June 17, 2011
Project No. 94305

Mr. Greg Hefter, PE
AECOM
999 Town & Country Road
Orange, California 92868

Subject: **Revised Addendum to Structure Preliminary Geotechnical Report (4th Revision, dated November 4, 2009)**
Interstate 215/Barton Road Interchange Improvements
City of Grand Terrace, San Bernardino County, California
08-SBd- 215-PM 0.58/1.95
Caltrans Contract No. 0800000282 (EA 0J0700)

Dear Mr. Hefter:

Kleinfelder previously submitted a Structure Preliminary Geotechnical Report (4th Revision), dated November 4, 2009 for the subject project. Based on our discussions with representatives of AECOM, we understand this report was approved by Caltrans. We also understand a new alternative (Alternative 7) has recently been added to the project. This addendum to our report has been prepared to address the new alternative. This addendum has been revised to include our responses to Caltrans review comments on our previous version of addendum report dated May 13, 2011. A separate addendum to our Preliminary Materials Report will be prepared based on revised Traffic Indices (TI's) for the project.

PROPOSED IMPROVEMENTS AND PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

Three of the current build alternatives (Alternatives 3, 5 and 6) are described in our Structure Preliminary Geotechnical Report (SPGR) dated November 4, 2009. The recently added Alternative 7 is described below.

Alternative 7 (Combined Type L-1/L-7 Interchange)

Proposed improvements for Alternative 7 include the reconfiguration of northbound ramps to Type L-1 (spread diamond) and southbound ramps to Type L-7 (partial cloverleaf). A preliminary layout plan for Alternative 7 is included as an attachment to this addendum. Southbound and northbound lanes of the ramps will consist of one lane at I-215 and widen to three lanes at Barton Road. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure. Commerce Way will be realigned to connect to Barton Road east of Michigan Street.

Based on the attached preliminary layout plan, seven new retaining walls (RW1 through RW7) are proposed for the Alternative 7 alignment. The locations of the retaining walls are shown on the attached plan. We understand the proposed walls would be Caltrans Type 1 walls. If right-of-way restrictions preclude the use of Type 1 walls, retaining walls RW-2 and RW-3 may be changed to Caltrans Type 5 walls. Based on the preliminary layout plan, the height of the proposed retaining walls will range from approximately 4 to 24 feet. Caltrans Standard Type 1 and Type 5 walls are considered feasible from a geotechnical standpoint. For preliminary cost estimating purposes, retaining walls with a height of 14 feet or less may be assumed to be supported on shallow spread

1220 Research Drive, Suite B, Redlands, CA 92374 p | 909.793.2691 f | 909.792.1704

footings. Retaining walls with a height greater than 14 feet may need to be supported on deep foundations, such as driven piles. The feasibility of these foundation types for the walls should be further evaluated during a later design phase of the project after the completion of exploratory borings and laboratory testing. Lateral earth pressures acting against the retaining walls can be estimated using the values presented in the Caltrans Standard Plan sheets for retaining walls.

We understand the bridge configuration and bridge details for replacement of the Barton Road Overcrossing (Bridge No. 54-528) for Alternative 7 are the same as for Alternative 6. The Planning Study drawing for the proposed Barton Road Overcrossing (Replace) for Alternative 6 is included as an attachment to this addendum. Preliminary seismic recommendations, approach embankment slope recommendations, and foundation recommendations provided in our SPGR, dated November 4, 2009, are applicable for the proposed bridge replacement for Alternative 7.

Site-specific soil borings and laboratory testing should be performed to develop design level recommendations during a later design phase of the project. Soil borings should be performed at the proposed bridge and retaining wall locations. At least one boring should be performed at each support location for the bridge.

CLOSURE

The information presented in this Addendum is subject to the provisions and requirements outlined in the Limitations section of Kleinfelder's November 4, 2009 Structure Preliminary Geotechnical Report for this project. We appreciate the opportunity to be of service on this project. If you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

KLEINFELDER WEST, INC.

REGISTERED PROFESSIONAL ENGINEER
MADAN CHIRUMALLA, PE
No. 74186
Exp. 6/30/11
CIVIL
STATE OF CALIFORNIA

Madan Chirumalla, PE
Staff Engineer

Scott G. Lawson, PE, GE
Senior Engineer

Reviewed by:

Richard F. Escandon, PG, CEG
Project Manager/Principal Geologist

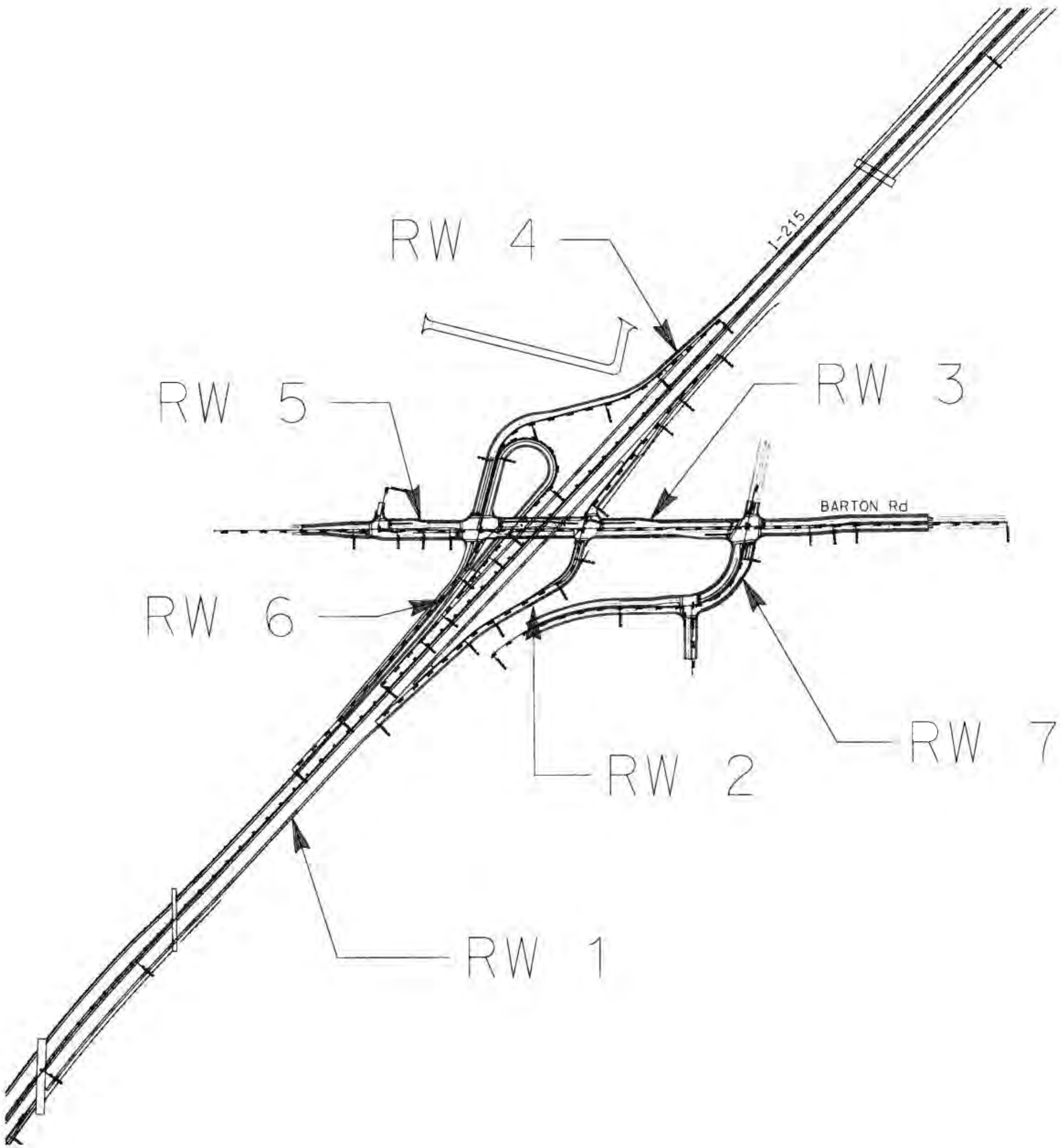
PROFESSIONAL GEOLOGIST
RICHARD F. ESCANDON
No. 1213
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

MC:lg

Attachments: Attachment 1 – Preliminary Layout of Alternative 7 and Retaining Wall Profiles
Attachment 2 – Planning Study, Barton Road OC (Replace), Alternative 6 (Same as Alternative 7)
Attachment 3 – Responses to Caltrans Review Comments

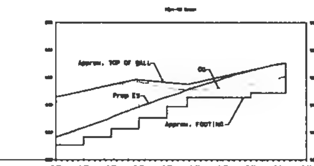
KLEINFELDER 1220 Research Drive, Suite B, Redlands, CA 92374 **p |** 909.793.2691 **f |** 909.792.1704

ATTACHMENT 1

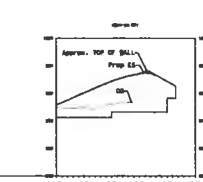


RETAINING WALL PROFILES

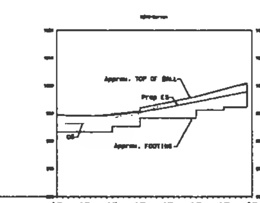
RW 1



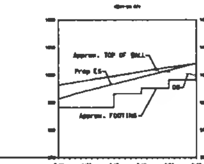
RW 2



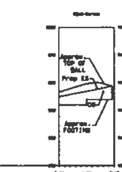
RW 3



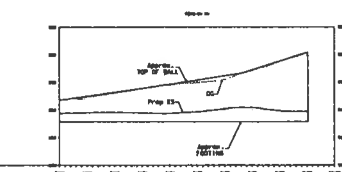
RW 4



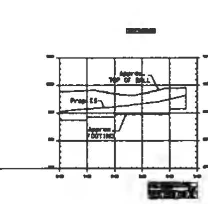
RW 5



RW 6



RW 7



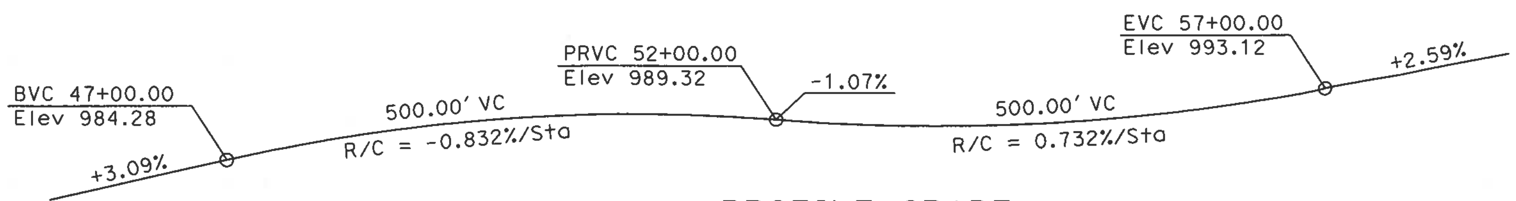
ATTACHMENT 2

PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

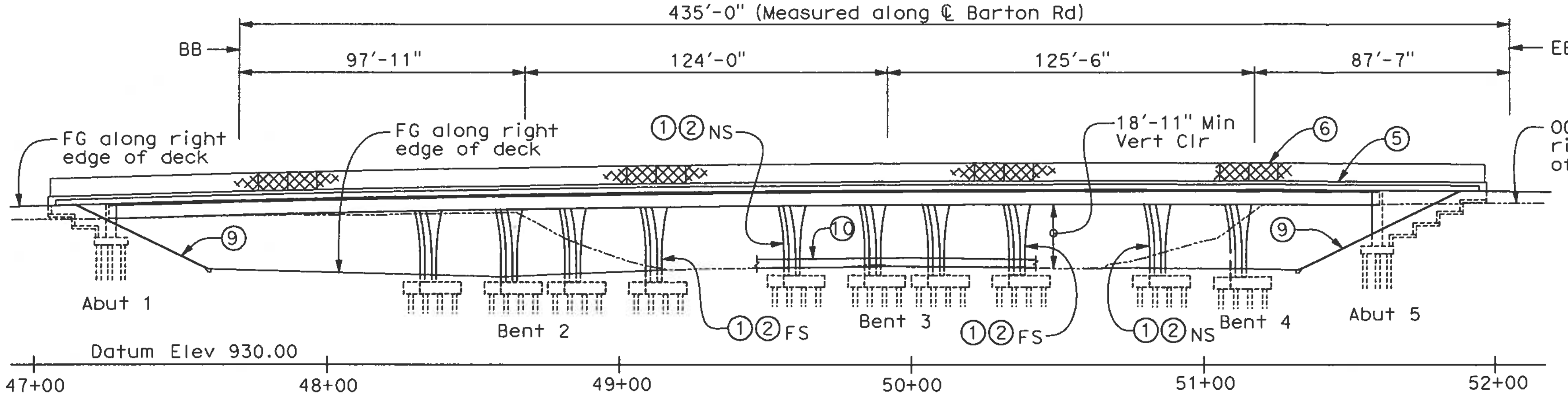
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
1887 BUSINESS CENTER DRIVE, SUITE 6
SAN BERNARDINO, CA 92408

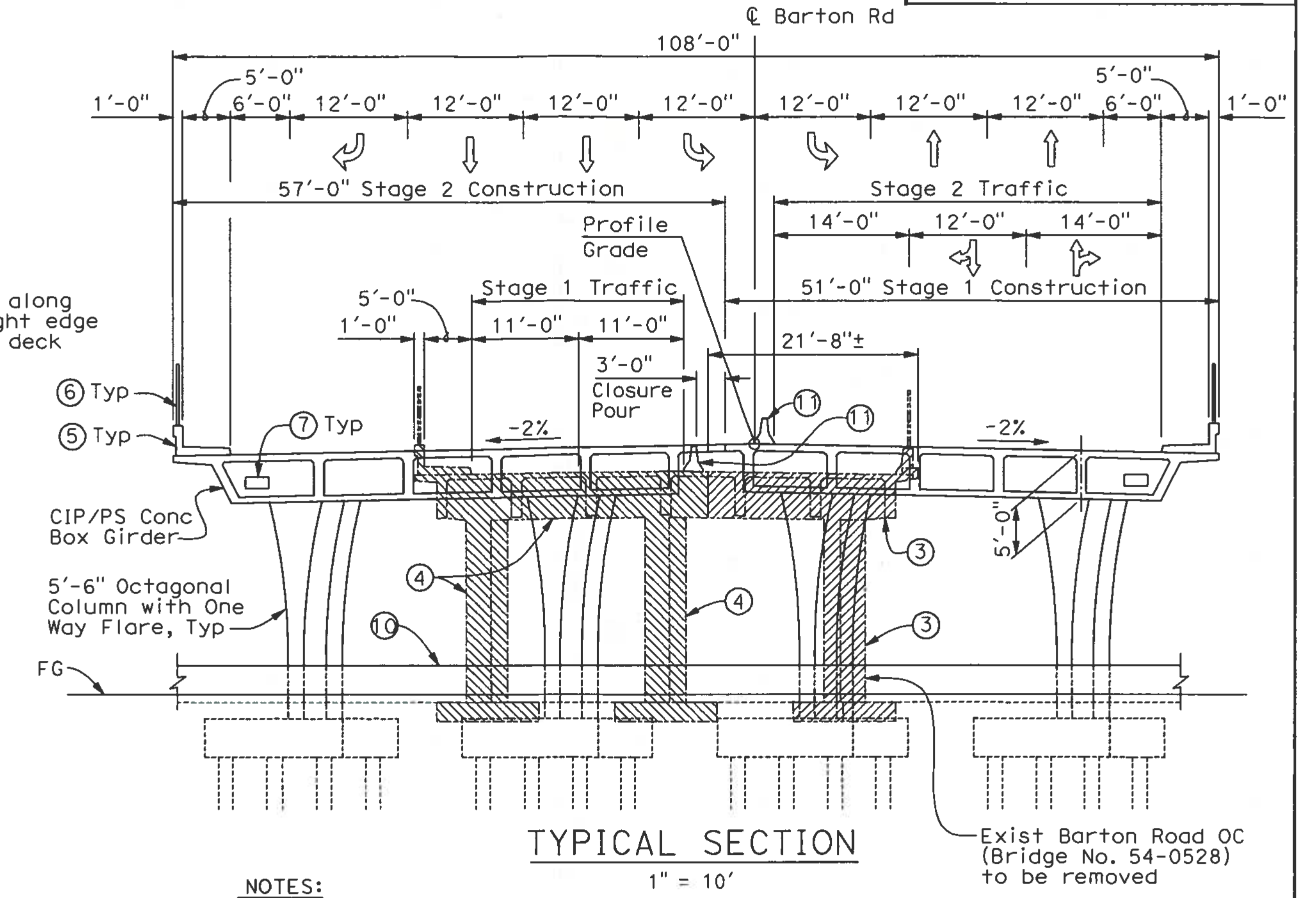
ALTERNATIVE 6



PROFILE GRADE
No Scale



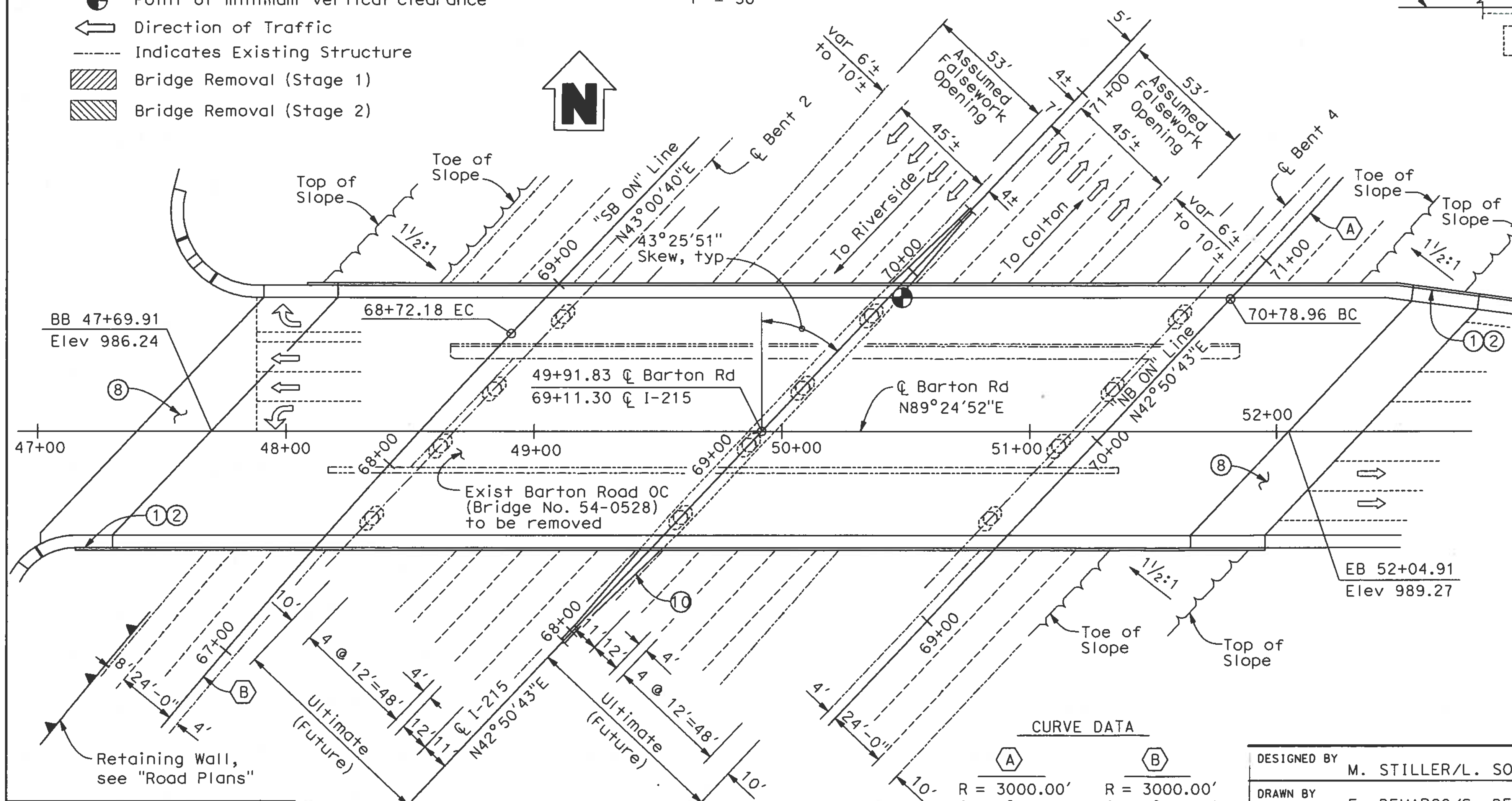
ELEVATION
1" = 30'



TYPICAL SECTION
1" = 10'

LEGEND

- Point of minimum vertical clearance
- Direction of Traffic
- Indicates Existing Structure
- Bridge Removal (Stage 1)
- Bridge Removal (Stage 2)



PLAN
1" = 30'

NOTES:

1. Paint "Bridge No. 54-0528" & year completed
2. Paint "Barton Road Overcrossing"
3. Bridge Removal (Portion) Stage 1 construction)
4. Bridge Removal (Stage 2 construction)
5. Concrete Barrier, Type 26
6. Chain Link Railing, Type 7
7. Future Utility Opening
8. Structure Approach, Type N(30S)
9. Slope Paving
10. Concrete Barrier, Type 60E, see "Road Plans"
11. Temporary Railing, Type K (Anchored)

Date of estimate	= 7/7/09
Str Depth	= 5'-0"
Length	= 435'-0"
Width	= 108'-0"
Area	= 46,980 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	= $231 / sq ft
Total Cost	= $11,096,000

VEHICULAR TRAFFIC
1.____ New olignment. No troffic ot the site.
2.____ Traffic will be detoured awoy from the site.
3. X Traffic will be corried on the structure. Stage construction will/~~will not~~ be required.
4. X Troffic will pass under the structure on I-215 (Name of St. or Hwy.)

A.____ No falsework ollowed over troffic.
B. X Folsework opening(s) required:

	Temporary Vertical Clearance	Width of Traffic Opening
N Bnd.	15'	45'
S Bnd.	15'	45'
Two-way		

C. X Temporary troffic lane reduction needed far footing excavation.

PEDESTRIAN TRAFFIC
Falsework opening(s) required on n/a (Name of St.)
Location Height Width

RAILROAD TRAFFIC
Falsework opening(s) required over n/a (Name of RR)
Vertical Clearance Horizontol Clear Width

CURVE DATA

Ⓐ	Ⓑ
R = 3000.00'	R = 3000.00'
Δ = 4°20'29"	Δ = 4°30'26"
T = 113.71'	T = 118.06'
L = 227.31'	L = 235.99'

		DATE
DESIGNED BY	M. STILLER/L. SOTO	7/7/09
DRAWN BY	F. DEMARCO/S. DESALEGN	7/7/09
CHECKED BY	M. CHAR	7/7/09
APPROVED		

M. CHAR
PROJECT ENGINEER

PLANNING STUDY
BARTON ROAD OC (REPLACE)

BRIDGE NO. TBD | CU
SCALE: AS NOTED | EA

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

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

ATTACHMENT 3

Project Name: **I-215/Barton Road Interchange Improvements**
08-SBd- 215-PM 0.58/1.95, Caltrans Contract No. 0800000282 (EA 0J0700)
Responses by: **Madan Chirumalla, PE and Scott G. Lawson, PE, GE**

This document contains the response to Caltrans review comments dated June 8, 2011.

RESPONSE TO COMMENTS ON ADDENDUM TO STRUCTURE PRELIMINARY GEOTECHNICAL REPORT

Comment No.	Page No.	Comments	Responses
1	Page 1	Revise the project limit to the most recent one. Also add project number 0800000282 to the project description.	Our addendum to report has been revised accordingly.
2	General	If the retaining walls need to be supported on deep foundations, cast-in-drilled-hole (CIDH) piles cannot be used for support. Caltrans does not allow the use of CIDH piles for batter piles.	Comment acknowledged. Reference to cast-in-drilled-hole (CIDH) piles has been removed.

REVISED PRELIMINARY
GEOTECHNICAL/STRUCTURES DESIGN REPORT
INTERSTATE 215/BARTON ROAD INTERCHANGE
IMPROVEMENTS PROJECT
CITY OF GRAND TERRACE
SAN BERNARDINO COUNTY, CALIFORNIA
CALTRANS EA NO. 0J070K
08-SBD-215-PM 0.8/1.8

Prepared for:
LIM AND NASCIMENTO
ENGINEERING CORPORATION
20 Empire Drive
Lake Forest, California 92630

Prepared by:
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1220 Research Drive, Suite B
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Project No. 94305

March 4, 2009

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March 4, 2009
Project No. 94305

Mr. William Nascimento, PE, SE
Lim and Nascimento Engineering Corporation
20 Empire Drive
Lake Forest, California 92630

Subject: **Revised Preliminary Geotechnical/Structures Design Report**
Interstate 215/Barton Road Interchange Improvements Project
City of Grand Terrace, San Bernardino County, California
08-SBD-215-PM 0.8/1.8
Caltrans EA No. 0J070K

Dear Mr. Nascimento:

Kleinfelder West, Inc. (Kleinfelder) is pleased to present this Preliminary Geotechnical/Structures Design Report for the Interstate 215/Barton Road Interchange Improvements Project, located in the City of Grand Terrace, San Bernardino County, California.

The purpose of our study was to evaluate the geologic and geotechnical characteristics of the project area, based on our review of available information, and to provide preliminary recommendations for project design. This report presents preliminary design and constructability recommendations based upon a review of available literature and as-built plans. Our response to Caltrans review comments dated September 23, 2008 are incorporated in this report (see Appendix F).

A Structure Foundation Report (SFR), Geotechnical Design Report (GDR) and should be prepared for the project in order to provide more specific geotechnical recommendations for final design of the project.

We appreciate the opportunity to provide geotechnical services to Lim & Nascimento Engineering Corporation and trust the information in this report meets the current project needs. If you have any questions, please contact the undersigned at your convenience.

Respectfully submitted,
KLEINFELDER WEST, INC.

Carlos V. Amante

Carlos V. Amante, PE, GE
Geotechnical Group Manager

REGISTERED PROFESSIONAL ENGINEER
CARLOS V. AMANTE
No. 2724
Exp. 6-30-10
GEOTECHNICAL
STATE OF CALIFORNIA

Richard F. Escandon, PG, CEG
Principal Geologist

PROFESSIONAL GEOLOGIST
RICHARD F. ESCANDON
No. 1213
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

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PLATES

APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE

This report presents the results of our preliminary geotechnical/structures design study for the Interstate 215 (I-215)/Barton Road Interchange, located in the City of Grand Terrace, San Bernardino County, California. The study area includes the existing I-215/Barton Road Interchange, Barton Road, Grand Terrace Road and Commerce Way (see Plate 1, *Site Vicinity Map*). The purpose of this study is to provide preliminary geological and geotechnical engineering information for use by the design engineer for further planning, design and economic evaluations of the proposed interchange.

The purpose of the proposed project is to improve the operation of the existing interchange and local circulation, enhance safety, alleviate existing level of service deficiencies, and accommodate projected future traffic volumes within the project vicinity. The proposed project includes the replacement of Barton Road Overcrossing, widening of Barton Road, realignment of West Grand Terrace Road and Commerce Way, reconfiguration and construction of new I-215 on-ramps and off-ramps as necessary to connect to Barton Road, as well as to improve turn storage capacity.

Our understanding of the project is based on our discussions with Lim and Nascimento Engineering Corporation (LAN Engineering) and our review of the documents listed in Section 3.0 of this report.

1.2 SCOPE OF SERVICES

Our scope of services performed for this study consisted of a review of pertinent geotechnical and geologic literature, review of Caltrans records relating to existing nearby bridge structures, a site reconnaissance, and limited engineering analysis based on the available data. In accordance with the verbal agreement between Kleinfelder and LAN Engineering, we did not perform any subsurface investigation, sampling or laboratory testing. Available reports and as-built plans were reviewed for our preliminary evaluation of site soil conditions. References used for our study are listed at the end of this report.

The following items are addressed in this report:

- Regional and site geology.
- Geologic hazards including faulting and seismicity.
- Preliminary seismic design parameters.
- Preliminary site preparation and fill slope recommendations.
- Preliminary bridge foundation alternatives.

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 EXISTING FACILITIES

The I-215/Barton Road Interchange includes the I-215 freeway, Barton Road Overcrossing (Bridge No. 54-528) over I-215, Barton Road, Grand Terrace Road and Commerce Way. The project site area is shown on Plate 1, *Site Vicinity Map*.

The existing I-215/Barton Road interchange is a diamond interchange, approximately 400 feet wide between the northbound and southbound ramp intersections. The on-ramps and off-ramps are one-lane wide at the freeway entrance and exit and widened to two lanes at Barton Road.

2.1.1 Barton Road Overcrossing (Caltrans Bridge No. 54-528)

Barton Road Overcrossing is an eastbound/westbound bridge with two traffic lanes and one center-turn lane. The existing bridge was constructed in 1958 and is approximately 257 feet long and 52 feet wide. The minimum vertical clearance between the bridge and the I-215 freeway is approximately 15 feet.

The bridge is constructed with cast-in-place, prestressed concrete girders supported on two abutments (Abutments 1 and 5) and three intermediate bents (Bents 2 through 4). The abutments and bents are founded on spread footings. Abutment spread footings shown on the as-built drawings are 6 feet wide and 2 feet thick and spread footings for the bents are 7.5 feet wide by 7.5 feet long and 2 feet thick. The design bearing pressures are not provided in the reviewed plans. Approximate bottom of foundation elevations for are provided in Table 1, below.

Table 1
Bottom of Foundation Elevations
Barton Road Overcrossing

Location	Foundation Type	Bottom of Footing Elevation (feet)*
Abutment 1 (West)	Spread Footing	972
Bents 2 through 4	Spread Footing	958
Abutment 5 (East)	Spread Footing	974

*Note: Elevations were obtained directly from the as-built plans. No correction has been made based on changes in elevation datum.

Existing cut slopes forming the eastern and western embankments for the Barton Road Overcrossing have heights of up to 25 feet with an overall slope gradient of 2:1 (Horizontal:Vertical, H:V). The abutments of Barton Road Overcrossing had been retrofitted with 30-inch cast-in-drilled-hole (CIDH) piles in 1995.

2.1.2 Local Streets

Barton Road, Grand Terrace Road and Commerce Way are two-lane roads in the subject area. The as-built plans for the existing pavement sections of Barton Road and side streets in the study area were not available. During our site reconnaissance, pavement distress was observed at the location of the existing abutments for Barton Road Overcrossing.

Alligator cracks were observed at several locations on Barton Road, Grand Terrace Road, Commerce Way, and the on- and off-ramps for the I-215 freeway at Barton Road Overcrossing Bridge.

2.1.3 Culverts

Based on our site reconnaissance on June 2, 2008, several inlets to culverts were observed on the I-215 freeway, along the median and shoulders, at the location of Barton Road Overcrossing.

2.2 PROPOSED IMPROVEMENTS

The proposed project consists of replacing the existing Barton Road Overcrossing, widening of Barton Road, reconfiguration of I-215 freeway on- and off-ramps as necessary to connect to Barton Road, as well as to improve turn storage capacity, and realigning of Grand Terrace Road and Commerce Way.

The Project Development Team (PDT) is currently evaluating a no-build and three build alternatives for the proposed project: Alternative 1, No-build; Alternative 3, Type L-7 Partial Cloverleaf Interchange; Alternative 5, Bowtie Configuration Interchange; and Alternative 6, Combined Type L-7/L-6 Interchange. Alternative 2, Type L-2 Spread Diamond Interchange and Alternative 4C, Combined Type L-2/L-8 Spread Diamond Interchange have been dropped by the PDT. The three build design alternatives (Alternatives 3, 5 and 6) are illustrated in Appendix B and described as follows:

- Alternative 3 (Type L-7 Partial Cloverleaf Interchange): Proposed improvements for Alternative 3 include the construction of new southbound on- and off- ramps in the northwest quadrant and northbound on- and off ramps in the southeast quadrant. All the proposed on- and off-ramps are one lane wide at the freeway and widened to three lanes at Barton Road. The conceptual plans for the proposed structures are shown in Appendix C. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure. Grand Terrace Road and Commerce Way will be realigned.

- Alternative 5 (Bowtie Configuration Interchange): Proposed improvements for Alternative 5 include the construction of new southbound off-ramp and northbound on-ramp in the northwest quadrant and northbound off-ramp and southbound on-ramp in the southwest quadrant. The conceptual plans for the proposed structures are shown in Appendix C. A three-lane and a two-lane bridge structure will be built on northbound off- and on- ramps, respectively, crossing over I-215. Southbound and northbound on-ramps will consist of two lanes and southbound and northbound off-ramps will consist of one lane at I-215 and widened to three lanes at Barton Road. The existing two-lane Barton Road Overcrossing will be replaced with a new six lane structure. Grand Terrace Road will be re-aligned.

- Alternative 6 (Combined Type L-7/L-6 Interchange): Proposed improvements for Alternative 6 include the construction of new southbound off- and on-ramps in the northwest quadrant and northbound off- and on-ramps in the southeast quadrant. The conceptual plans for the proposed structures are shown in Appendix C. Southbound and northbound off-ramps will consist of one lane at I-215 and widened to three lanes at Barton Road and Commerce Way, respectively. The existing Commerce Way will be realigned to the east and remains as a five lane arterial same as existing. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure.

3.0 PERTINENT REPORTS AND INVESTIGATIONS

The following documents were reviewed for this study:

- *Barton Road Overcrossing* (as-built plans), prepared by the Department of Public Works, Division of Highways, dated August 29, 1958.
- *Planning Study Drawings, Barton Road OC (Replace), Barton Road NB Off-Ramp OC, Barton Road NB On-Ramp OC, Newport Avenue OC (Replace)*, prepared by LAN Engineering, dated May 9, 2008.
- *Exhibit Barton Interchange, Alternatives 3, 4C, 5 and 6,* prepared by LAN Engineering, undated, scale 1"= 100'.
- *Project Study Report (PDS) to Request Programming For Capital Support (Project Approval and Environmental Document Phase) in the 2008 STIP,* Interstate 215 at Barton Road, between Iowa Avenue Interchange and Washington Avenue Interchange, prepared by Yong H. Kim (dated March 2, 2007) and approved by Michael A. Perovich, District Director (dated April 3, 2007), Caltrans District 8, San Bernardino, CA.

Most of the geologic data compiled and reviewed for this study were obtained from the Geologic Map of the Riverside East/South ½ of the San Bernardino South Quadrangles, map scale 1:24,000, (Dibblee, 2003). Other maps and publications we reviewed addressing regional geology include the *Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles*, California, map scale 1 :100,000 (Morton, D.M., and Millen, F.K., 2006), *Geologic Map of California, San Bernardino Sheet,* compiled by T.H. Rogers (1967), map scale 1:250,000, and the *Geologic Map of the San Bernardino Quadrangle, California*, compiled by E.J. Bortugno and T.E. Spittler (1986), map scale 1:250,000. We also reviewed the Generalized *Geologic Map of Southwest San Bernardino County, California (map scale 1:48,000)* compiled by Morton (1974 in Fife et al., 1976). These reports and maps are presented in the references section of this report.

Maps, reports, and other studies reviewed addressing faulting and seismicity included "*Fault Rupture Hazard Zones in California*," (Bryant, W.A., and Hart, E.W., 2007); "*Fault Activity Map of California and Adjacent Areas, California*," Jennings, C.W. (1994); and *Map showing Quaternary faults and 1978-84 Seismicity of the Los Angeles Region, California*, Ziony, J.I., and Jones, L. (1989).

Groundwater information from wells within the study area was researched based on records available through the Cooperative Well Measuring Program (CWMP) covering the Upper Santa Ana River, San Jacinto, and Upper Santa Margarita Watersheds. The CWMP (2007) is compiled by the Western Municipal Water District. Other groundwater records reviewed included groundwater contour maps and records prepared for the Chino Basin (Wildermuth Environmental, 2005), and for Southwestern San Bernardino County (Fife and others, 1976).

Additional references used are listed in Section 9.0 of this report.

4.0 REGIONAL GEOLOGY AND SEISMICITY, AND CLIMATE

4.1 REGIONAL GEOLOGY

The project site is located within California's Peninsular Ranges Geomorphic Province. The Province is characterized by a complex series of northwest-southeast oriented mountain ranges separated by similarly trending faults which extends 200 kilometers (125 miles) from the Transverse Ranges and the Los Angeles Basin south to the Mexican border and beyond. Total width of the Peninsular Ranges Province varies from 48 to 160 kilometers (30 to 100 miles) and includes the offshore area, and is bounded on the east by the Colorado Desert and the south by the Gulf of California. The Peninsular Ranges contain extensive Cretaceous plutonic rocks intruded into older metamorphic rocks and deep alluvial-filled valleys.

The site is situated within the southeastern edge of the upper Santa Ana River Valley. This area is a broad alluvial-filled basin bounded on the north by the San Gabriel Mountains, the south by the Jurupa and La Sierra Hills, the west and southwest by the Puente and Chino Hills, and on the east by the San Jacinto fault. The Santa Ana river has incised into granitic bedrock of the Peninsular Ranges batholith in area of the City of Riverside. Older fan deposits cap the granitic bedrock on the flanks of the Santa Ana River flood plain and are generally approximately 60 to 100 feet higher in elevation than the active river surface elevation.

Regional geologic maps for the area indicate the site is underlain by Pleistocene older alluvial fan deposits (Morton 1978, Dibblee 2003). The alluvial fan deposits are derived from the surrounding mountains. Based on available literature, the thickness of alluvium and depth to bedrock beneath the site is estimated to be on order of 500 feet (Fife, 1976). However, granitic bedrock is exposed in outcrop on the freeway cut slope several hundred feet north of the interchange, indicating that bedrock is likely shallower beneath the site. Depth to bedrock beneath the site is unknown but is likely deeper than 50 feet.

4.2 REGIONAL FAULTING AND SEISMICITY

No known sufficiently active faults have been identified on the subject site, and thus, the potential for future surface fault rupture at the site is considered to be low. However, the project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active.

An active fault is a fault that has experienced seismic activity during historic time (since roughly 1800) or exhibits evidence of surface displacement during Holocene time (Hart and Bryant, 1997). The definition of "potentially active" varies. A generally accepted definition of "potentially active" is a fault showing evidence of displacement that is older than 11,000 years (Holocene age) and younger than 1.7 million years (Pleistocene age). However, "potentially active" is no longer used as criteria for zoning by the CGS. The terms "sufficiently active" and "well-defined" are now used by the CGS as criteria for zoning faults under the Alquist-Priolo Earthquake Fault Act. The definition "inactive" generally implies that a fault has not been active since the beginning of the Pleistocene Epoch (older than 1.7 million years old).

4.3 CLIMATE

The climate in the region of the site is generally characterized by dry, moderate to warm summers and moist, cool winters. On average, the warmest month is July, with temperatures ranging from 61 to 94 degrees Fahrenheit. The coolest month is December, with temperatures ranging from 41 to 68 degrees Fahrenheit. The highest recorded temperature was 113 degrees Fahrenheit in 1960 and the lowest recorded temperature was 22 degrees Fahrenheit in 1990. The maximum average precipitation is 2.5 inches, which typically occurs in January; and the minimum average precipitation is less than 0.1 inch, which typically occurs in July. On average, the precipitation in Grand Terrace is less than 1 inch, between the months of April and October. Water usually freezes and thaws when the air temperature is below and above 39.2 degrees Fahrenheit. Therefore, the subject project site is not a freeze-thaw area.

5.0 GEOTECHNICAL CONDITIONS

5.1 GEOLOGIC MAPPING

A field reconnaissance was performed for this study. Detailed geologic mapping was not performed. The purpose of the reconnaissance was to observe and document soils and geotechnical conditions in the project area, visually evaluate the performance of existing embankment slopes, and verify regional geologic conditions based on mapping by others.

The reconnaissance used the U.S.G.S. San Bernardino South Quadrangle, 7½ Minute series Topographic map, Map Scale 1:24,000 for reference. Regional geologic maps reviewed for this study included the Riverside East and south ½ San Bernardino South Map (Dibblee, 2003), *Geologic Map of San Bernardino and Santa Ana 30' X 60' Quadrangles, California* (Morton and Miller, 2006), and the *Generalized Geologic Map of Southwestern San Bernardino County, California* (Fife, 1976).

5.2 SOIL SURVEY MAPPING

According to the United States Department of Agriculture (USDA) Soil Conservation Service, the on-site surficial soils within the project limits are comprised of Greenfield sandy loam (2 to 9 percent slopes; soil symbol: GtC). This soil has medium runoff and the hazard to erosion is moderate if the soil is unprotected.

5.3 SUBSURFACE SOIL CONDITIONS

Based on a review of Log of Test Boring (LOTB) data for Barton Road Overcrossing, and nearby Newport Avenue Overcrossing, subsurface materials at the subject site consist of alternating layers of loose to dense sand, silty sand, sandy silt, and gravel to a depth of approximately 40 feet below the existing grade. Although not documented on the as-built plans, fill materials appear to have been placed during the construction of the embankments and ramps for the bridges. The depth to bedrock is unknown but is not anticipated to be encountered during site development.

5.4 WATER

5.4.1 Surface Water

Surface drainage flows primarily by surficial sheet flow over the existing contour of the land. Proposed roadway improvements should be designed to provide positive surface drainage to prevent ponding and/or saturation of the soils in the vicinity of foundations or pavements. Flood plain data reviewed for the area indicates that the project site lies outside designated Federal Emergency Management Agency (FEMA) 100-year and 500-year floodplains (FEMA, 1996).

5.4.2 Groundwater

The project study area is located within the Middle Santa Ana Hydrologic area of the greater Santa Ana River Groundwater Basin. The main water-bearing deposits in the area are the Holocene- and Pleistocene-age alluvium underlying the site.

Based on the LOTB data for nearby Newport Avenue Overcrossing (Bridge No. 54-529) dated August 29, 1958, groundwater was encountered in boring B-4 at a depth of 34 feet below ground surface (elevation of 987 feet). The LOTB data for Barton Road Overcrossing (dated August 29, 1958) indicate that groundwater was not encountered in the borings drilled to a maximum depth of 34 feet below ground surface (elevation of 948 feet). This data indicates that the depth to groundwater at the project site may be greater than 30 feet below ground surface.

Recent groundwater measurements by the Western Municipal Water District Cooperative Well Measuring program (WMWD, 2007) within a mile of the project site has reported groundwater elevation of approximately 822 feet above Mean Sea Level (MSL).

Fluctuations of the groundwater level, localized zones of perched water, and soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on or immediately adjacent to the site can also cause a fluctuation of local groundwater levels.

5.4.3 Infiltration

Detailed project plans showing locations of proposed infiltration basins or swales have not been developed or reviewed. In general, infiltration rates for future infiltration basins and swales will vary depending on the composition and associated permeability of the underlying soils. Subsurface exploration was not performed as part of this study and the nature and composition of the underlying soils has not been evaluated. Project specific infiltration rates should be evaluated during the final design phase of the project and should be based on subsurface exploration, laboratory testing, and appropriate analysis.

6.0 GEOLOGIC HAZARDS

6.1 SEISMIC SHAKING

The project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or sufficiently active and well defined fault. These active and sufficiently active and well defined faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience ground acceleration as the result of moderate to large magnitude earthquakes.

The closest active faults to the site are Rialto-Colton-Claremont (RCC) and San Jacinto (SJO) located northeast approximately 2.5 and 4 kilometers (km), respectively from the project site. Numerous other faults may also represent significant hazards, such as San Andreas fault, located approximately 15 km from the site. However, the RCC fault is considered to have the greatest impact to the site due to anticipated peak ground accelerations resulting from a maximum credible earthquake.

In addition to the known faults, recent research indicates that “blind faults” (faults that apparently have not broken the surface and display little or no surface expression) may underlie the Los Angeles Basin and adjacent areas to the west. Faults of this type are thought to have been responsible for the Whittier Narrows earthquake of 1987 and the Northridge earthquake of 1994. With the current understanding of the regional tectonic setting, it is believed that blind faulting is not present under the site vicinity.

6.2 GROUND SURFACE RUPTURE

Faults classified as either active or potentially active by the State have not been identified on-site. The site is not located within a designated Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007), where a site-specific fault investigation is required.

Ground surface rupture is usually confined to the narrow surface trace of an active fault. Since no known active fault traces project toward or cross the site, the potential for ground surface rupture is considered low.

6.3 LIQUEFACTION POTENTIAL

Soil liquefaction is a phenomenon in which saturated, cohesionless soils lose their 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 clean, loose, uniformly graded, fine-grained sands, and non-plastic silts that are saturated. Silty sands, under certain site conditions, may also be susceptible to liquefaction.

