition, Caltrans, 2011

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==========================================================================

                 SHAFT for Windows, Version 2012.7.9

                  Serial Number :  297192525

               VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                (c) Copyright ENSOFT, Inc., 1987-2012
                      All Rights Reserved

==========================================================================


     Path to file locations      : U:\PROJECT FILES\20151065.001A - Torrey Meadows
Drive Bridge\Calculations\Foundations\Shaft\
     Name of input data file     : Abut 3 Downward_(Static).sfd
     Name of output file         : Abut 3 Downward_(Static).sfo
     Name of plot output file    : Abut 3 Downward_(Static).sfp
     Name of runtime file        : Abut 3 Downward_(Static).sfr


--------------------------------------------------------------------------
                     Time and Date of Analysis
--------------------------------------------------------------------------

          Date:  November 04, 2014     Time:  14:41:29

     Torrey Meadows Dr. OC - Abut 3 (Static)


     PROPOSED DEPTH =      90.0 FT
     ----------------


     NUMBER OF LAYERS =    2
     ------------------


     WATER TABLE DEPTH =     110.0 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO 1----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.350E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.130E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.000E+00


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                   = 0.412E+00
```

```
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                  = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                       = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST       = 0.350E+02
  SOIL UNIT WEIGHT, LB/CU FT                          = 0.130E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT            = 0.100E+11
  DEPTH, FT                                           = 0.650E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)              = 0.700E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)             = 0.500E+00


LAYER NO 2----SAND

  AT THE TOP

  SKIN FRICTION COEFFICIENT- BETA                     = 0.412E+00
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                  = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                       = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST       = 0.100E+03
  SOIL UNIT WEIGHT, LB/CU FT                          = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT            = 0.100E+11
  DEPTH, FT                                           = 0.650E+02


  AT THE BOTTOM

  SKIN FRICTION COEFFICIENT- BETA                     = 0.250E+00
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                  = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                       = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST       = 0.100E+03
  SOIL UNIT WEIGHT, LB/CU FT                          = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT            = 0.100E+11
  DEPTH, FT                                           = 0.900E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)              = 0.700E+00
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)             = 0.500E+00



DRILLED SHAFT INFORMATION
-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    5.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.



PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
```

```
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS      QB      QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
 6.0     0.70     2.63    22.98    25.61     1.84    11.49     13.33
 7.0     0.81     5.66    25.50    31.16     3.96    12.75     16.71
 8.0     0.93     9.09    28.01    37.10     6.36    14.01     20.37
 9.0     1.05    12.89    30.53    43.41     9.02    15.26     24.28
10.0     1.16    17.05    33.04    50.09    11.94    16.52     28.46
11.0     1.28    21.57    35.55    57.12    15.10    17.78     32.87
12.0     1.40    26.41    38.07    64.48    18.49    19.03     37.52
13.0     1.51    31.59    40.58    72.17    22.11    20.29     42.40
14.0     1.63    37.07    43.10    80.17    25.95    21.55     47.50
15.0     1.75    42.86    45.61    88.47    30.00    22.80     52.81
16.0     1.86    48.94    48.12    97.06    34.26    24.06     58.32
17.0     1.98    55.30    49.74   105.04    38.71    24.87     63.58
18.0     2.09    61.92    50.28   112.20    43.35    25.14     68.49
19.0     2.21    68.81    50.28   119.09    48.17    25.14     73.31
20.0     2.33    75.95    50.28   126.23    53.17    25.14     78.31
21.0     2.44    83.33    50.28   133.61    58.33    25.14     83.47
22.0     2.56    90.94    50.28   141.22    63.66    25.14     88.80
23.0     2.68    98.78    50.28   149.06    69.15    25.14     94.28
24.0     2.79   106.83    50.28   157.11    74.78    25.14     99.92
25.0     2.91   115.09    50.28   165.36    80.56    25.14    105.70
26.0     3.03   123.54    50.28   173.82    86.48    25.14    111.62
27.0     3.14   132.18    50.28   182.46    92.53    25.14    117.67
28.0     3.26   141.01    50.28   191.29    98.70    25.14    123.84
29.0     3.37   150.01    50.28   200.28   105.00    25.14    130.14
30.0     3.49   159.17    50.28   209.45   111.42    25.14    136.56
31.0     3.61   168.49    50.28   218.77   117.95    25.14    143.08
32.0     3.72   177.97    50.28   228.25   124.58    25.14    149.72
33.0     3.84   187.58    50.28   237.86   131.31    25.14    156.45
34.0     3.96   197.34    50.28   247.62   138.14    25.14    163.28
35.0     4.07   207.22    50.28   257.50   145.06    25.14    170.19
36.0     4.19   217.23    50.28   267.51   152.06    25.14    177.20
37.0     4.31   227.35    50.28   277.63   159.14    25.14    184.28
38.0     4.42   237.58    50.28   287.85   166.30    25.14    191.44
39.0     4.54   247.91    50.28   298.19   173.53    25.14    198.67
40.0     4.65   258.33    50.28   308.61   180.83    25.14    205.97
41.0     4.77   268.85    50.28   319.12   188.19    25.14    213.33
42.0     4.89   279.44    50.28   329.72   195.61    25.14    220.75
43.0     5.00   290.11    50.28   340.39   203.08    25.14    228.22
44.0     5.12   300.86    50.28   351.13   210.60    25.14    235.74
45.0     5.24   311.66    50.28   361.94   218.16    25.14    243.30
46.0     5.35   322.52    50.28   372.80   225.76    25.14    250.90
47.0     5.47   333.43    50.28   383.71   233.40    25.14    258.54
48.0     5.59   344.39    50.28   394.67   241.07    25.14    266.21
49.0     5.70   355.38    50.28   405.66   248.77    25.14    273.91
50.0     5.82   366.41    50.28   416.69   256.49    25.14    281.63
51.0     5.93   377.46    50.28   427.74   264.22    25.14    289.36
52.0     6.05   388.54    50.28   438.82   271.98    25.14    297.12
53.0     6.17   399.63    50.28   449.91   279.74    25.14    304.88
54.0     6.28   410.73    50.28   461.01   287.51    25.14    312.65
55.0     6.40   421.83    50.28   472.11   295.28    25.14    320.42
56.0     6.52   432.94    50.28   483.22   303.06    25.14    328.19
57.0     6.63   444.03    50.28   494.31   310.82    25.14    335.96
58.0     6.75   455.11    50.28   505.39   318.58    25.14    343.72
```

```
59.0      6.87    466.18     50.28   516.46    326.33     25.14     351.46
60.0      6.98    477.22     50.28   527.50    334.05     25.14     359.19
61.0      7.10    488.23     50.28   538.51    341.76     25.14     366.90
62.0      7.21    499.21     44.29   543.50    349.45     22.15     371.59
63.0      7.33    510.15     37.11   547.26    357.10     18.56     375.66
64.0      7.45    521.04     33.52   554.56    364.73     16.76     381.49
65.0      7.56    531.89     33.52   565.40    372.32     16.76     389.08
66.0      7.68    542.67     33.52   576.19    379.87     16.76     396.63
67.0      7.80    553.39     33.52   586.91    387.37     16.76     404.13
68.0      7.91    564.04     33.52   597.56    394.83     16.76     411.59
69.0      8.03    574.61     33.52   608.13    402.23     16.76     418.99
70.0      8.15    585.10     33.52   618.62    409.57     16.76     426.33
71.0      8.26    595.51     33.52   629.03    416.86     16.76     433.62
72.0      8.38    605.83     33.52   639.34    424.08     16.76     440.84
73.0      8.50    616.05     33.52   649.57    431.23     16.76     447.99
74.0      8.61    626.17     33.52   659.69    438.32     16.76     455.08
75.0      8.73    636.19     33.52   669.71    445.33     16.76     462.09
76.0      8.84    646.10     33.52   679.62    452.27     16.76     469.03
77.0      8.96    655.90     33.52   689.42    459.13     16.76     475.89
78.0      9.08    665.58     33.52   699.10    465.90     16.76     482.66
79.0      9.19    675.14     33.52   708.66    472.60     16.76     489.36
80.0      9.31    684.57     33.52   718.09    479.20     16.76     495.96
81.0      9.43    693.87     33.52   727.39    485.71     16.76     502.47
82.0      9.54    703.04     33.52   736.56    492.13     16.76     508.89
83.0      9.66    712.06     33.52   745.58    498.45     16.76     515.20
84.0      9.78    720.95     33.52   754.47    504.66     16.76     521.42
85.0      9.89    729.68     33.52   763.20    510.78     16.76     527.54


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton             IN.
  0.4093E+00      0.2016E-03      0.4888E-03      0.1000E-04
  0.2046E+01      0.1008E-02      0.2444E-02      0.5000E-04
  0.4093E+01      0.2016E-02      0.4888E-02      0.1000E-03
  0.1868E+03      0.9835E-01      0.2444E+00      0.5000E-02
  0.2509E+03      0.1394E+00      0.3666E+00      0.7500E-02
  0.3019E+03      0.1752E+00      0.4888E+00      0.1000E-01
  0.4749E+03      0.3214E+00      0.1222E+01      0.2500E-01
  0.5876E+03      0.4473E+00      0.2444E+01      0.5000E-01
  0.6357E+03      0.5184E+00      0.3666E+01      0.7500E-01
  0.6635E+03      0.5709E+00      0.4888E+01      0.1000E+00
  0.7070E+03      0.7680E+00      0.1196E+02      0.2500E+00
  0.7128E+03      0.1026E+01      0.1929E+02      0.5000E+00
  0.7151E+03      0.1154E+01      0.2208E+02      0.6250E+00
  0.7182E+03      0.1315E+01      0.2575E+02      0.7812E+00
  0.7250E+03      0.1743E+01      0.3402E+02      0.1200E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton             IN.
  0.8008E+00      0.3539E-03      0.6983E-03      0.1000E-04
  0.4004E+01      0.1770E-02      0.3492E-02      0.5000E-04
  0.8008E+01      0.3539E-02      0.6983E-02      0.1000E-03
  0.2998E+03      0.1566E+00      0.3492E+00      0.5000E-02
  0.3737E+03      0.2101E+00      0.5237E+00      0.7500E-02
  0.4276E+03      0.2536E+00      0.6983E+00      0.1000E-01
  0.5904E+03      0.4121E+00      0.1746E+01      0.2500E-01
```

```
  0.6811E+03      0.5289E+00      0.3492E+01      0.5000E-01
  0.7101E+03      0.5848E+00      0.5237E+01      0.7500E-01
  0.7227E+03      0.6234E+00      0.6983E+01      0.1000E+00
  0.7399E+03      0.7940E+00      0.1662E+02      0.2500E+00
  0.7475E+03      0.1054E+01      0.2422E+02      0.5000E+00
  0.7493E+03      0.1181E+01      0.2603E+02      0.6250E+00
  0.7525E+03      0.1341E+01      0.2918E+02      0.7812E+00
  0.7595E+03      0.1769E+01      0.3620E+02      0.1200E+01