The potential impacts of liquefaction to the site may include: 1) settlement of the ground surface; 2) lateral spreading of the ground; 3) additional downdrag forces on foundation piles as a result of soil settlement above the liquefied layers; and 3) reduction of shear strength of the liquefied soil resulting in reduced load-carrying capacity.

The potential for liquefaction at the site was evaluated using data obtained from our research and the as-built LOTB sheets of nearby structures. Due to the researched depth to groundwater (see Section 5.4.2), it is our opinion that under a preliminary, screening-level liquefaction analysis, the site has a low to moderate liquefaction potential. A site-specific liquefaction analysis should be performed in conjunction with a design-level geotechnical investigation for the project.

6.4 COLLAPSIBLE SOILS

A collapsible soil is generally defined as a soil that will undergo a sudden decrease in volume when its internal structural support is lost. Soils found to be most susceptible to collapse include loess (fine-grained wind-deposited soil) deposits, valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. The degree of collapse for a soil sample is defined by the collapse potential value, which is expressed as a percent collapse of the total sample.

The project site is located in a geologic area prone to collapsible soil conditions. The collapse potential of subsurface soils at the site should be evaluated as part of a design-level geotechnical investigation.

7.0 GEOTECHNICAL ANALYSIS AND DESIGN

7.1 SEISMIC DESIGN PARAMETERS

The project site is located in a seismically-active region. The controlling fault for this project site is the Rialto-Colton-Claremont (RCC) fault located approximately 2.5 km northeast of the project site. The Rialto-Colton-Claremont fault has an unknown style of faulting capable of generating earthquakes with a maximum credible earthquake (MCE) magnitude of 6.75. A summary of recommended seismic design parameters is presented in Table 2, below.

Table 2
Summary of Seismic Design Parameters

Causative Fault (Type of Fault)	Rialto-Colton-Claremont (Unknown style of faulting)
MCE[1] Magnitude	6.75
Distance to Fault	2.5 km
Design PBA[2]	0.7g
SDC Soil Profile Type	Type D
ARS Curve Recommendation[3]	SDC ARS Figure B.7 modified for directivity effects and scaled to design PBA ; Damping = 5%

Notes:
[1] MCE = Maximum Credible Earthquake
[2] Design PBA = Design Peak Bedrock Acceleration, based on Caltrans Seismic Hazard Map (1996) and verified by attenuation relationships by Sadigh et al. (1997).
[3] Modified for directivity effects and verified using the attenuation relationship by Sadigh et al. (1997). The directivity and PBA modifications are based on Caltrans SDC Version 1.4 (dated June 2006) and Guidelines for Structures Foundation Reports, Version 2.0 (dated March 2006).

The Peak Bedrock Acceleration (PBA) was determined based on the *1996 California Seismic Hazard Map* (Mualchin, 1996), presented on Plate 3, *Fault and PBA Map*, and verified according to the attenuation relationships presented by Sadigh et al. (1997) in accordance with *Caltrans Guidelines for Structures Foundation Reports Version 2.0*, dated March 2006. The PBA at the site is estimated to be 0.7g from Rialto-Colton-Claremont fault. Based on our review of as-built LOTB sheets of nearby bridges, we classify the site as Soil Profile Type D in accordance with Table B.1 of Caltrans *Seismic Design Criteria* (SDC), Version 1.4, dated June 2006.

The recommended standard acceleration response spectra (ARS) curve is Figure B.7 in Appendix B of *Caltrans Seismic Design Criteria, Version 1.4*, dated June 2006. The standard ARS curve is modified to account for fault-rupture directivity (near-source) effects per Caltrans SDC Section 6.1.2.1 and Caltrans Guidelines for Structures Foundation Reports. The recommended *Preliminary Design ARS Curve* is presented on Plate 4.

7.2 EXCAVATIONS

Detailed project grading plans were not available at the time this report was prepared. We anticipate that temporary excavations will be required during construction of foundations, abutments, wingwalls, retaining walls, drainage improvements and underground utilities.

Bedrock-type material is not anticipated. However, large cobbles and boulders are anticipated within the required depths of excavation. Conventional earth moving equipment is expected to be capable of performing the excavations required. In general, groundwater is not anticipated within the excavations at the site unless deep foundations are used for the bridge or retaining structures.

7.3 FILL AND CUT SLOPES

Approach embankments constructed of compacted fill soils will be required for the new bridges and bridge widening, and ramps. In accordance with the latest edition of Caltrans Highway Design Manual (HDM), fill slopes should be 4:1 (H:V) or flatter. Slopes steeper than 4:1 (H:V) must be approved by the District Landscape Architect. We anticipate that the fill slopes within Caltrans right-of-way will be constructed at an inclination of approximately 4:1 (H:V) or flatter in accordance with Caltrans recommendation. Embankment fill slopes within the City of Grand Terrace right-of-way may be constructed at an inclination of 2:1 (H:V) or flatter. Future cut slopes, if proposed, should have a gradient of 4:1 (H:V) or steeper in accordance with the latest edition of Caltrans Highway Design Manual.

We anticipate the proposed slopes will be stable provided the embankments are constructed in accordance with the requirements of the Caltrans Standard Specifications and the project GDR. Detailed slope stability analyses should be performed following availability of site improvement plans and a site-specific geotechnical investigation.

7.4 FOUNDATIONS FOR NEW BRIDGE STRUCTURES

In accordance with Caltrans Memo to Designers Section 5-1, deep foundations should be used at the abutments when the expected peak bedrock acceleration is 0.6g or greater, and the embankment height is 10 feet or greater, or if the bents are on piles and significant densification of the foundation material during an earthquake can be expected. The exception to this recommendation is for abutments under single-span bridges. Our analyses indicate a peak bedrock acceleration of 0.7g at the bridge site. Based on the planning study drawings, presented in Appendix B, the proposed embankments will have heights ranging from 25 feet to 35 feet. On a preliminary basis, the new bridge abutments and bents for Barton Road Overcrossing, and Barton Road NB Off- and On- Ramp Overcrossings, should be supported on deep foundations.

Deep foundations may consist of cast-in-drilled-hole piles (CIDH piles) or driven piles. Driven piles may be precast, prestressed concrete pile, cast-in-steel-shell (CISS) concrete pile, steel H-pile, or steel pipepile. Site-specific issues including noise, vibration, ground heave, headroom, constructability, and drivability must be considered when selecting driven piles. Drivability should be evaluated to verify that driven piles can penetrate to the required tip elevations.

Recommendations for pile type, axial and lateral pile capacity, and minimum tip elevations, etc. can be developed as part of a design-level structure foundation report for the site.

7.5 EARTH RETAINING SYSTEMS

The specific configuration of earth retaining structures is not known at this time. The following recommendations can be used for preliminary design.

7.5.1 Lateral Earth Pressures

Lateral earth pressures acting against earth retaining systems can be estimated using the values presented in the Caltrans Standard Plan sheets for retaining walls. The lateral earth pressures provided are for walls backfilled with materials that meet Caltrans standards for abutment and retaining wall backfill. Proper drainage should be designed behind the walls to allow for drained conditions in the backfill soils and to prevent excessive hydrostatic pressure above the water table.

7.5.2 Backfill Placement

All backfill should be placed and compacted in accordance with the latest edition of the Caltrans Standard Specifications. Light equipment should be used during backfill compaction to reduce the potential for possible overstressing of the wall.

7.6 MINOR STRUCTURES

Specific details regarding minor structures for the project, such as sound walls and overhead signs, were not yet developed at the time this report was prepared.

7.7 CULVERT FOUNDATIONS

The new culvert structures, if any, should be founded on either engineered fill or native materials, which is firm and unyielding.

7.8 CORROSION STUDY

Section 4.1 of the "Corrosion Guidelines" prepared by the Corrosion Technology Branch, Caltrans Office of Engineering and Testing Services (September 2003) defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2,000 ppm of sulfates, or has a pH of less than 5.5. In general, a minimum resistivity for soil and/or water less than 1,000 ohm-cm indicates the presence of high quantities of soluble salts and a higher propensity for corrosion.

Since no subsurface investigation or laboratory testing was performed during this phase of the project, site-specific corrosion conditions cannot yet be evaluated. A corrosion evaluation based on laboratory testing of field soil samples should be performed during a design-level geotechnical investigation of the site.

For preliminary estimating purposes, we recommend a minimum of 10-gage Corrugated Steel Pipe (CSP) or Corrugated Aluminized Steel Pipe (CASP) for metal pipes, assuming abrasive conditions. For reinforced concrete culverts, a Modified Type II cement with a maximum water-to-cement ratio of 0.45 is recommended for preliminary design. For any existing culverts that will remain in place or that will be extended, we recommend that the culverts be inspected, repaired or replaced, if necessary.

7.9 PAVEMENT DESIGN

Preliminary pavement design recommendations for this project are provided in a separate *Preliminary Materials Report* prepared by Kleinfelder.

8.0 LIMITATIONS

The conclusions and recommendations presented in this report are for the preliminary design of the proposed Interstate 215/Barton Road Interchange improvements in the City of Grand Terrace, California, as described in the text of this report. The findings, conclusions and recommendations were prepared in accordance with generally accepted geotechnical engineering practice. No warranty, express or implied, is made. This report was based on the proposed project information provided to Kleinfelder. 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. This report is presented with the understanding that a design-level Structure Foundation Report (SFR) and a separate Geotechnical Design Report (GDR) will be prepared for the subject project in the future.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference," as that latter term is used relative to contracts or other matters of law.

This report may be used only by the project designers and Caltrans and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. 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 harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

Environmental site assessment for the presence or absence of hazardous/toxic materials in the soil, surface water, groundwater or atmosphere, or the presence of wetlands was not included in the scope of our services for this report.

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PLATES

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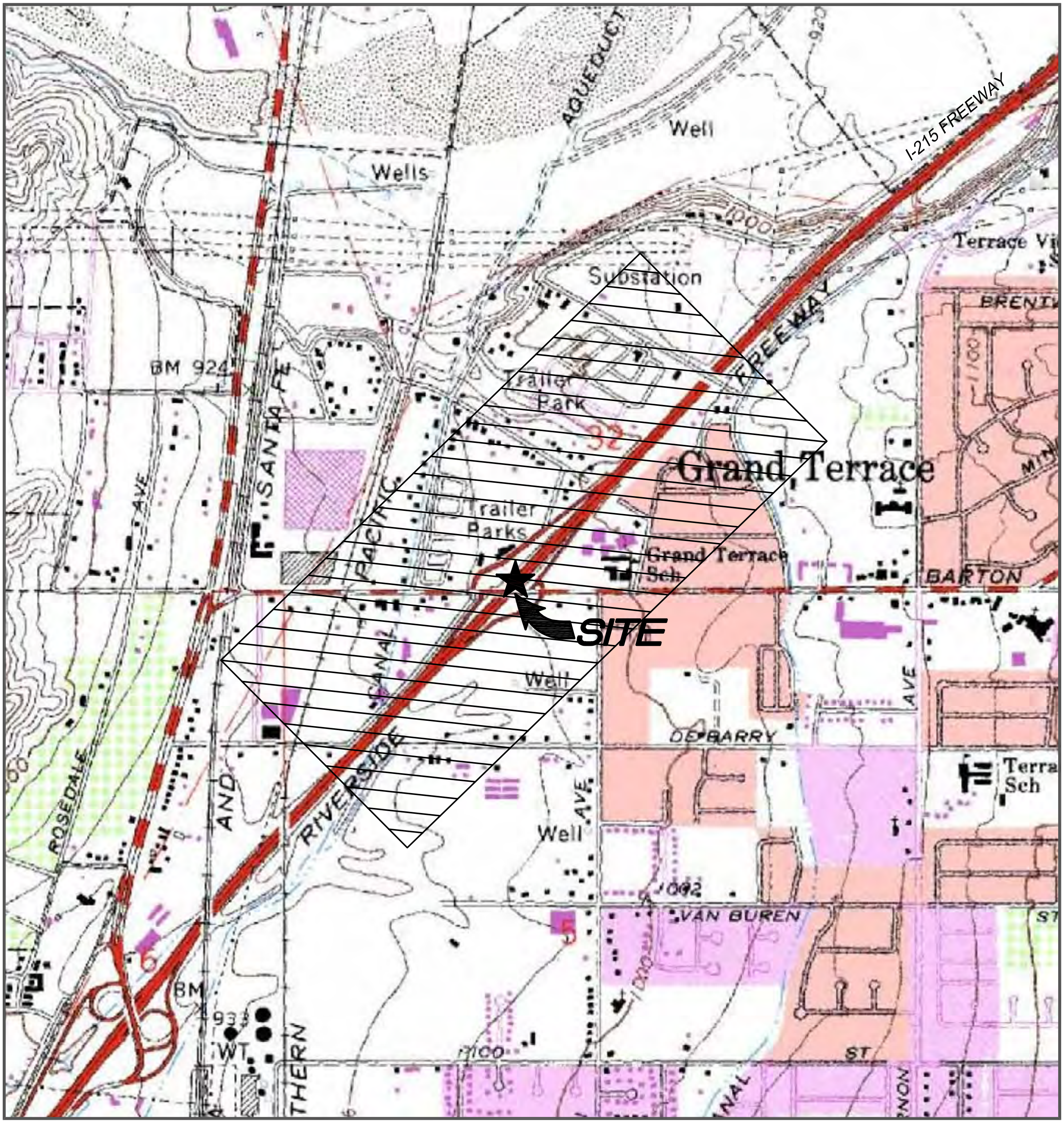

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34.034°N, -117.325°W
USGS SAN BERNARDINO SOUTH (CA) QUADRANGLE

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ATTACHED IMAGES:
ATTACHED XREFS:
DIAMOND BAR, CA

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SITE VICINITY MAP

INTERSTATE-215 / BARTON ROAD INTERCHANGE
IMPROVEMENTS PROJECT
GRAND TERRACE, CALIFORNIA

PLATE

1

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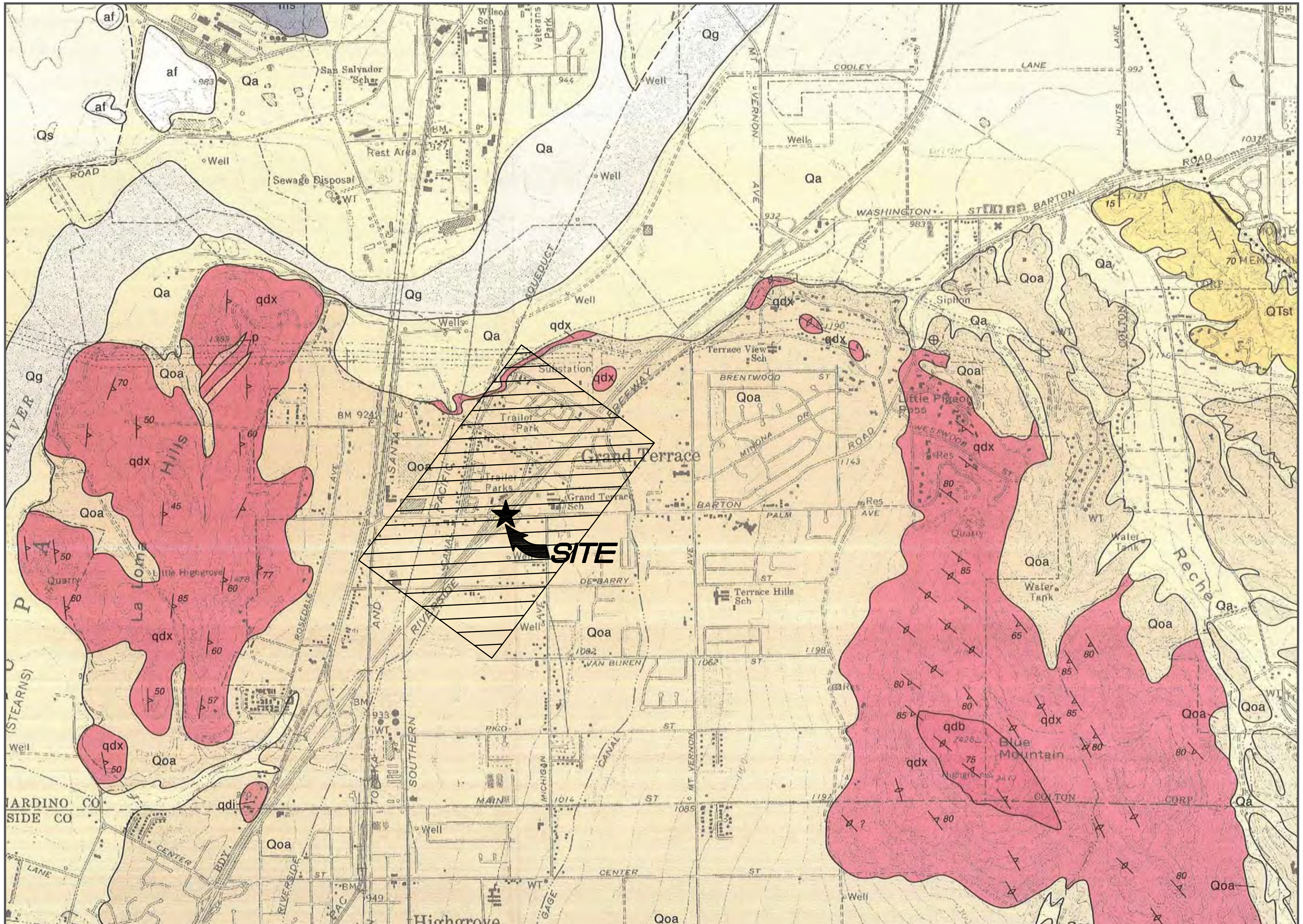


LEGEND

SURFICIAL DEPOSITS

Unindurated, undissected

af *Artificial cut and fill, grading and fill by human activity for urban development during last several decades*
Qg *Alluvial gravel and sand of stream channels*
Qa *Alluvial sand, gravel and clay of valley areas, covered with soil*
Qs *Drift sand, deposited by north winds*

OLDER SURFICIAL SEDIMENTS

Weakly indurated alluvial fan deposits derived from local terrains of plutonic rocks

Qoa *Alluvial fan deposits of sand, minor gravel, tan to light reddish brown, dissected by stream channels from source areas, top surfaces slope more than about 40ft per 0.7 mile in*

SAN TIMOTEO FORMATION

(San Timoteo beds of Frick, 1921) stream-laid alluvial sediments of detritus derived from plutonic and metamorphic rocks of San Bernadino Mountains area, weakly indurated, upper part yielded vertebrate fauna diagnostic of Blancan Stage, Plio-Pleistocene (Frick, 1921, Savage, et. al. 1954), or Irvingtonian 1 Stage, earliest Pleistocene (Repenning, 1987)

QTst *Upper part, sandstone, light gray to tan, fine to coarse grained, arkosic, bedded and minor conglomerate of pebbles and cobbles of mostly granitic detritus, some of gneissic rocks and quartzite; includes some thin layers of soft greenish to light reddish silty claystone, top not exposed in quadrangle*

PLUTONIC ROCKS OF PENINSULAR RANGES

Complex of medium grained holocrystalline plutonic rocks, mostly of quartz diorite to granodiorite composition, in which biotite flakes and hornblende are oriented nearly parallel to form gneissoid structure and which contain dark gray fine grained discoid inclusions (xenoliths) oriented parallel to gneissoid foliation. These distinctive granitic rocks called Bonzal Tonalite, by Larsen 1984, form a major part of batholith of the Peninsular Ranges. These rocks are either intrusive into or recrystallized from an enormously thick metasedimentary petrolith (ms) at great depth, as suggested by scattered engulfed remnants of those petroliths, probably in Cretaceous time. In this quadrangle these granitic rocks interpreted by Morton and Cox, 2001 as two plutons, one as ValVerde Tonalite pluton in SW and central parts of quadrangle, the other as a dioperic granodiorite-tonalite pluton of Box Springs Mountains, including its central core of biotite tonalite. Radiometric age, probably cooling age variously interpreted from 88Ma to 110 Ma, or Cretaceous (Larsen, 1948, Morton and Cox, 2001).

qdx *Leucocratic, light gray, composed of 1/3 quartz, 2/3 sodic plagioclase feldspar, less than 4% K-feldspar and 6-10% biotite and hornblende; gray, massive to gneissoid, contains scattered dark gray discoid inclusions (xenoliths) parallel to gneissoid foliation; rock somewhat incoherent, weathered to low relief; emplacement radiometric age ^{40}Ar ^{39}Ar age of hornblende 100 Ma, biotite 95 Ma, and K-feldspar 88 Ma (Morton and Cox, 2001)*

qdb *Biotite quartz diorite (tonalite) of Morton and Cox, 2001, similar to* **qdi**, *but nearly devoid of hornblende, somewhat lighter gray, more massive, and contains few inclusions (xenoliths); forms core of pluton of Box Springs Mountain (Morton and Cox, 2001), or structurally overlies unit* **qdx** *in synform; if intrusive, emplaced in axial part of synform; in NE area, radiometric (zircon) age 98.6 and 100.4 Ma (Morton and Cox, 2001)*

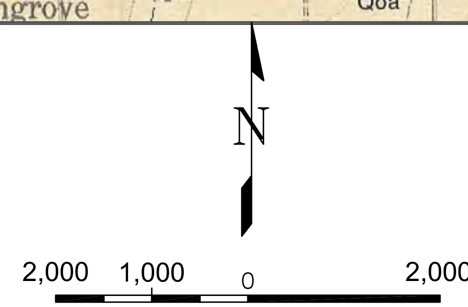
qdx *Quartz diorite, xenolith rich, ranges to granodiorite, composed of 1/3 quartz, 2/3-1/2 sodic plagioclase feldspar, minor potassic feldspar; mostly as small phenocrysts, and 10-15% biotite and hornblende; light to medium gray, gneissoid, contains abundant discoid inclusions (xenoliths) parallel to gneissoid foliation; coherent, erosion resistant to form Box Springs Mountain; divided into 3 slightly different units by Morton and Cox, 2001; lies NE of ValVerde pluton of Morton and Cox, 2001, or structurally overlies unit* **qdi**

METASEDIMENTARY ROCKS

Severely metamorphosed marine sedimentary rocks of inferred Paleozoic (?) age, as small pendant remnants engulfed in plutonic rocks

ms *Biotite schist, dark gray, fine grained foliated, includes minor biotite-quartz-feldspar schist or gneiss, quartzite and calc-silicate hornfels in Riverside area*

SOURCE: BASED ON DIBBLE, 2003 (#DF-109)



APPROXIMATE SCALE (feet)

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PROJECT NO.	94305	REGIONAL GEOLOGIC MAP	PLATE 2
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CHECKED BY:	MC	INTERSTATE-215 / BARTON ROAD INTERCHANGE IMPROVEMENTS PROJECT GRAND TERRACE, CALIFORNIA	
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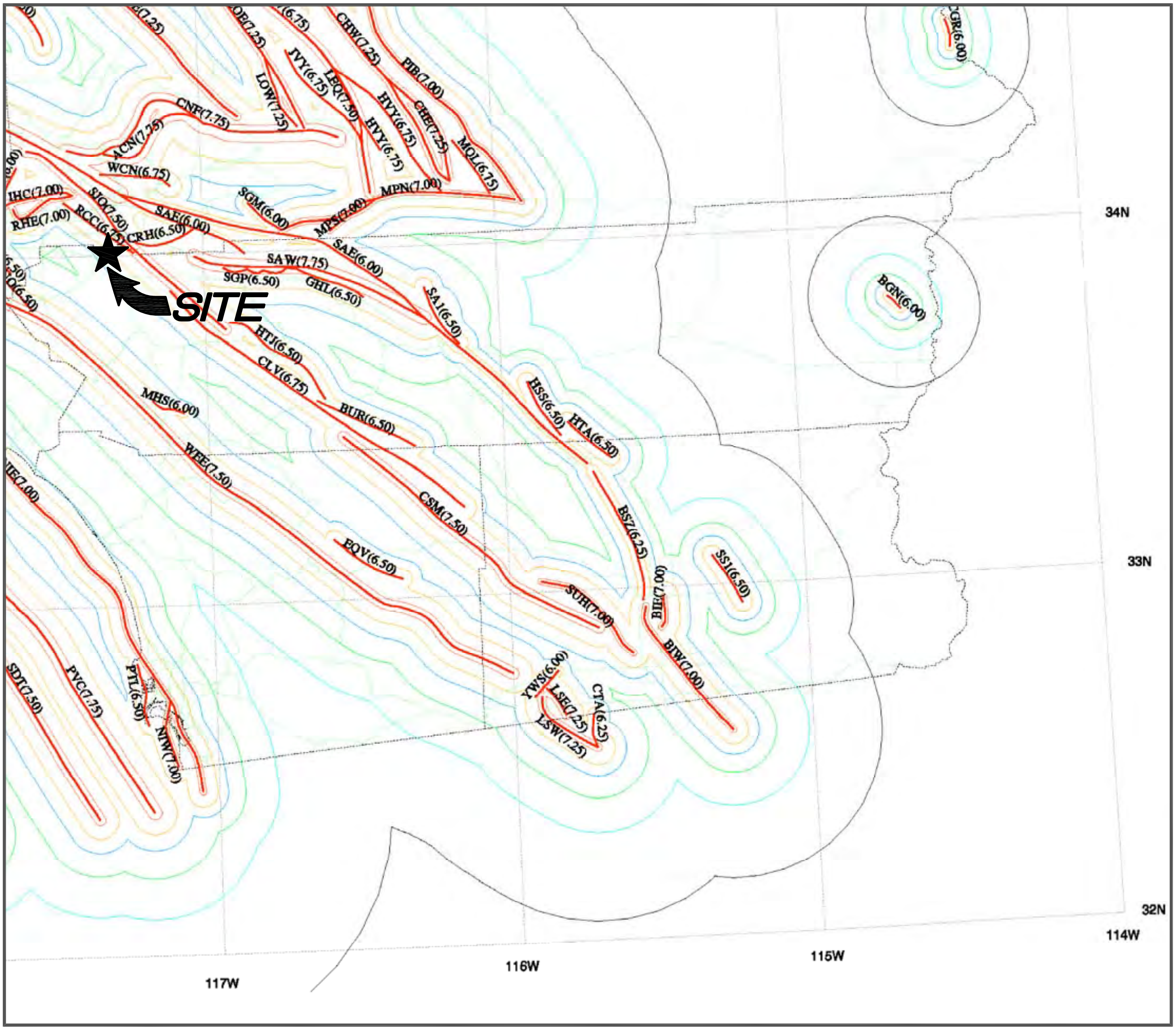

SOURCE: BASED ON CALIFORNIA SEISMIC HAZARD MAP & MAXIMUM CREDIBLE EARTHQUAKES (MCE), DATED 1996.

N

50 25 0 50

APPROXIMATE SCALE (kilometers)

LEGEND:

- 0.7g Peak Acceleration Contour
- 0.6g Peak Acceleration Contour
- 0.5g Peak Acceleration Contour
- 0.4g Peak Acceleration Contour
- 0.3g Peak Acceleration Contour
- 0.2g Peak Acceleration Contour
- 0.1g Peak Acceleration Contour
- Special Seismic Source (SSS)
- Faults with Fault Codes (MCE)
- State Highways
- County Boundary
- Latitude & Longitude

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www.kleinfelder.com

PROJECT NO.	94305
DRAWN:	7/07/08
DRAWN BY:	MRG
CHECKED BY:	MC
FILE NAME: 94305p3.dwg	

FAULT AND PBA MAP

INTERSTATE-215 / BARTON ROAD INTERCHANGE IMPROVEMENTS PROJECT
GRAND TERRACE, CALIFORNIA

PLATE
3

PLOTTED: 07 Jul 2008, 11:22am, MGriffin LAYOUT: 2
CAD FILE: U:\MGriffin\CADD\2008\94305\080627_Intst.-215_Barton-Rd_Intchg\
Images: For Geologic Map-I-215-Barton Rd_Page_1.tif Images: use this for Plate 3_1.tif
ATTACHED IMAGES:
ATTACHED XREFS:
DIAMOND BAR, CA

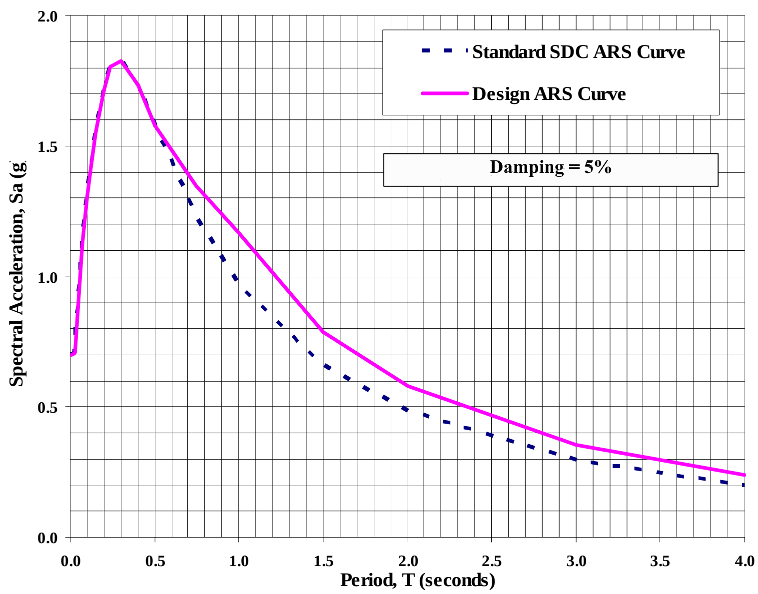
CALTRANS BRIDGE DESIGN ARS CURVE

(Version 4.0, Copyright 2007, Developed By: GeoSoftware Solutions, All Rights Reserved, http://www.geosoftwaresolutions.com)
(Licensed to: Kleinfelder West, Inc. - Redlands, California)

PROJECT INFORMATION	
Project Name	I-215/ Barton Rd Interchange Improvements Project
Project No.	94305
Location	Grand Terrace, California

INPUT PARAMETERS	
Controlling Fault Name	Rialto-Colton-Claremont (RCC)
Fault Type	Unknown (XX)
MCE Moment Magnitude	6.75
Distance to Fault	2.50 kilometers
Peak Bedrock Acceleration Based on 1996 California Seismic Hazard Map	0.6 g
Soil Profile Type	D

COMPUTED RESULTS	
Peak Bedrock Acceleration Based on Sadigh et al. (1997)[1]	0.67 g
Design Peak Bedrock Acceleration (g)	0.70 g



COMPUTED ARS CURVES

Period T (seconds)	Standard SDC ARS Curve[2] Sa (g)	Design ARS Curve[3] Sa (g)
0.010	0.700	0.700
0.020	0.703	0.703
0.030	0.708	0.708
0.050	0.917	0.917
0.075	1.127	1.127
0.100	1.305	1.305
0.120	1.416	1.416
0.150	1.551	1.551
0.170	1.622	1.622
0.200	1.716	1.716
0.240	1.801	1.801
0.300	1.824	1.824
0.400	1.733	1.733
0.500	1.576	1.576
0.750	1.226	1.349
1.000	0.972	1.167
1.500	0.656	0.787
2.000	0.483	0.579
3.000	0.294	0.352
4.000	0.198	0.237

Prepared By:______________ Date: ________
Reviewed By: ______________ Date: ________

NOTES:

[1]Peak Bedrock Acceleration (PBA):
Estimated using attenuation relationship by Sadigh et al. (1997) for rock site.
Sadigh et al. (1997) recommended no increase for Strike-Slip Fault, 10% increase for Oblique Fault; and 20% increase for Reverse/Thrust Fault. If type of fault is unknown, a 10% increase is assumed.

[2]Standard Seismic Design Criteria (SDC) ARS Curve:
Used Caltrans standard SDC ARS curve for the given PBA, magnitude, and soil profile type.

[3]Design ARS Curve:
When the bridge is located within 15 km of the controlling fault, the standard SDC ARS curve was modified as follows to account for fault rupture directivity effect:
- For Periods < 0.5 sec, no increase in standard SDC spectral acceleration values.
- For Periods > 1.0 sec, the standard SDC spectral acceleration values were increased by 20%.
- For Periods between 0.5 sec and 1.0 sec, spectral acceleration values were linearly interpolated.

PLOTTED: 15 Jul 2008, 9:07am, MGriffin LAYOUT: 4
CAD FILE: U:\MGriffin\CADD\2008\94305\080715_Intst.-215_Barton-Rd_Intchg\
ATTACHED IMAGES:
ATTACHED XREFS:
DIAMOND BAR, CA

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PROJECT NO.	94305
DRAWN:	7/07/08
DRAWN BY:	MRG
CHECKED BY:	MC
FILE NAME:	94305p4.dwg

PRELIMINARY DESIGN ARS CURVE

INTERSTATE-215 / BARTON ROAD INTERCHANGE IMPROVEMENTS PROJECT
GRAND TERRACE, CALIFORNIA

PLATE
4

APPENDIX A

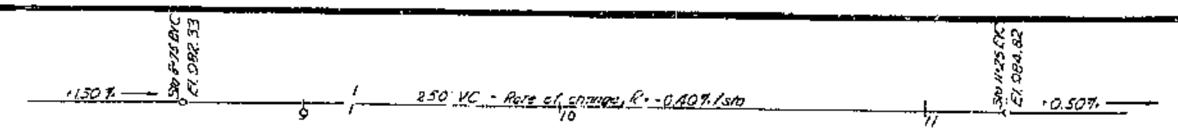
AS-BUILT PLANS OF EXISTING AND NEARBY STRUCTURES

FED. ROAD DIV. NO.	STATE	PROJ. No.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF			124	175

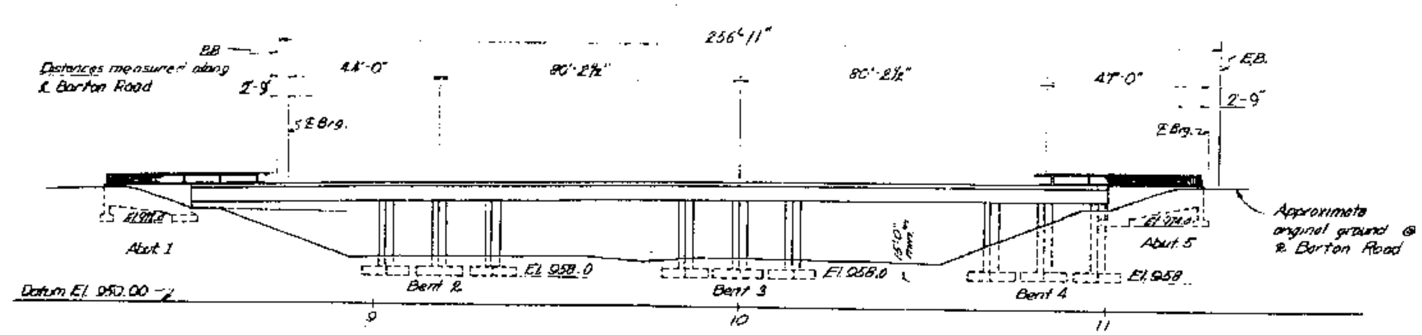
P.M. 1.3

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VIII	SBd	15	F	1	7

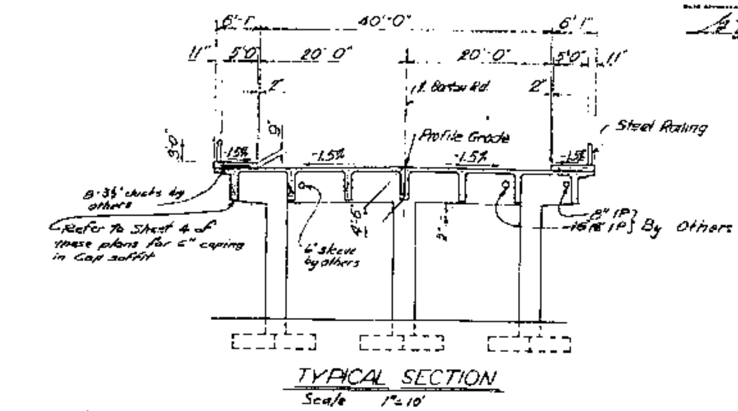
Bid Advertised APR 29 1959



PROFILE GRADE



ELEVATION
1" = 20'



TYPICAL SECTION
Scale 1" = 10'

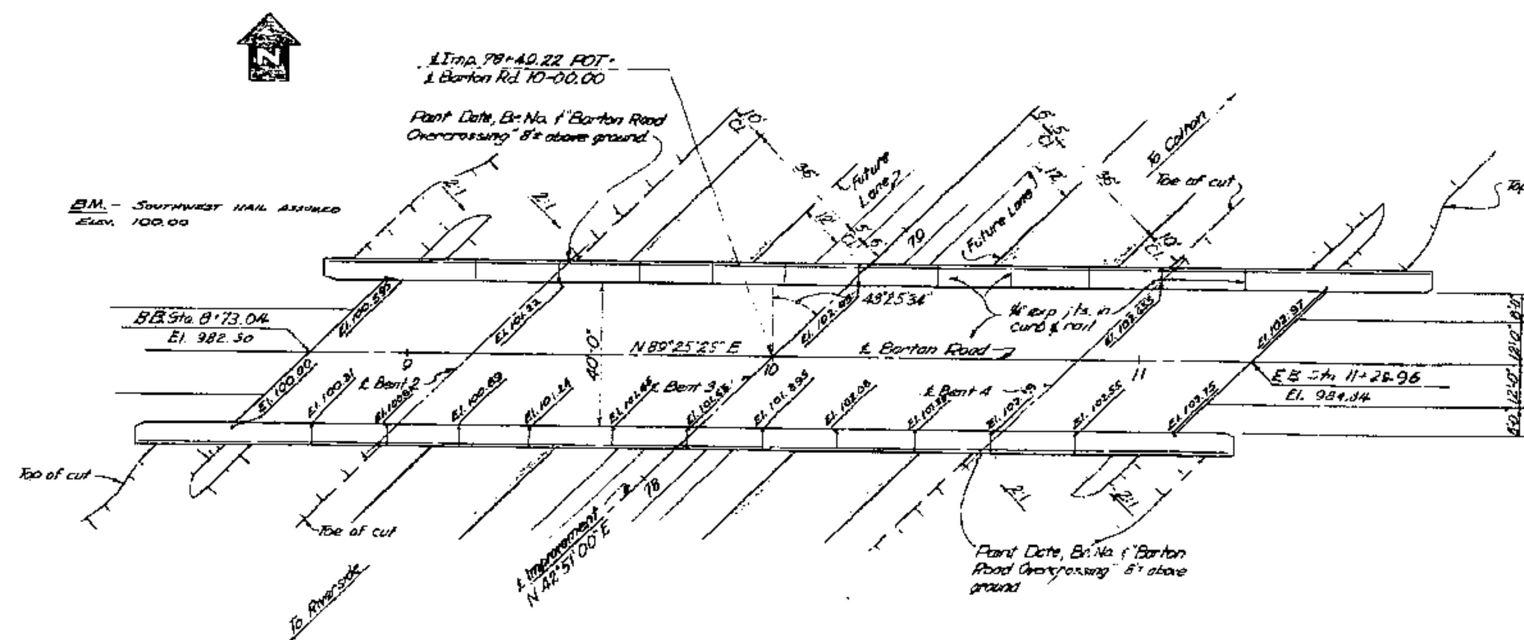
INDEX TO PLANS

Sheet No.	Title
1	General Plan
2	Foundation Plan
3	Abutment Details
4	Bent Details
5	Typical Section
6	Girder Reinforcement
7	Log of Test Borings

APPROXIMATE QUANTITIES

STRUCTURE EXCAVATION	450 C.Y.
STRUCTURE BACKFILL	250 C.Y.
CLASS "A" CONCRETE (BRIDGES)(1,060 C.Y.)	LUMP SUM
RUBBER WATERSTOPS	146 L.F.
BAR REINFORCING STEEL (BRIDGES)(230,000 LBS.)	LUMP SUM
MISCELLANEOUS STEEL	5,700 LBS.
STEEL RAILING	602 L.F.

Notes: For "G Sheets" see Br # 54-530



PLAN
1" = 20'

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

AS BUILT
CORRECTIONS BY
CONTRACT NO. 59-8VC8 F

For Bridge Lighting Plans see Road Plans

For Railing Details see "G-2"
" Standard Details see "G-3"
For Standard Details No 2 see "G-5"
See "Newport Ave O.C." for pouring diagram

LL: H20-S16-44 & Alternative

For General Notes see "Washington Ave O.C."