   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton             IN.
  0.1771E+00      0.1025E-03      0.2793E-03      0.1000E-04
  0.8856E+00      0.5123E-03      0.1397E-02      0.5000E-04
  0.1771E+01      0.1025E-02      0.2793E-02      0.1000E-03
  0.8879E+02      0.5169E-01      0.1397E+00      0.5000E-02
  0.1292E+03      0.7663E-01      0.2095E+00      0.7500E-02
  0.1661E+03      0.1004E+00      0.2793E+00      0.1000E-01
  0.3280E+03      0.2186E+00      0.6983E+00      0.2500E-01
  0.4715E+03      0.3516E+00      0.1397E+01      0.5000E-01
  0.5490E+03      0.4429E+00      0.2095E+01      0.7500E-01
  0.5984E+03      0.5136E+00      0.2793E+01      0.1000E+00
  0.6742E+03      0.7419E+00      0.7290E+01      0.2500E+00
  0.6781E+03      0.9984E+00      0.1436E+02      0.5000E+00
  0.6809E+03      0.1127E+01      0.1813E+02      0.6250E+00
  0.6840E+03      0.1288E+01      0.2232E+02      0.7812E+00
  0.6905E+03      0.1717E+01      0.3184E+02      0.1200E+01

DRILLED SHAFT INFORMATION
-------------------------

 DIAMETER OF STEM          =    2.500  FT.
 DIAMETER OF BASE          =    2.500  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    5.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    7.069  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.



PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS      QB      QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
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```
 6.0     1.09     3.28    30.57    33.85     2.30    15.28     17.58
 7.0     1.27     7.08    33.71    40.79     4.95    16.85     21.81
 8.0     1.45    11.36    36.85    48.21     7.95    18.43     26.38
 9.0     1.64    16.11    39.99    56.10    11.28    20.00     31.27
10.0     1.82    21.32    43.14    64.45    14.92    21.57     36.49
11.0     2.00    26.96    46.28    73.24    18.87    23.14     42.01
12.0     2.18    33.02    49.42    82.44    23.11    24.71     47.82
13.0     2.36    39.48    52.56    92.05    27.64    26.28     53.92
14.0     2.55    46.34    55.71   102.05    32.44    27.85     60.29
15.0     2.73    53.58    58.85   112.42    37.50    29.42     66.93
16.0     2.91    61.17    61.99   123.16    42.82    31.00     73.82
17.0     3.09    69.12    65.13   134.25    48.38    32.57     80.95
18.0     3.27    77.41    68.28   145.68    54.18    34.14     88.32
19.0     3.45    86.02    71.42   157.43    60.21    35.71     95.92
20.0     3.64    94.94    74.56   169.50    66.46    37.28    103.74
21.0     3.82   104.16    76.85   181.01    72.92    38.42    111.34
22.0     4.00   113.68    78.13   191.81    79.58    39.07    118.64
23.0     4.18   123.47    78.56   202.03    86.43    39.28    125.71
24.0     4.36   133.54    78.56   212.10    93.48    39.28    132.76
25.0     4.55   143.86    78.56   222.42   100.70    39.28    139.98
26.0     4.73   154.42    78.56   232.98   108.10    39.28    147.38
27.0     4.91   165.23    78.56   243.79   115.66    39.28    154.94
28.0     5.09   176.26    78.56   254.82   123.38    39.28    162.66
29.0     5.27   187.51    78.56   266.07   131.25    39.28    170.53
30.0     5.45   198.96    78.56   277.52   139.27    39.28    178.55
31.0     5.64   210.62    78.56   289.18   147.43    39.28    186.71
32.0     5.82   222.46    78.56   301.02   155.72    39.28    195.00
33.0     6.00   234.48    78.56   313.04   164.14    39.28    203.42
34.0     6.18   246.67    78.56   325.23   172.67    39.28    211.95
35.0     6.36   259.03    78.56   337.59   181.32    39.28    220.60
36.0     6.55   271.53    78.56   350.09   190.07    39.28    229.35
37.0     6.73   284.18    78.56   362.74   198.93    39.28    238.21
38.0     6.91   296.97    78.56   375.53   207.88    39.28    247.16
39.0     7.09   309.88    78.56   388.44   216.92    39.28    256.20
40.0     7.27   322.92    78.56   401.48   226.04    39.28    265.32
41.0     7.45   336.06    78.56   414.62   235.24    39.28    274.52
42.0     7.64   349.30    78.56   427.86   244.51    39.28    283.79
43.0     7.82   362.64    78.56   441.20   253.85    39.28    293.13
44.0     8.00   376.07    78.56   454.63   263.25    39.28    302.53
45.0     8.18   389.57    78.56   468.13   272.70    39.28    311.98
46.0     8.36   403.15    78.56   481.71   282.21    39.28    321.49
47.0     8.55   416.79    78.56   495.35   291.75    39.28    331.03
48.0     8.73   430.48    78.56   509.04   301.34    39.28    340.62
49.0     8.91   444.23    78.56   522.79   310.96    39.28    350.24
50.0     9.09   458.01    78.56   536.57   320.61    39.28    359.89
51.0     9.27   471.83    78.56   550.39   330.28    39.28    369.56
52.0     9.46   485.67    78.56   564.23   339.97    39.28    379.25
53.0     9.64   499.54    78.56   578.10   349.68    39.28    388.96
54.0     9.82   513.41    78.56   591.97   359.39    39.28    398.67
55.0    10.00   527.29    78.56   605.85   369.11    39.28    408.38
56.0    10.18   541.17    78.56   619.73   378.82    39.28    418.10
57.0    10.36   555.04    78.56   633.60   388.53    39.28    427.81
58.0    10.55   568.89    78.56   647.45   398.23    39.28    437.51
59.0    10.73   582.72    78.56   661.28   407.91    39.28    447.19
60.0    10.91   596.52    78.56   675.08   417.57    39.28    456.85
61.0    11.09   610.29    71.42   681.71   427.20    35.71    462.91
62.0    11.27   624.01    63.09   687.10   436.81    31.54    468.35
63.0    11.46   637.68    55.94   693.63   446.38    27.97    474.35
64.0    11.64   651.30    52.37   703.68   455.91    26.19    482.10
65.0    11.82   664.86    52.37   717.23   465.40    26.19    491.59
66.0    12.00   678.34    52.37   730.71   474.84    26.19    501.02
67.0    12.18   691.74    52.37   744.11   484.22    26.19    510.40
68.0    12.36   705.05    52.37   757.42   493.53    26.19    519.72
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69.0     12.55   718.26     52.37   770.64   502.78     26.19     528.97
70.0     12.73   731.38     52.37   783.75   511.96     26.19     538.15
71.0     12.91   744.39     52.37   796.76   521.07     26.19     547.26
72.0     13.09   757.28     52.37   809.66   530.10     26.19     556.28
73.0     13.27   770.06     52.37   822.43   539.04     26.19     565.23
74.0     13.46   782.71     52.37   835.09   547.90     26.19     574.09
75.0     13.64   795.24     52.37   847.61   556.67     26.19     582.85
76.0     13.82   807.62     52.37   860.00   565.34     26.19     591.52
77.0     14.00   819.87     52.37   872.25   573.91     26.19     600.10
78.0     14.18   831.97     52.37   884.35   582.38     26.19     608.57
79.0     14.36   843.92     52.37   896.29   590.74     26.19     616.93
80.0     14.55   855.71     52.37   908.08   599.00     26.19     625.18
81.0     14.73   867.34     52.37   919.71   607.14     26.19     633.32
82.0     14.91   878.80     52.37   931.17   615.16     26.19     641.34
83.0     15.09   890.08     52.37   942.45   623.06     26.19     649.24
84.0     15.27   901.19     52.37   953.56   630.83     26.19     657.02


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton            IN.               ton            IN.
  0.2567E+00      0.9605E-04      0.6110E-03      0.1000E-04
  0.1284E+01      0.4803E-03      0.3055E-02      0.5000E-04
  0.2567E+01      0.9605E-03      0.6110E-02      0.1000E-03
  0.1298E+03      0.4859E-01      0.3055E+00      0.5000E-02
  0.1895E+03      0.7227E-01      0.4583E+00      0.7500E-02
  0.2433E+03      0.9491E-01      0.6110E+00      0.1000E-01
  0.4655E+03      0.2054E+00      0.1528E+01      0.2500E-01
  0.6411E+03      0.3191E+00      0.3055E+01      0.5000E-01
  0.7264E+03      0.3912E+00      0.4583E+01      0.7500E-01
  0.7748E+03      0.4438E+00      0.6110E+01      0.1000E+00
  0.8707E+03      0.6539E+00      0.1510E+02      0.2500E+00
  0.8836E+03      0.9143E+00      0.2675E+02      0.5000E+00
  0.8865E+03      0.1042E+01      0.3014E+02      0.6250E+00
  0.8894E+03      0.1169E+01      0.3352E+02      0.7500E+00
  0.9064E+03      0.1934E+01      0.5316E+02      0.1500E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton            IN.               ton            IN.
  0.4514E+00      0.1507E-03      0.8729E-03      0.1000E-04
  0.2257E+01      0.7534E-03      0.4364E-02      0.5000E-04
  0.4514E+01      0.1507E-02      0.8729E-02      0.1000E-03
  0.2213E+03      0.7574E-01      0.4364E+00      0.5000E-02
  0.3093E+03      0.1103E+00      0.6547E+00      0.7500E-02
  0.3807E+03      0.1415E+00      0.8729E+00      0.1000E-01
  0.6297E+03      0.2763E+00      0.2182E+01      0.2500E-01
  0.7883E+03      0.3934E+00      0.4364E+01      0.5000E-01
  0.8498E+03      0.4575E+00      0.6547E+01      0.7500E-01
  0.8764E+03      0.4998E+00      0.8729E+01      0.1000E+00
  0.9141E+03      0.6764E+00      0.2112E+02      0.2500E+00
  0.9288E+03      0.9381E+00      0.3588E+02      0.5000E+00
  0.9308E+03      0.1065E+01      0.3784E+02      0.6250E+00
  0.9328E+03      0.1191E+01      0.3980E+02      0.7500E+00
  0.9495E+03      0.1954E+01      0.5656E+02      0.1500E+01
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   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton             IN.
  0.1258E+00      0.5601E-04      0.3492E-03      0.1000E-04
  0.6292E+00      0.2801E-03      0.1746E-02      0.5000E-04
  0.1258E+01      0.5601E-03      0.3492E-02      0.1000E-03
  0.6361E+02      0.2817E-01      0.1746E+00      0.5000E-02
  0.9535E+02      0.4232E-01      0.2619E+00      0.7500E-02
  0.1260E+03      0.5632E-01      0.3492E+00      0.1000E-01
  0.2844E+03      0.1343E+00      0.8729E+00      0.2500E-01
  0.4618E+03      0.2363E+00      0.1746E+01      0.5000E-01
  0.5784E+03      0.3164E+00      0.2619E+01      0.7500E-01
  0.6573E+03      0.3816E+00      0.3492E+01      0.1000E+00
  0.8271E+03      0.6312E+00      0.9078E+01      0.2500E+00
  0.8383E+03      0.8906E+00      0.1763E+02      0.5000E+00
  0.8422E+03      0.1019E+01      0.2243E+02      0.6250E+00
  0.8461E+03      0.1147E+01      0.2723E+02      0.7500E+00
  0.8633E+03      0.1913E+01      0.4975E+02      0.1500E+01


DRILLED SHAFT INFORMATION
-------------------------

 DIAMETER OF STEM          =    3.000  FT.
 DIAMETER OF BASE          =    3.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    5.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =   10.180  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.



PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS      QB      QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
 6.0     1.57     3.94    38.85    42.79     2.76    19.43     22.18
 7.0     1.83     8.49    42.62    51.11     5.94    21.31     27.26
 8.0     2.09    13.63    46.39    60.02     9.54    23.20     32.74
 9.0     2.36    19.33    50.16    69.50    13.53    25.08     38.61
10.0     2.62    25.58    53.93    79.51    17.90    26.97     44.87
11.0     2.88    32.35    57.71    90.05    22.64    28.85     51.50
12.0     3.14    39.62    61.48   101.10    27.74    30.74     58.47
13.0     3.40    47.38    65.25   112.63    33.17    32.62     65.79
14.0     3.67    55.61    69.02   124.63    38.93    34.51     73.44
15.0     3.93    64.29    72.79   137.08    45.00    36.39     81.40
16.0     4.19    73.41    76.56   149.97    51.39    38.28     89.67
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17.0     4.45    82.95    80.33   163.28    58.06    40.17     98.23
18.0     4.71    92.89    84.10   176.99    65.02    42.05    107.07
19.0     4.97   103.22    87.87   191.09    72.25    43.94    116.19
20.0     5.24   113.93    91.64   205.57    79.75    45.82    125.57
21.0     5.50   125.00    95.41   220.41    87.50    47.71    135.21
22.0     5.76   136.42    99.19   235.60    95.49    49.59    145.08
23.0     6.02   148.17   102.96   251.12   103.72    51.48    155.20
24.0     6.28   160.24   106.73   266.97   112.17    53.36    165.53
25.0     6.55   172.63   109.70   282.33   120.84    54.85    175.69
26.0     6.81   185.31   111.75   297.06   129.72    55.88    185.59
27.0     7.07   198.27   112.78   311.06   138.79    56.39    195.18
28.0     7.33   211.51   113.13   324.64   148.06    56.56    204.62
29.0     7.59   225.01   113.13   338.13   157.51    56.56    214.07
30.0     7.86   238.76   113.13   351.88   167.13    56.56    223.69
31.0     8.12   252.74   113.13   365.87   176.92    56.56    233.48
32.0     8.38   266.95   113.13   380.08   186.87    56.56    243.43
33.0     8.64   281.38   113.13   394.50   196.96    56.56    253.53
34.0     8.90   296.01   113.13   409.13   207.21    56.56    263.77
35.0     9.16   310.83   113.13   423.96   217.58    56.56    274.15
36.0     9.43   325.84   113.13   438.97   228.09    56.56    284.65
37.0     9.69   341.02   113.13   454.15   238.71    56.56    295.28
38.0     9.95   356.36   113.13   469.49   249.45    56.56    306.02
39.0    10.21   371.86   113.13   484.99   260.30    56.56    316.87
40.0    10.47   387.50   113.13   500.62   271.25    56.56    327.81
41.0    10.74   403.27   113.13   516.40   282.29    56.56    338.85
42.0    11.00   419.16   113.13   532.29   293.41    56.56    349.98
43.0    11.26   435.17   113.13   548.30   304.62    56.56    361.18
44.0    11.52   451.28   113.13   564.41   315.90    56.56    372.46
45.0    11.78   467.49   113.13   580.62   327.24    56.56    383.81
46.0    12.04   483.78   113.13   596.91   338.65    56.56    395.21
47.0    12.31   500.15   113.13   613.27   350.10    56.56    406.67
48.0    12.57   516.58   113.13   629.71   361.61    56.56    418.17
49.0    12.83   533.07   113.13   646.20   373.15    56.56    429.71
50.0    13.09   549.61   113.13   662.74   384.73    56.56    441.29
51.0    13.35   566.20   113.13   679.32   396.34    56.56    452.90
52.0    13.62   582.81   113.13   695.94   407.97    56.56    464.53
53.0    13.88   599.44   113.13   712.57   419.61    56.56    476.17
54.0    14.14   616.10   113.13   729.22   431.27    56.56    487.83
55.0    14.40   632.75   113.13   745.88   442.93    56.56    499.49
56.0    14.66   649.41   113.13   762.53   454.58    56.56    511.15
57.0    14.92   666.05   113.13   779.17   466.23    56.56    522.80
58.0    15.19   682.67   113.13   795.80   477.87    56.56    534.43
59.0    15.45   699.27   113.13   812.39   489.49    56.56    546.05
60.0    15.71   715.83   105.13   820.96   501.08    52.56    553.64
61.0    15.97   732.35    95.99   828.33   512.64    47.99    560.64
62.0    16.23   748.81    85.70   834.52   524.17    42.85    567.02
63.0    16.50   765.22    78.85   844.07   535.66    39.42    575.08
64.0    16.76   781.56    75.42   856.98   547.09    37.71    584.80
65.0    17.02   797.83    75.42   873.25   558.48    37.71    596.19
66.0    17.28   814.01    75.42   889.42   569.80    37.71    607.51
67.0    17.54   830.09    75.42   905.50   581.06    37.71    618.77
68.0    17.80   846.06    75.42   921.47   592.24    37.71    629.95
69.0    18.07   861.92    75.42   937.33   603.34    37.71    641.05
70.0    18.33   877.65    75.42   953.07   614.36    37.71    652.07
71.0    18.59   893.26    75.42   968.68   625.28    37.71    662.99
72.0    18.85   908.74    75.42   984.16   636.12    37.71    673.83
73.0    19.11   924.07    75.42   999.49   646.85    37.71    684.56
74.0    19.38   939.26    75.42  1014.67   657.48    37.71    695.19
75.0    19.64   954.28    75.42  1029.70   668.00    37.71    705.71
76.0    19.90   969.15    75.42  1044.57   678.40    37.71    716.11
77.0    20.16   983.85    75.42  1059.26   688.69    37.71    726.40
78.0    20.42   998.37    75.42  1073.78   698.86    37.71    736.57
79.0    20.68  1012.71    75.42  1088.12   708.89    37.71    746.60
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```
80.0    20.95  1026.85    75.42  1102.27   718.80    37.71    756.51
81.0    21.21  1040.81    75.42  1116.22   728.56    37.71    766.27
82.0    21.47  1054.56    75.42  1129.97   738.19    37.71    775.90
83.0    21.73  1068.10    75.42  1143.51   747.67    37.71    785.38


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton            IN.
  0.1937E+00      0.5850E-04      0.7332E-03      0.1000E-04
  0.9685E+00      0.2925E-03      0.3666E-02      0.5000E-04
  0.1937E+01      0.5850E-03      0.7332E-02      0.1000E-03
  0.9800E+02      0.2944E-01      0.3666E+00      0.5000E-02
  0.1471E+03      0.4424E-01      0.5499E+00      0.7500E-02
  0.1946E+03      0.5893E-01      0.7332E+00      0.1000E-01
  0.4300E+03      0.1398E+00      0.1833E+01      0.2500E-01
  0.6543E+03      0.2373E+00      0.3666E+01      0.5000E-01
  0.7830E+03      0.3079E+00      0.5499E+01      0.7500E-01
  0.8586E+03      0.3605E+00      0.7332E+01      0.1000E+00
  0.1023E+04      0.5755E+00      0.1818E+02      0.2500E+00
  0.1051E+04      0.8399E+00      0.3423E+02      0.5000E+00
  0.1055E+04      0.9672E+00      0.3934E+02      0.6250E+00
  0.1063E+04      0.1247E+01      0.4827E+02      0.9000E+00
  0.1088E+04      0.2161E+01      0.7655E+02      0.1800E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton            IN.
  0.3179E+00      0.8495E-04      0.1047E-02      0.1000E-04
  0.1589E+01      0.4248E-03      0.5237E-02      0.5000E-04
  0.3179E+01      0.8495E-03      0.1047E-01      0.1000E-03
  0.1617E+03      0.4298E-01      0.5237E+00      0.5000E-02
  0.2391E+03      0.6433E-01      0.7856E+00      0.7500E-02
  0.3111E+03      0.8505E-01      0.1047E+01      0.1000E-01
  0.6181E+03      0.1904E+00      0.2619E+01      0.2500E-01
  0.8524E+03      0.2997E+00      0.5237E+01      0.5000E-01
  0.9626E+03      0.3695E+00      0.7856E+01      0.7500E-01
  0.1014E+04      0.4162E+00      0.1047E+02      0.1000E+00
  0.1084E+04      0.5982E+00      0.2560E+02      0.2500E+00
  0.1106E+04      0.8600E+00      0.4735E+02      0.5000E+00
  0.1111E+04      0.9876E+00      0.5213E+02      0.6250E+00
  0.1116E+04      0.1265E+01      0.5732E+02      0.9000E+00
  0.1140E+04      0.2179E+01      0.8145E+02      0.1800E+01


   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton            IN.
  0.1027E+00      0.3754E-04      0.4190E-03      0.1000E-04
  0.5133E+00      0.1877E-03      0.2095E-02      0.5000E-04
  0.1027E+01      0.3754E-03      0.4190E-02      0.1000E-03
  0.5160E+02      0.1881E-01      0.2095E+00      0.5000E-02
  0.7759E+02      0.2825E-01      0.3142E+00      0.7500E-02
  0.1036E+03      0.3771E-01      0.4190E+00      0.1000E-01
  0.2493E+03      0.9311E-01      0.1047E+01      0.2500E-01
  0.4345E+03      0.1727E+00      0.2095E+01      0.5000E-01
```

```
0.5735E+03       0.2408E+00       0.3142E+01       0.7500E-01
0.6784E+03       0.2995E+00       0.4190E+01       0.1000E+00
0.9601E+03       0.5524E+00       0.1077E+02       0.2500E+00
0.9968E+03       0.8199E+00       0.2112E+02       0.5000E+00
0.9995E+03       0.9467E+00       0.2654E+02       0.6250E+00
0.1010E+04       0.1228E+01       0.3922E+02       0.9000E+00
0.1036E+04       0.2144E+01       0.7165E+02       0.1800E+01
```