BRIDGE DEPARTMENT
DESIGN SECTION 1

DESIGN	By DE Young	Checked
DETAILS	By	Checked
QUANTITIES	By	Checked
SPECIFICATIONS	By	

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BARTON ROAD OVERCROSSING
LOCATED APPROXIMATELY .3 MI. N. OF THE RIVERSIDE-SAN BERNARDINO COUNTY LINE

GENERAL PLAN

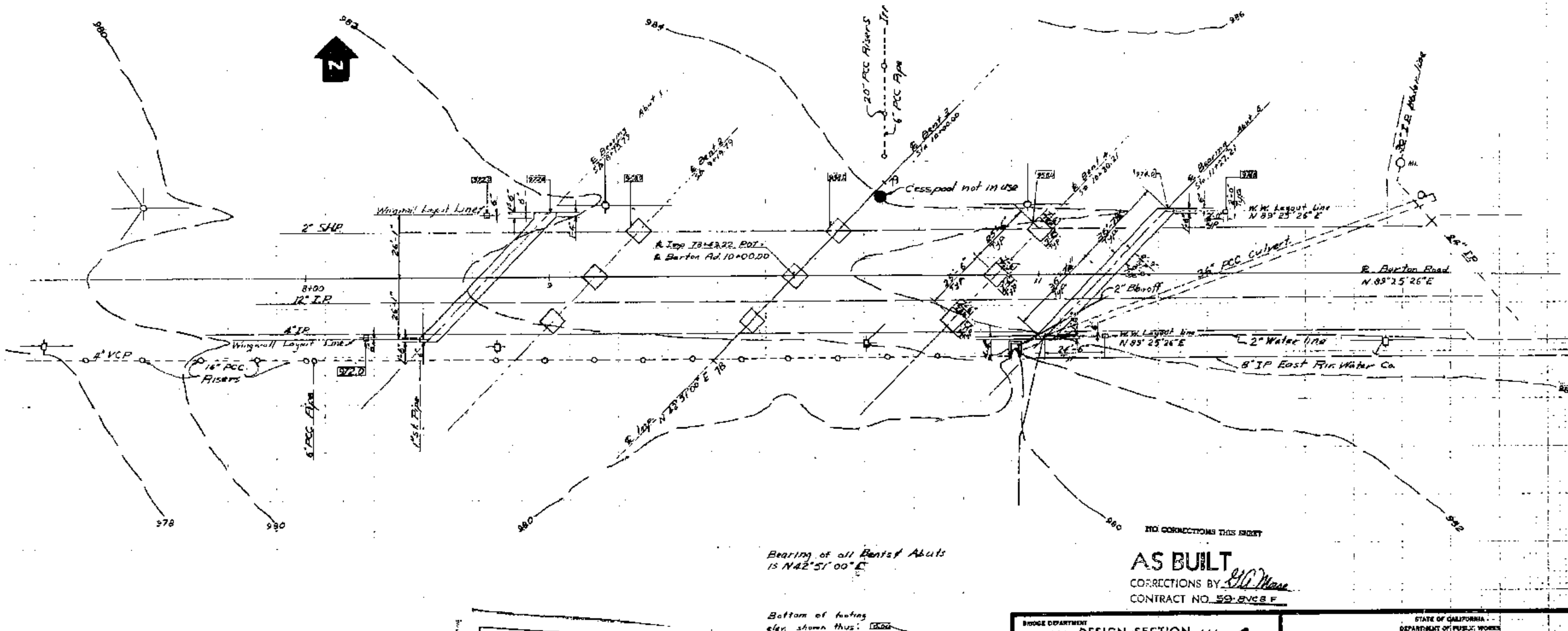
SCALE As Noted | BRIDGE 54-528 | FILE | DRAWING C-4958-1

PREL. DRAWING No. P-4958

124

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

7	CALIF			125	175



NO CORRECTIONS THIS SHEET

AS BUILT
CORRECTIONS BY G.A. Moore
CONTRACT NO. 59-8VC8 F

BRIDGE DEPARTMENT
DESIGN SECTION 1

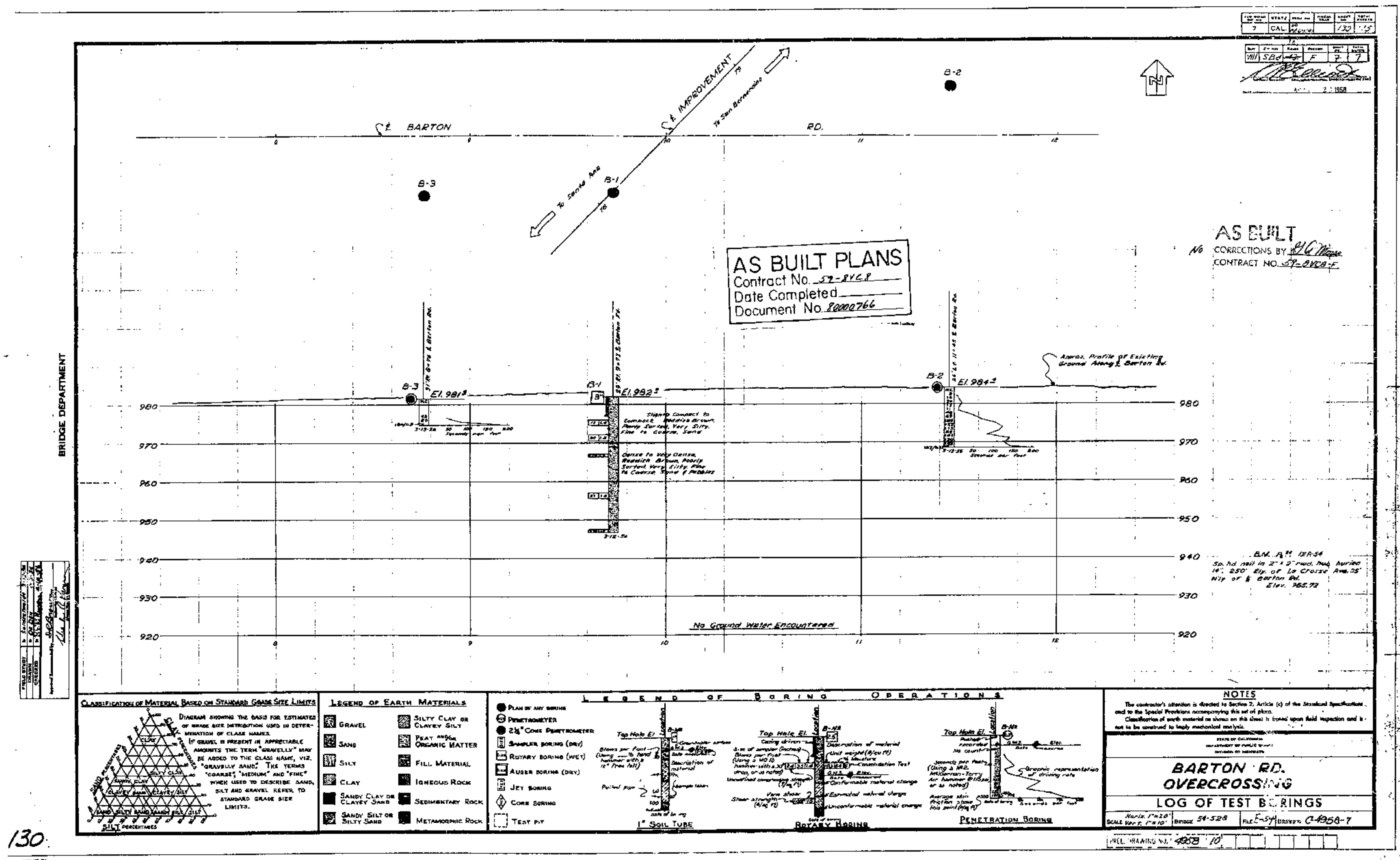
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BARTON ROAD OVERCROSSING
FOUNDATION PLAN

SCALE 1" = 20' | BRIDGE 54-528 | FILE | DRAWING C-4958-2

PREL. DRAWING NO. P-4958

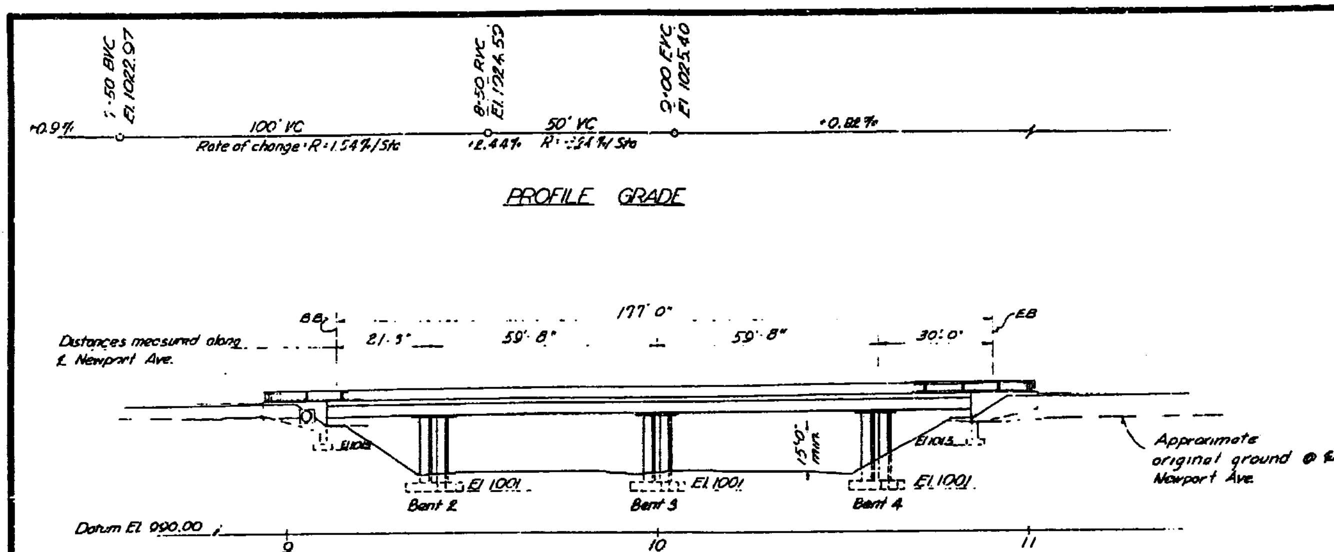
125



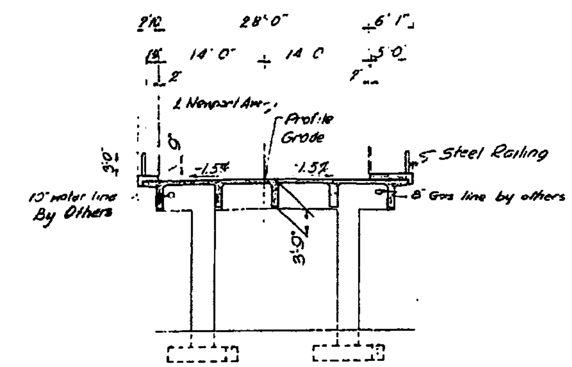
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE ___ SIGNATURE ___ TITLE ___

P.M. 17



ELEVATION
1"=20'



TYPICAL SECTION
1"=10'

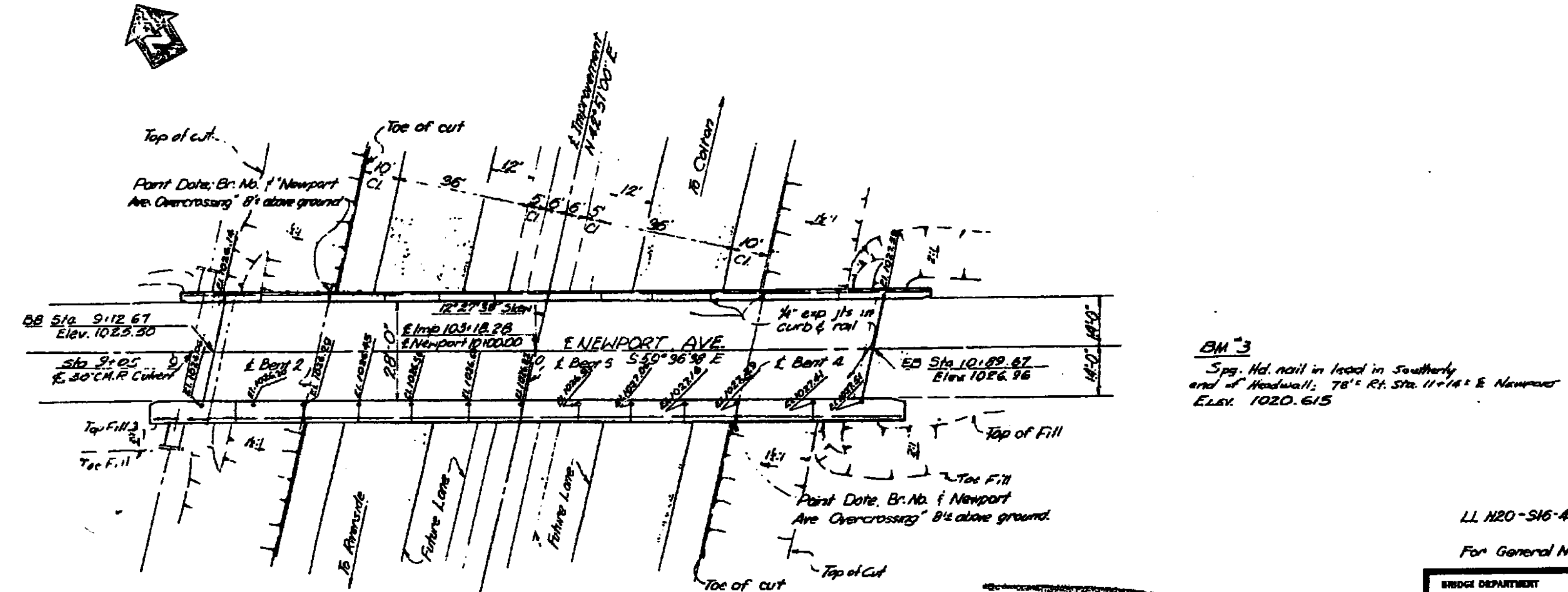
INDEX TO PLANS

Sheet No.	Title
1	General Plan
2	Foundation Plan
3	Abutment & Bent Details
4	Deck & Girder Details
5	Log of Test Borings

APPROXIMATE QUANTITIES

STRUCTURE EXCAVATION	260 C.Y.
STRUCTURE BACKFILL	185 C.Y.
CLASS "A" CONCRETE (BRIDGES)(460 C.Y.)	LUMP SUM
BAR REINFORCING STEEL (BRIDGES)(99,000 LBS.)	LUMP SUM
STEEL RAILING	402 L.F.

AS BUILT
CORRECTIONS BY G.C. Moss
CONTRACT NO. 59-8VC8-F



PLAN
1"=20'

BM #3
Spg. Hd. nail in lead in Southerly end of Headwall; 78'± Rt. Sta. 11+14± ℄ Newport
Elev. 1020.615

Note: For "G Sheets" See Br. # 54-530

LL H20-S16-44. & Alternative

For General Notes see "Washington Ave. O.C."

For Standard Details see "G-3"
For Steel Railing Details see "G-2"

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
DESIGN SECTION 1
Project Designer O.E. Young
Chief Designer W.F. Reed

DESIGN	By E.J. Wood 4/57	Checked
DETAILS	By	Checked
QUANTITIES	By	Checked
SPECIFICATIONS	By	
Approval Recommended by		

59-8VC8

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NEWPORT AVENUE OVERCROSSING
LOCATED APPROXIMATELY 1.8 MI. N. OF THE RIVERSIDE-SAN BERNARDINO COUNTY LINE

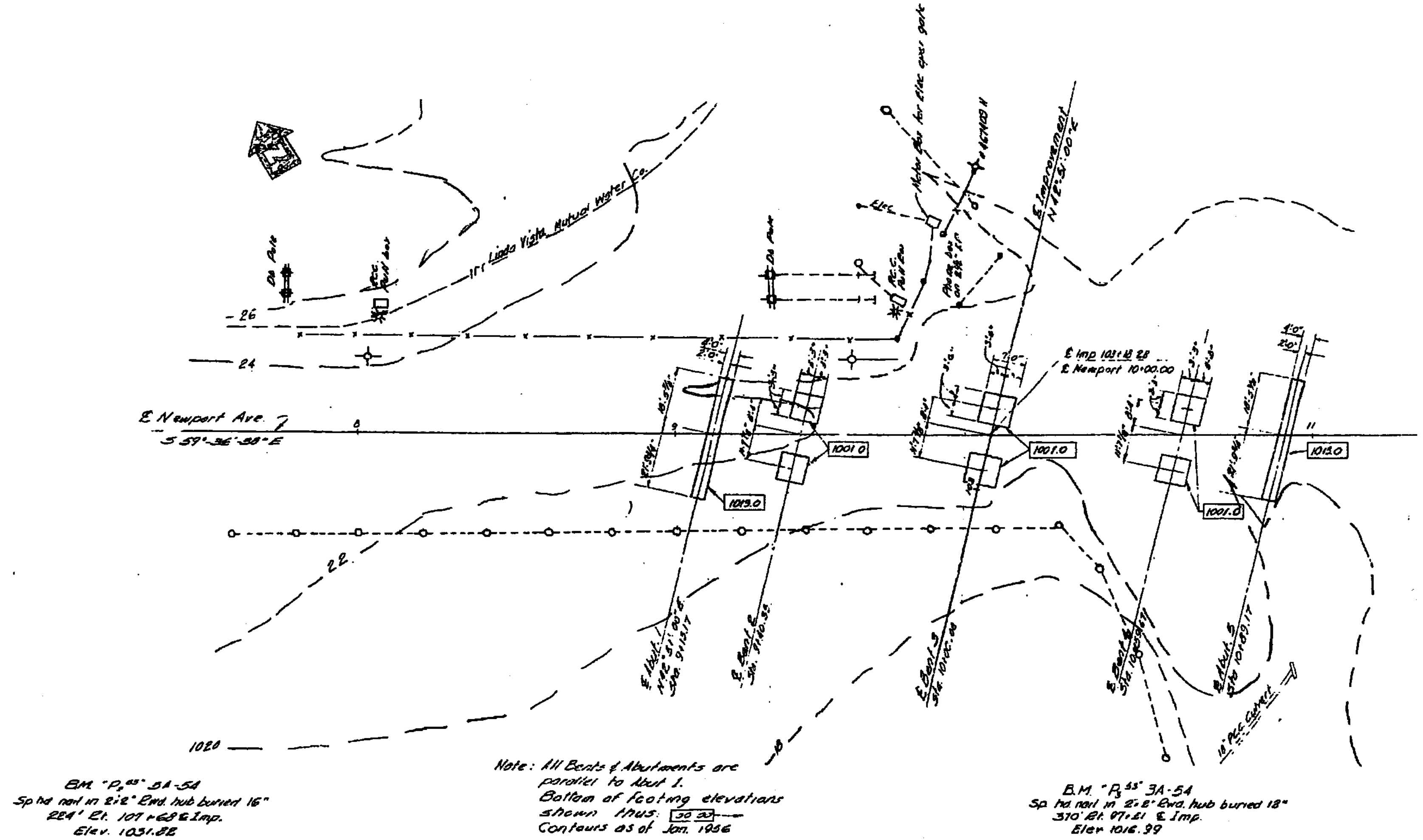
GENERAL PLAN

SCALE As Noted | BRIDGE 54-520 | DRAWING C4959-1

PREL. DRAWING No. P-4959

131

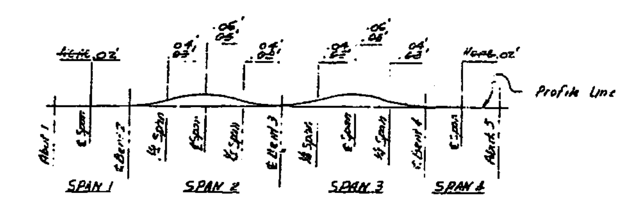
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 11.3.1971 SIGNATURE TITLE



BM "P53" 3A-54
Sp. hd. nail in 2x2" Rwd. hub buried 16"
224' Rt. 107+68 E Imp.
Elev. 1031.82

Note: All Bents & Abutments are parallel to Abut 1.
Bottom of footing elevations shown thus: [30.30]
Contours as of Jan. 1956

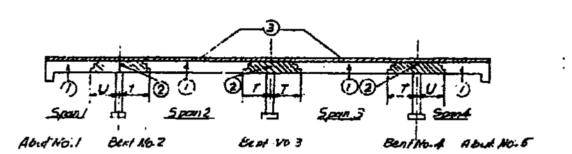
B.M. "P55" 3A-54
Sp. hd. nail in 2x2" Rwd. hub buried 18"
370' Rt. 97+21 E Imp.
Elev 1016.99



CAMBER DIAGRAM FOR TOTAL GIRDER DEFLECTION DUE TO DEAD LOADS

No Scale

Notes:
The camber required for ultimate deflection is shown. For values at time of falsework removal divide those shown by 4.
The amount of camber for construction will be determined by the Engineer.



SUPERSTRUCTURE PLACING DIAGRAM

Numbers (1) and (2) indicate sequence of placing girder stem concrete. (2) may be placed simultaneously with (1) when approved by the Engineer, and provided that the (1) sections are placed in adjoining spans.
Top slab concrete (3) may be placed separately from (1) and (2), but the only joints permitted shall be located within 2'-0" of the girder joints shown between (1) and (2). The length of placing (3) shall not exceed 100 feet. (3) may be placed with (1) and (2).
T = 1/5 Span length
U = 1/4 Span length
For any deviation from the above the contractor shall submit a diagram to the Engineer for approval.

AS BUILT
No CORRECTIONS BY G.O. Moore
CONTRACT NO. 59-8VC8-F

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

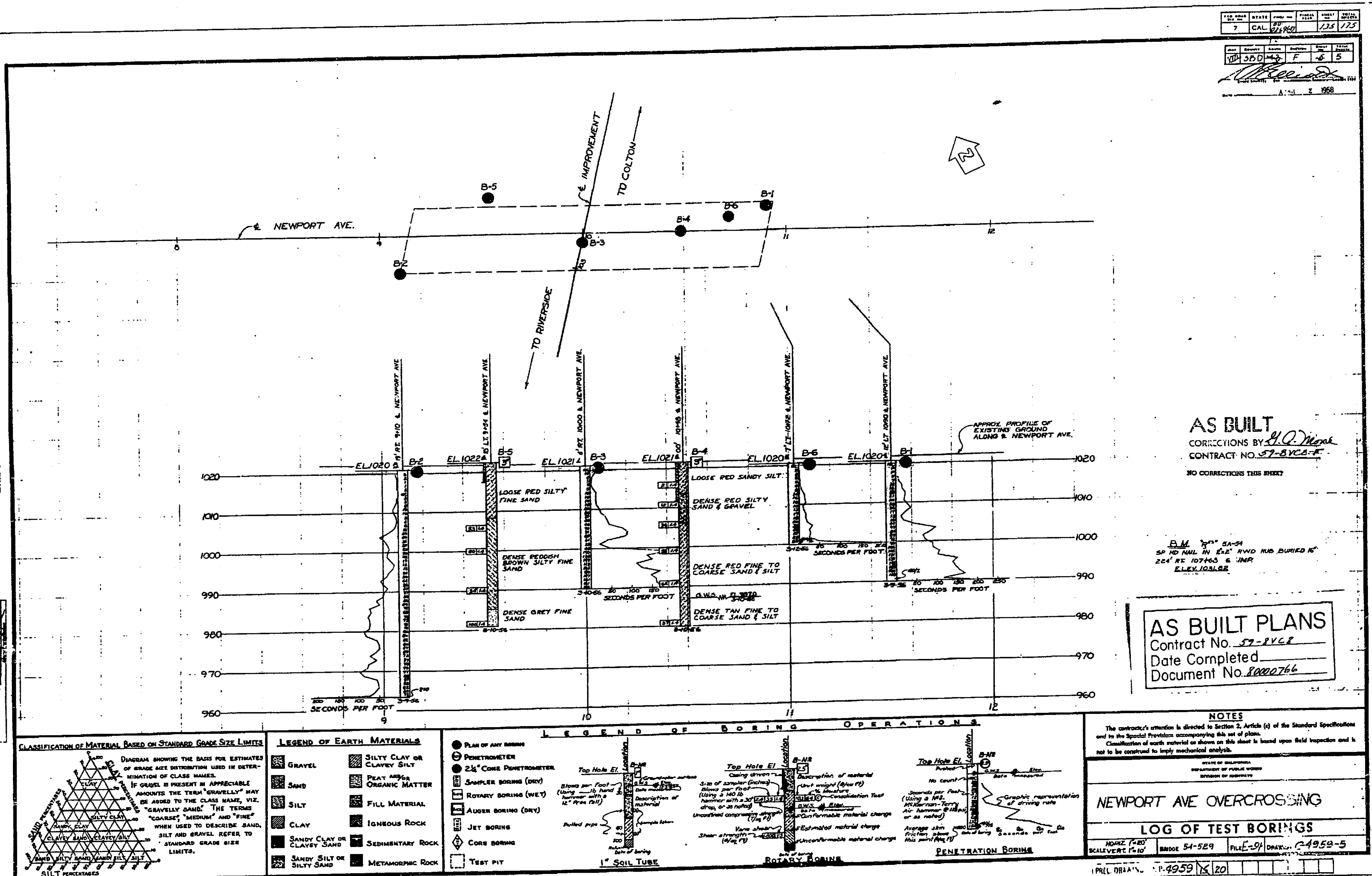
BRIDGE DEPARTMENT
DESIGN SECTION 1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NEWPORT AVE. OVERCROSSING
FOUNDATION PLAN

SCALE 1" = 20'-0" | BRIDGE 3A-529 | DRAWING G-4959-2
PREL. DRAWING NO. F-4959

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE M. 3 1971 SIGNATURE TITLE



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

DATE ___ SIGNATURE ___ TITLE ___

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

KLEINFELDER
Bright People. Right Solutions.

APPENDIX B

I-215/BARTON ROAD INTERCHANGE
ALTERNATIVES 3, 5 AND 6

EXHIBIT BARTON INTERCHANGE
ALTERNATIVE 3 INT
SCALE 1"=100'

LIM & NASCIMENTO ENG. CORP.
1887 BUSINESS CENTER DR. SUITE 6
SAN BERNARDINO,CA 92408

EXHIBIT BARTON INTERCHANGE ALTERNATIVE 5 INT

SCALE 1"=100'

LIM & NASCIMENTO ENG. CORP.
1887 BUSINESS CENTER DR. SUITE 6
SAN BERNARDINO,CA 92408

EXHIBIT BARTON INTERCHANGE ALTERNATIVE 6

SCALE 1"=100'

LAN

LIM & NASCIMENTO ENG. CORP.
1887 BUSINESS CENTER DR. SUITE 6
SAN BERNARDINO,CA 92408

EXHIBIT6 int.dgn 10/29/2008 2:06:19 PM

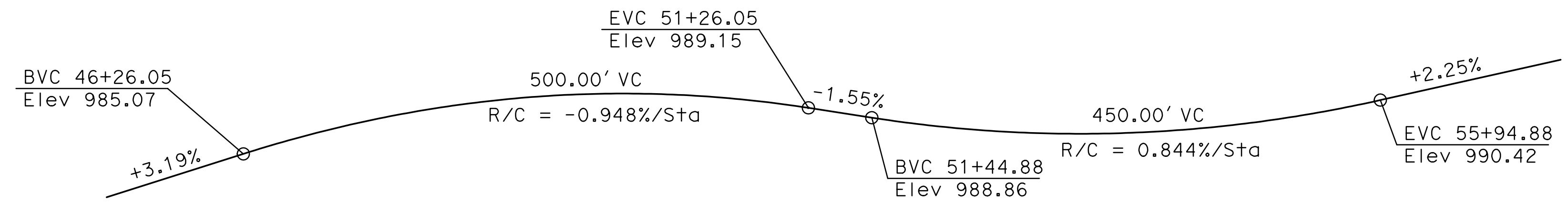
APPENDIX C

CONCEPTUAL DESIGN PLANS OF PROPOSED STRUCTURES

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
20 EMPIRE DRIVE
LAKE FOREST, CA 92630

ALTERNATIVE 3



PROFILE GRADE
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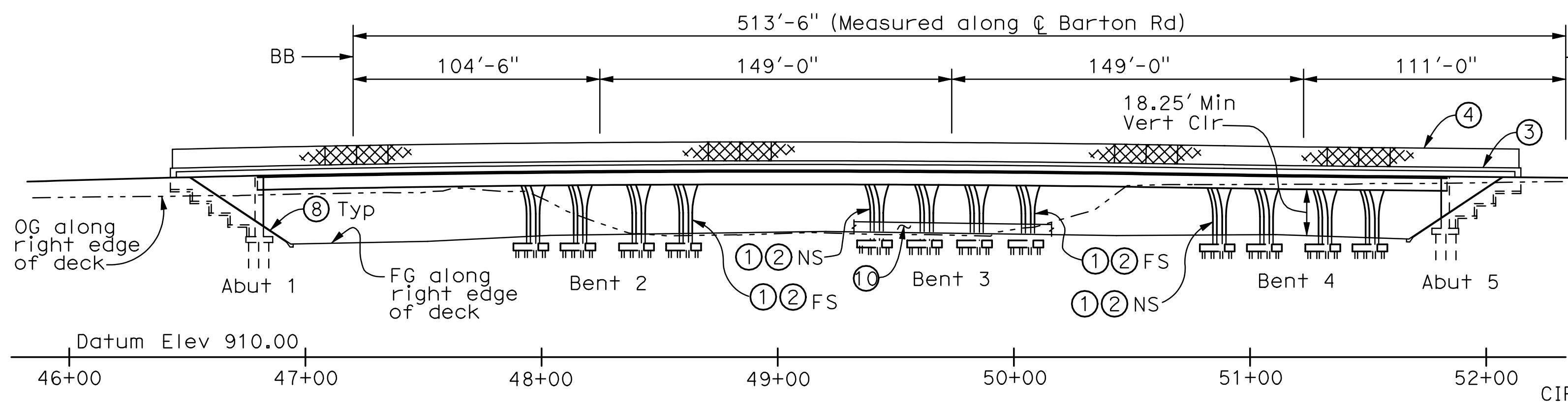
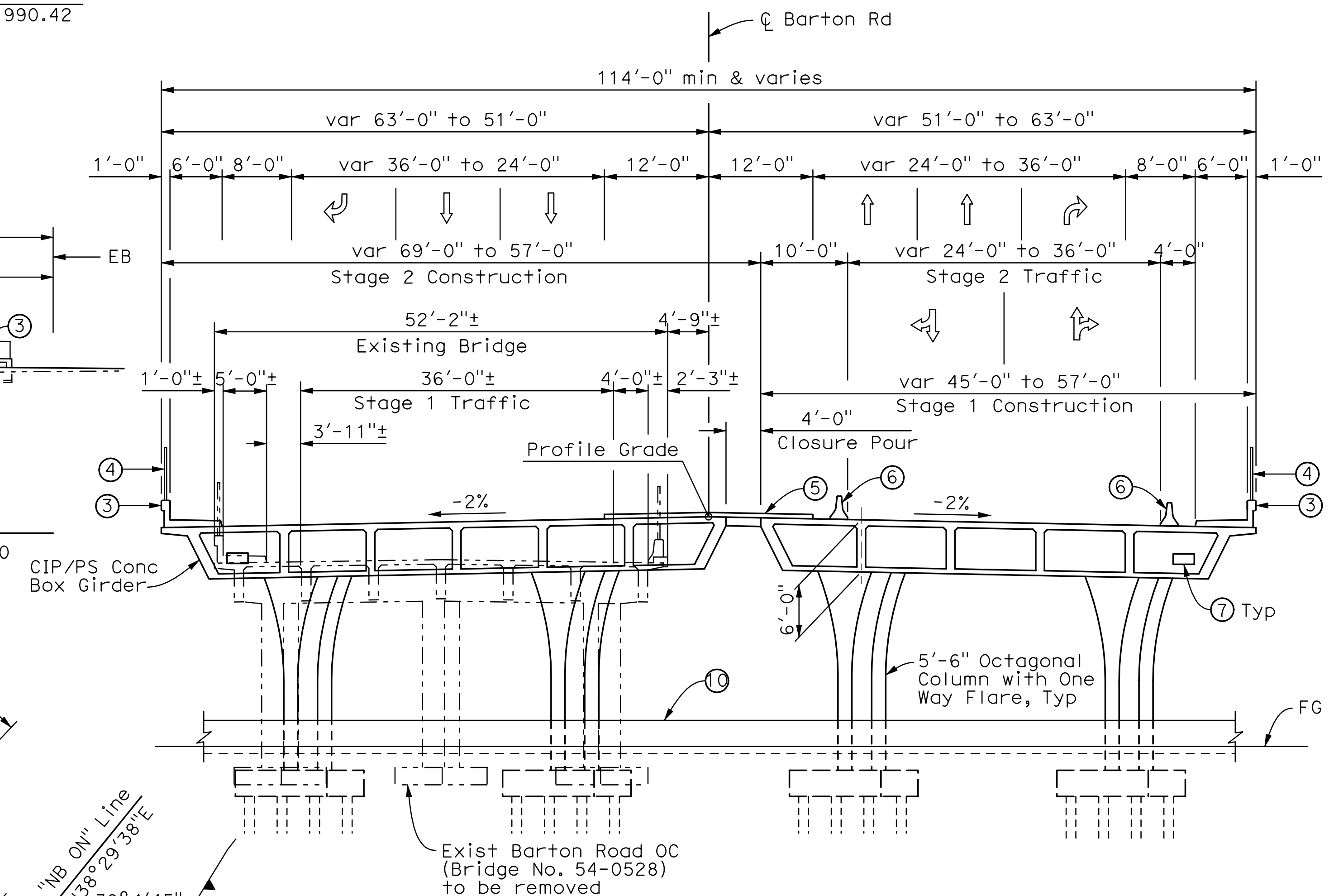
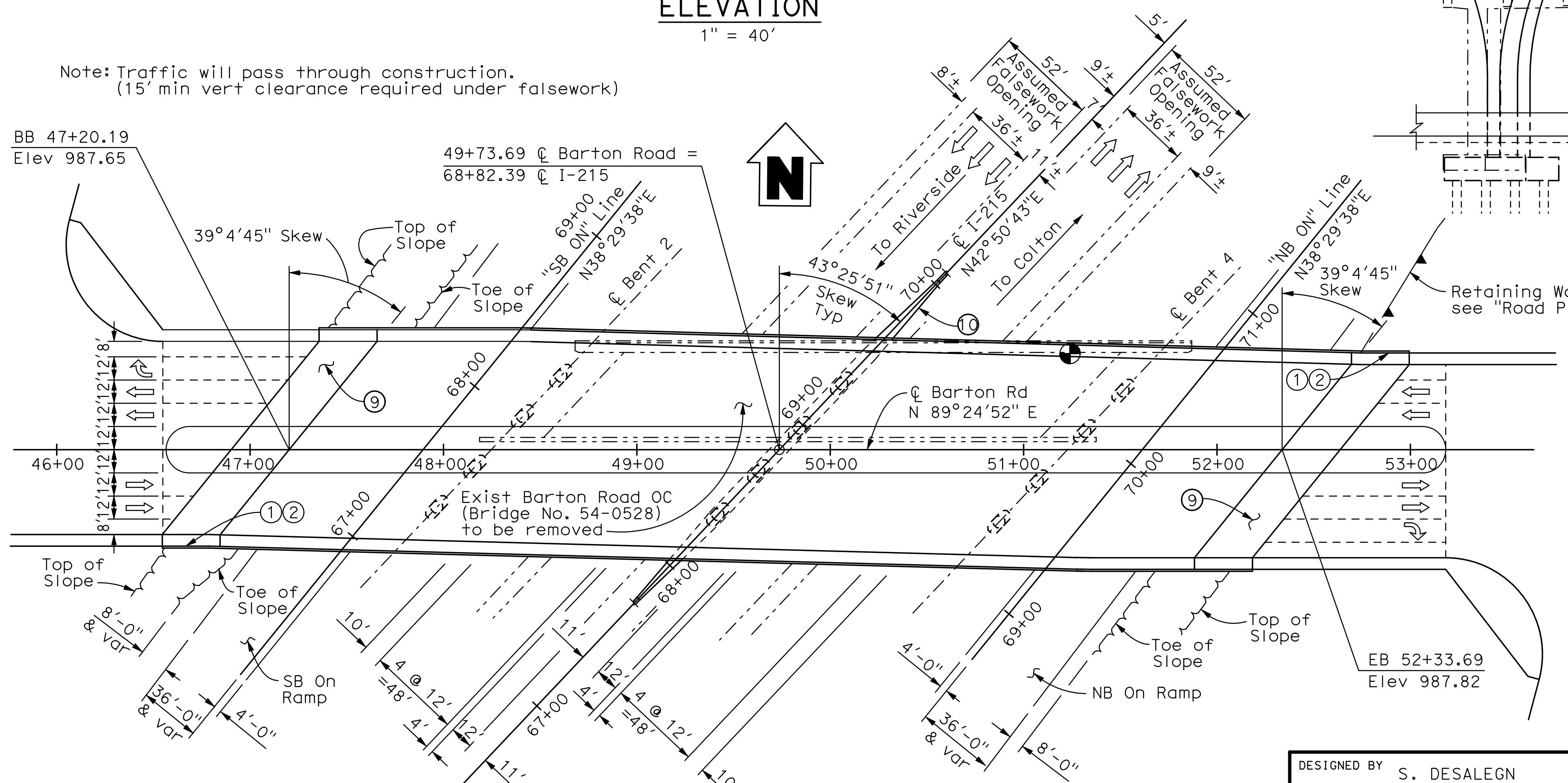


ELEVATION
1" = 40'



TYPICAL SECTION
1" = 10'
(Bent 3 Shown, Bent 2 and Bent 4 Similar)

Note: Traffic will pass through construction.
(15' min vert clearance required under falsework)



PLAN
1" = 40'

NOTES:

1. Paint "Bridge No. 54-0528" & year completed
2. Paint "Barton Road Overcrossing"
3. Concrete Barrier, Type 26
4. Chain Link Railing, Type 7
5. Concrete Median
6. Temporary Railing Type K
7. Future Utility Opening
8. Slope Paving
9. Structure Approach, Type N(30S)
10. Concrete Barrier, Type 60E, see "Road Plans"

Date of estimate	=	5/9/08
Str Depth	=	6'-0"
Length	=	513'-6"
Width	=	116'-0"
Area	=	59,570 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$230 / sq ft
Total Cost	=	$13,701,000

LEGEND

- Point of minimum vertical clearance
- Direction of Traffic
- ---- Indicates Existing Structure

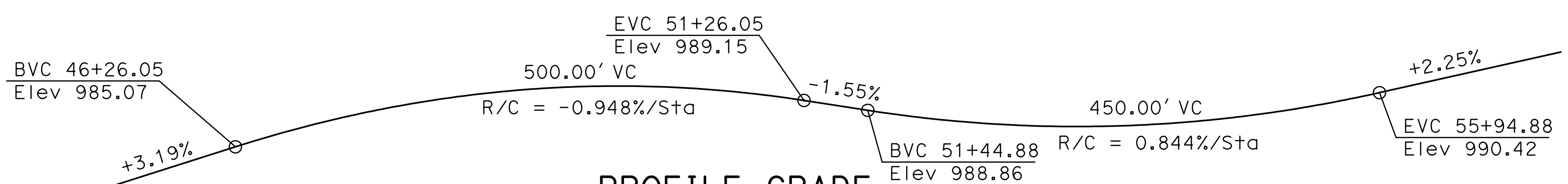
DESIGNED BY S. DESALEGN	DATE 5/9/08	W. NASCIMENTO PROJECT ENGINEER	PLANNING STUDY
DRAWN BY S. DESALEGN	DATE 5/9/08		BARTON ROAD OC (REPLACE)
CHECKED BY	DATE		BRIDGE NO. TBD / CU
APPROVED	DATE		SCALE: AS NOTED / EA

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
20 EMPIRE DRIVE
LAKE FOREST, CA 92630

ALTERNATIVE 5



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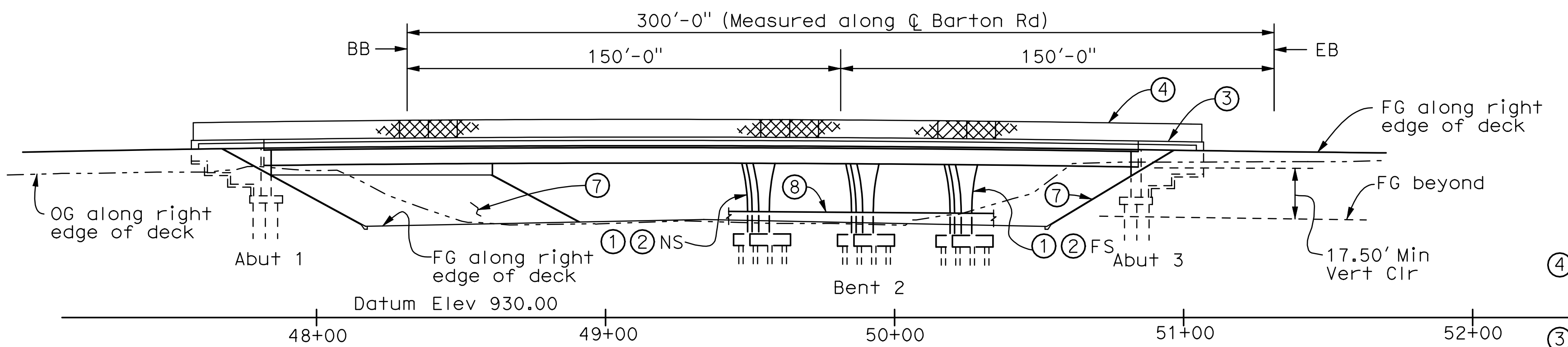
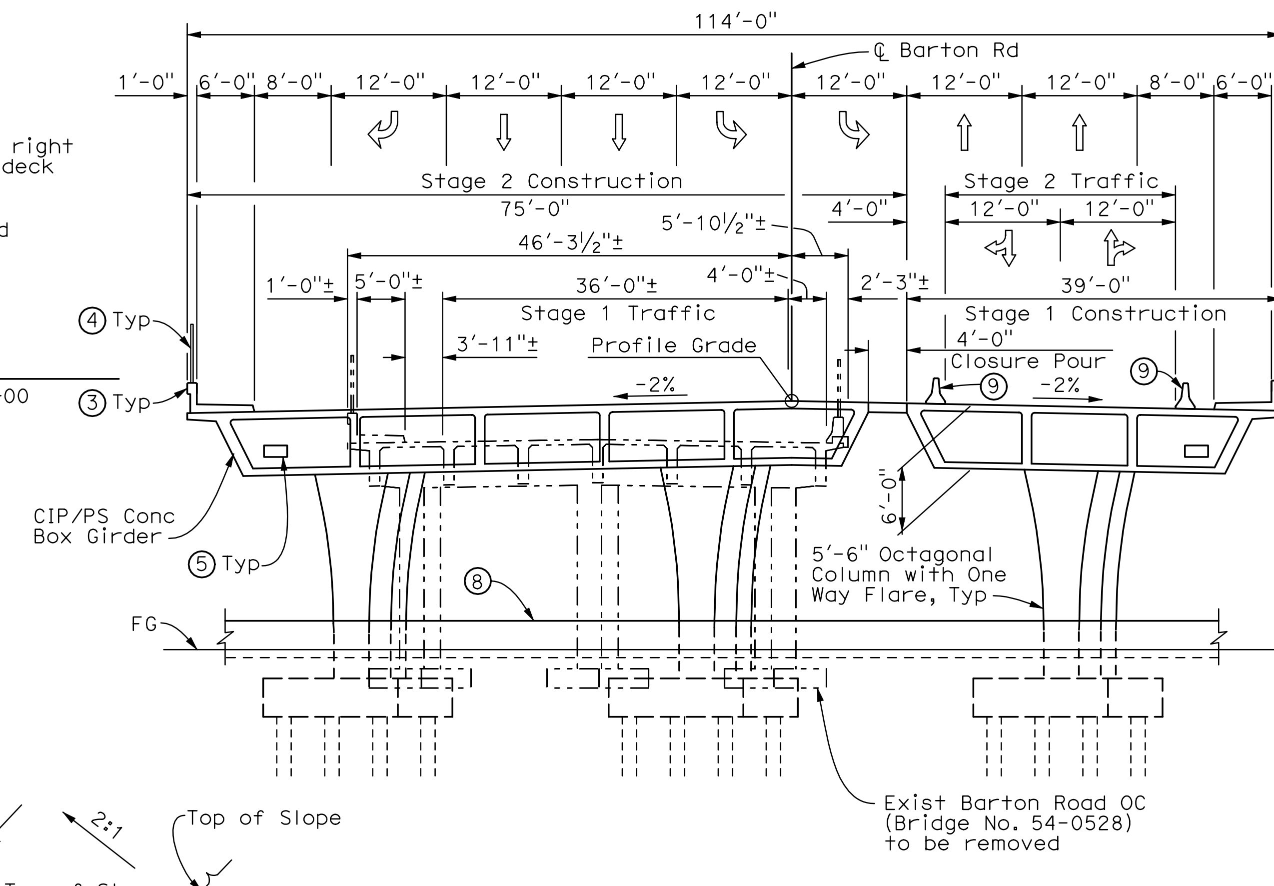
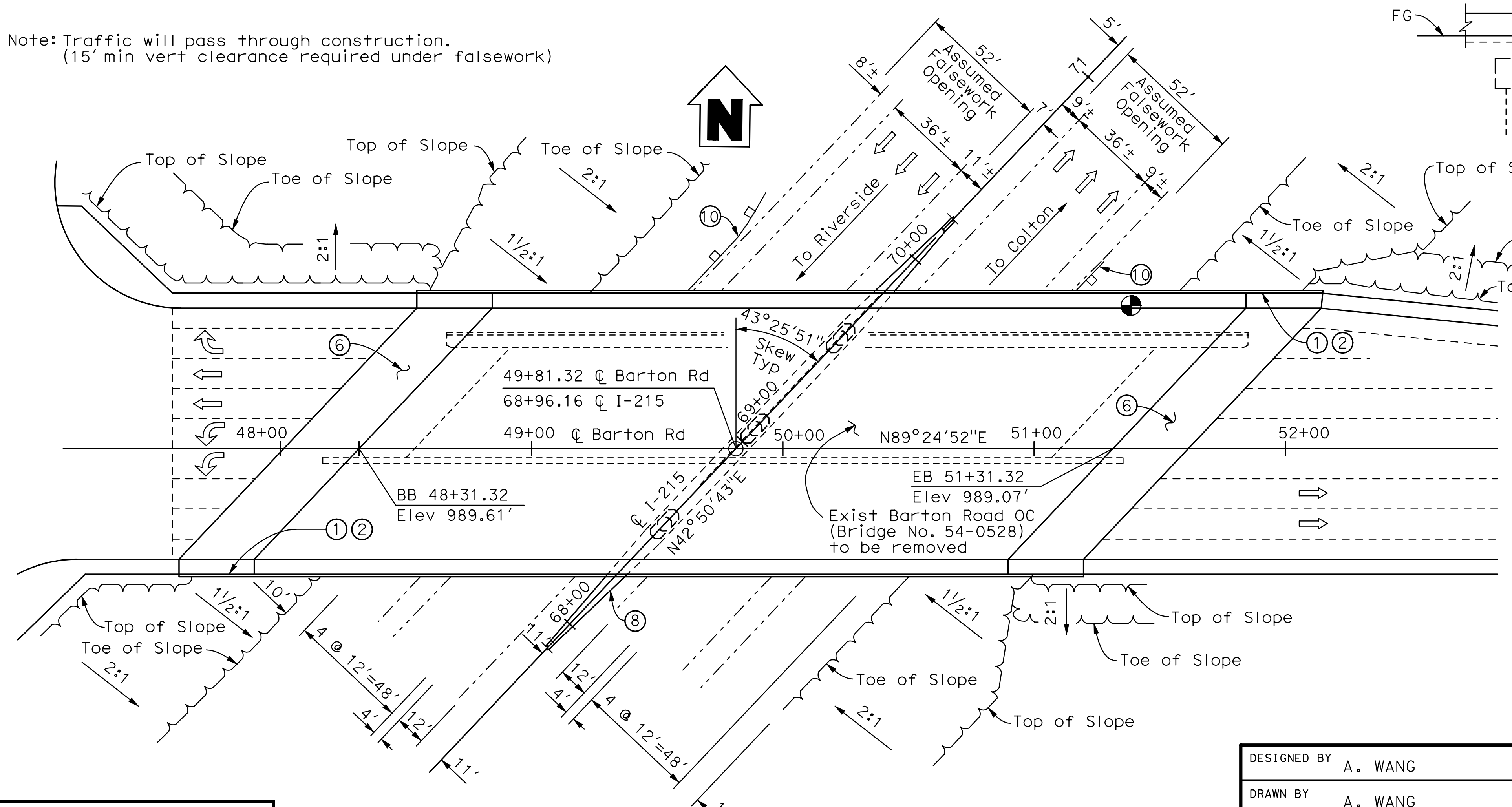