```
     =========================================================================

                      SHAFT for Windows, Version 2012.7.9

                       Serial Number :  297192525

                    VERTICALLY LOADED DRILLED SHAFT ANALYSIS
                     (c) Copyright ENSOFT, Inc., 1987-2012
                           All Rights Reserved

     =========================================================================


     Path to file locations      : U:\PROJECT FILES\20151065.001A - Torrey Meadows
Drive Bridge\Calculations\Foundations\Shaft\
     Name of input data file     : Abut 3 Downward_(Extreme Event Case).sfd
     Name of output file         : Abut 3 Downward_(Extreme Event Case).sfo
     Name of plot output file    : Abut 3 Downward_(Extreme Event Case).sfp
     Name of runtime file        : Abut 3 Downward_(Extreme Event Case).sfr


     -------------------------------------------------------------------------
                          Time and Date of Analysis
     -------------------------------------------------------------------------

               Date:  November 05, 2014     Time:  09:58:43

     Torrey Meadows Dr. OC - Abut 3 (Extreme Event)


     PROPOSED DEPTH =      90.0 FT
     ----------------


     NUMBER OF LAYERS =    2
     ------------------


     WATER TABLE DEPTH =     110.0 FT.
     -------------------




     SOIL INFORMATION
     ---------------

     LAYER NO 1----SAND

       AT THE TOP

       SKIN FRICTION COEFFICIENT- BETA                   = 0.120E+01
       UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.000E+00
       INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
       BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.350E+02
       SOIL UNIT WEIGHT, LB/CU FT                        = 0.130E+03
       MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
       DEPTH, FT                                         = 0.000E+00


       AT THE BOTTOM

       SKIN FRICTION COEFFICIENT- BETA                   = 0.412E+00
```

```
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                     = 0.360E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.350E+02
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.130E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.650E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.100E+01
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.100E+01


LAYER NO 2----SAND

  AT THE TOP

  SKIN FRICTION COEFFICIENT- BETA                   = 0.412E+00
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.100E+03
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.650E+02


  AT THE BOTTOM

  SKIN FRICTION COEFFICIENT- BETA                   = 0.250E+00
  UNDRAINED SHEAR STRENGTH, LB/SQ FT                = 0.000E+00
  INTERNAL FRICTION ANGLE, DEG.                     = 0.340E+02
  BLOWS PER FOOT FROM STANDARD PENETRATION TEST     = 0.100E+03
  SOIL UNIT WEIGHT, LB/CU FT                        = 0.125E+03
  MAXIMUM LOAD TRANSFER FOR SOIL, LB/SQ FT          = 0.100E+11
  DEPTH, FT                                         = 0.900E+02


  LRFD RESISTANCE FACTOR (SIDE FRICTION)            = 0.100E+01
  LRFD RESISTANCE FACTOR (TIP RESISTANCE)           = 0.100E+01



DRILLED SHAFT INFORMATION
-------------------------

 DIAMETER OF STEM          =    2.000  FT.
 DIAMETER OF BASE          =    2.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    5.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =    4.524  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.



PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
```

```
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS       QB      QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
  6.0     0.70     2.63    22.98    25.61     2.63    22.98     25.61
  7.0     0.81     5.66    25.50    31.16     5.66    25.50     31.16
  8.0     0.93     9.09    28.01    37.10     9.09    28.01     37.10
  9.0     1.05    12.89    30.53    43.41    12.89    30.53     43.41
 10.0     1.16    17.05    33.04    50.09    17.05    33.04     50.09
 11.0     1.28    21.57    35.55    57.12    21.57    35.55     57.12
 12.0     1.40    26.41    38.07    64.48    26.41    38.07     64.48
 13.0     1.51    31.59    40.58    72.17    31.59    40.58     72.17
 14.0     1.63    37.07    43.10    80.17    37.07    43.10     80.17
 15.0     1.75    42.86    45.61    88.47    42.86    45.61     88.47
 16.0     1.86    48.94    48.12    97.06    48.94    48.12     97.06
 17.0     1.98    55.30    49.74   105.04    55.30    49.74    105.04
 18.0     2.09    61.92    50.28   112.20    61.92    50.28    112.20
 19.0     2.21    68.81    50.28   119.09    68.81    50.28    119.09
 20.0     2.33    75.95    50.28   126.23    75.95    50.28    126.23
 21.0     2.44    83.33    50.28   133.61    83.33    50.28    133.61
 22.0     2.56    90.94    50.28   141.22    90.94    50.28    141.22
 23.0     2.68    98.78    50.28   149.06    98.78    50.28    149.06
 24.0     2.79   106.83    50.28   157.11   106.83    50.28    157.11
 25.0     2.91   115.09    50.28   165.36   115.09    50.28    165.36
 26.0     3.03   123.54    50.28   173.82   123.54    50.28    173.82
 27.0     3.14   132.18    50.28   182.46   132.18    50.28    182.46
 28.0     3.26   141.01    50.28   191.29   141.01    50.28    191.29
 29.0     3.37   150.01    50.28   200.28   150.01    50.28    200.28
 30.0     3.49   159.17    50.28   209.45   159.17    50.28    209.45
 31.0     3.61   168.49    50.28   218.77   168.49    50.28    218.77
 32.0     3.72   177.97    50.28   228.25   177.97    50.28    228.25
 33.0     3.84   187.58    50.28   237.86   187.58    50.28    237.86
 34.0     3.96   197.34    50.28   247.62   197.34    50.28    247.62
 35.0     4.07   207.22    50.28   257.50   207.22    50.28    257.50
 36.0     4.19   217.23    50.28   267.51   217.23    50.28    267.51
 37.0     4.31   227.35    50.28   277.63   227.35    50.28    277.63
 38.0     4.42   237.58    50.28   287.85   237.58    50.28    287.85
 39.0     4.54   247.91    50.28   298.19   247.91    50.28    298.19
 40.0     4.65   258.33    50.28   308.61   258.33    50.28    308.61
 41.0     4.77   268.85    50.28   319.12   268.85    50.28    319.12
 42.0     4.89   279.44    50.28   329.72   279.44    50.28    329.72
 43.0     5.00   290.11    50.28   340.39   290.11    50.28    340.39
 44.0     5.12   300.86    50.28   351.13   300.86    50.28    351.13
 45.0     5.24   311.66    50.28   361.94   311.66    50.28    361.94
 46.0     5.35   322.52    50.28   372.80   322.52    50.28    372.80
 47.0     5.47   333.43    50.28   383.71   333.43    50.28    383.71
 48.0     5.59   344.39    50.28   394.67   344.39    50.28    394.67
 49.0     5.70   355.38    50.28   405.66   355.38    50.28    405.66
 50.0     5.82   366.41    50.28   416.69   366.41    50.28    416.69
 51.0     5.93   377.46    50.28   427.74   377.46    50.28    427.74
 52.0     6.05   388.54    50.28   438.82   388.54    50.28    438.82
 53.0     6.17   399.63    50.28   449.91   399.63    50.28    449.91
 54.0     6.28   410.73    50.28   461.01   410.73    50.28    461.01
 55.0     6.40   421.83    50.28   472.11   421.83    50.28    472.11
 56.0     6.52   432.94    50.28   483.22   432.94    50.28    483.22
 57.0     6.63   444.03    50.28   494.31   444.03    50.28    494.31
 58.0     6.75   455.11    50.28   505.39   455.11    50.28    505.39
```

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59.0      6.87   466.18    50.28   516.46   466.18    50.28    516.46
60.0      6.98   477.22    50.28   527.50   477.22    50.28    527.50
61.0      7.10   488.23    50.28   538.51   488.23    50.28    538.51
62.0      7.21   499.21    44.29   543.50   499.21    44.29    543.50
63.0      7.33   510.15    37.11   547.26   510.15    37.11    547.26
64.0      7.45   521.04    33.52   554.56   521.04    33.52    554.56
65.0      7.56   531.89    33.52   565.40   531.89    33.52    565.40
66.0      7.68   542.67    33.52   576.19   542.67    33.52    576.19
67.0      7.80   553.39    33.52   586.91   553.39    33.52    586.91
68.0      7.91   564.04    33.52   597.56   564.04    33.52    597.56
69.0      8.03   574.61    33.52   608.13   574.61    33.52    608.13
70.0      8.15   585.10    33.52   618.62   585.10    33.52    618.62
71.0      8.26   595.51    33.52   629.03   595.51    33.52    629.03
72.0      8.38   605.83    33.52   639.34   605.83    33.52    639.34
73.0      8.50   616.05    33.52   649.57   616.05    33.52    649.57
74.0      8.61   626.17    33.52   659.69   626.17    33.52    659.69
75.0      8.73   636.19    33.52   669.71   636.19    33.52    669.71
76.0      8.84   646.10    33.52   679.62   646.10    33.52    679.62
77.0      8.96   655.90    33.52   689.42   655.90    33.52    689.42
78.0      9.08   665.58    33.52   699.10   665.58    33.52    699.10
79.0      9.19   675.14    33.52   708.66   675.14    33.52    708.66
80.0      9.31   684.57    33.52   718.09   684.57    33.52    718.09
81.0      9.43   693.87    33.52   727.39   693.87    33.52    727.39
82.0      9.54   703.04    33.52   736.56   703.04    33.52    736.56
83.0      9.66   712.06    33.52   745.58   712.06    33.52    745.58
84.0      9.78   720.95    33.52   754.47   720.95    33.52    754.47
85.0      9.89   729.68    33.52   763.20   729.68    33.52    763.20


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton            IN.
  0.4093E+00      0.2016E-03      0.4888E-03     0.1000E-04
  0.2046E+01      0.1008E-02      0.2444E-02     0.5000E-04
  0.4093E+01      0.2016E-02      0.4888E-02     0.1000E-03
  0.1868E+03      0.9835E-01      0.2444E+00     0.5000E-02
  0.2509E+03      0.1394E+00      0.3666E+00     0.7500E-02
  0.3019E+03      0.1752E+00      0.4888E+00     0.1000E-01
  0.4749E+03      0.3214E+00      0.1222E+01     0.2500E-01
  0.5876E+03      0.4473E+00      0.2444E+01     0.5000E-01
  0.6357E+03      0.5184E+00      0.3666E+01     0.7500E-01
  0.6635E+03      0.5709E+00      0.4888E+01     0.1000E+00
  0.7070E+03      0.7680E+00      0.1196E+02     0.2500E+00
  0.7128E+03      0.1026E+01      0.1929E+02     0.5000E+00
  0.7151E+03      0.1154E+01      0.2208E+02     0.6250E+00
  0.7182E+03      0.1315E+01      0.2575E+02     0.7812E+00
  0.7250E+03      0.1743E+01      0.3402E+02     0.1200E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton            IN.
  0.8008E+00      0.3539E-03      0.6983E-03     0.1000E-04
  0.4004E+01      0.1770E-02      0.3492E-02     0.5000E-04
  0.8008E+01      0.3539E-02      0.6983E-02     0.1000E-03
  0.2998E+03      0.1566E+00      0.3492E+00     0.5000E-02
  0.3737E+03      0.2101E+00      0.5237E+00     0.7500E-02
  0.4276E+03      0.2536E+00      0.6983E+00     0.1000E-01
  0.5904E+03      0.4121E+00      0.1746E+01     0.2500E-01
```

```
  0.6811E+03       0.5289E+00       0.3492E+01       0.5000E-01
  0.7101E+03       0.5848E+00       0.5237E+01       0.7500E-01
  0.7227E+03       0.6234E+00       0.6983E+01       0.1000E+00
  0.7399E+03       0.7940E+00       0.1662E+02       0.2500E+00
  0.7475E+03       0.1054E+01       0.2422E+02       0.5000E+00
  0.7493E+03       0.1181E+01       0.2603E+02       0.6250E+00
  0.7525E+03       0.1341E+01       0.2918E+02       0.7812E+00
  0.7595E+03       0.1769E+01       0.3620E+02       0.1200E+01


   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton            IN.              ton             IN.
  0.1771E+00       0.1025E-03       0.2793E-03       0.1000E-04
  0.8856E+00       0.5123E-03       0.1397E-02       0.5000E-04
  0.1771E+01       0.1025E-02       0.2793E-02       0.1000E-03
  0.8879E+02       0.5169E-01       0.1397E+00       0.5000E-02
  0.1292E+03       0.7663E-01       0.2095E+00       0.7500E-02
  0.1661E+03       0.1004E+00       0.2793E+00       0.1000E-01
  0.3280E+03       0.2186E+00       0.6983E+00       0.2500E-01
  0.4715E+03       0.3516E+00       0.1397E+01       0.5000E-01
  0.5490E+03       0.4429E+00       0.2095E+01       0.7500E-01
  0.5984E+03       0.5136E+00       0.2793E+01       0.1000E+00
  0.6742E+03       0.7419E+00       0.7290E+01       0.2500E+00
  0.6781E+03       0.9984E+00       0.1436E+02       0.5000E+00
  0.6809E+03       0.1127E+01       0.1813E+02       0.6250E+00
  0.6840E+03       0.1288E+01       0.2232E+02       0.7812E+00
  0.6905E+03       0.1717E+01       0.3184E+02       0.1200E+01

DRILLED SHAFT INFORMATION
-------------------------

 DIAMETER OF STEM           =    2.500  FT.
 DIAMETER OF BASE           =    2.500  FT.
 END OF STEM TO BASE        =    0.000  FT.
 ANGLE OF BELL              =    0.000  DEG.
 IGNORED TOP PORTION        =    5.000  FT.
 IGNORED BOTTOM PORTION     =    0.000  FT.
 AREA OF ONE PERCENT STEEL =     7.069  SQ.IN.
 ELASTIC MODULUS, Ec        = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM        =    0.000  CU.YDS.



PREDICTED RESULTS
-----------------

QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS      QB      QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)   (TONS)   (TONS)    (TONS)
```

```
   6.0     1.09     3.28    30.57    33.85     3.28    30.57     33.85
   7.0     1.27     7.08    33.71    40.79     7.08    33.71     40.79
   8.0     1.45    11.36    36.85    48.21    11.36    36.85     48.21
   9.0     1.64    16.11    39.99    56.10    16.11    39.99     56.10
  10.0     1.82    21.32    43.14    64.45    21.32    43.14     64.45
  11.0     2.00    26.96    46.28    73.24    26.96    46.28     73.24
  12.0     2.18    33.02    49.42    82.44    33.02    49.42     82.44
  13.0     2.36    39.48    52.56    92.05    39.48    52.56     92.05
  14.0     2.55    46.34    55.71   102.05    46.34    55.71    102.05
  15.0     2.73    53.58    58.85   112.42    53.58    58.85    112.42
  16.0     2.91    61.17    61.99   123.16    61.17    61.99    123.16
  17.0     3.09    69.12    65.13   134.25    69.12    65.13    134.25
  18.0     3.27    77.41    68.28   145.68    77.41    68.28    145.68
  19.0     3.45    86.02    71.42   157.43    86.02    71.42    157.43
  20.0     3.64    94.94    74.56   169.50    94.94    74.56    169.50
  21.0     3.82   104.16    76.85   181.01   104.16    76.85    181.01
  22.0     4.00   113.68    78.13   191.81   113.68    78.13    191.81
  23.0     4.18   123.47    78.56   202.03   123.47    78.56    202.03
  24.0     4.36   133.54    78.56   212.10   133.54    78.56    212.10
  25.0     4.55   143.86    78.56   222.42   143.86    78.56    222.42
  26.0     4.73   154.42    78.56   232.98   154.42    78.56    232.98
  27.0     4.91   165.23    78.56   243.79   165.23    78.56    243.79
  28.0     5.09   176.26    78.56   254.82   176.26    78.56    254.82
  29.0     5.27   187.51    78.56   266.07   187.51    78.56    266.07
  30.0     5.45   198.96    78.56   277.52   198.96    78.56    277.52
  31.0     5.64   210.62    78.56   289.18   210.62    78.56    289.18
  32.0     5.82   222.46    78.56   301.02   222.46    78.56    301.02
  33.0     6.00   234.48    78.56   313.04   234.48    78.56    313.04
  34.0     6.18   246.67    78.56   325.23   246.67    78.56    325.23
  35.0     6.36   259.03    78.56   337.59   259.03    78.56    337.59
  36.0     6.55   271.53    78.56   350.09   271.53    78.56    350.09
  37.0     6.73   284.18    78.56   362.74   284.18    78.56    362.74
  38.0     6.91   296.97    78.56   375.53   296.97    78.56    375.53
  39.0     7.09   309.88    78.56   388.44   309.88    78.56    388.44
  40.0     7.27   322.92    78.56   401.48   322.92    78.56    401.48
  41.0     7.45   336.06    78.56   414.62   336.06    78.56    414.62
  42.0     7.64   349.30    78.56   427.86   349.30    78.56    427.86
  43.0     7.82   362.64    78.56   441.20   362.64    78.56    441.20
  44.0     8.00   376.07    78.56   454.63   376.07    78.56    454.63
  45.0     8.18   389.57    78.56   468.13   389.57    78.56    468.13
  46.0     8.36   403.15    78.56   481.71   403.15    78.56    481.71
  47.0     8.55   416.79    78.56   495.35   416.79    78.56    495.35
  48.0     8.73   430.48    78.56   509.04   430.48    78.56    509.04
  49.0     8.91   444.23    78.56   522.79   444.23    78.56    522.79
  50.0     9.09   458.01    78.56   536.57   458.01    78.56    536.57
  51.0     9.27   471.83    78.56   550.39   471.83    78.56    550.39
  52.0     9.46   485.67    78.56   564.23   485.67    78.56    564.23
  53.0     9.64   499.54    78.56   578.10   499.54    78.56    578.10
  54.0     9.82   513.41    78.56   591.97   513.41    78.56    591.97
  55.0    10.00   527.29    78.56   605.85   527.29    78.56    605.85
  56.0    10.18   541.17    78.56   619.73   541.17    78.56    619.73
  57.0    10.36   555.04    78.56   633.60   555.04    78.56    633.60
  58.0    10.55   568.89    78.56   647.45   568.89    78.56    647.45
  59.0    10.73   582.72    78.56   661.28   582.72    78.56    661.28
  60.0    10.91   596.52    78.56   675.08   596.52    78.56    675.08
  61.0    11.09   610.29    71.42   681.71   610.29    71.42    681.71
  62.0    11.27   624.01    63.09   687.10   624.01    63.09    687.10
  63.0    11.46   637.68    55.94   693.63   637.68    55.94    693.63
  64.0    11.64   651.30    52.37   703.68   651.30    52.37    703.68
  65.0    11.82   664.86    52.37   717.23   664.86    52.37    717.23
  66.0    12.00   678.34    52.37   730.71   678.34    52.37    730.71
  67.0    12.18   691.74    52.37   744.11   691.74    52.37    744.11
  68.0    12.36   705.05    52.37   757.42   705.05    52.37    757.42
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69.0    12.55   718.26    52.37   770.64   718.26    52.37    770.64
70.0    12.73   731.38    52.37   783.75   731.38    52.37    783.75
71.0    12.91   744.39    52.37   796.76   744.39    52.37    796.76
72.0    13.09   757.28    52.37   809.66   757.28    52.37    809.66
73.0    13.27   770.06    52.37   822.43   770.06    52.37    822.43
74.0    13.46   782.71    52.37   835.09   782.71    52.37    835.09
75.0    13.64   795.24    52.37   847.61   795.24    52.37    847.61
76.0    13.82   807.62    52.37   860.00   807.62    52.37    860.00
77.0    14.00   819.87    52.37   872.25   819.87    52.37    872.25
78.0    14.18   831.97    52.37   884.35   831.97    52.37    884.35
79.0    14.36   843.92    52.37   896.29   843.92    52.37    896.29
80.0    14.55   855.71    52.37   908.08   855.71    52.37    908.08
81.0    14.73   867.34    52.37   919.71   867.34    52.37    919.71
82.0    14.91   878.80    52.37   931.17   878.80    52.37    931.17
83.0    15.09   890.08    52.37   942.45   890.08    52.37    942.45
84.0    15.27   901.19    52.37   953.56   901.19    52.37    953.56


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton            IN.              ton             IN.
  0.2567E+00      0.9605E-04      0.6110E-03      0.1000E-04
  0.1284E+01      0.4803E-03      0.3055E-02      0.5000E-04
  0.2567E+01      0.9605E-03      0.6110E-02      0.1000E-03
  0.1298E+03      0.4859E-01      0.3055E+00      0.5000E-02
  0.1895E+03      0.7227E-01      0.4583E+00      0.7500E-02
  0.2433E+03      0.9491E-01      0.6110E+00      0.1000E-01
  0.4655E+03      0.2054E+00      0.1528E+01      0.2500E-01
  0.6411E+03      0.3191E+00      0.3055E+01      0.5000E-01
  0.7264E+03      0.3912E+00      0.4583E+01      0.7500E-01
  0.7748E+03      0.4438E+00      0.6110E+01      0.1000E+00
  0.8707E+03      0.6539E+00      0.1510E+02      0.2500E+00
  0.8836E+03      0.9143E+00      0.2675E+02      0.5000E+00
  0.8865E+03      0.1042E+01      0.3014E+02      0.6250E+00
  0.8894E+03      0.1169E+01      0.3352E+02      0.7500E+00
  0.9064E+03      0.1934E+01      0.5316E+02      0.1500E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton            IN.              ton             IN.
  0.4514E+00      0.1507E-03      0.8729E-03      0.1000E-04
  0.2257E+01      0.7534E-03      0.4364E-02      0.5000E-04
  0.4514E+01      0.1507E-02      0.8729E-02      0.1000E-03
  0.2213E+03      0.7574E-01      0.4364E+00      0.5000E-02
  0.3093E+03      0.1103E+00      0.6547E+00      0.7500E-02
  0.3807E+03      0.1415E+00      0.8729E+00      0.1000E-01
  0.6297E+03      0.2763E+00      0.2182E+01      0.2500E-01
  0.7883E+03      0.3934E+00      0.4364E+01      0.5000E-01
  0.8498E+03      0.4575E+00      0.6547E+01      0.7500E-01
  0.8764E+03      0.4998E+00      0.8729E+01      0.1000E+00
  0.9141E+03      0.6764E+00      0.2112E+02      0.2500E+00
  0.9288E+03      0.9381E+00      0.3588E+02      0.5000E+00
  0.9308E+03      0.1065E+01      0.3784E+02      0.6250E+00
  0.9328E+03      0.1191E+01      0.3980E+02      0.7500E+00
  0.9495E+03      0.1954E+01      0.5656E+02      0.1500E+01
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   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.              ton             IN.
  0.1258E+00      0.5601E-04      0.3492E-03      0.1000E-04
  0.6292E+00      0.2801E-03      0.1746E-02      0.5000E-04
  0.1258E+01      0.5601E-03      0.3492E-02      0.1000E-03
  0.6361E+02      0.2817E-01      0.1746E+00      0.5000E-02
  0.9535E+02      0.4232E-01      0.2619E+00      0.7500E-02
  0.1260E+03      0.5632E-01      0.3492E+00      0.1000E-01
  0.2844E+03      0.1343E+00      0.8729E+00      0.2500E-01
  0.4618E+03      0.2363E+00      0.1746E+01      0.5000E-01
  0.5784E+03      0.3164E+00      0.2619E+01      0.7500E-01
  0.6573E+03      0.3816E+00      0.3492E+01      0.1000E+00
  0.8271E+03      0.6312E+00      0.9078E+01      0.2500E+00
  0.8383E+03      0.8906E+00      0.1763E+02      0.5000E+00
  0.8422E+03      0.1019E+01      0.2243E+02      0.6250E+00
  0.8461E+03      0.1147E+01      0.2723E+02      0.7500E+00
  0.8633E+03      0.1913E+01      0.4975E+02      0.1500E+01


DRILLED SHAFT INFORMATION
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 DIAMETER OF STEM          =    3.000  FT.
 DIAMETER OF BASE          =    3.000  FT.
 END OF STEM TO BASE       =    0.000  FT.
 ANGLE OF BELL             =    0.000  DEG.
 IGNORED TOP PORTION       =    5.000  FT.
 IGNORED BOTTOM PORTION    =    0.000  FT.
 AREA OF ONE PERCENT STEEL =   10.180  SQ.IN.
 ELASTIC MODULUS, Ec       = 0.360E+07 LB/SQ IN
 VOLUME OF UNDERREAM       =    0.000  CU.YDS.




PREDICTED RESULTS