ELEVATION
1" = 30'



TYPICAL SECTION
1" = 10'

Note: Traffic will pass through construction.
(15' min vert clearance required under falsework)



PLAN
1" = 30'

NOTES:

1. Paint "Bridge No. 54-0528" & year completed
2. Paint "Barton Road Overcrossing"
3. Concrete Barrier, Type 26
4. Chain Link Railing, Type 7
5. Future Utility Opening
6. Structure Approach, Type N(30S)
7. Slope Paving
8. Concrete Barrier, Type 60E, see "Road Plans"
9. Temporary Railing, Type K
10. Existing MBGR, see "Road Plans"

Date of estimate	=	5/9/08
Str Depth	=	6'-0"
Length	=	300'-0"
Width	=	114'-0"
Area	=	34,200 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$230 / sq ft
Total Cost	=	$7,866,000

LEGEND

- Point of minimum vertical clearance
- Direction of Traffic
- ---- Indicates Existing Structure

DESIGNED BY	A. WANG	DATE	5/9/08
DRAWN BY	A. WANG	DATE	5/9/08
CHECKED BY		DATE	
APPROVED		DATE	

W. NASCIMENTO
PROJECT ENGINEER

PLANNING STUDY

BARTON ROAD OC (REPLACE)

BRIDGE NO. TBD | CU
SCALE: AS NOTED | EA

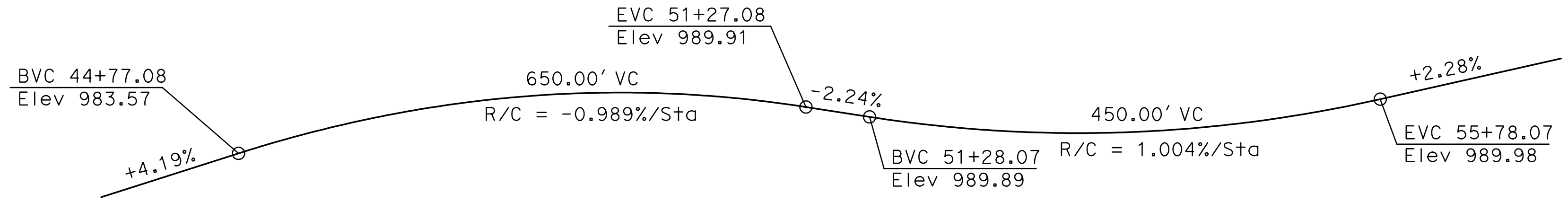
X
DESIGN OVERSIGHT
X
SIGN OFF DATE

PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
1887 BUSINESS CENTER DRIVE, SUITE 6
SAN BERNARDINO, CA 92408

ALTERNATIVE 6



PROFILE GRADE
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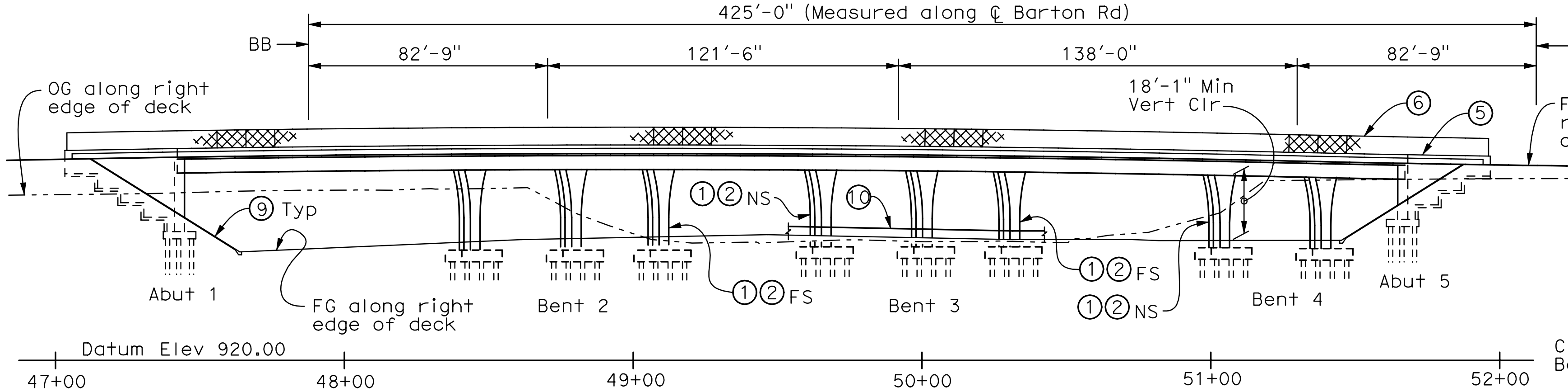
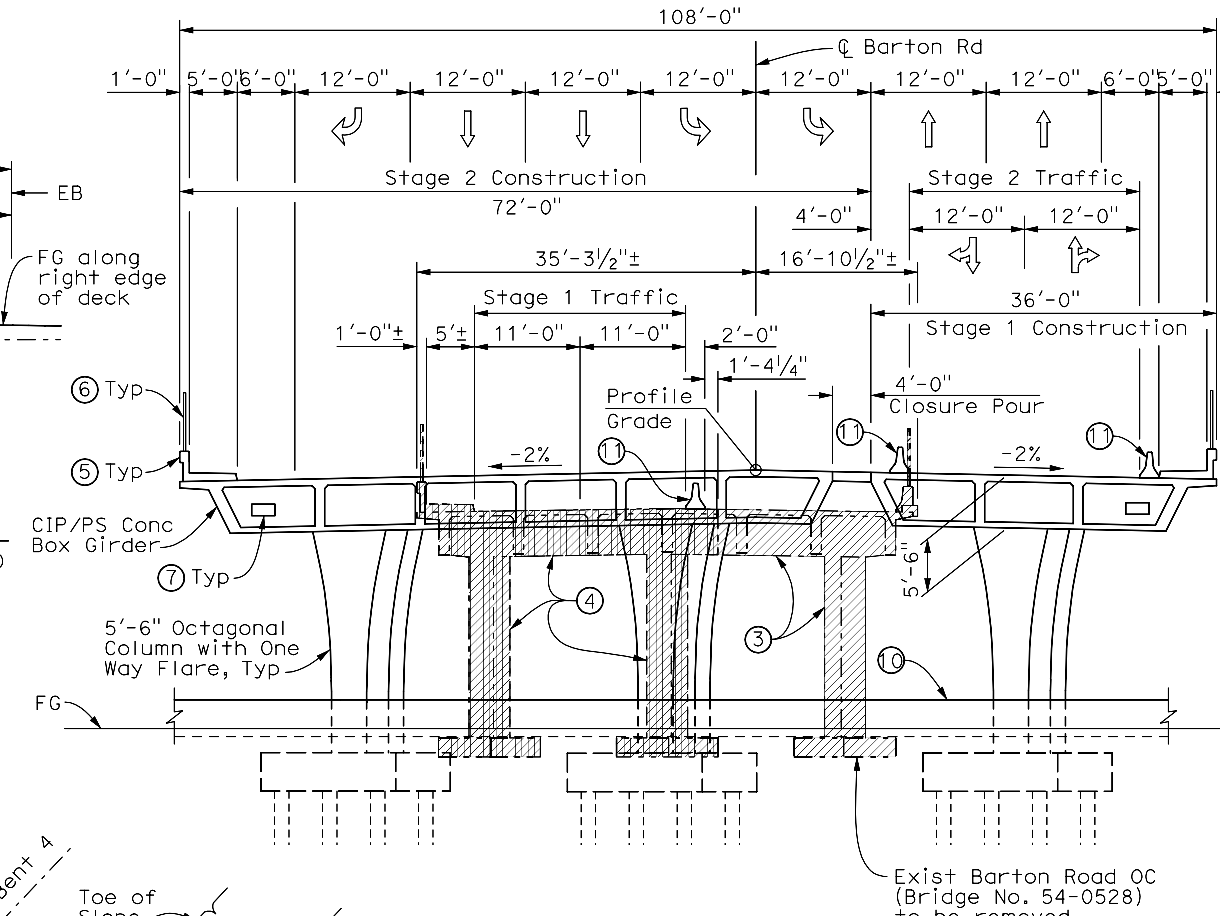
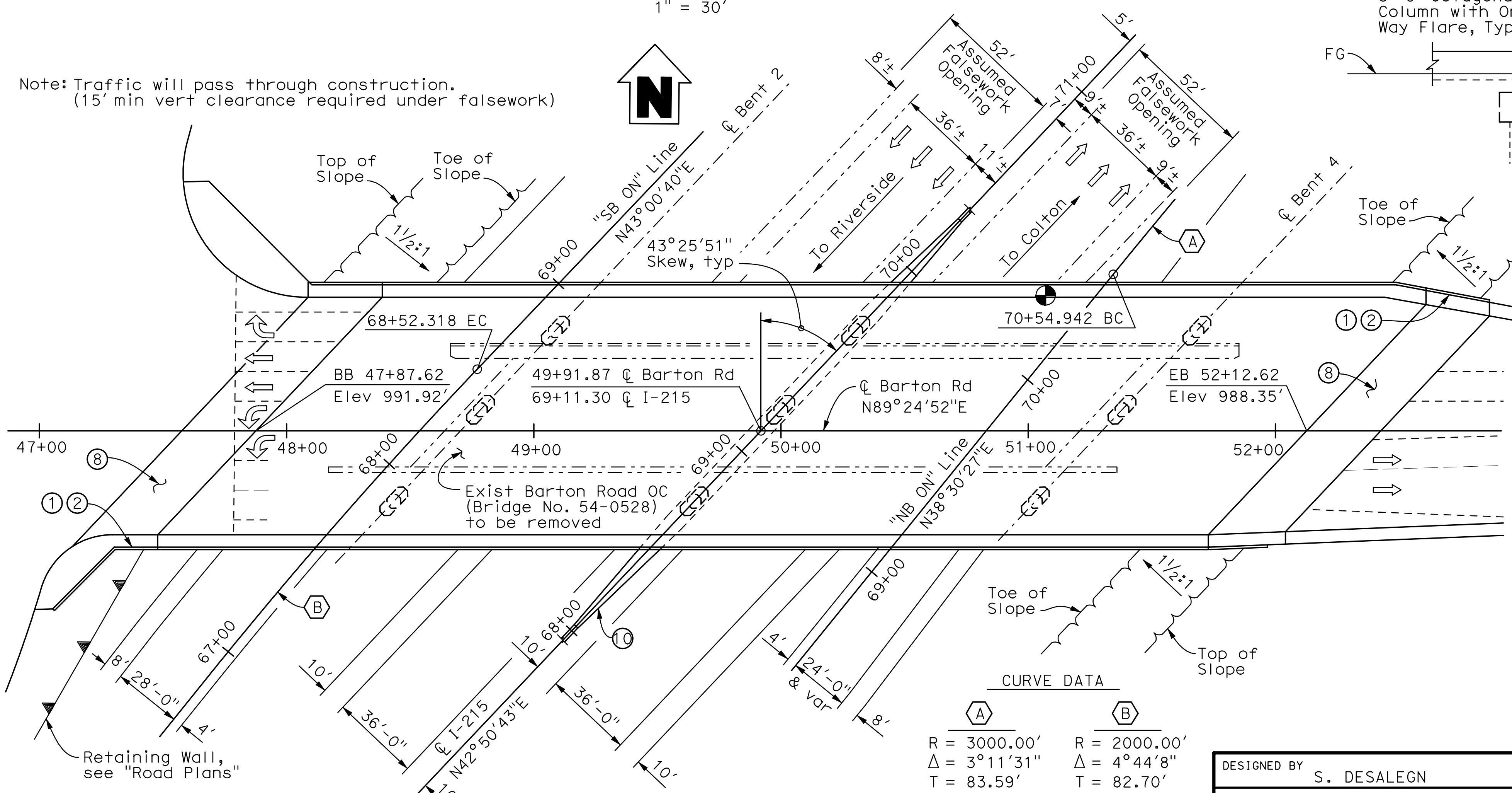


ELEVATION
1" = 30'



TYPICAL SECTION
1" = 10'



PLAN
1" = 30'

CURVE DATA

	A	B
R =	3000.00'	2000.00'
Δ =	3°11'31"	4°44'8"
T =	83.59'	82.70'
L =	167.13'	165.30'

NOTES:

1. Paint "Bridge No. 54-0528" & year completed
2. Paint "Barton Road Overcrossing"
3. Bridge Removal (Portion) Stage 1 construction)
4. Bridge Removal (Stage 2 construction)
5. Concrete Barrier, Type 26
6. Chain Link Railing, Type 7
7. Future Utility Opening
8. Structure Approach, Type N(30S)
9. Slope Paving
10. Concrete Barrier, Type 60E, see "Road Plans"
11. Temporary Railing, Type K

Date of estimate	=	11/19/08
Str Depth	=	5'-6"
Length	=	425'-0"
Width	=	108'-0"
Area	=	45,900 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$230 / sq ft
Total Cost	=	$10,557,000

LEGEND

- Point of minimum vertical clearance
- Direction of Traffic
- Indicates Existing Structure
- Bridge Removal (Stage 1)
- Bridge Removal (Stage 2)

DESIGNED BY S. DESALEGN	DATE 11/19/08	M. CHAR PROJECT ENGINEER	PLANNING STUDY
DRAWN BY S. DESALEGN	DATE 11/19/08		BARTON ROAD OC (REPLACE)
CHECKED BY	DATE		BRIDGE NO. TBD / CU
APPROVED	DATE		SCALE: AS NOTED / EA

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

ADVANCE PLANNING STUDY SHEET (ENGLISH) (REV. 2/25/05)

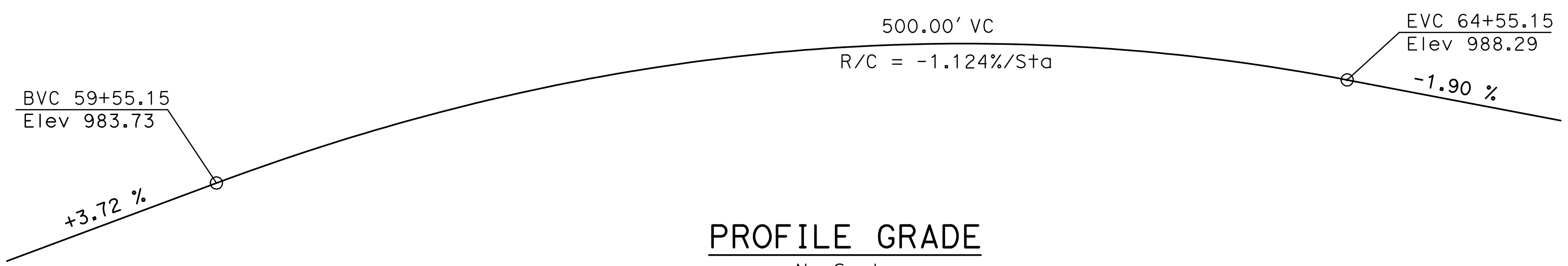
FILE => $REQUEST

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

PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

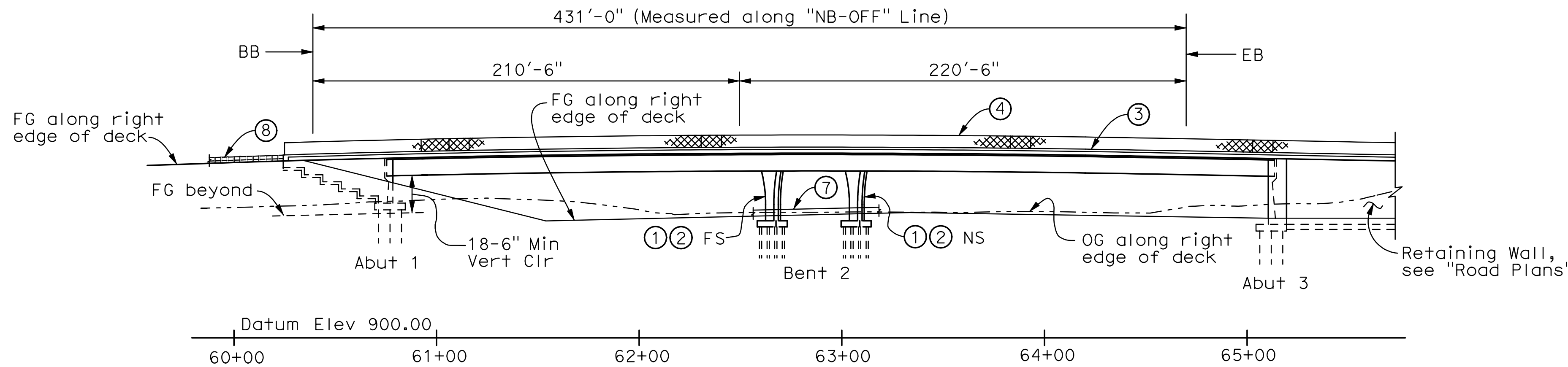
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
20 EMPIRE DRIVE
LAKE FOREST, CA 92630



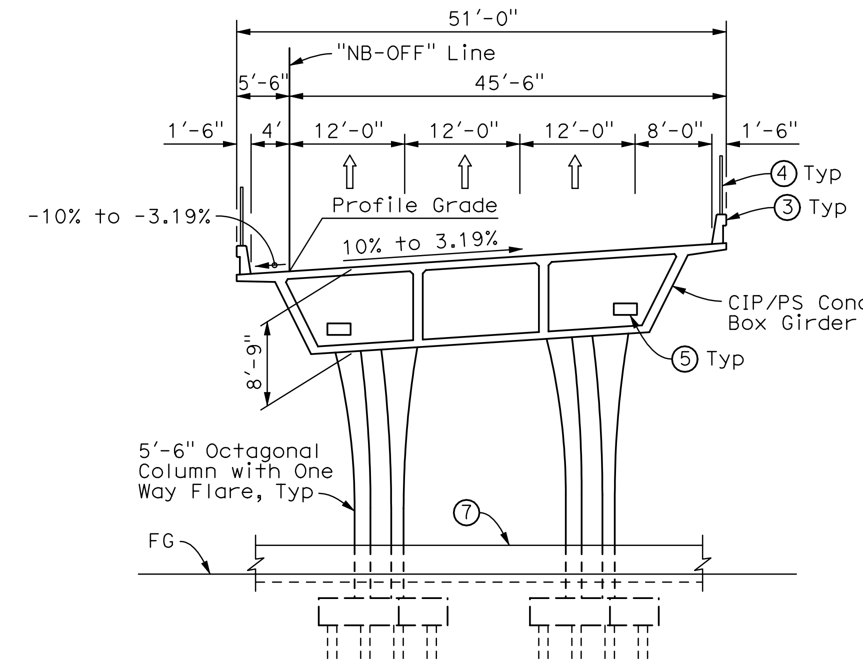
PROFILE GRADE

No Scale



DEVELOPED ELEVATION

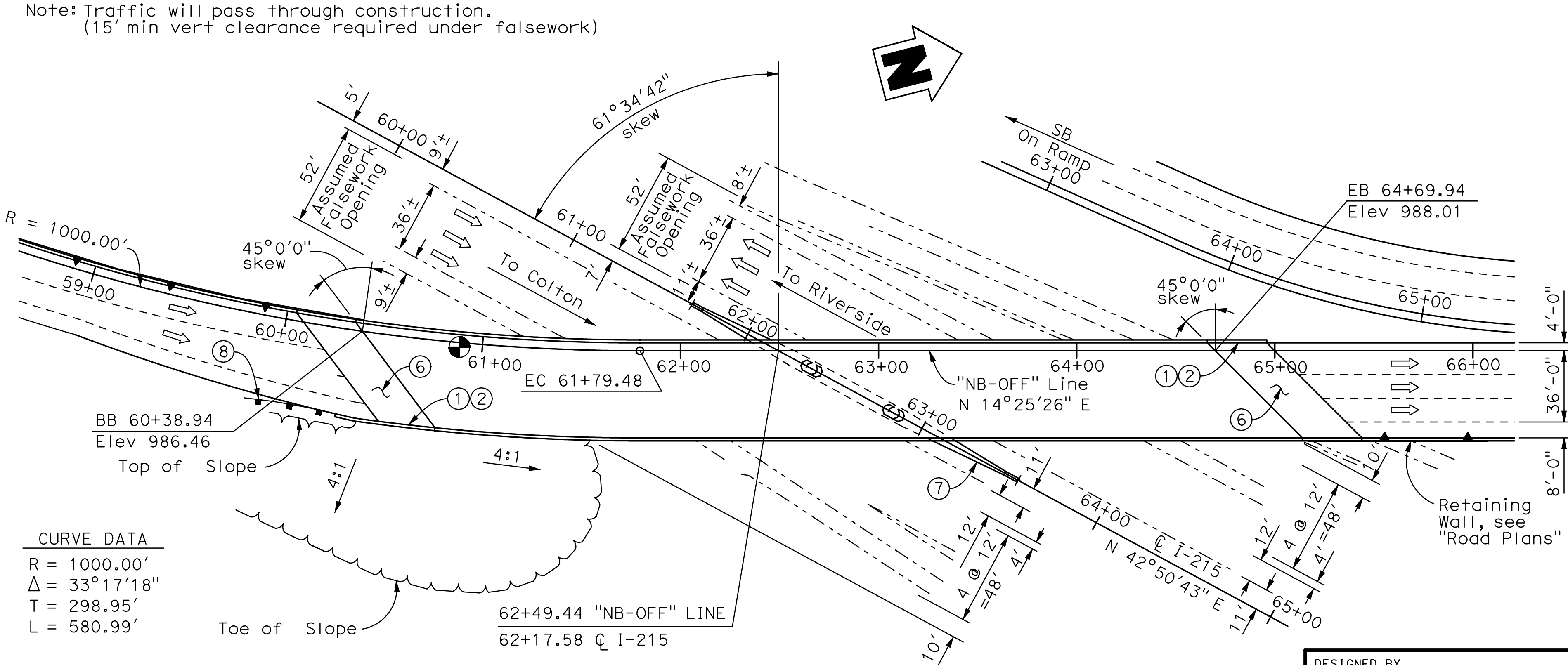
1" = 40′



TYPICAL SECTION

1" = 10′

Note: Traffic will pass through construction.
(15′ min vert clearance required under falsework)



CURVE DATA

R = 1000.00′
Δ = 33°17′18"
T = 298.95′
L = 580.99′

PLAN

1" = 40′

NOTES:

1. Paint "Bridge No. xx-xxxx" & year completed
2. Paint "Barton Road NB Off-Ramp OC"
3. Concrete Barrier, Type 736
4. Chain Link Railing, Type 7
5. Future Utility Opening
6. Structure Approach, Type N(30S)
7. Concrete Barrier, Type 60E, see "Road Plans"
8. Metal Beam Guard Railing

Date of estimate	=	5/9/08
Str Depth	=	8′-9"
Length	=	431′-0"
Width	=	51′-0"
Area	=	21,980 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$230 / sq ft
Total Cost	=	$5,056,000

LEGEND

Point of minimum vertical clearance

⇨ Direction of Traffic

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

DESIGNED BY	A. WANG	DATE	5/9/08
DRAWN BY	S. DESALEGN	DATE	5/9/08
CHECKED BY		DATE	
APPROVED		DATE	

W. NASCIMENTO
PROJECT ENGINEER

PLANNING STUDY

BARTON ROAD NB OFF-RAMP OC

BRIDGE NO. TBD		CU
SCALE: AS NOTED		EA

ADVANCE PLANNING STUDY SHEET (ENGLISH) (REV. 2/25/05)

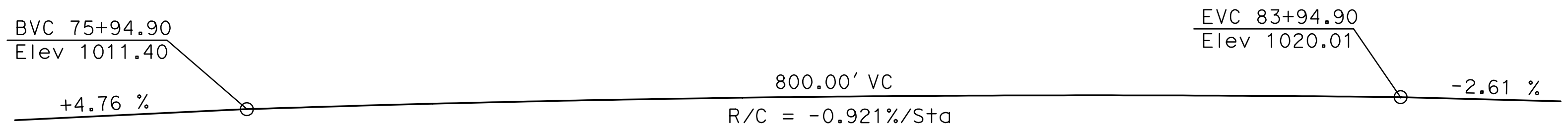
FILE => Y:\SNBG0701_ Barton Road IC\Plans\APS\APS_Barton Rd OC Alt5 NB OFF-Ramp.dgn

USERNAME => allen DATE PLOTTED => 5/9/2008 TIME PLOTTED => 5:43:55 PM

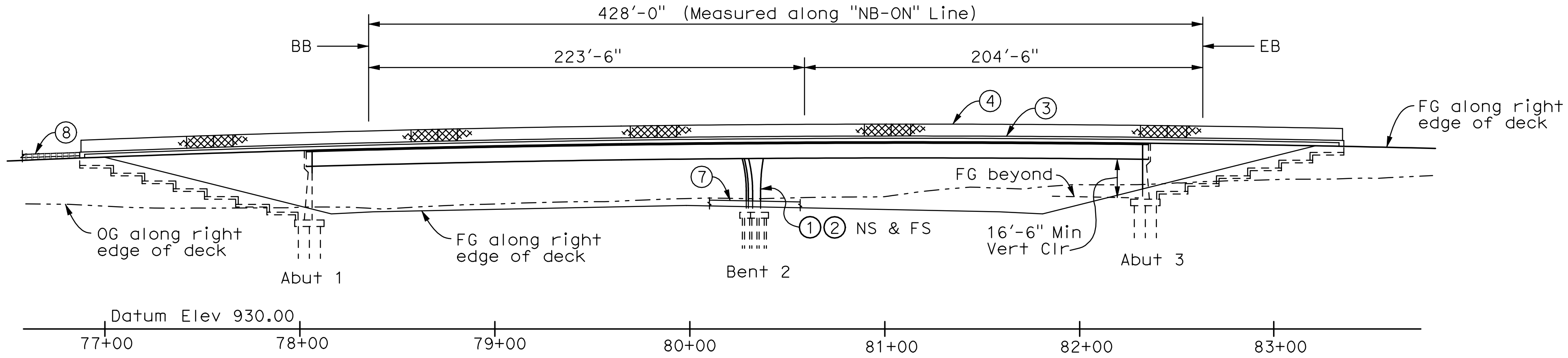
PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

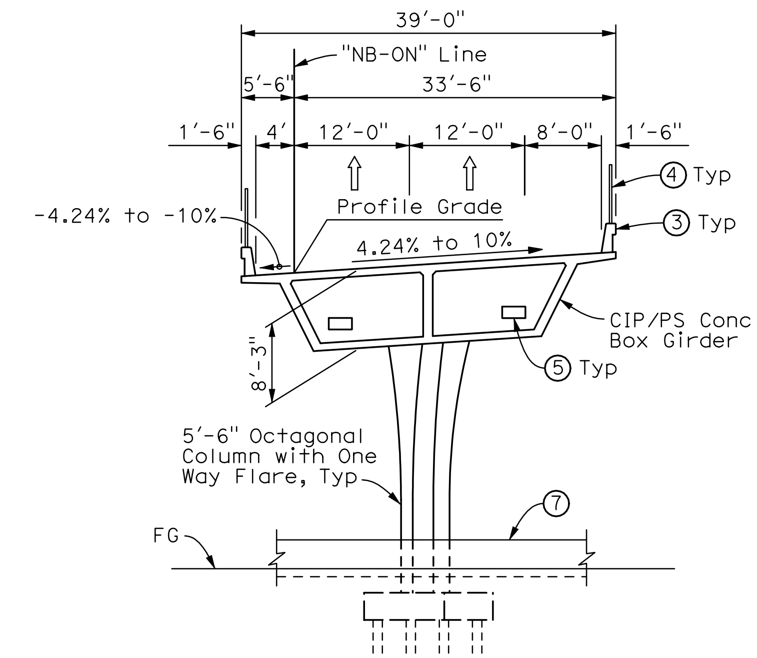
LIM & NASCIMENTO ENGINEERING
20 EMPIRE DRIVE
LAKE FOREST, CA 92630



PROFILE GRADE
No Scale

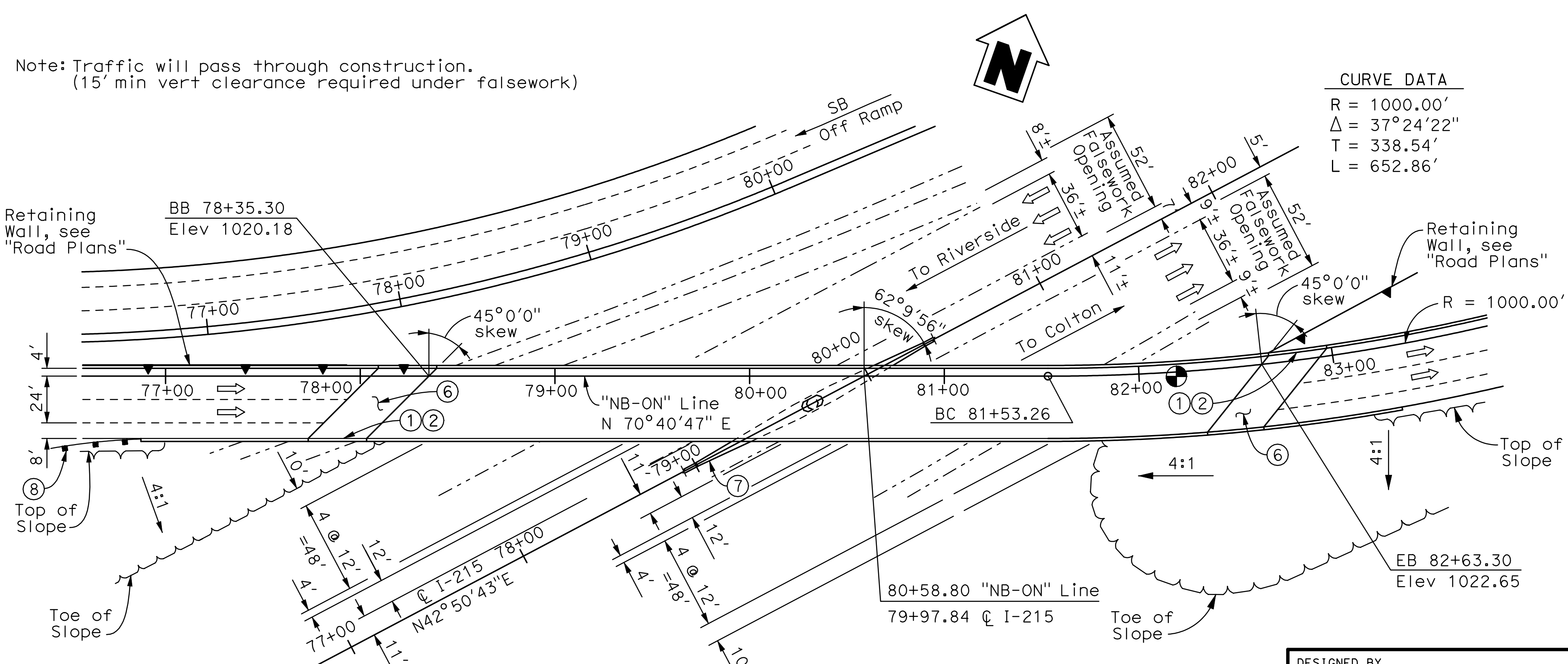


DEVELOPED ELEVATION
1" = 40'



TYPICAL SECTION
1" = 10'

Note: Traffic will pass through construction.
(15' min vert clearance required under falsework)



PLAN
1" = 40'

CURVE DATA

R = 1000.00'
Δ = 37°24'22"
T = 338.54'
L = 652.86'

NOTES:

1. Paint "Bridge No. xx-xxxx" & year completed
2. Paint "Barton Road NB On-Ramp OC"
3. Concrete Barrier, Type 736
4. Chain Link Railing, Type 7
5. Future Utility Opening
6. Structure Approach, Type N(30S)
7. Concrete Barrier, Type 60E, see "Road Plans"
8. Metal Beam Guard Railing

Date of estimate	=	5/9/08
Str Depth	=	8'-3"
Length	=	428'-0"
Width	=	39'-0"
Area	=	16,692 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$230
Total Cost	=	$3,839,000

LEGEND

- Point of minimum vertical clearance
- ⇨ Direction of Traffic

TIME PLOTTED => 5:46:02 PM
DATE PLOTTED => 5/9/2008
USERNAME => allen

DESIGNED BY	A. WANG	DATE	5/9/08
DRAWN BY	S. DESALEGN	DATE	5/9/08
CHECKED BY		DATE	
APPROVED		DATE	

W. NASCIMENTO
PROJECT ENGINEER

PLANNING STUDY

BARTON ROAD NB ON-RAMP OC

BRIDGE NO.	TBD	CU	
SCALE:	AS NOTED	EA	

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

ADVANCE PLANNING STUDY SHEET (ENGLISH) (REV. 2/25/05)

FILE => Y:\SNBG0701_ Barton Road IC\Plans\APS\APS_Barton Rd OC Alt5 NB On-Ramp.dgn

APPENDIX D

RESPONSE TO CALTRANS REVIEW COMMENTS

KLEINFELDER
Bright People. Right Solutions.

1220 Research Drive, Suite B
Redlands, CA
92374

p| 909.793.2691
f| 909.792.1704
kleinfelder.com

March 4, 2009
Project No. 94305

Mr. William Nascimento, PE, SE
Lim & Nascimento Engineering Corporation
20 Empire Drive
Lake Forest, California 92630

Subject: **Response to Caltrans Review Comments (September 23, 2008)**
Preliminary Geotechnical/Structures Design Report (July 21, 2008)
Interstate 215/Barton Road Interchange Improvements Project
City of Grand Terrace, San Bernardino County, California
08-SBD- 215-PM 0.8/1.8
Caltrans **EA No. 0J070K**

Dear Mr. Nascimento:

Kleinfelder has prepared this letter in response to comments provided by the California Department of Transportation (Caltrans), Program/Project Management (MS 1229), pertaining to their review of our report entitled *Preliminary Geotechnical/Structures Design Report, Interstate 215/ Barton Road Interchange Improvements Project, City of Grand Terrance, San Bernardino County, California,* dated July 21, 2008. Caltrans has requested responses and resolutions on six comments (Comments 1 through 6). The Caltrans review comments and our responses to these comments are presented below:

Comment No. 1. *Section 2.1.4 "Culverts" on Page 5 and Section 7.8 "Corrosion Study" on Pages 19 and 20: For any existing culverts that will remain in place or that will be extended, be sure to have those culverts inspected and repair or replace those culverts if necessary. It is recommended adding a statement to the PGSDR and to the Preliminary Materials Report (PMR) addressing the possible replacement or repair of existing culverts, as part of these reports Culvert/ Corrosivity Study recommendations.*

Response to Comment No. 1. We have added a statement regarding the possible replacement or repair of existing culverts in Section 7.8, Corrosion Study, of our report. Please see our revised report for changes.

Comment No. 2. *Section 7.2 "Excavations" and Section 7.3 "Fill Slopes" on page 17: It is concurred with the statements in these reports regarding the Caltrans standards of 4:1 (H:V) steepness for the embankment fill slopes, but do likewise for any cut slopes. If permanent cut slopes will become part of this project, it is recommended a maximum steepness of 4:1 (H:V) for any such cut slopes too. Add a statement to these reports addressing the recommended steepness of any future permanent cut slopes.*

Response to Comment No. 2. We concur with Caltrans on the comment. The recommend maximum steepness for future permanent cut slopes is provided in Section 7.3 of our report. Please see our revised report for changes.

Comment No. 3. *Section 7.8 "Corrosion Study" on Pages 19 and 20: These sections appear reasonable to us for preliminary purposes. Be sure that the design-level of the Geotechnical Design Report (GDR) and Materials Report (MR) will evaluate other options for culverts and other pipes. Besides Reinforced Concrete Pipe (RCP), Corrugated Steel Pipe (CSP), and Corrugated Aluminized Steel Pipe (CASP), also evaluate if Corrugated Aluminum Pipe (CAP) or plastic pipes will be adequate or not. Consider potential abrasion as well as corrosivity for evaluating the different options for pipe and drainage structure materials.*

Response to Comment No. 3. The options for culverts and other pipes will be evaluated for the design-level geotechnical and materials reports when corrosivity test data become available. The potential for abrasion and corrosion will be considered in evaluating the different options for pipe and drainage structure materials for the design-level geotechnical and materials reports.

Comment No. 4. *General: No section was found in the PGSDR addressing climatic conditions.*

Response to Comment No. 4. We have included a separate section on climatic conditions in our revised preliminary geotechnical/structural design report. Please see Section 4.3, Climate, of our revised report.

Comment No. 5. *Section 2.1.1: The abutments of Barton Road Overcrossing (OC) (#54-0528) had been retrofitted with 30-inch Cast-in-Drilled-Hole (CIDH) in 1995. Please add the above information in the section of the existing facilities.*

Response to Comment No. 5. We have added the above-mentioned sentence in our revised report. Please see Section 2.1.1 of our revised report for changes.

Comment No. 6. *It seems that the subject preliminary report is for Barton Road OC and some information for the Newport Avenue OC. It is Caltrans policy that preliminary/final foundation report should be prepared separately for each structure.*

Response to Comment No. 6. We agree with Caltans on the comment. Newport Avenue OC is not a part of this project. Therefore, the information regarding Newport Avenue OC has been deleted from our revised report. Since Newport Avenue OC is located close to the Barton Road OC, we have used the Log of Test Boring (LOTB) data of both bridges to evaluate the subsurface soil conditions and estimate the groundwater depth at the subject site.

CLOSURE

The information contained in this letter/report is subject to the conditions and limitations contained within the preliminary foundation report. We appreciate the opportunity to be of service on this project. If you have any questions, comments or require additional information, please do not hesitate to contact our office at your convenience.

Respectfully submitted,
KLEINFELDER WEST, INC.

Carlos V. Amante

Carlos V. Amante, PE, GE
Geotechnical Group Manager

Richard F. Escandon, PG, CEG
Principal Geologist

CVA:lg

DEPARTMENT OF TRANSPORTATION
PROGRAM/PROJECT MANAGEMENT (MS 1229)
464 WEST 4TH STREET, 6TH FLOOR
SAN BERNARDINO, CA 92401-1400
PHONE (909) 388-7165
FAX (909) 383-6899
TTY (909) 383-6300

Flex your power!
Be energy efficient!

September 29, 2008

Mr. Gilbert Betancourt
Project Manager
SANBAG
1170 West Third Street
San Bernardino, CA 92410-1715

08-SBd-215-PM 0.80/1.80
In Grand Terrace at Barton Road I/C
Reconstruct Interchange
08-224-0J0700

Dear Mr. Betancourt:

Preliminary Geotechnical/Structural Design Report Review

We have reviewed the Preliminary Geotechnical/Structural Design Report (PGSDR) date stamped July 25, 2008 for the Interstate 215 at Barton Road Interchange in the City of Grand Terrace, County of San Bernardino. We will continue processing this review upon receipt of three (3) copies of the revised PGSDR. The resubmittal shall include responses and resolutions to all of the following comments.

1. Section 2.1.4 "Culverts" on Page 5, and Section 7.8 "Corrosion Study" on Pages 19 and 20: For any existing culverts that will remain in place or that will be extended, be sure to have those culverts inspected and repair or replace those culverts if necessary. It is recommended adding a statement to the PGSDR and to the Preliminary Materials Report (PMR) addressing the possible replacement or repair of existing culverts, as part of these reports Culvert/Corrosivity Study recommendations.

2. Section 7.2 "Excavations" and Section 7.3 "Fill Slopes" on Page 17: It is concurred with the statements in these reports regarding the Caltrans standards of 4:1 (H:V) steepness for the embankment fill slopes, but do likewise for any cut slopes. If permanent cut slopes will become part of this project, it is recommended a maximum steepness of 4:1 (H:V) for any such cut slopes too. Add a statement to these reports addressing the recommended steepness of any future permanent cut slopes.

3. Section 7.8 "Corrosion Study" on Pages 19 and 20: These sections appear reasonable to us for preliminary purposes. Be sure that the design-level of the Geotechnical Design Report (GDR) and Materials Report (MR) will evaluate other options for culverts and other pipes. Besides Reinforced Concrete Pipe (RCP), Corrugated Steel Pipe (CSP), and Corrugated Aluminized Steel Pipe (CASP), also evaluate if Corrugated Aluminum Pipe (CAP) or plastic pipes will be adequate or not. Consider potential abrasion as well as corrosivity for evaluating the different options for pipe and drainage structure materials.

4. General: No section was found in the PGSDR addressing climatic conditions.

5. Section 2.1.1: The abutments of Barton Road Overcrossing (OC) (#54-0528) had been retrofitted with 30-inch Cast-in-Drilled-Hole (CIDH) in 1995. Please add the above information in the section of the existing facilities.

6. It seems that the subject preliminary report is for Barton Road OC and some information for the Newport Avenue OC. It is Caltrans' policy that preliminary/final foundation report should be prepared separately for each structure.

If you have any questions regarding these comments, please call me at (909) 388-7165.

Sincerely,

JOE MERAZ
Project Manager
Program/Project Management

c: William Nascimento, LAN Engineering

June 17, 2011
Project No. 94305

Mr. Greg Hefter, PE
AECOM
999 Town & Country Road
Orange, California 92868

Subject: **Revised Addendum to Structure Preliminary Geotechnical Report (4th Revision, dated November 4, 2009)**
Interstate 215/Barton Road Interchange Improvements
City of Grand Terrace, San Bernardino County, California
08-SBd- 215-PM 0.58/1.95
Caltrans Contract No. 0800000282 (EA 0J0700)

Dear Mr. Hefter:

Kleinfelder previously submitted a Structure Preliminary Geotechnical Report (4th Revision), dated November 4, 2009 for the subject project. Based on our discussions with representatives of AECOM, we understand this report was approved by Caltrans. We also understand a new alternative (Alternative 7) has recently been added to the project. This addendum to our report has been prepared to address the new alternative. This addendum has been revised to include our responses to Caltrans review comments on our previous version of addendum report dated May 13, 2011. A separate addendum to our Preliminary Materials Report will be prepared based on revised Traffic Indices (TI's) for the project.

PROPOSED IMPROVEMENTS AND PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

Three of the current build alternatives (Alternatives 3, 5 and 6) are described in our Structure Preliminary Geotechnical Report (SPGR) dated November 4, 2009. The recently added Alternative 7 is described below.

<u>Alternative 7 (Combined Type L-1/L-7 Interchange)</u>

Proposed improvements for Alternative 7 include the reconfiguration of northbound ramps to Type L-1 (spread diamond) and southbound ramps to Type L-7 (partial cloverleaf). A preliminary layout plan for Alternative 7 is included as an attachment to this addendum. Southbound and northbound lanes of the ramps will consist of one lane at I-215 and widen to three lanes at Barton Road. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure. Commerce Way will be realigned to connect to Barton Road east of Michigan Street.

Based on the attached preliminary layout plan, seven new retaining walls (RW1 through RW7) are proposed for the Alternative 7 alignment. The locations of the retaining walls are shown on the attached plan. We understand the proposed walls would be Caltrans Type 1 walls. If right-of-way restrictions preclude the use of Type 1 walls, retaining walls RW-2 and RW-3 may be changed to Caltrans Type 5 walls. Based on the preliminary layout plan, the height of the proposed retaining walls will range from approximately 4 to 24 feet. Caltrans Standard Type 1 and Type 5 walls are considered feasible from a geotechnical standpoint. For preliminary cost estimating purposes, retaining walls with a height of 14 feet or less may be assumed to be supported on shallow spread

1220 Research Drive, Suite B, Redlands, CA 92374 p | 909.793.2691 f | 909.792.1704

footings. Retaining walls with a height greater than 14 feet may need to be supported on deep foundations, such as driven piles. The feasibility of these foundation types for the walls should be further evaluated during a later design phase of the project after the completion of exploratory borings and laboratory testing. Lateral earth pressures acting against the retaining walls can be estimated using the values presented in the Caltrans Standard Plan sheets for retaining walls.

We understand the bridge configuration and bridge details for replacement of the Barton Road Overcrossing (Bridge No. 54-528) for Alternative 7 are the same as for Alternative 6. The Planning Study drawing for the proposed Barton Road Overcrossing (Replace) for Alternative 6 is included as an attachment to this addendum. Preliminary seismic recommendations, approach embankment slope recommendations, and foundation recommendations provided in our SPGR, dated November 4, 2009, are applicable for the proposed bridge replacement for Alternative 7.

Site-specific soil borings and laboratory testing should be performed to develop design level recommendations during a later design phase of the project. Soil borings should be performed at the proposed bridge and retaining wall locations. At least one boring should be performed at each support location for the bridge.