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QS      = ULTIMATE SIDE RESISTANCE;
QB      = ULTIMATE BASE RESISTANCE;
WT      = WEIGHT OF DRILLED SHAFT (UPLIFT CAPACITY ONLY);
QU      = TOTAL ULTIMATE RESISTANCE;
LRFD QS = TOTAL SIDE FRICTION USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE SIDE RESISTANCE;
LRFD QB = TOTAL BASE BEARING USING LRFD RESISTANCE FACTOR
          TO THE ULTIMATE BASE RESISTANCE
LRFD QU = TOTAL CAPACITY WITH LRFD RESISTANCE FACTOR.

LENGTH  VOLUME     QS       QB       QU     LRFD QS  LRFD QB   LRFD QU
(FEET)  (CU.YDS) (TONS)   (TONS)  (TONS)    (TONS)   (TONS)    (TONS)
 6.0     1.57     3.94    38.85    42.79     3.94    38.85     42.79
 7.0     1.83     8.49    42.62    51.11     8.49    42.62     51.11
 8.0     2.09    13.63    46.39    60.02    13.63    46.39     60.02
 9.0     2.36    19.33    50.16    69.50    19.33    50.16     69.50
10.0     2.62    25.58    53.93    79.51    25.58    53.93     79.51
11.0     2.88    32.35    57.71    90.05    32.35    57.71     90.05
12.0     3.14    39.62    61.48   101.10    39.62    61.48    101.10
13.0     3.40    47.38    65.25   112.63    47.38    65.25    112.63
14.0     3.67    55.61    69.02   124.63    55.61    69.02    124.63
15.0     3.93    64.29    72.79   137.08    64.29    72.79    137.08
16.0     4.19    73.41    76.56   149.97    73.41    76.56    149.97
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17.0     4.45    82.95    80.33   163.28    82.95    80.33    163.28
18.0     4.71    92.89    84.10   176.99    92.89    84.10    176.99
19.0     4.97   103.22    87.87   191.09   103.22    87.87    191.09
20.0     5.24   113.93    91.64   205.57   113.93    91.64    205.57
21.0     5.50   125.00    95.41   220.41   125.00    95.41    220.41
22.0     5.76   136.42    99.19   235.60   136.42    99.19    235.60
23.0     6.02   148.17   102.96   251.12   148.17   102.96    251.12
24.0     6.28   160.24   106.73   266.97   160.24   106.73    266.97
25.0     6.55   172.63   109.70   282.33   172.63   109.70    282.33
26.0     6.81   185.31   111.75   297.06   185.31   111.75    297.06
27.0     7.07   198.27   112.78   311.06   198.27   112.78    311.06
28.0     7.33   211.51   113.13   324.64   211.51   113.13    324.64
29.0     7.59   225.01   113.13   338.13   225.01   113.13    338.13
30.0     7.86   238.76   113.13   351.88   238.76   113.13    351.88
31.0     8.12   252.74   113.13   365.87   252.74   113.13    365.87
32.0     8.38   266.95   113.13   380.08   266.95   113.13    380.08
33.0     8.64   281.38   113.13   394.50   281.38   113.13    394.50
34.0     8.90   296.01   113.13   409.13   296.01   113.13    409.13
35.0     9.16   310.83   113.13   423.96   310.83   113.13    423.96
36.0     9.43   325.84   113.13   438.97   325.84   113.13    438.97
37.0     9.69   341.02   113.13   454.15   341.02   113.13    454.15
38.0     9.95   356.36   113.13   469.49   356.36   113.13    469.49
39.0    10.21   371.86   113.13   484.99   371.86   113.13    484.99
40.0    10.47   387.50   113.13   500.62   387.50   113.13    500.62
41.0    10.74   403.27   113.13   516.40   403.27   113.13    516.40
42.0    11.00   419.16   113.13   532.29   419.16   113.13    532.29
43.0    11.26   435.17   113.13   548.30   435.17   113.13    548.30
44.0    11.52   451.28   113.13   564.41   451.28   113.13    564.41
45.0    11.78   467.49   113.13   580.62   467.49   113.13    580.62
46.0    12.04   483.78   113.13   596.91   483.78   113.13    596.91
47.0    12.31   500.15   113.13   613.27   500.15   113.13    613.27
48.0    12.57   516.58   113.13   629.71   516.58   113.13    629.71
49.0    12.83   533.07   113.13   646.20   533.07   113.13    646.20
50.0    13.09   549.61   113.13   662.74   549.61   113.13    662.74
51.0    13.35   566.20   113.13   679.32   566.20   113.13    679.32
52.0    13.62   582.81   113.13   695.94   582.81   113.13    695.94
53.0    13.88   599.44   113.13   712.57   599.44   113.13    712.57
54.0    14.14   616.10   113.13   729.22   616.10   113.13    729.22
55.0    14.40   632.75   113.13   745.88   632.75   113.13    745.88
56.0    14.66   649.41   113.13   762.53   649.41   113.13    762.53
57.0    14.92   666.05   113.13   779.17   666.05   113.13    779.17
58.0    15.19   682.67   113.13   795.80   682.67   113.13    795.80
59.0    15.45   699.27   113.13   812.39   699.27   113.13    812.39
60.0    15.71   715.83   105.13   820.96   715.83   105.13    820.96
61.0    15.97   732.35    95.99   828.33   732.35    95.99    828.33
62.0    16.23   748.81    85.70   834.52   748.81    85.70    834.52
63.0    16.50   765.22    78.85   844.07   765.22    78.85    844.07
64.0    16.76   781.56    75.42   856.98   781.56    75.42    856.98
65.0    17.02   797.83    75.42   873.25   797.83    75.42    873.25
66.0    17.28   814.01    75.42   889.42   814.01    75.42    889.42
67.0    17.54   830.09    75.42   905.50   830.09    75.42    905.50
68.0    17.80   846.06    75.42   921.47   846.06    75.42    921.47
69.0    18.07   861.92    75.42   937.33   861.92    75.42    937.33
70.0    18.33   877.65    75.42   953.07   877.65    75.42    953.07
71.0    18.59   893.26    75.42   968.68   893.26    75.42    968.68
72.0    18.85   908.74    75.42   984.16   908.74    75.42    984.16
73.0    19.11   924.07    75.42   999.49   924.07    75.42    999.49
74.0    19.38   939.26    75.42  1014.67   939.26    75.42   1014.67
75.0    19.64   954.28    75.42  1029.70   954.28    75.42   1029.70
76.0    19.90   969.15    75.42  1044.57   969.15    75.42   1044.57
77.0    20.16   983.85    75.42  1059.26   983.85    75.42   1059.26
78.0    20.42   998.37    75.42  1073.78   998.37    75.42   1073.78
79.0    20.68  1012.71    75.42  1088.12  1012.71    75.42   1088.12
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80.0     20.95  1026.85    75.42  1102.27  1026.85    75.42   1102.27
81.0     21.21  1040.81    75.42  1116.22  1040.81    75.42   1116.22
82.0     21.47  1054.56    75.42  1129.97  1054.56    75.42   1129.97
83.0     21.73  1068.10    75.42  1143.51  1068.10    75.42   1143.51


   RESULT FROM TREND (AVERAGED) LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.               ton            IN.
  0.1937E+00      0.5850E-04      0.7332E-03      0.1000E-04
  0.9685E+00      0.2925E-03      0.3666E-02      0.5000E-04
  0.1937E+01      0.5850E-03      0.7332E-02      0.1000E-03
  0.9800E+02      0.2944E-01      0.3666E+00      0.5000E-02
  0.1471E+03      0.4424E-01      0.5499E+00      0.7500E-02
  0.1946E+03      0.5893E-01      0.7332E+00      0.1000E-01
  0.4300E+03      0.1398E+00      0.1833E+01      0.2500E-01
  0.6543E+03      0.2373E+00      0.3666E+01      0.5000E-01
  0.7830E+03      0.3079E+00      0.5499E+01      0.7500E-01
  0.8586E+03      0.3605E+00      0.7332E+01      0.1000E+00
  0.1023E+04      0.5755E+00      0.1818E+02      0.2500E+00
  0.1051E+04      0.8399E+00      0.3423E+02      0.5000E+00
  0.1055E+04      0.9672E+00      0.3934E+02      0.6250E+00
  0.1063E+04      0.1247E+01      0.4827E+02      0.9000E+00
  0.1088E+04      0.2161E+01      0.7655E+02      0.1800E+01


   RESULT FROM UPPER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.               ton            IN.
  0.3179E+00      0.8495E-04      0.1047E-02      0.1000E-04
  0.1589E+01      0.4248E-03      0.5237E-02      0.5000E-04
  0.3179E+01      0.8495E-03      0.1047E-01      0.1000E-03
  0.1617E+03      0.4298E-01      0.5237E+00      0.5000E-02
  0.2391E+03      0.6433E-01      0.7856E+00      0.7500E-02
  0.3111E+03      0.8505E-01      0.1047E+01      0.1000E-01
  0.6181E+03      0.1904E+00      0.2619E+01      0.2500E-01
  0.8524E+03      0.2997E+00      0.5237E+01      0.5000E-01
  0.9626E+03      0.3695E+00      0.7856E+01      0.7500E-01
  0.1014E+04      0.4162E+00      0.1047E+02      0.1000E+00
  0.1084E+04      0.5982E+00      0.2560E+02      0.2500E+00
  0.1106E+04      0.8600E+00      0.4735E+02      0.5000E+00
  0.1111E+04      0.9876E+00      0.5213E+02      0.6250E+00
  0.1116E+04      0.1265E+01      0.5732E+02      0.9000E+00
  0.1140E+04      0.2179E+01      0.8145E+02      0.1800E+01


   RESULT FROM LOWER-BOUND LINE

   TOP  LOAD     TOP MOVEMENT       TIP LOAD      TIP  MOVEMENT
      ton             IN.               ton            IN.
  0.1027E+00      0.3754E-04      0.4190E-03      0.1000E-04
  0.5133E+00      0.1877E-03      0.2095E-02      0.5000E-04
  0.1027E+01      0.3754E-03      0.4190E-02      0.1000E-03
  0.5160E+02      0.1881E-01      0.2095E+00      0.5000E-02
  0.7759E+02      0.2825E-01      0.3142E+00      0.7500E-02
  0.1036E+03      0.3771E-01      0.4190E+00      0.1000E-01
  0.2493E+03      0.9311E-01      0.1047E+01      0.2500E-01
  0.4345E+03      0.1727E+00      0.2095E+01      0.5000E-01
```
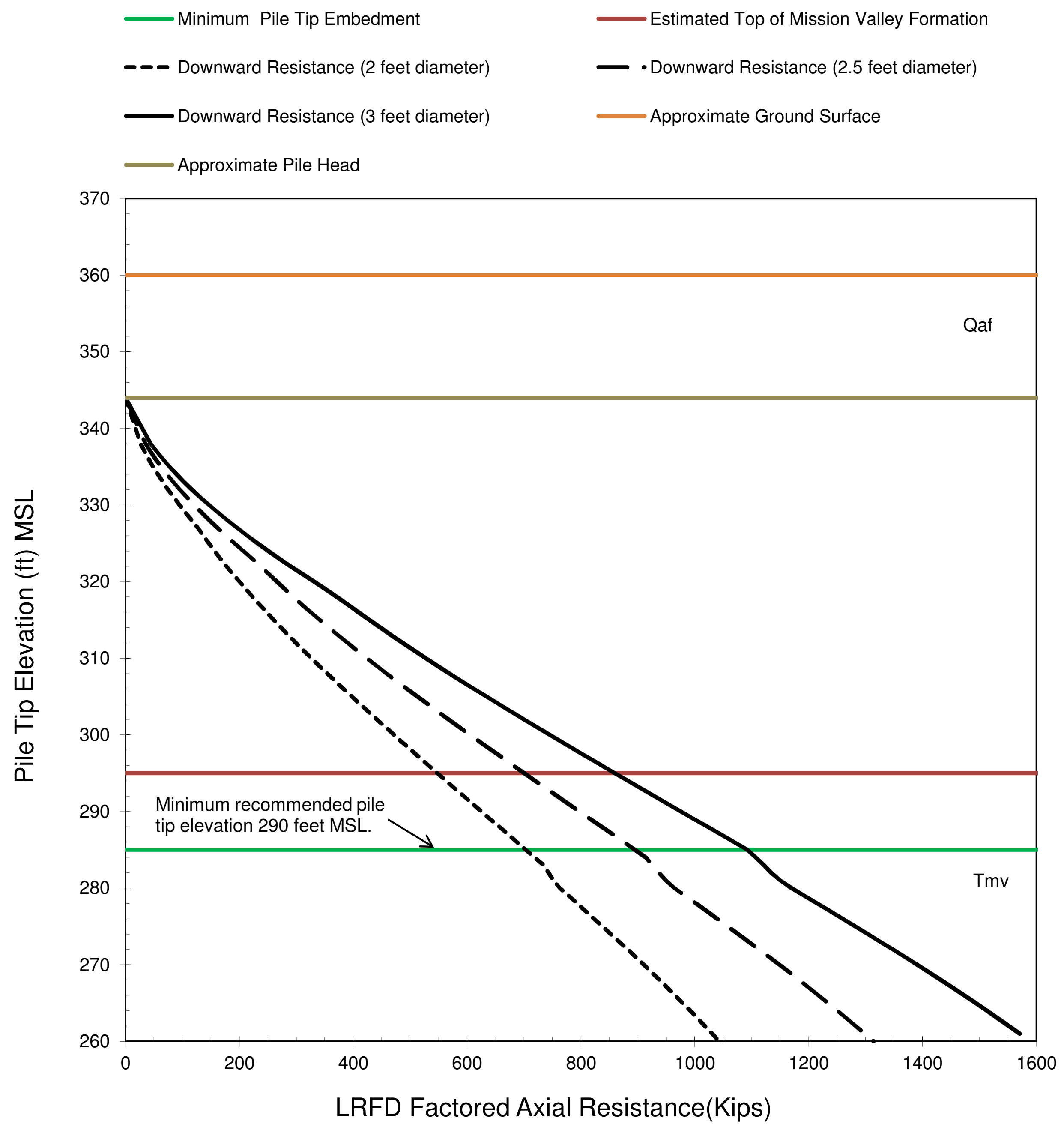
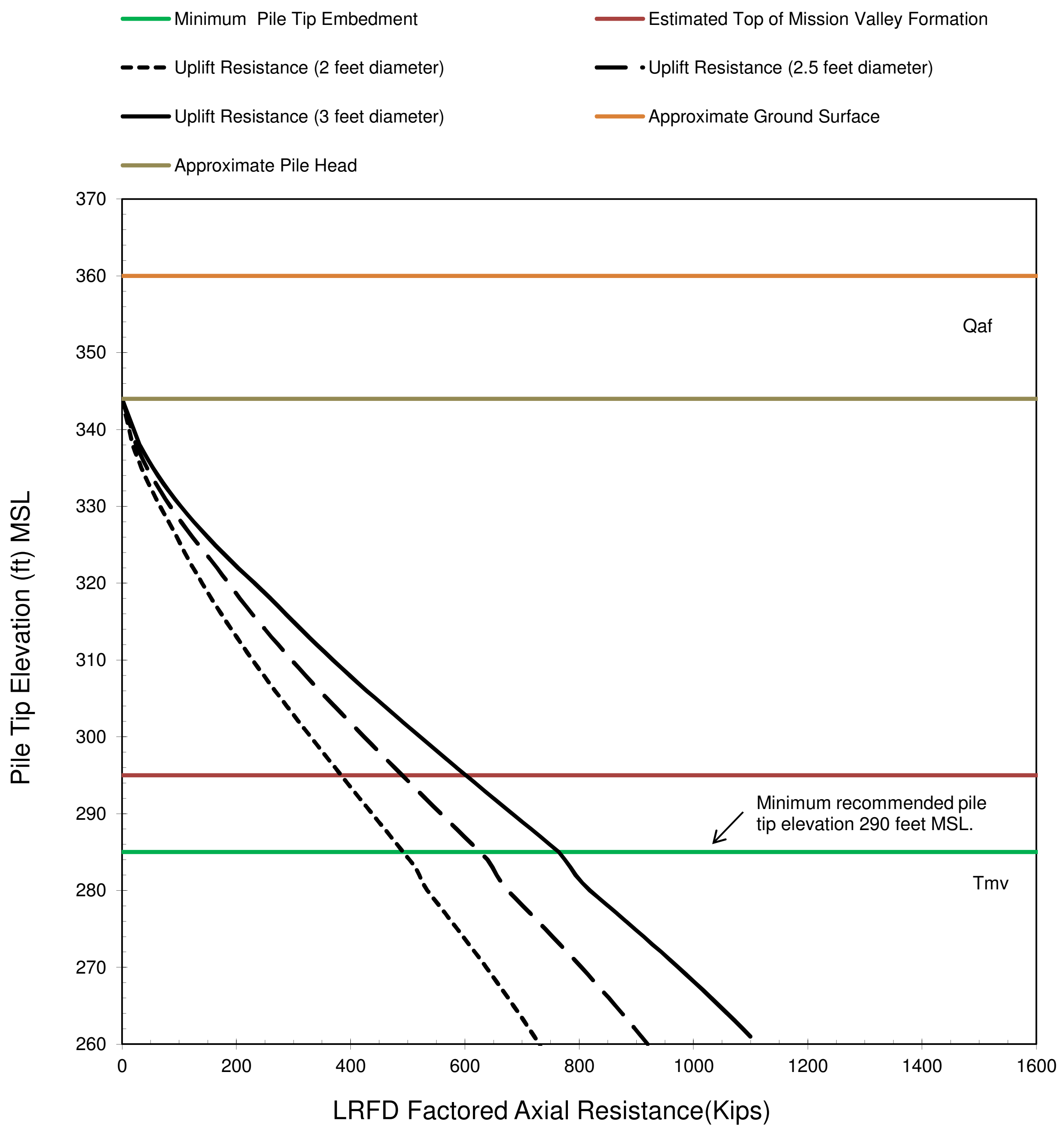

```
                 Abut 3 Downward_(Extreme Event Case)
0.5735E+03       0.2408E+00       0.3142E+01       0.7500E-01
0.6784E+03       0.2995E+00       0.4190E+01       0.1000E+00
0.9601E+03       0.5524E+00       0.1077E+02       0.2500E+00
0.9968E+03       0.8199E+00       0.2112E+02       0.5000E+00
0.9995E+03       0.9467E+00       0.2654E+02       0.6250E+00
0.1010E+04       0.1228E+01       0.3922E+02       0.9000E+00
0.1036E+04       0.2144E+01       0.7165E+02       0.1800E+01
```



Minimum recommended pile tip elevation 290 feet MSL.

NOTES:
1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 0.5 and 0.7 used for end bearing and side friction, respectively.

KLEINFELDER Bright People. Right Solutions.	Project Number:	20151065	**LRFD AXIAL RESISTANCE STRENGTH LIMIT STATE ABUTMENT 3 - DOWNWARD**	**FIGURE**
	Date:	11/1/2014		
	Entry By:	EK	TORREY MEADOWS DRIVE OVERCROSSING AT SR-56 POST MILE 5.6, DISTRICT 11 SAN DIEGO, CALIFORNIA	**10**
	Checked By:	MA		
	Date:	11/5/2014		



NOTES:
1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 0.5 and 0.7 used for end bearing and side friction, respectively.

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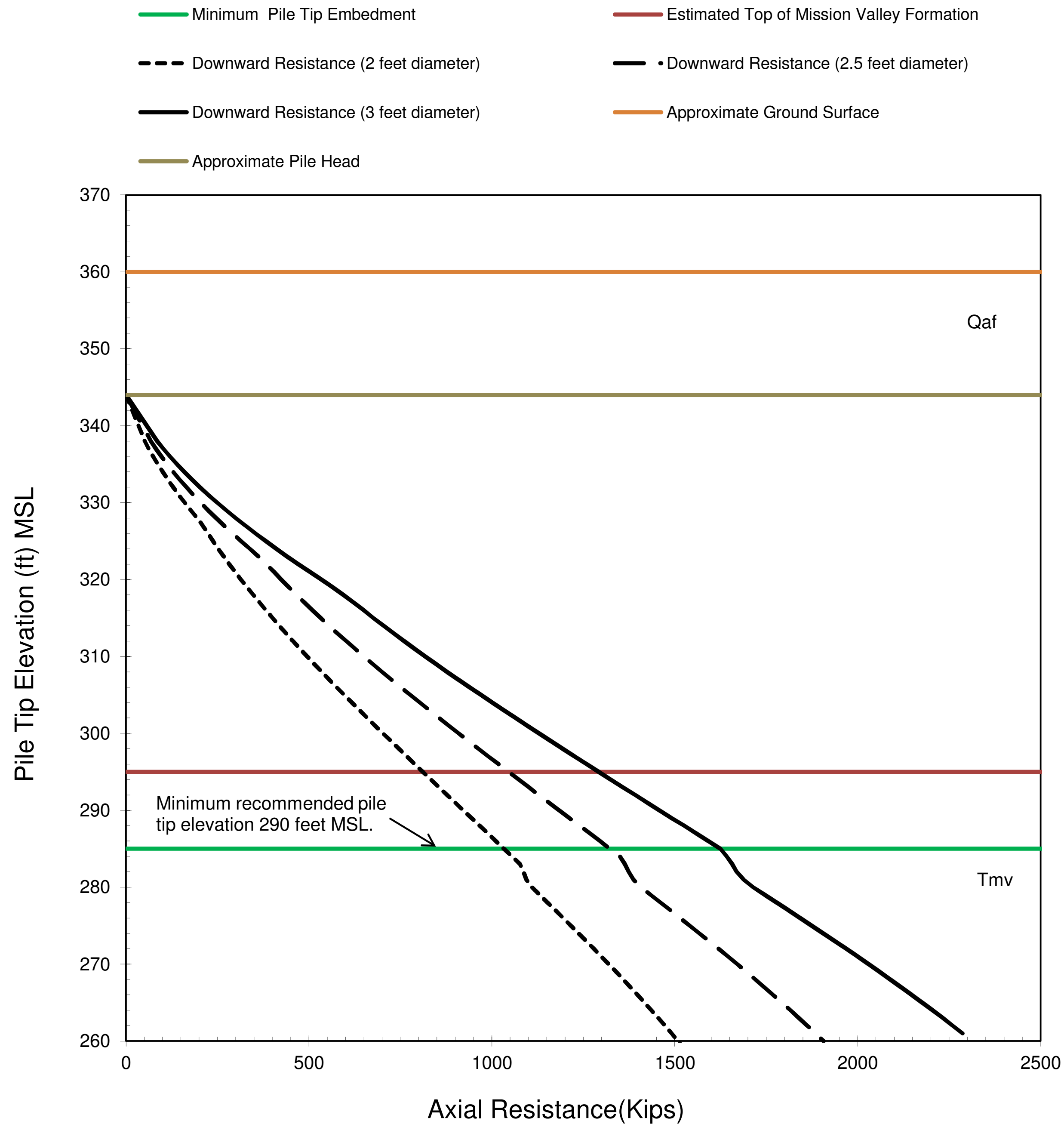
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
STRENGTH LIMIT STATE
ABUTMENT 3 - UPLIFT

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

11



NOTES:

1. The resistance curves represent nominal (unfactored) axial resistance for single diameter CIDH piles
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 1.0 used for both end bearing and side friction.

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Project Number:	20151065
Date:	11/1/2014
Entry By:	EK
Checked By:	MA
Date:	11/5/2014

LRFD AXIAL RESISTANCE
EXTREME EVENT CASE
ABUTMENT 3 - DOWNWARD

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

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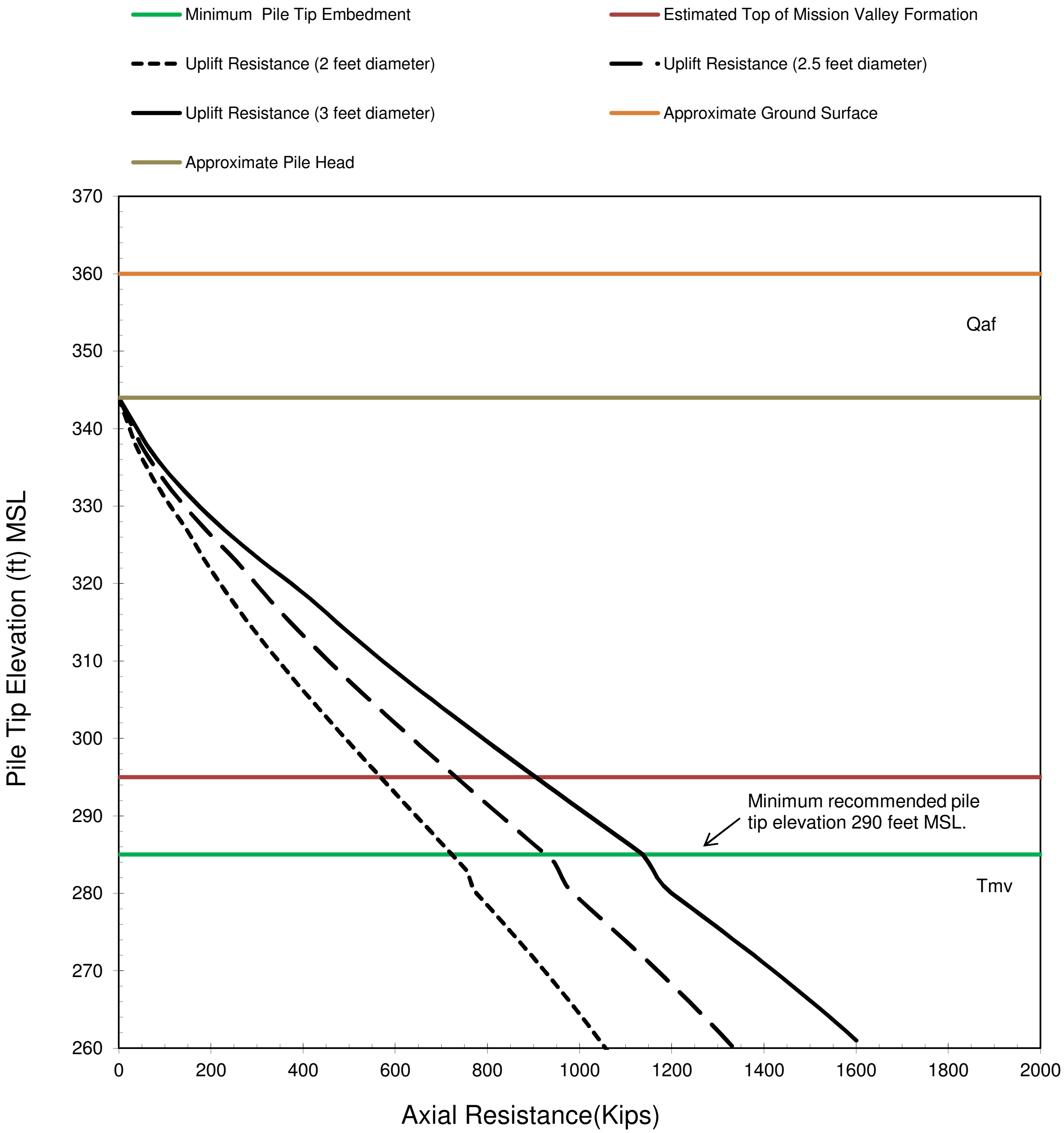

NOTES:

1. The resistance curves represent LRFD factored axial resistance for single CIDH piles.
2. The resistance curves include skin friction and end bearing.
3. The uplift CIDH pile resistance curve does not include the pile dead weight.
4. The design groundwater is assumed to be at elevation +250 feet MSL.
5. The resistance curves should be used only for the Abutment 3 location at Torrey Meadows Drive Overcrossing.
6. LRFD Resistance factor of 1.0 used for both end bearing and side friction.

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LRFD AXIAL RESISTANCE
EXTREME EVENT CASE
ABUTMENT 3 - UPLIFT

TORREY MEADOWS DRIVE
OVERCROSSING AT SR-56
POST MILE 5.6, DISTRICT 11
SAN DIEGO, CALIFORNIA

FIGURE

13

Lateral Pile Foundation Design

Table XX - Soil Input Parameters for LPILE under Static Condition

Layer	Elevation (ft)		p-y Curve	Effective Unit Weight, γ (pcf)	Friction Angle, φ' (deg)	Undrained Cohesion (psf)	Strain Factor, ε_{50}	Horizontal Subgrade Reaction Modulus, k (pci)
	Top	Bott.						
1	360	295	Sand (Reese)	130	36	n/a	n/a	90
2	295	260	Silt (cemented c-phi)	125	34	600	0.004	225

Source: User's manual for LPile, Version 2012-06

Notes:

n/a = not applicable

Design groundwater is assumed to be below elevation of +260 feet MSL.