CLOSURE

The information presented in this Addendum is subject to the provisions and requirements outlined in the Limitations section of Kleinfelder's November 4, 2009 Structure Preliminary Geotechnical Report for this project. We appreciate the opportunity to be of service on this project. If you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

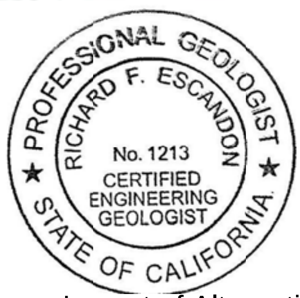
KLEINFELDER WEST, INC.

Madan Chirumalla, PE
Staff Engineer

Scott G. Lawson, PE, GE
Senior Engineer

Reviewed by:

Richard F. Escandon, PG, CEG
Project Manager/Principal Geologist



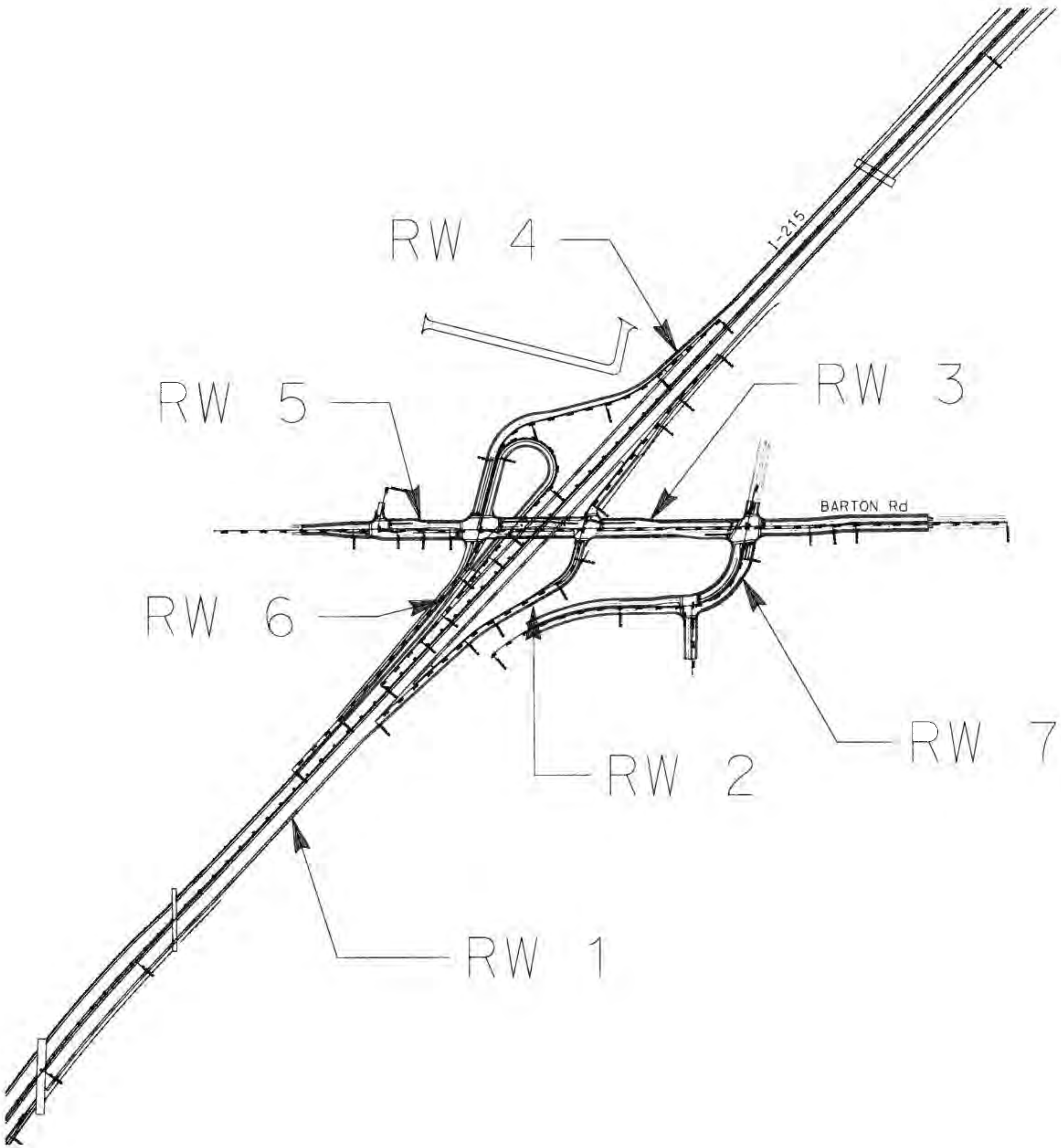
MC:lg

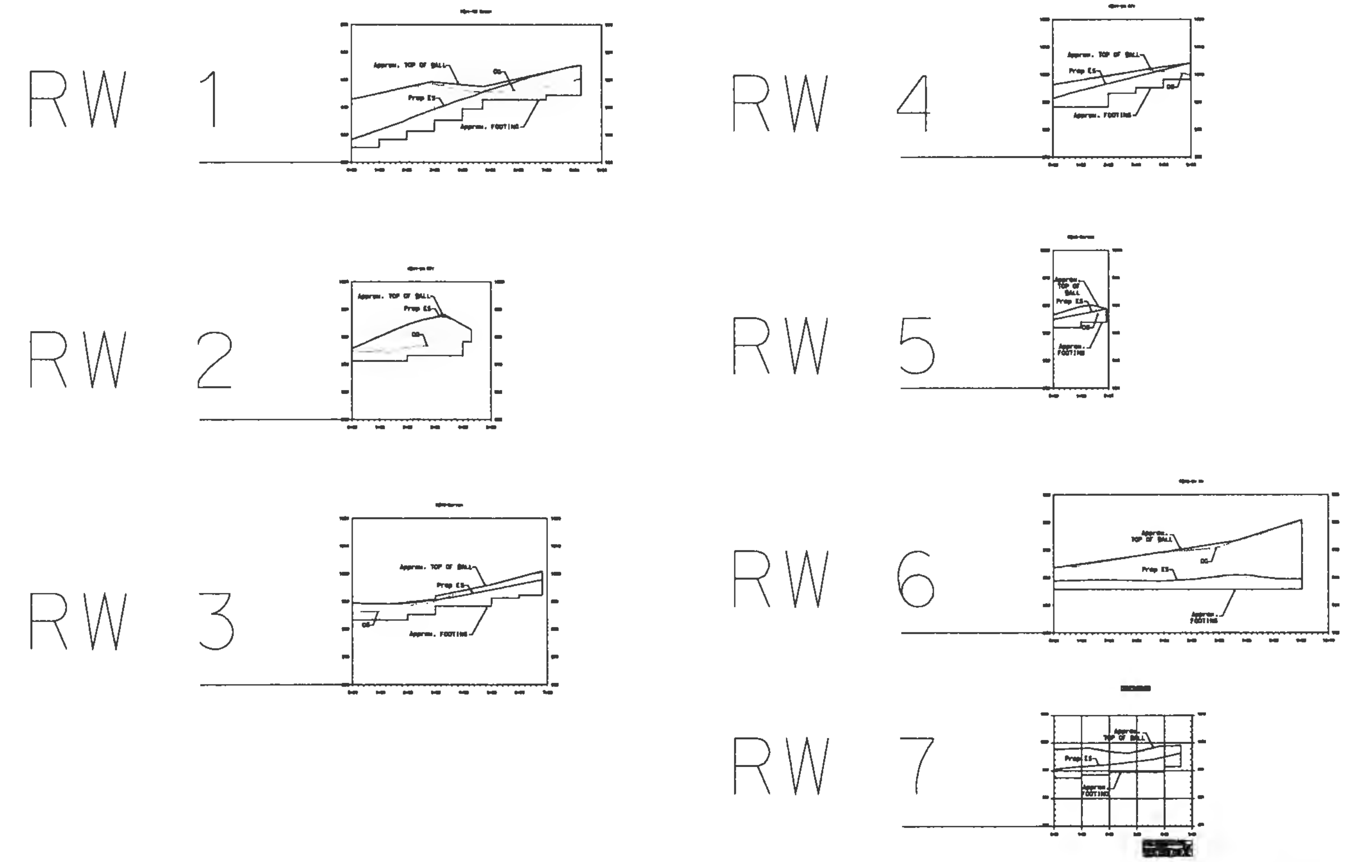
Attachments: Attachment 1 – Preliminary Layout of Alternative 7 and Retaining Wall Profiles
Attachment 2 – Planning Study, Barton Road OC (Replace), Alternative 6 (Same as Alternative 7)
Attachment 3 – Responses to Caltrans Review Comments

KLEINFELDER 1220 Research Drive, Suite B, Redlands, CA 92374 p | 909.793.2691 f | 909.792.1704

ATTACHMENT 1

RETAINING WALL PROFILES





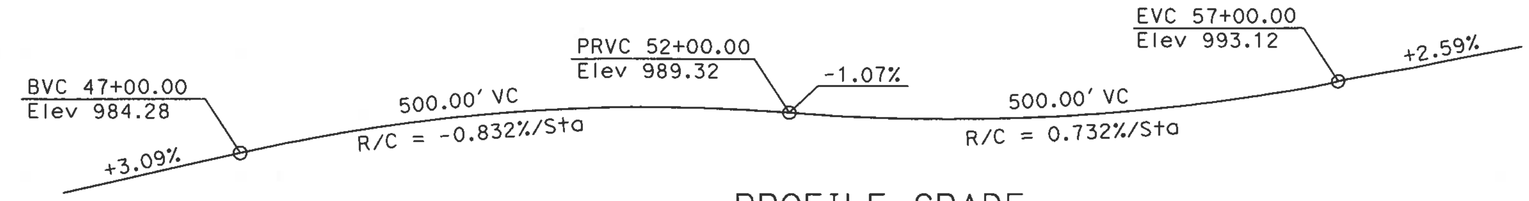
ATTACHMENT 2

PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

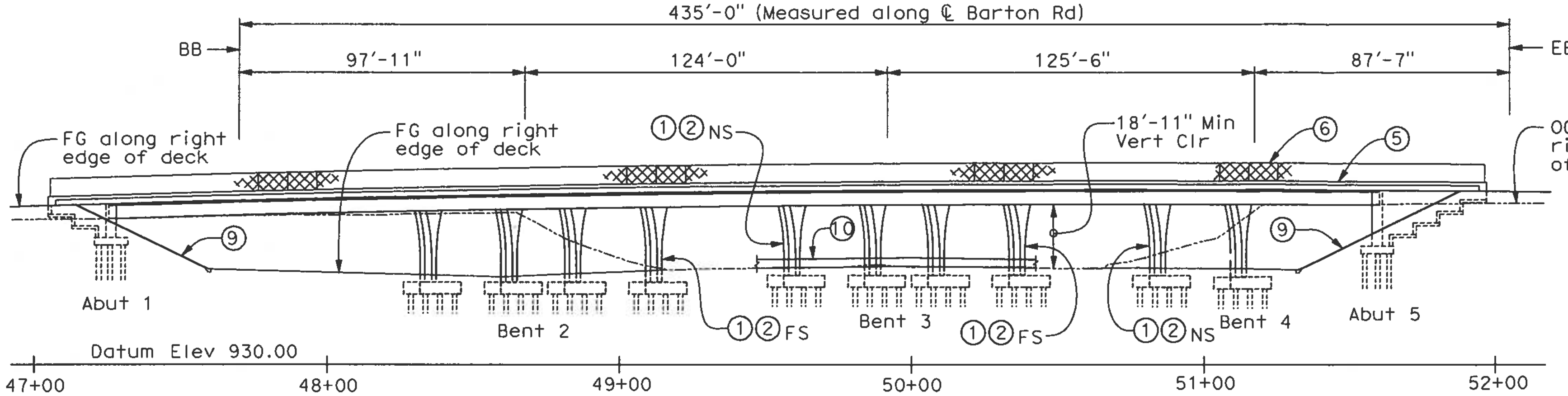
DIST.	COUNTY	ROUTE	POST MILES TOTAL PROJECT
08	SBd	215	

LIM & NASCIMENTO ENGINEERING
1887 BUSINESS CENTER DRIVE, SUITE 6
SAN BERNARDINO, CA 92408

ALTERNATIVE 6

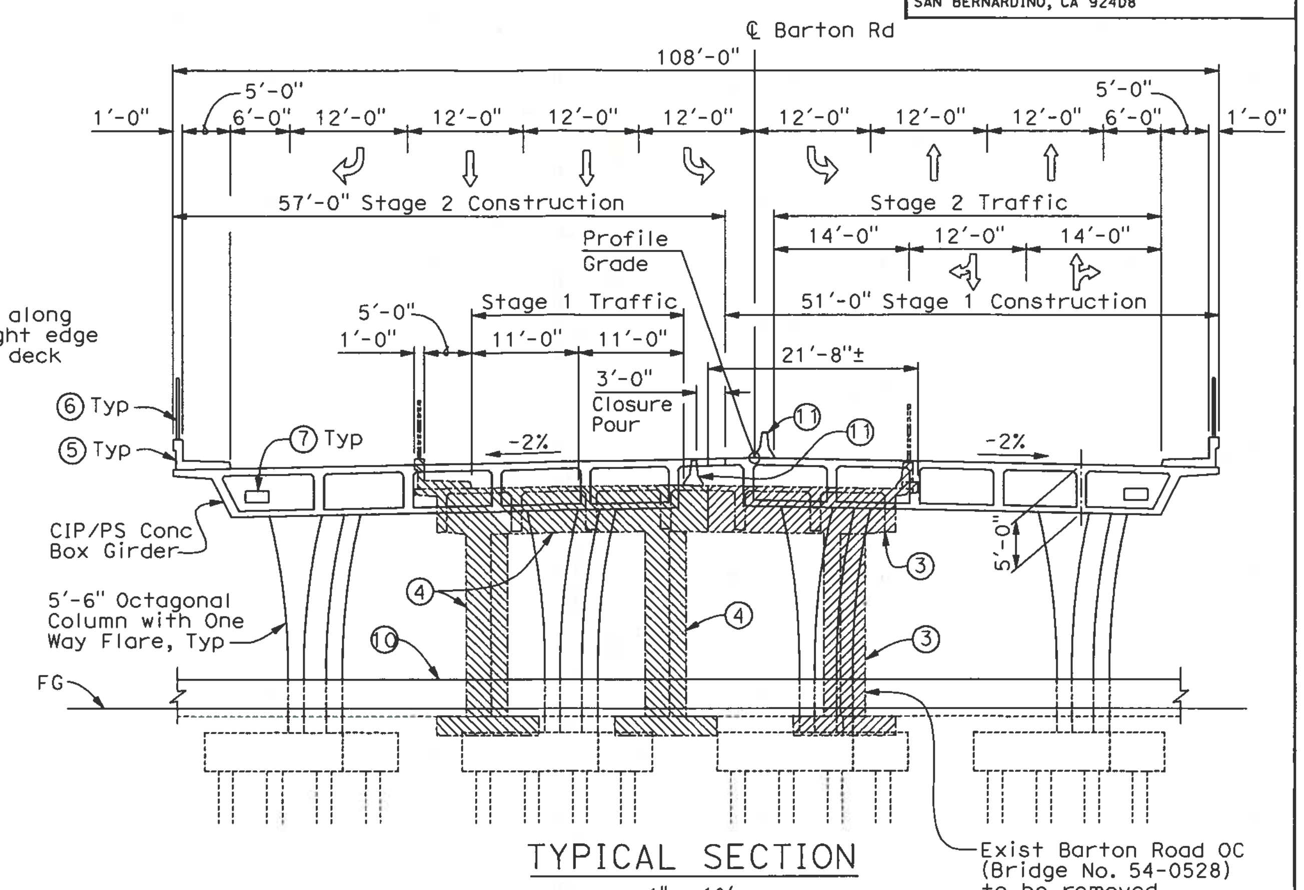


PROFILE GRADE
No Scale

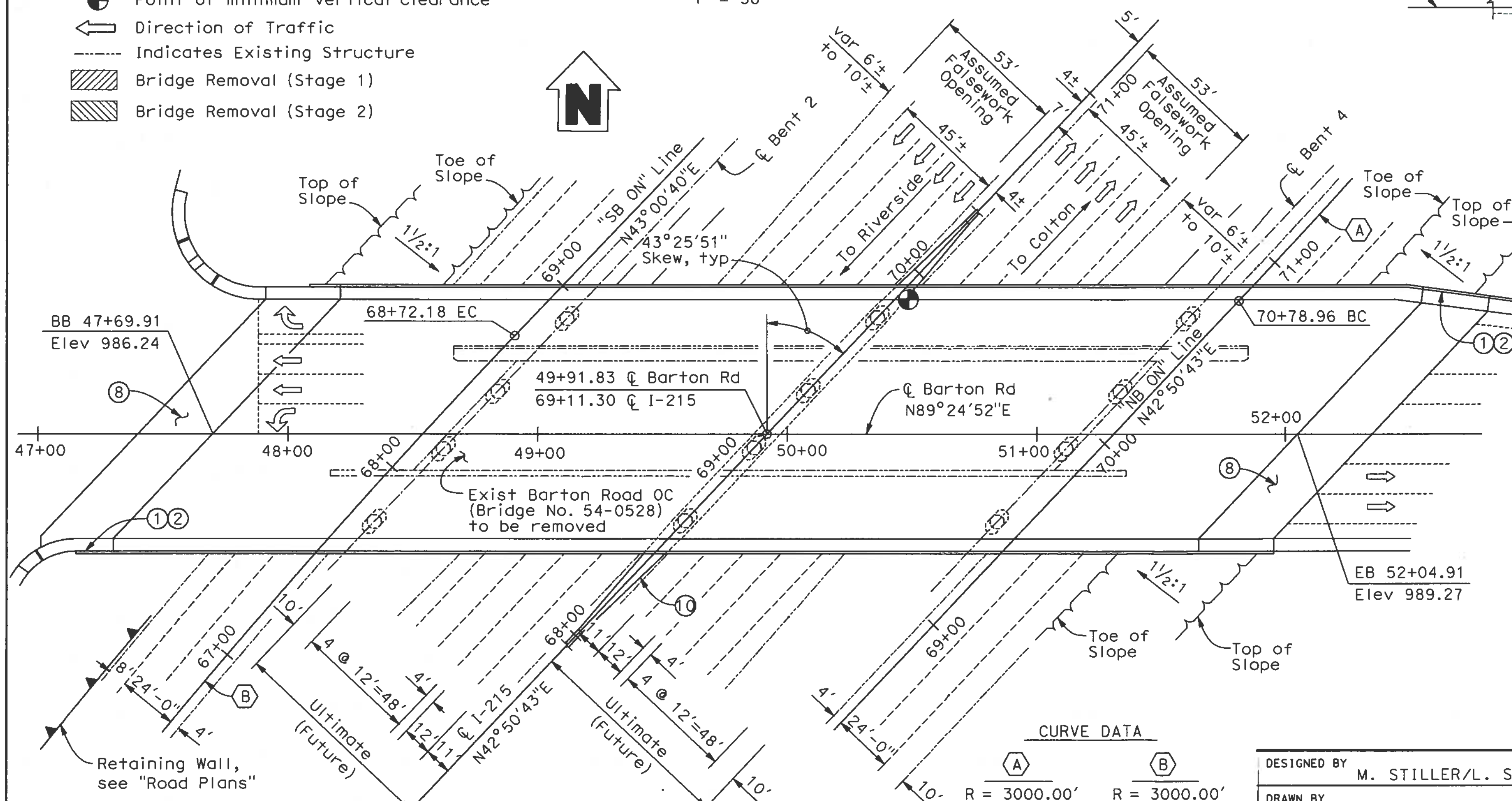


ELEVATION
1" = 30'

LEGEND
- Point of minimum vertical clearance
- Direction of Traffic
- Indicates Existing Structure
- Bridge Removal (Stage 1)
- Bridge Removal (Stage 2)



TYPICAL SECTION
1" = 10'



PLAN
1" = 30'

CURVE DATA

(A)	(B)
R = 3000.00'	R = 3000.00'
Δ = 4°20'29"	Δ = 4°30'26"
T = 113.71'	T = 118.06'
L = 227.31'	L = 235.99'

NOTES:

1. Paint "Bridge No. 54-0528" & year completed
2. Paint "Barton Road Overcrossing"
3. Bridge Removal (Portion) Stage 1 construction)
4. Bridge Removal (Stage 2 construction)
5. Concrete Barrier, Type 26
6. Chain Link Railing, Type 7
7. Future Utility Opening
8. Structure Approach, Type N(30S)
9. Slope Paving
10. Concrete Barrier, Type 60E, see "Road Plans"
11. Temporary Railing, Type K (Anchored)

Date of estimate	=	7/7/09
Str Depth	=	5'-0"
Length	=	435'-0"
Width	=	108'-0"
Area	=	46,980 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	=	$231 / sq ft
Total Cost	=	$11,096,000

VEHICULAR TRAFFIC
1. ___ New alignment. No traffic at the site.
2. ___ Traffic will be detoured away from the site.
3. X Traffic will be carried on the structure. Stage construction will/~~will not~~ be required.
4. X Traffic will pass under the structure on I-215 (Name of St. or Hwy.)
   - A. ___ No falsework allowed over traffic.
   - B. X Falsework opening(s) required:

	Temporary Vertical Clearance	Width of Traffic Opening
N Bnd.	15'	45'
S Bnd.	15'	45'
Two-way		

   - C. X Temporary traffic lane reduction needed for footing excavation.

PEDESTRIAN TRAFFIC
Falsework opening(s) required on n/a (Name of St.)
Location Height Width

RAILROAD TRAFFIC
Falsework opening(s) required over n/a (Name of RR)
Vertical Clearance Horizontal Clear Width

DESIGNED BY	M. STILLER/L. SOTO	DATE	7/7/09
DRAWN BY	F. DEMARCO/S. DESALEGN	DATE	7/7/09
CHECKED BY	M. CHAR	DATE	7/7/09
APPROVED		DATE	

M. CHAR
PROJECT ENGINEER

PLANNING STUDY

BARTON ROAD OC (REPLACE)

BRIDGE NO. TBD | CU
SCALE: AS NOTED | EA

X
DESIGN OVERSIGHT
X
SIGN OFF DATE

ATTACHMENT 3

Project Name: **I-215/Barton Road Interchange Improvements**
08-SBd- 215-PM 0.58/1.95, Caltrans Contract No. 0800000282 (EA 0J0700)
Responses by: **Madan Chirumalla, PE and Scott G. Lawson, PE, GE**

This document contains the response to Caltrans review comments dated June 8, 2011.

RESPONSE TO COMMENTS ON ADDENDUM TO STRUCTURE PRELIMINARY GEOTECHNICAL REPORT

Comment No.	Page No.	Comments	Responses
1	Page 1	Revise the project limit to the most recent one. Also add project number 0800000282 to the project description.	Our addendum to report has been revised accordingly.
2	General	If the retaining walls need to be supported on deep foundations, cast-in-drilled-hole (CIDH) piles cannot be used for support. Caltrans does not allow the use of CIDH piles for batter piles.	Comment acknowledged. Reference to cast-in-drilled-hole (CIDH) piles has been removed.

STRUCTURE PRELIMINARY GEOTECHNICAL REPORT
RIVERSIDE CANAL BRIDGE
INTERSTATE 215/BARTON ROAD
INTERCHANGE IMPROVEMENTS
CITY OF GRAND TERRACE
SAN BERNARDINO COUNTY, CALIFORNIA
08-SBD- 215-PM 0.58/1.66
CALTRANS EA NO. 08-0J0700

June 5, 2012

June 5, 2012
Project No. 94305

Mr. Greg Hefter, PE
AECOM
999 Town & Country Road
Orange, California 92868

Subject: **Structure Preliminary Geotechnical Report**
Riverside Canal Bridge
Interstate 215/Barton Road Interchange Improvements
City of Grand Terrace, San Bernardino County, California
08-SBd- 215-PM 0.58/1.66
Caltrans EA No. 08-0J0700

Dear Mr. Hefter:

Kleinfelder West, Inc. (Kleinfelder) is pleased to present this Structure Preliminary Geotechnical Report for the new Riverside Canal Bridge as part of the Interstate 215/Barton Road Interchange Improvements Project, located in the City of Grand Terrace, San Bernardino County, California.

The purpose of our study was to evaluate the geologic and geotechnical characteristics of the project area, based on our review of available information, and to provide preliminary recommendations for project design. This report presents preliminary design and constructability recommendations based upon a review of available literature and as-built plans. Separate design-level Structure Foundation Report (SFR) and Geotechnical Design Report (GDR) should be prepared in order to provide more specific geotechnical recommendations for final design of the project.

We appreciate the opportunity to provide geotechnical services to AECOM and trust the information in this report meets the current project needs. If you have any questions, please contact the undersigned at your convenience.

Respectfully submitted,

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1.0 INTRODUCTION

1.1 PURPOSE

This report presents the results of our preliminary geotechnical design study for the proposed Riverside Canal Bridge as part of the Interstate 215 (I-215)/Barton Road Interchange project, located in the City of Grand Terrace, San Bernardino County, California. The study area is shown on Plate 1, *Site Vicinity Map*. The purpose of this study is to provide preliminary geological and geotechnical engineering information for use by the design engineer for preliminary planning, design and economic evaluations of the proposed new Riverside Canal Bridge.

The purpose of the proposed I-215/Barton Road Interchange Improvement project is to improve the operation of the existing interchange and local circulation, enhance safety, alleviate existing level of service deficiencies, and accommodate projected future traffic volumes within the project vicinity. The proposed project includes replacement of the Barton Road Overcrossing bridge, widening of Barton Road, realignment of West Grand Terrace Road and Commerce Way, reconfiguration and construction of new I-215 on-ramps and off-ramps as necessary to connect to Barton Road, as well as to improve turn storage capacity. Included in the project is a new bridge over the existing historic City of Riverside Irrigation Canal that crosses the proposed northbound off ramp at De Berry Street.

Our understanding of the project is based on our discussions with AECOM and our review of the documents listed in Section 3.0 of this report.

1.2 SCOPE OF SERVICES

Our scope of services performed for this study consisted of a review of pertinent geotechnical and geologic literature, review of Caltrans records relating to existing nearby bridge structures, a site reconnaissance, and limited engineering analysis based on the available data. We did not perform any subsurface investigation, sampling or laboratory testing. Available reports and as-built plans were reviewed for our preliminary evaluation of site soil conditions. References used for our study are listed at the end of this report. The following items are addressed in this report:

- Regional and site geology.
- Geologic hazards including faulting and seismicity.
- Preliminary seismic design parameters.
- Preliminary site preparation and fill slope recommendations.
- Preliminary bridge foundation alternatives.

2.0 EXISTING FACILITIES AND PROPOSED IMPROVEMENTS

2.1 EXISTING FACILITIES

The I-215/Barton Road Interchange includes the I-215 freeway, Barton Road Overcrossing (Bridge No. 54-528) over I-215, Barton Road, Grand Terrace Road and Commerce Way, and the culturally historic City of Riverside Irrigation Canal. The project site area is shown on Plate 1, *Site Vicinity Map*.

The existing I-215/Barton Road interchange is a diamond interchange, approximately 400 feet wide between the northbound and southbound ramp intersections. The on-ramps and off-ramps are one-lane wide at the freeway entrance and exit and widen to two lanes at Barton Road. Newport Avenue and Canal Street are two-lane roads in the project area.

2.1.1 Barton Road Overcrossing (Caltrans Bridge No. 54-528)

Barton Road Overcrossing is an eastbound/westbound bridge with two traffic lanes and one center-turn lane. The existing bridge was constructed in 1958 and is approximately 257 feet long and 52 feet wide. The minimum vertical clearance between the bridge and the I-215 freeway is approximately 15 feet.

The bridge is constructed with cast-in-place, prestressed concrete girders supported on two abutments (Abutments 1 and 5) and three intermediate bents (Bents 2 through 4). The abutments and bents are founded on spread footings. Abutment spread footings shown on the as-built drawings are 6 feet wide and 2 feet thick and spread footings for the bents are 7.5 feet wide by 7.5 feet long and 2 feet thick. The design bearing pressures are not provided in the reviewed plans. Approximate bottom of foundation elevations are presented in Table 1, below.

Table 1
Bottom of Foundation Elevations, Barton Road Overcrossing

Location	Foundation Type	Bottom of Footing Elevation (feet)*
Abutment 1 (West)	Spread Footing	972
Bents 2 through 4	Spread Footing	958
Abutment 5 (East)	Spread Footing	974
***Note:** Elevations were obtained directly from the as-built plans. No correction has been made based on changes in elevation datum.		

Existing cut slopes forming the eastern and western embankments for the Barton Road Overcrossing have heights of up to 25 feet with an overall slope gradient of 2:1 (Horizontal:Vertical, H:V). The abutments of Barton Road Overcrossing had been retrofitted with 30-inch cast-in-drilled-hole (CIDH) piles in 1995.

2.1.2 City of Riverside Irrigation Canal

The City of Riverside Irrigation Canal is a culturally historic canal that extends from Grand Terrace south into the City of Riverside. The canal in the project area is an open trapezoidal concrete-lined canal approximately 10 feet wide by approximately 6 feet deep with approximate 1:1 (H:V) concrete-lined side slopes. The open channel runs sub parallel along the east side of I-215 and enters into a closed conduit at its junction with De Berry Street.

2.2 PROPOSED IMPROVEMENTS

The proposed project consists of replacing the existing Barton Road Overcrossing, widening of Barton Road, reconfiguration of I-215 freeway Barton Road on- and off-ramps as necessary to connect to Barton Road, as well as to improve turn storage capacity, and realigning of Grand Terrace Road and Commerce Way.

The Project Development Team (PDT) is currently evaluating a no-build and three build alternatives for the proposed project: Alternative 1, No-build; Alternative 3, Type L-7 Cloverleaf Interchange; Alternative 6, Combined Type L-7/L-6 Interchange; and, Alternative 7, Combined L-1/L-7. Alternative 2, Type L-2 Spread Diamond Interchange, Alternative 4C, Combined Type L-2/L-8 Spread Diamond Interchange, and Alternative 5 have been dropped by the PDT. The three build design alternatives (Alternatives 3, 5 and 6) are illustrated in Appendix B and described as follows:

- <u>Alternative 3 (Type L-7 Cloverleaf Interchange):</u> Proposed improvements for Alternative 3 include the construction of new southbound on- and off- ramps in the northwest quadrant and northbound on- and off ramps in the southeast quadrant. All the proposed on- and off-ramps are one lane wide at the freeway and widened to three lanes at Barton Road. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure. Grand Terrace Road and Commerce Way will be realigned.

- Alternative 6 (Combined Type L-7/L-6 Interchange): Proposed improvements for Alternative 6 include the construction of new southbound off- and on-ramps in the northwest quadrant and northbound off- and on-ramps in the southeast quadrant. The southbound and northbound off-ramps will consist of one lane at I-215 and will be widened to three lanes at Barton Road and Commerce Way, respectively. The existing Commerce Way will be realigned to the east and will remain as a five-lane arterial same as existing. The existing two-lane Barton Road Overcrossing will be replaced with a new seven-lane structure.

- Alternative 7 (Combined Type L-1/L-7 Interchange): Proposed improvements for Alternative 7 include the reconfiguration of northbound ramps to Type L-1 (spread diamond) and southbound ramps to Type L-7 (partial cloverleaf). A preliminary layout plan for Alternative 7 is included as an attachment to this addendum. Southbound and northbound lanes of the ramps will consist of one lane at I-215 and widen to three lanes at Barton Road. The existing two-lane Barton Road Overcrossing will be replaced with a new six-lane structure. Commerce Way will be realigned to connect to Barton Road east of Michigan Street.

The Planning Study Drawings for the Riverside Canal are shown in Appendix B. The Riverside Canal Bridge will be a single span bridge proposed to be supported on driven piles or drilled piers at both abutments. The new Riverside Canal bridge will have a total length of approximately 150 feet measured along the centerline of the proposed bridge.

3.0 PERTINENT REPORTS AND INVESTIGATIONS

The following documents were reviewed for this study:

- *Newport Avenue Overcrossing* (as-built plans), prepared by the Department of Public Works, Division of Highways, dated August 29, 1958.
- *Planning Study Drawings, Newport Avenue OC (Replace)*, prepared by LAN Engineering, dated July 7, 2009.
- *Exhibit Barton Interchange, Alternatives 3, 4C, 5 and 6,* prepared by LAN Engineering, undated, scale 1"= 100'.
- *Barton Road Overcrossing* (as-built plans), prepared by the Department of Public Works, Division of Highways, dated August 29, 1958.
- *Grand Terrace Underpass (as-built plans),* prepared by the Department of Public Works, Division of Highways, dated August 1957
- *Project Study Report (PDS) to Request Programming For Capital Support (Project Approval and Environmental Document Phase) in the 2008 STIP,* Interstate 215 at Barton Road, between Iowa Avenue Interchange and Washington Avenue Interchange, prepared by Yong H. Kim (dated March 2, 2007) and approved by Michael A. Perovich, District Director (dated April 3, 2007), Caltrans District 8, San Bernardino, CA.
- *Advanced Planning Studies Memo, Section 1, APS Design Memo, I-215/Barton Road Interchange Project,* prepared by LAN Engineering.

Most of the geologic data compiled and reviewed for this study were obtained from the Geologic Map of the Riverside East/South ½ of the San Bernardino South Quadrangles, map scale 1:24,000 (Dibblee, 2003). Other maps and publications we reviewed addressing regional geology include the *Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles*, California, map scale 1 :100,000 (Morton, D.M., and Miller, F.K., 2006), *Geologic Map of California, San Bernardino Sheet,* compiled by T.H. Rogers (1967), map scale 1:250,000, and the *Geologic Map of the San Bernardino Quadrangle, California*, compiled by E.J. Bortugno and T.E. Spittler (1986), map scale

1:250,000. We also reviewed the Generalized *Geologic Map of Southwest San Bernardino County, California (map scale 1:48,000)* compiled by Morton (1974 in Fife et al., 1976). Reference details for these reports and maps are presented in the reference section of this report (see Section 9.0).

Maps, reports, and other studies reviewed addressing faulting and seismicity included *Fault Rupture Hazard Zones in California* (Bryant, W.A., and Hart, E.W., 2007), *Fault Activity Map of California and Adjacent Areas, California (*Jennings, C.W., 1994); and *Map showing Quaternary faults and 1978-84 Seismicity of the Los Angeles Region, California* (Ziony, J.I., and Jones, L.,1989).

Groundwater information from wells within the study area was researched based on records available through the Cooperative Well Measuring Program (CWMP) covering the Upper Santa Ana River, San Jacinto, and Upper Santa Margarita Watersheds. The CWMP is compiled by the Western Municipal Water District (WMWD, 2009). Other groundwater records reviewed included groundwater contour maps and records prepared for Southwestern San Bernardino County (Fife and others, 1976).

Additional references used are listed in Section 9.0 of this report.

4.0 REGIONAL GEOLOGY AND SEISMICITY, AND CLIMATE

4.1 REGIONAL GEOLOGY

The project site is located within California's Peninsular Ranges Geomorphic Province. The Province is characterized by a complex series of northwest-southeast oriented mountain ranges separated by similarly trending faults which extends 200 kilometers (125 miles) from the Transverse Ranges and the Los Angeles Basin south to the Mexican border and beyond. Total width of the Peninsular Ranges Province varies from 48 to 160 kilometers (30 to 100 miles) and includes the offshore area, and is bounded on the east by the Colorado Desert and the south by the Gulf of California. The Peninsular Ranges contain extensive Cretaceous plutonic rocks intruded into older metamorphic rocks and deep alluvial-filled valleys.

The site is situated within the southeastern edge of the upper Santa Ana River Valley in the City of Grand Terrace, California. This area is a broad alluvial-filled basin bounded on the north by the San Gabriel Mountains, the south by the Jurupa and La Sierra Hills, the west and southwest by the Puente and Chino Hills, and on the east by the San Jacinto fault. The Santa Ana River has incised into granitic bedrock of the Peninsular Ranges batholith in area of the City of Riverside. Older fan deposits cap the granitic bedrock on the flanks of the Santa Ana River flood plain and are generally approximately 60 to 100 feet higher in elevation than the active river surface elevation.

Regional geologic maps for the area indicate the site is underlain by Pleistocene-age older alluvial fan deposits (Morton, 1978; Dibblee, 2003; Morton and Miller, 2006). The alluvial fan deposits are derived from the surrounding mountains. Thickness of alluvium and depth to bedrock beneath the site are estimated to be greater than 100 feet. However, granitic bedrock is exposed in outcrop on the I-215 freeway cut slope several hundred feet north of the existing Newport Road Overcrossing and also southwest of the site, indicating that bedrock may be shallower beneath the site. Subsurface investigations have not performed to confirm the depth to bedrock.

4.2 REGIONAL FAULTING AND SEISMICITY

No known active faults have been identified on the subject site, thus the potential for future surface fault rupture at the site is considered to be low. However, the project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or potentially active.

An active fault is a fault that has experienced seismic activity during historic time (since roughly 1800) or exhibits evidence of surface displacement during Holocene time (Bryant and Hart, 2007). The definition of “potentially active” varies. A generally accepted definition of “potentially active” is a fault showing evidence of displacement that is older than 11,000 years (Holocene age) and younger than 1.7 million years (Pleistocene age). However, “potentially active” is no longer used as criteria for zoning by the CGS. The terms “sufficiently active” and “well-defined” are now used by the CGS as criteria for zoning faults under the Alquist-Priolo Earthquake Fault Act. The definition “inactive” generally implies that a fault has not been active since the beginning of the Pleistocene Epoch (older than 1.7 million years old).

4.3 CLIMATE

The climate in the region of the site is generally characterized by dry, moderate to warm summers and moist, cool winters. On average, the warmest month is July, with temperatures ranging from 61 to 94 degrees Fahrenheit. The coolest month is December, with temperatures ranging from 41 to 68 degrees Fahrenheit. The highest recorded temperature was 113 degrees Fahrenheit in 1960 and the lowest recorded temperature was 22 degrees Fahrenheit in 1990. The maximum average precipitation is 2.5 inches, which typically occurs in January; and the minimum average precipitation is less than 0.1 inch, which typically occurs in July. On average, the precipitation in Grand Terrace is less than 1 inch, between the months of April and October. Water usually freezes and thaws when the air temperature is below and above 39.2 degrees Fahrenheit. Therefore, the subject project site is not a freeze-thaw area.

5.0 GEOTECHNICAL CONDITIONS

5.1 GEOLOGIC MAPPING

A field reconnaissance was performed for this study. Detailed geologic mapping was not performed. The purpose of the reconnaissance was to observe and document soils and geotechnical conditions in the project area, visually evaluate the performance of existing embankment slopes, and verify regional geologic conditions based on mapping by others.

The reconnaissance used the U.S.G.S. San Bernardino South Quadrangle, 7½ Minute series Topographic map, Map Scale 1:24,000 for reference. Regional geologic maps reviewed for this study included the Riverside East and south ½ San Bernardino South Map (Dibblee, 2003), *Geologic Map of San Bernardino and Santa Ana 30' X 60' Quadrangles, California* (Morton and Miller, 2006), and the *Generalized Geologic Map of Southwestern San Bernardino County, California* (Fife, 1976).

5.2 SOIL SURVEY MAPPING

According to the United States Department of Agriculture (USDA) Soil Conservation Service, the on-site surficial soils within the project limits are comprised of Hanford coarse sandy loam (2 to 9 percent slopes; soil symbol: HaC). This soil has medium runoff and has a moderate susceptibility to sheet and rill erosion by water if the soil is unprotected (USDA, 2007).

5.3 SUBSURFACE SOIL CONDITIONS

Based on a review of Log of Test Boring (LOTB) data for the Barton Road Interchange and the Grand Terrace Underpass, subsurface materials in the vicinity of the subject site consist of alternating layers of medium dense to very dense, fine to coarse sand and gravel to a depth of approximately 35 to 50 feet below the existing grade which corresponds to an elevation of 946 feet above Mean Sea Level (MSL) to the north of the site and elevation 902 feet MSL south of the site, respectively. The depth to bedrock is unknown based on LOTB data reviewed, but could be on the order of 100 feet based on the review of geologic maps and nearby rock outcrops. However, bedrock could occur at shallower depths. Subsurface exploration should confirm the depth to bedrock.

5.3 TOPOGRAPHY AND DRAINAGE

The ground surface elevation in the project area is approximately 945 feet above MSL. Surface drainage flows primarily by surficial sheet flow over the existing contour of the land. Proposed roadway improvements should be designed to provide positive surface drainage to prevent ponding and/or saturation of the soils in the vicinity of foundations or pavements.

5.4 GROUNDWATER

The project study area is located within the Middle Santa Ana Hydrologic area of the greater Santa Ana River Groundwater Basin. The main water-bearing deposits in the area are the Holocene- and Pleistocene-age alluvium underlying the site.

Based on the LOTB data for Barton Road Overcrossing dated 1958, groundwater was not encountered in any borings to a depth of approximately 35 feet below ground surface (elevation of 946 feet above MSL). The LOTB data for Grand Terrance Undercrossing dated 1957 indicated that groundwater was not encountered in any borings to a depth of approximately 50 feet below ground surface (elevation of 902 feet above MSL). Current groundwater conditions should be confirmed during the design phase of the project. Changes in groundwater conditions could impact the design and construction of proposed deep foundation systems.

Fluctuations of the groundwater level, localized zones of perched water, and soil moisture content should be anticipated during and following the rainy season. Irrigation of landscaped areas on or immediately adjacent to the site can also cause a fluctuation of local groundwater levels.

6.0 GEOLOGIC HAZARDS

6.1 SEISMIC SHAKING

The project site is located in the highly seismic southern California region within the influence of several fault systems that are considered to be active or sufficiently active and well defined fault. These active and sufficiently active and well defined faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the project site will periodically experience ground acceleration as the result of moderate to large magnitude earthquakes.

The active faults in the vicinity of the project alignment are the San Bernardino section of the San Jacinto fault zone and San Bernardino Valley section of the San Jacinto fault zone. Numerous other faults may also represent significant hazards, such as the San Andreas fault. However, the San Bernardino section of the San Jacinto fault is considered to have the greatest impact due to its proximity to the site and anticipated peak ground accelerations.

In addition to the known faults, recent research indicates that “blind faults” (faults that apparently have not broken the surface and display little or no surface expression) may underlie the Los Angeles Basin and adjacent areas to the west. Faults of this type are thought to have been responsible for the Whittier Narrows earthquake of 1987 and the Northridge earthquake of 1994. With the current understanding of the regional tectonic setting, it is believed that blind faulting is not present under the site vicinity.

6.2 GROUND SURFACE RUPTURE

Faults classified as either active or potentially active by the State have not been identified on-site. The site is not located within a designated Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007), where a site-specific fault investigation is required.

Ground surface rupture is usually confined to the narrow surface trace of an active fault. Since no known active fault traces project toward or cross the site, the potential for ground surface rupture is considered low.

6.3 LIQUEFACTION POTENTIAL

Soil liquefaction is a phenomenon in which saturated, cohesionless soils lose their 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 clean, loose, uniformly graded, fine-grained sands, and non-plastic silts that are saturated. Silty sands, under certain site conditions, may also be susceptible to liquefaction.

An updated liquefaction evaluation was not performed for this study due to lack of site-specific subsurface data. However, preliminary liquefaction evaluations were performed for the I215/Barton Road project and it is our opinion that the previous evaluations are applicable for this portion of the project. Due to the dense nature of soils beneath the existing grade, our analysis indicates the site has low potential for liquefaction. A more detailed assessment should be performed during the design phase of the project to confirm or modify the preliminary conclusions provided herein.

A procedure for estimating seismically induced settlement during earthquakes was developed by Tokimatsu and Seed (1987). Based on these procedures and data from other portions of the project, we previously estimated that the site has a potential for seismically induced settlement during the design earthquake.

The preliminary liquefaction and seismic settlement compaction findings described herein should be re-evaluated during final design. A site-specific geotechnical investigation should be completed during project design to further evaluate groundwater conditions, alluvial soil characteristics, and the potential for liquefaction and seismic compaction.

6.4 COLLAPSIBLE SOILS

A collapsible soil is generally defined as a soil that will undergo a sudden decrease in volume when its internal structural support is lost. Soils found to be most susceptible to collapse include loess (fine-grained, wind-deposited soil) deposits, valley alluvium deposited within a semi-arid to arid climate, and residual soil deposits. The degree of collapse for a soil sample is defined by the collapse potential value, which is expressed as a percent collapse of the total sample.

The project site is located in a geologic area prone to collapsible soil conditions. The collapse potential of subsurface soils at the site should be evaluated as part of a design-level geotechnical investigation.

7.0 GEOTECHNICAL ANALYSIS AND DESIGN

7.1 CALTRANS SEISMIC DESIGN PARAMETERS

The project site is located in a seismically active region. Seismic design parameters were developed in accordance with the Caltrans 2010 Seismic Design Criteria, Appendix B (Caltrans, 2009a, 2009b, 2010). Based on mapping by the California Geologic Survey (Bryant and Hart, 2007) and on the Caltrans ARS Online website (Caltrans 2009a), the San Jacinto fault zone (San Bernardino Section) is located approximately 3.2 km northeast of the site. According to the Caltrans (2009b) fault database, the San Jacinto fault zone (Fault ID No. 229) is a RLSS fault dipping 90 degrees with an assigned Maximum Magnitude (M_{Max}) of 7.5. The characteristics of this fault are summarized in the following Table 2.

Table 2
Site Characteristics and Governing Deterministic Fault Parameters

Site Coordinates	Latitude = 34.0301 degrees, Longitude = -117.3287 degrees
Shear Wave Velocity, $V_{s(30)}$[1]	270 m/s
Depth to V_s=1.0 km/s, $Z_{1.0}$	327 m
Depth to V_s=2.5 km/s, $Z_{2.5}$	2 km
Fault Name	San Jacinto fault zone (San Bernardino section), Fault ID 229
Maximum Magnitude (M_{Max})	7.5
Fault Type	Right Lateral Strike Slip (RLSS)
Fault Dip	90 degrees
Dip Direction	Vertical
Bottom of Rupture Plane	16 km
Top of Rupture Plane (Z_{tor})	0 km
R_{RUP}[2]	3.2 km
R_{jB}[3]	3.2 km
R_X[4]	3.2 km
F_{norm} (1 for normal, 0 for others)	0
F_{rev} (1 for reverse, 0 for others)	0
Peak Ground Acceleration (PGA)	0.61

Notes:
[1] $V_{s(30)}$ estimate based the median value for Soil Profile Type D, 270 m/s.
[2] R_{RUP} = Closest distance from the site to the fault rupture plane.
[3] R_{JB} = Joyner-Boore distance; the shortest horizontal distance to the surface projection of the rupture area.
[4] R_X = Horizontal distance from the site to the fault trace or surface projection of the top of the rupture plane.

Because of the lack of available subsurface data for the site, a refined estimate of the shear wave velocity in the upper 30 meters (V_{s30}) could not be made. Based on the available LOTB data, we used a median value of V_{s30} of 886 ft/s (270 m/s) for Soil Profile Type D (180 to 360 m/s). The site is not located within a California deep soil basin region as defined by Caltrans (2009a and c), and $Z_{1.0}$=327 m and $Z_{2.5}$=2 km were adopted from the ARS Online output, so that the basin amplification factors were 1.0 for all periods.

7.1.1 Design Response Spectrum

The deterministic response spectrum was calculated using the Caltrans Deterministic Spreadsheet (version dated 7/28/09) and checked using ARS Online as required by Caltrans (2009b). The probabilistic response spectrum was developed using the 2008 United States Geological Survey (USGS) Interactive Deaggregation (Beta) website (USGS, 2009) with $V_{s(30)}$ = 270 m/s with the Caltrans Probabilistic Spreadsheet (version dated 8/4/09), and compared with results from ARS Online as required by Caltrans (2009b). The near-fault amplification factors were applied as necessary to both the deterministic and probabilistic spectra.

The upper envelope of the deterministic and probabilistic spectral values dictates the design response spectrum. However, the probabilistic response spectrum was found to govern for all spectral periods. The recommended acceleration and displacement design response spectra are presented graphically on Plate 3a and numerically on Plate 3b.

7.2 EXCAVATIONS

Detailed project grading plans were not available at the time this report was prepared. We anticipate that temporary excavations will be required during construction of foundations, abutments, wingwalls, retaining walls, drainage improvements and underground utilities.

Bedrock-type material is not anticipated during site development, based on the data reviewed. Conventional earth moving equipment is expected to be capable of performing the excavations required. However, groundwater and/or bedrock may be encountered at the site if deep foundations are used for the bridge or retaining structures. Subsurface conditions including depth to bedrock and groundwater should be confirmed during the design phase of the project.

7.3 FILL AND CUT SLOPES

Based on the Planning Study drawing presented in Appendix B, fill slopes are not proposed for the new structure. Future fill slopes, if proposed in Caltrans right-of-way, should have a gradient of 4:1 (H:V) in accordance with the latest edition of Caltrans Highway Design Manual (HDM). Detailed slope stability analyses should be performed following availability of site improvement plans and a site-specific geotechnical investigation.

7.4 FOUNDATIONS FOR NEW BRIDGE STRUCTURE

Based on our discussions with the project structural engineer, pile foundations are proposed to support the proposed bridge structure. Deep foundations may consist of cast-in-drilled-hole piles (CIDH piles) or driven piles. CIDH piles will not be feasible if batter piles are needed. Driven piles consist of steel H-piles. Driven concrete piles, cast-in-steel-shell (CISS) or steel pipe piles are not recommended due to anticipated hard driving conditions in the very dense soils. Site-specific issues including noise, vibration, ground heave, headroom, constructability, and drivability must be considered when selecting driven piles. Drivability should be evaluated to verify that driven piles can penetrate to the required tip elevations. Driven steel HP piles may be feasible to install with the use of pile driving tips. However, if corrosive conditions are present, additional treatment of the piles or sacrificial steel thickness may be required. Pile drivability should be evaluated during the final design phase after exploratory borings and laboratory testing have been completed.

CIDH or H-piles are considered most suitable from a geotechnical standpoint. Evaluations for nearby proposed structures (Kleinfelder, 2010) were used to estimate preliminary foundation capacities for the Riverside Canal bridge. For estimating purposes, the abutments may be supported on 35 to 40-foot long, 24-inch diameter CIDH piles for design load of 70 tons (140 kips) per pile or 40 to 45-foot long 30-inch diameter CIDH piles for design load of 100 tons (200 kips). We anticipate that

HP 14x89 steel pile driven to approximately 40 to 50 feet or refusal, whichever occurs first, will achieve standard nominal capacities.

The designer should select the most suitable pile type based on the geotechnical data and discussion provided herein, their own technical evaluations, cost and constructability considerations, and the latest Caltrans requirements.

Recommendations for pile type, axial and lateral pile capacity, and minimum tip elevations, etc. can be developed as part of a design-level structure foundation report for the site.

7.5 LATERAL EARTH PRESSURES

Lateral earth pressures acting against earth retaining systems can be estimated using the values presented in the Caltrans Standard Plan sheets for retaining walls (Caltrans, 2010). The lateral earth pressures provided are for walls backfilled with materials that meet Caltrans standards for abutment and retaining wall backfill. Proper drainage should be designed behind the walls to allow for drained conditions in the backfill soils and to prevent excessive hydrostatic pressure above the water table.

7.5.1 Backfill Placement

All backfill should be placed and compacted in accordance with the latest edition of the Caltrans Standard Specifications (Caltrans, 2010). Light equipment should be used during backfill compaction to reduce the potential for possible overstressing of the wall.

7.6 MINOR STRUCTURES

Specific details regarding minor structures for the project, such as sound walls and overhead signs, were not yet developed at the time this report was prepared.

7.7 CORROSION STUDY

Section 4.1 of the "Corrosion Guidelines" prepared by the Corrosion Technology Branch, Caltrans Office of Engineering and Testing Services (September 2003) defines a corrosive area as an area where the soil and/or water contains more than 500 ppm of chlorides, more than 2,000 ppm of sulfates, or has a pH of less than 5.5. In general, a minimum resistivity for soil and/or water less than 1,000 ohm-cm indicates the presence of high quantities of soluble salts and a higher propensity for corrosion.

Since no subsurface investigation or laboratory testing was performed during this phase of the project, site-specific corrosion conditions cannot yet be evaluated. A corrosion evaluation based on laboratory testing of field soil samples should be performed during a design-level geotechnical investigation of the site.

7.8 SCOUR

The proposed bridge will span the Riverside Canal which is a concrete-lined, Trapezoidal channel, which transitions to a buried culvert. Therefore, scour potential is not considered a design issue.

8.0 LIMITATIONS

The conclusions and recommendations presented in this report are for the preliminary design of the proposed Riverside Canal Bridge for the Interstate 215/Barton Road Interchange improvements in the City of Grand Terrace, California, as described in the text of this report. The findings, conclusions and recommendations were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of this profession completing PA/ED studies practicing under similar conditions in the geographic vicinity and at the time the services were performed. No warranty, express or implied, is made. This report was based on the proposed project information provided to Kleinfelder. 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. This report is presented with the understanding that a design-level Structure Foundation Report (SFR) and a separate Geotechnical Design Report (GDR) will be prepared for the subject project in the future.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by the authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference," as that latter term is used relative to contracts or other matters of law.

This report may be used only by the project designers and Caltrans and only for the purposes stated, within a reasonable time from its issuance, but in no event later than one year from the date of the report. Land use, site conditions (both on site and off site) or other factors may change over time, and additional work may be required with the passage of time. 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 harmless Kleinfelder from any claim or liability associated with such unauthorized use or non-compliance.

Environmental site assessment for the presence or absence of hazardous/toxic materials in the soil, surface water, groundwater or atmosphere, or the presence of wetlands was not included in the scope of our services for this report.

9.0 REFERENCES

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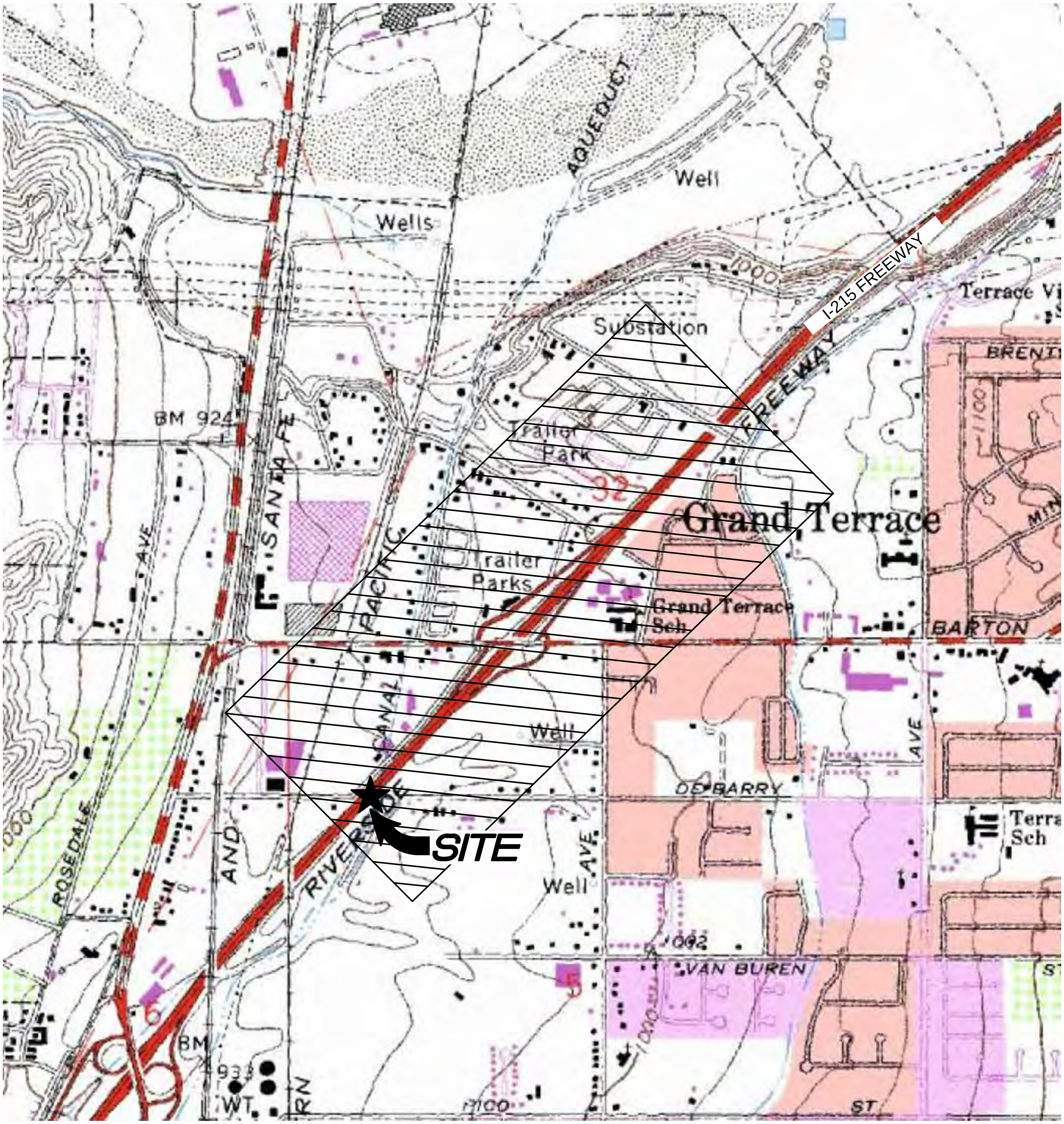
PLATES



34.0388°N, -117.3193°W
USGS SAN BERNARDINO SOUTH (CA) QUADRANGLE

N

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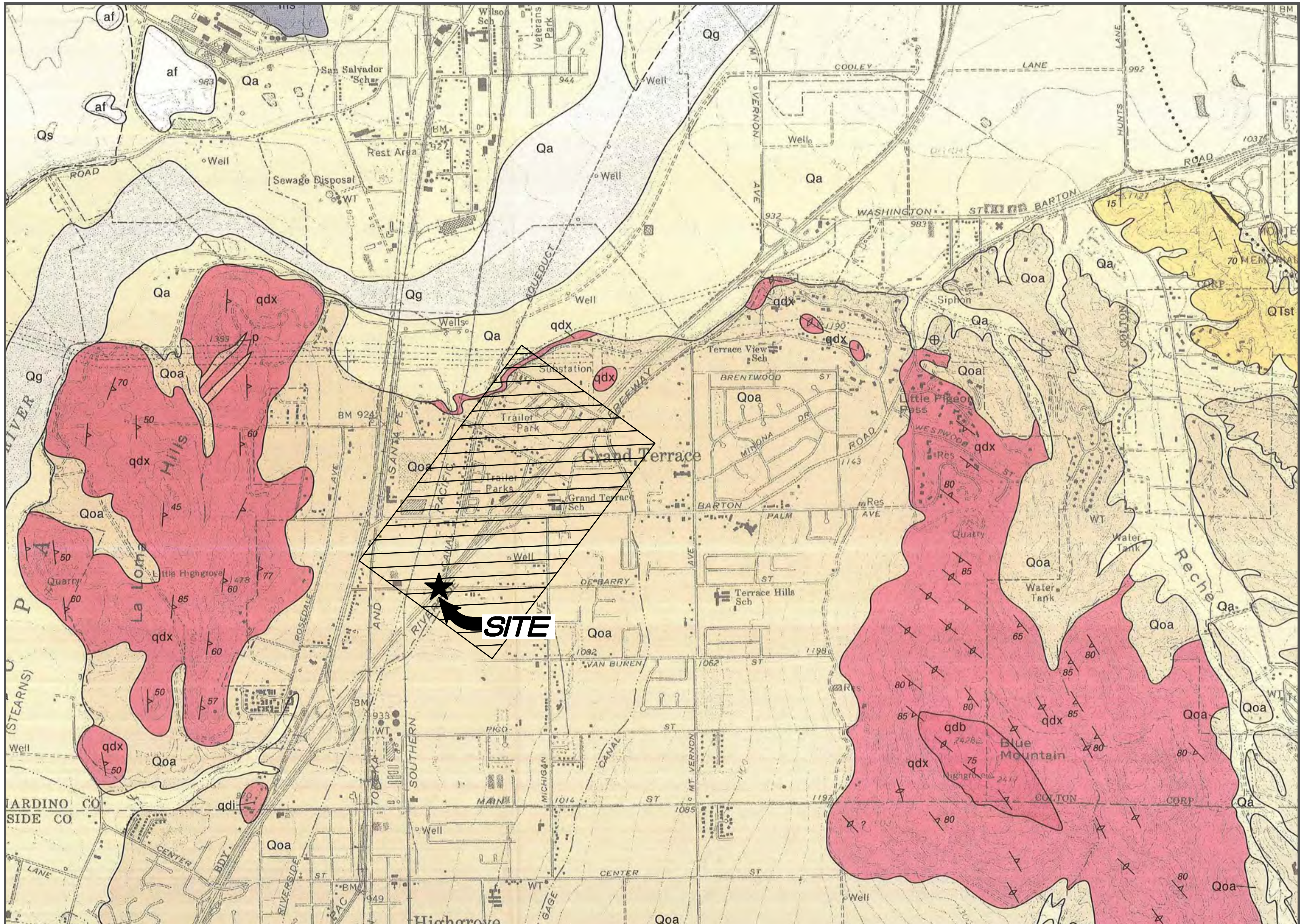
PROJECT NO.	94305
DRAWN:	05/2012
DRAWN BY:	MRG
CHECKED BY:	MC
FILE NAME:	94305p1.dwg

SITE VICINITY MAP

RIVERSIDE CANAL BRIDGE
INTERSTATE-215 / BARTON ROAD INTERCHANGE
IMPROVEMENTS PROJECT
GRAND TERRACE, CALIFORNIA

PLATE
1



SOURCE: BASED ON DIBBLE, 2003 (#DF-109)

LEGEND

af | Qa | Qg | Qs

SURFICIAL DEPOSITS

Unindurated, undissected

af *Artificial cut and fill, grading and fill by human activity for urban development during last several decades*

Qg *Alluvial gravel and sand of stream channels*

Qa *Alluvial sand, gravel and clay of valley areas, covered with soil*

Qs *Drift sand, deposited by north winds*

Qoa

OLDER SURFICIAL SEDIMENTS

Weakly indurated alluvial fan deposits derived from local terrains of plutonic rocks

Qoa *Alluvial fan deposits of sand, minor gravel, tan to light reddish brown, dissected by stream channels from source areas, top surfaces slope more than about 40ft per 0.7 mile in*

QTst

SAN TIMOTEO FORMATION

(San Timoteo beds of Frick, 1921) stream-laid alluvial sediments of detritus derived from plutonic and metamorphic rocks of San Bernadino Mountains area, weakly indurated, upper part yielded vertebrate fauna diagnostic of Blancan Stage, Plio-Pleistocene (Frick, 1921, Savage, et. al. 1954), or Irvingtonian 1 Stage, earliest Pleistocene (Repenning, 1987)

QTst *Upper part, sandstone, light gray to tan, fine to coarse grained, arkosic, bedded and minor conglomerate of pebbles and cobbles of mostly granitic detritus, some of gneissic rocks and quartzite; includes some thin layers of soft greenish to light reddish silty claystone, top not exposed in quadrangle*

qdb | qdx

PLUTONIC ROCKS OF PENINSULAR RANGES

Complex of medium grained holocrystalline plutonic rocks, mostly of quartz diorite to granodiorite composition, in which biotite flakes and hornblende are oriented nearly parallel to form gneissoid structure and which contain dark gray fine grained discoid inclusions (xenoliths) oriented parallel to gneissoid foliation. These distinctive granitic rocks called Bonzal Tonalite, by Larsen 1984, form a major part of batholith of the Peninsular Ranges. These rocks are either intrusive into or recrystallized from an enormously thick metasedimentary petrolith (ms) at great depth, as suggested by scattered engulfed remnants of those petroliths, probably in Cretaceous time. In this quadrangle these granitic rocks interpreted by Morton and Cox, 2001 as two plutons, one as ValVerde Tonalite pluton in SW and central parts of quadrangle, the other as a dioperic granodiorite-tonalite pluton of Box Springs Mountains, including its central core of biotite tonalite. Radiometric age, probably cooling age variously interpreted from 88Ma to 110 Ma, or Cretaceous (Larsen. 1948. Morton and Cox, 2001).

qdx *Leucocratic, light gray, composed of 1/3 quartz, 2/3 sodic plagioclase feldspar, less than 4% K-feldspar and 6-10% biotite and hornblende; gray, massive to gneissoid, contains scattered dark gray discoid inclusions (xenoliths) parallel to gneissoid foliation; rock somewhat incoherent, weathered to low relief; emplacement radiometric age ^{40}Ar ^{39}Ar age of hornblende 100 Ma, biotite 95 Ma, and K-feldspar 88 Ma (Morton and Cox, 2001)*

qdb *Biotite quartz diorite (tonalite) of Morton and Cox, 2001, similar to* **qdi**, *but nearly devoid of hornblende, somewhat lighter gray, more massive, and contains few inclusions (xenoliths); forms core of pluton of Box Springs Mountain (Morton and Cox, 2001), or structurally overlies unit* **qdx** *in synform; if intrusive, emplaced in axial part of synform; in NE area, radiometric (zircon) age 98.6 and 100.4 Ma (Morton and Cox, 2001)*

qdx *Quartz diorite, xenolith rich, ranges to granodiorite, composed of 1/3 quartz, 2/3-1/2 sodic plagioclase feldspar, minor potassic feldspar; mostly as small phanocrysts, and 10-15% biotite and hornblende; light to medium gray, gneissoid, contains abundant discoid inclusions (xenoliths) parallel to gneissoid foliation; coherent, erosion resistant to form Box Springs Mountain; divided into 3 slightly different units by Morton and Cox, 2001; lies NE of ValVerde pluton of Morton and Cox, 2001, or structurally overlies unit* **qdl**

ms

METASEDIMENTARY ROCKS

Severely metamorphosed marine sedimentary rocks of inferred Paleozoic (?) age, as small pendant remnants engulfed in plutonic rocks

ms *Biotite schist, dark gray, fine grained foliated, includes minor biotite-quartz-feldspar schist or gneiss, quartzite and calc-silicate hornfels in Riverside area*

N

2,000 1,000 0 2,000

APPROXIMATE SCALE (feet)

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PROJECT NO.	94305
DRAWN:	05/2012
DRAWN BY:	MRG
CHECKED BY:	MC
FILE NAME:	94305p2.dwg

REGIONAL GEOLOGIC MAP

RIVERSIDE CANAL BRIDGE
INTERSTATE-215 / BARTON ROAD INTERCHANGE
IMPROVEMENTS PROJECT
GRAND TERRACE, CALIFORNIA

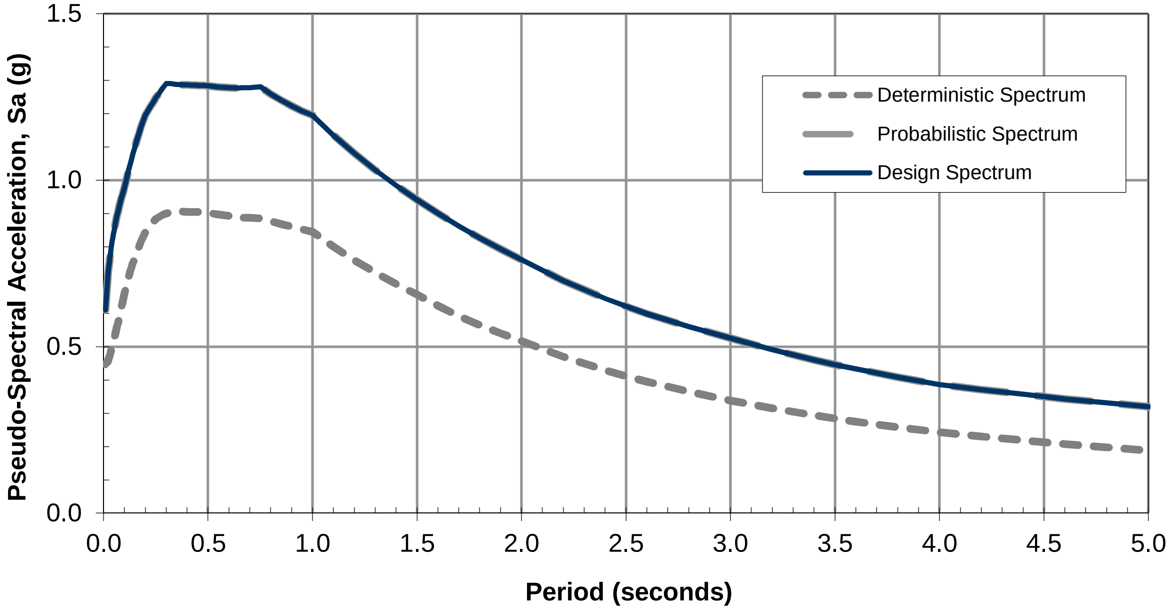
PLATE

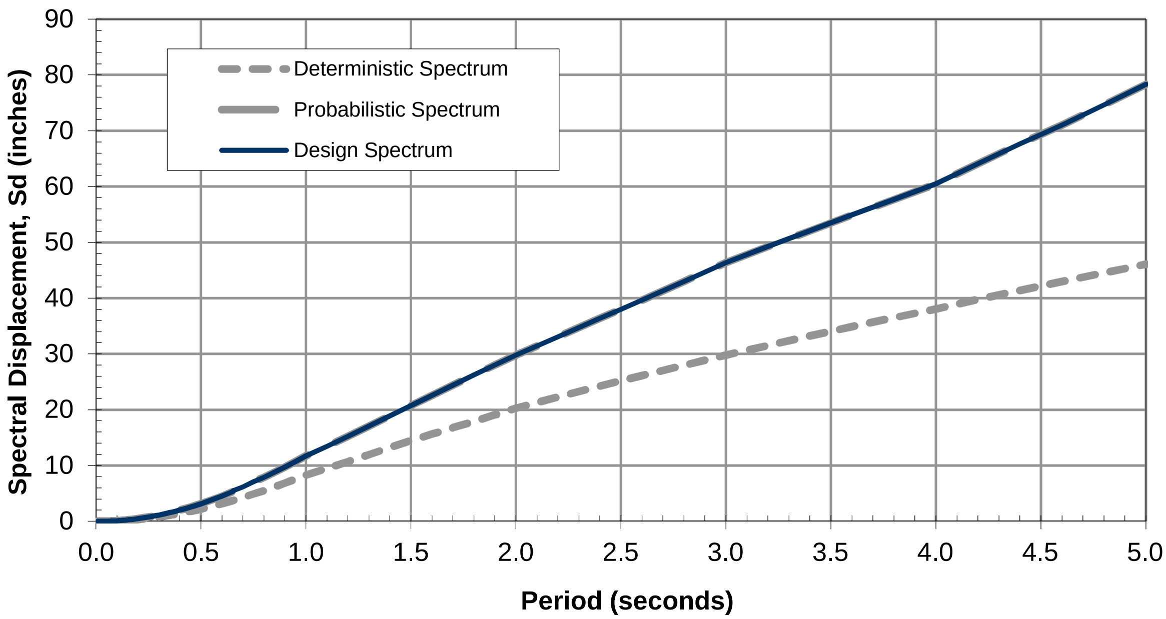
2

PLOTTED: 24 May 2012, 3:10pm, dfahrney
CAD FILE: L:\2012\CADD\94305\ LAYOUT: 2
ATTACHED IMAGES: Images: For Geologic Map-I-215-Barton Rd_Page_1.tif Images: For Geologic Map-I-215-Barton Rd_Page_2.tif
ATTACHED XREFS:
DIAMOND BAR, CA

SITE DATA

Latitude (degrees):	34.0301	Shear Wave Velocity, V_{s30}:	270 m/s
Longitude (degrees):	-117.3287	Depth to Vs = 1.0 km/s, $Z_{1.0}$:	327
		Depth to Vs = 2.5 km/s, $Z_{2.5}$:	2 km





KLEINFELDER Bright People. Right Solutions. www.kleinfelder.com	PROJECT NO 94305	**PRELIMINARY DESIGN CALTRANS ARS CURVES**	PLATE
	DRAWN: 5/30/12		
	DRAWN BY: AW	Riverside Canal Bridge	**3A**
	CHECKED BY: SL	I-215/BARTON RD INTERCHANGE IMPROVEMENTS PROJCET	
	FILE NAME: Design ARS_Riverside Canal.xls	GRAND TERRACE, CALIFORNIA	

DESIGN ARS CURVE ORDINATES

Period (s)	Sa (g)	Sd (inches)	Period (s)	Sa (g)	Sd (inches)
0.010	0.610	0.001	0.360	1.288	1.634
0.020	0.703	0.003	0.380	1.287	1.819
0.022	0.717	0.003	0.400	1.287	2.015
0.025	0.736	0.005	0.420	1.286	2.220
0.029	0.758	0.006	0.440	1.286	2.437
0.030	0.763	0.007	0.450	1.285	2.547
0.032	0.774	0.008	0.460	1.285	2.661
0.035	0.788	0.009	0.480	1.285	2.898
0.036	0.792	0.010	0.500	1.284	3.142
0.040	0.810	0.013	0.550	1.280	3.790
0.042	0.818	0.014	0.600	1.278	4.503
0.044	0.826	0.016	0.650	1.277	5.281
0.045	0.829	0.016	0.667	1.278	5.565
0.046	0.833	0.017	0.700	1.278	6.129
0.048	0.840	0.019	0.750	1.281	7.053
0.050	0.847	0.021	0.800	1.259	7.886
0.055	0.864	0.026	0.850	1.240	8.769
0.060	0.880	0.031	0.900	1.223	9.696
0.065	0.894	0.037	0.950	1.208	10.671
0.067	0.900	0.040	1.000	1.195	11.696
0.070	0.908	0.044	1.100	1.135	13.446
0.075	0.921	0.051	1.200	1.081	15.234
0.080	0.933	0.058	1.300	1.031	17.049
0.085	0.944	0.067	1.400	0.984	18.883
0.090	0.956	0.076	1.500	0.941	20.726
0.095	0.966	0.085	1.600	0.901	22.569
0.100	0.976	0.096	1.700	0.863	24.404
0.110	1.004	0.119	1.800	0.827	26.225
0.120	1.030	0.145	1.900	0.793	28.023
0.130	1.054	0.174	2.000	0.761	29.794
0.133	1.061	0.184	2.200	0.698	33.066
0.140	1.077	0.207	2.400	0.645	36.363
0.150	1.099	0.242	2.500	0.621	37.988
0.160	1.120	0.281	2.600	0.599	39.632
0.170	1.140	0.322	2.800	0.560	42.972
0.180	1.160	0.368	3.000	0.526	46.335
0.190	1.178	0.416	3.200	0.491	49.211
0.200	1.196	0.468	3.400	0.460	52.047
0.220	1.217	0.577	3.500	0.446	53.475
0.240	1.237	0.697	3.600	0.433	54.925
0.250	1.247	0.763	3.800	0.408	57.664
0.260	1.256	0.831	4.000	0.386	60.448
0.280	1.274	0.978	4.200	0.371	64.055
0.290	1.282	1.055	4.400	0.357	67.647
0.300	1.290	1.136	4.600	0.343	71.037
0.320	1.290	1.293	4.800	0.331	74.643
0.340	1.289	1.458	5.000	0.320	78.301

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PROJECT NO	94305
DRAWN:	5/30/12
DRAWN BY:	AW
CHECKED BY:	SL
FILE NAME:	Design ARS_Riverside Canal.xls

PRELIMINARY DESIGN
CALTRANS ARS CURVES

Riverside Canal Bridge

I-215/BARTON RD INTERCHANGE IMPROVEMENTS PROJCET

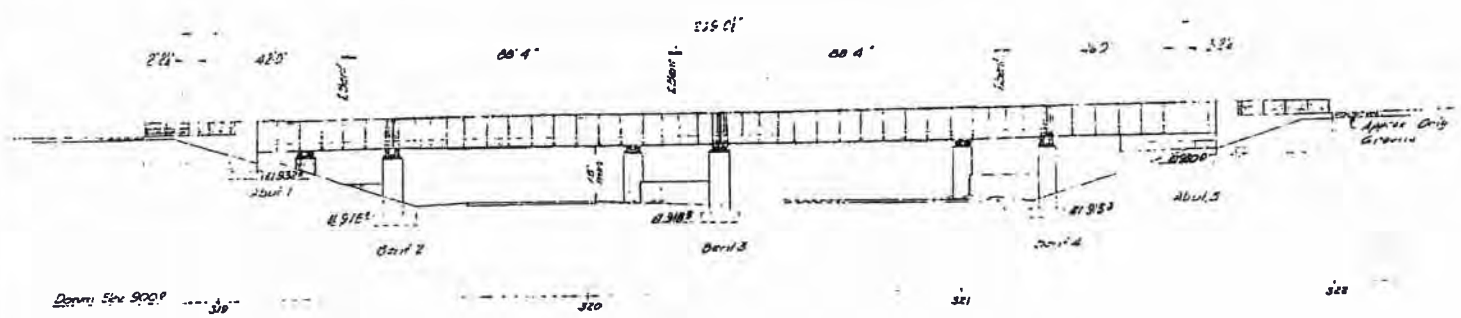
GRAND TERRACE, CALIFORNIA

PLATE
3B

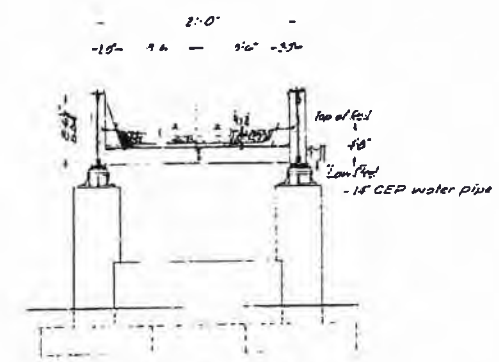
APPENDIX A

AS-BUILT PLANS OF NEARBY STRUCTURES

PROFILE GRADE
No Scale



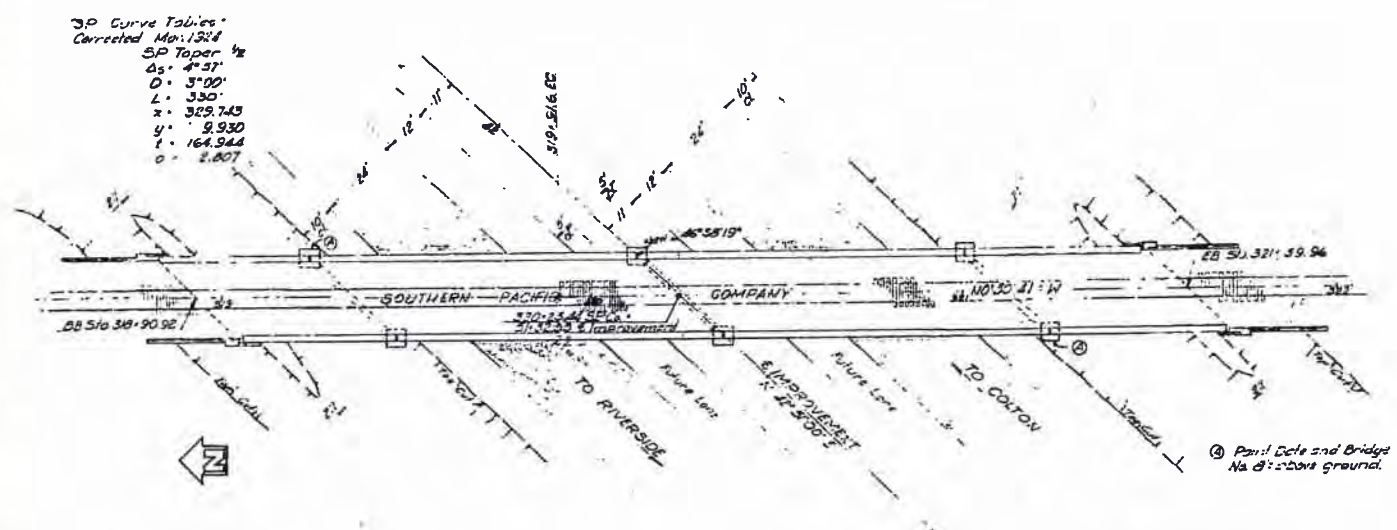
ELEVATION
1" = 20'



TYPICAL SECTION

INDEX TO PLANS

Sheet	Title
1	General Plan
2	Foundation Plan
3	Abutment Details #1
4	Abutment Details #2
5	Bent Details
6	Typical Section
7	Girder Details
8	Bearing Details
9	Log Test Borings



PLAN
1" = 20'

APPROXIMATE QUANTITIES

STRUCTURE EXCAVATION	630 C.Y.
STRUCTURE BACKFILL	520 C.Y.
CLASS "A" CONCRETE (BRIDGES)(540 C.Y.)	LUMP SUM
RUBBER WATERSTOPS	60 L.F.
BAR REINFORCING STEEL (BRIDGES)(78,000 LBS.)	LUMP SUM
MEMBRANE WATERPROOFING	530 S.Y.
PROTECTIVE COVERING	530 S.Y.
STRUCTURAL STEEL (670,000 LBS.)	LUMP SUM
CLEANING AND PAINTING STRUCTURAL STEEL	LUMP SUM

Note; For "G Sheets" see Br# 54-530

AS BUILT
CORRECTIONS BY G.C. Mace
CONTRACT NO. 59-8VC8-F

For "General Notes" see "Foundation Plan"

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

LIVE LOADING
Cooper's E-72

BRIDGE DEPARTMENT
··· DESIGN SECTION ··· 1

DESIGN	D E Young 8-56	King 9-57
DETAILS	D E Young 7-56	King 9-57
QUANTITIES	Whitaker 8-57	Hall 8-57
SPECIFICATIONS	9-57	

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRAND TERRACE UNDERPASS
LOCATED APPROXIMATELY 0.8 MI. NORTH OF THE SAN BERNARDINO-RIVERSIDE CO. LINE

GENERAL PLAN

SCALE As Noted | BRIDGE 54-519 | FILE | DRAWING G-4859-1

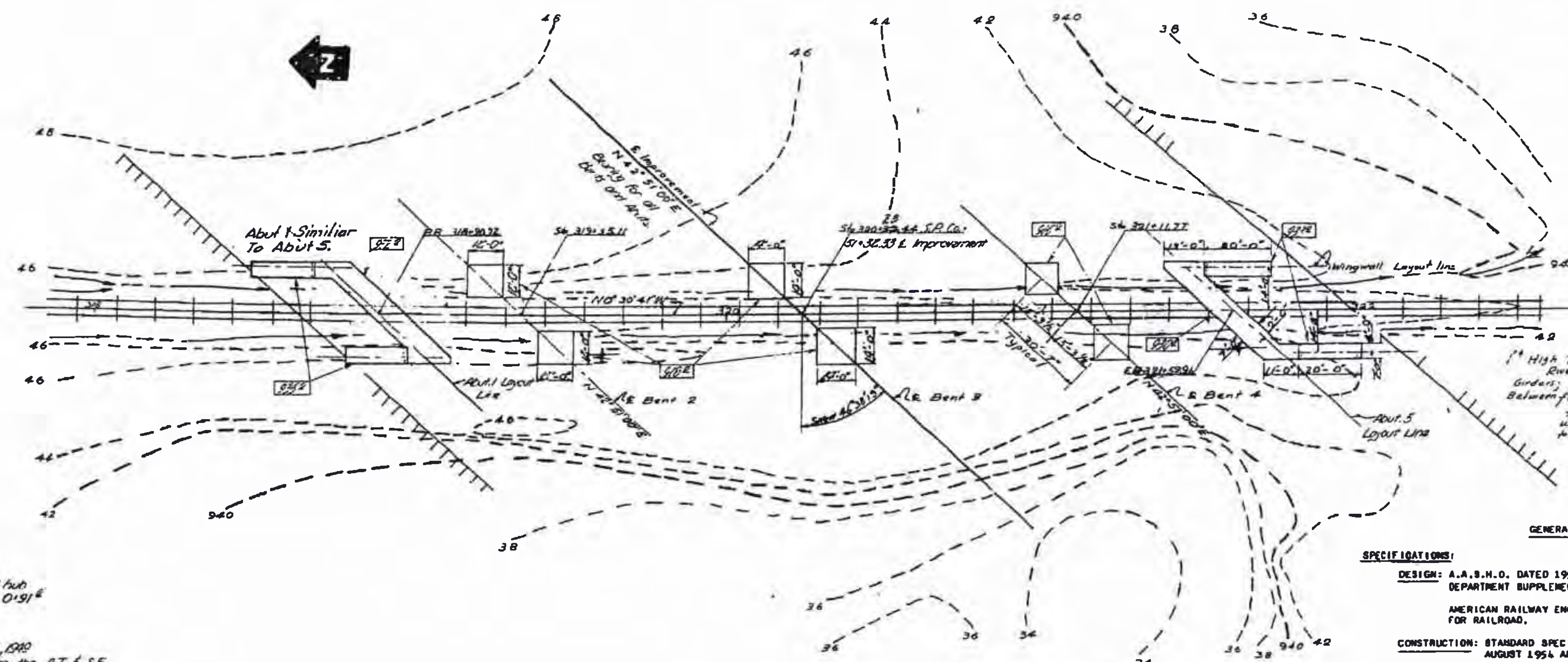
PREL. DRAWING NO. P-4859

115

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.			116	125

Dist	County	Route	Section	Sheet No.	Total Sheets
VIII	S.Bd	43	F	2	9

2 4 1958



NOTE

1" High Tension Bolts were used in lieu of Rivets; to connect pipe brackets to Girders; Walkway brackets to Girders; Diaphrams Between floor Beams.

5/8" carriage bolts with nut & lock washer was used to connect walk plates to brackets.

B.M. "Q 51" 9 A-39
Sp. Hd. nail in 6"×6" redwood hub buried 16"; 66' Rt. "Q 51" (9-10) 0+91 ℄
Elev. 944.88

B.M. U.S.C. & G.S. R 479, 1949
Std. brass disc 0.7 mi. N. along the A.T. & S.F. R.R. from Highgrove in wly. hd. wall of P.C.C. culv. of conc.
Elev. 933.66

Note: Bottom of Footing Elev. shown thus

GENERAL NOTES

SPECIFICATIONS:

DESIGN: A.A.S.H.O. DATED 1953 WITH SUBSEQUENT REVISIONS, AND BRIDGE DEPARTMENT SUPPLEMENT DATED 1953.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, CURRENT ISSUE, FOR RAILROAD.

CONSTRUCTION: STANDARD SPECIFICATIONS, DIVISION OF HIGHWAYS, DATED AUGUST 1954 AND THE SPECIAL PROVISIONS.

LIVE LOADING: E-72

UNIT STRESSES:

REINFORCED CONCRETE: F_S = 20,000 P.S.I., N = 10

F_C = 1,200

STRUCTURAL STEEL: F_S 18,000 P.S.I.

FOOTING PRESSURE: 5 TONS P.S.F.

RIVET SIZES: 1" - 1" HIGH TENSION BOLTS - 5/8" CARRIAGE BOLTS

REINFORCEMENT: EMBEDMENT IS CLEAR TO OUTSIDE OF BAR AND IS 2" TO MAIN REINFORCEMENT, EXCEPT AS NOTED. BACKING FOR HOOKS IS FOUR DIAMETERS, EXCEPT AS NOTED.

WHERE REINFORCING BARS ARE SPLICED THEY SHALL HAVE A 20 DIAMETER LAP UNLESS OTHERWISE CALLED FOR ON THE PLANS.

~~WELDING~~ GENERAL NOTES

THE RELATION BETWEEN FILLET WELD SIZE AND THE MAXIMUM THICKNESS OF MATERIAL ON WHICH VARIOUS SIZES OF FILLET WELD MAY BE USED SHALL BE IN ACCORDANCE WITH ARTICLE 222 (b) OF THE A.W.S. SPECIFICATIONS.

THE METHODS OF JOINT PREPARATION SHOWN ON THE PLANS ARE BASED ON THE USE OF MANUAL SHIELDED ARC WELDING. IN THE EVENT THAT AUTOMATIC OR SEMI-AUTOMATIC SUBMERGED ARC PROCESSES ARE USED, THE CONTRACTOR MAY SUBMIT ALTERNATIVE METHODS OF JOINT PREPARATION FOR APPROVAL BY THE ENGINEER. "U" BUTT WELDS MAY BE SUBSTITUTED FOR VEE TYPE SHOWN ON THE PLANS. "J" BUTT WELDS MAY BE SUBSTITUTED FOR BEVEL TYPES SHOWN ON THE PLANS.

SHOP PLANS SHALL INDICATE WELDING SEQUENCE AND THE TYPE OF STEEL TO BE USED.

AS BUILT
CORRECTIONS BY G.A. Moore
CONTRACT NO. 59-8VC8-F

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
... DESIGN SECTION ... 1

Project Designer
Chief Designer

DESIGN		
DETAILS		
QUANTITIES		B-57
SPECIFICATIONS		
Approval Recommended by		

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRAND TERRACE U.P.

FOUNDATION PLAN

SCALE 1"=20'	BRIDGE 54 519	FILE	DRAWING C-4859-2

PREL. DRAWING NO. P- 4859

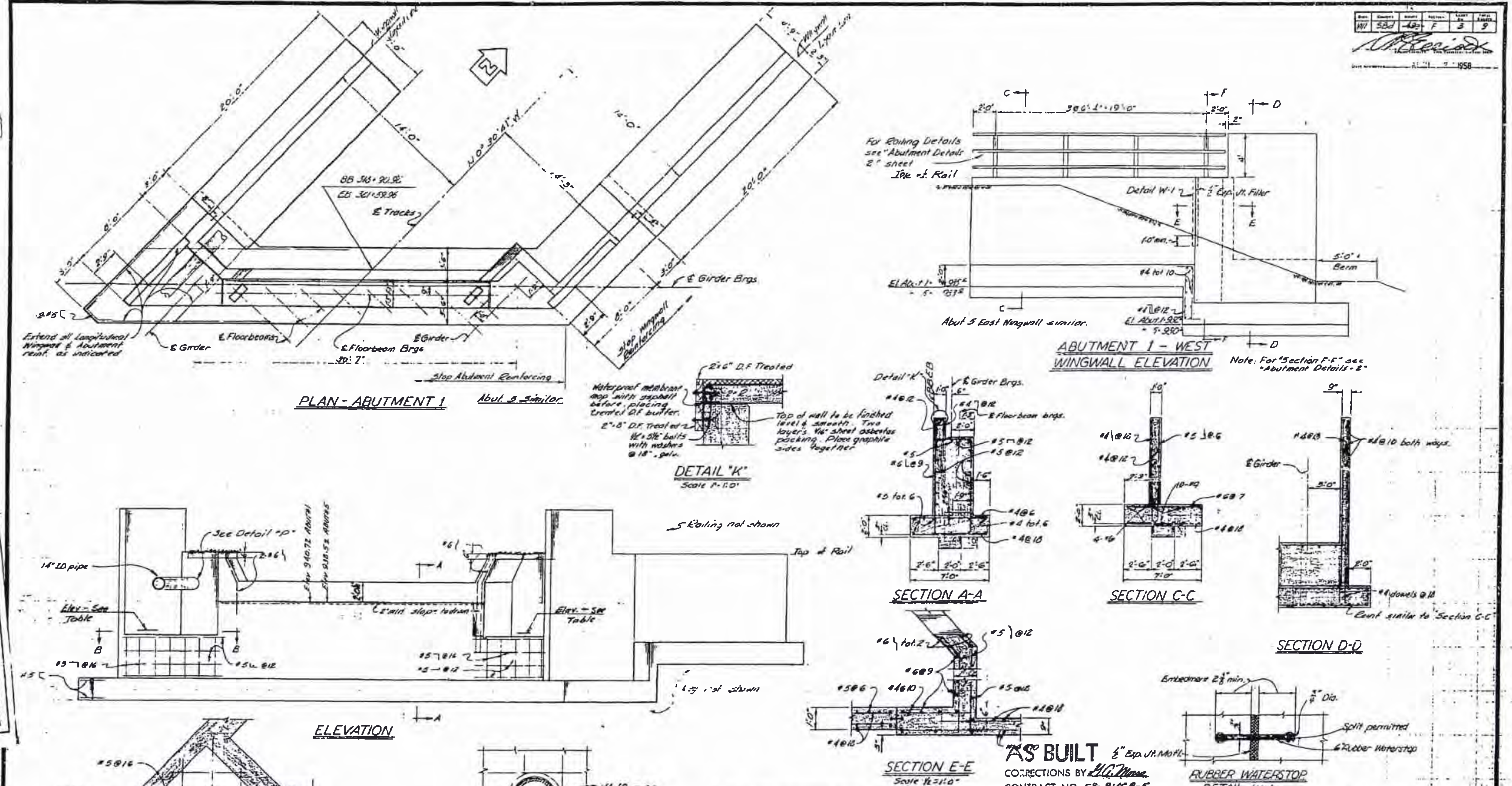
116

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

FED. ROAD DIV. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF			117	175

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VIII	SBd	43	F	3	9

Date approved 1958



TOP OF MASONRY PLATE ELEVATIONS		
Abut	East Gird	West Gird
1	939.08	938.90
5	936.98	936.10

"AS" BUILT
CORRECTIONS BY H.G. Moore
CONTRACT NO. 59-8VC8-F

BRIDGE DEPARTMENT
DESIGN SECTION 1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRAND TERRACE UNDERPASS

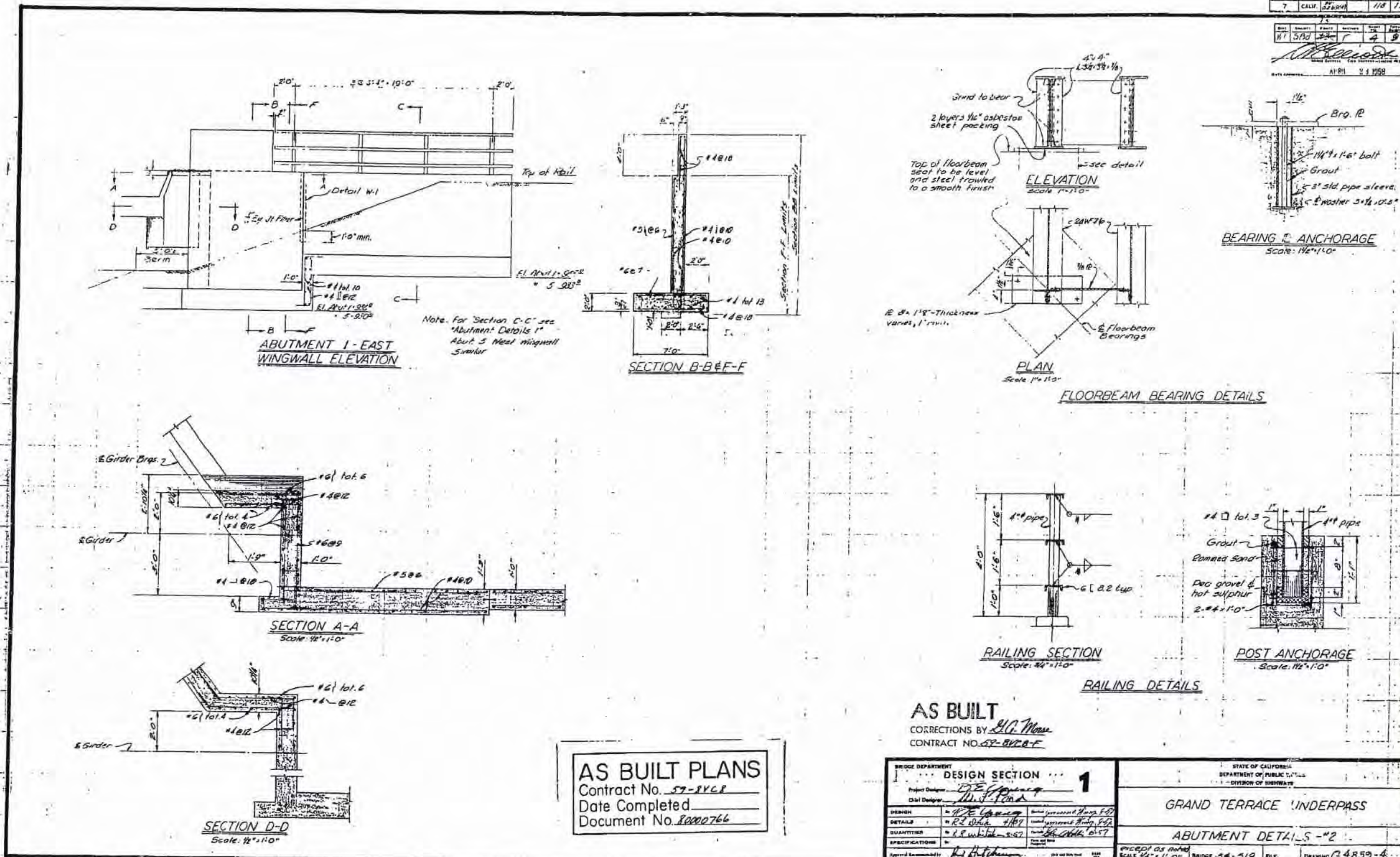
ABUTMENT DETAILS #1

SCALE except as noted ½"=1'-0" | BRIDGE 54-519 | FILE | DRAWING C-4859-3

PREL. DRAWING NO. P-4859

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

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



AS BUILT
CORRECTIONS BY G.C. Moore
CONTRACT NO. 59-8VC8-F

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
DESIGN SECTION 1

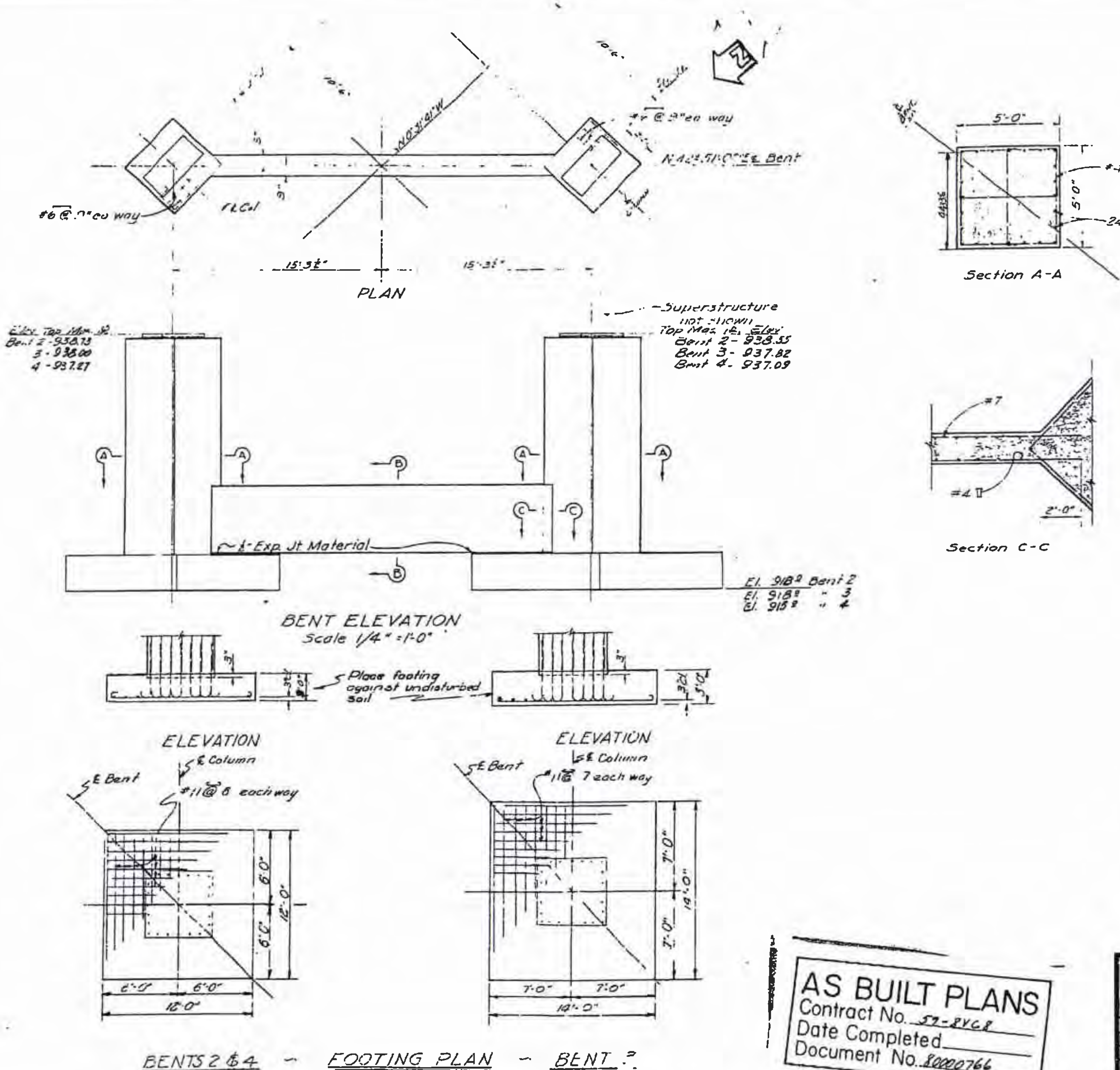
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRAND TERRACE UNDERPASS

ABUTMENT DETAILS - #2

except as noted
SCALE 1/4" = 1'-0"
BRIDGE 54-519
DRAWING C-4859-4
PREL. DRAWING No. P-4859

7 CALIF. 118 175
APRIL 1958



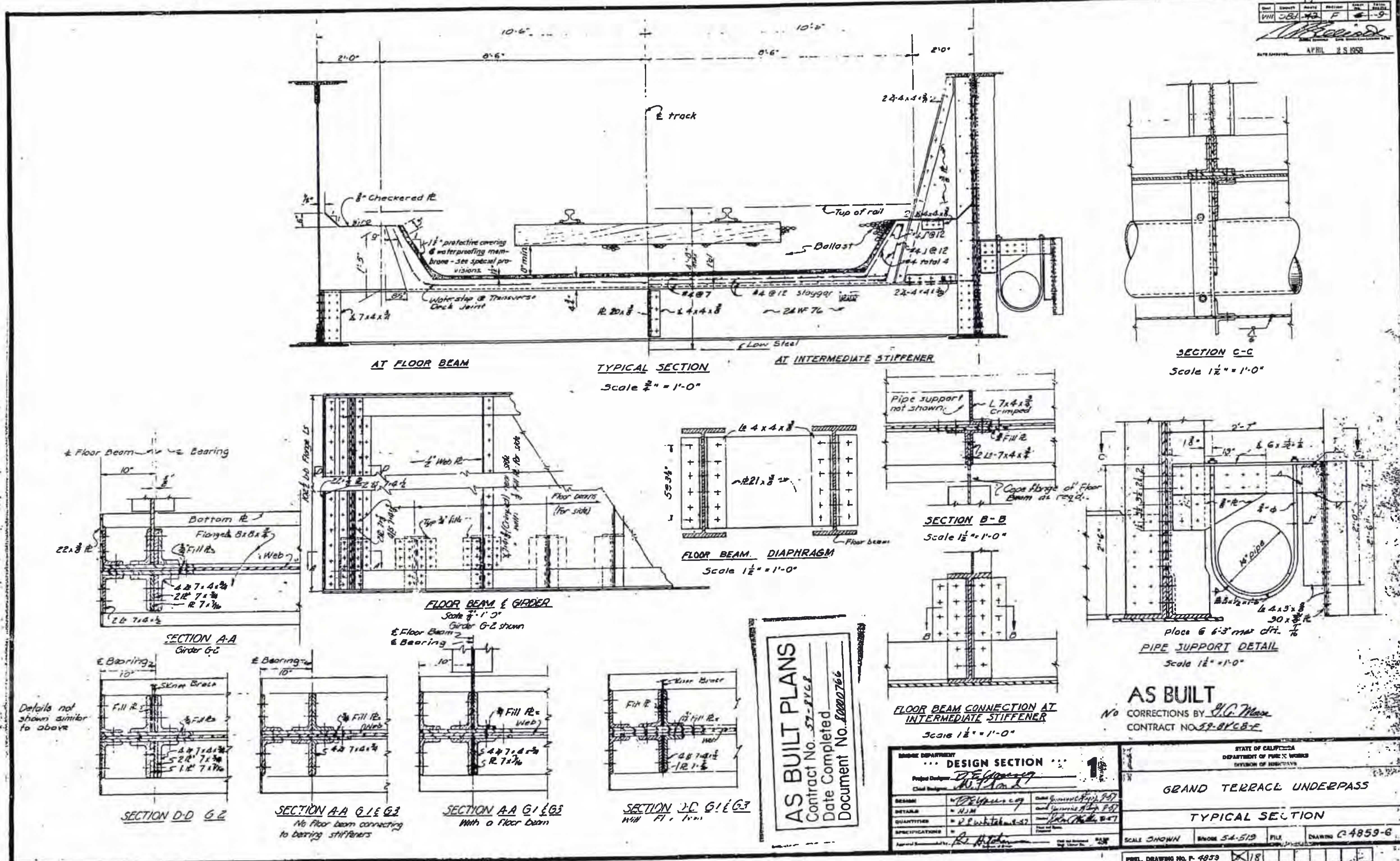
AS BUILT
No CORRECTIONS BY G.C. Moore
CONTRACT NO. 59-8VC8-F

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT ··· DESIGN SECTION ··· 1	STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS
Project Designer D.E. Young 5/57; Chief Designer W.J. Ward	GRAND TERRACE UNDERPASS
DESIGN: D.E. Young 5/57; DETAILS; QUANTITIES: R.C. Whitaker 5/57; SPECIFICATIONS	BENT DETAILS
	SCALE 3/4" = 1'-0" or as shown; BRIDGE 54-519; DRAWING C-4859-5

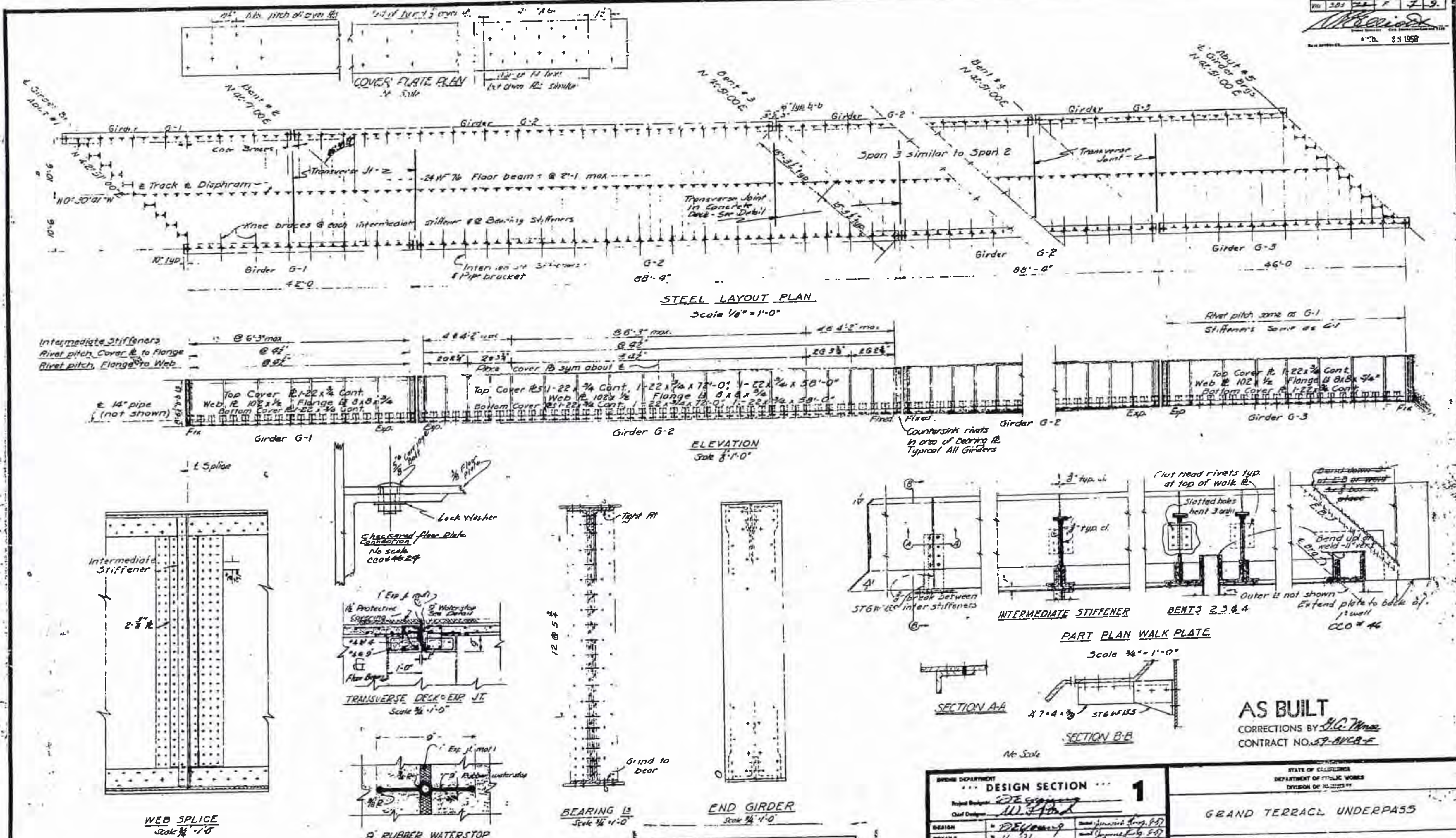
PREL. DRAWING No. P-4859

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



120

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



AS BUILT
CORRECTIONS BY: H.G. Moss
CONTRACT NO. 59-8VC8-F

7	CALIF.	121	175

BRIDGE DEPARTMENT
DESIGN SECTION 1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

GRAND TERRACE UNDERPASS

GIRDER DETAILS

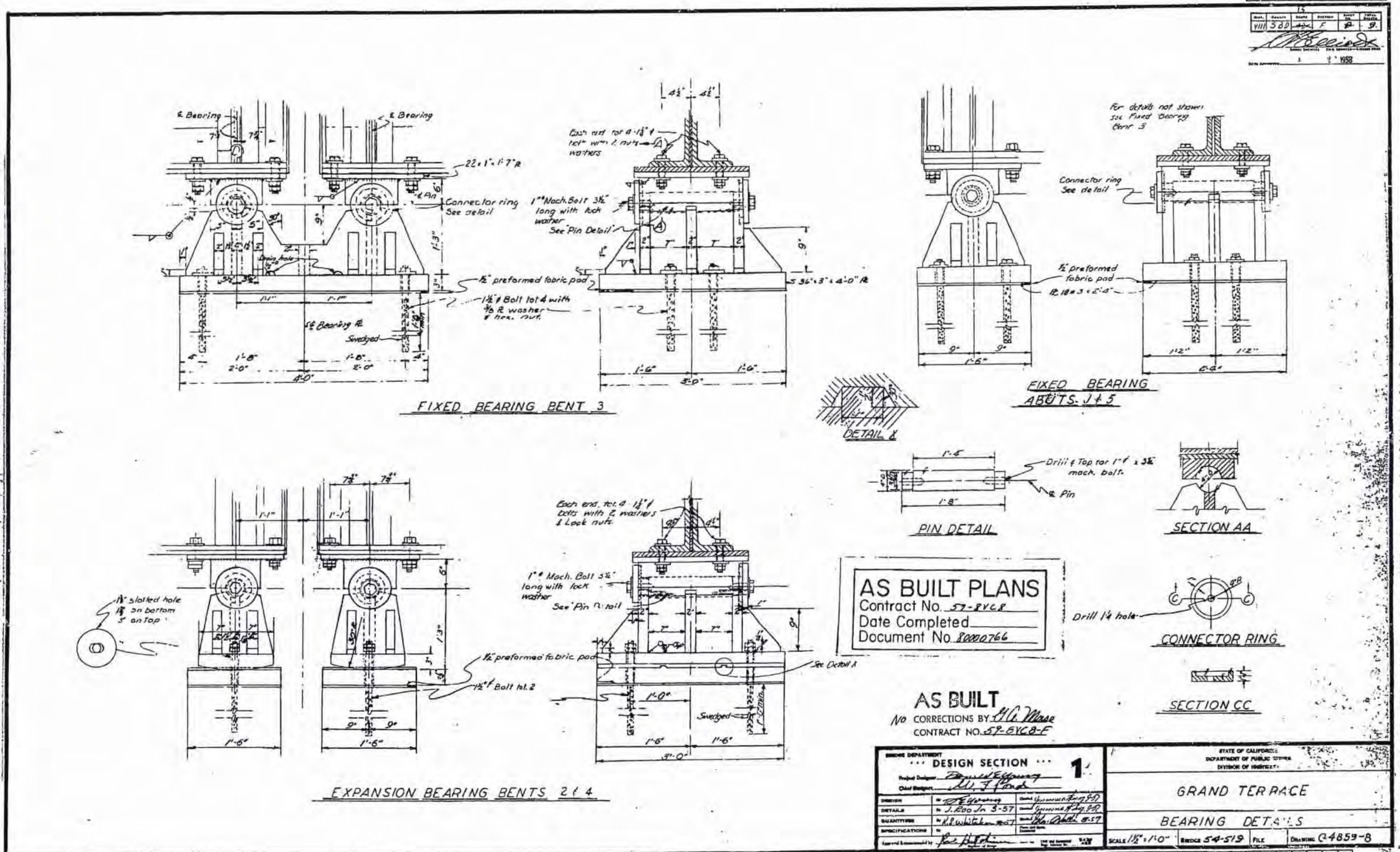
SCALE: SHOWN — BRIDGE 54-519 — DRAWING C-4859-7

PREL. DRAWING No. P-4859

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

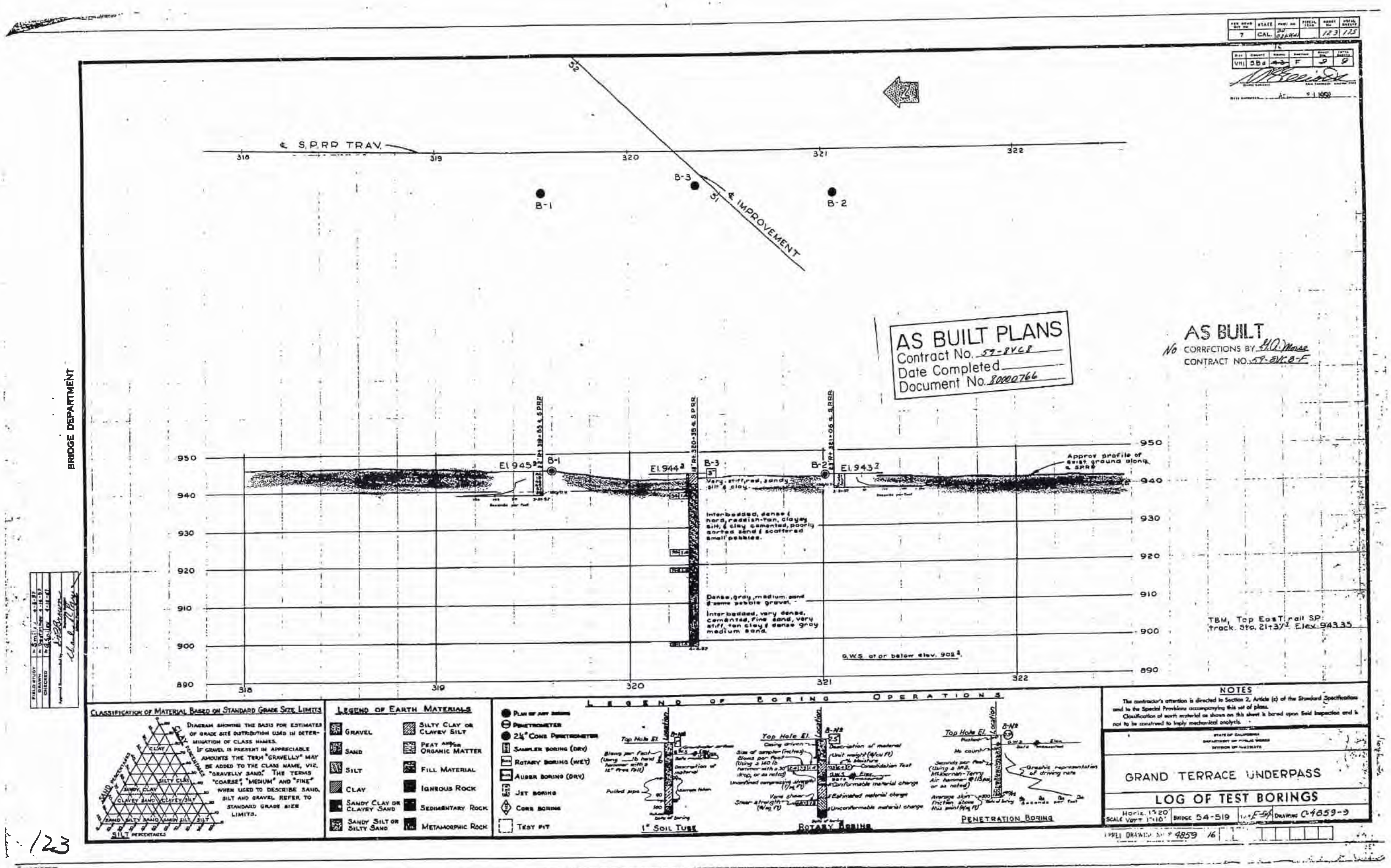
121

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



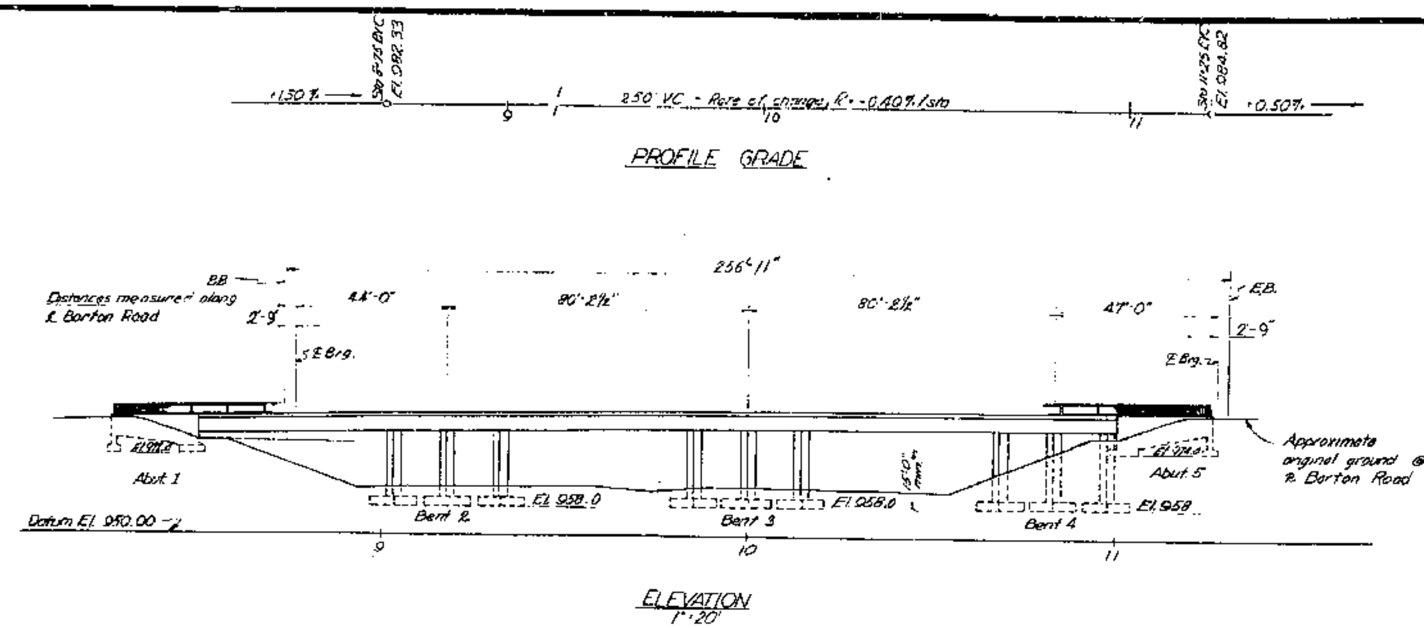
122

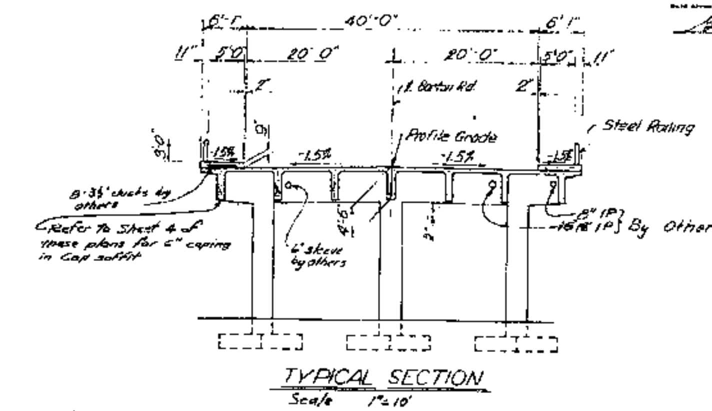
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN



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

DATE [illegible] 3 1971 SIGNATURE [illegible] TITLE [illegible]





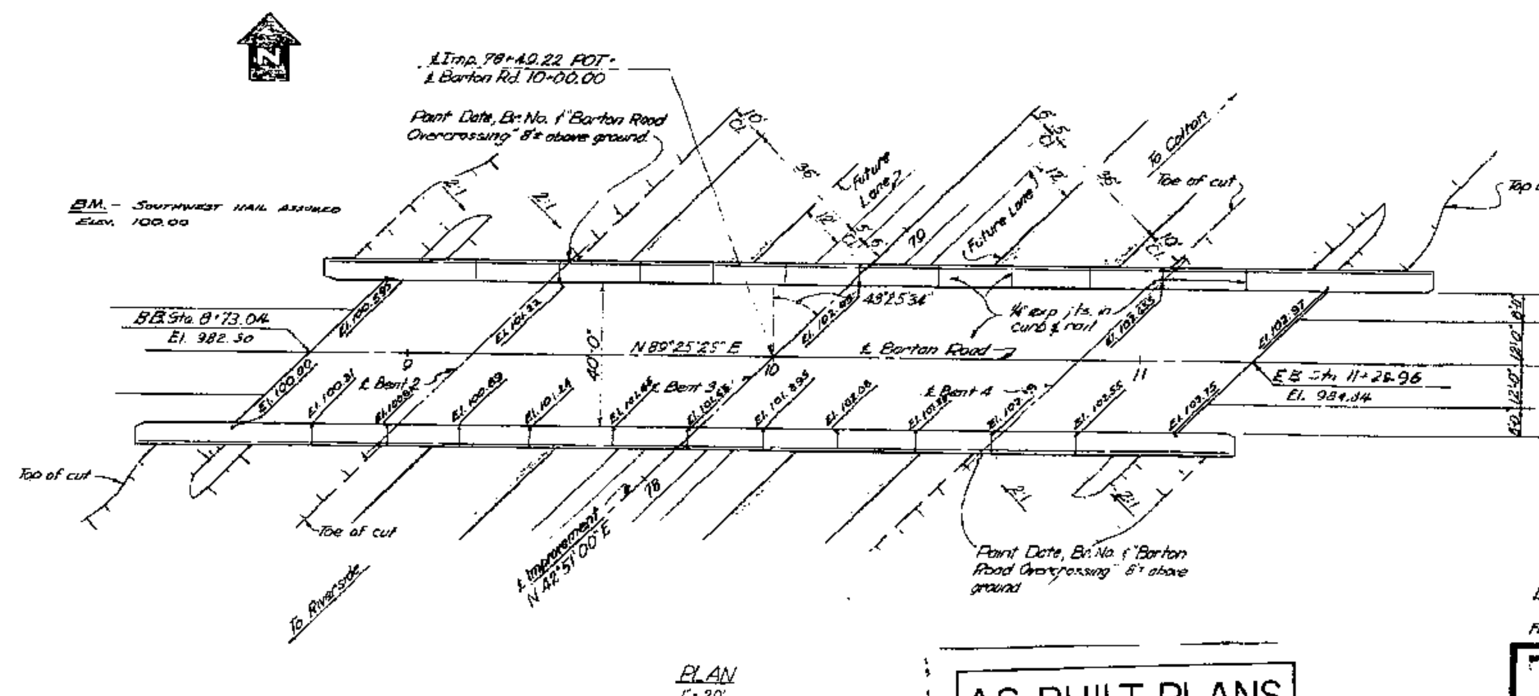
INDEX TO PLANS

Sheet No.	Title
1	General Plan
2	Foundation Plan
3	Abutment Details
4	Bent Details
5	Typical Section
6	Girder Reinforcement
7	Log of Test Borings

APPROXIMATE QUANTITIES

STRUCTURE EXCAVATION	450 C.Y.
STRUCTURE BACKFILL	250 C.Y.
CLASS "A" CONCRETE (BRIDGES)(1,060 C.Y.)	LUMP SUM
RUBBER WATERSTOPS	146 L.F.
BAR REINFORCING STEEL (BRIDGES)(230,000 LBS.)	LUMP SUM
MISCELLANEOUS STEEL	5,700 LBS.
STEEL RAILING	602 L.F.

Notes: For "G Sheets" see Br # 54-530



AS BUILT
CORRECTIONS BY G.C. Moose
CONTRACT NO. 59-8VC8 F

For Bridge Lighting Plans see Road Plans

For Railing Details see "G-2"
" Standard Details see "G-3"
For Standard Details No 2 see "G-5"
See "Newport Ave O.C." for pouring diagram

LL: H20-S16-44 & Alternative

For General Notes see "Washington Ave O.C."

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
DESIGN SECTION 1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

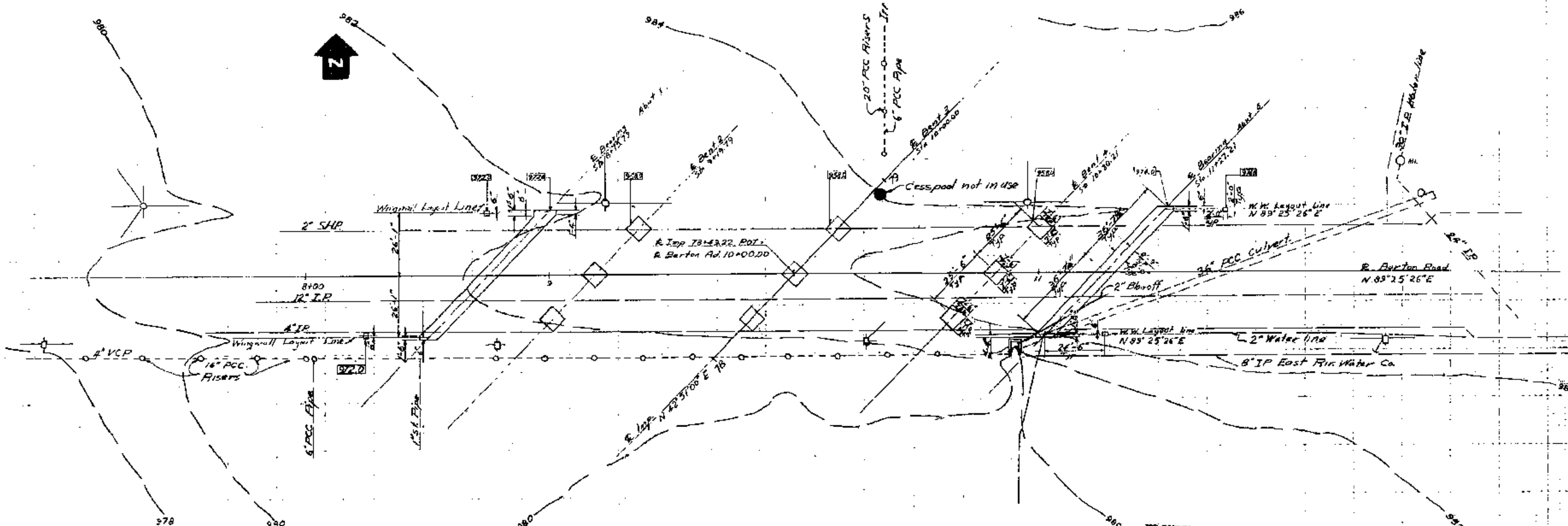
BARTON ROAD OVERCROSSING
LOCATED APPROXIMATELY .3 MI. N. OF THE RIVERSIDE-SAN BERNARDINO COUNTY LINE

GENERAL PLAN

SCALE As Noted | BRIDGE 54-528 | FILE | DRAWING G4958-1

PREL. DRAWING No. F-4958

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



Bearing of all Bents & Abuts is N42°51'00" E

Bottom of footing elev. shown thus:

NO CORRECTIONS THIS SHEET

AS BUILT
CORRECTIONS BY G.G. Moore
CONTRACT NO. 59-8VC8 F

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
DESIGN SECTION 1

STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

BARTON ROAD OVERCROSSING

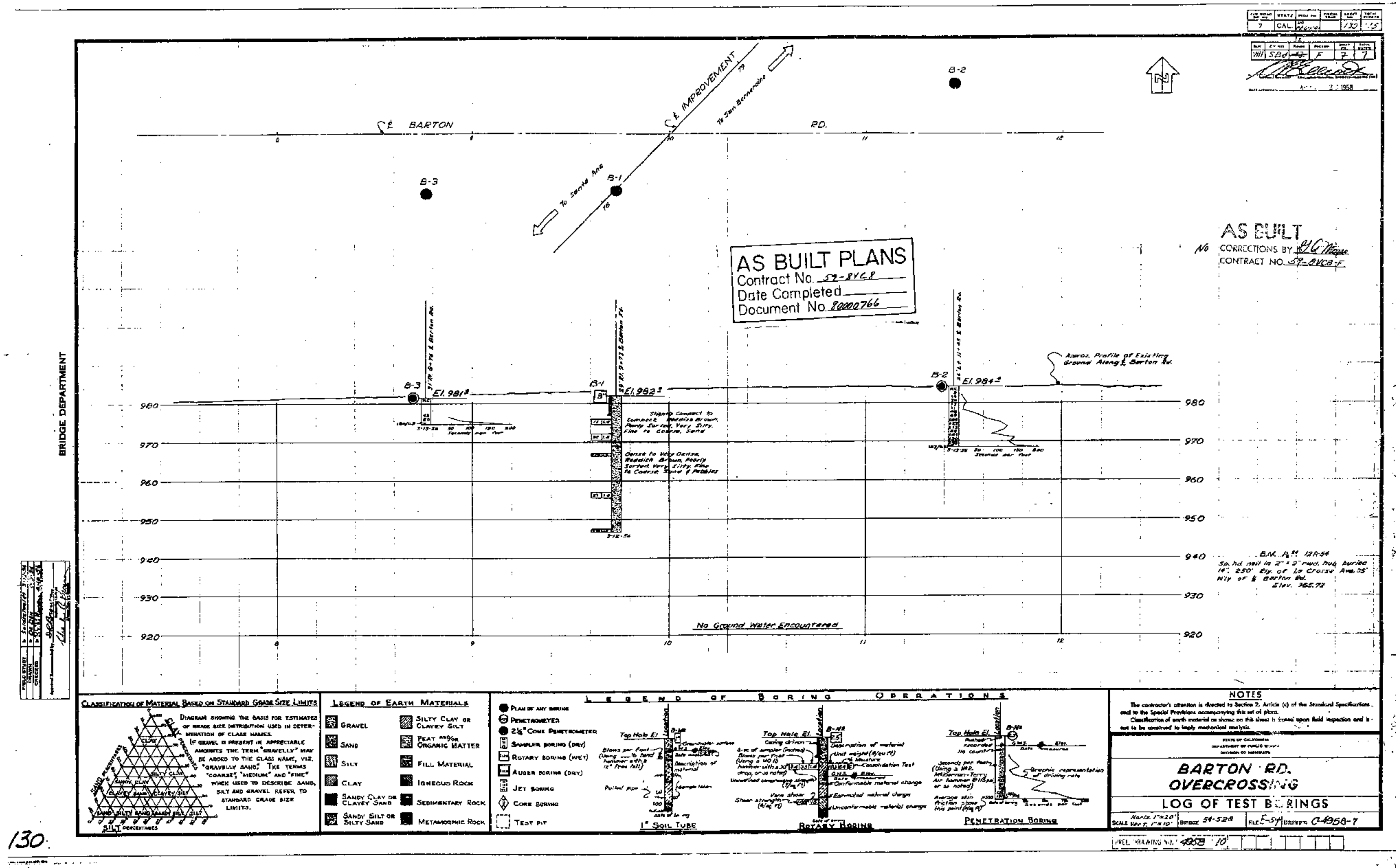
FOUNDATION PLAN

SCALE 1" = 20' | BRIDGE 54-528 | FILE | DRAWING C-4958-2

PREL. DRAWING NO. P-4958

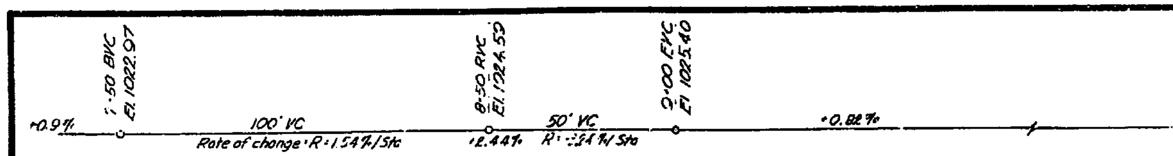
125

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

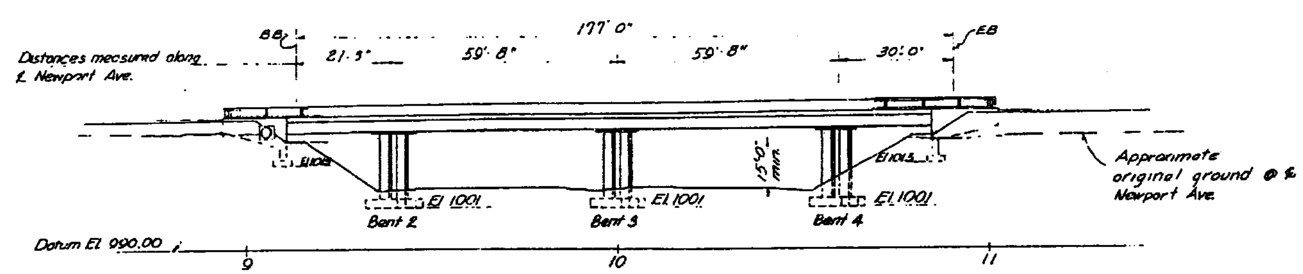


I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

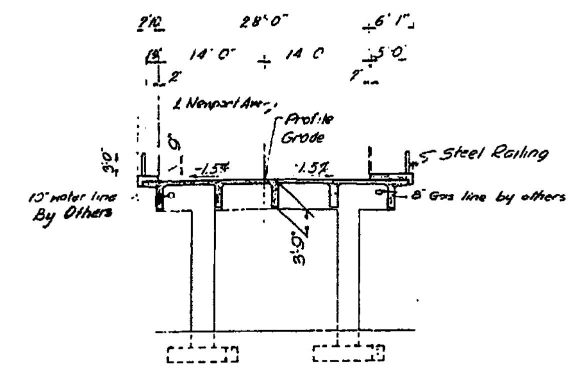
DATE ______ SIGNATURE ______ TITLE ______



PROFILE GRADE



ELEVATION
1"=20'



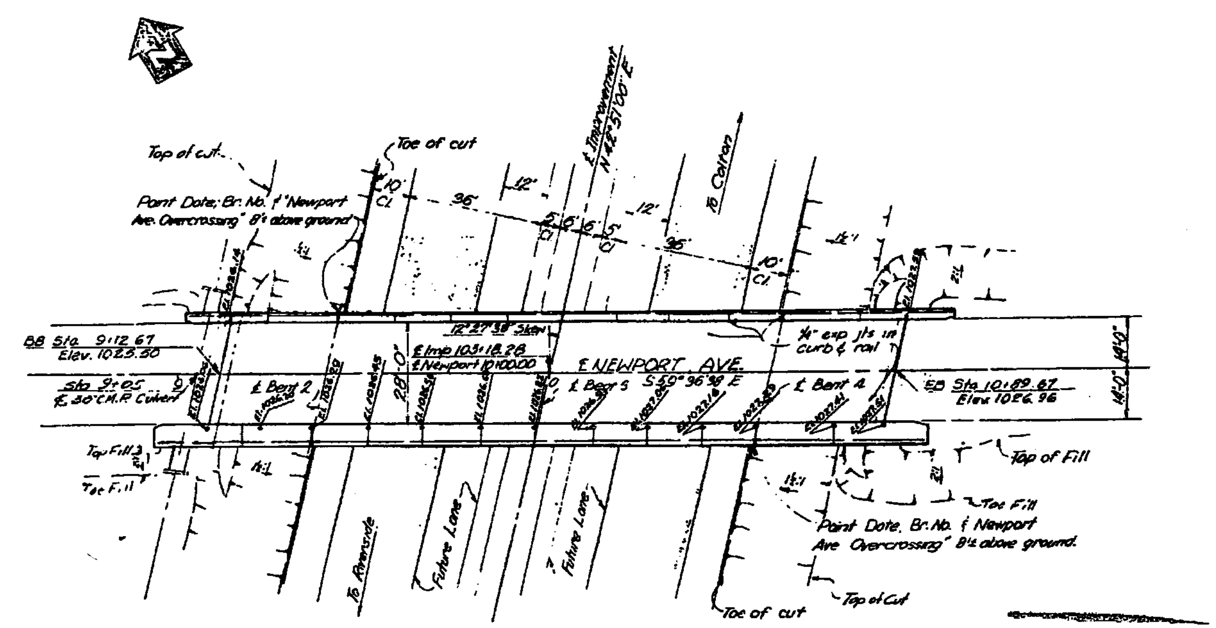
TYPICAL SECTION
1"=10'

INDEX TO PLANS

Sheet No.	Title
1	General Plan
2	Foundation Plan
3	Abutment & Bent Details
4	Deck & Girder Details
5	Log of Test Borings

APPROXIMATE QUANTITIES

STRUCTURE EXCAVATION	260 C.Y.
STRUCTURE BACKFILL	185 C.Y.
CLASS "A" CONCRETE (BRIDGES)(460 C.Y.)	LUMP SUM
BAR REINFORCING STEEL (BRIDGES)(99,000 LBS.)	LUMP SUM
STEEL RAILING	402 L.F.



PLAN
1"=20'

BM #3
Spg. Hd. nail in lead in Southerly end of Headwall; 78'± Rt. Sta. 11+14± ℄ Newport
Elev. 1020.615

AS BUILT
CORRECTIONS BY G.C. Moore
CONTRACT NO. 59-8VC8-F

Note: For "G Sheets" See Br. # 54-530

LL H20-S16-44. & Alternative

For General Notes see "Washington Ave. O.C."

For Standard Details see "G-3"
For Steel Railing Details see "G-2"

AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT
··· DESIGN SECTION ··· 1
Project Designer D.E. Young
Chief Designer W.F. Rod

DESIGN	5/57	Checked
DETAILS	9-57	Checked
QUANTITIES	9-57	Checked
SPECIFICATIONS	A.D.D. 9-57	

Approval Recommended by

59-8VC8
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

NEWPORT AVENUE OVERCROSSING
LOCATED APPROXIMATELY 1.8 MI. N. OF THE RIVERSIDE-SAN BERNARDINO COUNTY LINE

GENERAL PLAN

SCALE As Noted | BRIDGE 54-520 | DRAWING C4959-1

PREL. DRAWING No. P-4959

DIST.	COUNTY	ROUTE	SECTION	SHEET No.	TOTAL SHEETS
VIII	SBd	15	F	1	5

P.M. 1.7

131

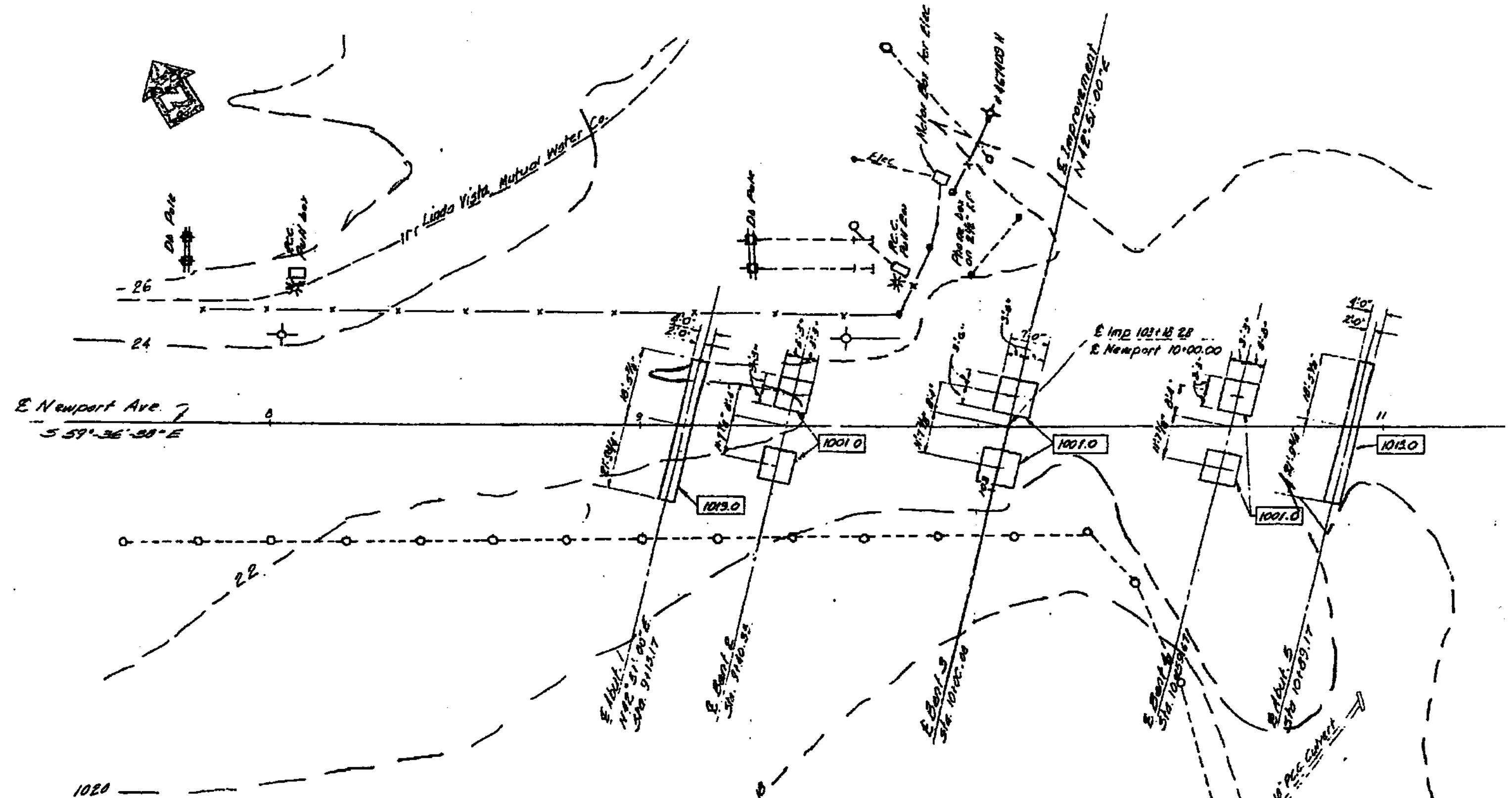
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE M. 3 1971 SIGNATURE ______ TITLE ______

FED. ROAD DIV. NO.	STATE		FISCAL YEAR	SHEET NO.	TOTAL SHEETS
7	CALIF.			132	175

DIST.	COUNTY	ROUTE	SECTION	SHEET NO.	TOTAL SHEETS
VIII	SBd		F	2	5

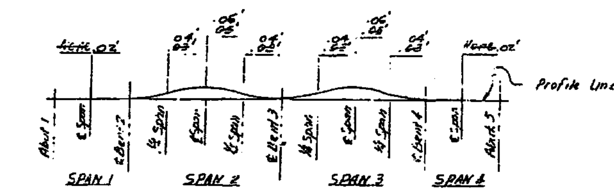
1958



BM "P_3 65" 3A-54
Sp'ke nail in 2"x2" Rwd. hub buried 16"
224' Rt. 107+68 E Imp.
Elev. 1031.82

Note: All Bents & Abutments are parallel to Abut 1.
Bottom of footing elevations shown thus:
Contours as of Jan. 1956

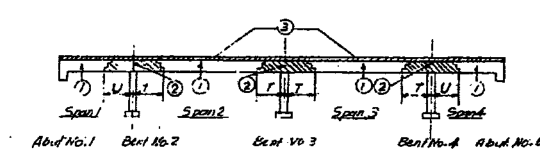
B.M. "P_3 55" 3A-54
Sp. ke nail in 2"x2" Rwd. hub buried 18"
370' Rt. 97+21 E Imp.
Elev 1016.99



CAMBER DIAGRAM FOR TOTAL GIRDER DEFLECTION DUE TO DEAD LOADS

No Scale

Notes:
The camber required for ultimate deflection is shown. For values at time of falsework removal divide those shown by 4
The amount of camber for construction will be determined by the Engineer.



SUPERSTRUCTURE PLACING DIAGRAM

Numbers (1) and (2) indicate sequence of placing girder stem concrete (2) may be placed simultaneously with (1) when approved by the Engineer, and provided that the (1) sections are placed in adjoining spans.
Top slab concrete (3) may be placed separately from (1) and (2), but the only joints permitted shall be located within 2'-0" of the girder joints shown between (1) and (2). The length of placing (3) shall not exceed 100 feet (3) may be placed with (1) and (2)
T = 1/5 Span length
U = 1/4 Span length
For any deviation from the above the contractor shall submit a diagram to the Engineer for approval.

AS BUILT
No CORRECTIONS BY G.O. Moran
CONTRACT NO. 59-8VC8-F

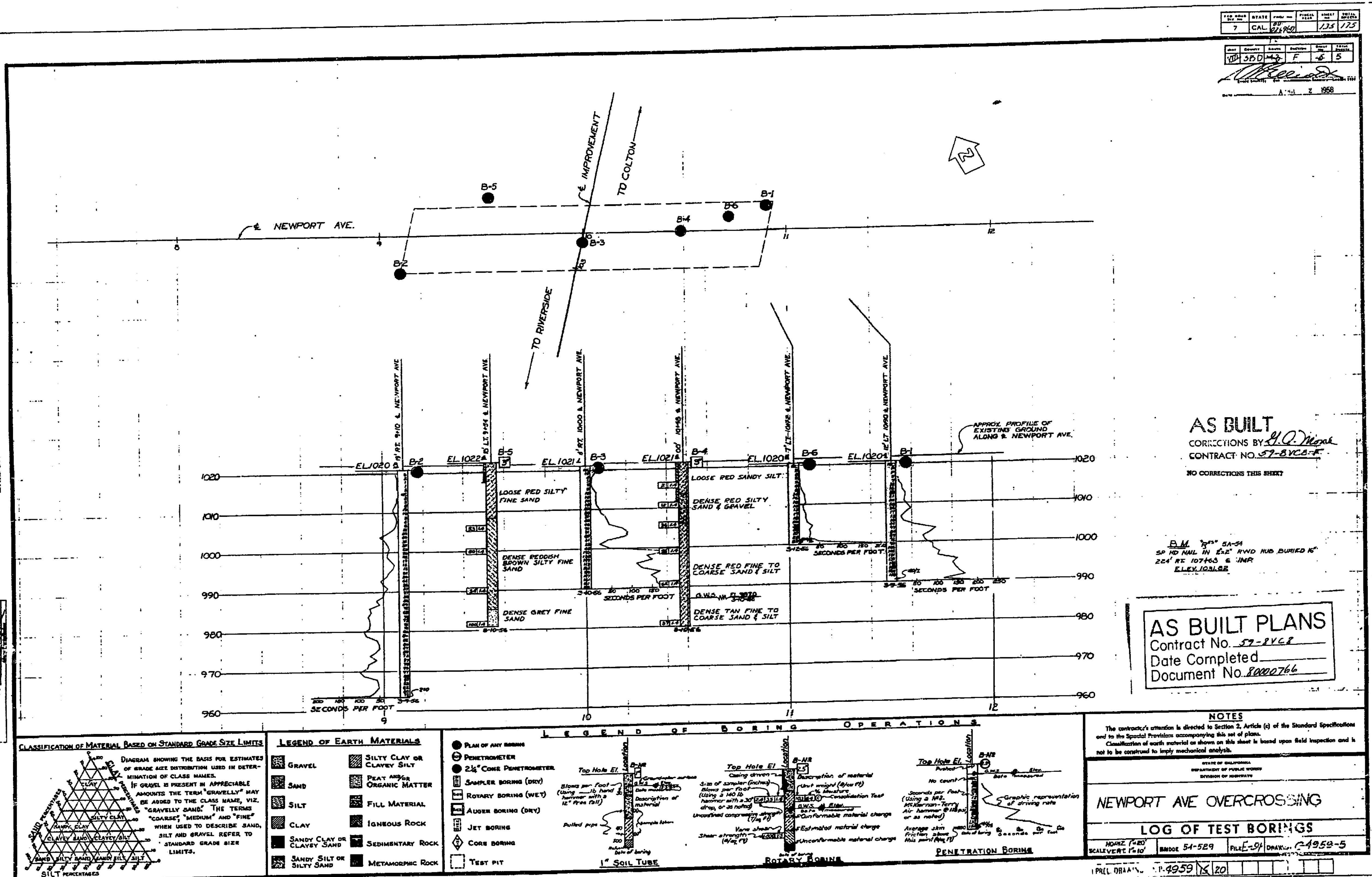
AS BUILT PLANS
Contract No. 59-8VC8
Date Completed
Document No. 80000766

BRIDGE DEPARTMENT DESIGN SECTION 1		STATE OF CALIFORNIA DEPARTMENT OF PUBLIC WORKS DIVISION OF HIGHWAYS
Project Designer		NEWPORT AVE. OVERCROSSING
Chief Designer		FOUNDATION PLAN
DESIGN	By E.I. Doud 5/57	SCALE 1" = 30'-0"
DETAILS	By E.I. Doud 9/57	BRIDGE 54-529
QUANTITIES	By	FILE
SPECIFICATIONS		DRAWING G-4959-2
Approval Recommended by		

PREL. DRAWING NO. F-4959

132

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 3 1971 SIGNATURE TITLE



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

DATE M. 3 1971 SIGNATURE [illegible] TITLE [illegible]

APPENDIX B

PLANNING STUDY DRAWINGS

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	SBd	215	0.58/1.66		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER G. W. HEFTER No. 46655 Exp. 06/30/13 CIVIL STATE OF CALIFORNIA

AECOM
999 W. TOWN & COUNTRY Rd
ORANGE, CA 92868

SANBAG
1170 WEST 3RD STREET
SAN BERNARDINO, CA 92410

NOTE:
* PLACE MBGR WHERE CLEAR RECOVERY ZONE IS LESS THAN 30', TYPICAL FOR ALL RAMPS.

TYPICAL STRUCTURAL SECTIONS

A — 0.95' JPCP, 1.30' AB

B — 0.75' HMA (TYPE C), 0.95' AB

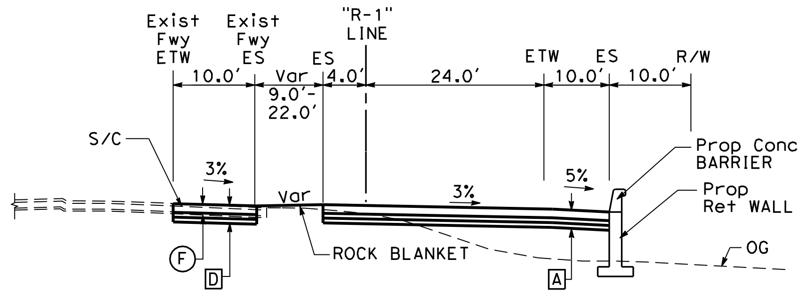
C — 0.40' PCC

D — 0.95' JPCP, 0.10' HMABB, 0.40' LCB, 0.60' AS

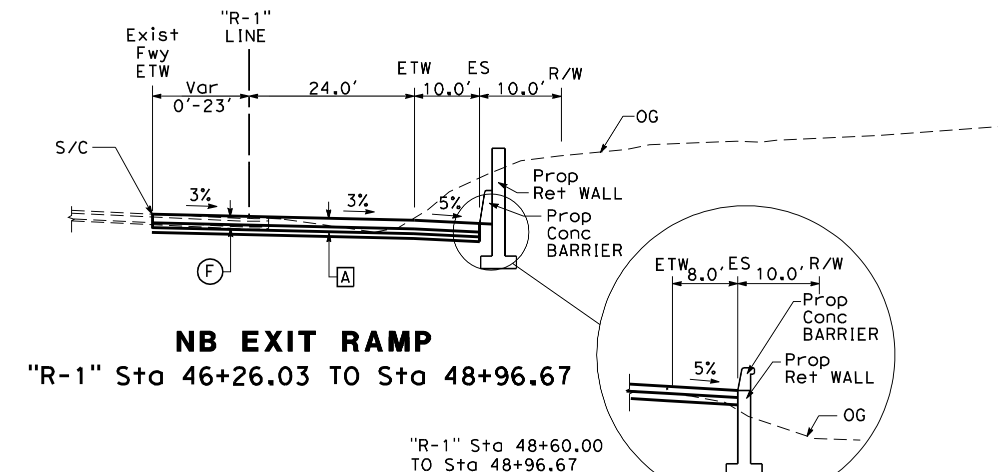
E — 0.75' HMA (TYPE C), 0.85' AB

F — Exist 1.10' JPCP, 0.10' HMABB, 0.50' LCB, 0.70' AS

PAVEMENT LEGEND:
- HMA = HOT MIX ASPHALT (TYPE A)
- JPCP = JOINTED PLAIN CONCRETE PAVEMENT
- AS = CLASS 2 AGGREGATE SUBBASE
- AB = CLASS 2 AGGREGATE BASE
- AC = ASPHALT CONCRETE
- PCC = PORTLAND CEMENT CONCRETE PAVEMENT
- LCB = LEAN CONCRETE BASE
- HMABB = HOT MIX ASPHALT BOND BREAKER



NB EXIT RAMP
"R-1" Sta 48+96.67 TO Sta 50+26.27



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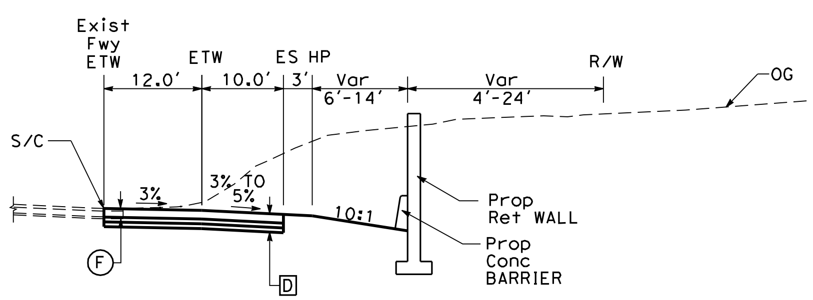
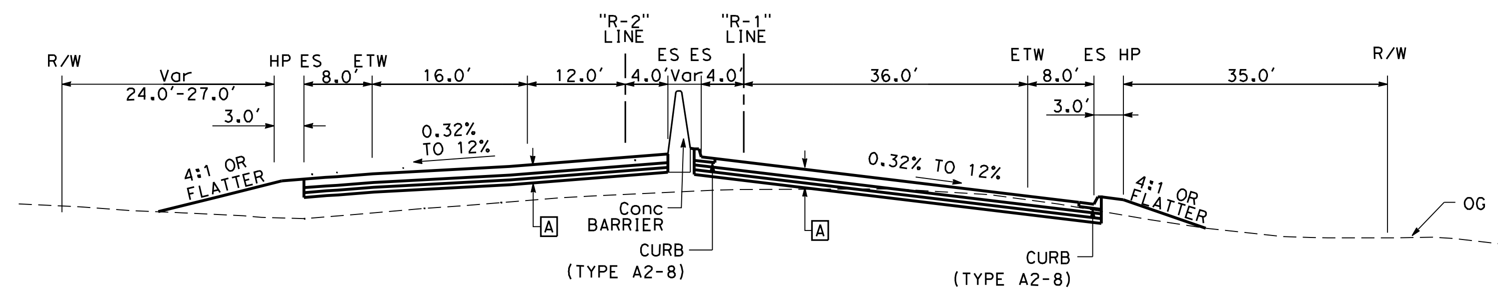
"R-1" Sta 46+26.03 TO Sta 48+96.67

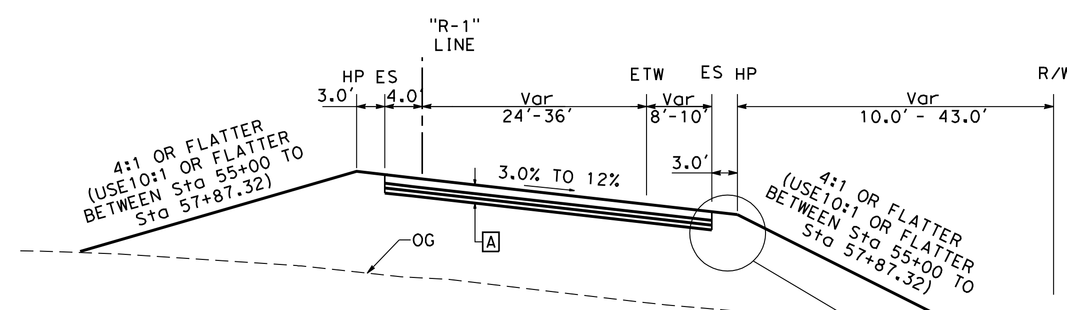


NB EXIT LANE AND TRANSITION
"I-215" Sta 31+37.12 TO Sta 46+26.03

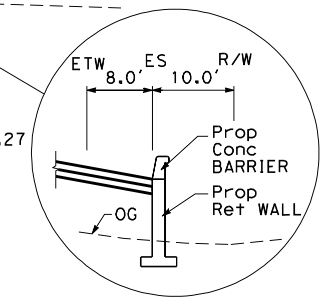


NB ENTRANCE RAMP
"R-2" Sta 54+00.00 TO Sta 56+80.62

NB EXIT RAMP
"R-1" STA 57+87.32 TO STA 60+36.10



NB EXIT RAMP
"R-1" Sta 50+26.27 TO Sta 57+87.32



"R-1" Sta 50+26.27 TO Sta 54+21.52

I-215/BARTON ROAD I/C TYPICAL CROSS SECTIONS ALTERNATIVE 6

NO SCALE

X-3

REVISED BY | DATE REVISED

CALCULATED-DESIGNED BY | CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR GREG HEFTER

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION Caltrans®

DATE PLOTTED => 5/24/2012 TIME PLOTTED => 2:43:23 PM

LAST REVISION 00-00-00

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	SBd	215	0.58/1.66		

REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
G. W. HEFTER
No. 46655
Exp. 06/30/13
CIVIL
STATE OF CALIFORNIA

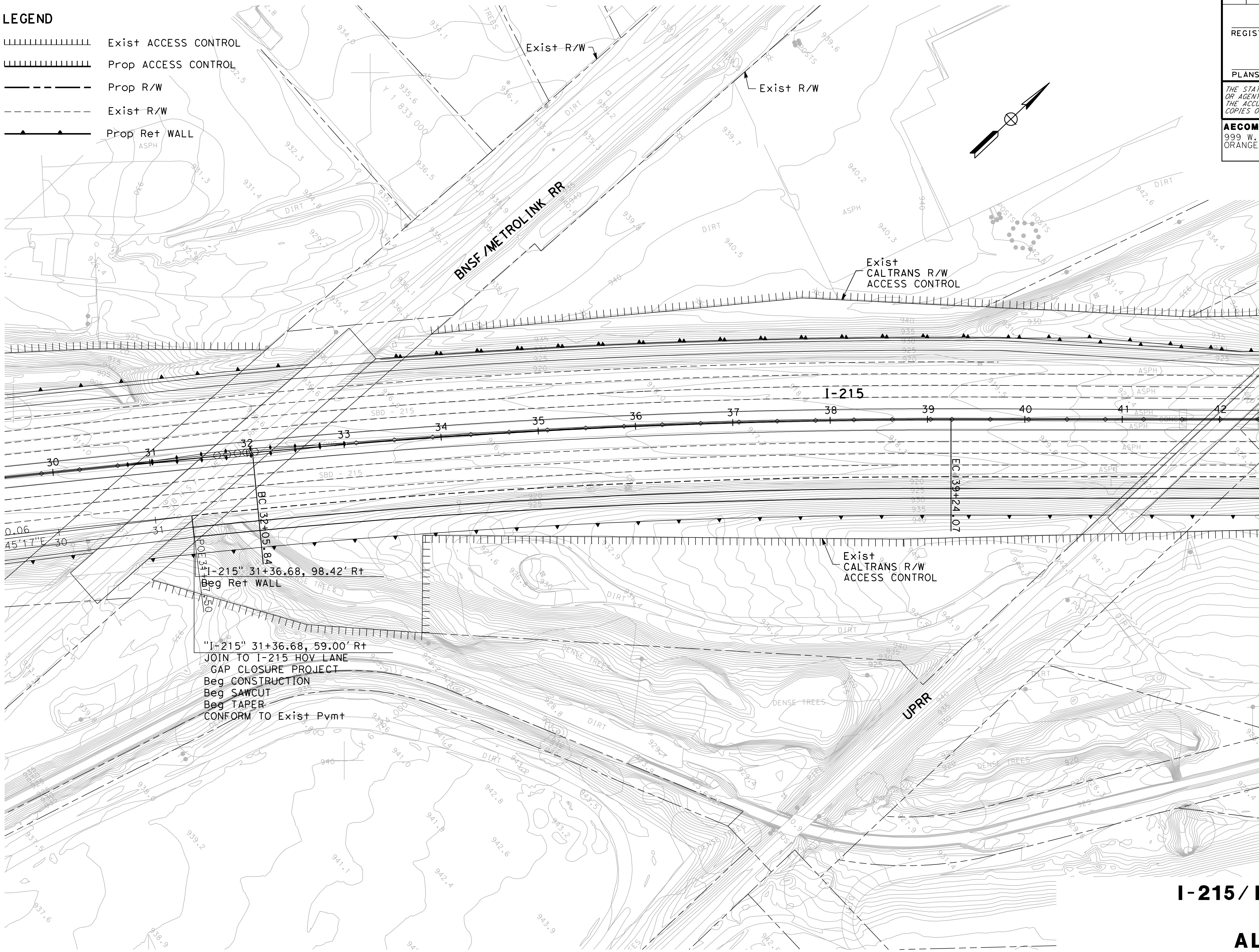
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS PLAN SHEET.

AECOM
999 W. TOWN & COUNTRY Rd
ORANGE, CA 92868

SANBAG
1170 WEST 3RD STREET
SAN BERNARDINO, CA 92410

LEGEND

- Exist ACCESS CONTROL
- Prop ACCESS CONTROL
- Prop R/W
- Exist R/W
- Prop Ret WALL



I-215/BARTON ROAD I/C
LAYOUT
ALTERNATIVE 6

SCALE: 1"=50'

L-1

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: GREG HEFTER

CALCULATED-DESIGNED BY | CHECKED BY

REVISED BY | DATE REVISED

LAST REVISION 00-00-00 | DATE PLOTTED => 5/24/2012 | TIME PLOTTED => 2:42:50 PM

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
08	SBd	215	0.58/1.66		

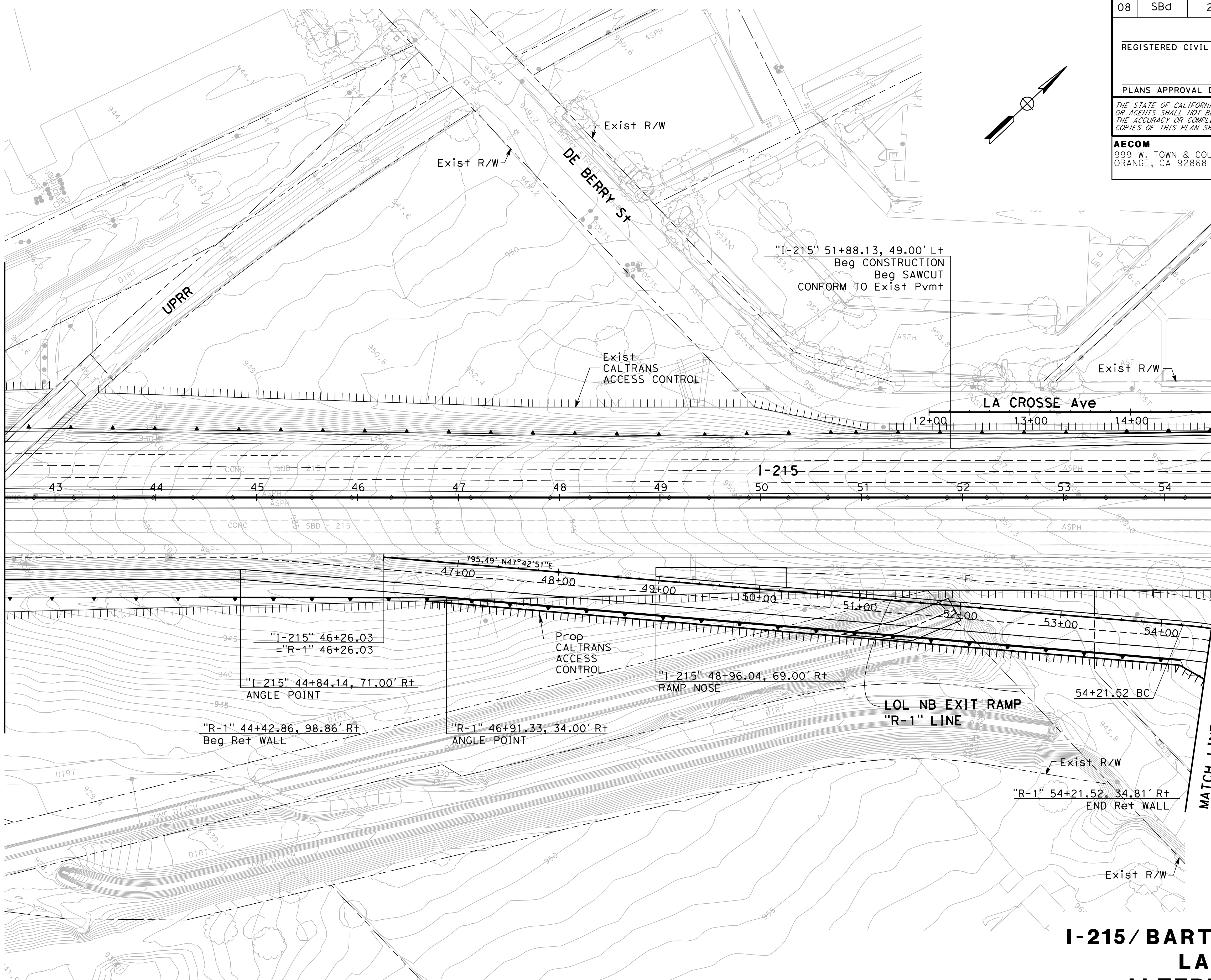
REGISTERED CIVIL ENGINEER DATE

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
G. W. HEFTER
No. 46655
Exp. 06/30/13
CIVIL
STATE OF CALIFORNIA

AECOM
999 W. TOWN & COUNTRY Rd
ORANGE, CA 92868

SANBAG
1170 WEST 3RD STREET
SAN BERNARDINO, CA 92410



MATCH LINE "I-215" 42+50
SEE SHEET L-1

MATCH LINE "I-215" 54+50
"LA CROSSE Ave" 14+83
SEE SHEET L-3

MATCH LINE "R-1" 54+50
SEE SHEET L-3

I-215/BARTON ROAD I/C
LAYOUT
ALTERNATIVE 6

SCALE: 1"=50'

L-2

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR: GREG HEFTER

CALCULATED-DESIGNED BY

CHECKED BY

REVISED BY

DATE REVISED

LAST REVISION 00-00-00

DATE PLOTTED => 5/24/2012
TIME PLOTTED => 2:44:13 PM

BORDER LAST REVISED 7/2/2010

USERNAME => AECOM
DGN FILE => R:\SNBG0702-I-215 Barton\Plans\DGN\Alternative 6\80J070ea002.dgn

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

UNIT 0000

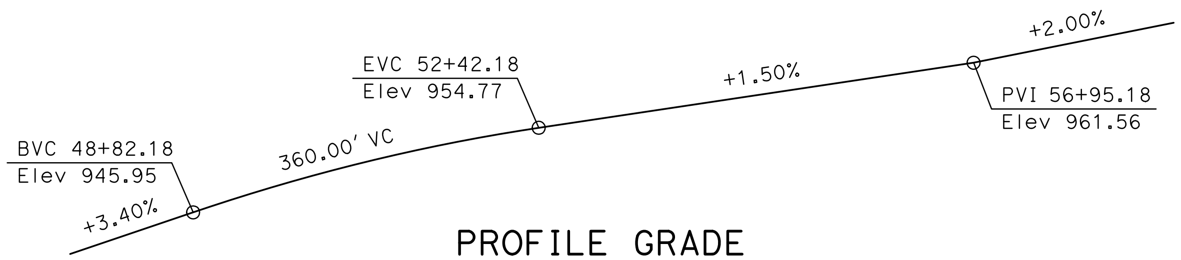
PROJECT NUMBER & PHASE 0800000282

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No	TOTAL SHEETS
08	SBd	215	0.53/1.66		

SAN BERNARDINO ASSOCIATED GOVERNMENTS
472 N. ARROWHEAD AVENUE
SAN BERNARDINO, CA 92401

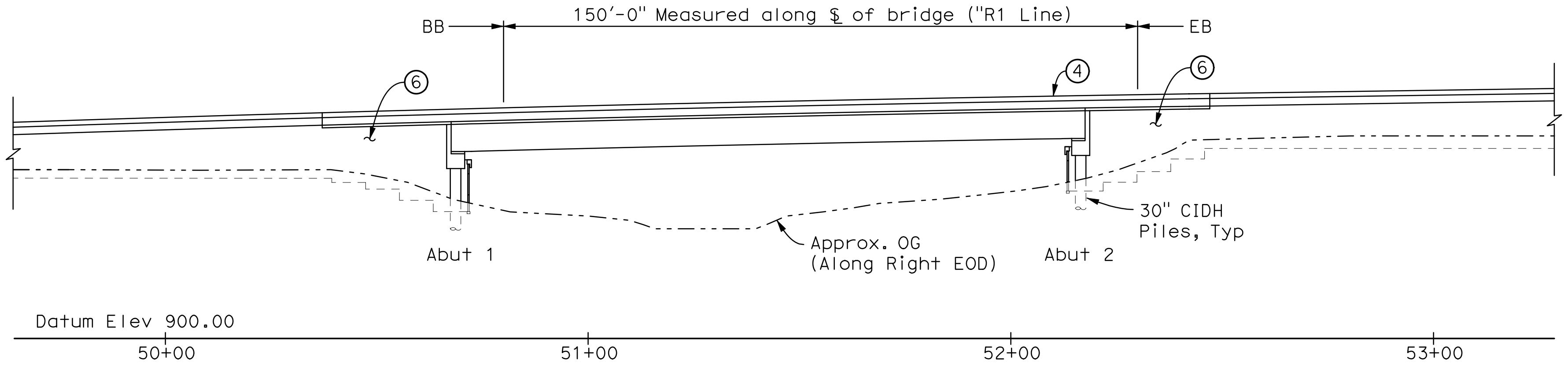
AECOM
1887 BUSINESS CENTER DRIVE, SUITE 6
SAN BERNARDINO, CA 92408

ALIGNMENT ALTERNATIVE 6



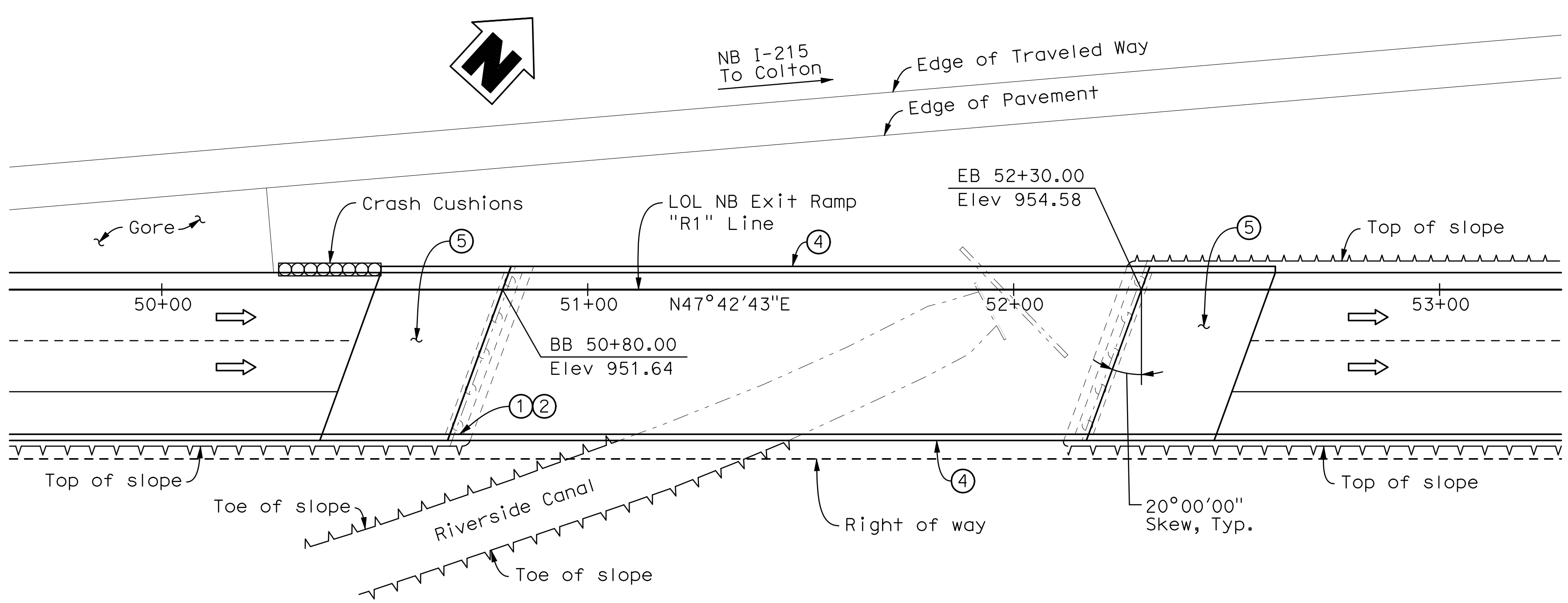
PROFILE GRADE

No Scale



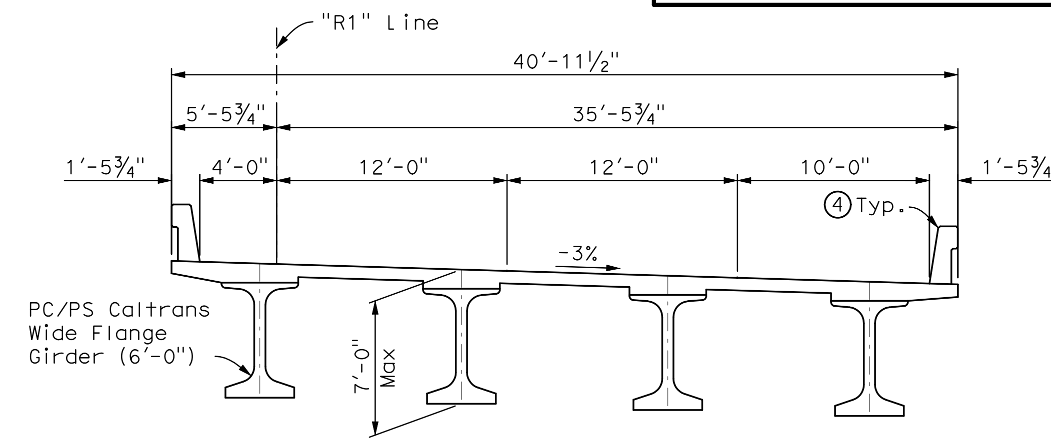
ELEVATION

1" = 20'



PLAN

1" = 20'



TYPICAL SECTION

1" = 5'

NOTES:

1. Paint "Bridge No. XX-XXXX"
2. Paint "Riverside Canal Bridge"
3. Future Utility Opening
4. Concrete Barrier, Type 736
5. Structure Approach, Type N(30S)
6. Retaining Wall (MSE)

Date of estimate	= May 30, 2012
Str Depth	= 7'-0"
Length	= 150'-0"
Width	= 40'-11½"
Area	= 6,143.75 sq ft
Avg Cost per Sq Ft Including 10% Mobilization & 25% Contingency	= $166.02 / sq ft
Total Cost	= $1,020,000

VEHICULAR TRAFFIC

1. X New alignment. No traffic at the site.
2. ____ Traffic will be detoured away from the site.
3. ____ Traffic will be carried on the structure. Stage construction will/will not be required.
4. ____ Traffic will pass under the structure on ________ (Name of St. or Hwy.)

A. X No falsework allowed over traffic.
B. ____ Falsework opening(s) required:

	Temporary Vertical Clearance	Width of Traffic Opening
___ Bnd.	________	________
___ Bnd.	________	________
___ Two-way	________	________

C. ____ Temporary traffic lane reduction needed for footing excavation.

PEDESTRIAN TRAFFIC

Falsework opening(s) required on n/a (Name of St.)

Location ________ Height ________ Width ________

RAILROAD TRAFFIC

Falsework opening(s) required over n/a (Name of RR)

Vertical Clearance ________ Horizontal Clear Width ________

DESIGNED BY	R. PRICE	DATE	5/24/12
DRAWN BY	F. DEMARCO	DATE	5/24/12
CHECKED BY		DATE	
APPROVED		DATE	

PROJECT ENGINEER

PLANNING STUDY

RIVERSIDE CANAL BRIDGE

BRIDGE NO.	XX	CU	08
SCALE:	AS NOTED	EA	0J0700

ROBERT ZEZOFF
DESIGN OVERSIGHT

SIGN OFF DATE

PREPARED FOR THE STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION