CITY COUNCIL COMMITTEE

INFRASTRUCTURE & FRANCHISE

Laura Hoffmeister, Chair
Edi Birsan, Committee Member

5:30 p.m.
Monday, May 11, 2015

Building A, Garden Conference Room
1950 Parkside Drive, Concord

AGENDA

ROLL CALL

PUBLIC COMMENT PERIOD

1. **CONSIDERATION** – Approve Change in Project Scope for the Seismic Retrofit of the Marsh Drive Bridge Over Walnut Creek Channel (Project No. 1854) and Transfer in Lead Agency Responsibility from the City of Concord to Contra Costa County; (Funded by State and Federal Grants and Gas Tax). Report by Jeff Rogers, Associate Civil Engineer.

2. **DISCUSSION** – Proposal to Install New Bus Shelters in the City of Concord. Report by Ray Kuzbari, Transportation Manager.

3. **ADJOURNMENT**

In accordance with the Americans with Disabilities Act and California Law, it is the policy of the City of Concord to offer its public programs, services and meetings in a manner that is readily accessible to everyone, including those with disabilities. If you are disabled and require a copy of a public hearing notice, or an agenda and/or agenda packet in an appropriate alternative format; or if you require other accommodation, please contact the ADA Coordinator at (925) 671-3361, at least five days in advance of the meeting. Advance notification within this guideline will enable the City to make reasonable arrangements to ensure accessibility.

Distribution: City Council
Valerie Barone, City Manager
Jovan Grogan, Deputy City Manager
Mark Coon, City Attorney
Victoria Walker, Community & Economic Development Director
Robert Ovadia, City Engineer
Jeff Rogers, Associate Civil Engineer
Ray Kuzbari, Transportation Manager
Administrative Services

AGENDA ITEM NO._____

TO THE INFRASTRUCTURE COMMITTEE:

DATE: May 11, 2015

SUBJECT: APPROVE CHANGE IN PROJECT SCOPE FOR THE SEISMIC RETROFIT OF THE MARSH DRIVE BRIDGE OVER WALNUT CREEK CHANNEL (PROJECT NO. 1854) AND TRANSFER IN LEAD AGENCY RESPONSIBILITY FROM THE CITY OF CONCORD TO CONTRA COSTA COUNTY; (FUNDED BY: STATE AND FEDERAL GRANTS AND GAS TAX)

Report in Brief

The Marsh Drive Bridge spans the Walnut Creek Channel and is located approximately 1,000 feet west of Solano Way in North Concord (see map on Attachment 1). The bridge was originally constructed in 1938. The City owns the eastern half of the bridge and Contra Costa County owns the western half. Since late 2010 staff has been pursuing an encroachment permit from the Contra Costa County Flood Control District (CCFCD). During this time the County, CCFCD and the Army Corps of Engineers (ACOE) have expressed their concerns pertaining to the negative hydraulic impact the bridge, in its existing condition, poses to the Walnut Creek Channel, and their reluctance to approve any modification to the bridge that would further reduce its hydraulic capacity.

On March 31, 2014, staff met with representatives from Contra Costa County Public Works Department (County), CCFCD and the ACOE to discuss the City's proposed Seismic Retrofit and a retrofit by replacement alternative. Following this meeting, the County commissioned a Feasibility Study Report to review the costs and benefits of retrofit and replacement options including any anticipated mitigation measures (the Feasibility Study Report can be found as Attachment 2.). It was agreed that should the ultimate recommendation from the study be to move forward with the current retrofit option, that the City would continue managing the project. Further, if the recommendation were to be retrofit by replacement, the County would become the lead agency for completing the project; and the City would support the County's efforts to obtain Highway Bridge Program funding from Caltrans, provided that the City would not need to return the already expended grant funds.

The Feasibility Study Report was completed in February of this year and builds a strong case for the retrofit by replacement alternative. City Staff is in agreement with the findings of the report and recommends pursuing a retrofit by replacement of the existing bridge along an adjacent alignment option in lieu of the current seismic retrofit.

Background

The Marsh Drive Bridge spans the Walnut Creek Channel and is located approximately 1,000 feet west of Solano Way in North Concord. The bridge was originally constructed in 1938 as a 203-foot long reinforced concrete bridge with one lane in each direction. The bridge was lengthened in 1965 to 326 feet. Additionally, in 1965 to mitigate degradation of the concrete columns in the creek, steel/concrete jackets were installed around existing columns at five locations and in 2009, concrete column jackets were added to ten additional columns that had localized failure of the concrete cover and expansive rebar corrosion.

The jurisdictional limit of the City of Concord and Contra Costa County is located mid-span; the City owns the eastern half of the bridge and Contra Costa County owns the western half. The Walnut Creek Channel is owned by the Contra Costa Flood Control District (CCFCD) and is under the jurisdiction of the Army Corps of Engineers (ACOE). The City Council approved the Seismic Retrofit of the Marsh Drive Bridge over Walnut Creek Channel (Project PJ1854) in the FY 1998-99 Capital Improvement Program. The project is funded by a federal grant with the required match provided by the State. In 2003, the State suspended its matching funds and the project was placed on hold. The project was reactivated in FY 2006-07 when State funds became available, at which point staff began the environmental review process and preliminary design. This phase was mainly funded by a $118,748 Seismic Safety Retrofit Program federal grant administered by Caltrans. The City maintained the role as the lead agency for the project, while Contra Costa County (County) provided support. Since the project was reactivated the Plans, Specifications and Engineers Estimate (PS&E) package has been completed and the corresponding environmental documents reached 75% Completion. The retrofit design called for the installation of a support beam and 36-inch diameter outrigger columns at each of the nine bridge support sections in the creek.

Since late 2010 staff has been pursuing an encroachment permit from the CCFCD. In 2010, CCFCD updated its hydraulic model for the Walnut Creek Channel which clearly indicated that the existing bridge structure impedes flow during heavy (100 year) rain events. In their review of the project, CCFCD expressed concerns with the seismic retrofit based on the "negative hydraulic impact" the new columns would cause. Based on CCFCD's model, the water surface elevation was estimated to increase by 2.40 inches. At that time, the CCFCD suggested that the City and the County look at the option of retrofit by replacement. In an attempt to reduce the negative hydraulic impact, the City modified the retrofit design and reduced the diameter of the new columns from 36" to 30". At the City's request, the County re-ran the hydraulic model using the 30" columns and found the increase in water surface elevation was reduced to less than 2-inches. CCFCD advised the City that based on the County's past project experience, the ACOE would not approve any improvements to the bridge that would result in an increased water surface elevation without mitigation. Based on the analysis conducted, the mitigation would extend approximately 7,200 feet upstream. We were further advised that the approval process, due to the need for mitigation would likely take 24 months.

On March 31, 2014, staff met with the County, CCFCD and the ACOE in Sacramento to further discuss pursuing the retrofit, including any permitting implications due to the increase in water surface elevation, as well as considerations for replacing the bridge in lieu of constructing the retrofit. ACOE staff confirmed that they would not permit a retrofit project that impacted the water surface elevations without mitigation. Following the meeting the County commissioned a Feasibility Study Report to review the costs and benefits of retrofit and replacement options including any anticipated mitigation measures (Attachment 2).

Discussion

The final Feasibility Study Report was completed in February, 2015. The report includes a brief history of the bridge, an assessment of the current structure, and reviews five design alternatives (3-replacement and 2-seismic retrofit alternatives), and provides a Cost and Life Cycle Evaluation Summary for each alternative. The analysis of the current structure identified the following deficiencies:

1. Seismic – The structure requires retrofit with outrigger bents at each support location to meet current seismic safety standards.
2. Structural – The structure lacks structural capacity to carry permit loading (heavy trucks).
3. Hydraulic – The structure currently obstructs the Walnut Creek 100-year design storm flow.
4. Scour – Maintenance inspection concerns exist regarding the scour vulnerability and structure stability during high flow events.
5. Functional Safety – The travelled way width is narrow and when considering the current average daily traffic (ADT) would be considered functionally obsolete (Caltrans Inspection Report Lists ADT at 2,000 vehicles per day but recent traffic count shows 5,688 vehicles per day. See Functional Assessment on page 9 of this report for additional information.
6. Deck – Significant deck cracking exists and warrants treatment.

The report included the analysis of five alternatives for retrofit and replacement including the following:

1. **Replacement** of the existing structure with a Cast In Place/Pre-Stressed (CIP/PS) Concrete Box Girder along the existing alignment.
2. **Replacement** of the existing structure with a Cast In Place Concrete Slab along the existing alignment.
3. **Replacement** of the existing structure with a Cast In Place Concrete Slab along an adjacent alignment.
4. **Seismic Retrofit** of the existing structure as proposed in City's current retrofit design with associated flood mitigation.
5. **Seismic Retrofit** of the existing structure with the addition of raising and rehabilitating the bridge deck

Concurrent with the study, City and County staff have discussed the need to move forward with either the retrofit or retrofit by replacement, funding constraints and project management. Through these discussions, City and County staff agreed that should the ultimate recommendation from the study be to move forward with the current retrofit option, that the City would continue managing the project. Further, if the recommendation were to be retrofit by replacement, the County would become the lead agency for completing the project; and the City would support the County taking over as lead agency and working with

Caltrans to obtain Highway Bridge Program funds, provided the City would not need to return the already expended grant funds.

The report concludes that the most cost-effective alternative is to replace the structure via a Cast In Place Slab Bridge on an Existing Alignment style (Alternative #2). While this alternative does mitigate all of the existing deficiencies, it would require a road closure during construction, approximately 7 months. The bridge's large traffic demand, with lack of nearby detour routes makes, this not the best alternative. The replacement option of Cast-in-Place Slab Bridge on an Adjacent Alignment (Alternative #3), provides the next most cost-effective alternative and would allow traffic to remain on Marsh Drive during construction. However, this alternative would take longer to construct, approximately 18 months, and is estimated to cost about $700,000 more than Alternative #2.

It is important to note that while the retrofit alternatives address the seismic deficiencies, they do not address all of the deficiencies outlined above. Specifically, Alternative #4 (Seismic Retrofit of the existing structure as proposed in City's current retrofit design) does not address deficiencies 2-6, and Alternative #5 (Seismic Retrofit and raising and repairing the bridge deck) does not address deficiencies 2 and 5.

City Staff is in agreement with the findings of the report and recommends pursuing Alternative #3, retrofit by replacement of the existing bridge along an adjacent alignment in lieu of the current seismic retrofit. Due to permitting issues, it is unlikely that the retrofit as planned would be approved soon and will require additional funding to update the environmental documents, design and construct the required mitigation measures and to acquire a Joint Aquatic Resources Permit (JARPA) which provides coverage under the Army Corps of Engineers, Regional Water Quality Control Board and the California Department of Fish and Game.

Should the Committee approve staff's recommendation to move forward with Alternative #3, staff will transition the project to the County as the lead agency. As lead agency, the County would be responsible for acquiring the necessary funding to for the retrofit by replacement project, and managing the project and associated funding moving forward. City staff will provide a supporting role on the project including coordination with funding agencies to transfer lead agency responsibility and in obtaining additional funds for the project, provided that the City is not held liable for returning funds already expended on the project. The estimated cost associated with City staff's supporting effort, is estimated to be $30,000 and will be proposed in the FY2015-16 CIP.

Fiscal Impact

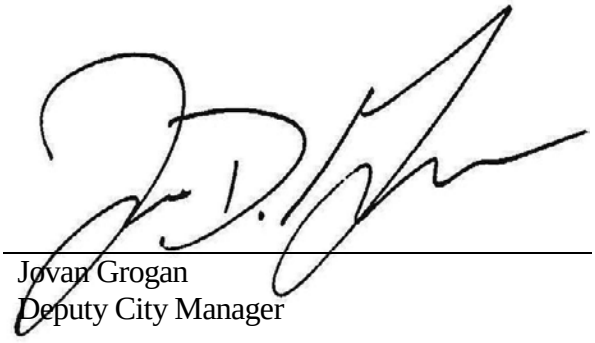
The estimated cost to fund the City's supporting role to the County for the retrofit by replacement project Alternative #3 is estimated to be $30,000. Additional funds will be needed.

Public Contact

The Council Agenda was posted.

Recommendation for Action

Staff recommends that the Committee approve a change in project scope for the Seismic Retrofit of the Marsh Drive Bridge over Walnut Creek (Project No. 1854) and transfer of Lead Agency responsibility from the City of Concord to Contra Costa County and support their efforts in pursuing a bridge replacement in lieu of the seismic retrofit.



Jovan Grogan
Deputy City Manager

Prepared by: Jeff Rogers, PE
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Reviewed by: Robert Ovadia
City Engineer
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Reviewed by: Victoria Walker
Director Comm. & Econ. Development
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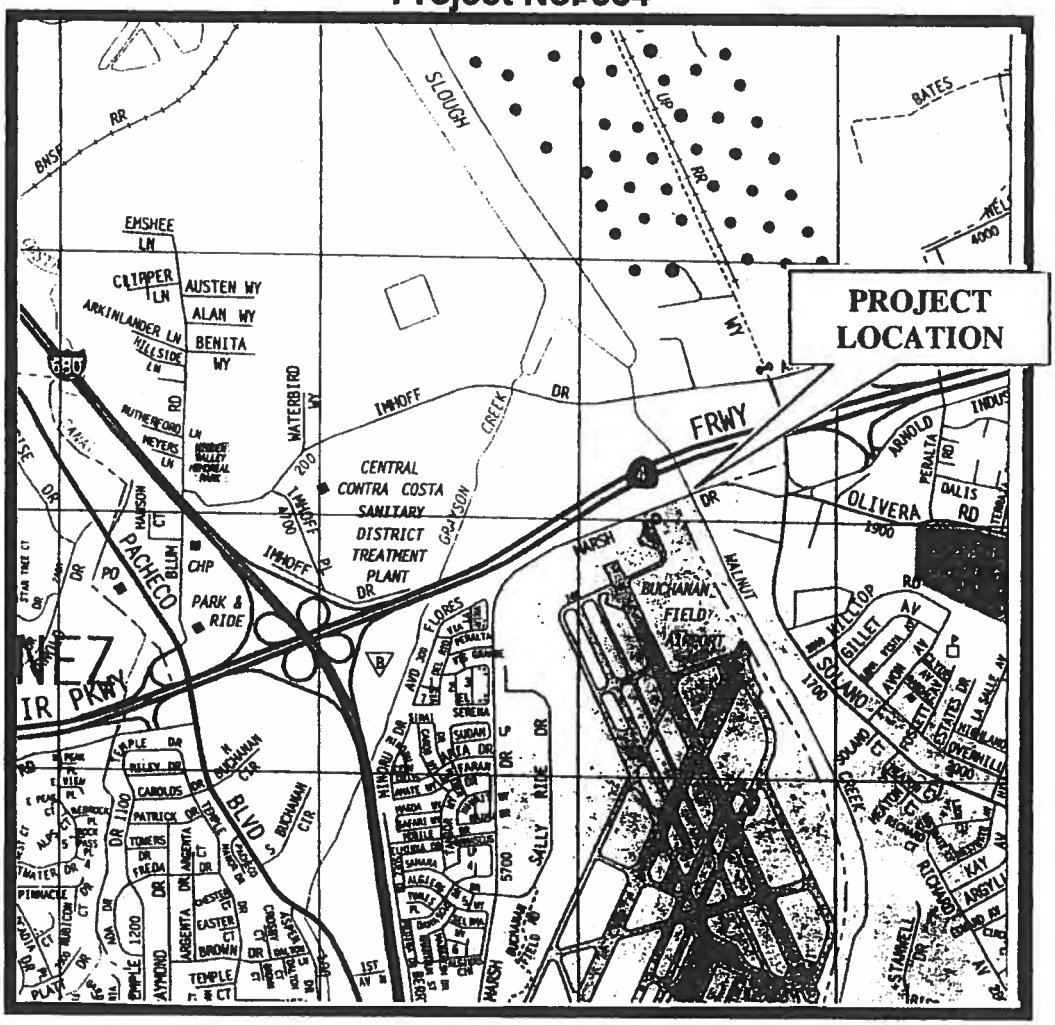
Attachment 1: Vicinity Map – Marsh Drive Bridge over Walnut Creek Channel
Attachment 2: Marsh Drive Bridge over Walnut Creek Feasibility Study Report

Concord

MARSH CREEK BRIDGE
OVER WALNUT CREEK CHANNEL
Project No.1854



VICINITY MAP
NTS

Attachment 2

Marsh Drive Bridge over Walnut Creek
Feasibility Study Report
Bridge No. 28C-0442

Prepared For:
Contra Costa County
Public Works Department
Prepared By:

QUINCY ENGINEERING

February 18th, 2015

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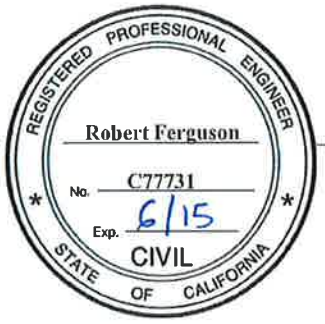
This Feasibility Study Report and technical information has been prepared under the direction of the following registered civil engineers. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

2-18-15

REGISTERED CIVIL ENGINEER *DATE*

2-18-15

REGISTERED CIVIL ENGINEER *DATE*



The project manager has reviewed this draft project report and concurs with the recommendations, conclusions, and decisions as made by the registered civil engineers and described in this report based on the information available at this time.

James L. Foster, Jr. - PROJECT MANAGER 2-18-15 *DATE*

County Approval recommended by:

Neil Leary – COUNTY PROJECT MANAGER *DATE*
SENIOR ENGINEER, CONTRA COSTA COUNTY DEPARTMENT OF PUBLIC WORKS

County Approval by:

Kevin Emigh – *DATE*
DESIGN DIVISION MANAGER, CONTRA COSTA COUNTY DEPARTMENT OF PUBLIC WORKS

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Table of Contents

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Executive Summary

Contra Costa County has requested professional Engineering Services from Quincy Engineering Inc., through the existing On-Call contract, to evaluate the feasibility of replacing the Marsh Drive at Walnut Creek Bridge (Bridge No. 28C-0442). The bridge is jointly owned by the City of Concord and Contra Costa County.

Consideration for replacement is the result of identified bridge deficiencies as documented in Caltrans Maintenance Reports and the City of Concord's seismic retrofit project as follows:

1. Seismic – The structure requires retrofit with outrigger bents at each support location to meet current seismic safety standards.
2. Structural – The structure lacks structural capacity to carry permit loading.
3. Hydraulic – The structure currently obstructs the Walnut Creek 100-year design storm flow
4. Scour – Maintenance inspection concerns exist regarding the scour vulnerability and structure stability during high flow events.
5. Functional Safety – The travelled way width is narrow and when considering the current average daily traffic (ADT) would be considered functionally obsolete (Caltrans Inspection Report lists ADT at 2,000 vehicles per day but recent traffic count shows 5,688 vehicles per day, see *Functional Assessment* on page 9 of this report for additional information)
6. Deck – Significant deck cracking exists and warrants treatment.

This structure has a long history:

- It was constructed in 1938 as a 6-span reinforced concrete slab bridge.
- It was lengthened in 1965 adding 4 additional reinforced concrete spans. During the 1965 construction project, concrete column jackets were installed around the existing Bent 2, 3, 4, 5, and 6 piles/pile extensions.
- In 2009, concrete column jackets were placed on the ten columns at Bent Numbers 3A and 4A, which were experiencing deterioration due to localized failure of the concrete cover and expansive rebar corrosion.

Bent 2A Bent 3A Bent 4A

Figure 1 – Existing bridge looking downstream (north)

Retrofit Project - In June 1998, Concord City Council approved the Seismic Retrofit of the Marsh Drive Bridge. Contra Costa County agreed to have the City of Concord take the lead in the development of the Highway Bridge Program (HBP), Seismic Retrofit Contract. The purpose of this project was to address the seismic deficiencies only. The proposed retrofit places outrigger bents supported on 36 inch diameter cast in steel shell piles at each existing bent locations.

Hydraulic Capacity Concerns - Flow through the Walnut Creek Channel is constricted by the existing bridge structure resulting in a backwater effect. The proposed seismic retrofit project will add additional piles in the channel which will increase the 100-year storm event water surface elevation by 0.11 feet. The Walnut Creek Channel falls under the jurisdiction of the Army Corps of Engineers (ACOE). Past project experience indicates that ACOE would not approve any improvements to the bridge in the creek which resulted in impacts to the water surface elevation without mitigations to the upstream channel. These mitigations would likely involve increasing the height of the upstream portion of the levee.

Feasibility Study - Upon consideration of the structure's age and other significant deficiencies that have become readily apparent in recent years, Contra Costa County recently initiated a feasibility study to consider a bridge replacement in lieu of a bridge retrofit. An alternative development and comparison as well as a life cycle cost analysis was included in the evaluation to assure the best use of public funds for the identified "build" project.

Project Alternatives – Project alternatives considered include the following:

- Replace on existing alignment with road closure
- Replace on adjacent alignment with road open
- Retrofit – Place outrigger bents at each existing bent location
- Retrofit and Rehabilitate – Place outrigger bents at each existing bent location, rehabilitate the bridge deck to extend the service life to 20 years, and raise the bridge to meet hydraulic conveyance requirements

Comparison of the alternatives was completed and based on available information and scoping level cost estimates. The life cycle cost analysis used the scoping level estimates and developed a Present Worth comparison. The life-cycle cost estimate assumed the retrofitted structure would be replaced in 20 years and a new structure would last 100 years. The results of the alternative comparison are shown in Figure 3.

Figure 2 – Marsh Drive looking east (Google Street View)

Alternative	Description	Remaining Deficiencies	Pros	Cons	Construction and RW Cost	Lifecycle – PW Cost
Replacement Alternatives						
1 - Replace on Existing Alignment	Three-span Box Girder with Road Closure	none	Meets current standards	Requires road closure	$6.695M	$6.813M
2 - Replace on Existing Alignment	Multi-span Slab with Road Closure	none	Meets current standards	Requires road closure	$5.353M	$5.471M
3 - Replace on Adjacent Alignment	Multi-span slab with Road Open	none	Meets current standards, no road closure	Requires more right of way	$6.039M	$6.157M
Retrofit Alternatives						
4 - Retrofit (and Levee Mitigation)	Outrigger Bents with Road Open	FO,SD,HD, ED	Seismically Adequate	Deficiencies remain	$3.900M	$7.624M
5 - Retrofit and Rehabilitate	Retrofit, Deck Rehab, and Raise Deck with Road Closed	FO,SD	Seismic, Hydraulic, and Deck adequate	Still Functionally and Structurally deficient	$3.591M	$6.787M

FO – Functionally Obsolete HD – Hydraulically Deficient (100-year flow above bridge soffit)
SD – Structurally Deficient ED – Element (Deck) Deficient

Figure 3 – Alternative Comparison Table

Overview and Approach

The goal of this Feasibility Study is to consider the "big picture" for structure and route function and to consider the prudent expenditure and long term investment of public funds being made for this transportation infrastructure project. Selection of the appropriate "build" project alternative is the desired outcome. The alternative evaluation and selection was based on available information and scoping level considerations. Once selected, the appropriate build project will be programmed for Highway Bridge Program funding and follow the typical project development process resulting in Environmental Clearance, Design, Plans, Specifications, Estimates and ultimately Construction. The intent of this report is to provide the scoping level information necessary to select and program a build alternative.

Primarily, the choice is between continued investment in repairing, retrofitting and rehabilitating the 77 year old structure to extend its service life for continued use for 20 years or so, or replacing the existing structure with a new structure now.

Contra Costa County and Quincy Engineering's approach to this Feasibility Study is as follows:

1. Collect and evaluate information
2. Develop replacement alternatives and cost analysis
3. Review Retrofit and Replacement Alternatives
4. Develop life cycle cost comparison
5. Develop a Draft Feasibility Study Report
6. Conduct a Feasibility Study review meeting
7. Develop a Final Feasibility Study Report

Existing Information

Existing Bridge

The existing bridge consists of two bridges built at two different times. In 1965 the original 1938 6-span reinforced concrete slab bridge structure was lengthened by adding 4 additional reinforced concrete slab spans. (As Built Plans Attached, See Appendix h)

Figure 4 – Underside of the existing structure

Repair History
This structure has a long history of modification and repair. Lengthening the bridge in 1965 increased the hydraulic conveyance capacity of the bridge. The concrete jackets added in 1965 and in 2009 addressed a corrosion and decay issue as shown in Figure 5 and 6.

Figures 5 and 6 – Concrete spalled area needing repair and concrete jacket repair

Inspection Report
The current inspection report indicates that some bridge elements need repair and/or rehabilitation. For this evaluation, the bridge substructure issues are assumed to be addressed by the seismic retrofit. The bridge deck cracking will need to be addressed. The 2007 inspection report recommended the bridge deck be treated with Methacrylate to address the cracking issues.

Hydraulic Capacity
The Contra Costa County Flood Control District indicated that the existing structure currently obstructs the design flood flow by 2 feet, creating a backwater effect. The proposed retrofit would increase the upstream water surface elevation by 0.11 feet.

Structurally Deficient
The structure was designed for H-15 loading, can carry legal loads, and is restricted for permit loading. It was not designed for current HL93 nor P15 permit loading.

Seismic Retrofit

The current seismic retrofit project intends to construct a new support system consisting of outrigger bents at each existing bent location as shown in Figure 7.

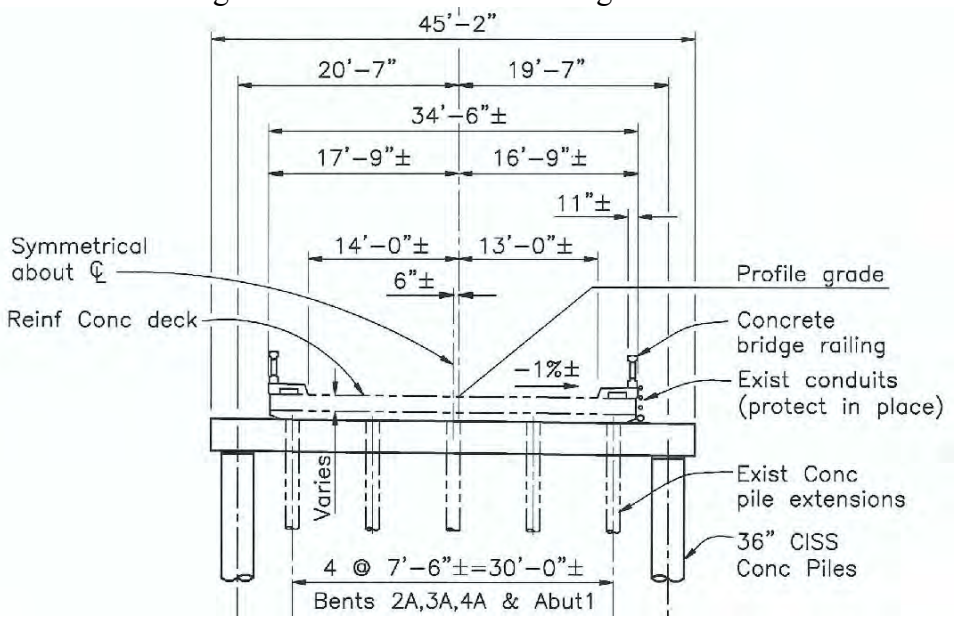

Figure 7 – Outrigger Bents as part of the Current Seismic Retrofit Strategy

Functional Assessment

In 2011, a traffic count was taken which resulted in an ADT of 5,688 vehicles per day on Marsh Drive. When compared to the 2,000 vehicles per day shown on the Bridge Inspection Report's Structure Inventory and Appraisal sheet (see Appendix H), the bridge should be considered Functionally Obsolete (for inadequate Deck Geometry based on ADT). Per FHWA Non-Regulatory Supplement OPI: HNG-33, a structure is considered functionally obsolete when an appraisal rating of 3 or less is coded to Item 68 - Deck Geometry as part of the *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges* definition. The rating of a structure's Deck Geometry is a function of the ADT. As ADT increases, so does the required bridge width.

Need & Purpose

The "big picture" need for this project is to provide the public using Marsh Drive with a safe bridge to cross Walnut Creek. In order to meet this need, addressing the many deficiencies in either a phased approach with repair, retrofit and rehabilitation or all at once with a replacement structure is needed. The purpose of the seismic retrofit project is to address the seismic needs of the existing structure. This will also address the substructure deterioration issues and possibly allow for future rehabilitation such as raising the bridge for hydraulic clearance and/or widening for functional safety.

Feasibility Report Development Process

The evaluation and development process for this Feasibility Study Report was as follows;

Survey Data – Contra Costa County provided Quincy Engineering site topographic survey and preliminary RW information.

Preliminary Alternatives Consideration – Quincy Engineering developed preliminary replacement alternatives with input from the County as follows:

Roadway

- Horizontal - Two horizontal alignments were considered:
  - Retain the existing alignment assuming road closure during construction
  - Adjacent alignment assuming road open during construction.
- Vertical – Raise the vertical profile to provide adequate hydraulic clearance
- Design Speed – The first cut was to identify the "best fit" geometry to fit the existing geometry which correlated to 40 mph.
- Roadway width – The roadway width was set using county standards for this route classification and will include striped bike lanes and sidewalks.

Bridge

- Box Girder – A typical CIP/PS Concrete Box Girder bridge was considered
- Slab Bridge – A typical CIP/PS Concrete Slab bridge was considered

Review – The County reviewed the draft alternatives and including staff from Traffic Engineering and the Flood Control District.

Traffic – The Traffic review comments included the following;

- Design Speed – Design speed ranges of 40, 45 and 50 mph are reasonable to consider. The County strives to provide higher design speeds for safety however the County can consider design exceptions when physical constraints and/or significant impacts result from the higher design speeds. Consideration of higher design speeds should be made.
- Detour - Detour around the construction site for road closure during construction is reasonable to consider. However, based on the amount of traffic, detour length and duration of the delay, additional study may render a road closure as an unacceptable impact. Identification of potential detour routes and detour duration should be made. The route should be kept open to pedestrians throughout construction.

Flood Control District – The Flood Control District review comments which were in part based on some preliminary modeling included the following;

- Hydraulic Obstruction – The bridge alternatives were evaluated for smaller more frequent supports associated with the slab structure type and the larger less frequent supports associated with the box girder structure type.
- Hydraulic Clearance – The Hydraulic clearance of the bridge alternatives should be increased from elevation 22.0 to either elevation 24.0 (for the three span replacement alternative) or elevation 24.5 (for the six span replacement alternative) based on preliminary modeling for the 100-year flood event. See Appendix F, *Hydraulic Information* for additional information.

Design - The design review comments included the following;

- Design Speed – Evaluate vertical curve design speeds of 45 and 50 mph for each alternative to understand the relative impacts to project conform limits and project approach fill footprint.
- Hydraulic clearance – Increase the profile grade of each alternative to provide hydraulic clearance to either elevation 24.0 (for the three span replacement alternative) or elevation 24.5 (for the six span replacement alternative) based on preliminary modeling.
- Detour – For comparison purposes, consider both road closure and road open during construction alternatives
- Alternative comparison – The retrofit and/or retrofit and rehabilitation alternatives to compare to the replacement alternatives were considered as follows:
  - Retrofit – Include this as a stand-alone build alternative even though the hydraulic impacts may not render it viable.
  - Retrofit, raise and rehabilitate – Include this alternative including raising the bridge to meet hydraulic requirements and seal the bridge deck to provide an extended service life.
  - Strengthening the structure - Addresses structural capacity deficiencies. Widening the structure to address functional safety was not included in the comparison.

Alternative Update and Draft Feasibility Report Development– Quincy Engineering updated the alternatives with the comments as indicated above, developed a scoping level cost estimate, drafted a life cycle cost analysis and prepared an Administrative Draft Feasibility Study.

Review – The County Design, Flood Control District and Traffic Engineering Divisions reviewed the Administrative Draft Feasibility Report and provided comments which were addressed and incorporated as agreed. (See Appendix i)

Draft Feasibility Report Update - Quincy Engineering updated the Feasibility Report alternatives as indicated above and prepared a Draft Feasibility Study.

Report Review Meeting – The County and Quincy Engineering conducted a review meeting

Final Feasibility Report – Quincy Engineering provided a Final Feasibility Report**.**

Replacement Alternatives

Three replacement alternatives were developed for comparison to the retrofit and rehabilitation alternatives. The replacement alternatives differed by bridge type and road open or closed during construction. The bridge types considered were a typical CIP/PS Concrete Box girder bridge and a typical CIP/PS Concrete Slab bridge. The bridge length was set to approximately match the top of channel width and based on the existing bridge length. **The 11x17 plans showing the Alternatives including the horizontal layout, vertical profile and bridge planning studies are in the Appendix.**

Horizontal Alignment – The horizontal alignment was set to conform to the existing roadway as close as practically possible.

For Alternatives 1 and 2, the existing alignment was retained and the road widened equally on both sides. Important to note is the horizontal curve at the north end of the bridge correlates to a 40 mph design speed.

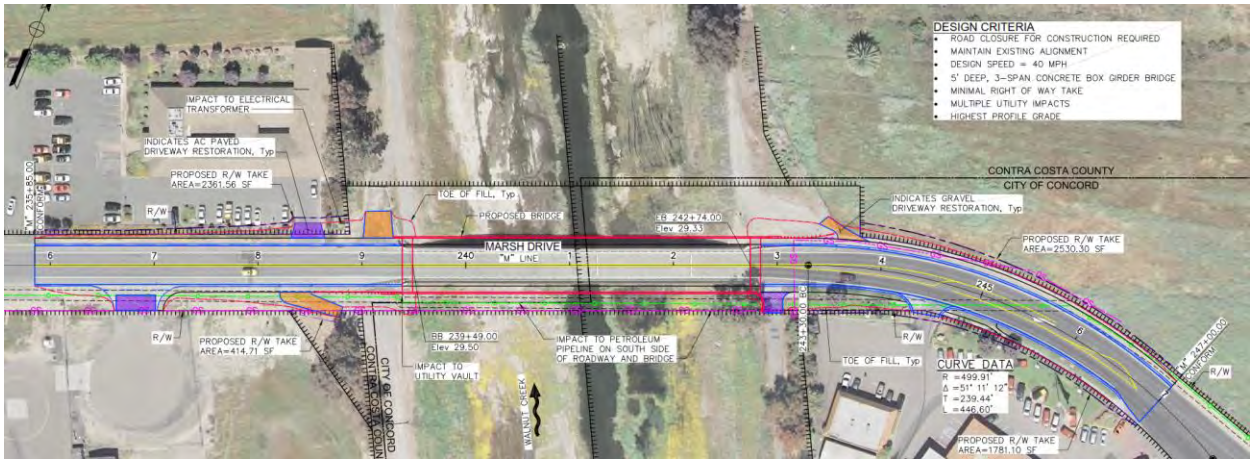

Figure 8 - Alternative 1 Layout (Alternative 2 similar)

For Alternative 3, the horizontal alignment was shifted downstream (north) to avoid impact to the Airport, Car dealership and a high risk gas line.

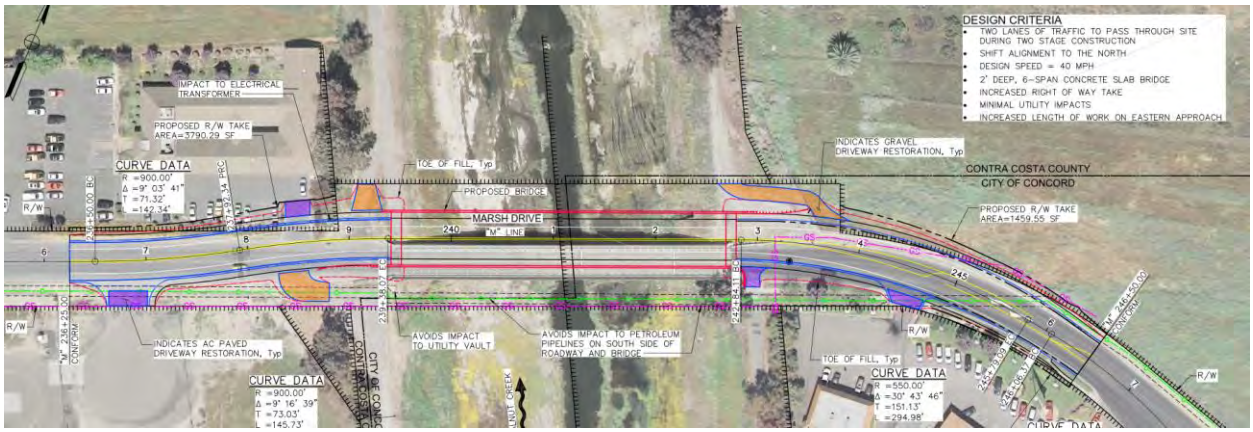

Figure 9 - Alternative 3 Layout

Vertical Profile – The vertical profile was set to provide the required hydraulic clearance for the bridge type. This proved to have the most significant impact to approach fill height and footprint. Additional consideration of 45 mph and 50 mph design speeds were made to understand the relative differences. The approach fill height increased one to two feet and the conform point was extended one to two hundred feet as the design speed increased.

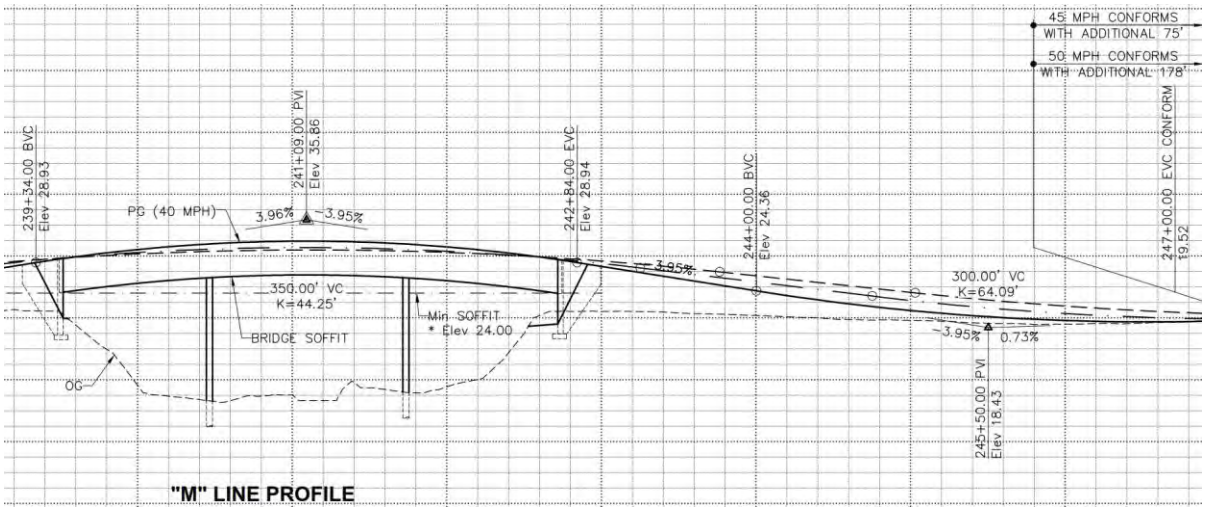

Figure 10 - Alternative 1 Profile at East end

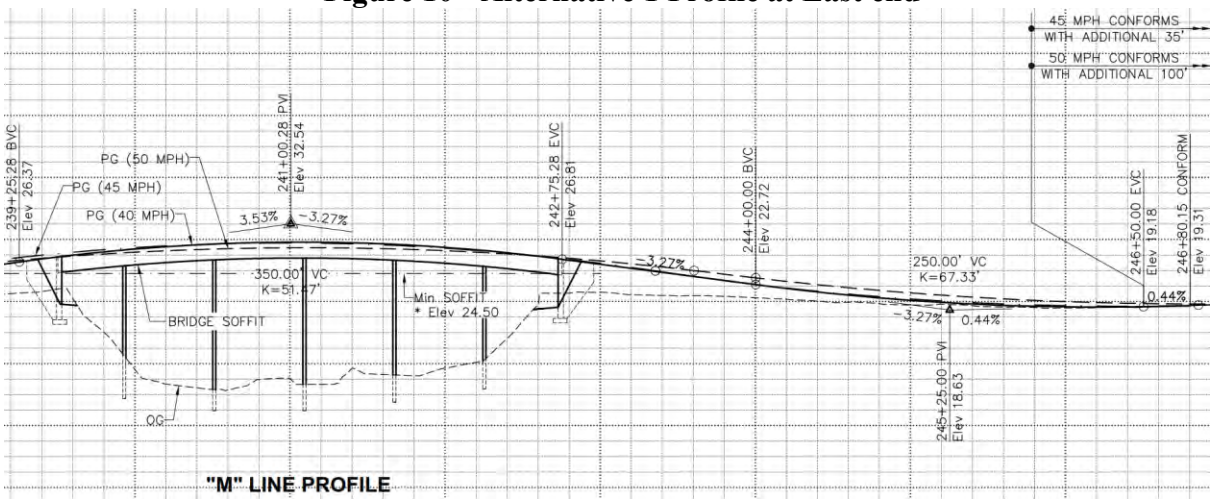

Figure 11 - Alternative 3 profile at East end (Alternative 2 similar)

Bridge Types – For this study two bridge types were considered:

- Cast-In-Place Prestressed (CIP/PS) Concrete Box Girder bridge - In California a CIP/PS Concrete Box Girder bridge is a very economical and common bridge type. Based on the typical span ranges and depth to span ratios, this resulted in a three span, 5' deep bridge with two rows of 4' diameter cast-in-steel-shell (CISS) concrete pile supports in the channel. Although the structure depth was more than other types, the fewer rows of supports in the channel may be more desirable from a hydraulic viewpoint. The proposed minimum soffit elevation has been set at 24.0 feet for this alternative based on coordination between Quincy Engineering and the Flood Control District.
- Cast-In-Place Prestressed (CIP/PS) Concrete Slab bridge - In California, the CIP/PS Concrete Slab bridge is also a very economical and common bridge type. Based on the typical span ranges and depth to span ratios, this resulted in a six span, 2' deep bridge with five rows of 2' diameter CISS concrete pile supports in the channel. The increase in the number of piles in the channel (when compared the CIP/PS Box alternative) tends to increase the design water surface elevation. Therefore, the minimum soffit elevation for these alternatives has been set at 24.5 feet based on coordination between Quincy Engineering and the Flood Control District.

Alternative 1 – CIP/PS Box Girder Bridge on existing alignment with road closed during construction

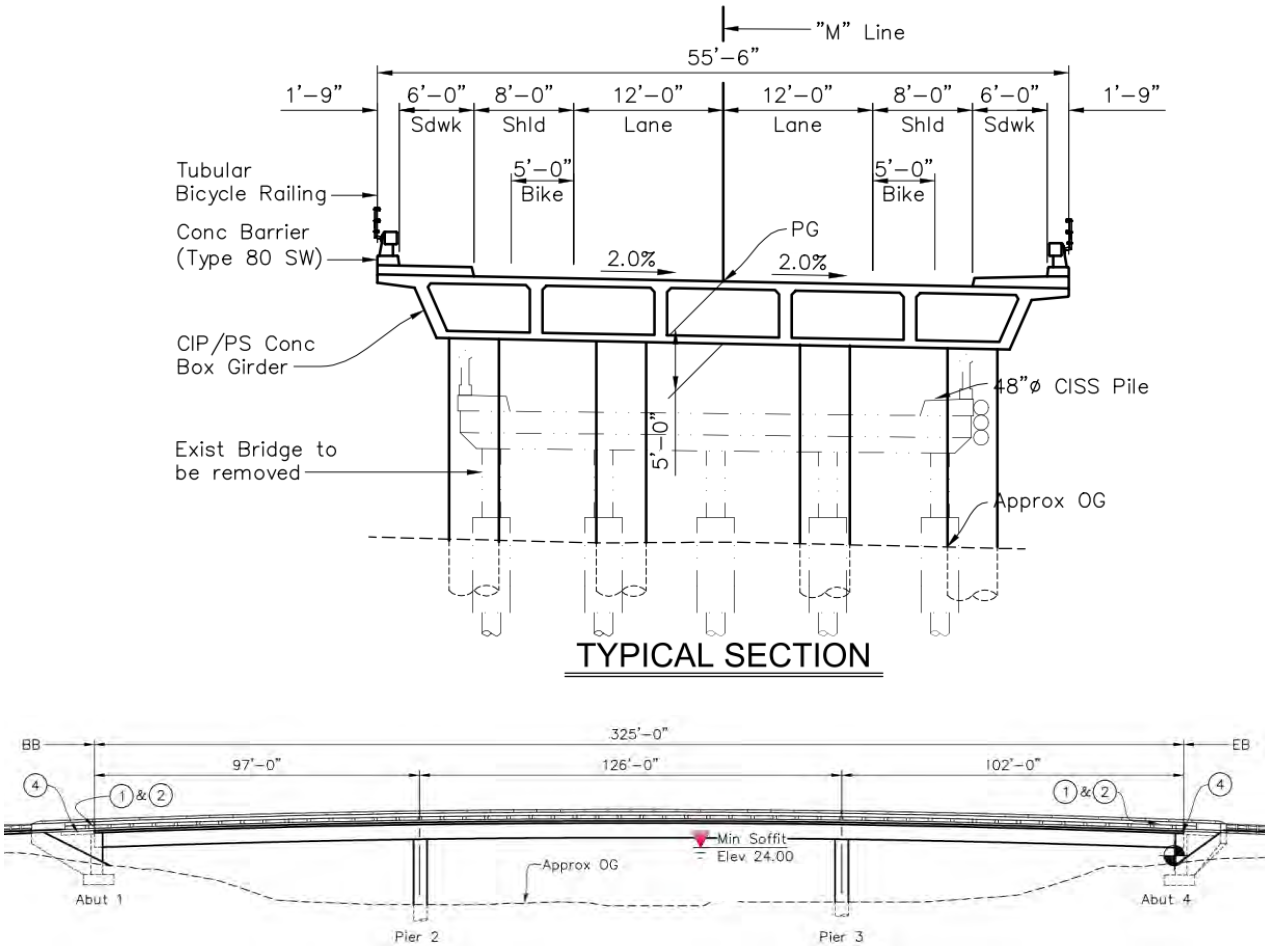

Figure 12 – Alternative 1 CIP/PS Box Girder Bridge typical section and bridge profile

The span capabilities of a box girder bridge would result in only two supports located within the channel. The depth of the superstructure would require raising the roadway grade by about 8 feet and would result in a larger approach roadway fill footprint, larger project impacts, and higher project costs. Pedestrian access across Walnut Creek would be maintained throughout construction by way of a temporary bridge.

Alternative 2 – CIP/PS Slab on existing alignment with road closed during construction.

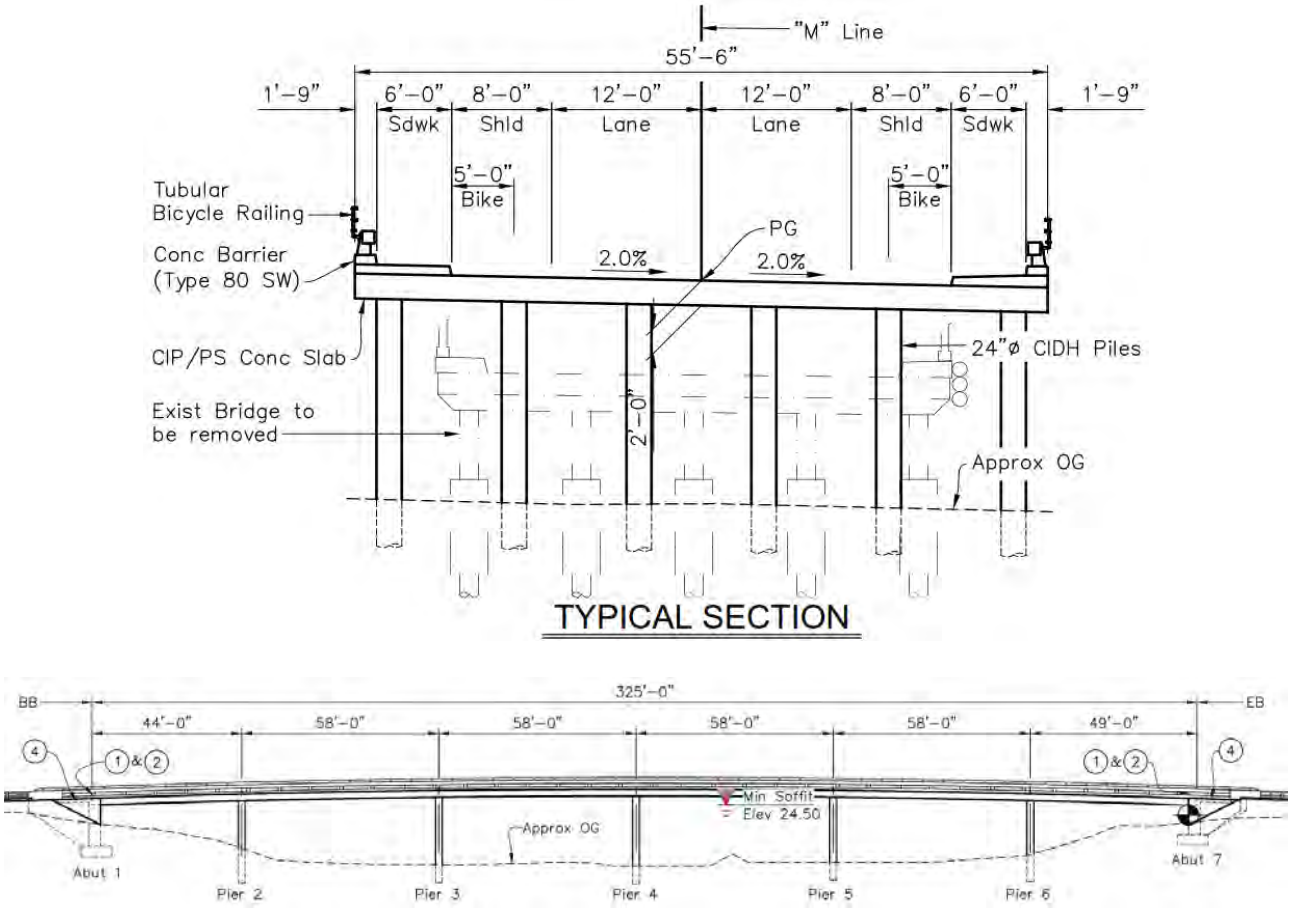

Figure 13 – Alternative 2 CIP/PS Slab Bridge typical section and bridge profile

Alternative 2 would provide the thinnest superstructure and would raise the approach roadway grade by about 5 feet. Road closure would be required for this alternative. Pedestrian access across Walnut Creek would be maintained throughout construction by way of a temporary bridge. This would be the most cost effective replacement alternative and would have the least impacts (aside from the traffic impacts) during construction.

Alternative 3 – CIP/PS Slab on adjacent alignment with road open during construction.

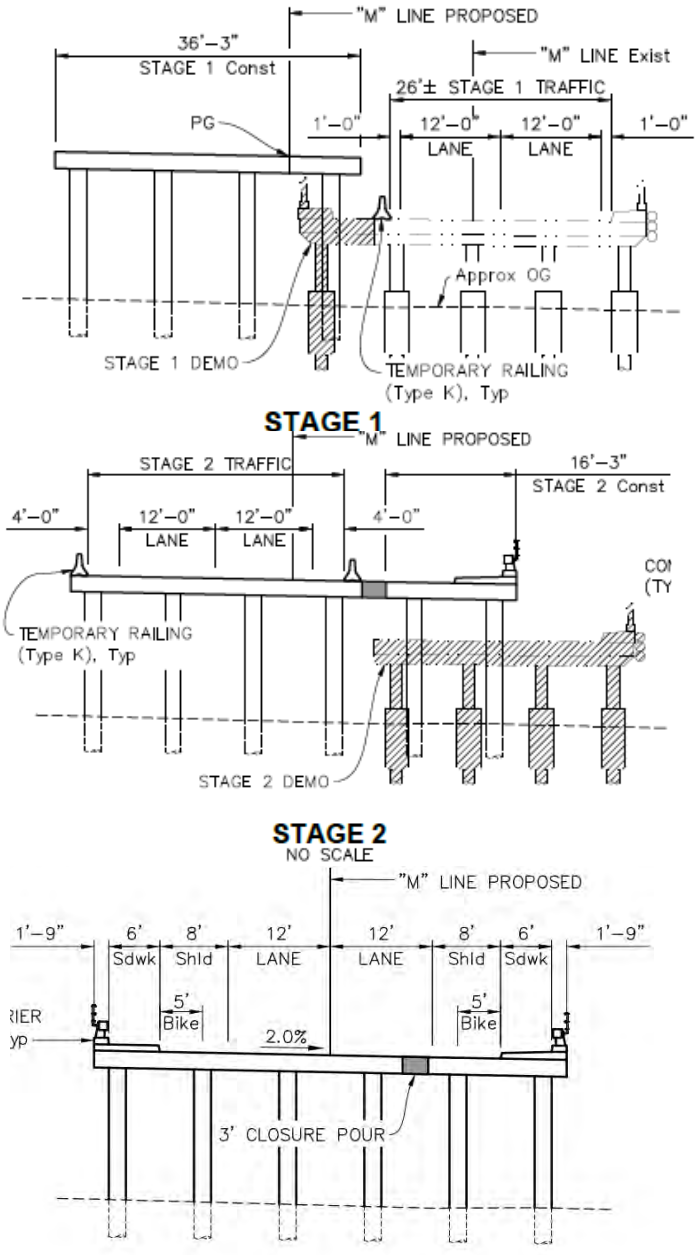

Figure 14 – Alternative 3 CIP/PS Slab Bridge Stage construction and typical section

Alternative 3 would allow the road to remain open throughout construction by utilizing staged construction. This alternative would provide the thinnest superstructure and would raise the approach roadway grade by about 5 feet. The slab bridge configuration would provide the most cost effective of the replacement alternatives for staged construction. It would have a larger right-of-way impact and a longer construction duration. This alternative would accommodate pedestrian traffic throughout construction with a temporary pedestrian bridge in stage 1. Pedestrians would be able to use the new structure during stage 2 and the temporary bridge could be removed.

Retrofit and Rehabilitation Alternatives

Two Retrofit and Rehabilitation alternatives were considered. The retrofit only alternative was considered since that project is currently in the project development phase. The retrofit, raise and deck rehabilitation alternative was included based on the assumption that the hydraulic issues associated with the retrofit project would have to be addressed with the retrofit construction as well as the deck rehabilitation as recommended in the bridge inspection reports.

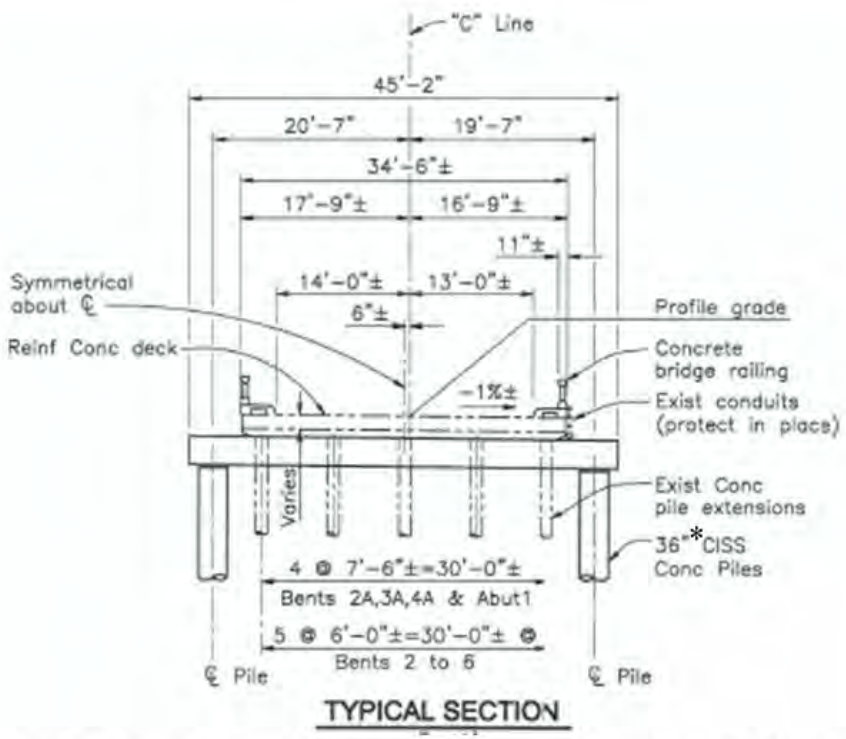

Figure 15 – Alternative 4 Retrofit with outrigger bents (Alternative 5 similar)
***Note: City of Concord has recently stated that pile diameter could be revised to 30".**

Alternative 4 – Retrofit with Outrigger Bents

Alternative 4 would provide a seismic retrofit which addresses solely the seismic deficiency. This alternative would add to the existing backwater effect and increase the risk of flooding upstream. Any work within the channel will need to be approved by ACOE. Although the increase in water surface elevation is 0.11', the Flood Control District's experience with the ACOE is that any increase in water surface elevation is unacceptable and would need to be mitigated. This mitigation could include costly measures such as levee raising and additional channel work.

According to the Flood Control District, a project to raise the Walnut Creek levee between Marsh Drive and Concord Avenue would cost roughly $3,000,000. This estimate includes trail reconstruction costs and other project costs such as permitting, design and construction engineering. To create a direct cost comparison between this and the other Alternatives outlined herein, 25% for preliminary engineering and 15% for construction engineering of the levee mitigation project costs were removed to create a construction only cost of the levee mitigation. The construction only cost for levee mitigation would then be $2,000,000.

The bridge would still be considered hydraulically deficient because the water surface elevation during the 100-year flood event would be higher than the bridge soffit creating a pressure flow condition. To be considered hydraulically sufficient, the bridge would need to capable of passing the 50-year flood with sufficient freeboard to accommodate debris or the bridge would need to provide sufficient opening to pass the 100-year flood without freeboard (*Chapter 820* of the *Caltrans Highway Design Manual*).

This alternative would maintain the existing substandard pedestrian access both during and after construction.

Alternative 5 – Retrofit, Raise and Rehabilitate Deck.
Alternative 5 would include the work outlined in Alternative 4 and would also raise the structure and rehabilitate the deck. Raising the structure by 3 feet would improve the hydraulic sufficiency of the bridge and eliminate the need for additional levee work (mitigation of the backwater effect intensified by the outrigger bent retrofit). Based on the condition of the bridge deck as stated in the maintenance reports, deck rehabilitation would be needed to extend the structure's service life. This alternative would not address the structural and functional deficiencies. Pedestrian access across Walnut Creek would be maintained throughout construction by way of a temporary bridge.

Cost

The cost estimates were developed for the alternatives based on the following assumptions:
Roadway - The roadway costs were developed using the Caltrans 6-page estimate format. It included developing approximate quantities for the "big ticket" items, current typical unit prices, and mobilization and contingencies included per the 6-page methods.

Bridge - The bridge cost estimates were based on the Caltrans Bridge cost per square foot data with 10% mobilization and 25% contingencies added.

Right-of-Way – The right of way costs were based on approximate permanent take areas outside the existing right of way, 5 feet from the fill slope catch point, and were assumed to cost $35 per square foot and included an additional 20% to account for real property labor costs.

Environmental Mitigation - Each alternative includes a lump sum of $100,000 for environmental mitigation.

Retrofit – The programmed construction cost estimate was used.

Deck rehabilitation – A square foot cost of $12 per square foot was used

Raise Structure – An estimated cost of $450,000 was assumed based on anticipated falsework and hydraulic jacks to raise each of the two frames independently. This equates to about $40 per square foot. The $40 per square foot value is about the average cost for raising a structure based on a recent Caltrans project, currently in construction, on Interstate 80 between Roseville and Donner Pass.

Strengthen Structure – The cost to strengthen the structure to address the structural deficiencies was not developed.

Widen Structure – The cost to widen the structure to address the functional deficiencies was not developed.

Temporary Pedestrian Bridge - For alternatives 1, 2, and 5, a $150,000 lump sum cost is included to provide a temporary pedestrian bridge to cross Walnut Creek throughout Construction. For Alternative 3, this cost has been reduced to $112,500 since the temporary bridge would only be needed for Stage 1 of construction. Alternative 4 does not have this cost included since the construction work will be below deck. This alternative will not improve the substandard pedestrian facility.

Cost Evaluation Summary

The cost estimates are in the appendix and a summary of the alternative costs is below. These costs are based on construction related items and right-of-way costs.

1. Alternative 1: CIP Concrete Box Girder Bridge, Road Closed During Construction:

Bridge Replacement:	$ 5,095,000
Non-structure Construction Items:	$ 1,300,000
Right-of-Way:	$ 300,000
Total Project Cost:	**$ 6,695,000**

2. Alternative 2: CIP Concrete Slab Bridge, Road Closed During Construction:

Bridge Replacement:	$ 4,103,000
Non-structure Construction Items:	$ 1,080,000
Right-of-Way:	$ 170,000
Total Project Cost:	**$ 5,353,000**

3. Alternative 3: CIP Concrete Slab Bridge, Road Open during Construction:

Bridge Replacement:	$ 4,599,000
Non-structure Construction Items:	$ 1,200,000
Right-of-Way:	$ 240,000
Total Project Cost:	**$ 6,039,000**

4. Alternative 4: Seismic Retrofit:

Seismic Retrofit costs:	$ 1,900,000
Levee Mitigations:	$ 2,000,000
Total Project Cost:	**$ 3,900,000**

5. Alternative 5: Deck Rehabilitation and Seismic Retrofit and Raise Profile:

Deck Rehabilitation:	$ 111,000
Seismic Retrofit costs:	$ 1,900,000
Raise Bridge Profile:	$ 450,000
Raise Road Approaches & Related Items:	$ 960,000
Right-of-Way:	$ 170,000
Total Project Cost:	**$ 3,591,000**

Life Cycle Cost Evaluation Summary

The Life Cycle Cost Analysis Report is contained within the appendix. The analysis followed the methodology presented in the National Cooperative Highway Research Program (NCHRP) Report 483 titled *Bridge Life Cycle Cost Analysis*. This method results in a present worth cost comparison.

For a new bridge, the service life was assumed to be 100 years for this analysis. It was assumed that every 40 years a deck rehabilitation would be completed.

For the retrofit analysis, it was assumed that the retrofitted structure would be replaced in 20 years due to all of the remaining structural and functional deficiencies as well as it being 97 years old in 20 years. This assumption was applied to the retrofit, raise and rehabilitate deck alternative.

Replacement	**Present Worth**
Alternative 1: CIP Concrete Box Girder Bridge, Road Closed During Construction:	$6,813,000
Alternative 2: CIP Concrete Slab Bridge, Road Closed During Construction:	$5,471,000
Alternative 3: CIP Concrete Slab Bridge, Road Open During Construction:	$6,157,000
Retrofit	
Alternative 4: Seismic Retrofit, Road Open:	$7,624,000
Alternative 5: Seismic Retrofit, Raise Profile and Rehab Deck, Road Closed:	$6,787,000

Project Schedule Evaluation Summary

The overall project schedule for each alternative has been evaluated.

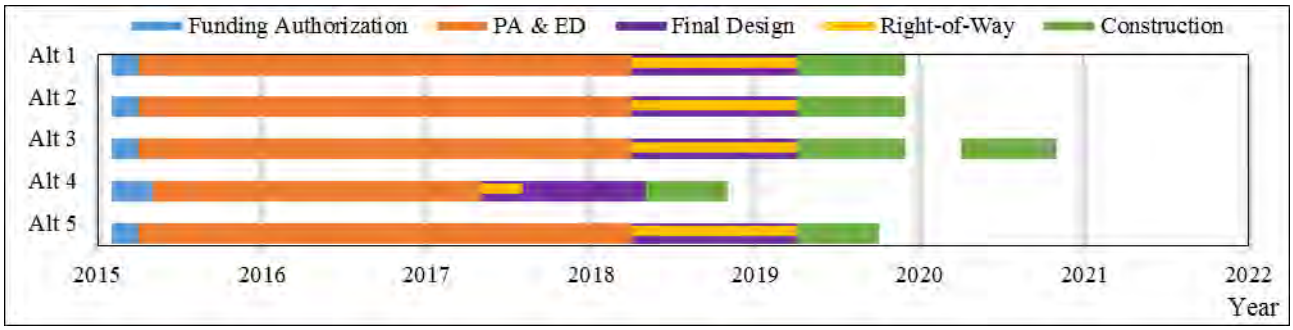

Figure 16: Project Schedule Summary Chart

Project Schedule Assumptions

Funding Authorization

For each alternative, 2 months has been assumed to obtain funding approval. Since Alternative 4 already has funding authorization for the seismic retrofit project, a 3 month duration has been assigned to Alternative 4 in order to obtain funding for the levee raising portion of the project.

Project Approval and Environmental Document (PA & ED)

The PA & ED phase of each alternative is assumed to be 36 months. Alternative 4 PA & ED is nearly complete, however, an additional 24 month duration is assumed to account for PA & ED for the levee raise project and would allow ACOE to review and approve this flood plain mitigation.

Final Design

The Final design duration for Alternative 4 is assumed to be 12 months to account for the design of the levee raise project. The seismic retrofit design is already at its 80% milestone and would likely require less than 12 months to complete final design. The final design duration is assumed to be 12 months for all other alternatives as well.

Right-of-Way

The right-of-way phase for each alternative would be concurrent with the final design phase and would not likely drive the project schedule. Alternative 4 is assumed to have the shortest right-of-way phase since it would likely only require temporary construction easements. All other alternatives require right-of-way take and assume 12 months for the right-of-way phase.

Construction

Summer construction is assumed for each alternative. The assumed duration for each alternative is based on the complexity and type of work being performed. For example, retrofit construction would likely take less time than full bridge replacement. The Alternative 3 construction duration would be the longest since this alternative is staged to keep the road open throughout construction. Because of this staging, Alternative 3 is separated into two construction seasons and would provide a seismically safe structure at the end of the first season. Alternative 4 does not include approach roadway construction and would therefore have the shortest duration. The levee raise project would be built concurrently with the seismic retrofit and is assumed to take 6 months.

Alternative Comparison

When comparing the various project alternatives, numerous factors need to be evaluated and compared, such as:

- Construction schedule
- Service life of the structure alternative
- Vehicular/pedestrian access during construction
- Right-of-way impacts
- Overall Cost-effectiveness

As indicated above in the life cycle cost analysis, the Alternative 2 and 3 replacement alternatives are more cost effective than both of the retrofit alternatives. Additionally, Alternatives 2 and 3 address the structural and functional deficiencies that will remain if Alternatives 4 or 5 are constructed.

Alternative	Description	Remaining Deficiencies	Pros	Cons	Construction and RW Cost	Lifecycle – PW Cost
Replacement Alternatives						
1 - Replace on Existing Alignment	Three-span Box Girder with Road Closure	none	Meets current standards	Requires road closure	$6.695M	$6.813M
2 - Replace on Existing Alignment	Multi-span Slab with Road Closure	none	Meets current standards	Requires road closure	$5.353M	$5.471M
3 - Replace on Adjacent Alignment	Multi-span slab with Road Open	none	Meets current standards, no road closure	Requires more right of way	$6.039M	$6.157M
Retrofit Alternatives						
4 - Retrofit (and Levee Mitigation)	Outrigger Bents with Road Open	FO,SD,HD, ED	Seismically Adequate	Deficiencies remain	$3.900M	$7.624M
5 - Retrofit and Rehabilitate	Retrofit, Deck Rehab, and Raise Deck with Road Closed	FO,SD	Seismic, Hydraulic, and Deck adequate	Still Functionally and Structurally deficient	$3.591M	$6.787M

FO – Functionally Obsolete HD – Hydraulically Deficient (100-year flow above bridge soffit)
SD – Structurally Deficient ED – Element (Deck) Deficient

Figure 17 – Alternative Comparison Table

Recommendations

Based on the results of this analysis, we recommend the following:

1. The bridge should be replaced instead of rehabilitated. This will address all of the deficiencies that exist with the current structure and will provide the best value for the public. Because it is Structurally Deficient with a sufficiency rating of 61.2, this bridge is eligible for rehabilitation under HBP guidelines. However, the Life Cycle Cost Analysis shows that bridge replacement is a more cost effective alternative. According to chapter 6 of Caltrans *Local Assistance Program Guidelines*, "Bridge replacement may be an appropriate "rehabilitation" option if a detailed cost analysis (HBRRP participating) shows that replacement is the most cost-effective solution. Cost-effectiveness studies may include life cycle cost analysis." Based on the results of the life cycle cost analysis and the numerous deficiencies of the existing bridge, it is reasonable to expect that a replacement project would be approved for funding through the HBP program. Approval from the Caltrans Structures Local Assistance Engineer will be required.
2. The replacement Alternative 3 should be programmed in the federal Highway Bridge Program since road closure on this arterial roadway with 6,000 vehicles per day may prove to be an unacceptable impact during construction.
3. After programming approval, the replacement project should proceed with the project development process expeditiously to address the many existing deficiencies and provide for public safety.

Benefits of Alternative 3

- Provides continued access to the Airport throughout construction
- Provides Class 2 bicycle facility
- 8' wide shoulders for disabled vehicles
- Improved pedestrian facilities (6' wide sidewalks)
- Bridge railings which meet current design and crash testing standards

Replacement Project Cost and Schedule

The estimated total project costs, including design, right of way and construction are included below assuming Replacement Alternative 3:

PE (25% of Construction)	$1,159,800
R/W	$240,000
Construction *	$4,639,200
Contingency (25% of Construction)	$1,159,800
CE (15% of Construction)	$695,880
Total Cost	$7,894,680

HBP (88.53%)	$6,989,160
Local (11.47%)	$ 905,520

*The contingency is itemized separately

We recommend the following project schedule:

Funding Authorization/E-76 (6-8 weeks)	March 2015
Project Approval/Environmental (36 months)	March 2015-March 2018
Final Design (18 months)	March 2018-September 2019
Right of Way (18 months)	March 2018 – September 2019
Construction (12-15 months)	September 2019-December 2020

Additional Considerations

The following items should be considered in the next phase of the project development process and may affect the project scope, schedule and cost.

Design Criteria

The design criteria for the vertical and horizontal alignment warrants additional study to identify the "best fit" options that minimize the impacts. The level of detail for the alternative development and cost estimate comparison at this phase was adequate for project scoping. Refinement in the next phase and design exception consideration will be necessary for higher design speed criteria.

Geotechnical Analysis

Geotechnical considerations were not part of this study. Identification of substructure type selection and project design requirements may warrant additional support type considerations.

Hydraulic Analysis

Supplemental refinement in the next phase will warrant additional hydraulic modeling and evaluation. The scoping level soffit elevation provided clearance to pass the Q100 flow. Additional consideration for the Q50 plus 2' of clearance will be appropriate in the next phase.

Environmental Impacts

Avoidance of environmentally sensitive areas, mitigation measures and costs, as well as construction season restrictions should be considered in the next phase. On-site mitigation for environmental impacts may not be available.

Utilities

Many utilities exist in the project area including a high risk gas line with prior rights. Alternative 3 shifted the alignment away from the high risk gas line, airport, and car dealership. However, there will likely be impacts or protective measures required for the gas line. Many additional utilities are attached to the existing structure, are in the area of impact, and will be significantly affected by viable build Alternatives 1, 2, 3, and 5.

Traffic/Detour

Two detour routes were identified and resulted in a 7 minute and 12 minute delay. One utilized only county and city streets and the other also used SR4. Reduction in construction costs, environmental impact duration, and utility impact duration would be realized with a road closure and single stage construction. Due to the traffic use of this route, consideration of a traffic study for a detour should be made.

Pedestrians

Pedestrian access through the site should be considered. Access to the trail that runs along the east side of the creek may need to be maintained. Alternatives 1 and 2 may require a temporary pedestrian facility if the route is to remain open to pedestrians throughout construction. Alternative 3 can accommodate pedestrian access over the creek during stage 2 of construction. A temporary pedestrian bridge would be needed for stage 1 since the existing bridge cannot support a standardized pedestrian facility.

Contractor Access

Contractor access to the site should be assumed from both ends of the bridge as well as from both sides. Restrictions or special consideration for cranes and pile driving may be necessary due to the proximity of the project to the airport.

Construction Staging Area

Construction staging areas next to the site appear viable on adjacent undeveloped land.

Right of Way

For this study, minimizing RW impact by using retaining walls was not considered. In the event that RW and/or environmental impacts become an issue, retaining walls for containment of approach fills may be warranted.

Aesthetics

For this study, Type 80 SW railings with tubular hand railings were included. Consideration of formliners and staining in the next phase would be warranted.

Project Personnel

The following personnel have been involved in the Feasibility Study to date.

Name	Position	Department	Email	Telephone
Kevin Emigh	Design Division Manager	Contra Costa County - Design	kemig@pw.cccounty.us	(925) 313-2233
Adelina Huerta	Project Manager - Planning Phase	Contra Costa County	ahuer@pw.cccounty.us	(925) 313-2305
Neil Leary	County Project Manager - Design/ Construction Phase	Contra Costa County - Design	nlear@pw.cccounty.us	(925) 313-2278
Paul Detjens	Senior Civil Engineer	Contra Costa County Flood Control	pdetj@pw.cccounty.us	(925) 313-2394
Brian Louis	Civil Engineer	Contra Costa County Flood Control	bloui@pw.cccounty.us	(925) 313-2245
Craig Standafer	Civil Engineer	Contra Costa County	cstan@pw.cccounty.us	(925) 313-2018
Monish Sen	Senior Civil Engineer	Contra Costa County - Traffic Section	msen@pw.cccounty.us	(925) 313-2187
Janine Hampton,	Senior Land Surveyor	Contra Costa County - Survey	jhamp@pw.cccounty.us	(925) 313-2189
Jim Stein	County Surveyor	Contra Costa County - Survey	jstei@pw.cccounty.us	(925) 313-2343
James L. Foster Jr.	Consultant Project Manager	Quincy Engineering	jimf@quincyeng.com	916-368-9181
Carolyn Davis	Consultant Road Engineer	Quincy Engineering	carolynd@quincyeng.com	916-368-9181
Danny Mossman	Consultant Bridge Engineer	Quincy Engineering	dannym@quincyeng.com	916-368-9181
Robert Ferguson	Consultant Bridge Engineer	Quincy Engineering	robertf@quincyeng.com	916-368-9181

Appendix

a. Replacement Alternatives Plans
    i. Alternative 1 – CIP/PS Concrete Box Girder on existing alignment
    ii. Alternative 2 – CIP/PS Concrete Slab on existing alignment
    iii. Alternative 3 – CIP/PS Concrete Slab on adjacent alignment
b. Retrofit and Rehabilitate Alternative Plans
    iv. Alternative 4 – Seismic Retrofit
    v. Alternative 5 - Conceptual retrofit, raise and rehabilitate
c. Cost Estimate
    vi. Alternative 1 – CIP/PS Concrete Box Girder on existing alignment
    vii. Alternative 2 – CIP/PS Concrete Slab on existing alignment
    viii. Alternative 3 – CIP/PS Concrete Slab on adjacent alignment
    ix. Alternative 4 – Seismic Retrofit
    x. Alternative 5 - Conceptual retrofit, raise and rehabilitate
d. Life Cycle Cost Analysis Report
e. Traffic Information
    xi. Detour Routes
    xii. Accident History
f. Hydraulic Information
    xiii. Retrofit Assessment
    xiv. Replacement Clearance Assessment
g. Survey and Utility Information
h. Maintenance Reports and As-Built plans
i. Comment and Responses on Administrative Draft Feasibility Report

a. Replacement Alternatives Plans

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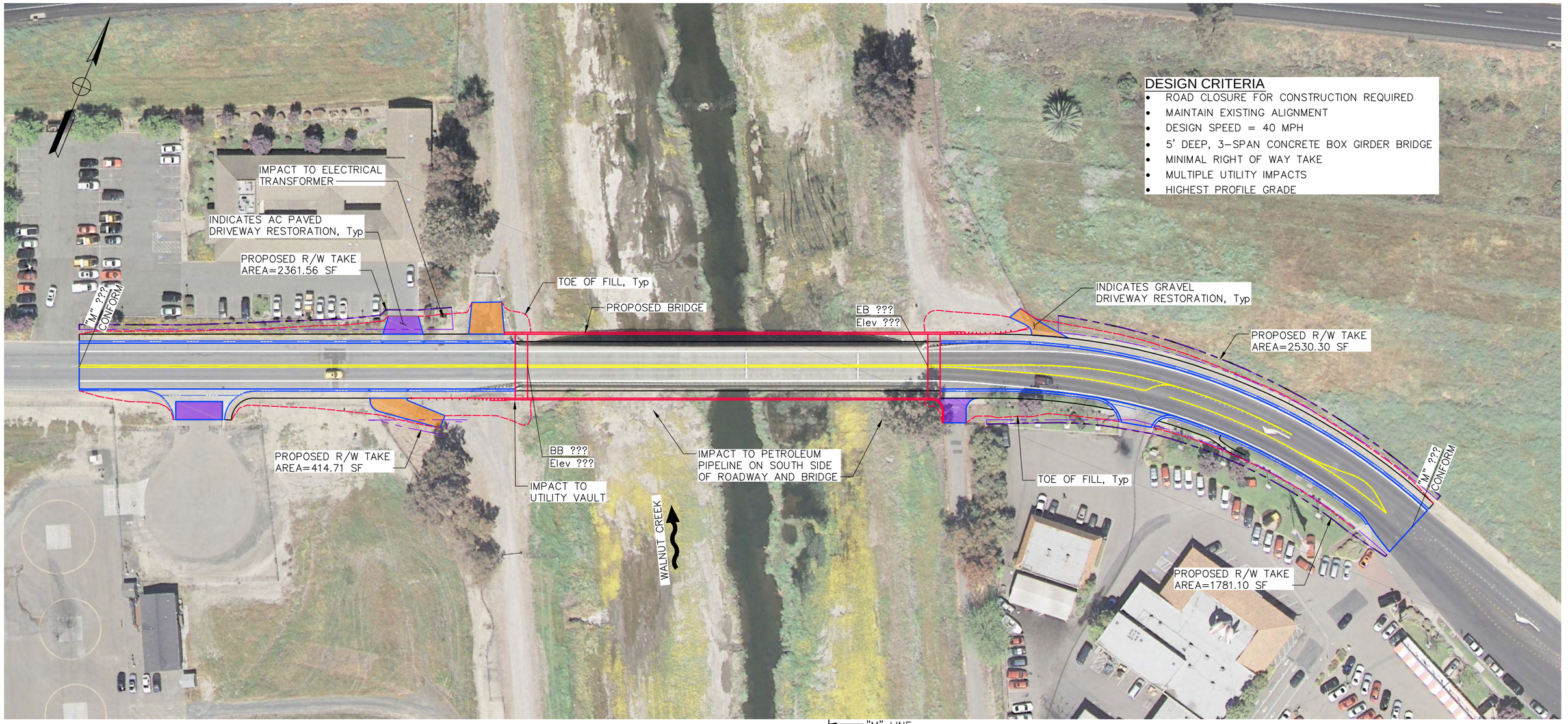

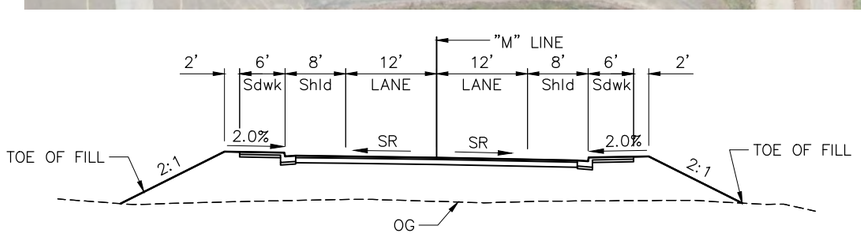

WEST APPROACH SECTION
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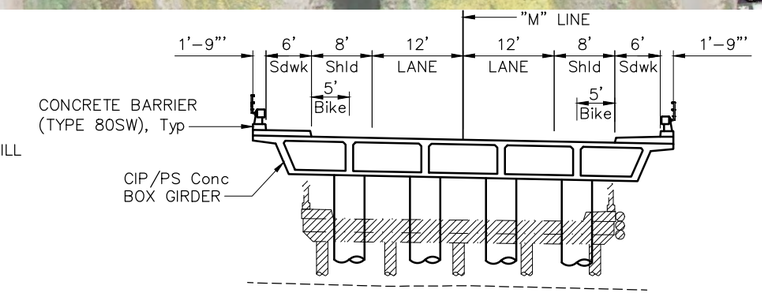

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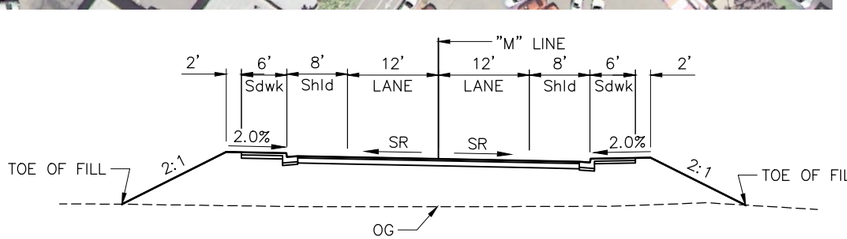

EAST APPROACH SECTION
1" = 10'

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — Carolyn Davis — No. C58440 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

FILE NO.

MARSH DRIVE BRIDGE OVER WALNUT CREEK

CIP/PS BOX GIRDER ALTERNATIVE 1 PLAN

SHEET 1 OF 9

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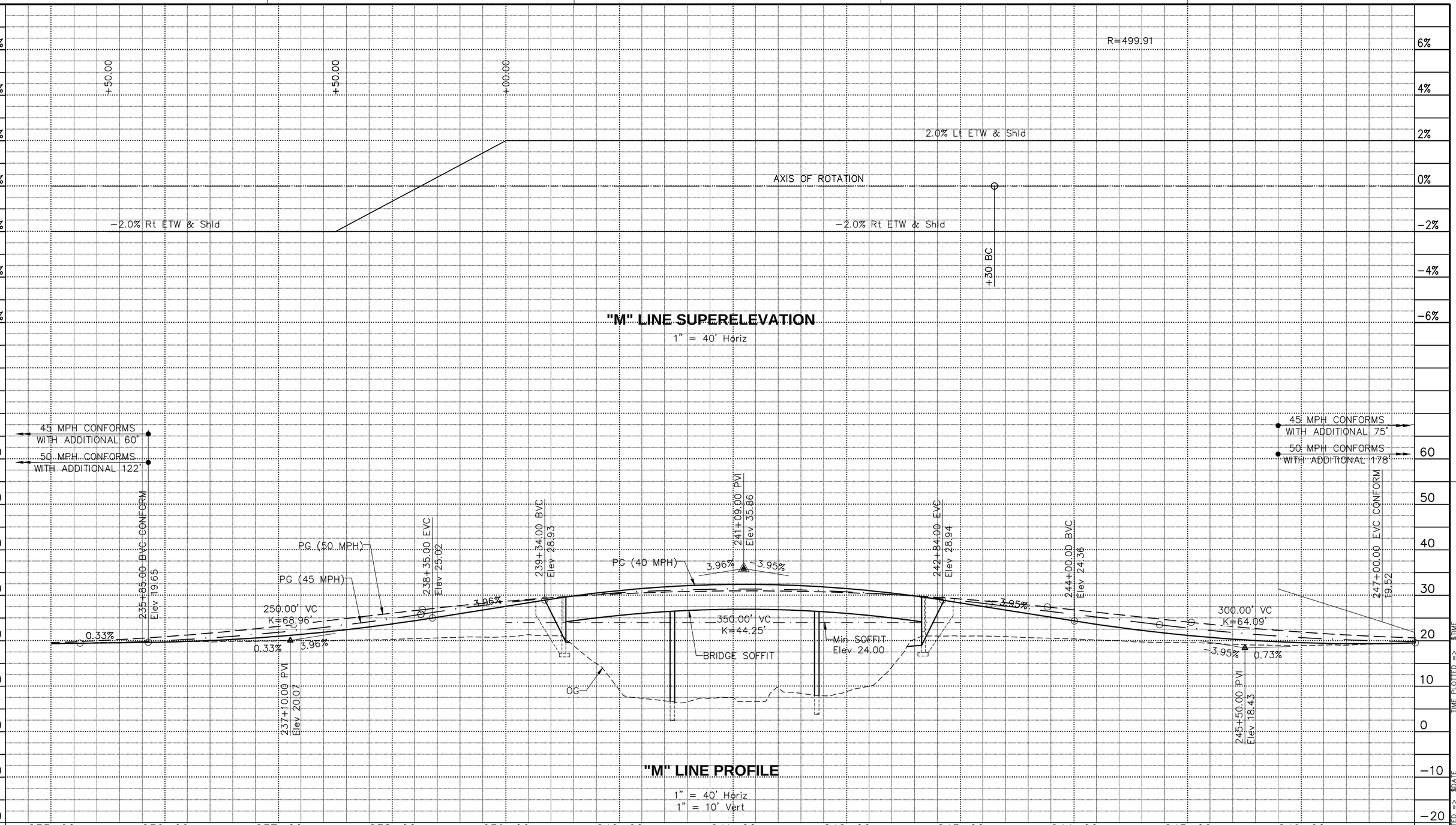
TIME PLOTTED => $TIME
FILE => $REQUEST



"M" LINE SUPERELEVATION

1" = 40' Horiz

"M" LINE PROFILE

1" = 40' Horiz
1" = 10' Vert

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

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 6/17/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — Carolyn Davis — No. C58440 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

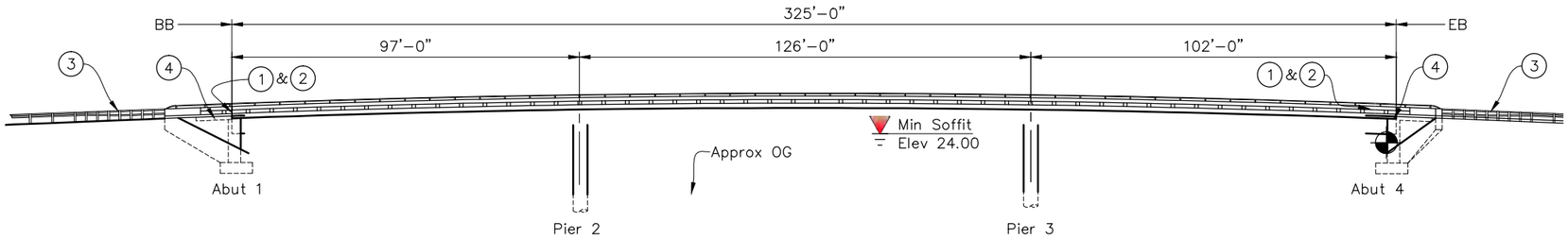
CIP/PS BOX GIRDER ALTERNATIVE 1 PROFILE

FILE NO.

SHEET 2 OF 9

FILE NAME: PEN TBL:

PROFILE GRADE
NO SCALE



ELEVATION
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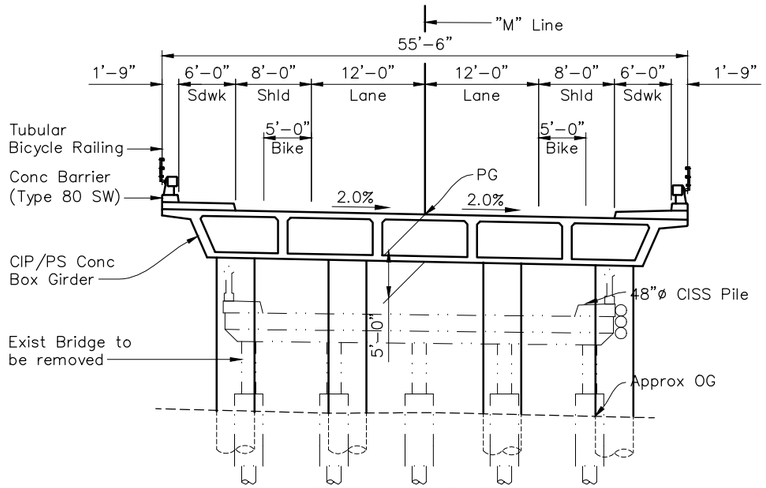

TYPICAL SECTION
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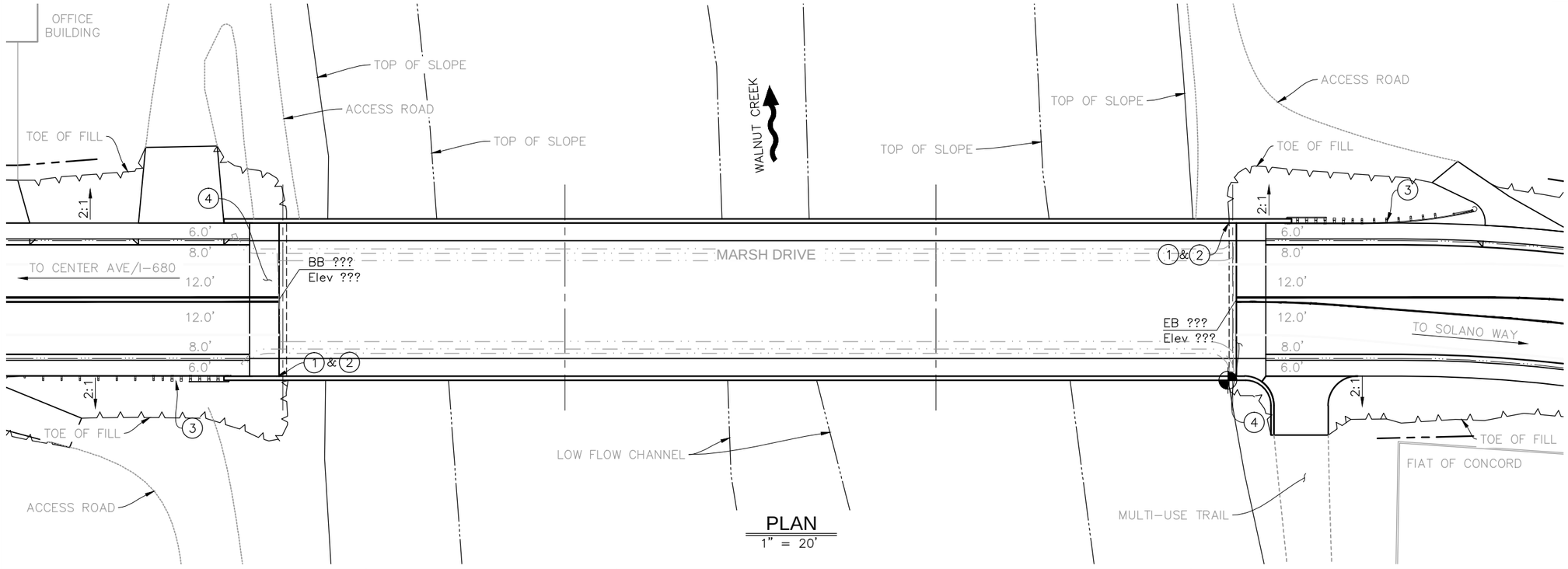

PLAN
1" = 20'

Notes:
1. Paint "XXX Bridge"
2. Paint "No. XXX–XXXX"
3. MBGR see "Road Plans"
4. Structure Approach Type EQ (10)

Point of Min vertical clearance

Existing structure

For General Notes, see "Deck Contours" sheet.
For Hydrologic Summary, see "Foundation Plan" sheet
For Utilities, see "Typical Section" sheet

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: J. Foster
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — James L. Foster Jr. — No. C45695 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

James L. Foster Jr.
PROJECT ENGINEER

Draft
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

BRIDGE NO.
28C–0442

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

ADVANCE PLANNING STUDY 1

FILE NO.

SHEET 3 OF 9

FILE NAME:

PEN TBL:

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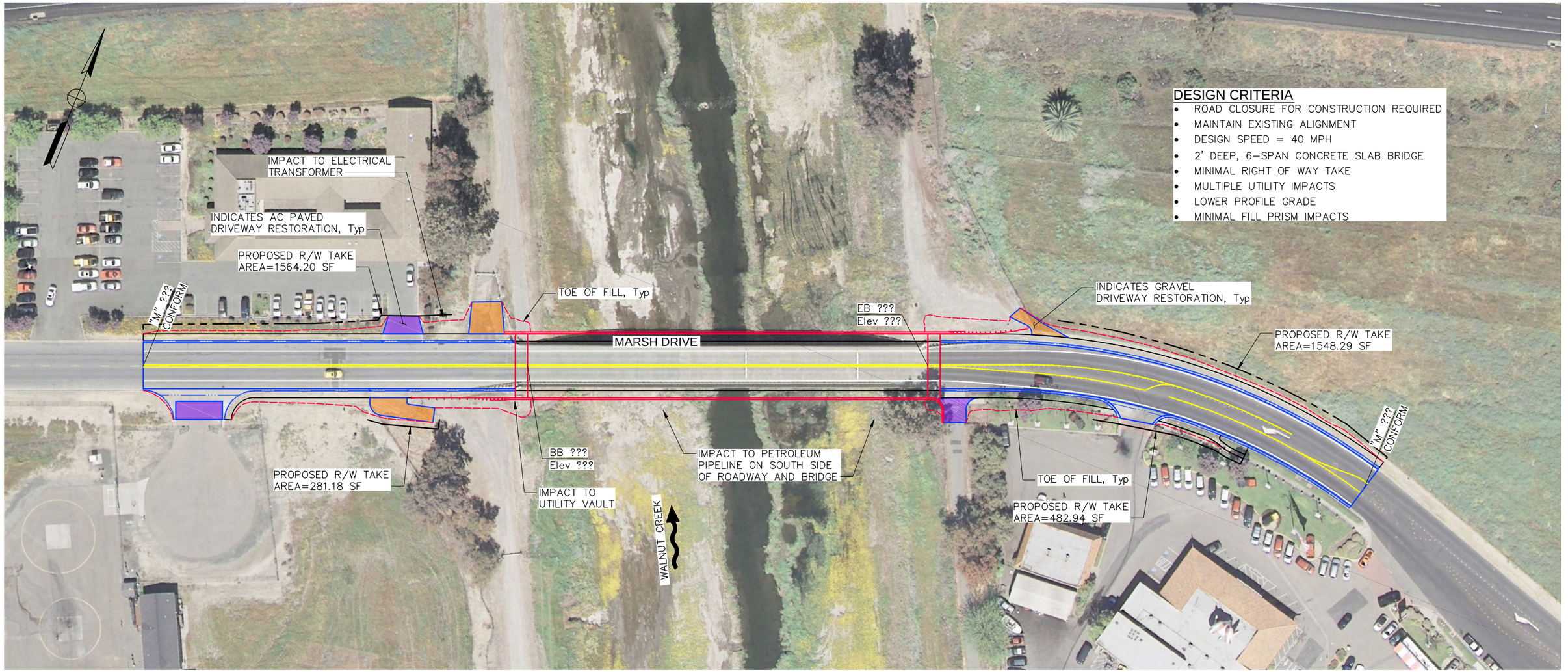
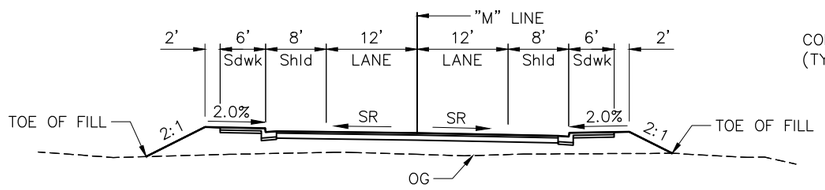
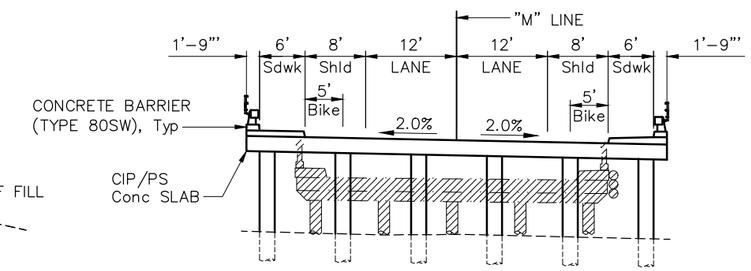
DATE PLOTTED => $DATE
USERNAME => $USER
FILE => $REQUEST

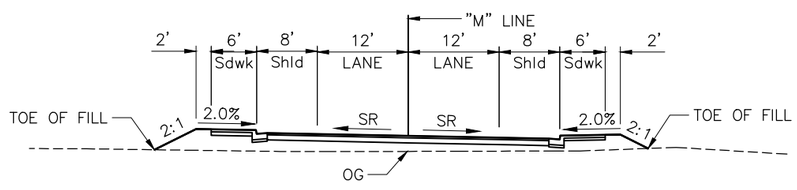




ALT 2 & ALT 3 WEST APPROACH SECTION
1" = 10'



BRIDGE SECTION
1" = 10'



ALT 2 & ALT 3 EAST APPROACH SECTION
1" = 10'

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — Carolyn Davis — No. C58440 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

CIP/PS SLAB ALTERNATIVE 2 PLAN

FILE NO.

SHEET 4 OF 9

FILE NAME:

PEN TBL:

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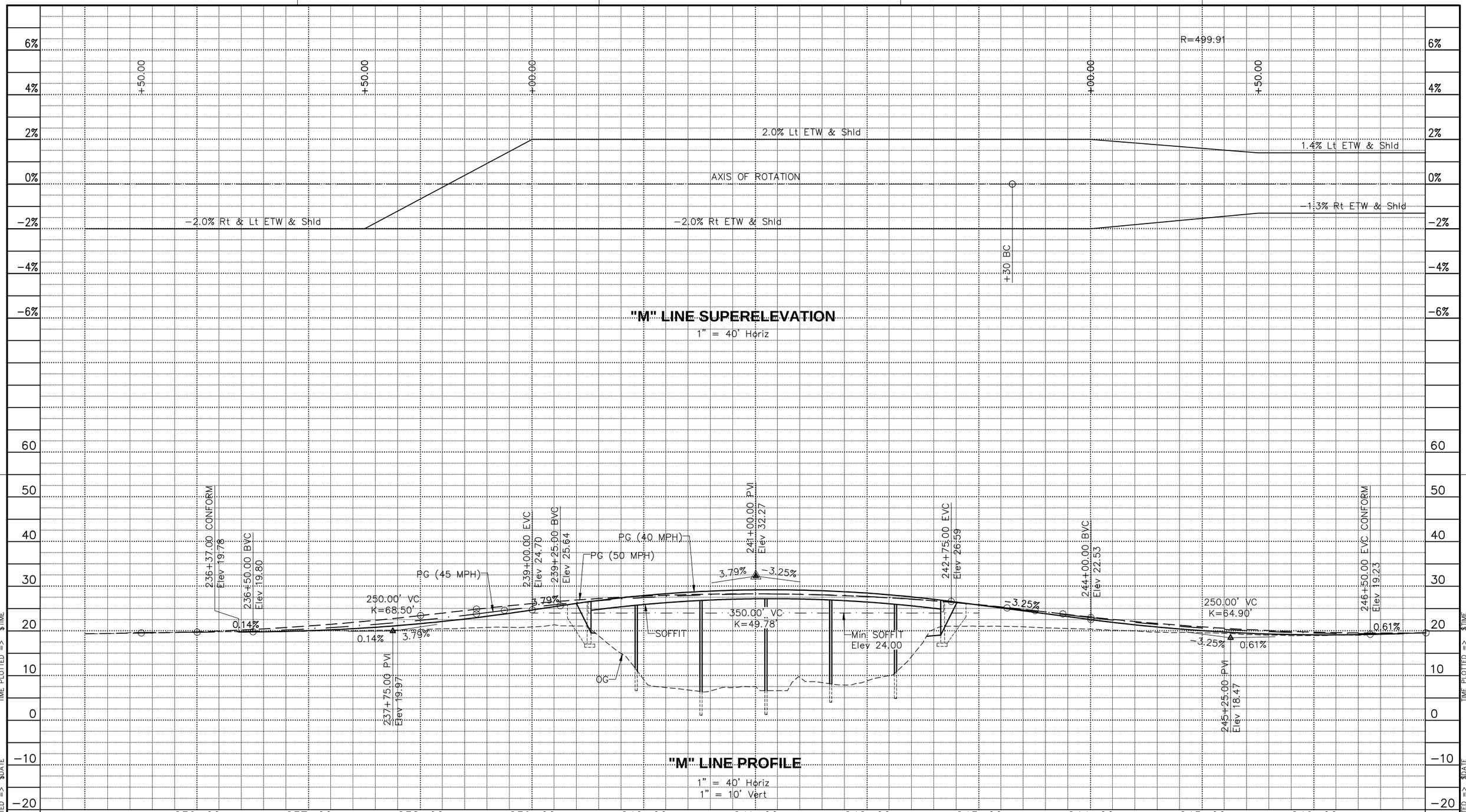
DATE PLOTTED => $DATE
TIME PLOTTED => $TIME
FILE => $REQUEST



"M" LINE SUPERELEVATION

1" = 40' Horiz

"M" LINE PROFILE

1" = 40' Horiz
1" = 10' Vert

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

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 6/17/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER
Carolyn Davis
No. C58440
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

CIP/PS SLAB ALTERNATIVE 2 PROFILE

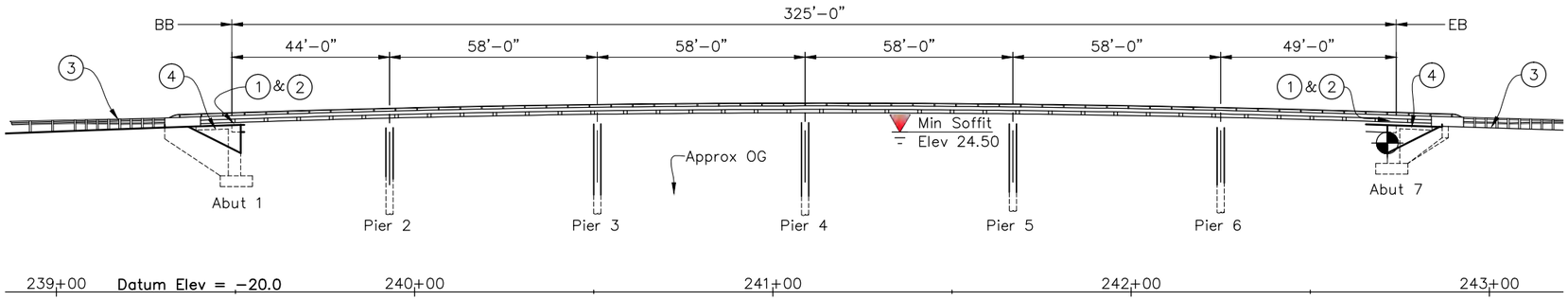
FILE NO.

SHEET 5 OF 9

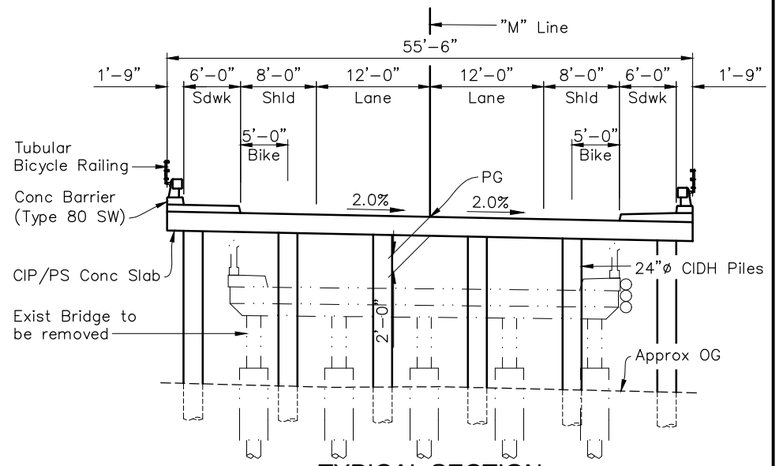
FILE NAME:

PEN TBL:

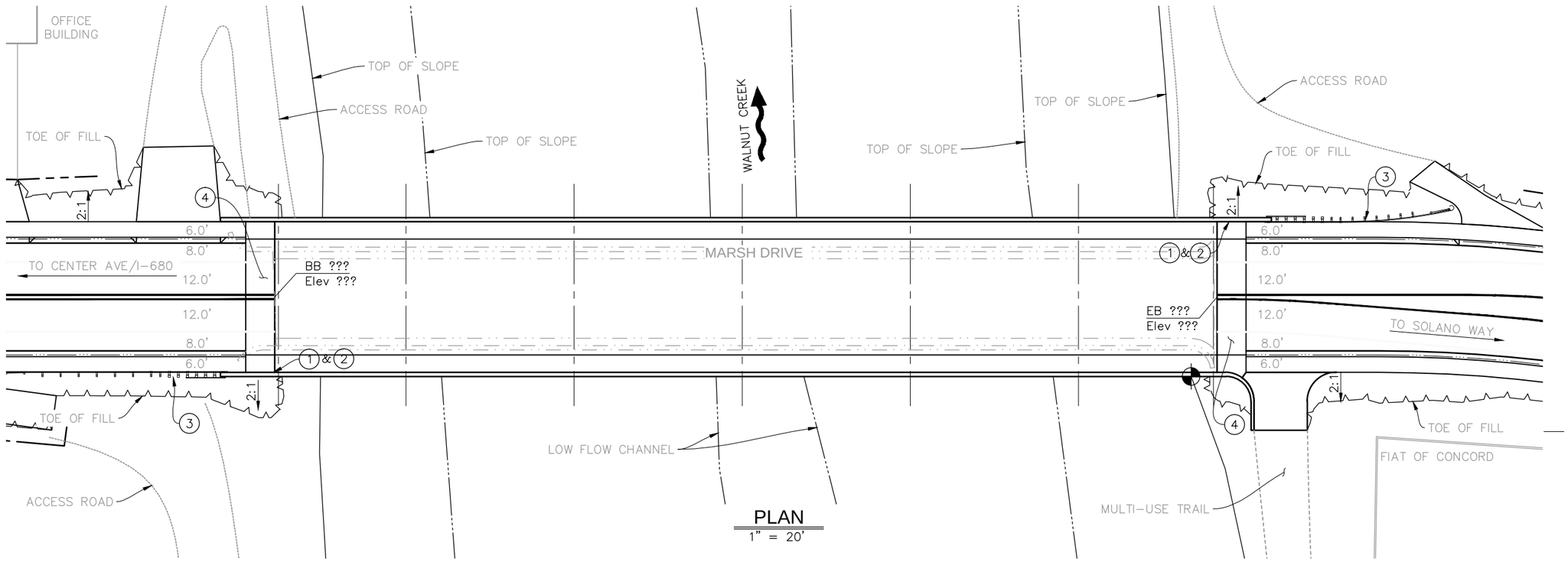
PROFILE GRADE
NO SCALE



ELEVATION
1" = 20'



TYPICAL SECTION
1/8" = 1'–0"



PLAN
1" = 20'

Notes:
1. Paint "XXX Bridge"
2. Paint "No. XXX–XXXX"
3. MBGR see "Road Plans"
4. Structure Approach Type EQ (10)

Point of Min vertical clearance

Existing structure

For General Notes, see "Deck Contours" sheet.
For Hydrologic Summary, see "Foundation Plan" sheet
For Utilities, see "Typical Section" sheet

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: J. Foster
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — James L. Foster Jr. — No. C45695 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

James L. Foster Jr.
PROJECT ENGINEER

Draft
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

BRIDGE NO.
28C–0442

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

ADVANCE PLANNING STUDY 2

FILE NO.

SHEET 6 OF 9

FILE NAME:

PEN TBL:

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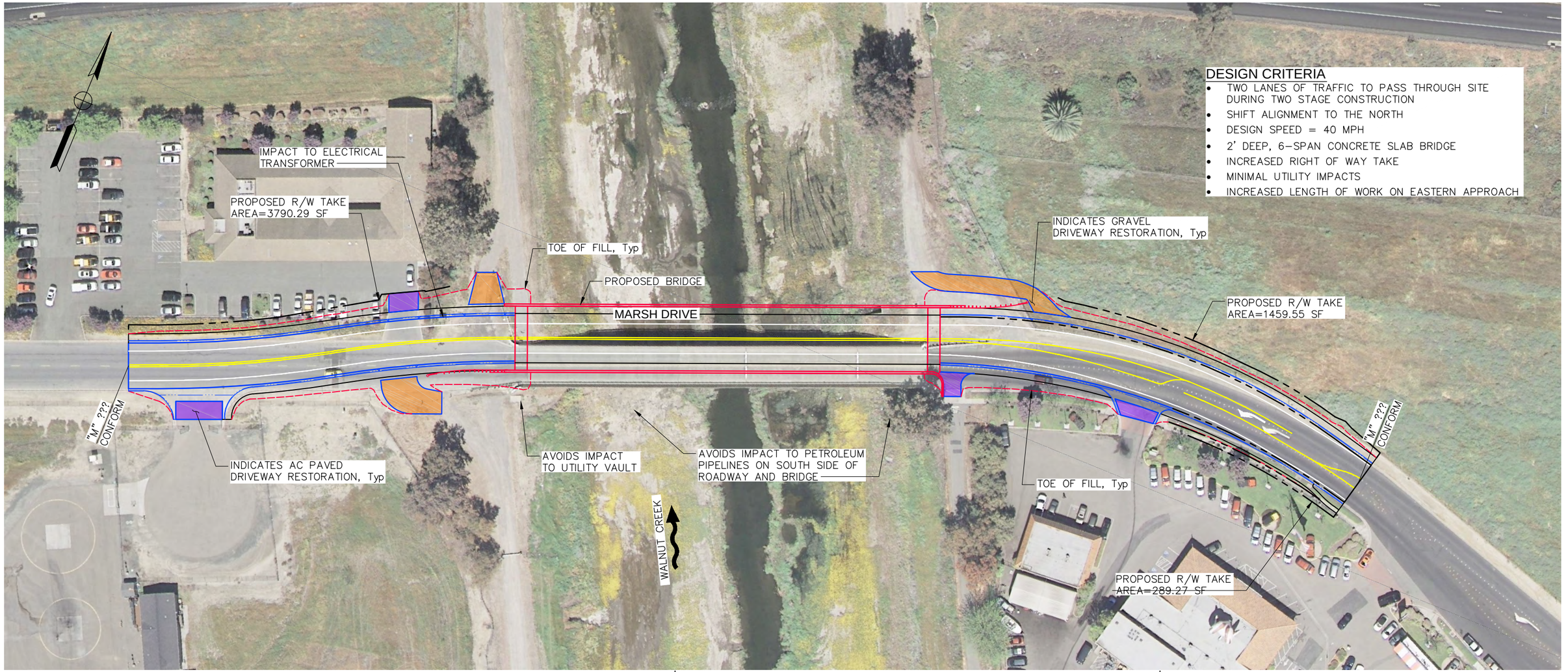
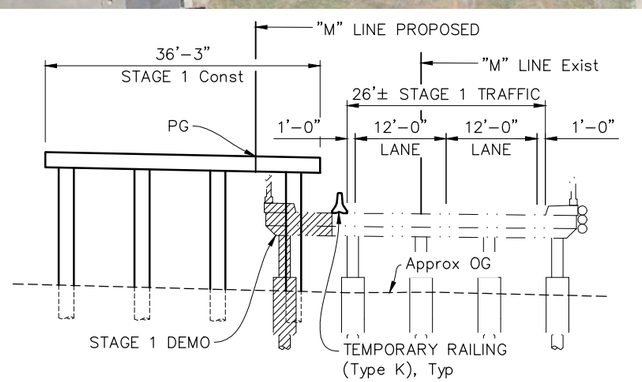
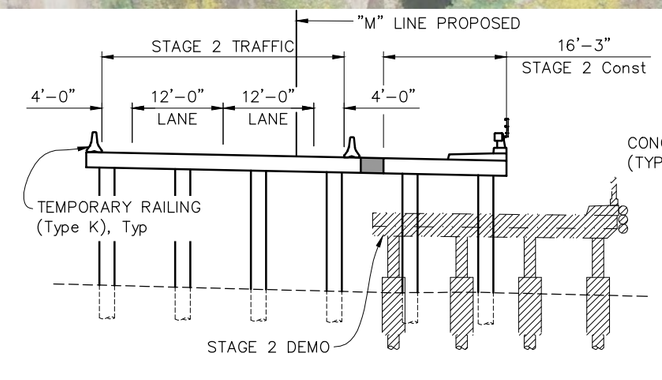
DATE PLOTTED => $DATE
USERNAME => $USER
FILE => $REQUEST





STAGE 1
NO SCALE



STAGE 2
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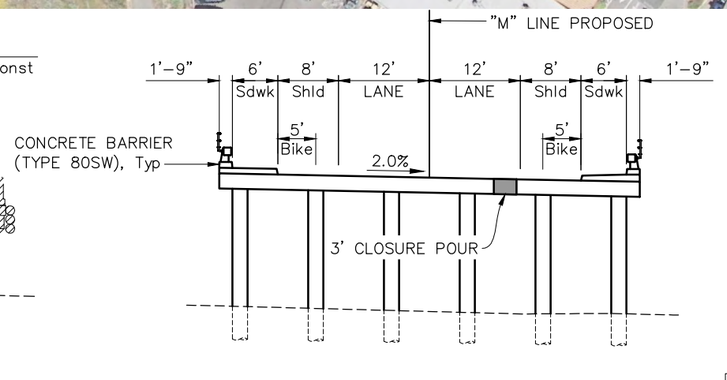

FINAL CONFIGURATION
NO SCALE

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS

NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — Carolyn Davis — No. C58440 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

FILE NO.

MARSH DRIVE BRIDGE OVER WALNUT CREEK

CIP/PS SLAB (2-STAGE CONST.) ALTERNATIVE 3 PLAN

SHEET 7 OF 9

FILE NAME: PEN TBL:

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TIME PLOTTED => $TIME
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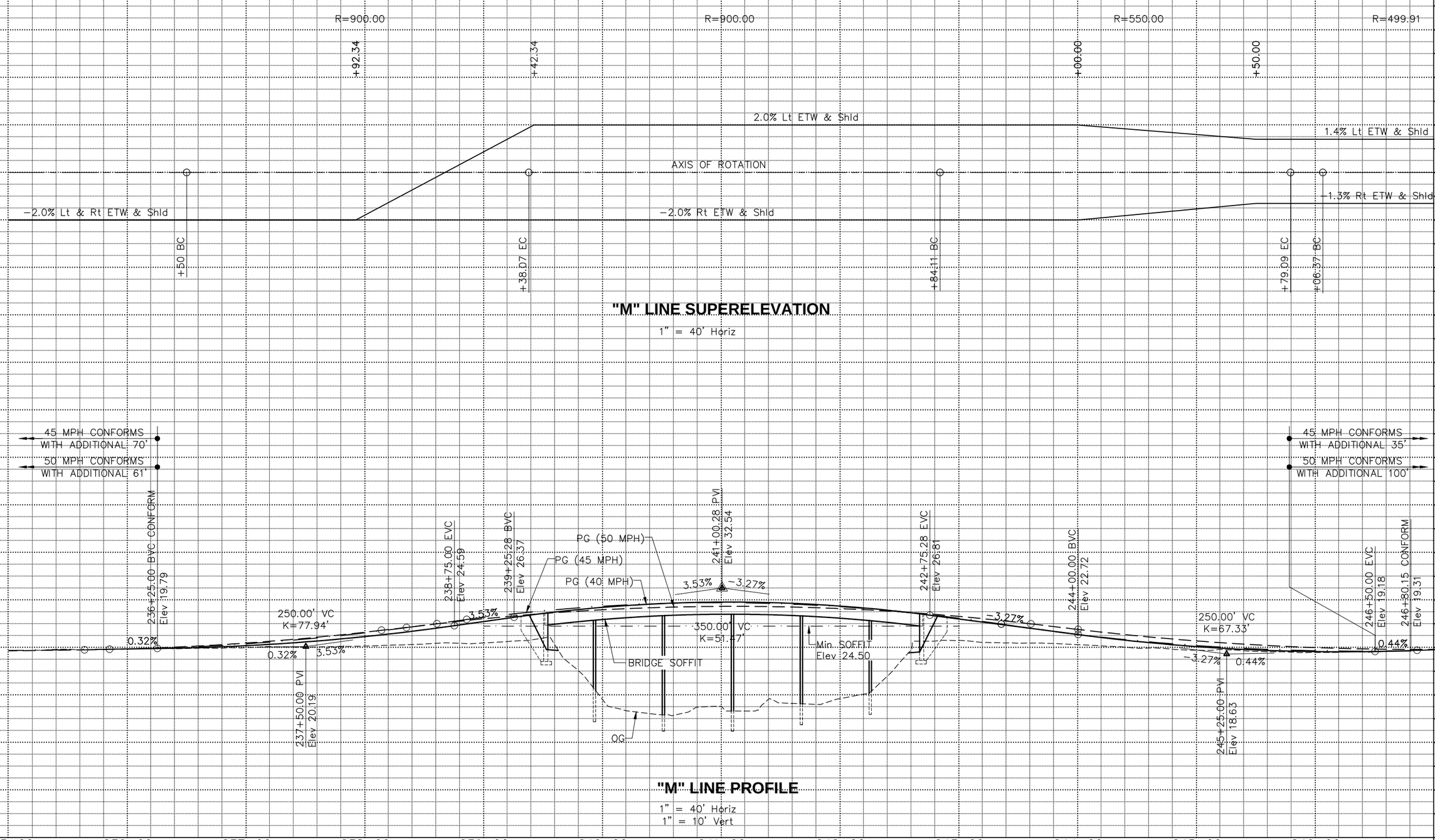


"M" LINE SUPERELEVATION

1" = 40' Horiz

"M" LINE PROFILE

1" = 40' Horiz
1" = 10' Vert

STATION	235+00	236+00	237+00	238+00	239+00	240+00	241+00	242+00	243+00	244+00	245+00	246+00	TOTAL
CY Exc													
CY Emb													

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

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: C. Davis
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 6/17/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER
Carolyn Davis
No. C58440
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

Carolyn Davis
PROJECT ENGINEER

Preliminary
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

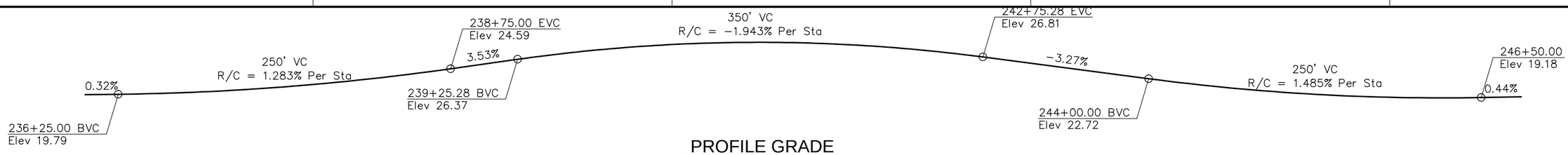
CIP/PS SLAB (2-STAGE CONST) ALTERNATIVE 3 PROFILE

FILE NO.

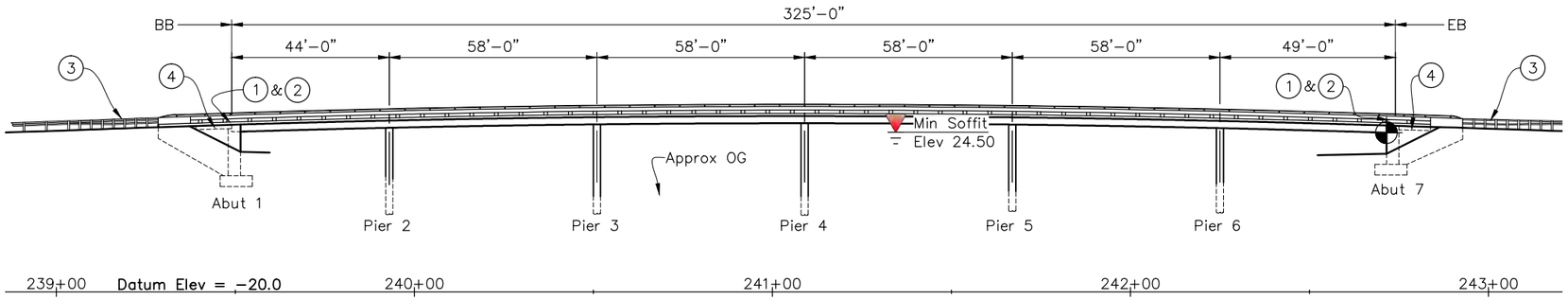
SHEET 8 OF 9

FILE NAME:

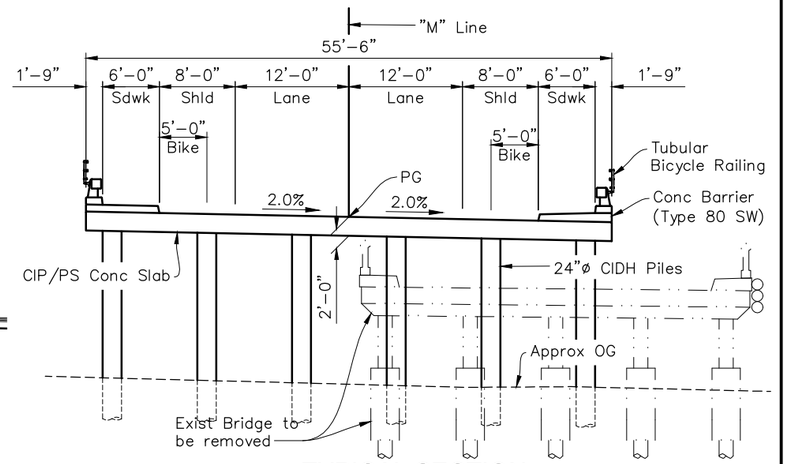
PEN TBL:



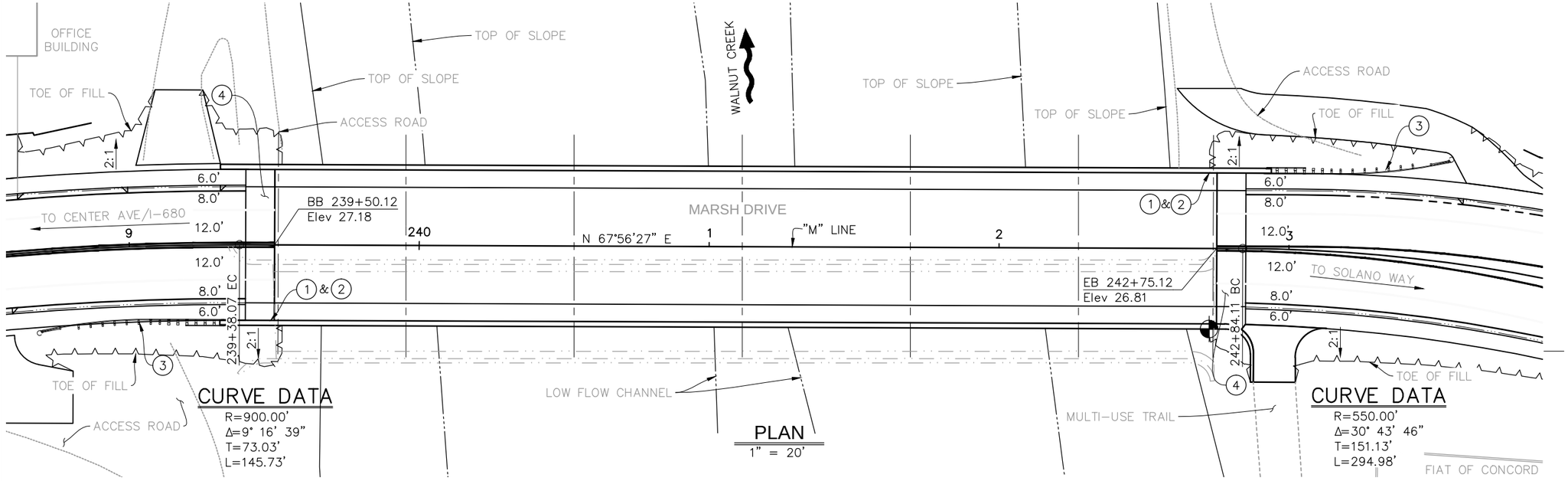
PROFILE GRADE
NO SCALE



ELEVATION
1" = 20'



TYPICAL SECTION
1/8" = 1'-0"



CURVE DATA
R=900.00'
Δ=9° 16' 39"
T=73.03'
L=145.73'

PLAN
1" = 20'

CURVE DATA
R=550.00'
Δ=30° 43' 46"
T=151.13'
L=294.98'

FIAT OF CONCORD

Notes:
1. Paint "XXX Bridge"
2. Paint "No. XXX-XXXX"
3. MBGR see "Road Plans"
4. Structure Approach Type EQ (10)

Point of Min vertical clearance

Existing structure

For General Notes, see "Deck Contours" sheet.
For Hydrologic Summary, see "Foundation Plan" sheet
For Utilities, see "Typical Section" sheet

QUINCY ENGINEERING, INC
11017 Cobblerock Drive, Suite 100
Rancho Cordova, CA 95670

REVISIONS			
NO.	DESCRIPTION	BY	DATE

DES.: J. Foster
DRAWN: D. Polglase
CHKD.: X. XXXXXXX
DATE: 10/02/2014
SCALE:
FLD. BK.

REGISTERED PROFESSIONAL ENGINEER — James L. Foster Jr. — No. C45695 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA

James L. Foster Jr.
PROJECT ENGINEER

Draft
PLANS APPROVAL DATE

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
255 GLACIER DRIVE
MARTINEZ, CALIFORNIA 94553

BRIDGE NO.
28C-0442

FOR REDUCED PLANS
ORIGINAL SCALE IS IN INCHES
0 1 2 3

BASE MAP	EAST COORD.	NORTH COORD.
X00	0000	0000

MARSH DRIVE BRIDGE
OVER WALNUT CREEK

ADVANCE PLANNING STUDY 3

FILE NO.

SHEET 9 OF 9

FILE NAME:

PEN TBL:

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

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b. Retrofit and Rehabilitate Alternative Plans

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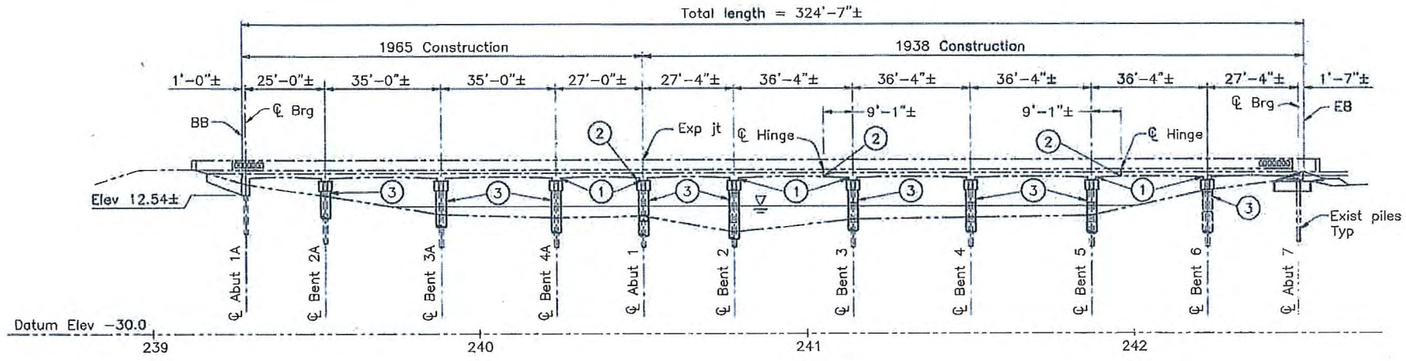
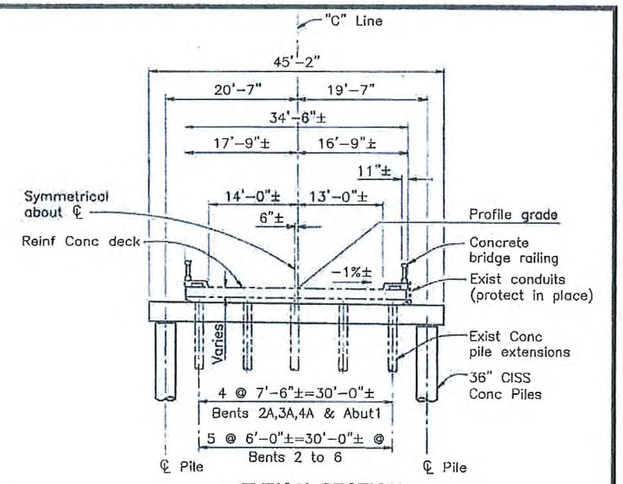


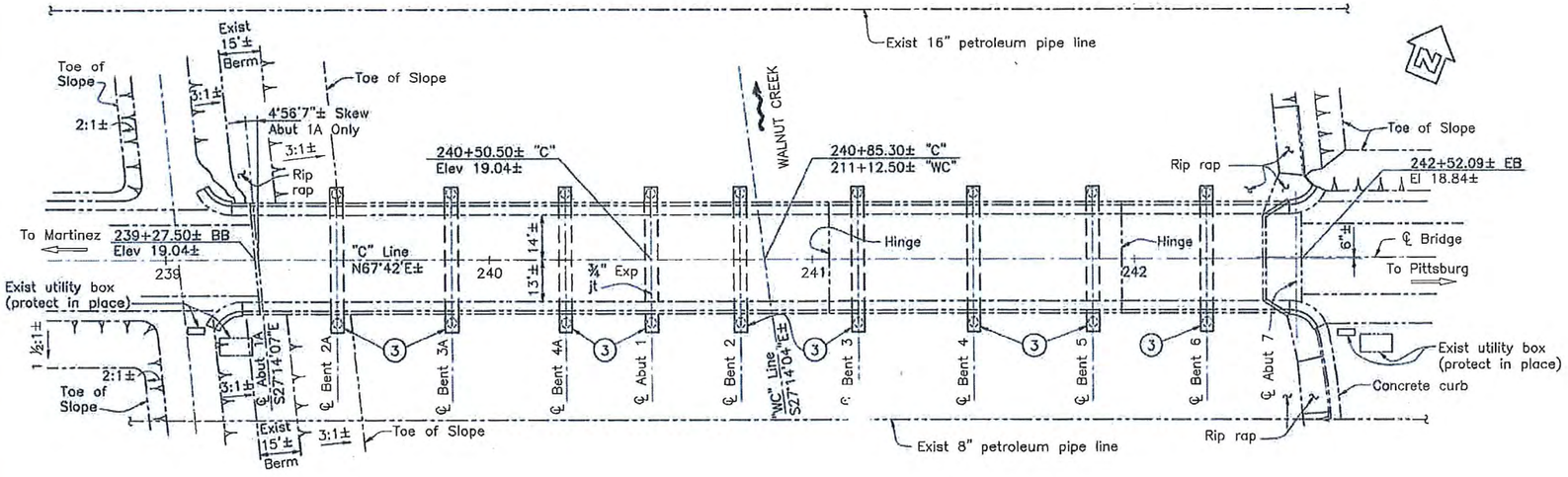
ELEVATION
1"=20'



TYPICAL SECTION
1"=10'

BENCH MARK

V.C. 479 – Solano Way at Marsh Drive – Cut "+" on traffic signal bolt @ southwesterly corner – Elev = 20.450'



PLAN
1"=20'

RETROFIT LEGEND

1. Install cable restrainers
2. Install shear keys
3. Install CISS pile each side of deck & strengthen bent cap

STANDARD PLANS DATED MAY, 2006

A101A	ABBREVIATION
A101B	SYMBOLS
B0-1	BRIDGE DETAILS
B0-13	BRIDGE DETAILS

IN-PROGRESS 80% SUBMITTAL

Alternative 4 – Seismic Retrofit with outrigger bents

The contractor shall verify controlling field dimensions prior to ordering or fabricating any material

REGISTERED PROFESSIONAL ENGINEER — ESMOND C. CHAN — No. 53923 — Exp. 12/31/11 — STRUCTURAL — STATE OF CALIFORNIA

Prepared by:

JMEC ENGINEERING INC.
165 LENNON LANE, SUITE 106
WALNUT CREEK, CA 94598
PHONE (925) 944-8999
FAX (925) 944-9998

REVIEWED _____ 20__
CITY ENGINEER

City of Concord
Department of Public Works & Engineering
1950 Parkside Drive
Concord, CA 94519
(925) 671-3361

RECORD DRAWING
(NO WARRANTY AS TO ACCURACY)
DATE ACCEPTED_____
PROJECT ENGINEER
REVISIONS BY_____ DATE____

NO.	DESCRIPTION	BY	DATE

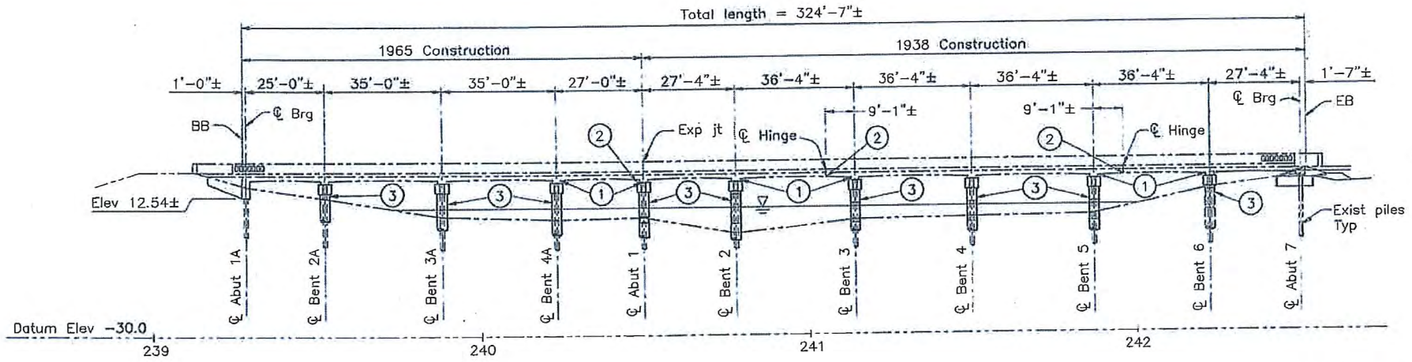
CITY OF CONCORD

MARSH DRIVE BRIDGE OVER WALNUT CREEK — S-1 — BR. NO. 28C-0442

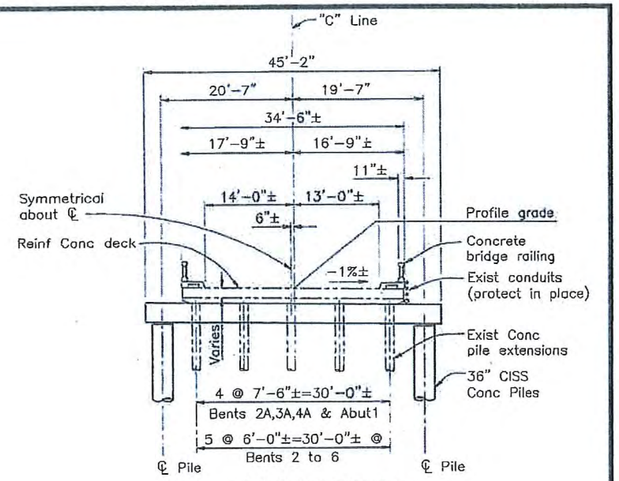
GENERAL PLAN

DESIGNED: E.C.	CHECKED: G.M.	SCALE: AS SHOWN	
DRAWN: K.L.	DATE: 08/31/10		
ROLL: FRAME	PROJECT NO. PJ 1854	SHEET 3	OF –

C:\CAD PROJ\3022\3022sp1.dwg Aug 31, 10 3:29pm



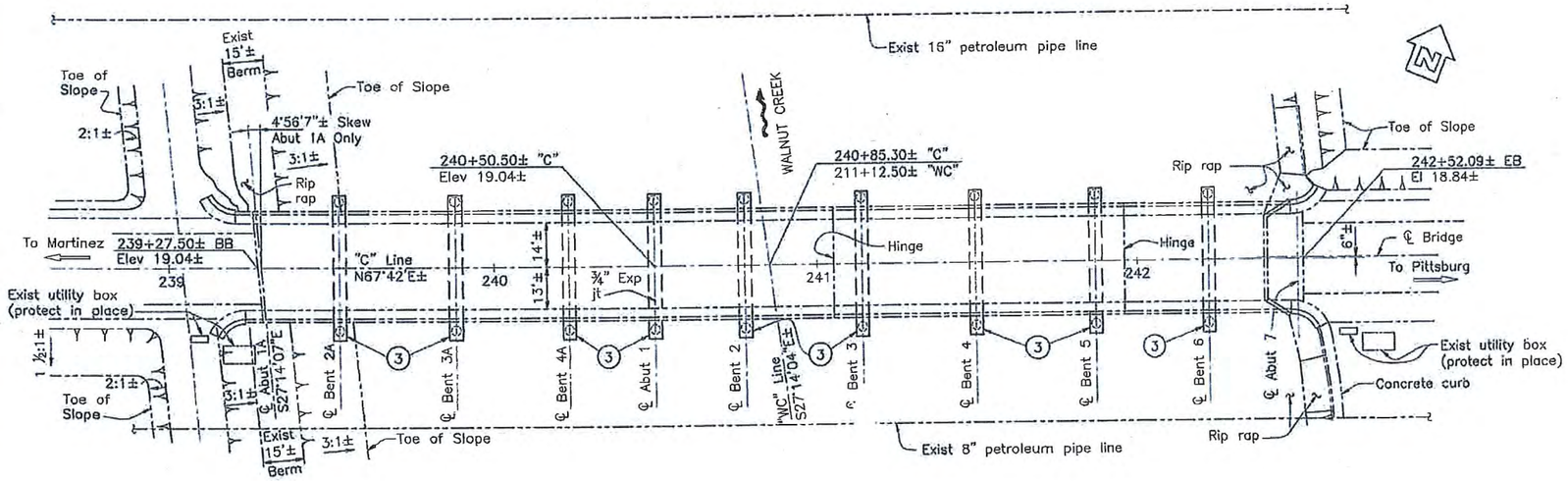
ELEVATION
1"=20'



TYPICAL SECTION
1"=10'

BENCH MARK

V.C. 479 – Solano Way at Marsh Drive – Cut "+" on traffic signal bolt @ southwesterly corner – Elev = 20.450'



PLAN
1"=20'

RETROFIT LEGEND

1. Install cable restrainers
2. Install shear keys
3. Install CISS pile each side of deck & strengthen bent cap

4. Raise Bridge Deck approximately 3 feet
5. Rehabilitate Bridge Deck with Methacrylate Sealant and Polyester Concrete overlay

IN-PROGRESS 80% SUBMITTAL

Alternative 5 – Seismic Retrofit, Raise Bridge, and Rehabilitate Bridge Deck

The contractor shall verify controlling field dimensions prior to ordering or fabricating any material

REGISTERED PROFESSIONAL ENGINEER — ESMOND C. CHAN — No. S3923 — Exp. 12/31/11 — STRUCTURAL — STATE OF CALIFORNIA

Prepared by:
JMEC ENGINEERING INC.
165 LENNON LANE, SUITE 106
WALNUT CREEK, CA 94598
PHONE (925) 944-6999
FAX (925) 944-9996

REVIEWED _____ 20__
CITY ENGINEER

City of Concord
Department of Public Works & Engineering
1950 Parkside Drive
Concord, CA 94519
(925) 671-3361

RECORD DRAWING
(NO WARRANTY AS TO ACCURACY)
DATE ACCEPTED _____
PROJECT ENGINEER
REVISIONS BY _____ DATE _____

REVISIONS			
NO.	DESCRIPTION	BY	DATE

CITY OF CONCORD

MARSH DRIVE BRIDGE OVER WALNUT CREEK — S-1 — BR. NO. 28C-0442

GENERAL PLAN

DESIGNED	E.C.	CHECKED G.M.	SCALE: AS SHOWN
DRAWN	K.L.	DATE: 08/31/10	
ROLL	FRAME	PROJECT NO. PJ 1854	SHEET 3 OF –

C:\C4S PROJ\30820\30820pj1.dwg Aug 31, 10 3:29pm

c. Cost Estimate

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Marsh Creek Road over Walnut Creek Bridge

Cost Summary

Alternative 1 - CIP/PS Box girder, One Stage, Road Closure															
Bridge Advance Planning Study Cost Estimate					**Roadway Planning Study Cost Estimate**				**Right of Way Planning Study Cost Estimate**						**Total**
Date of estimate			10/3/2014		Date of estimate			6/13/2014	Date of estimate			8/11/2014			
Structure Depth			5.0		Approach Roadway grade raise			6.0	Parcels affected			1			
Length			325		Length			797	Length			Varies			
Width			55.5		Average Width			56	Average Width			Varies			
Area			18037.5		Area			44632	Area (SF)			7088			
Cost	18037.5	200	$ 3,607,500		Cost	44632	29	$ 1,300,000	Cost (per County)	7088	35	$ 300,000			
10% Mobilization	3607500	10%	$ 360,750							Incl 20% addl for real prop costs					
25% Contingency	3968250	25%	$ 992,063												
Subtotal			$ 4,960,313		Subtotal			$ 1,300,000	Subtotal			$ 300,000			
Bridge Removal	13440	10	$ 134,400						High Risk Utility relocation (LF)			$ -			
Total Bridge Cost			$ 5,094,713		Total Road Cost			$ 1,300,000	Total RW/Utility Cost			$ 300,000			
Bridge Budget			**$ 5,095,000**		**Road Budget**			**$ 1,300,000**	**RW/Utility Budget**			**$ 300,000**			**$ 6,695,000**

Alternative 2 - CIP/PS Slab, One Stage, Road Closure															
Bridge Advance Planning Study Cost Estimate					**Roadway Planning Study Cost Estimate**				**Right of Way Planning Study Cost Estimate**						**Total**
Date of estimate			10/3/2014		Date of estimate			6/13/2014	Date of estimate			8/11/2014			
Structure Depth			2.0		Approach Roadway grade raise			3.0	Parcels affected			1			
Length			325		Length			695	Length			Varies			
Width			55.5		Average Width			56	Average Width			Varies			
Area			18037.5		Area			38920	Area (SF)			3877			
Cost	18037.5	160	$ 2,886,000		Cost	38920	28	$ 1,080,000	Cost (per County)	3877	35	$ 170,000			
10% Mobilization	2886000	10%	$ 288,600							Incl 20% addl for real prop costs					
25% Contingency	3174600	25%	$ 793,650												
Subtotal			$ 3,968,250		Subtotal			$ 1,080,000	Subtotal			$ 170,000			
Bridge Removal	13440	10	$ 134,400						High Risk Utility relocation (LF)			$ -			
Total Bridge Cost			$ 4,102,650		Total Road Cost			$ 1,080,000	Total RW/Utility Cost			$ 170,000			
Bridge Budget			**$ 4,103,000**		**Road Budget**			**$ 1,080,000**	**RW/Utility Budget**			**$ 170,000**			**$ 5,353,000**

Alternative 3 - CIP/PS Slab, Two Stage, Two Lanes open															
Bridge Advance Planning Study Cost Estimate					**Roadway Planning Study Cost Estimate**				**Right of Way Planning Study Cost Estimate**						
Date of estimate			10/3/2014		Date of estimate			6/13/2014	Date of estimate			8/11/2014			**Total**
Structure Depth			2.0		Approach Roadway grade raise			3.0	Parcels affected			2			
Length			325		Length			707	Length			Varies			
Width			55.5		Average Width			56	Average Width			Varies			
Area			18037.5		Area			39592	Area (SF)			5539			
Cost	18037.5	180	$ 3,246,750		Cost	39592	30	$ 1,200,000	Cost (per County)	5539	35	$ 240,000			
10% Mobilization	3246750	10%	$ 324,675							Incl 20% addl for real prop costs					
25% Contingency	3571425	25%	$ 892,856												
Subtotal			$ 4,464,281		Subtotal			$ 1,200,000	Subtotal			$ 240,000			
Bridge Removal	13440	10	$ 134,400						High Risk Utility relocation (LF)			$ -			
Total Bridge Cost			$ 4,598,681		Total Road Cost			$ 1,200,000	Total RW/Utility Cost			$ 240,000			
Bridge Budget			**$ 4,599,000**		**Road Budget**			**$ 1,200,000**	**RW/Utility Budget**			**$ 240,000**			**$ 6,039,000**

Marsh Creek Road over Walnut Creek Bridge

Programming Breakdown

Alternative 1 - CIP/PS Box girder, One Stage, Road Closure							
Programming Breakdown							
PE	RW	CON	Cont.	CE	HBP Participating	HBP	Local
25%			25%	15%		88.53%	11.47%
$ 1,279,000	$ 300,000	$ 5,116,000	$ 1,279,000	$ 767,400	**$ 8,741,400**	$ 7,738,761	$ 1,002,639

Alternative 2 - CIP/PS Slab, One Stage, Road Closure							
Programming Breakdown							
PE	RW	CON	Cont.	CE	HBP Participating	HBP	Local
25%			25%	15%		88.53%	11.47%
$ 1,036,600	$ 170,000	$ 4,146,400	$ 1,036,600	$ 621,960	**$ 7,011,560**	$ 6,207,334	$ 804,226

Alternative 3 - CIP/PS Slab, Two Stage, Two Lanes open							
Programming Breakdown							
PE	RW	CON	Cont.	CE	HBP Participating	HBP	Local
25%			25%	15%		88.53%	11.47%
$ 1,159,800	$ 240,000	$ 4,639,200	$ 1,159,800	$ 695,880	**$ 7,894,680**	$ 6,989,160	$ 905,520

PROJECT PLANNING COST ESTIMATE
(DRAFT FEASIBILITY REPORT COST ESTIMATE)

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA
Program Code

PROJECT DESCRIPTION:

Limits: Marsh Drive Bridge Over Walnut Creek

Proposed Improvement (Scope): Replace Marsh Drive Bridge Over Walnut Creek
Alternative 1 - CIP/PS Box girder, One Stage, Road Closure

SUMMARY OF PROJECT COST ESTIMATE

TOTAL ROADWAY ITEMS	$	1,300,000
TOTAL STRUCTURE ITEMS	$	5,094,713
SUBTOTAL CONSTRUCTION COSTS	$	6,394,713
TOTAL RIGHT OF WAY ITEMS	$	300,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	$	6,694,713

Alternative 1

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

I. ROADWAY ITEMS

Section 1 Earthwork	Quantity	Unit		Unit Price ($)		Item Cost ($)	Section Cost
Roadway Excavation	210	CY	$	50	$	10,500	
Imported Borrow	4550	CY	$	50	$	227,500	
Clearing & Grubbing	1	LS	$	20,000	$	20,000	
Rock Slope Protection (Light, Method B)	250	CY	$	225	$	56,250	
Rock Slope Protection Fabric	130	SQYD	$	10	$	1,300	
			$		$		
			$		$		
						Subtotal Earthwork $	315,550

Section 2 Pavement Structural Section*							
HMA (Type B)	550	TONS	$	180	$	99,000	
Class 2 Aggregate Base	720	CY	$	60	$	43,200	
Minor Concrete (Sidewalk)	70	CY	$	400	$	28,000	
Minor Concrete (Curb and Gutter)	71	CY	$	350	$	24,850	
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
						Subtotal Pavement Structural Section $	195,050

Section 3 Drainage							
Drainage System	1	LS	$	40,000	$	40,000	
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
						Subtotal Drainage $	40,000

*Reference sketch showing typical pavement structural section elements of the roadway.
Include (if available) T.I., R-Value and date when tests were performed.
NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 1

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

Section 4 Specialty Items	Quantity	Unit	Unit Price	Item Cost	Section Cost
Erosion Control	1	LS	$ 50,000	$ 50,000	
Water Pollution Control	1	LS	$ 20,000	$ 20,000	
Channel Stream Diversion	1	LS	$ 50,000	$ 50,000	
Pavement Delineation	1	LS	$ 5,000	$ 5,000	
Environmental Mitigation	1	LS	$ 100,000	$ 100,000	
Temporary Pedestrian Bridge	1	LS	$ 150,000	$ 150,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Specialty Items $	375,000

Section 5 Traffic Items					
Traffic Control	1	LS	$ 10,000	$ 10,000	
Roadside Signs	1	LS	$ 5,000	$ 5,000	
Construction Area Signs	1	LS	$ 10,000	$ 10,000	
Construction Staking	1	LS	$ 10,000	$ 10,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Traffic Items $	35,000

TOTAL SECTIONS 1 thru 5 $ 920,600

NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 1

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

Section 6 Minor Items	Item Cost	Section Cost
$ 920600 x (5%) = $ 46030 (Subtotal Sections 1 thru 5)		
TOTAL MINOR ITEMS		$ 46,030

Section 7 Roadway Mobilization		
$ 966630 x (10%) = $ 96663 (Subtotal Sections 1 thru 6)		
TOTAL ROADWAY MOBILIZATION		$ 96,663

Section 8 Roadway Additions

Supplemental Work
$ 966,630 x (5%) = $ 48332
(Subtotal Sections 1 thru 6)

Contingencies
$ 966,630 x (20%) = $ 193326
(Subtotal Sections 1 thru 6)

TOTAL ROADWAY ADDITIONS $ 241,658

TOTAL ROADWAY ITEMS $1,300,000
(Subtotal Sections 1 thru 8)

Estimate Prepared By M. Elledge (Print Name) Phone # (916) 368-9181 Date 6/12/2014

Estimate Checked By C. Davis (Print Name) Phone # (916) 368-9181 Date 7/31/2014

** Use appropriate percentage per Chapter 20.

Alternative 1

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

II. STRUCTURES ITEMS **Alternative 1 - CIP/PS Box girder, One Stage, Road Closure**

	Bridge	Bridge Removal	Detour Structure
Bridge Name	M.C.D.F. Br		
Structure Type	CIP/PS Slab		
Width (out to out) - (ft)	55.5		
Span Lengths - (ft)	325		
Total Area - (ft2)	18038		
Footing Type (pile/spread)	CIDH Piling		
Cost Per ft2	$275		
(incl. 10% mobilization			
and 25% contingency)			
Total Cost for Structure	$ 4,960,313	$134,400	

SUBTOTAL STRUCTURES ITEMS $ 5,094,713
(Sum of Total Cost for Structures)

Railroad Related Costs:

$ _____
$ _____
$ _____

SUBTOTAL RAILROAD ITEMS $ _____

TOTAL STRUCTURES ITEMS $ 5,094,713
(Sum of Structures Items plus Railroad Items)

COMMENTS:

Estimate Prepared By J. Foster Phone # (916) 368-91 Date 6/14/2014
(Print Name)

NOTE: If appropriate, attach additional pages and backup.

Alternative 1

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

III. RIGHT OF WAY ITEMS				ESCALATED VALUE
				177200
A. Acquisition, including excess lands, damages to remainder(s) and Goodwill	7088 SF	35 $/SF	x20%	$300,000
B. Utility Relocation (State share)				$0
C. Relocation Assistance				
D. Clearance/Demolition				
E. Title and Escrow Fees				

TOTAL RIGHT OF WAY ITEMS $300,000
(Escalated Value)

Anticipated Date of Right of Way Certification $
(Date to which Values are Escalated)

F. Construction Contract Work

Brief Description of Work:

Right of Way Branch Cost Estimate for Work * $ Not Included

* This dollar amount is to be included in the Roadway and/or Structures Items of Work, as appropriate. Do not include in Right of Way Items.
COMMENTS:

Estimate Prepared By (Print Name) Phone # Date

NOTE: If appropriate, attach additional pages and backup.

PROJECT PLANNING COST ESTIMATE
(DRAFT FEASIBILITY REPORT COST ESTIMATE)

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA
Program Code

PROJECT DESCRIPTION:

Limits: Marsh Drive Bridge Over Walnut Creek

Proposed Improvement (Scope): Replace Marsh Drive Bridge Over Walnut Creek
Alternative 2 - CIP/PS Slab, One Stage, Road Closure

SUMMARY OF PROJECT COST ESTIMATE

TOTAL ROADWAY ITEMS	$ 1,080,000
TOTAL STRUCTURE ITEMS	$ 4,102,650
SUBTOTAL CONSTRUCTION COSTS	$ 5,182,650
TOTAL RIGHT OF WAY ITEMS	$ 170,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	$ 5,352,650

Alternative 2

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

I. ROADWAY ITEMS

Section 1 Earthwork	Quantity	Unit	Unit Price ($)	Item Cost ($)	Section Cost
Roadway Excavation	400	CY	$ 50	$ 20,000	
Imported Borrow	1700	CY	$ 50	$ 85,000	
Clearing & Grubbing	1	LS	$ 20,000	$ 20,000	
Rock Slope Protection (Light, Method B)	250	CY	$ 225	$ 56,250	
Rock Slope Protection Fabric	130	SQYD	$ 10	$ 1,300	
			$	$	
			$	$	
				Subtotal Earthwork $	182,550

Section 2 Pavement Structural Section*					
HMA (Type B)	480	TONS	$ 180	$ 86,400	
Class 2 Aggregate Base	620	CY	$ 60	$ 37,200	
Minor Concrete (Sidewalk)	70	CY	$ 400	$ 28,000	
Minor Concrete (Curb and Gutter)	71	CY	$ 350	$ 24,850	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Pavement Structural Section $	176,450

Section 3 Drainage					
Drainage System	1	LS	$ 40,000	$ 40,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Drainage $	40,000

*Reference sketch showing typical pavement structural section elements of the roadway.
Include (if available) T.I., R-Value and date when tests were performed.
NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 2

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

Section 4 Specialty Items	Quantity	Unit	Unit Price	Item Cost	Section Cost
Erosion Control	1	LS	$ 50,000	$ 50,000	
Water Pollution Control	1	LS	$ 20,000	$ 20,000	
Environmental Mitigation	1	LS	$ 100,000	$ 100,000	
Channel Stream Diversion	1	LS	$ 50,000	$ 50,000	
			$	$	
Temporary Pedestrian Bridge	1	LS	$ 150,000	$ 150,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Specialty Items $	370,000

Section 5 Traffic Items					
Traffic Control	1	LS	$ 10,000	$ 10,000	
Roadside Signs	1	LS	$ 5,000	$ 5,000	
Construction Area Signs	1	LS	$ 10,000	$ 10,000	
Construction Staking	1	LS	$ 10,000	$ 10,000	
Pavement Delineation	1	LS	$ 5,000	$ 5,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Traffic Items $	35,000

TOTAL SECTIONS 1 thru 5 $ 764,000

NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 2

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

Section 6 Minor Items	Item Cost	Section Cost
$ 764000 x (5%) = $ 38200 (Subtotal Sections 1 thru 5)		
TOTAL MINOR ITEMS		$ 38,200

Section 7 Roadway Mobilization		
$ 802200 x (10%) = $ 80220 (Subtotal Sections 1 thru 6)		
TOTAL ROADWAY MOBILIZATION		$ 80,220

Section 8 Roadway Additions

Supplemental Work
$ 802,200 x (5%) = $ 40110
(Subtotal Sections 1 thru 6)

Contingencies
$ 802,200 x (20%) = $ 160440
(Subtotal Sections 1 thru 6)

TOTAL ROADWAY ADDITIONS $ 200,550

TOTAL ROADWAY ITEMS $1,080,000
(Subtotal Sections 1 thru 8)

Estimate Prepared By M. Elledge (Print Name) Phone # (916) 368-9181 Date 6/12/2014

Estimate Checked By C. Davis (Print Name) Phone # (916) 368-9181 Date 7/31/2014

** Use appropriate percentage per Chapter 20.

Alternative 2

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

II. STRUCTURES ITEMS **Alternative 2 - CIP/PS Slab, One Stage, Road Closure**

	Bridge	Bridge Removal	Detour Structure
Bridge Name	M.C.D.F. Br		
Structure Type	CIP/PS Slab		
Width (out to out) - (ft)	55.5		
Span Lengths - (ft)	325		
Total Area - (ft2)	18038		
Footing Type (pile/spread)	CIDH Piling		
Cost Per ft2	$220		
(incl. 10% mobilization			
and 25% contingency)			
Total Cost for Structure	$ 3,968,250	$134,400	

SUBTOTAL STRUCTURES ITEMS $ 4,102,650
(Sum of Total Cost for Structures)

Railroad Related Costs:

$
$
$

SUBTOTAL RAILROAD ITEMS $

TOTAL STRUCTURES ITEMS $ 4,102,650
(Sum of Structures Items plus Railroad Items)

COMMENTS:

Estimate Prepared By J. Foster (Print Name) Phone # (916) 368-918 Date 7/31/2014

NOTE: If appropriate, attach additional pages and backup.

Alternative 2

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

III. RIGHT OF WAY ITEMS				ESCALATED VALUE
A. Acquisition, including excess lands, damages to remainder(s) and Goodwill	3877 SF	35 $/SF	x 20%	$170,000
B. Utility Relocation (State share)				$0
C. Relocation Assistance				
D. Clearance/Demolition				
E. Title and Escrow Fees				

TOTAL RIGHT OF WAY ITEMS $170,000
(Escalated Value)

Anticipated Date of Right of Way Certification $
(Date to which Values are Escalated)

F. Construction Contract Work

Brief Description of Work:

Right of Way Branch Cost Estimate for Work * $ Not Included

* This dollar amount is to be included in the Roadway and/or Structures Items of Work, as appropriate. Do not include in Right of Way Items.
COMMENTS:

Estimate Prepared By (Print Name) Phone # Date

NOTE: If appropriate, attach additional pages and backup.

Alternative 3

PROJECT PLANNING COST ESTIMATE
(DRAFT FEASIBILITY REPORT COST ESTIMATE)

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA
Program Code

PROJECT DESCRIPTION:

Limits: Marsh Drive Bridge Over Walnut Creek

Proposed Improvement (Scope): Replace Marsh Drive Bridge Over Walnut Creek
Alternative 3 - CIP/PS Slab, Two Stage, Two Lanes open

SUMMARY OF PROJECT COST ESTIMATE

TOTAL ROADWAY ITEMS	$ 1,200,000
TOTAL STRUCTURE ITEMS	$ 4,598,681
SUBTOTAL CONSTRUCTION COSTS	$ 5,798,681
TOTAL RIGHT OF WAY ITEMS	$ 240,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	$ 6,038,681

Alternative 3

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

I. ROADWAY ITEMS

Section 1 Earthwork	Quantity	Unit	Unit Price ($)	Item Cost ($)	Section Cost
Roadway Excavation	350	CY	$ 50	$ 17,500	
Imported Borrow	2020	CY	$ 50	$ 101,000	
Clearing & Grubbing	1	LS	$ 20,000	$ 20,000	
Rock Slope Protection (Light, Method B)	250	CY	$ 225	$ 56,250	
Rock Slope Protection Fabric	130	SQYD	$ 10	$ 1,300	
			$	$	
			$	$	
				Subtotal Earthwork $	196,050

Section 2 Pavement Structural Section*					
HMA (Type B)	510	TONS	$ 180	$ 91,800	
Class 2 Aggregate Base	660	CY	$ 60	$ 39,600	
Minor Concrete (Sidewalk)	81	CY	$ 400	$ 32,400	
Minor Concrete (Curb and Gutter)	82	CY	$ 350	$ 28,700	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Pavement Structural Section $	192,500

Section 3 Drainage					
Drainage System	1	LS	$ 40,000	$ 40,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Drainage $	40,000

*Reference sketch showing typical pavement structural section elements of the roadway.
Include (if available) T.I., R-Value and date when tests were performed.
NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 3

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

Section 4 Specialty Items	Quantity	Unit	Unit Price	Item Cost	Section Cost
Erosion Control	1	LS	$ 50,000	$ 50,000	
Water Pollution Control	1	LS	$ 20,000	$ 20,000	
Environmental Mitigation	1	LS	$ 100,000	$ 100,000	
Channel Stream Diversion	1	LS	$ 50,000	$ 50,000	
				$	
Temporary Pedestrian Bridge	1	LS	112,500	$ 112,500	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Specialty Items $	332,500

Section 5 Traffic Items					
Traffic Control	1	LS	$ 100,000	$ 100,000	
Roadside Signs	1	LS	$ 5,000	$ 5,000	
Construction Area Signs	1	LS	$ 10,000	$ 10,000	
Construction Staking	1	LS	$ 10,000	$ 10,000	
K rail	1	LS	$ 5,000	$ 5,000	
Pavement Delineation	1	LS	$ 5,000	$ 5,000	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Traffic Items $	125,000

TOTAL SECTIONS 1 thru 5 $ 846,050

NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alternative 3

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

Section 6 Minor Items	Item Cost	Section Cost
$ 846050 x (5%) = $ 42303 (Subtotal Sections 1 thru 5)		
TOTAL MINOR ITEMS		$ 42,303

Section 7 Roadway Mobilization		
$ 888352.5 x (10%) = $ 88835 (Subtotal Sections 1 thru 6)		
TOTAL ROADWAY MOBILIZATION		$ 88,835

Section 8 Roadway Additions		
Supplemental Work		
$ 888,353 x (5%) = $ 44418 (Subtotal Sections 1 thru 6)		
Contingencies		
$ 888,353 x (20%) = $ 177671 (Subtotal Sections 1 thru 6)		
TOTAL ROADWAY ADDITIONS		$ 222,088
TOTAL ROADWAY ITEMS (Subtotal Sections 1 thru 8)		$1,200,000

Estimate Prepared By M. Elledge (Print Name) Phone # (916) 368-9181 Date 6/12/2014

Estimate Checked By C. Davis (Print Name) Phone # (916) 368-9181 Date 7/31/2014

** Use appropriate percentage per Chapter 20.

Alternative 3

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

II. STRUCTURES ITEMS **Alternative 3 - CIP/PS Slab, Two Stage, Two Lanes open**

	Bridge	Bridge Removal	Detour Structure
Bridge Name	M.C.D.F. Br		
Structure Type	CIP/PS Slab		
Width (out to out) - (ft)	55.5		
Span Lengths - (ft)	325		
Total Area - (ft2)	18038		
Footing Type (pile/spread)	CIDH Piling		
Cost Per ft2	$248		
(incl. 10% mobilization			
and 25% contingency)			
Total Cost for Structure	$ 4,464,281	$134,400	

SUBTOTAL STRUCTURES ITEMS (Sum of Total Cost for Structures) $ 4,598,681

Railroad Related Costs:

$
$
$

SUBTOTAL RAILROAD ITEMS $

TOTAL STRUCTURES ITEMS (Sum of Structures Items plus Railroad Items) $ 4,598,681

COMMENTS:

Estimate Prepared By J. Foster (Print Name) Phone # (916) 368-9181 Date 6/14/2014

NOTE: If appropriate, attach additional pages and backup.

Alternative 3

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

III. RIGHT OF WAY ITEMS — ESCALATED VALUE

A. Acquisition, including excess lands, damages to remainder(s) and Goodwill	5539 SF	35 $/SF	x 20%	$240,000
B. Utility Relocation (State share)				
C. Relocation Assistance				
D. Clearance/Demolition				
E. Title and Escrow Fees				

TOTAL RIGHT OF WAY ITEMS $ $240,000
(Escalated Value)

Anticipated Date of Right of Way Certification $ _____
(Date to which Values are Escalated)

F. Construction Contract Work

Brief Description of Work: _____

Right of Way Branch Cost Estimate for Work * $ Not Included

* This dollar amount is to be included in the Roadway and/or Structures Items of Work, as appropriate. Do not include in Right of Way Items.
COMMENTS:

Estimate Prepared By _____ Phone # _____ Date _____
(Print Name)

NOTE: If appropriate, attach additional pages and backup.

STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION

MARGINAL ESTIMATE - MISCELLANEOUS STRUCTURE OTHER THAN BRIDGE (EQ RETROFIT)

DS-D-0019A (REV. 5/93)

WITH FUTURE WIDEN

STRUCTURE	BR. NO.	CHARGE	EA	DESIGN SECT.
MARSH DRIVE BRIDGE (over Walnut Creek)	28C-0442		L02402	

DISTRICT	COUNTY	ROUTE	POST MILE	TYPE	LENGTH	WIDTH
04	CC	FAU A052		CSLFQ	324 ft 7 in	34 ft 6 in

CODE	CONTRACT ITEMS	UNIT	QUANTITY	CHECK	USE	PRICE	AMOUNT
12 0100	Traffic Control System	LS	1	1	1	$82,000.00	$82,000
49 5133	Furnish 36" Cast-In-Steel-Shell Concrete Piling	LF	1,472	1,473	1,473	$410.00	$603,930
49 5134	Drive 36" Cast-In-Steel-Shell Concrete Piling	EA	18	18	18	$12,500.00	$225,000
51 0053	Structural Concrete (Bridge)	CY	199	198	199	$1,000.00	$199,400
51 1109	Drill and Bond Dowel (Chemical Adhesive)	EA	480	480	480	$70.00	$33,600
51 5062	Core Concrete (3")	LF	86	86	86	$60.00	$5,160
51 XXXX	Core Concrete (1") and Pressure Grout	LF	400	400	400	$70.00	$28,000
52 0102	Bar Reinforcing Steel (Bridge)	LB	107,999	107,090	107,999	$2.00	$215,998
55 0102	Structural Steel (Bridge)	LB	8,563	8,696	8,696	$4.00	$34,784
59 0115	Clean and Paint Structural Steel	LS	1	1	1	$30,000.00	$30,000
75 0498	Miscellaneous Metal (Restrainer - Cable Type)	LB	2,986	3,077	3,077	$8.00	$24,616

		SUBTOTAL	$1,482,488
RECEIVED IN ESTIMATE SECTION BY	DATE	MOBILIZATION (10.00 %)	$148,249
		SUBTOTAL CONTRACT ITEMS	$1,630,737
QUANTITIES BY: E. Chan	DATE: 9/28/2012	SUPPLEMENTAL WORK	$0
		CONTINGENCIES (5.00 %)	$81,537
CHECKED BY: G. Mok	DATE: 10/1/2012	**TOTAL**	$1,712,274
		FOR BUDGET PURPOSES USE	$1,720,000
REVISED BY	DATE		
MARGINAL ESTIMATE BY: E. Chan	DATE: 10/10/2012		
COST INDEX	COMMENT		

2012 Construction Cost Index = 400

2014 " " " = 443

Increase by 11% 1,720,000 × 1.11 = $1,902,000

Note: 5% Contingencies seems low; 10% Common for retrofits
Environmental Mitigation Costs not included.

Jim Foster

From: Neil Leary <nlear@pw.cccounty.us>
Sent: Friday, June 20, 2014 8:55 AM
To: Jim Foster
Subject: FW: Marsh drive Bridge Seismic Retrofit - Engineer's Estimates
Attachments: WalnutCreekBridge(onMarshDrive)-MarginalEst_10_10_12.pdf

Hi Jim, attached is the latest engineers estimate for the city's retrofit project. Note that there was a later change to 30" diameter piers to address hydraulic concerns. This estimate predates that change and provided 36" diam piers.

Overall the estimate seems a little light.... It is missing the normal BMP bid items for work in a creek, 5% contingency is light,...

I am working on the traffic and hydraulic questions and hope to get back to you early next week with full or partial answers.

Neil Leary
Senior Civil Engineer - Design/Construction Division

Contra Costa County
Public Works
Department

255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2278
Fax: (925) 313-2333
Email: nlear@pw.cccounty.us

From: Adelina Huerta
Sent: Friday, June 20, 2014 8:35 AM
To: Neil Leary
Subject: FW: Marsh drive Bridge Seismic Retrofit - Engineer's Estimates

Adelina
(925) 313-2305

From: Rogers, Jeff [mailto:Jeff.Rogers@cityofconcord.org]
Sent: Friday, June 20, 2014 8:36 AM
To: Adelina Huerta
Subject: FW: Marsh drive Bridge Seismic Retrofit - Engineer's Estimates

Hi Adelina,

Nice to hear from you. Hope all is well. Attached is the latest estimate, if you need it stamped and signed let me know. Also, please read message below.

Thanks

PROJECT PLANNING COST ESTIMATE
(DRAFT FEASIBILITY REPORT COST ESTIMATE)

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA
Program Code

PROJECT DESCRIPTION:

Limits: Marsh Drive Bridge Over Walnut Creek

Proposed Improvement (Scope): Replace Marsh Drive Bridge Over Walnut Creek

Rehabilitation - Raise Roadway Profile - One stage, Road Closure

Using Road Quantities from Alternative 2
No sidewalk added to existing 40' road width

SUMMARY OF PROJECT COST ESTIMATE

TOTAL ROADWAY ITEMS	$ 960,000
TOTAL STRUCTURE ITEMS	$ 2,461,000
SUBTOTAL CONSTRUCTION COSTS	$ 3,421,000
TOTAL RIGHT OF WAY ITEMS	$ 170,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	$ 3,591,000

Alt 5 - Rehabilitation

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

I. ROADWAY ITEMS

Section 1 Earthwork	Quantity	Unit		Unit Price ($)		Item Cost ($)	Section Cost
Roadway Excavation	400	CY	$	50	$	20,000	
Imported Borrow	1700	CY	$	50	$	85,000	
Clearing & Grubbing	1	LS	$	20,000	$	20,000	
			$		$		
			$		$		
			$		$		
			$		$		
						Subtotal Earthwork $	125,000

Section 2 Pavement Structural Section*							
HMA (Type B)	480	TONS	$	180	$	86,400	
Class 2 Aggregate Base	620	CY	$	60	$	37,200	
Minor Concrete Curb & Gutter	71	CY	$	350	$	24,850	
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
						Subtotal Pavement Structural Section $	148,450

Section 3 Drainage							
Drainage System	1	LS	$	40,000	$	40,000	
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
			$		$		
						Subtotal Drainage $	40,000

*Reference sketch showing typical pavement structural section elements of the roadway.
Include (if available) T.I., R-Value and date when tests were performed.
NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alt 5 - Rehabilitation

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

Section 4 Specialty Items	Quantity	Unit	Unit Price	Item Cost	Section Cost
Erosion Control	1	LS	$ 50,000	$ 50,000	
Water Pollution Control	1	LS	$ 20,000	$ 20,000	
Environmental Mitigation	1	LS	$ 100,000	$ 100,000	
Channel Stream Diversion	1	LS	$ 50,000	$ 50,000	
			$	$	
Temporary Pedestrian Bridge	1	LS	$ 150,000	$ 150,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Specialty Items $	370,000

Section 5 Traffic Items					
Traffic Control	1	LS	$ 10,000	$ 10,000	
Roadside Signs	1	LS	$ 5,000	$ 5,000	
Construction Area Signs	1	LS	$ 10,000	$ 10,000	
Construction Staking	1	LS	$ 10,000	$ 10,000	
Pavement Delineation	1	LS	$ 5,000	$ 5,000	
			$	$	
			$	$	
			$	$	
			$	$	
			$	$	
				Subtotal Traffic Items $	35,000

TOTAL SECTIONS 1 thru 5 $ 678,450

NOTE: Extra lines are provided for items not listed, use additional lines as appropriate.

Alt 5 - Rehabilitation

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

Section 6 Minor Items		Item Cost	Section Cost
	$ 678,450 x (5%) = $	33923	
	(Subtotal Sections 1 thru 5)		
	TOTAL MINOR ITEMS		$ 33,923

Section 7 Roadway Mobilization

$ 712372.5 x (10%) = $	71237	
(Subtotal Sections 1 thru 6)		
TOTAL ROADWAY MOBILIZATION		$ 71,237

Section 8 Roadway Additions

Supplemental Work

$ 712,373 x (5%) = $	35619
(Subtotal Sections 1 thru 6)	

Contingencies

$ 712,373 x (20%) = $	142475
(Subtotal Sections 1 thru 6)	

TOTAL ROADWAY ADDITIONS	$ 178,093
TOTAL ROADWAY ITEMS (Subtotal Sections 1 thru 8)	$960,000

Estimate Prepared By M. Elledge (Print Name) Phone # (916) 368-9181 Date 6/12/2014

Estimate Checked By C. Davis (Print Name) Phone # (916) 368-9181 Date 7/31/2014

Estimate Modified by: R. Ferguson Phone # (916) 368-9181 Date 8/4/2014

** Use appropriate percentage per Chapter 20.

Alt 5 - Rehabilitation

District-County-Route 04 – CC – Marsh Drive
KP(PM) _____
EA _____

II. STRUCTURES ITEMS **Alternative 2 - CIP/PS Slab, One Stage, Road Closure**

	Bridge	Bridge Removal	Detour Structure
Bridge Name	M.C.D.F. Br		
Structure Type	Exist RC Slab		
Width (out to out) - (ft)	34.12		
Overall Length - (ft)	325		
Seismic Retrofit	$ 1,900,000		
Deck Rehabilitation	$ 111,000		
Raise Bridge Profile	$ 450,000		
Cost Per ft2			
(incl. 10% mobilization			
and 25% contingency)			
Total Cost for Structure	$ 2,461,000		

Deck Rehabilitation Costs based on unit Cost of $10 per square foot
Raised bridge estimate based on $40 per sqft unit cost using 2013 Caltrans bid Data for "Raise Bridge"

SUBTOTAL STRUCTURES ITEMS (Sum of Total Cost for Structures) $ 2,461,000

Railroad Related Costs:

_____ $ _____
_____ $ _____
_____ $ _____

SUBTOTAL RAILROAD ITEMS $ _____

TOTAL STRUCTURES ITEMS (Sum of Structures Items plus Railroad Items) $ 2,461,000

COMMENTS:

Estimate Prepared By R. Ferguson (Print Name) Phone # (916) 368-918 Date 8/4/2014

NOTE: If appropriate, attach additional pages and backup.

Alt 5 - Rehabilitation

District-County-Route 04 – CC – Marsh Drive
KP(PM)
EA

III. RIGHT OF WAY ITEMS — ESCALATED VALUE

A. Acquisition, including excess lands, damages to remainder(s) and Goodwill	3877 SF	35 $/SF	x20%	$170,000
B. Utility Relocation (State share)				$0
C. Relocation Assistance				
D. Clearance/Demolition				
E. Title and Escrow Fees				

TOTAL RIGHT OF WAY ITEMS $170,000
(Escalated Value)

Anticipated Date of Right of Way Certification $
(Date to which Values are Escalated)

F. Construction Contract Work

Brief Description of Work:

Right of Way Branch Cost Estimate for Work * $ Not Included

* This dollar amount is to be included in the Roadway and/or Structures Items of Work, as appropriate. Do not include in Right of Way Items.
COMMENTS:

Estimate Prepared By (Print Name) Phone # Date

NOTE: If appropriate, attach additional pages and backup.

d. Life Cycle Cost Analysis Report

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Life Cycle Cost Analysis Report

For

Marsh Drive Bridge over Walnut Creek

Bridge No. 28C0442

Prepared For:

Contra Costa County

Public Works Department

Prepared By:

QUINCY ENGINEERING

January 2015

This Life Cycle Cost Analysis has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

Robert Ferguson - REGISTERED CIVIL ENGINEER — 1-28-15 DATE

Submitted by

James L. Foster, JR, P.E., Project Manager — 1-28-15 Date — (916) 368-9181 Telephone
Quincy Engineering, Inc.

Approved by

Neil Leary - County Project Manager — Date
Senior Engineer, Contra Costa County
Department of Public Works

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Contents

NEED AND PURPOSE

Contra Costa County is seeking evaluation of the adequacy of the Marsh Drive Bridge (Bridge No. 28C-0442).

Purpose: This Life Cycle Cost Analysis will evaluate whether it is more cost effective to replace the existing bridge or rehabilitate the existing bridge.

Need: This analysis is needed to unequivocally determine the most appropriate use of public funding for use on this crossing.

This analysis will use long reaching projections for the investments made on either the immediate replacement or the retrofit and rehabilitation of the existing bridge.

EXISTING BRIDGE

This structure was built in 1938 and lengthened in 1965. The existing bridge is rated as Structurally Deficient per the Structure Inventory and Appraisal Report and has a sufficiency rating of 61.2.

Every two years Caltrans Structures Maintenance and Investigations Divisions inspects all bridges and prepares a report describing the bridge status. The latest report for this bridge, dated January 2013, was referenced to summarize the following items:

History and Condition

- Originally built in 1938
- Lengthened in 1965
- Concrete jackets were installed around columns in 1965 and 2009
- Column Jackets collect drift and reduce hydraulic capacity
- Seismically Deficient (lateral vulnerabilities as identified by City of Concord)
- Design Load H-15
- There is no load restriction posting, meaning that legally loaded trucks may use the facility
- The deck has many cracks, spalls and rock pockets

Geometry and Function

- 2 Lane
- 27' clear roadway width (AASHTO Minimum is 24' + two 8' shoulders for a sum of 40' for ADT greater than 2000))
- 34.5' total bridge width
- 325' Total Length
- Originally 6 spans, the bridge length was increased by adding 4 spans. There are now 10 spans.
- Classified as Minor Arterial per Caltrans CRS Mapping
- ADT of 6000 Vehicles per day

The existing bridge is a 10 span reinforced concrete slab superstructure on reinforced concrete pile extensions. The pile extensions have been retrofitted with concrete column jackets. The pile extensions tend to accumulate drift.

REPLACEMENT/ REHABILITATION ALTERNATIVES

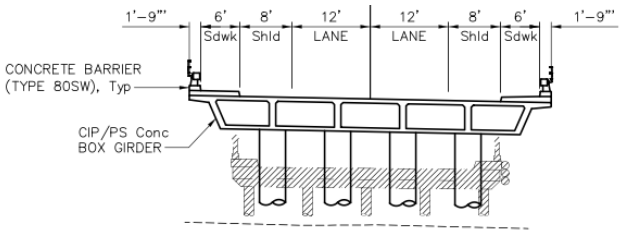
This project will either be a bridge rehabilitation or a bridge replacement. The following alternatives will be investigated:

Bridge Replacement

To meet the hydraulic requirements of Walnut Creek, the roadway profile will need to be raised. The new bridge will be approximately the same length as the existing bridge. The width of all three replacement alternatives will provide two 12' vehicular lanes and two 8' shoulders (meeting AASHTO minimum design criteria for the ADT and functional class of Marsh Drive). In addition, two 6' sidewalks will be provided to accommodate pedestrian traffic.

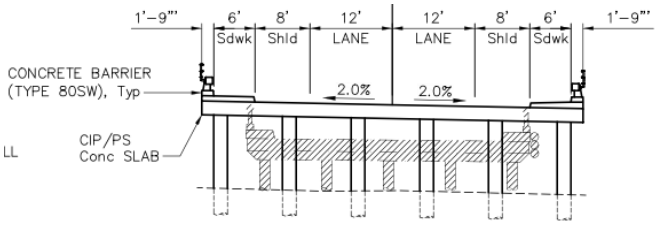
Alternative 1: Cast-in-Place (CIP), Prestressed (PS) Concrete Box Girder Bridge

This alternative will provide a 5' deep superstructure with three spans. This alternative requires the highest vertical profile which increases the approach roadway embankment fill significantly. This alternative also requires the highest profile grade which will increase the approach roadway and associated right of way costs.



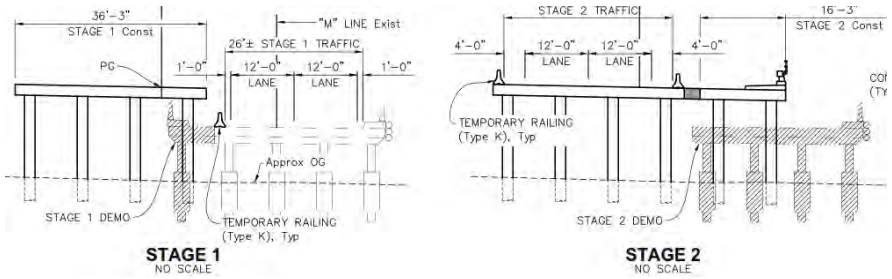
Alternative 2: CIP Concrete Slab Bridge, Road Closure and Detour during Construction

This alternative will provide a 2' deep superstructure with six spans. The intermediate supports would be small diameter concrete pile extensions, similar to the existing supports. This bridge would be built in a single stage, meaning that the road would be closed during construction. Closing the road during construction would minimize the required right of way and temporary construction easements for the replacement project.



Alternative 3: CIP Concrete Slab Bridge, Two Lanes Open during Construction

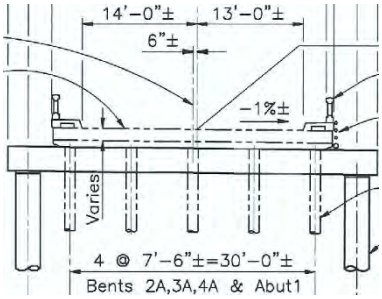
This alternative would provide essentially the same structure as Alternative 2 with the exception that Marsh drive would remain open to traffic throughout the construction of the replacement bridge. Additional right-of-way and temporary construction easements would be required to facilitate the lane width needed to maintain access to the public.



Bridge Rehabilitation

The existing structure could be rehabilitated to increase its service life. There are three distinct rehabilitation measures which must be performed to allow this structure an increased life span.

Alternative 4: Seismic Retrofit

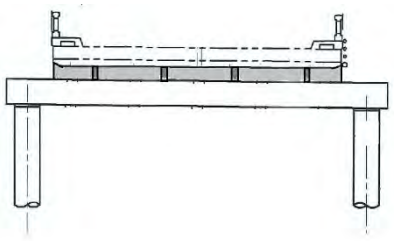


Seismic Retrofit

The City of Concord is currently exploring/planning a seismic retrofit of the existing bridge. This retrofit consists of placing a series of outrigger bents beneath the existing bridge soffit to increase the lateral capacity of the existing bridge. These additional bents would further limit the hydraulic capacity of the bridge to convey Walnut Creek storm water flows.

Alternative 5: Deck Rehabilitation, Seismic Retrofit and Raise Profile

This alternative incorporates the seismic retrofit measures described in Alternative 4 as well as the following rehabilitation measures:



Deck Rehabilitation

To address the current spalling, cracking and rock pockets on the existing deck, a methacrylate treatment and polyester concrete overlay would be applied. This would increase the service life of the wearing surface for the remainder of the existing bridge's assumed service life (20 years).

Raise Profile

It is anticipated that to meet the desired hydraulic capacity and to limit the need for recurring maintenance costs due to drift accumulation, the existing bridge would be raised and set on outrigger bents, similar to the section shown. The roadway approaches would reconstructed to meet the raised bridge profile.

Other Retrofit Improvements Not Implemented

Widening

Since structure widening does not increase the service life of the existing bridge, it is not being included in this analysis. Therefore, the HBP rehabilitation alternatives would require design exceptions since the existing structure does not meet the AASHTO design Criteria for clear roadway width across the bridge (determination is based on Average Daily Traffic (ADT) and the functional classification of Marsh Drive).

Strengthening

The existing bridge was not designed for current live loads (HL93 and P15 permit vehicles). It is considered infeasible to attempt to strengthen the bridge to meet these standards. The HBP rehabilitation alternatives would require a design exception for strength as well.

Barrier Replacement

The existing concrete baluster railing is not considered to be crash worthy by current standards. The retrofit alternatives would require a design exception for nonstandard traffic safety features as well.

LIFE CYCLE COST ANALYSIS

In order to determine the most economical alternative for this structure, a life cycle cost analysis was performed using the methodology presented in National Cooperative Highway Research Program (NCHRP) Report 483 titled Bridge Life Cycle-Cost Analysis. The key parameters and assumptions used for the analysis are listed below

Real Discount Rate (d)

The Real Discount Rate is defined by the Office of Management and Budget (OMB) as a forecast of real interest rates from which the inflation premium has been removed and based on the economic assumptions for the 2015 Budget. The 30 year interest rate of 1.9% was used for this project.

Nominal Discount Rate (D)

The Nominal Discount rate is defined from OMB as a forecast of nominal or market interest rates for 2014 on the economic assumptions for the Fiscal Year 2015 Budget. The 30 year interest rate of 3.9% was used for this project.

Inflation Rate (i)

The inflation rate was calculated as a function of the Real Discount Rate and the Nominal Discount Rate using the following equation taken from the NCHRP Report 483:

$i = [(1+D) / (1+d)]-1 = 1.96\%$

Bridge Service Life & Analysis Period

75 years is the required design service life of a new bridge per AASHTO LRFD, but it will be assumed that the bridges will be replaced every 100 years (conservative assumption). It is assumed that the existing 76 year old bridge has 20 more years of life. The life cycle cost analysis period is assumed to be 100 years.

Deck Rehabilitation

All alternatives will require Deck rehabilitation on a 40 year cycle. The deck rehabilitation costs are based on a unit cost of $10 per square foot of a polyester concrete overlay. This unit cost includes methacrylate treatment.

Residual Value

The residual value of each bridge alternative at the end of the analysis period was assumed to be the present value of a linearly depreciated construction cost of the bridge, which is consistent with the guidelines in the NCHRP Report 483.

ANALYSIS ASSUMPTIONS

Replacement Alternatives:

Life Cycle Assumptions

The overall cost of each replacement alternative incorporates the bridge replacement, approach roadway and associated right-of-way costs. It is assumed that the replacement bridge will be provided on year 0 of the 100 year life cycle.

Future costs throughout the assumed 100 year life cycle of the replacement bridges includes Deck Rehabilitation costs on a 40 year cycle.

Life Cycle Costs (Present Day Cost Estimates)

Bridge general plan estimates were prepared for three replacement alternatives utilizing unit prices determined from Caltrans Contract Cost Data and previous projects. 10% mobilization and 25% contingency were added to the sum of unit prices. A cost break down of the immediate replacement costs are shown below:

Alternative 1: CIP Concrete Box Girder Bridge, Road Closed During Construction:

- Bridge Replacement: $ 5,094,713
- Approach Roadway: $ 1,300,000
- Right-of-Way: $ 300,000
- **Total Rehabilitation Cost: $ 6,694,713**

Alternative 2: CIP Concrete Slab Bridge, Road Closed During Construction:

- Bridge Replacement: $ 4,102,650
- Approach Roadway: $ 1,080,000
- Right-of-Way: $ 170,000
- **Total Rehabilitation Cost: $ 5,352,650**

Alternative 3: CIP Concrete Slab Bridge, Road Open during Construction:

- Bridge Replacement: $ 4,598,681
- Approach Roadway: $ 1,200,000
- Right-of-Way: $ 240,000
- **Total Rehabilitation Cost: $ 6,038,681**

Rehabilitation Alternatives:

Life Cycle Assumptions

- Seismic retrofit is required immediately
- New foundation elements will be built to support the existing superstructure
- Deck rehabilitation will extend the service life of the wearing surface
- Raising the existing bridge will provide adequate hydraulic clearance
- The retrofitted bridge will provide service life for an additional 20 years
- To raise the existing bridge, the road must be closed
- Raising the bridge will correct the current drift accumulation maintenance issue
- The existing road profile will be raised to meet the raised bridge including curb, gutter and drainage features along the approach roadway
- The raised and rehabilitated bridge will not be widened
- After 20 years, the rehabilitated bridge will be replaced by a wider bridge, similar to the CIP slab described in Alternative 2.
- The sidewalk would be constructed in the future to meet the new wider bridge width
- Right-of-way for the final configuration would be acquired during the rehabilitation project

Immediate Rehabilitation Costs

Preliminary estimates were prepared for these alternatives utilizing unit prices determined from Caltrans Contract Cost Data and from previous projects. A 10% mobilization and 25% contingency were added to each of the unit prices. A cost break down of the immediate retrofit and rehabilitation costs are shown below:

Alternative 4: Seismic Retrofit:

- Seismic Retrofit costs: $ 1,900,000
- Levee Mitigation costs: $ 2,000,000
- **Total Rehabilitation Cost: $3,900,000**

Alternative 5: Deck Rehabilitation and Seismic Retrofit and Raise Profile:

- Deck Rehabilitation: $ 111,000
- Seismic Retrofit costs: $1,900,000
- Raise Bridge Profile: $ 450,000
- Raise Road Approaches: $ 960,000
- Right-of-Way: $ 170,000
- **Total Rehabilitation Cost: $ 3,591,000**

At the end of the assumed service life of the existing/rehabilitated bridge, it is assumed that the crossing would be replaced by a CIP concrete slab bridge similar to Alternative 2. The replacement cost and future deck rehabilitation costs are based on the cost assumptions used for Alternative 2.

Approach Roadway Costs

A six page estimate was prepared for both the rehabilitation and replacement alternatives.

Replacement Alternatives

The roadway costs for the replacement alternatives assumes widening the existing roadway to include two 12' lanes, two 8' shoulders and two 6' sidewalks as well as curb and gutter for improved drainage of the facility. For all alternatives (with exception to Alternative 4), the roadway costs are based on the assumption that the existing roadway will be replaced and raised to meet the necessary hydraulic clearance.

Alternative 1

The Box Girder bridge replacement alternative features the deepest superstructure and therefore requires the most elevated approach roadway. The cost of the embankment fill and associated right-of-way is high in this alternative because of this.

Alternative 2

This CIP Slab bridge alternative provides the most slender replacement option. Closing the road during construction to allow the approach roadway embankment to be built without the need for additional lane width minimizes the embankment fill and associated right-of-way costs.

Alternative 3

Keeping traffic open on Marsh Drive during construction of the CIP Slab Replacement Bridge increases the roadway and associated right-of-way costs. The additional width required for traffic handling is achieved by shifting the location of the replacement bridge. The replacement bridge will be constructed in stages to allow enough width on the existing bridge to keep traffic on it.

Retrofit Alternatives

Alternative 4

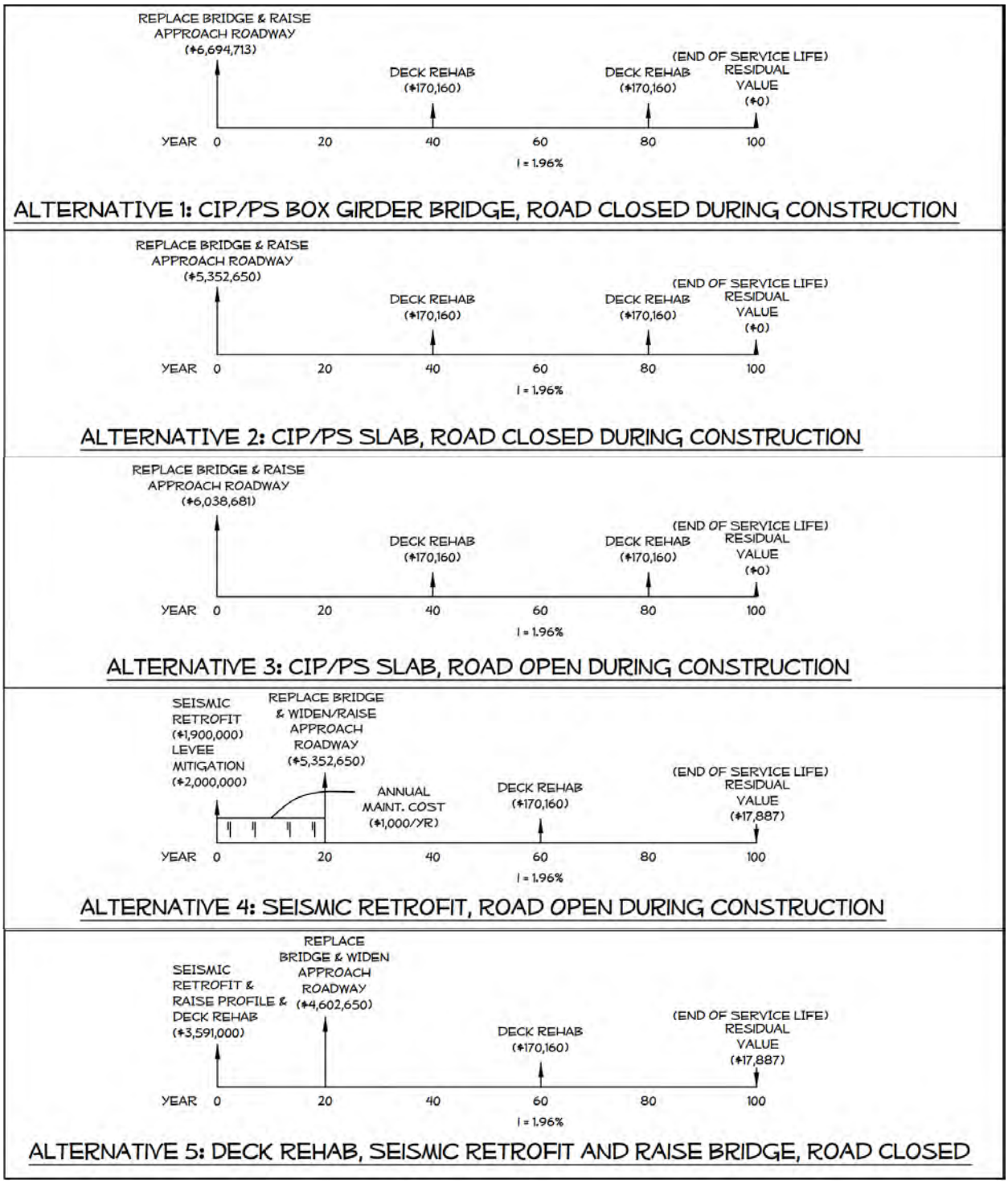
This retrofit alternative assumes no immediate approach roadway cost and no associated right-of-way costs. These costs are applied at year 20 to account for the cost of future replacement bridge and approach roadway and associated right-of-way costs. Because this alternative does not include raising the existing bridge, the addition of supports in the creek would likely trigger the need for Levee Mitigation due to the backwater effect of the design flows. Mitigations consist of raising the top of levee to the existing approach roadway elevation. Costs for this alternative include an assumed Levee Mitigation cost (based on an estimate from the Flood Control District) to account for this work. Note that associated Engineering and Right of Way costs are not included in the cost of this mitigation.

Alternative 5

Because the existing bridge is to be raised in this alternative, the roadway costs are approximately the same as shown in Alternative 2. This is because the road is anticipated to be closed during construction and the overall fill limits and right-of-way acquisition would be approximately the same. The difference is that in this alternative, the roadway is not being widened in year 0 of the 100 year cycle. Instead, the profile will be raised and right-of-way will be purchased in year 0 but, the widening and construction of the sidewalks would not occur until the retrofitted bridge is replaced in year 20.

LIFE CYCLE COST ANALYSIS TIMELINE

The Life Cycle timeline for all alternatives is illustrated in the graphic below.



LIFE CYCLE COST SUMMARY

ANALYSIS RESULTS

The following results show the cumulative present value of each alternative of the life cycle cost analysis:

Replacement

Alternative 1: CIP Concrete Box Girder Bridge, Road Closed During Construction:	$6,813,000
Alternative 2: CIP Concrete Slab Bridge, Road Closed During Construction:	$5,471,000
Alternative 3: CIP Concrete Slab Bridge, Road Open During Construction:	$6,157,000

Retrofit

Alternative 4: Seismic Retrofit, Road Open:	$7,624,000
Alternative 5: Deck Rehab, Seismic Retrofit and Raise Profile, Road Closed:	$6,787,000

Conclusion

This analysis has shown that over a 100 year analysis period, the bridge replacement using Alternative 2 is the most cost effective project solution.

Recommendation

Based on the results of the life cycle cost analysis, **we recommend replacing the existing bridge with Alternative 2.**

APPENDIX A

Life Cycle Cost Analysis Backup Calculations and Information

(See Feasibility Study Report for other supporting Information)

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Project: Marsh Drive Bridge over Walnut Creek
Client: Constra Costa County

LIFE CYCLE COST ANALYSIS: REPLACEMENT ALTERNATIVES

From Office of Management and Budget:
Real Discount Rate: d = 1.90%
Inflation Rate: I = 1.96%
Nominal Discount Rate: D = 3.90%

Base Year: 2015

Alternative 1: Replace w/ CIP/PS Box Girder, Road Closed

Expediture Description	Year		Life Cycle Costs		
	n	Date	Construction Cost, C	Future Value FV	Present Value PV
Design & Permitting	0	2015			
Bridge Replacement	0	2015	$5,094,713	$5,094,713	$5,094,713
Approach Road Con. Costs	0	2015	$1,300,000	$1,300,000	$1,300,000
Right of Way Items	0	2015	$300,000	$300,000	$300,000
Deck Rehab	40	2055	$170,160	$370,264	$80,148
Deck Rehab	80	2095	$170,160	$805,687	$37,751
Residual Value	100	2115	$0		$0
End Cycle					
Total					**$6,813,000**

Alternative 2: Replace w/ CIP/PS Slab, Road Closed

Expediture Description	Year		Life Cycle Costs		
	n	Date	Construction Cost, C	Future Value FV	Present Value PV
Design & Permitting	0	2015			
Bridge Replacement	0	2015	$4,102,650	$4,102,650	$4,102,650
Approach Road Con. Costs	0	2015	$1,080,000	$1,080,000	$1,080,000
Right of Way Items	0	2015	$170,000	$170,000	$170,000
Deck Rehab	40	2055	$170,160	$370,264	$80,148
Deck Rehab	80	2095	$170,160	$805,687	$37,751
Residual Value	100	2115	$0		$0
End Cycle					
Total					**$5,471,000**

Alternative 3: Replace w/ CIP/PS Slab, Road Open

Expediture Description	Year		Life Cycle Costs		
	n	Date	Construction Cost, C	Future Value FV	Present Value PV
Design & Permitting	0	2015			
Bridge Replacement	0	2015	$4,598,681	$4,598,681	$4,598,681
Approach Road Con. Costs	0	2015	$1,200,000	$1,200,000	$1,200,000
Right of Way Items	0	2015	$240,000	$240,000	$240,000
Deck Rehab	40	2055	$170,160	$370,264	$80,148
Deck Rehab	80	2095	$170,160	$805,687	$37,751
Residual Value	100	2115	$0		$0
End Cycle					
Total					**$6,157,000**

Calculations by: R. Ferguson

QUINCY ENGINEERING

Sheet: 1 of 1
Date: 1/27/2015

Project: Marsh Drive Bridge over Walnut Creek
Client: Constra Costa County

LIFE CYCLE COST ANALYSIS: RETROFIT ALTERNATIVES

From Office of Management and Budget:

Real Discount Rate:	d =	1.90%
Inflation Rate:	I =	1.96%
Nominal Discount Rate:	D =	3.90%

Base Year: 2015

Alternative 4: Seismic Retrofit, Road Open

Expediture Description	Year		Life Cycle Costs		
	n	Date	Construction Cost, C	Future Value FV	Present Value PV
Design & Permitting	0	2015			
Seismic Retrofit	0	2015	$1,900,000	$1,900,000	$1,900,000
Levee mitigation	0	2015	$2,000,000	$2,000,000	$2,000,000
Deck Rehab	0	2015		$0	$0
Right of Way Items	0	2015		$0	$0
Maintenance (Yearly Cost)	20	2035	$1,000		$13,711
Future Bridge Replacement	20	2035	$4,102,650	$6,051,900	$2,815,664
Future Approach Roadway	20	2035	$1,080,000	$1,593,129	$741,208
Future Right of Way Items	20	2035	$170,000	$250,770	$116,672
Deck Rehab	60	2075	$ 170,160	546184.3977	$55,006
Residual Value	100	2115	$ 820,530		($17,887)
End Cycle					
Total					**$7,624,000**

Alternative 5: Deck Rehab/Seismic Retro/Raise, Road Closed

Expediture Description	Year		Life Cycle Costs		
	n	Date	Construction Cost, C	Future Value FV	Present Value PV
Design & Permitting	0	2015			
Seismic Retrofit	0	2015	$1,900,000	$1,900,000	$1,900,000
Raise Bridge Profile	0	2015	$450,000	$450,000	$450,000
Deck Rehab	0	2015	$111,000	$111,000	$111,000
Approach Road Con. Costs	0	2015	$960,000	$960,000	$960,000
Right of Way Items	0	2015	$170,000	$170,000	$170,000
Maintenance (Yearly Cost)	20	2035	$0		
Future Bridge Replacement	20	2035	$4,102,650	$6,051,900	$2,815,664
Future Approach Roadway	20	2035	$500,000	$737,560	$343,152
Future Right of Way Items	20	2035	$0	$0	$0
Deck Rehab	60	2075	$170,160	$546,184	$55,006
Residual Value	100	2115	$ 820,530		($17,887)
End Cycle					
Total					**$6,787,000**

Calculations by: R. Ferguson

QUINCY ENGINEERING

Sheet: 1 of 1
Date: 1/27/2015

Project: Marsh Drive
Client: Contra Costa County

Life Cycle Cost Analysis - Supporting Information

Replacement Costs

Alternative	Bridge Type	Roadway grade Raise	Total Roadway Length	Construction Cost		ROW and Utility	Total Construction
				Bridge	Roadway		
1	CIP/PS Box Girder	6 feet	595 feet	$ 5,094,713	$ 1,300,000	$ 300,000	$ 6,694,713
2	CIP/PS Slab	3 feet	595 feet	$ 4,102,650	$ 1,080,000	$ 170,000	$ 5,352,650
3	CIP/PS Slab	3 feet	695 feet	$ 4,598,681	$ 1,200,000	$ 240,000	$ 6,038,681

Retrofit and Rehabilitation

Existing Structure Attributes
+Constructed in 1938 as a 6 span RC Slab
+Widened in 1965 with 4 span RC Slab

Deficiencies
+Structurally Deficient (Legal Loads only GGGGGG)
+Functionally Obsolete (Deck Geometry: ADT=6000 vpd Clear Width=27', Code 3 therefore FO)
+Scour Critical (Scour critical at pier 6 and potentially unstable per 2013 BIR)
+Hydraulically Deficient (Opening cannot convey 100 year flow)
+Poor Condition (Severe deck cracking, poor railing condition, deteriorating Pile Extensions)
+Seismically Deficient (Current Retrofit project confirms deficiency)

Br Length	325	feet
Br Width	34.12	feet
Rd Width	27	feet

Measures to extend Existing bridge service Life 20 years

Rehabilitation Measure	Reason	Cost
Seismic Retrofit	Improve Seismic performance	$ 1,900,000
Deck Rehabilitation	Maintenance and protection	$ 110,880
Raise Structure and App. Road	Fixes Hydraulic Deficiency	$ 450,000
	sum	$ 2,460,880

Measures needed but not required to extend service life 20 years

Rehabilitation Measure	Reason	Cost
Structure Rehabilitation	Repairs/ Increase Load Capacity	$ 1,000,000
Barrier Railing Replacement	Improve Safety	$ 83,950
Widening	Fixes Functional Obsolescence	$ 2,100,000
	sum	$ 3,183,950

Other Costs

Levee Mitigation Total Project Costs= $3,000,000
Based on Flood Control District Estimate including Prelim and Const Engineering

Envr and Prelim Engr costs = $750,000.00
(25% of Total Project Cost)

Construction Engr costs = $450,000.00
(15% of Total Project Cost)

Construction only Levee mitigation cost= $2,000,000.00 (Alt. 4 only)

Approach Roadway Construction Costs include Temporary Pedestrian Bridge Costs (Alt 1,2,3 and 5)

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e. Traffic Information

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Jim Foster

From: Neil Leary <nlear@pw.cccounty.us>
Sent: Tuesday, June 24, 2014 3:42 PM
To: Jim Foster
Subject: FW: Marsh Drive Bridge over WC Channel

Hi Jim, please see response from the County Traffic Engineer on the traffic issues related to the Marsh Drive project. I will need to reach out to another department for the 20 yr adt info. Let me know if that is critical to the report.

Hydraulic info to follow.

Neil Leary
Senior Civil Engineer - Design/Construction Division

Contra Costa County
Public Works
Department

255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2278
Fax: (925) 313-2333
Email: nlear@pw.cccounty.us

From: Monish Sen
Sent: Tuesday, June 24, 2014 3:17 PM
To: Neil Leary
Cc: Jerry Fahy; Adelina Huerta; Kevin Emigh; Gregory Stelzner
Subject: RE: Marsh Drive Bridge over WC Channel

Neil,

Here are my thoughts on the questions below:

1. Is Road closure during construction an option? (approx. 6-8 months)
   Road closure for a 6 to 8 month period for a road of this significance would not be desirable. Considering the lack of convenient detour routes, a daily volume of approx. 5,600, the proximity to the airport and Highway 4, effects on both County and City of Concord residents/businesses, there would have to be a compelling reason for us to consider this option. The consultant should develop a detour plan to see if this is even feasible.
2. What is the recommended design speed for the new facility—40 or 45mph? or other? Note that the bridge is signed for 40mph east of the bridge (see pic attached) and 45mph west of the bridge (pic attached).
   It is posted 45 mph on the County side (west side of bridge), with an advisory speed of 40 mph posted in advance of the curve in the City of Concord. Typically you would design for a 55 mph. Measured speeds from our one-day count on the west side of the bridge (Sept. 2011) indicate an 85th percentile of 31-35 mph in the eastbound direction and 41-45 in the westbound direction. Every attempt should be made to design to at least 45 mph, with 50 and 55 mph design speed also included in any analysis.

I understand you may contact DCD for any future projected volumes that they may have on this road.

Monish Sen
Senior Civil Engineer

CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
TRAFFIC COUNTS

HI-STAR NC-97 by Nu-Metrics
Dir Volume Program

Road No. **3975AU**
Name **MARSH DR.**

Interval 15 Minutes
No of Lanes 2
Report By J. Wu

Station 300' North of Mobile Dr.
Date Oct 21, 2008
Day of Week Tuesday

HOUR	N/B	S/B	TOT	AVG
00:00 - 01:00	21	9	30	15
01:00 - 02:00	16	16	32	16
02:00 - 03:00	6	2	8	4
03:00 - 04:00	8	8	16	8
04:00 - 05:00	12	14	26	13
05:00 - 06:00	33	53	86	43
06:00 - 07:00	82	117	199	100
07:00 - 08:00	125	233	358	179
08:00 - 09:00	162	199	361	181
09:00 - 10:00	137	185	322	161
10:00 - 11:00	134	143	277	139
11:00 - 12:00	165	189	354	177
12:00 - 13:00	217	192	409	205
13:00 - 14:00	239	194	433	217
14:00 - 15:00	242	174	416	208
15:00 - 16:00	252	200	452	226
16:00 - 17:00	318	210	528	264
17:00 - 18:00	335	248	583	292
18:00 - 19:00	244	164	408	204
19:00 - 20:00	143	108	251	126
20:00 - 21:00	121	69	190	95
21:00 - 22:00	76	50	126	63
22:00 - 23:00	51	36	87	44
23:00 - 24:00	36	35	71	36
TOTAL	3,175	2,848	6,023	

N/B PEAK
A.M. = 172
07:45 - 08:45
P.M. = 375
16:30 - 17:30

S/B PEAK
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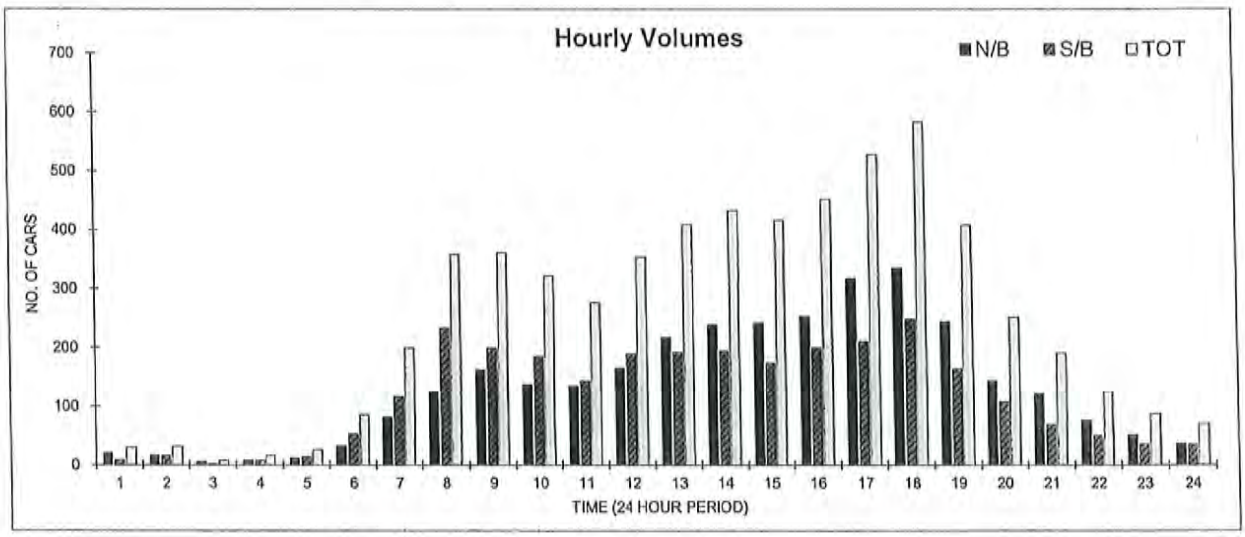
07:45 - 08:45
P.M. = 248
17:00 - 18:00



CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
TRAFFIC COUNTS

HI-STAR NC-97 by Nu-Metrics
Dir Volume Program

Interval 15 Minutes
No of Lanes 2
Report By J. Wu

Road No. **3975AU**
Name **MARSH DR.**

Station 250' North of Mobile Dr.
Date Nov 28, 2006
Day of Week Tuesday

HOUR	N/B	S/B	TOT	AVG
00:00 - 01:00	22	17	39	20
01:00 - 02:00	15	12	27	14
02:00 - 03:00	12	2	14	7
03:00 - 04:00	5	3	8	4
04:00 - 05:00	10	22	32	16
05:00 - 06:00	30	67	97	49
06:00 - 07:00	91	138	229	115
07:00 - 08:00	141	266	407	204
08:00 - 09:00	155	196	351	176
09:00 - 10:00	125	154	279	140
10:00 - 11:00	142	150	292	146
11:00 - 12:00	181	194	375	188
12:00 - 13:00	239	223	462	231
13:00 - 14:00	227	187	414	207
14:00 - 15:00	241	200	441	221
15:00 - 16:00	286	211	497	249
16:00 - 17:00	325	223	548	274
17:00 - 18:00	373	292	665	333
18:00 - 19:00	235	154	389	195
19:00 - 20:00	177	81	258	129
20:00 - 21:00	105	76	181	91
21:00 - 22:00	95	45	140	70
22:00 - 23:00	48	28	76	38
23:00 - 24:00	34	26	60	30
	== ===	== ===	== ===	
TOTAL	**3,314**	**2,967**	**6,281**	

N/B PEAK
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11:00 - 12:00
P.M. = 373
17:00 - 18:00

S/B PEAK
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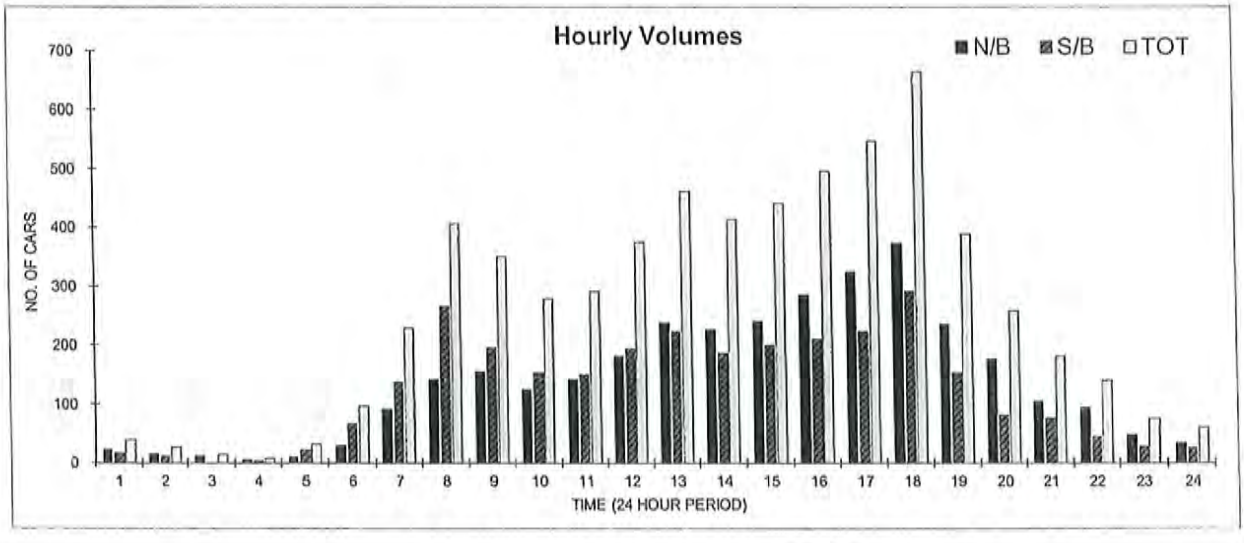
07:15 - 08:15
P.M. = 292
17:00 - 18:00



CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
TRAFFIC COUNTS

HI-STAR NC-97 by Nu-Metrics
Dir Volume Program

Interval 15 Minutes
No of Lanes 2
Report By J. Wu

Road No. **3975AU**
Name **MARSH DR.**

Station 50' North of Vista Grande
Date Oct 21, 2008
Day of Week Tuesday

HOUR	N/B	S/B	TOT	AVG
00:00 - 01:00	21	12	33	17
01:00 - 02:00	16	18	34	17
02:00 - 03:00	6	0	6	3
03:00 - 04:00	7	7	14	7
04:00 - 05:00	12	11	23	12
05:00 - 06:00	41	47	88	44
06:00 - 07:00	91	98	189	95
07:00 - 08:00	134	207	341	171
08:00 - 09:00	182	193	375	188
09:00 - 10:00	141	153	294	147
10:00 - 11:00	139	141	280	140
11:00 - 12:00	161	180	341	171
12:00 - 13:00	220	187	407	204
13:00 - 14:00	228	187	415	208
14:00 - 15:00	229	177	406	203
15:00 - 16:00	234	219	453	227
16:00 - 17:00	298	212	510	255
17:00 - 18:00	319	249	568	284
18:00 - 19:00	216	159	375	188
19:00 - 20:00	136	112	248	124
20:00 - 21:00	120	76	196	98
21:00 - 22:00	71	56	127	64
22:00 - 23:00	47	48	95	48
23:00 - 24:00	34	31	65	33
	== ===	== ===	== ===	
TOTAL	**3,103**	**2,780**	**5,883**	

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16:30 - 17:30

S/B PEAK
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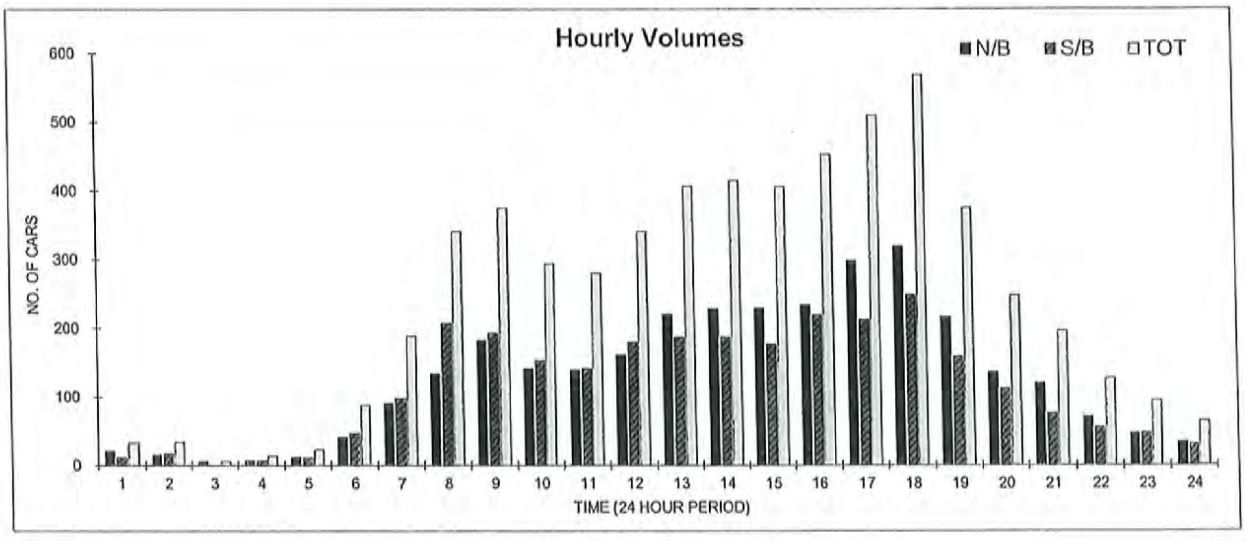
17:00 - 18:00



CONTRA COSTA COUNTY
PUBLIC WORKS DEPARTMENT
TRAFFIC COUNTS

HI-STAR NC-97 by Nu-Metrics
Dir Volume Program

Road No. **3975AU**
Name **MARSH DR.**

Interval 15 Minutes
No of Lanes 2
Report By J. Wu

Station 50' North of Vista Grande
Date Nov 28, 2006
Day of Week Tuesday

HOUR	N/B	S/B	TOT	AVG
00:00 - 01:00	19	16	35	18
01:00 - 02:00	14	12	26	13
02:00 - 03:00	12	3	15	8
03:00 - 04:00	4	2	6	3
04:00 - 05:00	14	16	30	15
05:00 - 06:00	33	60	93	47
06:00 - 07:00	100	118	218	109
07:00 - 08:00	157	227	384	192
08:00 - 09:00	162	166	328	164
09:00 - 10:00	129	148	277	139
10:00 - 11:00	142	133	275	138
11:00 - 12:00	169	185	354	177
12:00 - 13:00	228	218	446	223
13:00 - 14:00	210	179	389	195
14:00 - 15:00	215	185	400	200
15:00 - 16:00	252	210	462	231
16:00 - 17:00	288	232	520	260
17:00 - 18:00	335	305	640	320
18:00 - 19:00	216	160	376	188
19:00 - 20:00	153	95	248	124
20:00 - 21:00	99	73	172	86
21:00 - 22:00	97	57	154	77
22:00 - 23:00	43	29	72	36
23:00 - 24:00	31	29	60	30
TOTAL	3,122	2,858	5,980	

N/B PEAK
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07:45 - 08:45
P.M. = 335
17:00 - 18:00

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07:15 - 08:15
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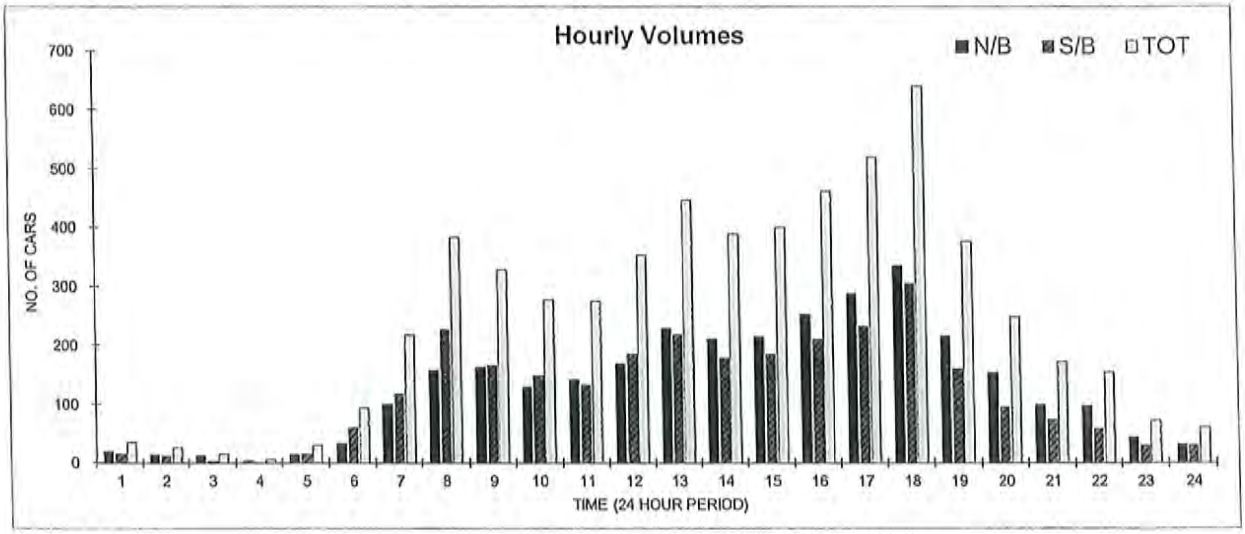
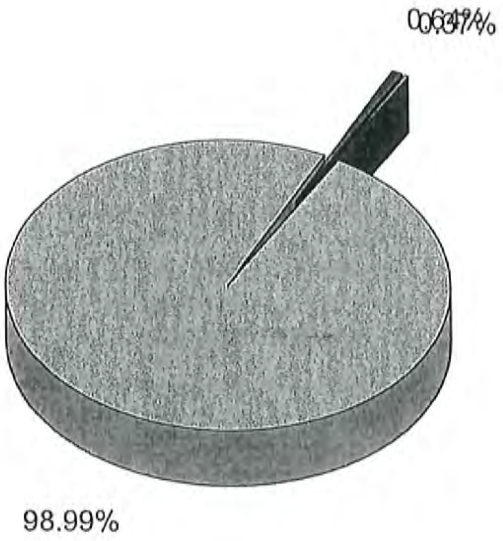
17:00 - 18:00



Vehicle Percentage Graph

HI-Star ID: 3311	Begin: Sep/21/11 00:00	End: Sep/22/11 00:00
Street: Marsh Dr	Lane: E/B	Hours: 24.00
State: CA	Oper: WLB	Period: 15
City: Martinez	Posted: 45	Raw Count: 2990
County: Counter # 3	AADT Factor: 1	AADT Count: 2,990

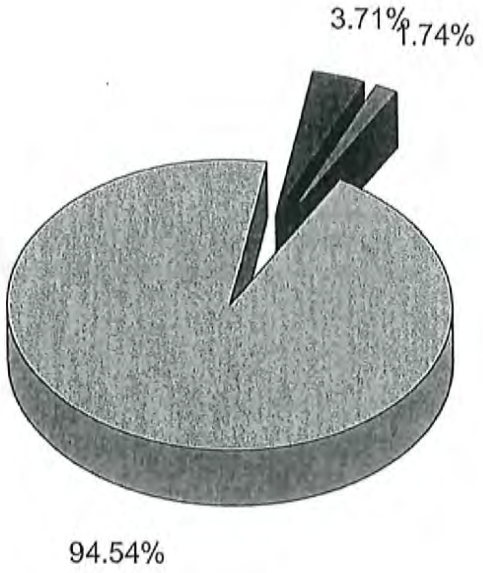


Wed,Sep/21/11 Marsh Dr

PASSENGER VEHICLES	VANS & PICKUPS	BUSSES & TRUCKS	TRACTOR TAILERS
0	2946	19	11

Vehicle Percentage Graph

HI-Star ID: 3335	Begin: Sep/21/11 00:00	End: Sep/22/11 00:00
Street: Marsh Dr	Lane: W/B	Hours: 24.00
State: CA	Oper: WLB	Period: 15
City: Martinez	Posted: 45	Raw Count: 2643
County: Counter # 5	AADT Factor: 1	AADT Count: 2,643



Wed,Sep/21/11 Marsh Dr

PASSENGER VEHICLES	VANS & PICKUPS	BUSSES & TRUCKS	TRACTOR TAILERS
0	2495	98	46

Accident Data From "Switers"

near Marsh Dr. Bridge over W.C. Channel.

16 INCIDENTS

⇒ 2001 to 2011

The yellow "pins identify the accident locations; the circled red number identifies the number of incidents at each pin ⇒ 16 total incidents

Wednesday, Jul 02, 2014 04:35 PM

From "Swithers"

Contra Costa County

7/2/2014
Page 1

Traffic Collision History Report
Midblock Collisions

Arterial: MARSH DR
Limit 1: VISTA GRANDE
Limit 2: SOLANO WAY (S)

Total Number of Collisions: 16
Date Range Reported: 1/1/2001 - 12/31/2011

Report No.	Date Time	Dist/Dir	Location	Type of Collision	Motor Veh. Involved With	DOT1	MPC 1	DOT2	MPC 2	PCF	# Inj	# Kld
0439509	9/29/02 10:25	1584' West of	Marsh Dr/Solano Way (N)	Sideswipe	Parked Motor Vehicle	West	Parked	West	Proceeding Straight	Improper Turning	0	0
0574005	12/30/02 14:25	2112' West of	Marsh Dr/Solano Way (N)	Broadside	Other Motor Vehicle	East	Other	East	Proceeding Straight	Unsafe Starting or Backing	2	0
1025535	9/18/03 11:00	1584' West of	Marsh Dr/Solano Way (N)	Sideswipe	Other Motor Vehicle	West	Parked	West	Proceeding Straight	Improper Passing	0	0
1194340	12/26/03 18:20	1700' West of	Marsh Dr/Solano Way (N)	Rear-End	Bicycle	West	Proceeding Straight	West	Proceeding Straight	Unsafe Speed	1	0
1525626	6/30/04 6:00	100' West of	Marsh Dr/Solano Way (N)	Hit Object	Fixed Object	North	Other			Improper Turning	0	0
1560392	7/28/04 11:35	528' North of	Marsh Dr/Vista Grande	Hit Object	Fixed Object	North	Ran Off Road			Improper Turning	0	0
1806266	12/24/04 17:25	800' West of	Marsh Dr/Solano Way (N)	Rear-End	Parked Motor Vehicle	West	Proceeding Straight	East	Parked	Unsafe Speed	1	0 - at BRIDGE
3248162	6/4/07 12:59	1584' West of	Marsh Dr/Solano Way (N)	Rear-End	Non-Collision	West	Slowing/Stopping	West	Slowing/Stopping	Unsafe Speed	0	0
3363654	9/26/07 21:10	1584' West of	Marsh Dr/Solano Way (N)	Sideswipe	Other Motor Vehicle	East	Other Unsafe Turning	East	Parked	Improper Turning	0	0
3877279	8/29/08 22:45	2112' West of	Marsh Dr/Solano Way (N)	Rear-End	Other Motor Vehicle	West	Proceeding Straight	Not Stated	Not Stated	Improper Turning	1	0

Contra Costa County

7/2/2014

Traffic Collision History Report
Midblock Collisions

Arterial: MARSH DR
Limit 1: VISTA GRANDE
Limit 2: SOLANO WAY (S)

Total Number of Collisions: 16
Date Range Reported: 1/1/2001 - 12/31/2011

Report No.	Date Time	Dist/Dir	Location	Type of Collision	Motor Veh. Involved With	DOT1	MPC 1	DOT2	MPC 2	PCF	# Inj	# Kld
3942820	10/25/08 2:15	1584' West of	Marsh Dr/Solano Way (N)	Rear-End	Parked Motor Vehicle	East	Proceeding Straight	East	Parked	Driving Under Influence	0	0
4060216	1/8/09 5:00	2112' West of	Marsh Dr/Solano Way (N)	Sideswipe	Other Motor Vehicle	East	Other Unsafe Turning	East	Parked	Improper Turning	0	0
4324081	7/14/09 2:00	528' West of	Marsh Dr/Solano Way (N)	Hit Object	Fixed Object	West	Other Unsafe Turning			Improper Turning	0	0
4508910	11/25/09 18:45	2112' West of	Marsh Dr/Solano Way (N)	Rear-End	Parked Motor Vehicle	East	Other Unsafe Turning	East	Not Stated	Improper Turning	1	0
4641459	3/9/10 5:15	1320' East of	Marsh Dr/Vista Grande	Hit Object	Fixed Object	West	Proceeding Straight			Improper Turning	0	0
4812856	6/29/10 21:28	2112' West of	Marsh Dr/Solano Way (N)	Sideswipe	Parked Motor Vehicle	West	Ran Off Road			Improper Turning	0	0

Traffic Collision History Report
Midblock Collisions

Arterial: MARSH DR
Limit 1: VISTA GRANDE
Limit 2: SOLANO WAY (S)

Total Number of Collisions: 16
Date Range Reported: 1/1/2001 - 12/31/2011

Report No.	Date Time	Dist/Dir	Location	Type of Collision	Motor Veh. Involved With	DOT1	MPC 1	DOT2	MPC 2	PCF	# Inj	# Kld

Total Number of Collisions: 16 Segment Length: 0.73 miles (3,841')

Settings Used For Query

Parameter	Setting
Limit 1	Do Not Include Intersection Related
Limit 2	Do Not Include Intersection Related
Intersection Related	Do Not Include Intersection Related
Sorted By	'Date and Time'

mapquest

Free App Print Send Link/Embed

Modified Route

4.13 miles
7 mins / 7 mins based on current traffic

Est. Fuel Cost
Calculate

You've modified your route Undo

Driving Directions

5047 Marsh Dr
Concord, CA 94520-5343
37.993732, -122.057195
(Address is approximate)

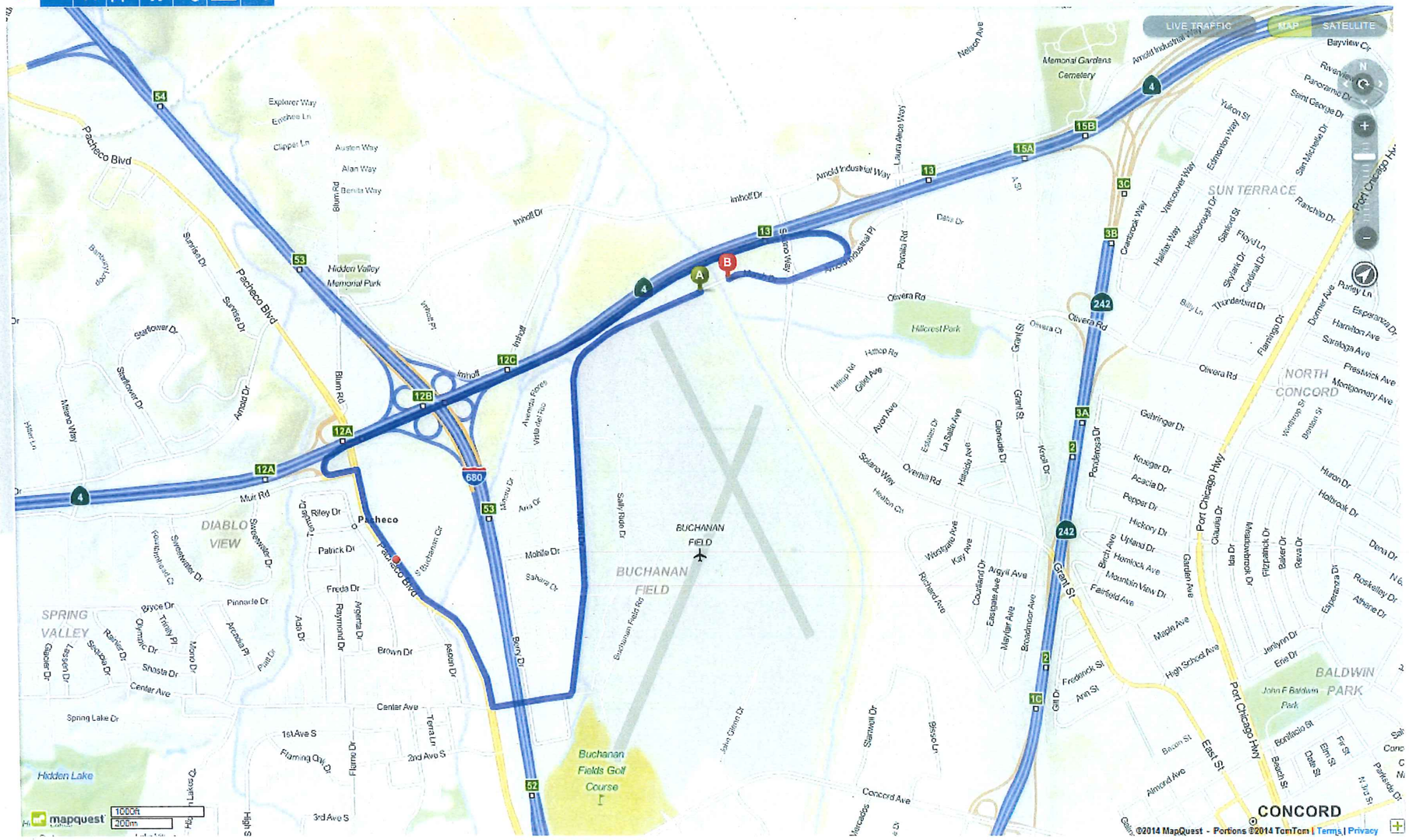
Add a Note Search Nearby Zoom

Online Offers:

Best Concord Hotels
Concord Restaurants

I know the area, hide the first few steps

1. Start out going **southwest** on **Marsh Dr** toward **Vista Grande**. — 1.2 mi
2. Turn **right** onto **Center Ave**. — 0.2 mi
3. Take the **2nd right** onto **Pacheco Blvd**. — 0.7 mi
   Pacheco Blvd is just past Berry Dr
   Subway is on the corner
   If you reach Aspen Dr you've gone a little too far
4. Turn **left** onto **Muir Rd**. — 0.07 mi
   Muir Rd is 0.1 miles past N Buchanan Cir
5. Merge onto **CA-4 E** toward **Stockton**. — 1.3 mi
   If you reach Sweetwater Dr you've gone about 0.2 miles too far
6. Take **EXIT 13** toward **Solano Way**. — 0.3 mi
7. Turn **right** onto **Arnold Industrial Pl**. — 0.2 mi
8. **Arnold Industrial Pl** becomes **Marsh Dr**. — 0.2 mi
9. **4971 MARSH DR**.
   Your destination is just past Iron Horse Trl
   If you reach Vista Grande you've gone about 0.6



mapquest

Modified Route

5.49 miles
12 mins / 14 mins based on current traffic

Est. Fuel Cost
Calculate

You've modified your route Undo

Driving Directions

5047 Marsh Dr
Concord, CA 94520-5343

37.968732, -122.057195
(Address is approximate)

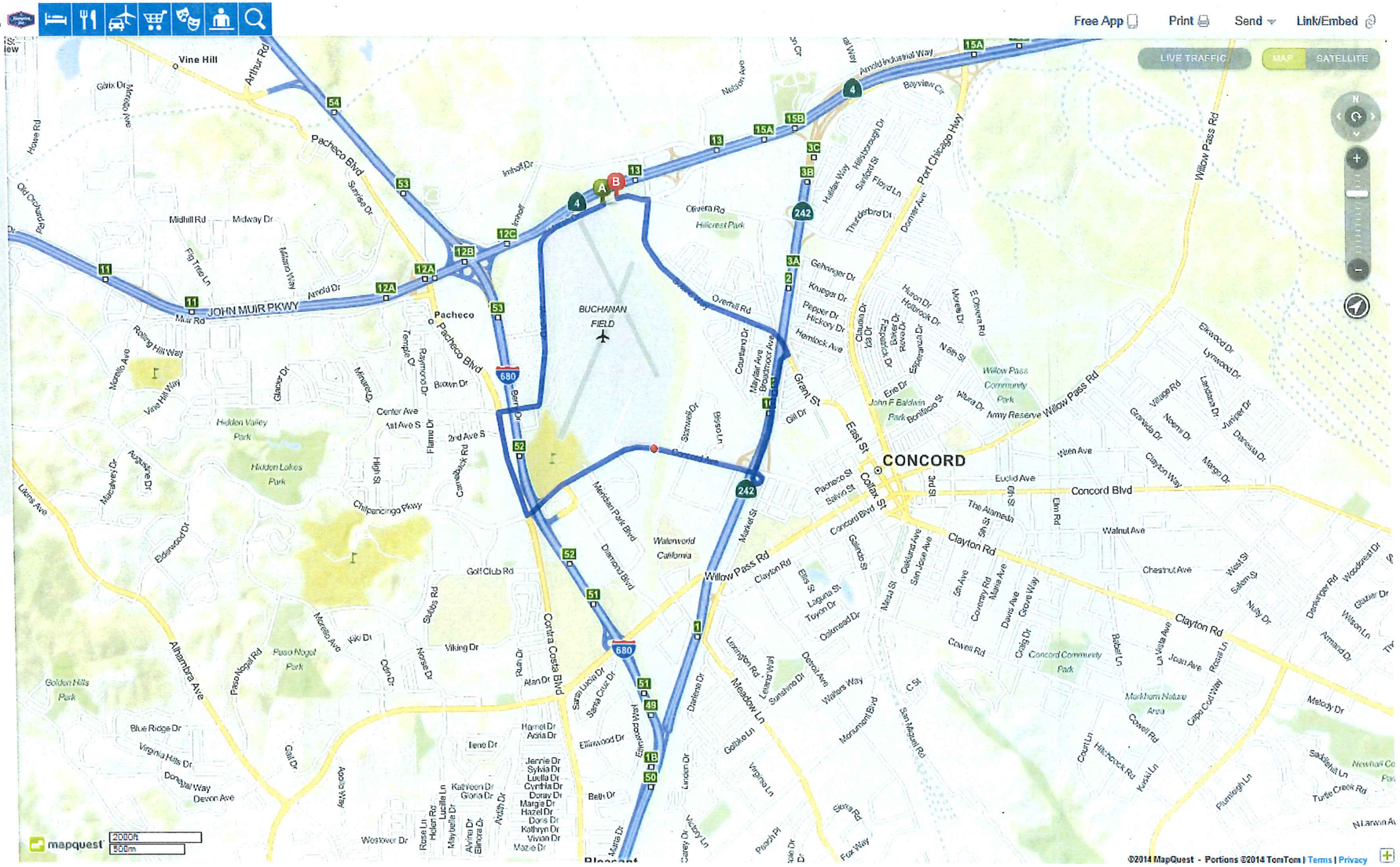
Add a Note Search Nearby Zoom

Online Offers:

Best Concord Hotels
Concord Restaurants

I know the area, hide the first few steps

1.	Start out going **southwest** on **Marsh Dr** toward **Vista Grande**.	1.2 mi
2.	Turn **right** onto **Center Ave**.	0.2 mi
3.	Take the **3rd left** onto **Pacheco Blvd**. *Pacheco Blvd is 0.1 miles past Berry Dr* *Subway is on the corner* *If you reach Aspen Dr you've gone a little too far*	0.1 mi
4.	**Pacheco Blvd** becomes **Contra Costa Blvd**.	0.4 mi
5.	Turn **left** onto **Concord Ave**. *Concord Ave is just past Chilpancingo Pkwy* *Farmers Insurance is on the corner* *If you reach Cottonwood Dr you've gone about 0.1 miles too far*	1.2 mi
6.	Merge onto **CA-242 N** toward **Pittsburg**.	0.7 mi
7.	Take the **Grant St** exit, **EXIT 2**, toward **Solano Way**.	0.2 mi
8.	Turn **left** onto **Grant St**.	0.2 mi



f. Hydraulic Information

Contra Costa County
Flood Control
& Water Conservation District

Julia R. Bueren,
ex officio Chief Engineer
R. Mitch Avalon,
Deputy Chief Engineer

Interoffice Memo

DATE: November 4, 2010

TO: Mario Consolacion, Current Development

FROM: Craig Standafer, Watershed Planning—Engineering

SUBJECT: Hydraulic Effects to Walnut Creek Channel by the Marsh Drive Bridge Seismic Retrofit Project

FILE: 4001-111-20 Lower Walnut Creek City file &
4001-111-00 [First & Last sheets only]

The City of Concord (City) proposes to seismically retrofit the Marsh Drive Bridge (Bridge) over the Walnut Creek Channel (Channel) by adding two 36-inch columns at each of the nine existing pier bents, as shown in Figure 1. Eighty percent (80%) plans for this project, No. PJ 1854, were submitted to the Contra Costa County Flood Control and Water Conservation District (FC District) for review.

Flow through the Channel is already constricted by the existing bridge columns. The proposed retrofit that adds 36-inch columns to the nine pier bents located in the Channel will unacceptably decrease the Channel flow capacity. Hydraulic modeling demonstrates that the proposed retrofit will cause the water surface elevation that occurs during the 25-year event to increase by a substantial 1.5 feet upstream of the bridge. During the 100-year event, the volume of stormwater that overbanks the channel upstream of the retrofitted bridge will increase by 43 acre-feet, which is nearly a 65 percent increase in floodwater that overbanks the already deficient Channel upstream of the Bridge.

The FC District does not consider this design as acceptable and recommends that the City use an alternative design that does not decrease the channel capacity. Alternatively, the City may propose mitigation; however, development of mitigation measures is beyond the scope of this analysis.

ANALYSIS

The Channel hydraulics were analyzed using an unsteady flow HEC-RAS hydraulic model. This model was prepared by the FC District in coordination with the Army Corps of Engineers, Sacramento District, to support the Lower Walnut Creek General Reevaluation Project (References 1 and 2). The purpose of the HEC-RAS model is to determine the current hydraulic performance of the channel and to analyze potential

modifications to the channel. The submittal of the City's 80% plans coincided with the first milestone in the development of this detailed model.

MODEL CHANNEL GEOMETRY AND INPUT HYDROLOGY

The HEC-RAS model includes the Channel from its outfall into Suisun Bay upstream to approximately the crossing of Monument Boulevard. The tributaries of Pacheco Creek, Grayson Creek, Clayton Valley Drain, and Pine Creek are included in the model. Hydrographs were generated for each tributary and the main stem of the Channel. The model was run to determine where the channel runs over its banks into surrounding areas and to calculate the volume of overbanking in various flood events.

Basic bridge geometry, including the number and size of piers in the channel, abutment dimensions, elevation of bridge soffit, and elevation of the top of the barrier rails, was modeled for all bridges that cross the Channel. Where applicable, bridge barrier rails are modeled as "solid" rather than slotted with the assumption that they become blocked with debris. Also, the effect of debris that backs up onto the piers is modeled to develop a relationship between hydraulic performance and required channel freeboard. As discussed below, pier debris is not added to this specific analysis of the Marsh Drive Bridge.

The topography used in the model is based on the "silted-in" condition of the Channel as observed in a photogrammetric and bathymetric survey performed by Towill and Associates in July, 2004. This survey was done to support engineering analyses in References 1 and 2. The purpose of the engineering analysis was to create permanent solutions to the siltation that has plagued the Walnut Creek Channel since its construction in 1964. See the references for additional information regarding channel siltation.

The model also includes improvements made by the 2007 Lower Walnut Creek Emergency Interim Protection Measures Project (Reference 3). This project raised the tops of many levees along Walnut Creek and the tributary Clayton Valley Drain to the as-built elevation, as some settling had occurred subsequent to construction. The project also desilted the Channel to its as-built dimensions from the Burlington Northern Santa Fe (BNSF) Railroad Bridge to the Clayton Valley Drain confluence located approximately 500 feet upstream of the Bridge. As reported in Reference 1, the Channel is expected to return to its fully silted-in condition within seven years of desilting, so this silted-in condition is used for the analysis of the Marsh Drive Bridge.

The hydrology input used in the model is a 6-hour storm that is centered over the Lower Walnut Creek watershed. This input was prepared by the Army Corps of Engineers (Reference 2). The methodology used to calculate the input hydrographs was

updated in Reference 2, which resulted in a peak flow rate and total storm volume that is greater than what was considered in the original Channel design.

BRIDGE GEOMETRY

The HEC-RAS model geometry discussed above was modified to show the effect of the bridge on channel flow capacity during the 100-year flow event. Four model runs were made as shown in Table 1 ranging from "Proposed Seismic Retrofit," which has the largest hydraulic impact to the Channel to a hypothetical "No Bridge" configuration.

Table 1 Model Run Comparison

Run/Bridge Configuration	Model Run Name	Model	Notes
Proposed Seismic Retrofit	MB01B1A_100	B	36-inch piers with 4-foot high by 3-foot wide bent caps
Existing Condition	MB03DA_100	D	Bridge piers as they exist today with Bents 3A & 4A jacketed to 30-inches
As Constructed	MB03AA_100	A	Bridge as constructed during extension in 1964 +/-
No Bridge (hypothetical)	MB01CA_100	C	No bridge. Abutments only.

The bridge soffit was set at 19.6 feet elevation, the approach roadway surface was set at 22.5 feet elevation, and the top of the barrier rail was set at 27.2 feet elevation. The "No Bridge" model uses the same channel cross sections, but removes the piers and the bridge superstructure. The existing bridge contains five identical columns at each of the nine pier bents. For consistency, no debris is assumed to collect on the bridge piers in this model because the proportional effect to each model is the same. However, in a real storm event, pier debris would negatively impact the bridge's hydraulic performance.

The "As Constructed" model represents the bridge following its 1964 extension to accommodate the widened Lower Walnut Creek Channel (See Figure 1). The original diameter of the columns at all Bents prior to the 1964 extension was 15 inches. During the extension project, Bents 2 through 6 were jacketed to a diameter of 30 inches up to the elevations shown in Figure 1; Abutment 1 became a "bent" with 15-inch diameter columns (although it was not renamed a "bent"); and Bents 2A through 4A were added with 15-inch diameter columns. The "Existing Condition" model adds the 30-inch pier jackets constructed by the 2009 emergency repairs to Bents 3A and 4A performed by Contra Costa County. Finally the "Proposed Seismic Retrofit" model adds the new 36-inch diameter piers with the bent cap to all nine bents.

ANALYSIS RESULTS

Figure 2 includes a bridge rating curve that illustrates how the channel water surface elevation varies with flow rate for each of the models. Figure 3 contains an upstream water surface elevation hydrograph (elevation vs. time) and a comparison of water surface profiles at the "maximum flow rate" and at a "medium flow rate."

The Figure 2 rating curve shows that the "Proposed Seismic Retrofit" model has the highest water surface elevation for a given flow rate and the "No Bridge" model has the lowest. Since this is an unsteady flow model, the flow rate in the channel varies over time as it does in an actual storm, so the following paragraphs discuss the hydraulic behavior of the bridge on the channel at different water surface elevations.

6 foot to 19.6 foot Water Surface Elevation: (Baseline flow rate to approximately 16,500 cubic feet per second, [cfs].) Before the upstream water surface contacts the bridge soffit, HEC-RAS uses the "Low Flow" equations. In the "Existing Condition" model, the switch from "Low Flow" to "High Flow" occurs at roughly 16,500 cfs. Coincidentally, the 25-year event peak flow rate as reported in Table 12A of Reference 2 is 16,900 cfs. (Further analysis is necessary to determine the actual channel capacity.)

In HEC-RAS, the Low Flow steps use the "highest energy solution" of one of four different equations. For bridges similar to the Marsh Drive Bridge, where the bridge columns are located in the channel and the channel cross section is generally constant through the bridge, the "Yarnell equation" typically generates the highest energy solution. This is likely because it is the only one of the four equations that accommodates the number of piers in a given bent (e.g. five in the two "existing" models and seven in the "proposed" model). By contrast, the momentum equation, the WSPRO method, and the energy equation only contain variables for the dimensions of the lead column (diameter and bent cap dimensions).

The Yarnell equation contains a constant "K"-value that represents the shape of the lead column and the pier bent configuration (number of columns). As stated in the HEC-RAS reference manual, the "K"- Value is an empirical constant that is based on hydraulic experiments that were performed in the 1930s on scale bridge models. A "K"-value of 2.0 was selected for all models because of the lack of variable precision since Yarnell did relatively few experiments on multiple column bridges. A ten-column railroad bent configuration has a value of 2.5 compared with the next available choice of 1.25 for a "square nose and tall" bent. Nonetheless, it should be noted that the proposed seven-pier bent configuration will have a greater hydraulic impact than the existing five-pier bent, which is not represented in the model results. (See the HEC-RAS User's Manual for more information regarding limitations of the hydraulic equations.)

19.6 foot to 22.5 foot Water Surface Elevation: (Approximately 16,500 cfs to 26,000 cfs.) Above the bridge soffit, HEC-RAS uses the "high flow" equations where flow under the bridge acts like a culvert and becomes pressurized. The resulting pressure flow under the bridge causes a relatively small increase in flow rate to produce a large change in the upstream water surface elevation. This can be seen in Figure 2 as the steep curve through elevation 19.6. The flow is constricted by the "grill" effect of the leading columns where less cross-sectional area is available for the same flow volume. The effect is increased upstream water surface elevation and increased velocity around the columns.

The Medium Flow profile of Figure 3 shows the dramatic difference in water surface elevation at a flow rate of about 18,000 cfs. At slightly higher flow rates, the water surface elevation begins to exceed the upstream channel banks (modeled in HEC-RAS as "lateral weirs"), so the volume of water that escapes into the surrounding area is calculated.

22.5 foot and greater Water Surface Elevation: (Approximately 26,000 cfs and greater.) As noted above, the bridge barrier rails are assumed to clog with debris; however, at the Marsh Drive Bridge, the assumption that all the water is impounded by the bridge barrier rail is too conservative, so a portion of the flow above 22.5 feet is approximated as weir flow. This is modeled by treating the approach roadways as weirs that go "around" the blocked bridge barrier rail and reenter the channel downstream of the bridge. By this point, a significant volume of water is escaping the Channel upstream of the bridge by overbanking.

CONCLUSIONS AND RECOMMENDATIONS

The comparisons of water surface profiles for each model run are shown in Figure 3. The "Maximum Flow" profile on the left shows the effect of the bridge at the 100-year peak flow rate. The difference in upstream water surface elevation between the "Existing Condition" and the "Proposed Seismic Retrofit" is on the order of 0.1 feet. However, this is not negligible because unlike most hydraulic models that assume a "glass wall" exists above the top of the banks, this unsteady flow model includes the channel levee profile and calculates the volume of flow that actually escapes the channel. The results show that the volume of water that flows over the channel banks during the storm increases by 43 acre-feet. This represents an increase of 64 percent of the total overbanking volume of the Walnut Creek Channel from the Marsh Drive Bridge upstream to Concord Avenue and of the tributary Clayton Valley Drain upstream to Hillcrest Park.

The "Medium Flow Profile" of Figure 3 (which coincidentally occurs at a flow rate slightly greater than the 25-year event peak flow) demonstrates that the water surface elevation upstream of the bridge differs by a substantial 1.5 feet. Although there is no upstream channel overbanking, the following undesirable conditions extend up to the Concord Avenue crossing:

(1) The bridge goes into pressure flow sooner, so the length of time that the piers are affected by local pier scour and foundation undercutting increases

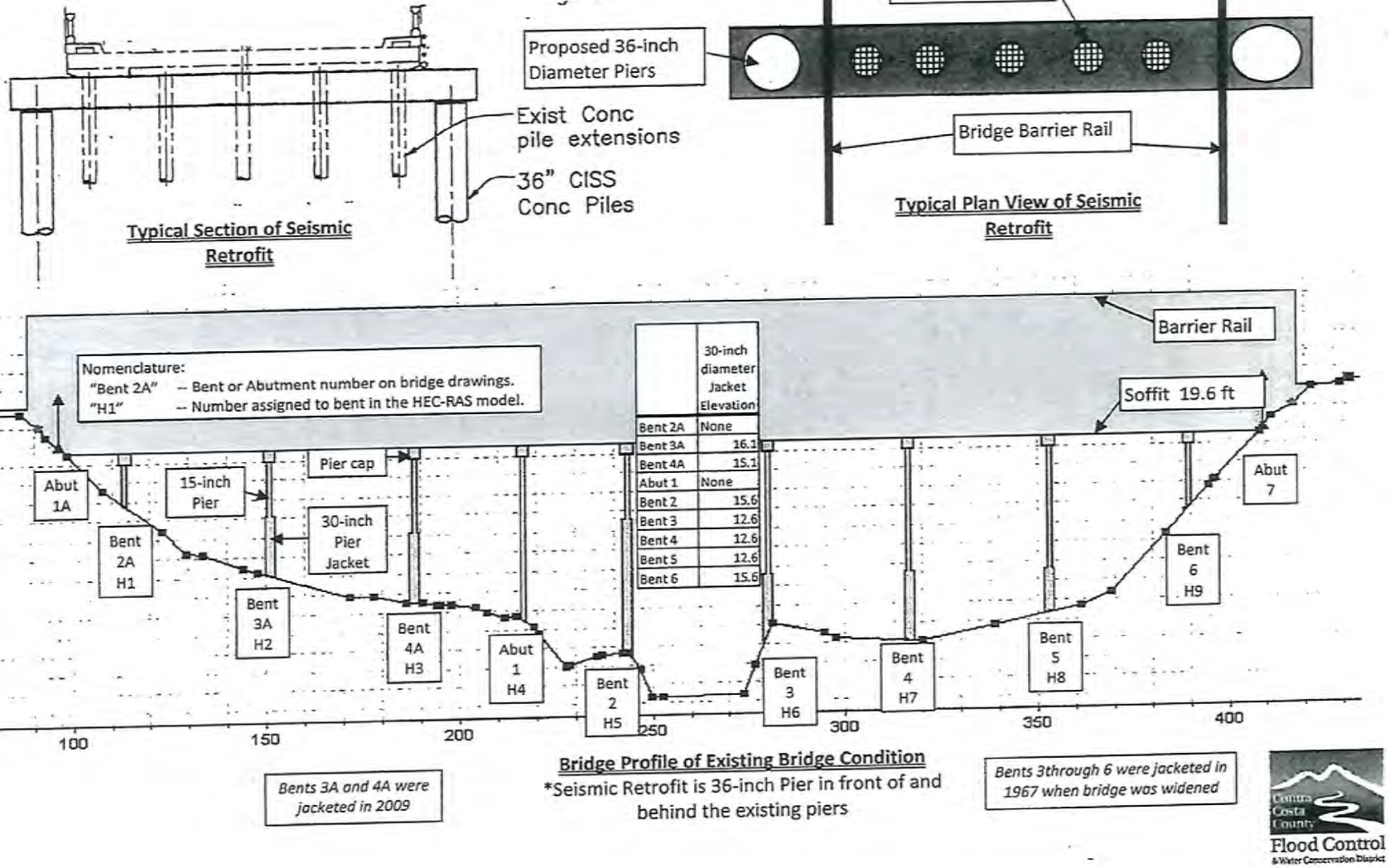
(2) The channel upstream of Marsh Drive to Concord Avenue will operate with less freeboard at the higher frequency events (5-year through 25-year), which increases the probability for levee failure.

The FC District does not consider the proposed bridge retrofit design as acceptable and recommends that the City use an alternative design that does not decrease the channel capacity. Alternatively, the City may propose mitigation for these impacts. Development of mitigation measures is beyond the scope of this analysis.

REFERENCES

1. Lower Walnut Creek Corrective Action Plan, prepared for the US Army Corps of Engineers, Sacramento District, June 28, 2007.
2. Lower Walnut Creek General Reevaluation Report Hydrology Appendix, Revised June 2008.
3. Construction Plans for the 2007 Lower Walnut Creek Emergency Interim Protection Measures project, Flood Control Project No. 7520-6B8345-07.

Figure 1
Proposed Seismic Retrofit



Bridge Profile of Existing Bridge Condition
*Seismic Retrofit is 36-inch Pier in front of and behind the existing piers

Contra Costa County Flood Control & Water Conservation District

Figure 2
Flow Rate Versus Elevation of Walnut Creek Channel at Marsh Drive Bridge

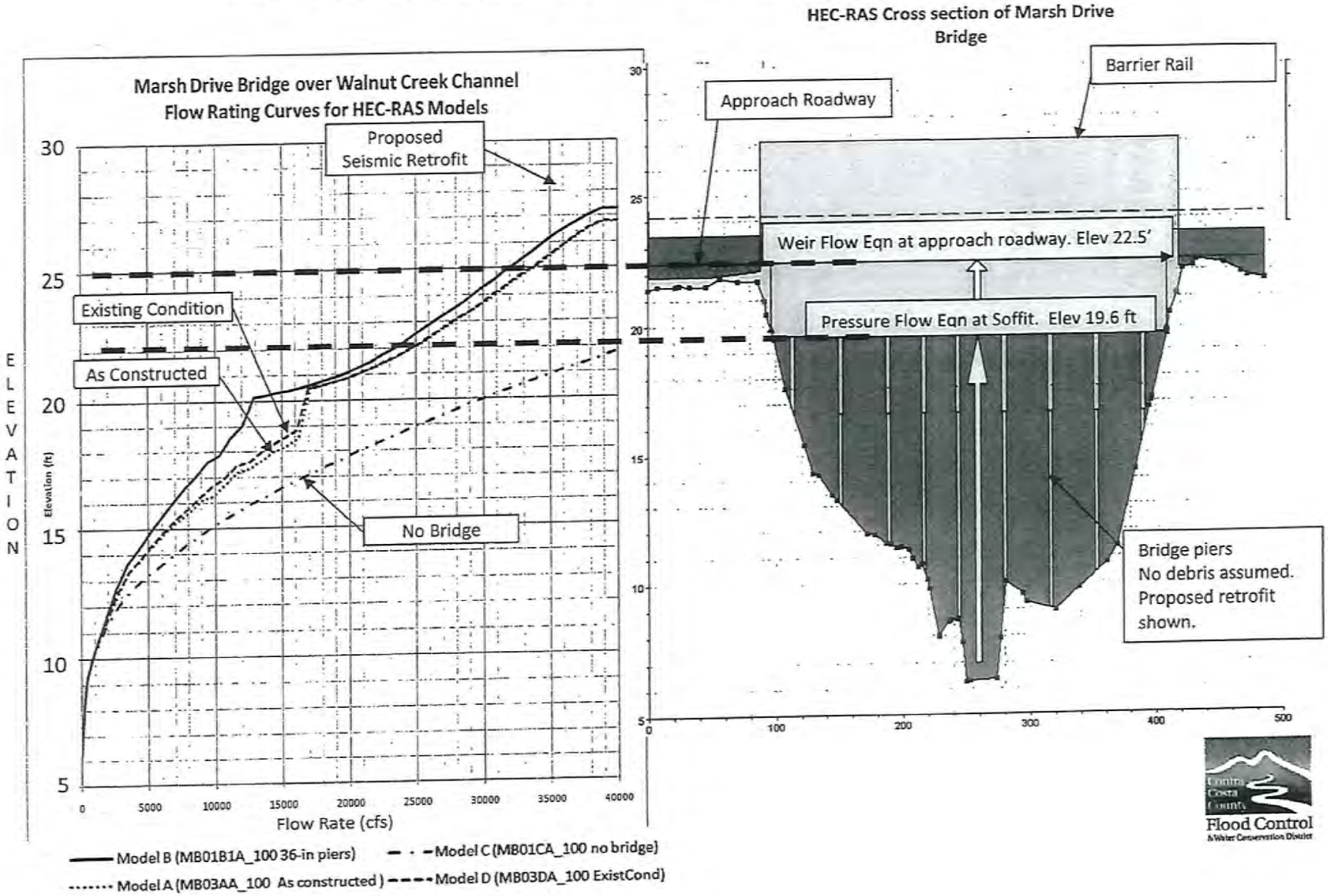
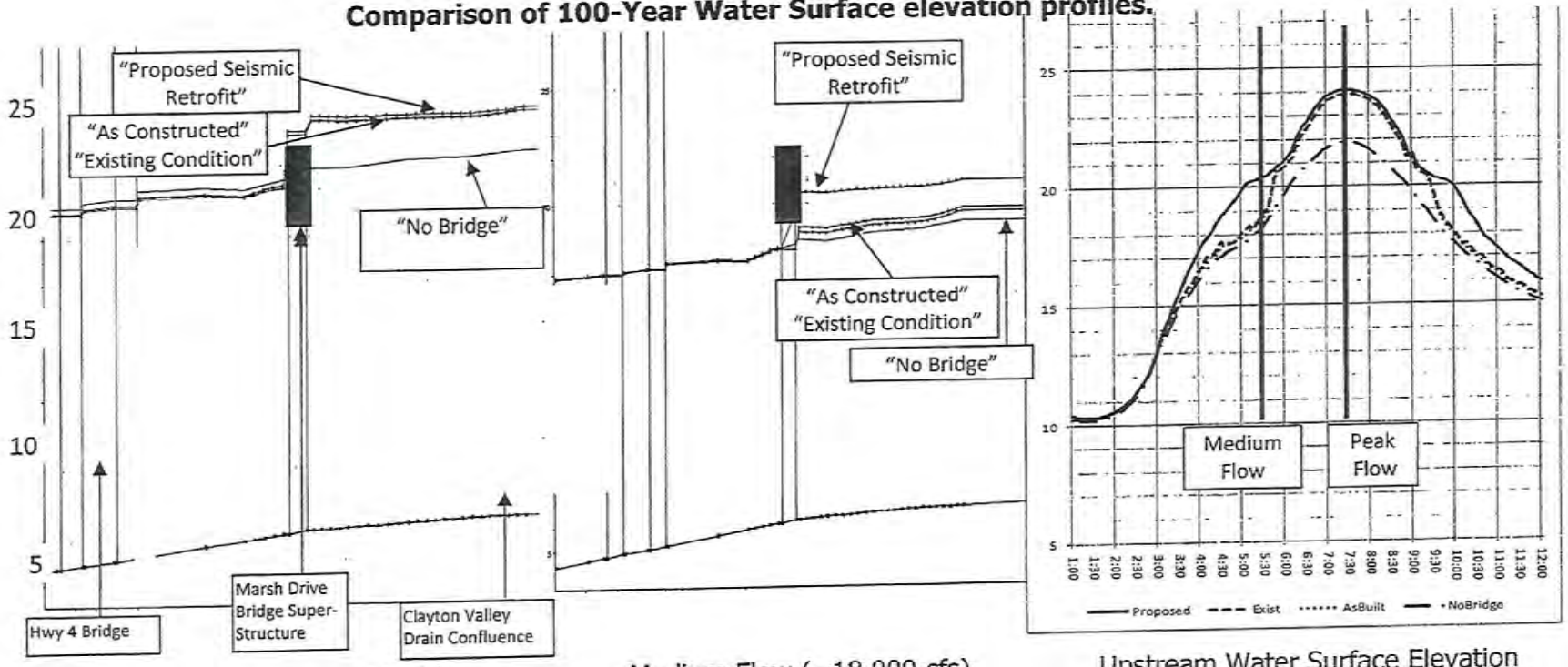


Figure 3
Comparison of 100-Year Water Surface elevation profiles.



Maximum Flow (~27,000 cfs)
Timestep 0730
100-year Peak Flow

Medium Flow (~18,000 cfs)
Timestep 0530

Upstream Water Surface Elevation Hydrograph at Marsh Drive Bridge

CMS:cw
G:\fldctl\Watershed Planning - Engineering\Zone 3B\Lower WC - COE\Hydraulics\Existing_Condtions_2009\02 CORRESPONDENCE\MarshDrBrdg Seismic Retrofit LWC Memo.docx

c: P. Detjens, Flood Control
C. Roner, Flood Control
A. Huerta, Transportation Engineering

Contra Costa County Flood Control & Water Conservation District

Contra Costa County
Flood Control
& Water Conservation District

Julia R. Bueren,
ex officio Chief Engineer
Steve Kowalewski,
Deputy Chief Engineer

Interoffice Memo

DATE: November 4, 2013

TO: Paul Detjens

FROM: Craig M, Standafer, P.E. CMS

SUBJECT: Lower Walnut Creek at Marsh Drive Bridge Proposed Seismic Retrofit -- Request by City of Concord to Determine if Modeling a Zero Net Impact is Feasible

FILE: 4001-111-20 Lower Walnut Creek File
4001-111-00 [First and last sheets only]

MESSAGE:

This memo is a follow-up to the October 22, 2013 memo (October 22 memo) by Craig Standafer to Paul Detjens. On October 23, 2013 the Contra Costa County Flood Control and Water Conservation District (FCD) met with the co-owners of the Marsh Drive Bridge, the City of Concord (City) and Contra Costa County. The City requested that the FCD investigate the feasibility of modeling improvements to calculating the net hydraulic impact of their proposed seismic retrofit of the Marsh Drive Bridge. They were interested in knowing if a more advanced two- or three-dimensional model could accomplish the task. The City desires to demonstrate that their proposed retrofit has a negligible net hydraulic impact when compared to the existing condition. A negligible net hydraulic impact is a net change in upstream water surface elevation (WSEL) of zero. The City made this request because they desire to construct the seismic retrofit plan, which will need United States Army Corps of Engineers (USACE) Section 408 Approval.

The hydraulic analyses presented in the October 22 memo and the memo from November 4, 2010 (2010 memo) demonstrate that the Marsh Drive Bridge, in its existing condition, is a significant hydraulic impediment to flow in the Walnut Creek channel. According to the unsteady flow HEC-RAS model that we are developing, the net hydraulic impact of the Marsh Drive Bridge is significant when compared with a hypothetical "no bridge" condition. Figure 2 of the October 22 memo approximately shows this. The hydraulic impact was computed assuming the 2005 channel topography and using hydrology (flow rates) from the USACE's 2008 study.

Regarding the specific impact of the City's proposed retrofit, Table 3 of the October 22 memo demonstrates that the proposed seismic retrofit has a 0.20-foot net hydraulic impact on the WSEL at a location 100 feet upstream of the bridge when compared to the existing bridge. An earlier analysis by the City of Concord demonstrated that the net hydraulic impact is on the order of 0.11 feet. These net hydraulic impacts are not negligible and require mitigation. The allowable tolerance for the net hydraulic impacts

among the regulatory agencies such as Caltrans and the USACE, Operations Division is not known at this time.

This memo provides a summary of the research done that includes discussions of other modeling tools with industry experts. Based on this research, it is unlikely that a more advanced modeling program could generate results that demonstrate a net hydraulic impact of zero. The two-dimensional modeling tools that are available do not adequately model bridges. Physical modeling is the only tool that is available, but it is very expensive, takes a lot of time, and is unlikely to produce the desired results. If this is pursued, the effort expended in documenting and explaining the complex model to the regulatory agencies may exceed the benefit gained.

Given the revised hydrology, sediment deposition in the channel, and the need to develop a mitigation plan for all of this, the ideal solution is the "retrofit by replacement" option. This option may not be available at this time, but this opinion has been received from several sources.

Modeling the Proposed Seismic Retrofit of Marsh Drive Bridge Using HEC-RAS

The Marsh Drive Bridge is modeled in HEC-RAS as River Station (RS) 211+11. A plan view from the HEC-RAS model is shown in **Figure 1** below. The Marsh Drive Bridge is located 400 feet upstream of the Highway 4 Bridges and 500 feet downstream of the confluence with the Clayton Valley Drain.

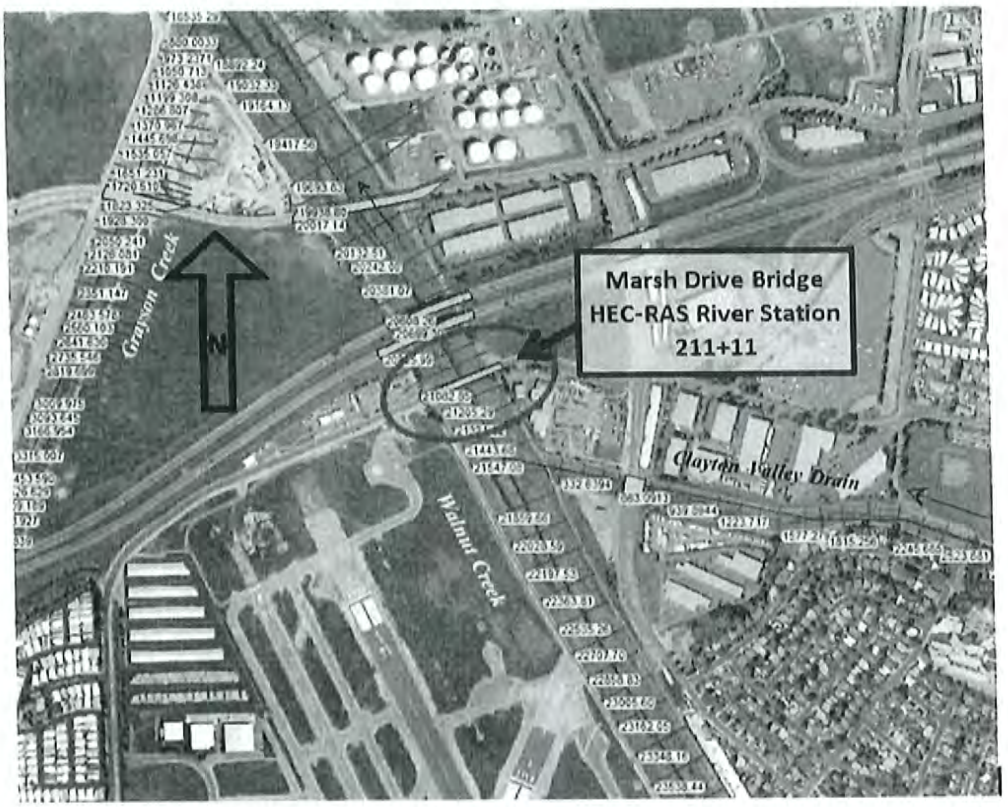


Figure 1 Plan View of HEC-RAS Model
Marsh Drive Bridge over Lower Walnut Creek

The Marsh Drive Bridge is modeled with the deck, barrier rails, approach roadway, and bridge piers as shown in **Figure 2**. **Figure 3** shows a detail of the proposed retrofit of a typical bent. The seismic retrofit consists of 36-inch diameter piers that span each of the nine pier bents. The 36-inch piers support a four-foot wide bent cap that in turn supports the existing bridge deck. (See the October 22 memo and 2010 memo for more details.)

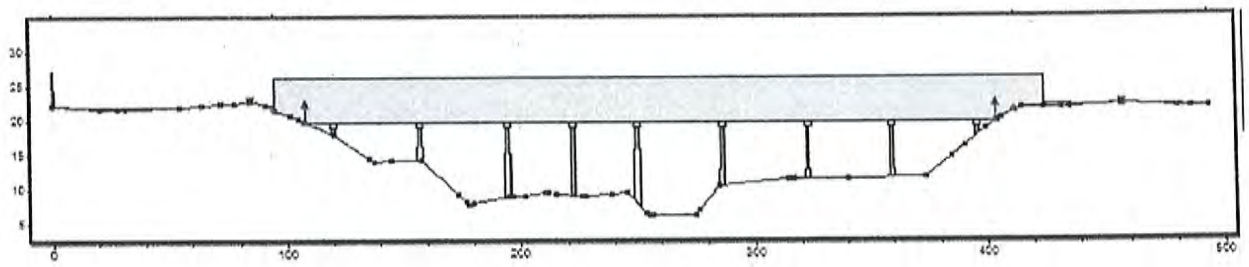


Figure 2 Profile View of Marsh Drive Bridge over Lower Walnut Creek Channel taken from the HEC-RAS Model

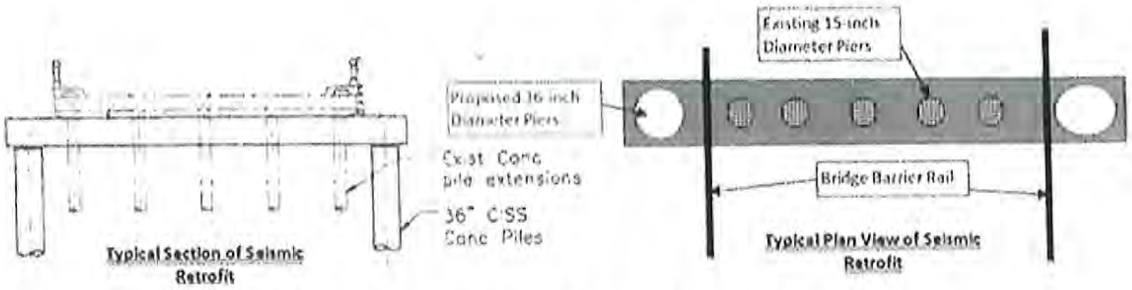


Figure 3 Marsh Drive Bridge Proposed Seismic Retrofit Pier Bent Cross Section and Plan View

The following are facts and possibilities for hydraulic improvements according to the design engineer, Esmond Chan of JMEC Engineering, Inc., for the proposed seismic retrofit:

- The diameter of the leading (upstream) pier must be 36 inches or greater to carry the loads.
- The existing 350-foot long bridge must be supported by nine pier bents. It is not possible to reduce the number of pier bents because of the design of the bridge deck.
- The proposed seismic retrofit pier bent is wide enough to accommodate a future widening project to bring the roadway to current standards.
- It may be possible to eliminate the interior piers. The engineer states that the new 36-inch diameter exterior piers are designed to carry the entire dead and live load of the bridge and that the existing interior piers would be redundant. **The City requests to see if this configuration can be modeled and determine if this configuration has a net hydraulic impact of zero.**

The following are facts about the hydraulics of the system as they relate to modeling the Marsh Drive Bridge. These variables do not change as a result of adding the proposed seismic retrofit.

- The channel geometry is based on the photogrammetric and bathymetric survey that was performed in 2005. The channel under the bridge has been depositing sediment, which returns rapidly after desilting operations. The FCD considers channel excavation solutions to be temporary and cannot be considered as mitigation. In 2007, the channel under the bridge was disilted to its design depth, leaving the incised low flow channel, and it is assumed that the silt will return after a short period of time. Even in the scenario where the channel was desilted to the

design cross section, the Marsh Drive Bridge would still raise the upstream water surface elevation by 2.1 feet.

- The average diameter of the existing piers is about two feet. Many of the original 15-inch diameter piers were jacketed to 30 inches over time. The hydraulic model includes the effect of two feet of pier debris on each side of the leading piers for all bridges in the model, including the Marsh Drive Bridge. The pier debris is added to the model based on the results of model validation/calibration runs that compare observations of known storm events. It must be noted that the original hydraulic analysis of the Marsh Drive Bridge did not include the effect of pier debris. For the FCD HEC-RAS models, all runs include the same amount of pier debris, so the net hydraulic impact is not affected in a comparative analysis.

- As discussed in the October 22 memo, the design flow rate is based on the USACE's hydrology that was published in their 2008 hydrology report.

Practical Hydraulic Improvements to the Proposed Seismic Retrofit

Prior to researching the modeling methods, I researched practical solutions to improve the hydraulic efficiency of the proposed seismic retrofit. I discussed the issues with Neil Leary of Contra Costa County's Design and Construction division. He is the County's authority on the bridges owned by Contra Costa County. He contacted Jim Foster of Quincy Engineering, who has assisted the County in many projects, to determine if there are any practical solutions. They discussed solutions such as removing the redundant piers under the existing deck or constructing a pier wall between the proposed 36-inch piers that were discussed at the October 23 meeting.

Based on this interview, they were unable to determine any simple ways to reduce the hydraulic impact to zero for this sort of bridge retrofit project. They agreed that the bridge structure that the bridge design engineer added for the seismic retrofit was necessary. Neil and Jim concluded that the best option is "retrofit by replacement." Quincy Engineering said that, in their experience, getting Caltrans to agree to the hydraulic impacts caused by the proposed bridge retrofit is not expected to be an overly difficult task.

HEC-RAS One Dimensional Modeling of the Bridge

As explained in the 2010 memo, HEC-RAS models the hydraulic impact caused by bridges using different equations depending on the flow regime. According to Section 5 of the *HEC-RAS Hydraulic Reference Manual*, HEC-RAS selects the equations depending on whether the flow is in the "low flow" or the "high flow" regime. The low flow regime equations are used when the WSEL is below the upstream bridge soffit, and the high flow regime equations are used when the WSEL is at or above the upstream soffit. The latest analyses run by the FCD indicate that Marsh Drive Bridge operates in pressure and weir flow (high flow regime) for the 100-year design flows, which distinguishes it from most other bridges. **Figure 4** shows a schematic profile of one of the pier bents of the proposed seismic retrofit operating in the high flow regime.

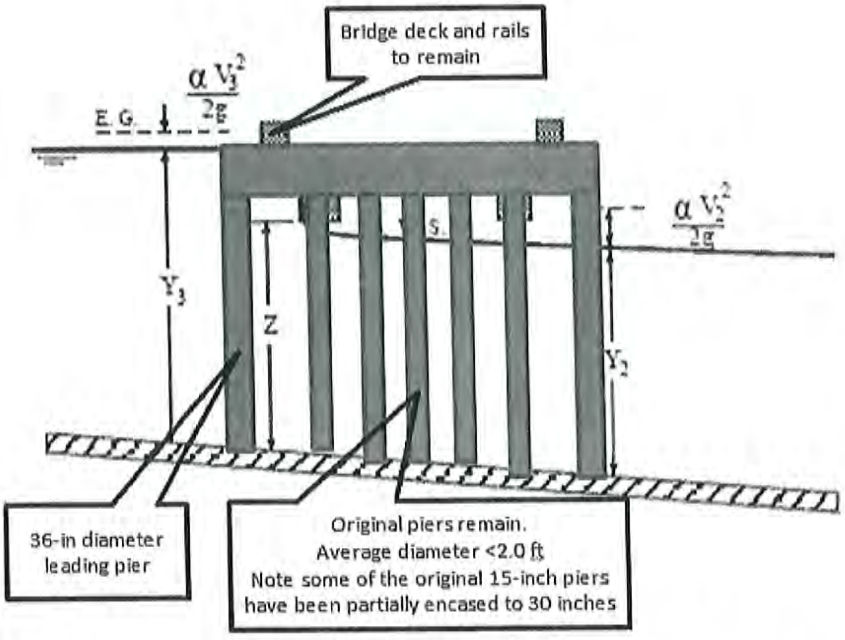


Figure 4 Schematic Profile Across the Marsh Drive

As explained in the *HEC-RAS Hydraulic Reference Manual*, the low flow regime includes the choice of the "highest energy solution" between the "standard energy step equations" and other methods that were derived based on physical modeling. The standard energy step includes expansion and contraction losses that would be caused by water expanding and then contracting around the bridge elements like sets of piers. These equation are based on the assumption that the water surface is not constrained by a "lid" as shown in **Figure 4**. The other experimentally-derived equations include Yarnell, the momentum approach, and "WSPRO" where the pier parameters (shape of leading pier and number of pier bents) could be entered. However, these equations are only considered when the WSEL is below the soffit.

Once the water surface reaches the soffit, the high flow regime equations are used. As discussed in Chapter 5 of the *HEC-RAS Hydraulic Reference Manual*, when the bridge goes into pressure flow, the main variable is the upstream cross sectional area available for flow. See **Figure 5** that contains excerpted sketches from the *HEC-RAS Hydraulic Reference Manual* that show the pressure flow condition.

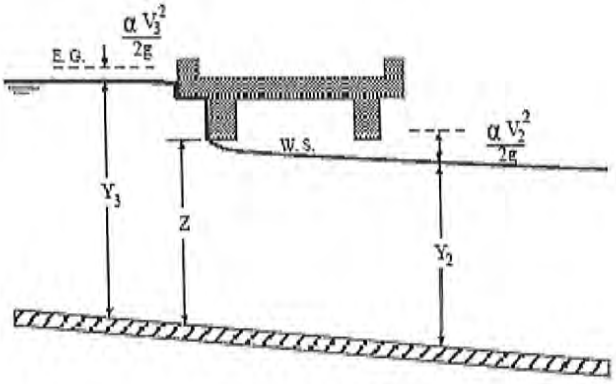


Figure 5-4 Example of a bridge under sluice gate type of pressure flow

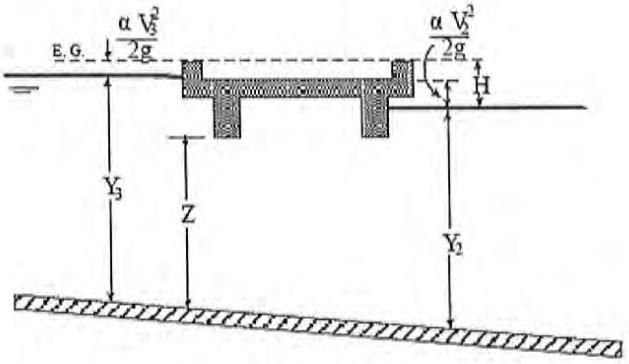


Figure 5-6 Example of a bridge under fully submerged pressure flow

Figure 5 Examples of Pressure Flow for Bridges from the HEC-RAS Hydraulic Reference Manual.

Depending on the downstream condition, HEC-RAS chooses between a sluice-gate equation when the downstream end of the bridge is free flow (below the soffit) and the orifice equation when the downstream end is submerged. When the upstream WSEL exceeds the roadway elevation, the weir equation is used. The equations for pressure flow are shown below:

Sluice-Gate Type Equation (equation 5-14):

$$Q = C_d A_{BU} \sqrt{2g}\left[Y_3 - \frac{Z}{2} + \frac{a_3 V_3^2}{2g} \right]^{1/2}$$

Orifice Equation (equation 5-15):

$$Q = CA\sqrt{2gH}$$

Each equation contains coefficients (C_d and C). As discussed in detail in Chapter 5 of the *HEC-RAS Hydraulic Reference Manual*, these coefficients are determined by HEC-RAS and are related to the upstream hydraulic head and degree of submergence at the downstream end of the bridge. The coefficients are not based on pier configurations or geometry like they are for the low flow regime equations. The conclusion is that anything that decreases the bridge open area (A_{BU} and A) at the leading edge of the bridge WILL have a hydraulic impact. Any effect that may occur downstream would be considered secondary or tertiary, and HEC-RAS does not have the ability to perform this refined calculation. This makes sense because the leading piers can be visualized as a grate that flow must pass through.

I discussed this in detail with Scott Stonestreet in the Hydraulics Division of the Sacramento District of the USACE and with Han-Bin Liang of Wreco. Scott is one of the leading authorities on bridge hydraulics and has a lot of experience modeling bridges with HEC-RAS. He successfully helped Caltrans to reduce their hydraulic impacts to bridges in the Los Angeles area. Han-Bin has worked on many projects throughout California that involve bridge replacement and retrofits.

They both agreed that the problem primarily relates to the leading piers as discussed above and that the hydraulic impacts downstream of the leading piers are negligible. According to Scott, it may be possible to compute this tertiary effect, and perhaps reduce the hydraulic impact below the 0.20 feet calculated using HEC-RAS. However it will not be possible to reduce the net hydraulic impact to zero.

We discussed different ways to model the five-foot gap between the leading 36-inch piers and the bridge deck as shown in **Figure 6**. This was suggested by Randell Harrison at the October 23 meeting. From a modeling perspective, this is a very nuanced situation that cannot be appropriately modeled using the equations available in HEC-RAS. Because of this, the HEC-RAS results would need to be validated against the results another modeling method. Also, from a practical perspective, this condition is considered temporary because the bent caps are designed to accommodate a fully widened roadway in the future. The future condition is modeled appropriately in HEC-RAS using weir and pressure flow.

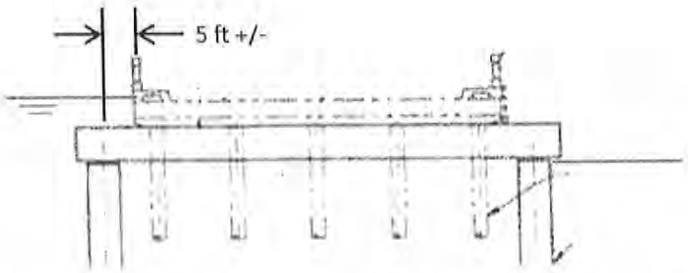


Figure 6 The Gap Between the 36-inch Pier and the Existing Bridge Deck

Two- and Three-Dimensional Models

With the methods that HEC-RAS uses to model the bridges in mind, I asked Scott and Han-Bin if there are two- and three-dimensional modeling tools that could model this proposed seismic retrofit. Both said that two-dimensional models are used for modeling floodplains and the behavior of fluids on a relatively large scale. They said that a physical model of the bridge itself is the only way to get results. Scott and I discussed that an analytical model for this application would be very high cost in terms of time and dollars with a low probability of computing a net hydraulic impact of zero. The Flood Control District does not have the expertise for this type of analysis, so it would need to be done by others.

Two-dimensional modeling tools are currently unable to accurately model pressure flow under a bridge surface. The two-dimensional models need to be coded with a stage-flow relationship from another source to begin. These sources would include one-dimensional modeling or physical modeling. Our discussions did not cover the full spectrum of software that might be available.

The City could pursue hiring somebody to perform the analysis, but it would take a lot of time and money to get the model constructed, run, validated, and documented. Model construction would require data entry from construction plans for the bridge geometry. The topography would need to be imported into a mesh under the bridge. Model construction would include extensive validation and refinements to ensure predicted results are reasonable. When doing complex modeling, the initial results are usually quite unexpected and need to be researched and validated. Furthermore, the results may be the same as the simpler HEC-RAS model produces.

Even if conclusive results could be found, the model will need to be checked and accepted by others. This task alone is time consuming. The USACE does not regularly use two-dimensional tools for this application. Also, it is worth noting that the National Flood Insurance Program has not yet accepted any two-dimensional modeling programs for that application.

The one-dimensional analysis tools like HEC-RAS remain the best analytical tool for the process. We briefly discussed three dimensional models, and we concluded these have not yet evolved to the point where they can replace a physical model. In the end, using a complex modeling tool would need to be explained to Caltrans and the USACE, who would need to come up to speed on it.

Conclusions and Recommendations

Given the revised hydrology, sediment deposition in the channel, and the need for the FCD to develop a mitigation plan for all of this, the ideal solution is the "retrofit by replacement" option. This option may not be available at this time, but this opinion has been received from several sources.

Based on this research, it is unlikely that a more advanced modeling program could generate results that demonstrate a net hydraulic impact of zero. There are no known practical solutions available to improve the hydraulic performance of a seismic retrofit, especially where the bridge is in the high flow regime during the design flows. The two-dimensional modeling tools that are available are not appropriate for the job and rely on other tools to determine the stage-flow relationship for the bridge. Physical modeling is the only tool that is available, but it is very expensive, takes a lot of time, and is unlikely to produce the desired results. Finally, the effort expended in documenting and explaining the complex model to the regulatory agencies may exceed the benefit gained.

It is recommended that the City take this information and determine if they wish to pursue a modeling path that demonstrates a net hydraulic impact of zero.

If the City continues to use the proposed seismic retrofit, they should propose appropriate mitigation that reduces the net hydraulic impact in preparation for the Section 408 approval process.

CS:cs
G:\fldctl\Watershed Planning - Engineering\Zone 3B - Walnut San Ramon\Lower WC\Hydraulics\2013 LWC Study\Marsh Drive Bridge\Memo Modeling for Zero Net Hydraulic Impact.docx

cc: Neil Leary, Contra Costa County, Design and Construction Division
Adelina Huerta, Contra Costa County, Design and Construction Division

Contra Costa County
Flood Control
& Water Conservation District

Julia R. Bueren,
ex officio Chief Engineer
Steve Kowalewski,
Deputy Chief Engineer

Interoffice Memo

DATE: January 16, 2014

TO: Paul R. Detjens

FROM: Craig M. Standafer, P.E. CMS

SUBJECT: Follow-up Transmittal of the Lower Walnut Creek Unsteady Flow HEC-RAS Model to the City of Concord for Their Use to Analyze the Impacts of the Proposed Seismic Retrofit of Marsh Drive Bridge -- Update for Six-Inch Lead Pier Reduction

FILE: 4001-111-20 Lower Walnut Creek File
4001-111-00 [First and last sheets only]

MESSAGE:

This memo updates the Lower Walnut Creek unsteady flow HEC-RAS model that was previously transmitted to the City of Concord (City) on October 23, 2013. The City requested to add a run that reduces the lead pier of the proposed seismic retrofit by an additional six inches.

This memorandum is the fourth in a series that has been transmitted to the City related to the hydraulics of the Walnut Creek channel at the Marsh Drive Bridge. The memoranda are listed below and are attached to this memo as reference.

- November 4, 2010, Craig M. Standafer to Mario Consolacion, *Hydraulic Effects to Walnut Creek Channel by the Marsh Drive Bridge Seismic Retrofit Project*, [Originally transmitted to the City as an attachment to a letter from Mario Consolacion on November 5, 2010.]
- October 22, 2013, Craig M. Standafer to Paul R. Detjens, *Transmittal of the Lower Walnut Creek Unsteady Flow HEC-RAS Model to the City of Concord for Their Use to Analyze the Impacts of the Proposed Seismic Retrofit of Marsh Drive Bridge*
- November 4, 2013, Craig M. Standafer to Paul R. Detjens, *Lower Walnut Creek at Marsh Drive Bridge Proposed Seismic Retrofit -- Request by City of Concord to Determine if Modeling a Zero Net Impact is Feasible*

The information contained in the memorandum is provided to the City as a courtesy and is the product of modeling the Contra Costa County Flood Control and Water Conservation District (FCD) has performed along a portion of Walnut Creek.

The City proposes to seismically retrofit the Marsh Drive Bridge over the Walnut Creek channel by adding two 36-inch columns at each of the nine existing pier bents. The results of hydraulic modeling indicate that the Walnut Creek channel upstream of the

Marsh Drive Bridge has inadequate freeboard, and in some locations, predicts flooding over the channel banks for the 100-year storm. The proposed seismic retrofit will further increase the upstream water surface elevation level (WSEL), worsening this situation.

Table 1 below contains a list of scenarios that have been modeled for the City using the unsteady flow HEC-RAS hydraulic model. For details of these scenarios, see the October 22, 2013 memo.

Table 1 HEC-RAS Models Transmitted to the City

Scenario Plan Number and Name	Notes
Plan 56 Existing Condition Reference the October 22, 2013 memo.	The existing condition bridge scenario includes the 18-inch Bridge piers as they were constructed in 1964 +/- plus the bridge piers at Bents 3A & 4A that were jacketed to 30 inches. The "average pier width" throughout is approximately 1.9 feet. All bridge piers have 2.0 ft of floating debris modeled on each side of them. The effective pier width is 5.9 feet from channel bottom to bridge soffit (including pier debris).
Plan 57 Proposed Seismic Retrofit Reference the October 22, 2013 memo.	The proposed seismic retrofit scenario includes 36-inch bridge piers with a 3-foot high by 4-foot wide bent cap. All piers have 2.0 ft of floating pier debris that is modeled on each side of them. The effective pier width is 7.0 feet (including pier debris).
Plan 55 No Bridge (Hypothetical) Reference the October 22, 2013 memo.	This is a hypothetical run that includes no Marsh Drive Bridge.
Plan 64 Proposed Seismic Retrofit with Six-Inch Lead Pier Reduction. ** ADDED WITH THIS MEMO. ***	This scenario reduces the proposed effective lead pier width by six inches (30-inch bridge piers with a 3-foot high by 3.5-foot wide bent cap.) All piers have 2.0 feet of floating pier debris modeled on each side of them. The effective lead pier width is 6.5 feet wide (including pier debris).

Model Results

Table 2 adds the results of Plan 64 for a comparison of the maximum WSEL at five locations along Walnut Creek between Marsh Drive Bridge and the upstream model limit.

Table 2 Maximum Water Surface Elevation Level Results of the Four Modeled Scenarios

Station	Location	Plan 56 Existing Condition (ft)	Plan 57 Proposed Retrofit +36-inch piers with 4-ft wide bent caps (ft)	Plan 58 Hypothet-ical No Bridge (ft)	Plan 64 Proposed Retrofit + 30-inch Piers (Six-Inch Lead Pier Reduction) (ft)
327+86	Upstream of Diamond Blvd	34.62	34.64	34.47	34.64
288+14	Upstream of Concord Avenue	31.02	31.02	29.98	31.02
259+04	~4800 feet Upstream of Marsh Drive Bridge	28.10	28.25	27.23	28.20
225+35	~1400 feet Upstream of Marsh Drive Bridge	25.84	26.00	23.91	25.98
212+05	~100 feet Upstream of Marsh Drive Bridge	25.04	25.24	21.96	25.16

At station 212+05, which is located 100 feet upstream of Marsh Drive Bridge, the hydraulic effect between the existing condition scenario (Plan 56) and the six-inch lead pier reduction scenario (Plan 64) is 0.12 feet. Table 2 shows how this hydraulic effect extends upstream to the Concord Avenue Bridge.

However, these results must be considered in light of other hydraulic effects. For example, the model results predict that the quantity of weir flow over the Marsh Drive Bridge during the storm peak is 2193 cfs for the proposed retrofit with 36-inch piers scenario (Plan 57) compared with 2177 cfs for the six-inch lead pier reduction scenario (plan 64). This weir flow must be accommodated and addressed by the proposed retrofit design, including bridge railing modifications, and must be discussed in the forthcoming environmental documents.

DISCUSSION OF THE MARSH DRIVE BRIDGE HYDRAULIC DESIGN

Research into the initial Marsh Drive Bridge hydraulic design has indicated hydraulic issues were prevalent at this highway bridge at the time the Walnut Creek channel was

constructed and the bridge was lengthened in the 1960s. The channel design is detailed in the Corps of Engineers document titled, *Design Memorandum no. 1, Walnut Creek Project, General Design and Basis of Design for Reach I (Suisun Bay to Willow Pass Road)*, dated January 15, 1963 (with Revisions on May 15, 1963).

In 2014, the FCD faces many issues along the Walnut Creek channel, which this proposed seismic retrofit of Marsh Drive Bridge exacerbates. In the 1960s, the bridge hydraulics had virtually no margin to pass the design (100-year) WSEL. The 1963 Design Memorandum indicates that the WSEL was determined to be at bridge soffit at the downstream end of the bridge. According to paragraph 32, on page 21, and the typical sections and profiles on the Plate III drawings, it appears the hydraulic designers did not assume bridge hydraulic losses due to pressure flow and instead considered only the Yarnell equations. The Yarnell equations are based on pier geometry only and are appropriate only when the WSEL is well below the bridge soffit. A pressure flow calculation would produce a significant jump in WSEL upstream of the bridge for a small increase in flow rate at the "instant" when the upstream WSEL contacts the bridge soffit.

This means that the bridge "barely passed" when designed, and any subsequent hydraulic constrictions or unfavorable design assumptions would have a significant effect on the upstream WSEL. These impacts extend to nearly the Willow Pass Road Bridge, which is located 12,500 feet upstream of the Marsh Drive Bridge.

Examples of subsequent hydraulic constrictions and unfavorable design assumptions are as follows:

- Many of the bridge piers required jacketing, as addressed in the November 4, 2010 memo. This further reduced the open area available to flow and would have put the upstream edge into weir flow, assuming that the initial calculations had the WSEL immediately below the soffit (i.e. assuming the Yarnell equations were valid at the time).

- The original design did not include the effect of pier debris, which the Corps of Engineers and the FCD have subsequently determined to be necessary. Our calibration study to the New Year's Storm of 2005/2006 concluded that pier debris must be included at all bridges in order to calibrate the modeled hydraulics to the channel's performance in a real storm event.

- The Corps of Engineers updated hydrology report from 2008 indicates that the flow rates have increased by about twenty percent above the 1960s design flow rates. Although the FCD is required to maintain the channel to pass the "design flows," the revised flows must be considered when looking at actual flood risk. This is a significant change that has reduced the level of flood protection in the area.

- The presence of Marsh Drive Bridge single-handedly causes a cascading hydraulic impact that extends for thousands of feet upstream. This type of effect is not caused by other bridges with a more modern design.

- Given the subsequent hydraulic constrictions and unfavorable design assumptions discussed above, it has been shown that the presence of the Marsh Drive Bridge increases the 100-year WSEL by over three feet at the upstream edge of the bridge. This is shown in **Table 2** by comparing Plan 57 to Plan 58 at Station 212+05.

- The backwater effect from Marsh Drive Bridge extends upstream to submerge the downstream edge of the Concord Avenue Bridge. In a similar fashion to the Marsh Drive Bridge, the Concord Avenue Bridge enters into pressure flow, causing an increase in WSEL upstream.

CONCLUSIONS AND RECOMMENDATIONS

As discussed above, the hydraulic effect of a Marsh Drive Bridge scenario with 30-inch piers and 3.5-foot bent caps (Plan 64) is 0.12 feet at a location 100 feet upstream of the BNSF Bridge compared to the existing condition scenario (Plan 56). This incremental impact extends up to the Concord Avenue Bridge, which is located 7,200 feet upstream of the Marsh Drive Bridge.

The Marsh Drive Bridge remains a significant hydraulic impediment to the Walnut Creek channel. Its hydraulic impact, in the existing condition extends to nearly the Willow Pass Road Bridge, which is located 12,500 feet upstream of the Marsh Drive Bridge. The FCD would welcome further discussion to replace the Marsh Drive Bridge with a longer and higher span. A modern bridge with a higher soffit elevation would significantly reduce the upstream WSEL, which in the end would better serve the public who live and work near the channel banks upstream of the Marsh Drive Bridge.

Next Steps

Assuming the City elects to proceed with a bridge retrofit instead of replacement, we expect that the Corps of Engineers will require the City to secure a Section 408 Major Permit from the Corps of Engineers. Our past experience on other creeks tells us we should expect this will be a lengthy, costly, and potentially onerous process. As the FCD already has the Corps-generated project hydraulic model available, the FCD will continue to provide hydraulic assistance, such as this memo, as needed. As noted in the November 4, 2013 memo, any requested two or three dimensional modeling is beyond the FCD's capabilities.

As was discussed in the October 23, 2013 meeting with the City, the Corps of Engineers will be requesting significant additional data in support of the Section 408 application submittal. The City should be prepared to describe proposed hydraulic mitigation, any bridge railing modifications needed to accommodate weir and pressure flow, and

calculations needed to ensure the retrofitted bridge can withstand lateral hydrostatic and hydrodynamic forces (including the effect of woody debris).

Electronic Files in this Model Transmittal

Table 3 contains the files that will be transmitted to the City for their use. This represents the full a collection modeling performed for the City to date. This transmittal includes two new files and two files that were modified. These files are stored on FCD servers at the following location for future reference:

G:\fldctl\Watershed Planning - Engineering\Zone 3B - Walnut San Ramon\Lower WC\Hydraulics\2013 LWC Study\Marsh Drive Bridge\HEC-RAS model

Table 3 List of Files in the Transmittal to the City

Plan Name	File Name	HEC-RAS File Name	Note
Plan 56: Existing Condition. Plan file and output file.	LWC_dev0113.p56 (.o56)	P56_MarshDrBr EC g38u24	
Plan 56: Existing Condition Geometry File.	LWC_dev0113.g38	G38 MarshDrBr EC FrG19	
Plan 57: Proposed Seismic Retrofit Plan file and output file.	LWC_dev0113.p57 (.o57)	P57_MarshCrBrPropRetr g39u24	
Plan 57: Proposed Seismic Retrofit Geometry File.	LWC_dev0113.g39	G39 MarshDrBrPropRetr FrG38	
Plan 55: No Bridge (Hypothetical) Plan file and output file.	LWC_dev0113.p55 (.o55)	P55_MarshCrBfHypNoBrdg g37u24	
Plan 55: No Bridge (Hypothetical) Geometry File.	LWC_dev0113.g37	G37 MarshDrBrHypNoBrdg FrG38	
Plan 64: Six-Inch Lead Pier Reduction Plan file and output file.	LWC_dev0113.p64 (.o64)	P64_MCBrPropRetr30inch g47u24	new
Plan 64: Six-Inch Lead Pier Reduction Geometry File.	LWC_dev0113.g47	G47 MDBrPropRetr30in FrG38	new
Unsteady Flow File for All Runs	LWC_dev0113.u24	U24_100 -- 2008USACEHyd FrU22p48	
HEC-RAS Project File	LWC_dev0113.prj		modi-fide
Output DSS File	LWC_dev0113.DSS		modi-fide
Input DSS File	WC6H100Y.DSS		

G:\fldctl\Watershed Planning - Engineering\Zone 3B - Walnut San Ramon\Lower WC\Hydraulics\2013 LWC Study\Marsh Drive Bridge\Memo Reduce leading piers by 6inches.docx

cc: Neil Leary, Contra Costa County, Design Division
Adelina Huerta, Contra Costa County, Design Division

Write It, Don't Say It

DATE: July 3, 2014
TO: Neil Leary, Design
FROM: Brian Louis, Flood Control
SUBJECT: Marsh Drive Bridge alternative hydraulics

The Marsh Drive Bridge was analyzed using HEC-RAS to determine what bridge soffit elevation provides 100-year storm flow conveyance. This is a planning level study that can be refined in future phases of this project. The table shown below was transmitted to Quincy Engineers for their Bridge Assessment Study.

This HEC-RAS modeling effort used unsteady flow with the newest revised hydrology and looked at the following two alternative bridge geometries:

1. 3-span box girder bridge with 48-inch diameter support columns and 5-foot deck thickness
2. 6-span slab deck bridge with 24-inch diameter support columns and 2-foot deck thickness

The goal of the this analysis was to set the soffit at varying elevations to determine what bridge soffit elevation allows 100-year flows to pass under the bridge soffit and not back up behind the bridge. Pressure flow is undesirable since it causes water to back up behind the Marsh Drive Bridge and increases the water surface elevation upstream of the bridge.

The deck width is 55.5 feet wide and the bridge length is 318 feet long. A pile debris width of 2 feet on both sides of each leading pier was assumed for all models.

The following table summarizes the bridge dimension options that were analyzed and results from the HEC-RAS models:

Marsh Drive Bridge replacement hydraulic data						
	Alternative 1: Box Girder 3-span bridge			Alternative 2: Slab 6-span bridge		
Option#	1	2	3	4	5	6
Deck thickness (feet)	5	5	5	2	2	2
Top of deck (feet)	27	28	29	24	25	26.5
Soffit elevation (feet)	22	23	24	22	23	24.5
Pier diameter (feet)	4	4	4	2	2	2
Pier debris width (feet)	8	8	8	6	6	6
100-year WSEL at upstream end of bridge (feet)	23.78	22.60	22.13	23.97	23.12	22.29
Flow type through Marsh Drive Bridge	Pressure flow	Open channel flow	Open channel flow	Pressure flow	Pressure flow	Open channel flow

The Alternative 1 (5-foot thick box girder deck bridge) can provide 100-year flow conveyance with soffit elevation 24.0 feet and top of bridge deck at elevation 29.0 feet.

The Alternative 2 (2-foot thick slab deck bridge) can provide 100-year flow conveyance with soffit elevation 24.5 feet. But since the bridge slab deck is only 2-feet thick, the final road grade would be about two feet lower than the 5-foot thick box girder deck bridge design. The slab deck bridge alternative provides a lower deck final grade elevation which helps reduce the quantity of earthwork required to conform to the final grade of the bridge deck.

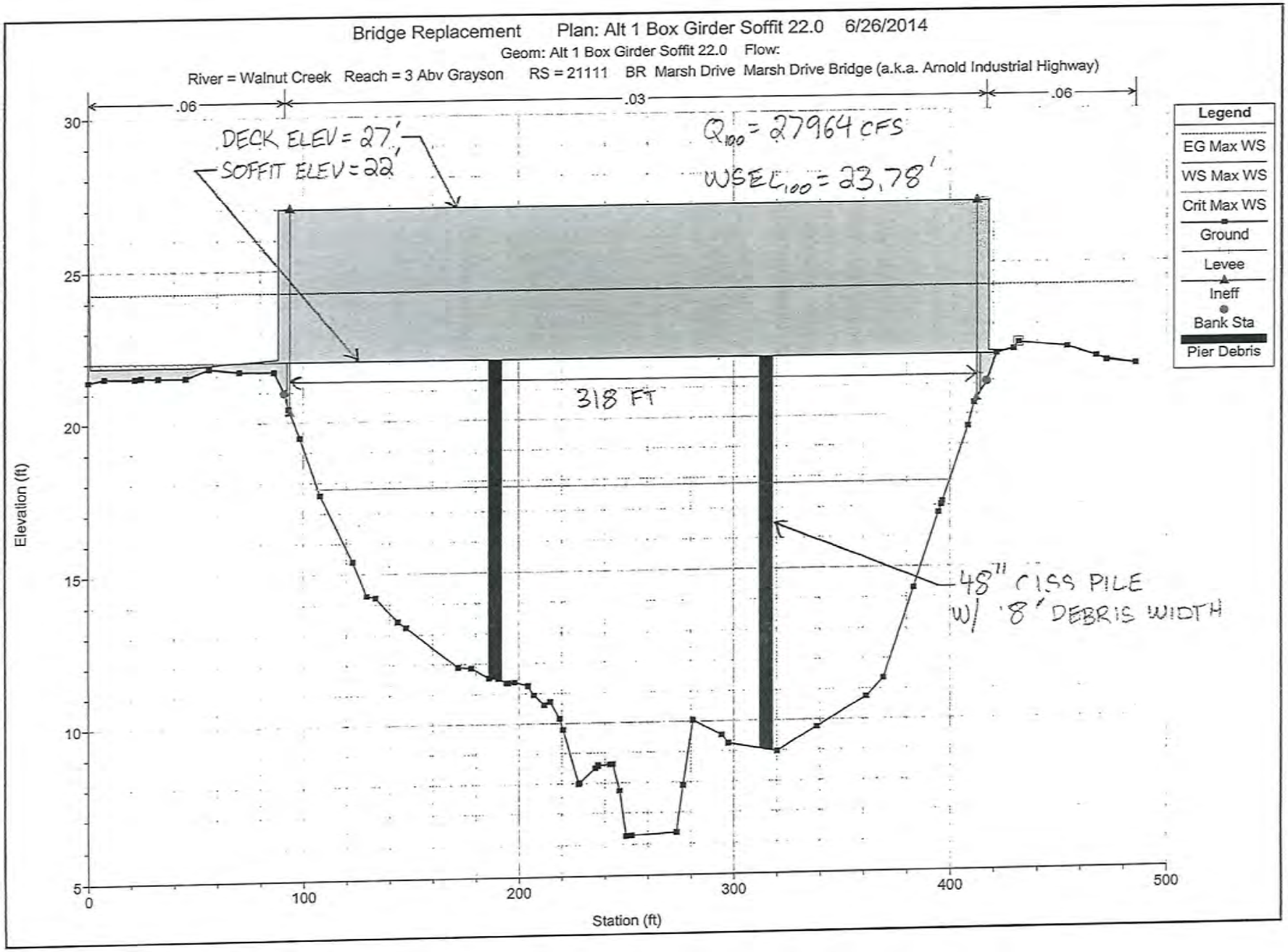
Option 6 is the preferred alternative geometry due to it having the lowest top of deck elevation, highest low chord elevation, and best hydraulic performance.

The HEC-RAS models are located on the G-Drive server in the following location:

G:\fldctl\Watershed Planning - Engineering\Zone 3B - Walnut San Ramon\Lower WC\Hydraulics\2013 LWC Study\Marsh Drive Bridge\HEC-RAS model\Bridge replacement\

Attachments:

1. HEC-RAS cross section at upstream end of bridge for Alternative 1 box girder with soffit elevation 22.0
2. HEC-RAS profile view for Alternative 1 box girder with soffit elevation 22.0
3. HEC-RAS cross section at upstream end of bridge for Alternative 1 box girder with soffit elevation 23.0
4. HEC-RAS profile view for Alternative 1 box girder with soffit elevation 23.0
5. HEC-RAS cross section at upstream end of bridge for Alternative 1 box girder with soffit elevation 24.0
6. HEC-RAS profile view for Alternative 1 box girder with soffit elevation 24.0
7. HEC-RAS cross section at upstream end of bridge for Alternative 2 slab deck bridge with soffit elevation 22.0
8. HEC-RAS profile view for Alternative 2 slab deck bridge with soffit elevation 22.0
9. HEC-RAS cross section at upstream end of bridge for Alternative 2 slab deck bridge with soffit elevation 23.0.
10. HEC-RAS profile view for Alternative 2 slab deck bridge with soffit elevation 23.0
11. HEC-RAS cross section at upstream end of bridge for Alternative 2 slab deck bridge with soffit elevation 24.0
12. HEC-RAS profile view for Alternative 2 slab deck bridge with soffit elevation 24.
13. HEC-RAS cross section at upstream end of bridge for Alternative 2 slab deck bridge with soffit elevation 24.5
14. HEC-RAS profile view for Alternative 2 slab deck bridge with soffit elevation 24.5
15. HEC-RAS output tables
16. Preliminary plan sheets for alternatives (6 sheets)


Bridge Replacement Plan: Alt 1 Box Girder Soffit 22.0 6/26/2014
Geom: Alt 1 Box Girder Soffit 22.0 Flow:
River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
DECK ELEV = 27'
SOFFIT ELEV = 22'
Q_{100} = 27964 CFS
$WSEL_{100}$ = 23.78'
318 FT
48" CISS PILE
W/ 8' DEBRIS WIDTH
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
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25
20
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10
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100
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400
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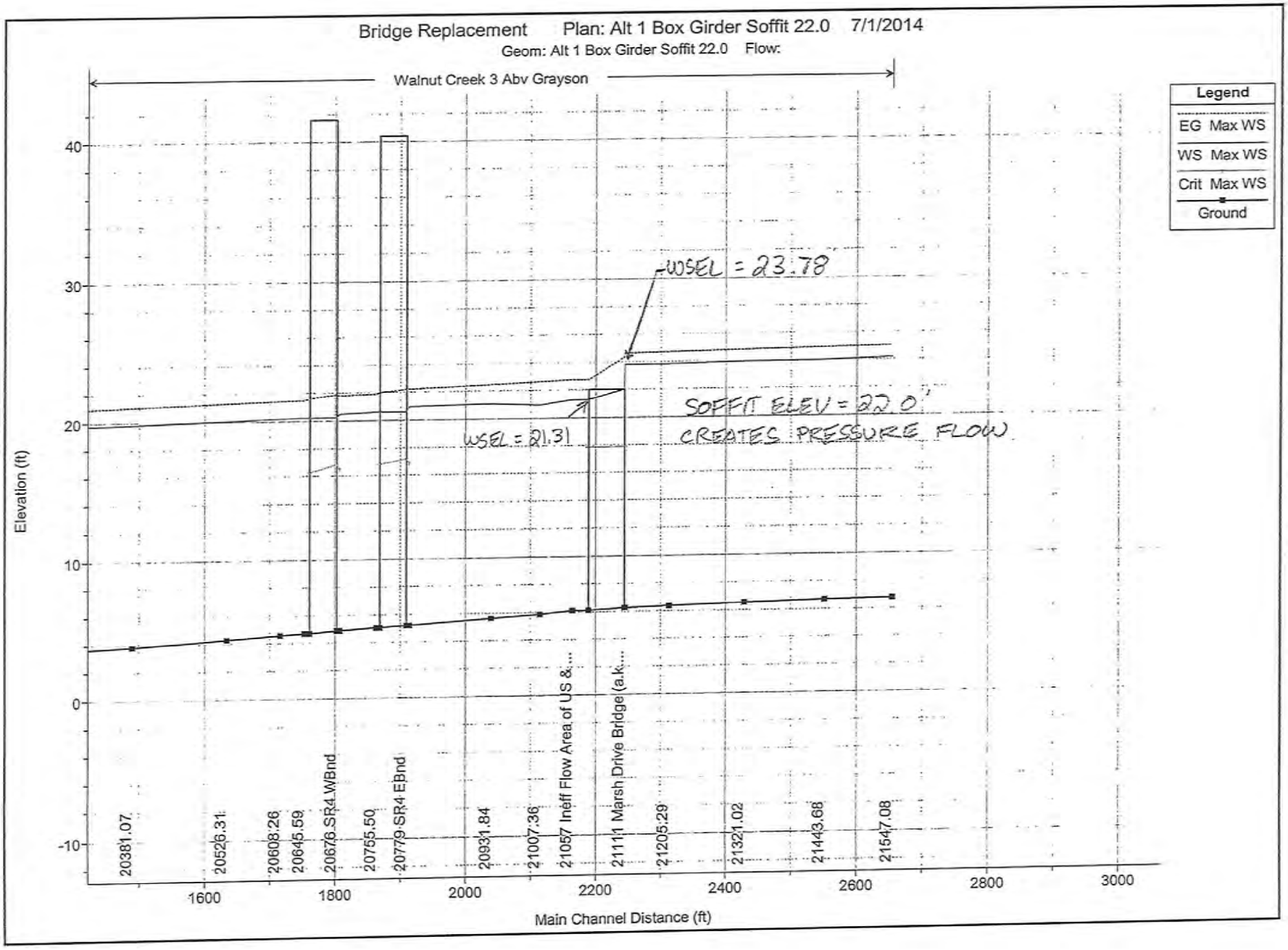
Bridge Replacement Plan: Alt 1 Box Girder Soffit 22.0 7/1/2014
Geom: Alt 1 Box Girder Soffit 22.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
WSEL = 23.78'
SOFFIT ELEV = 22.0'
CREATES PRESSURE FLOW
WSEL = 21.31
Elevation (ft)
Main Channel Distance (ft)
40
30
20
10
0
-10
1600
1800
2000
2200
2400
2600
2800
3000
20381.07
20526.31
20608.26
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
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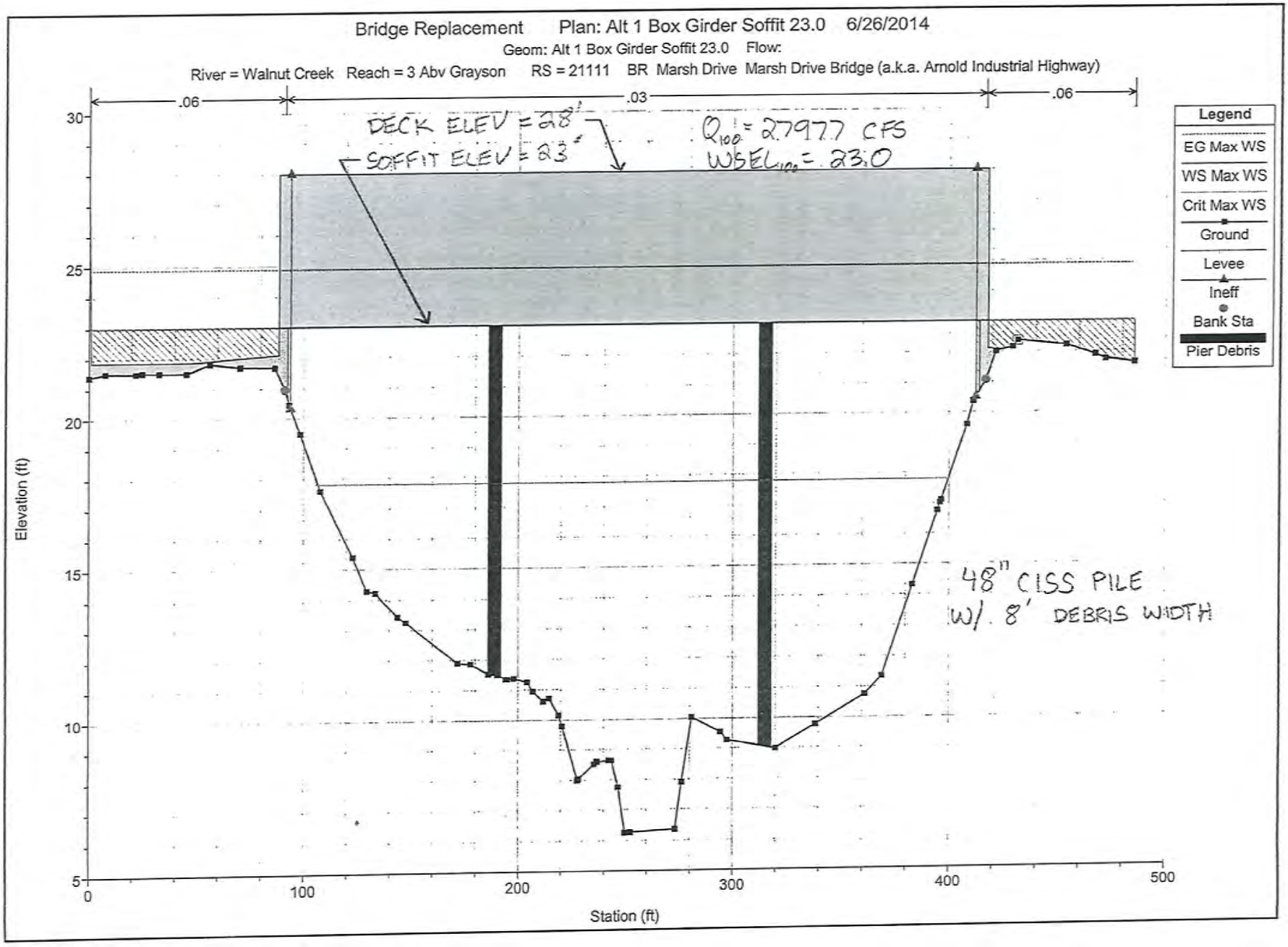
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River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
DECK ELEV = 28'
SOFFIT ELEV = 23'
Q100 = 27977 CFS
WSEL100 = 23.0
48" CISS PILE
W/ 8' DEBRIS WIDTH
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
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Pier Debris
Elevation (ft)
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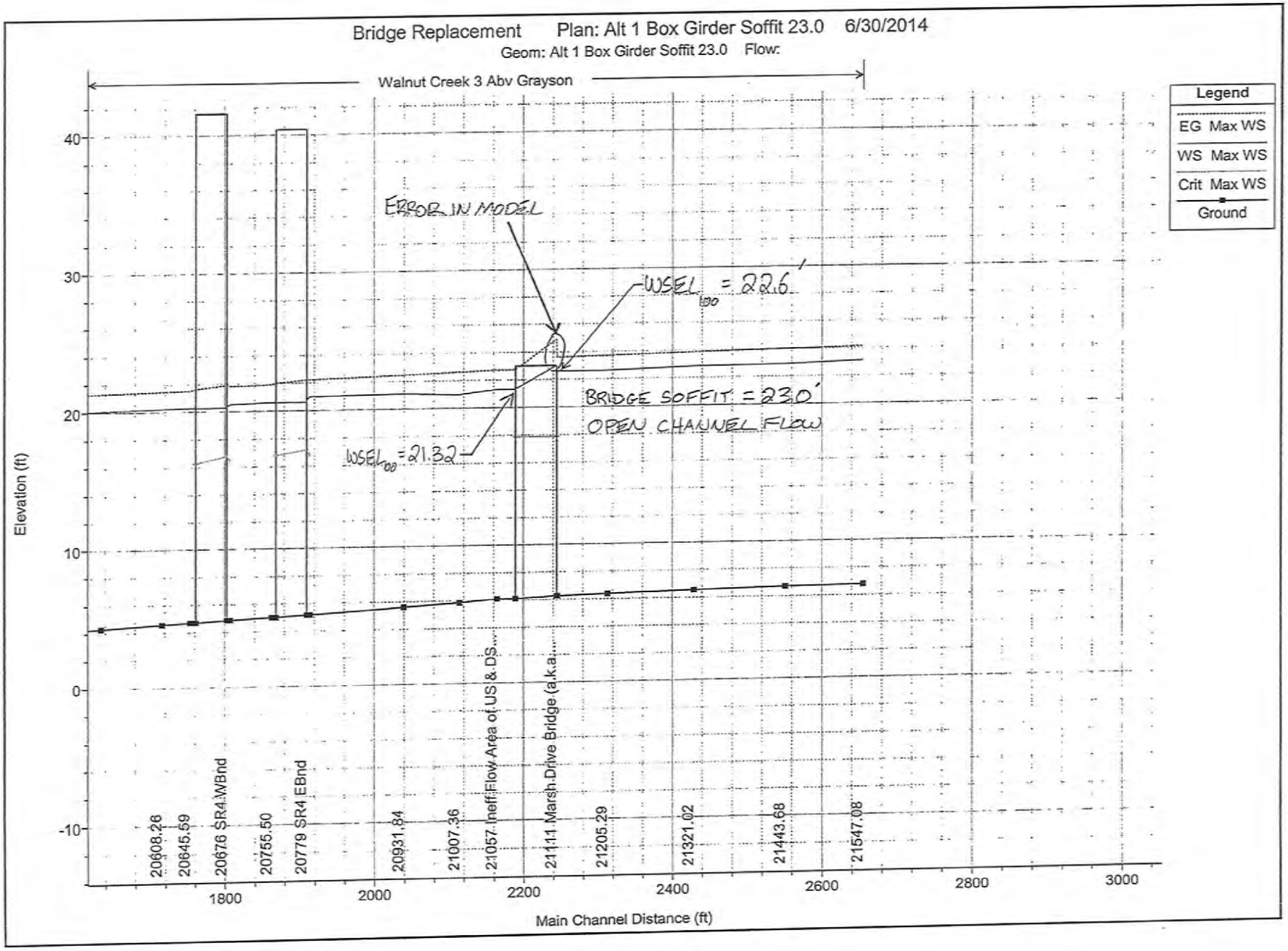
Bridge Replacement Plan: Alt 1 Box Girder Soffit 23.0 6/30/2014
Geom: Alt 1 Box Girder Soffit 23.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
ERROR IN MODEL
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BRIDGE SOFFIT = 23.0'
OPEN CHANNEL FLOW
WSEL100 = 21.32
Elevation (ft)
Main Channel Distance (ft)
20608.26
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
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21007.36
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21111 Marsh Drive Bridge (a.k.a...
21205.29
21321.02
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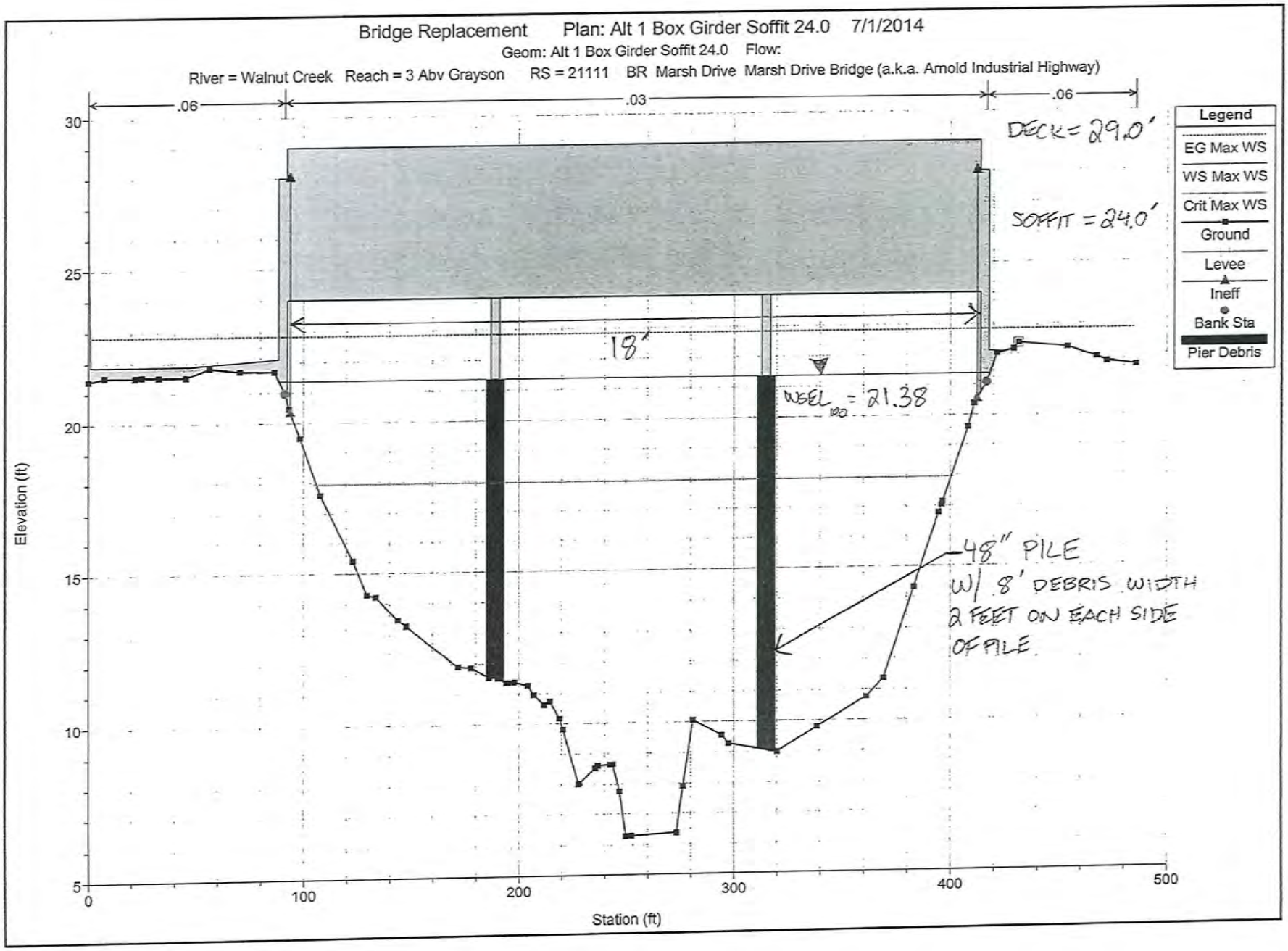
Bridge Replacement Plan: Alt 1 Box Girder Soffit 24.0 7/1/2014
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River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
DECK = 29.0'
SOFFIT = 24.0'
18'
WSEL = 21.38
48" PILE
W/ 8' DEBRIS WIDTH
2 FEET ON EACH SIDE
OF PILE
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
30
25
20
15
10
5
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300
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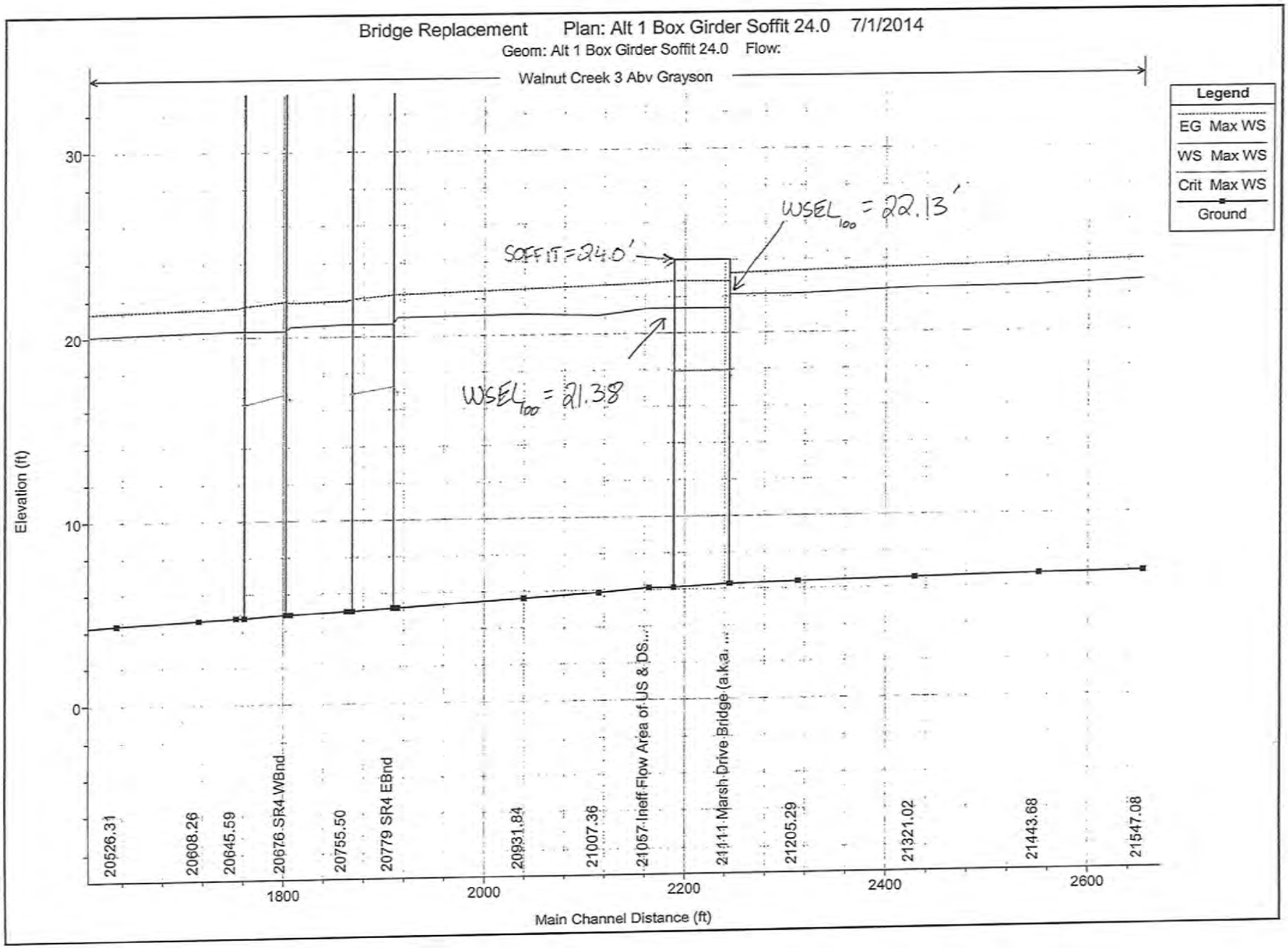
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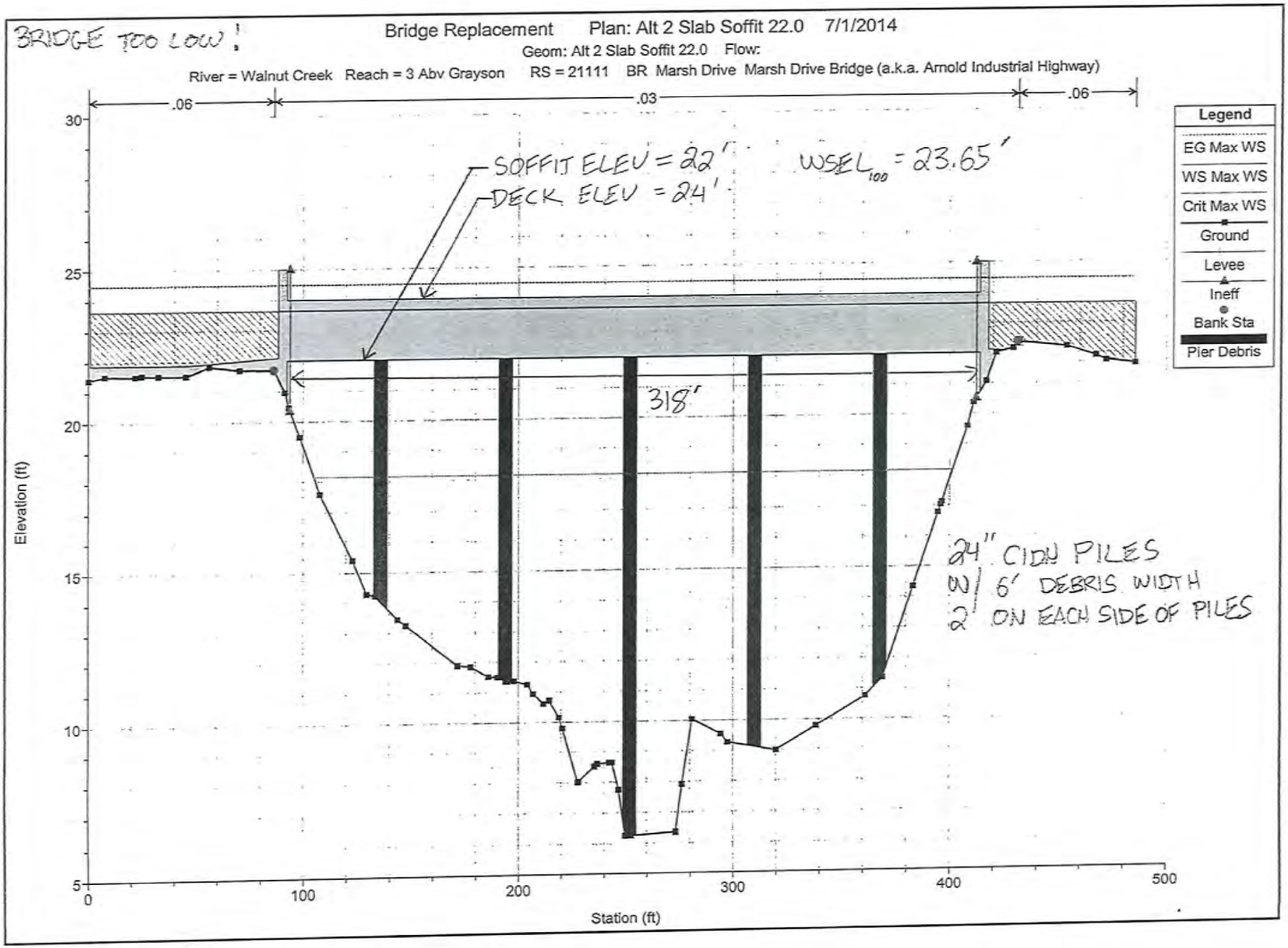
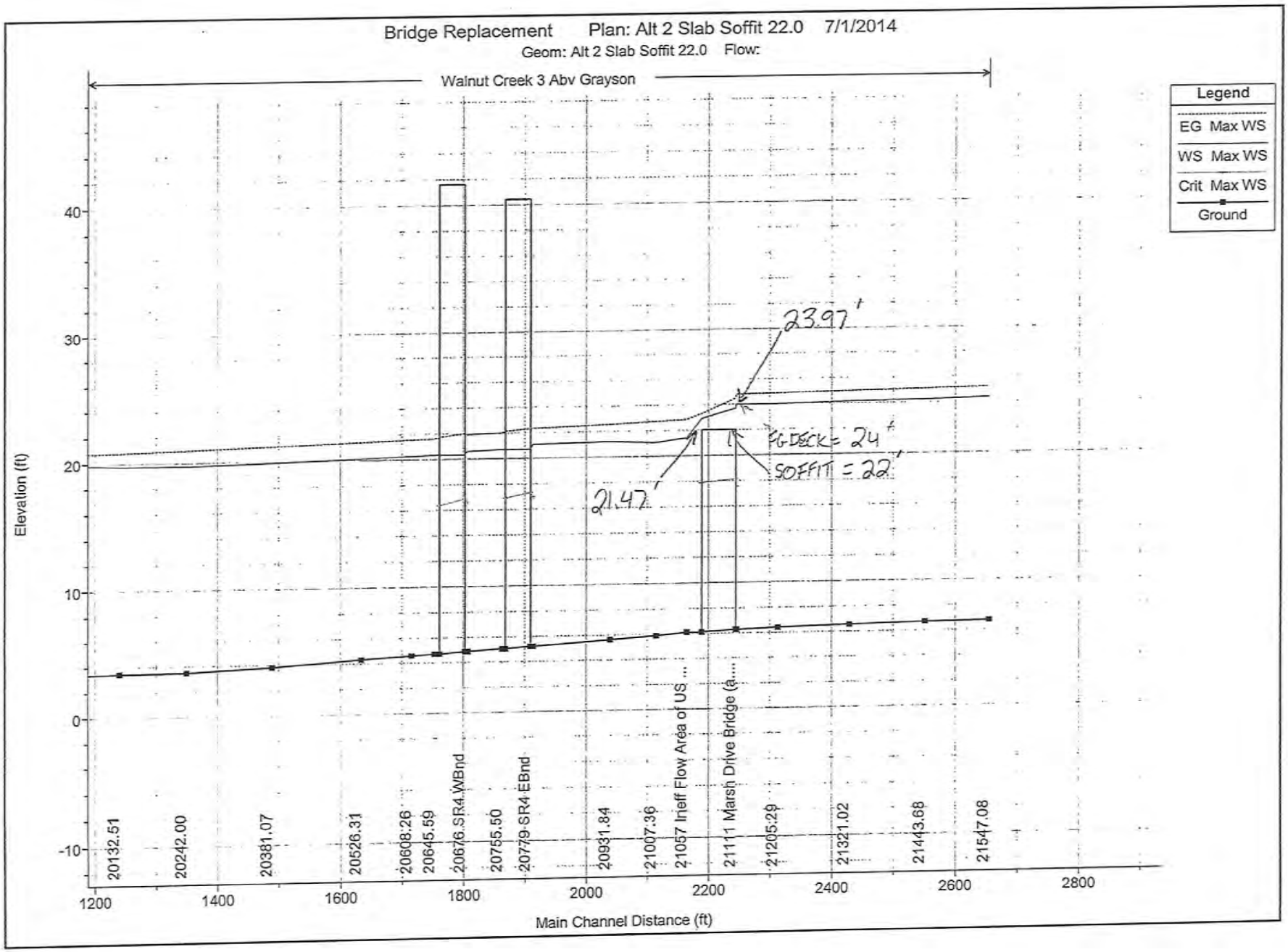
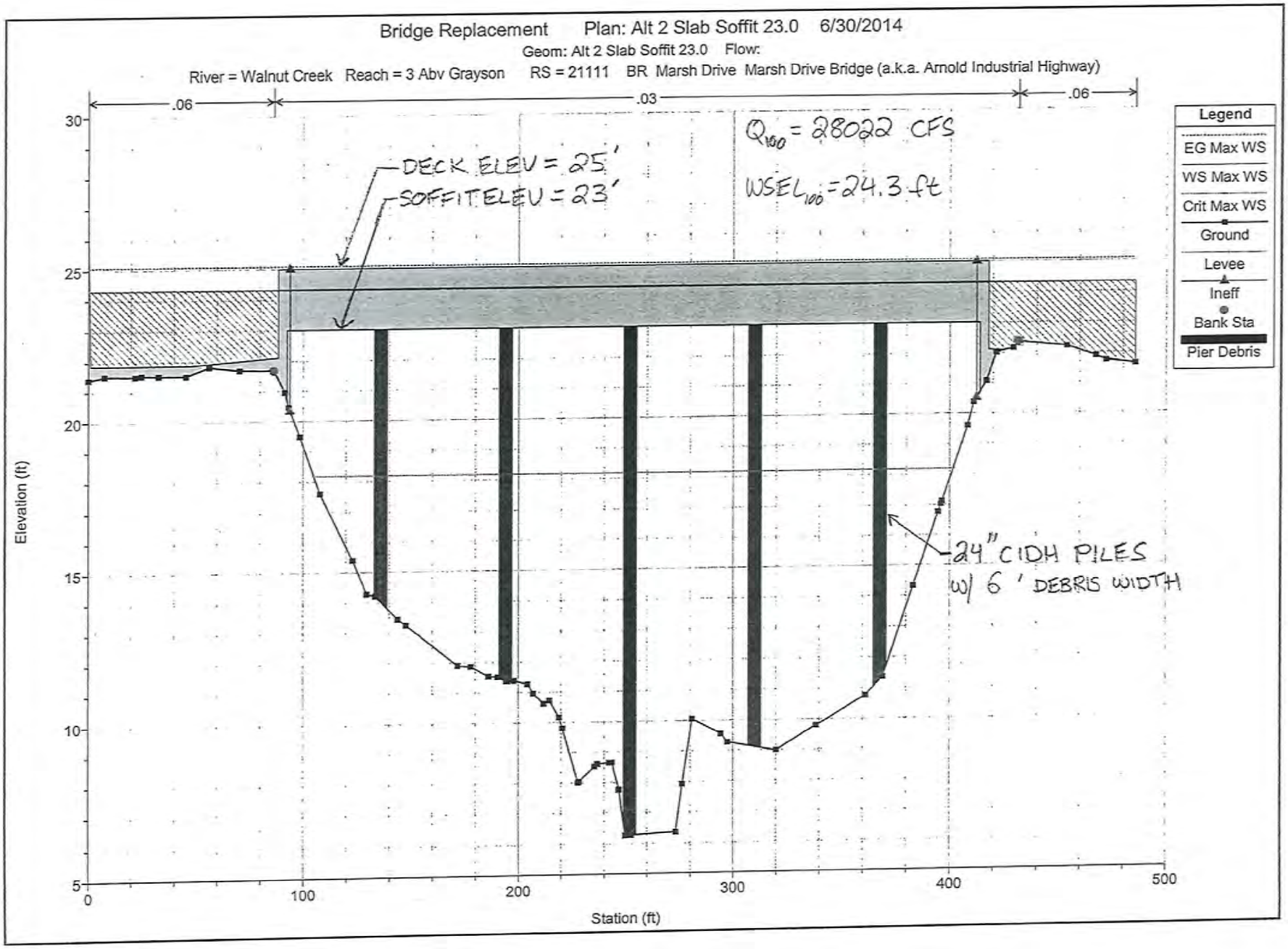
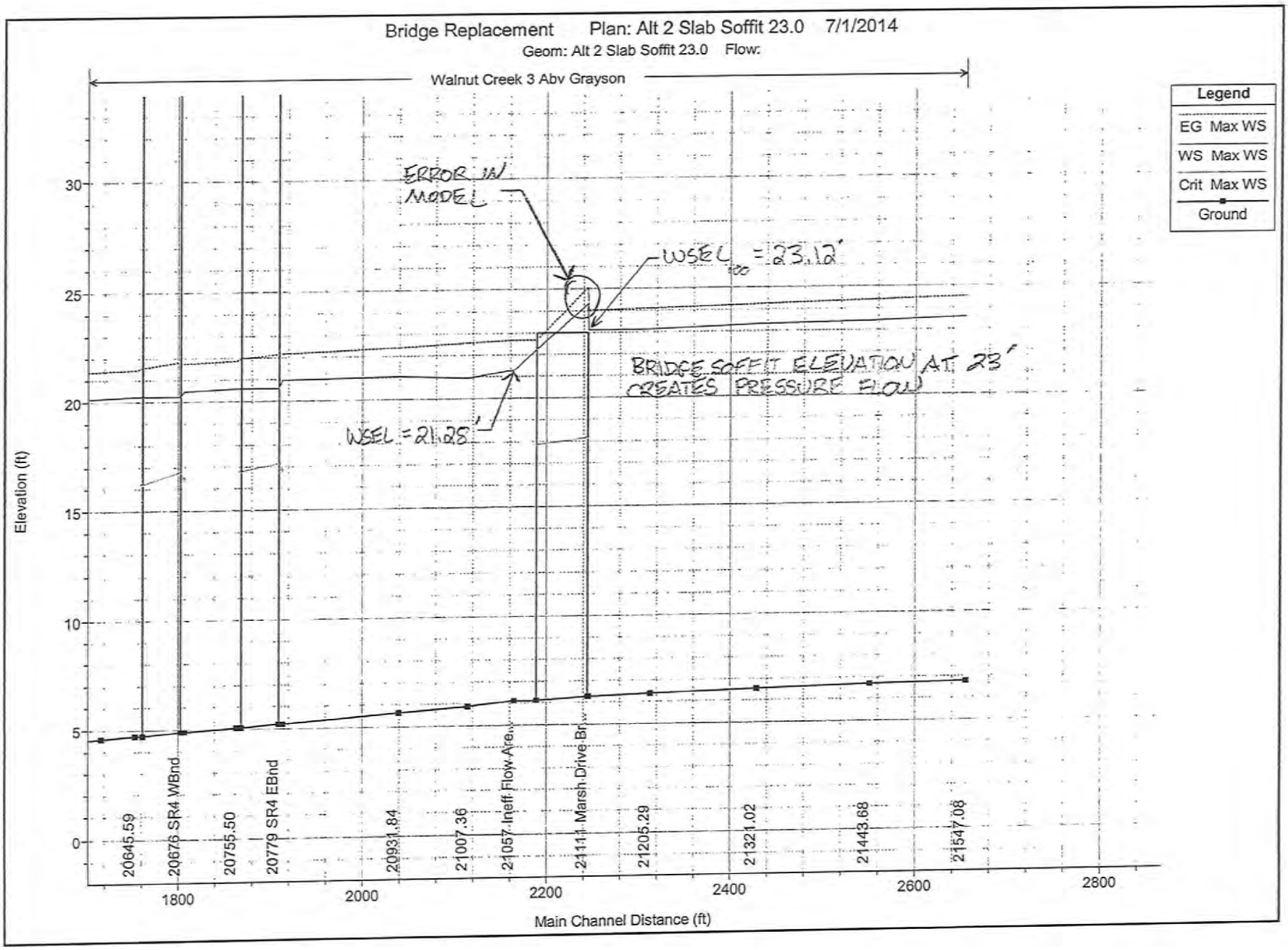
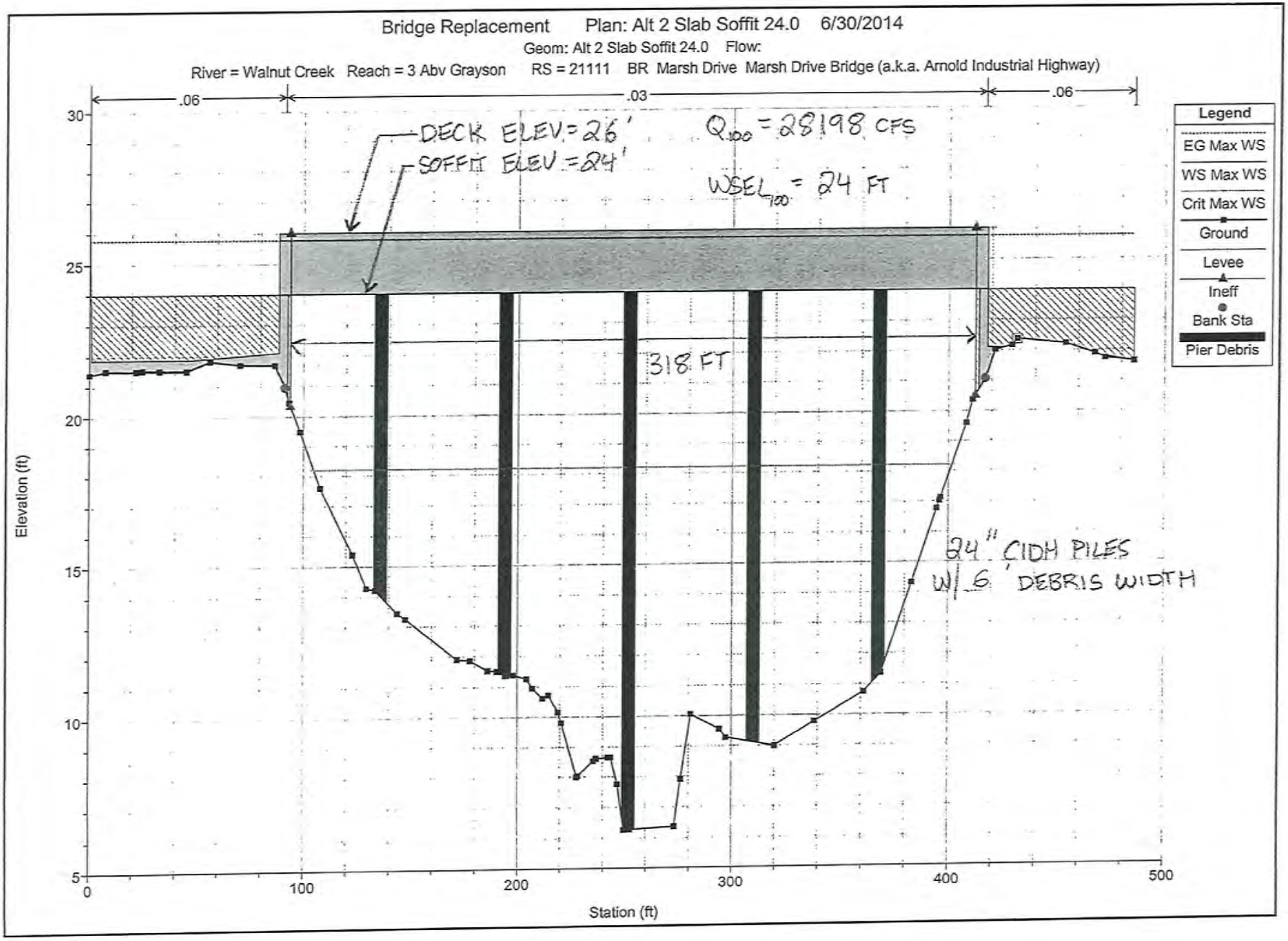
Geom: Alt 1 Box Girder Soffit 24.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
SOFFIT = 24.0'
WSEL100 = 22.13'
WSEL100 = 21.38
Elevation (ft)
30
20
10
0
20526.31
20608.26
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
20931.84
21007.36
21057 Ineff Flow Area of US & DS...
21111 Marsh Drive Bridge (a.k.a. ...
21205.29
21321.02
21443.68
21547.08
1800
2000
2200
2400
2600
Main Channel Distance (ft)

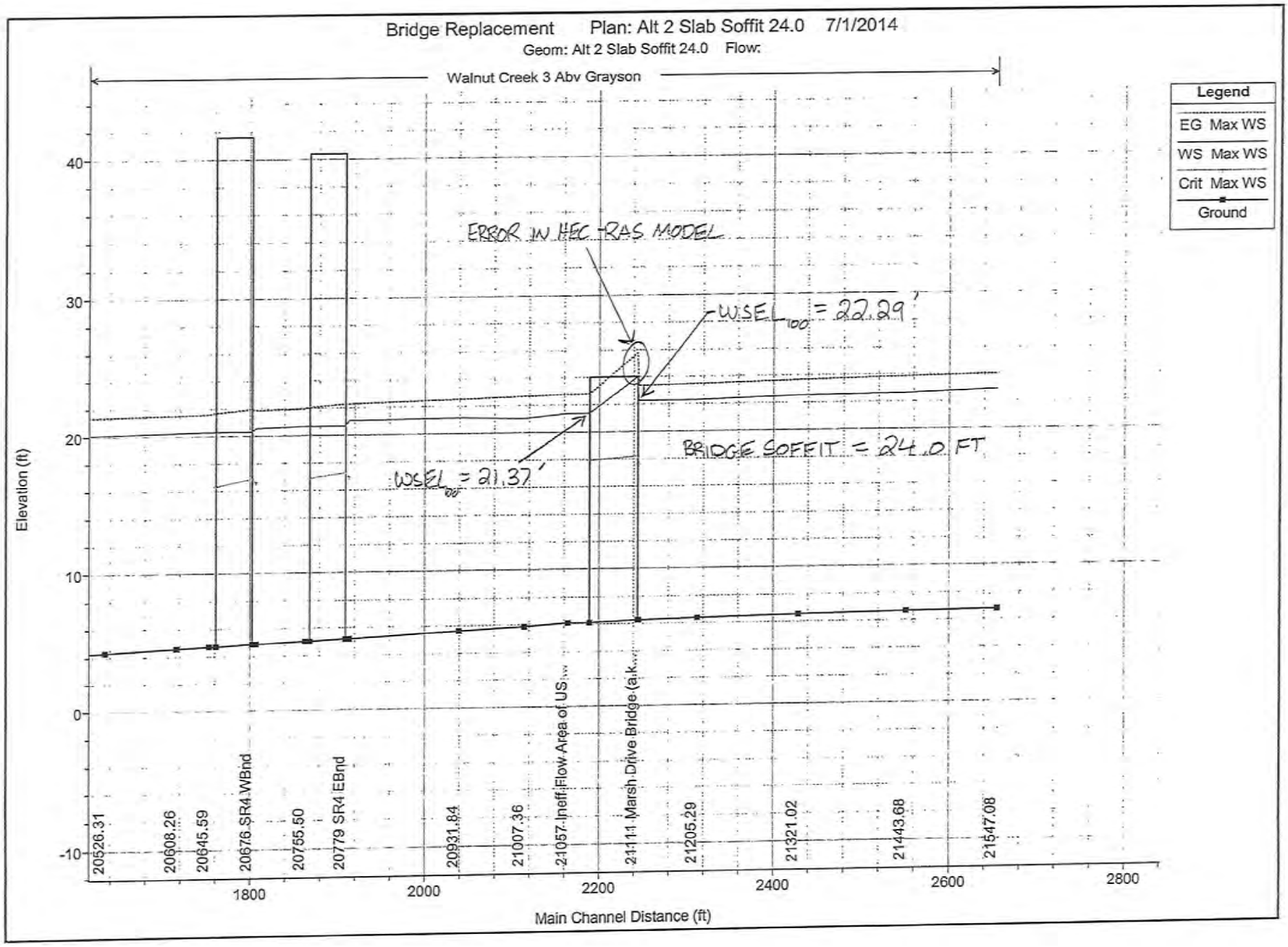

BRIDGE TOO LOW!
Bridge Replacement Plan: Alt 2 Slab Soffit 22.0 7/1/2014
Geom: Alt 2 Slab Soffit 22.0 Flow:
River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
SOFFIT ELEV = 22'
DECK ELEV = 24'
WSEL100 = 23.65'
318'
24" CIDH PILES
W/ 6' DEBRIS WIDTH
2' ON EACH SIDE OF PILES
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
30
25
20
15
10
5
0
100
200
300
400
500
Station (ft)

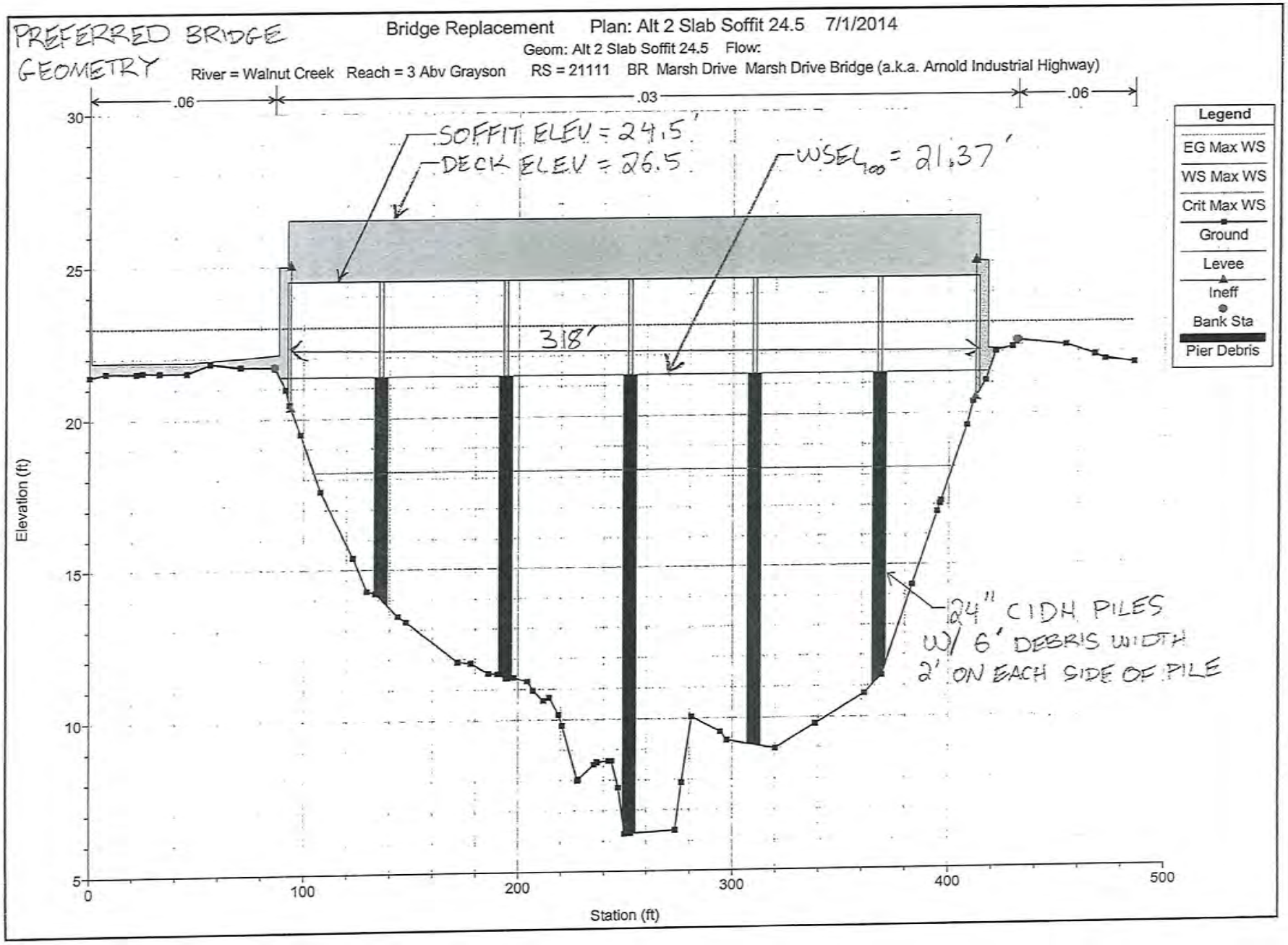

Bridge Replacement Plan: Alt 2 Slab Soffit 22.0 7/1/2014
Geom: Alt 2 Slab Soffit 22.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Elevation (ft)
Main Channel Distance (ft)
23.97'
21.47'
FG DECK = 24'
SOFFIT = 22'
20132.51
20242.00
20381.07
20526.31
20608.26
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
20931.84
21007.36
21057 Ineff Flow Area of US ...
21111 Marsh Drive Bridge (a...
21205.29
21321.02
21443.68
21547.08


Bridge Replacement Plan: Alt 2 Slab Soffit 23.0 6/30/2014
Geom: Alt 2 Slab Soffit 23.0 Flow:
River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
DECK ELEV = 25'
SOFFIT ELEV = 23'
Q100 = 28022 CFS
WSEL100 = 24.3 ft
24" CIDH PILES
w/ 6' DEBRIS WIDTH
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
30
25
20
15
10
5
0
100
200
300
400
500

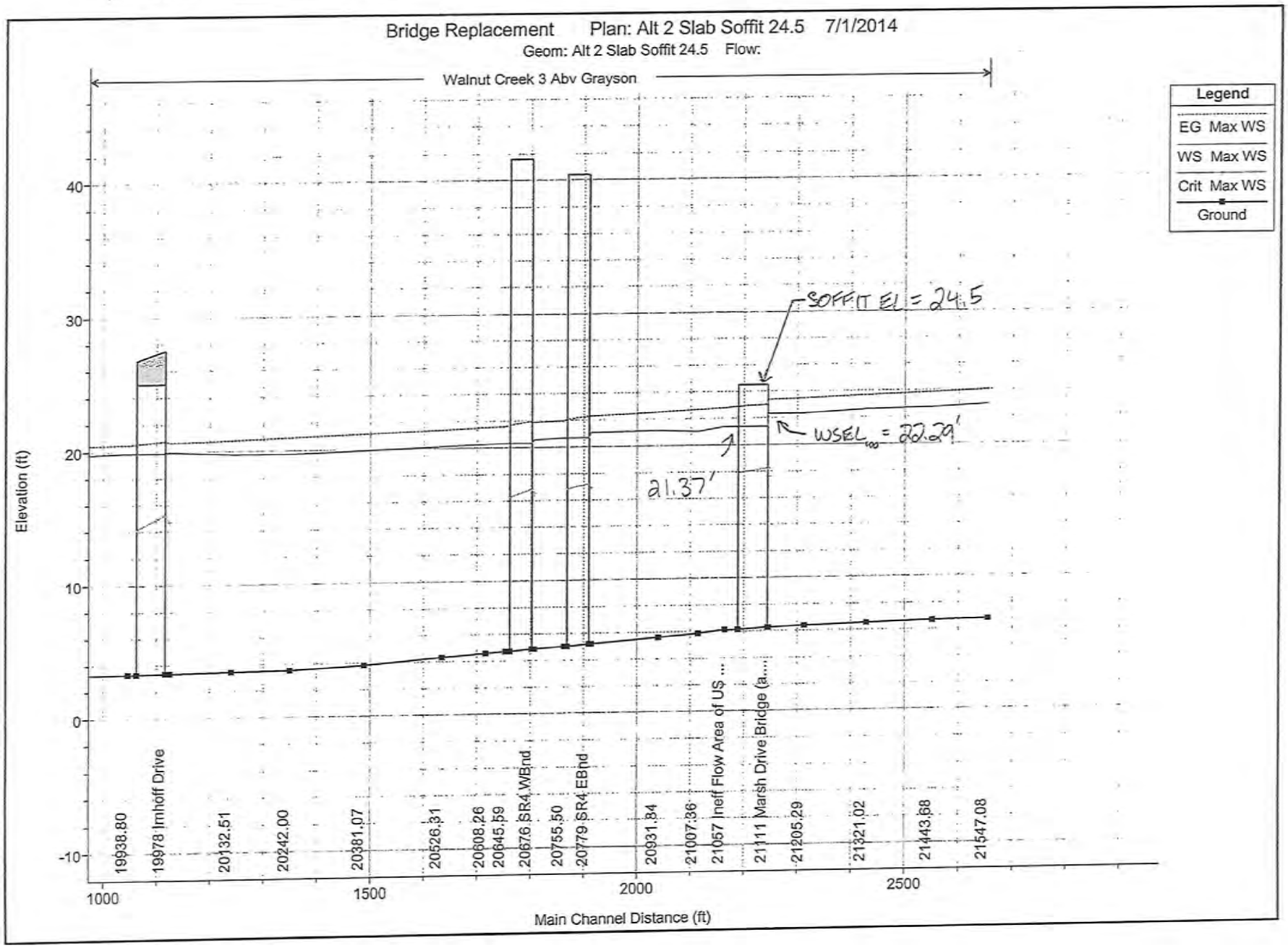

Bridge Replacement Plan: Alt 2 Slab Soffit 23.0 7/1/2014
Geom: Alt 2 Slab Soffit 23.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
ERROR IN MODEL
WSEL100 = 23.12'
BRIDGE SOFFIT ELEVATION AT 23' CREATES PRESSURE FLOW
WSEL = 21.28'
Elevation (ft)
Main Channel Distance (ft)
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
20931.84
21007.36
21057 Ineff Flow Are...
21111 Marsh Drive Br
21205.29
21321.02
21443.68
21547.08


Bridge Replacement Plan: Alt 2 Slab Soffit 24.0 6/30/2014
Geom: Alt 2 Slab Soffit 24.0 Flow:
River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
DECK ELEV = 26'
SOFFIT ELEV = 24'
Q100 = 28198 CFS
WSEL100 = 24 FT
318 FT
24" CIDH PILES
W/ 6' DEBRIS WIDTH
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
30
25
20
15
10
5
0
100
200
300
400
500


Bridge Replacement Plan: Alt 2 Slab Soffit 24.0 7/1/2014
Geom: Alt 2 Slab Soffit 24.0 Flow:
Walnut Creek 3 Abv Grayson
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
ERROR IN HEC-RAS MODEL
WSEL100 = 22.29'
WSEL100 = 21.37'
BRIDGE SOFFIT = 24.0 FT
Elevation (ft)
Main Channel Distance (ft)
20526.31
20608.26
20645.59
20676 SR4 WBnd
20755.50
20779 SR4 EBnd
20931.84
21007.36
21057 Ineff Flow Area of US...
21111 Marsh Drive Bridge (a.k...
21205.29
21321.02
21443.68
21547.08


PREFERRED BRIDGE GEOMETRY
Bridge Replacement Plan: Alt 2 Slab Soffit 24.5 7/1/2014
Geom: Alt 2 Slab Soffit 24.5 Flow:
River = Walnut Creek Reach = 3 Abv Grayson RS = 21111 BR Marsh Drive Marsh Drive Bridge (a.k.a. Arnold Industrial Highway)
.06
.03
.06
SOFFIT ELEV = 24.5'
DECK ELEV = 26.5'
WSEL100 = 21.37'
318'
24" CIDH PILES
W/ 6' DEBRIS WIDTH
2' ON EACH SIDE OF PILE
Legend
EG Max WS
WS Max WS
Crit Max WS
Ground
Levee
Ineff
Bank Sta
Pier Debris
Elevation (ft)
Station (ft)
30
25
20
15
10
5
0
100
200
300
400
500

PREFERRED OPTION



7/1/2014

Key talking points for phone conversation regarding the Marsh Drive Bridge

1. Slab deck is more desirable than box girder deck, since the final grade of the slab deck would be significantly lower.
    a. Slab deck with more piers is more desirable than box girder deck with less piers.
        i. Slab deck FG is significantly lower than box girder deck option.
            1. Final grade of slab deck minimized conform work

    b. Recommended bridge soffit elevation = 24.5′ with slab deck FG = 26.5′ would provide FEMA freeboard and conform to the likely bank improvements that are needed to provide adequate FEMA freeboard for 100-year storm flows.
        i. Minimum free board allowance per FEMA for levees is 1 foot above the minimum 3 feet within 100-feet on either side of bridges
        ii. 100-year WSEL upstream end of bridge = 22.29 feet

2. Model comparison
    a. Original proposed bridge geometry with Soffit Elev. = 22′, and Deck Elev. = 24′
        i. 100-year WSEL = 23.97′
    b. Revised proposed bridge geometry with Soffit Elev. = 24.5′ and Deck Elev. = 26.5′
        i. 100-year WSEL = 22.29′
    c. Original proposed geometry is too low and causes WSEL to increase upstream of bridge

Contra Costa County Flood Control & Water Conservation District

July 1, 2014
By: Brian Louis

Marsh Drive Bridge replacement hydraulic data

	Alternative 1: Box Girder 3-span bridge			Alternative 2: Slab 6-span bridge		
Option#	1	2	3	4	5	6
Deck thickness (feet)	5	5	5	2	2	2
Top of deck (feet)	27	28	29	24	25	26.5
Soffit elevation (feet)	22	23	24	22	23	24.5
Pier diameter (feet)	4	4	4	2	2	2
Pier debris width (feet)	8	8	8	6	6	6
100-year WSEL at upstream end of bridge (feet)	23.78	22.60	22.13	23.97	23.12	22.29
Flow type through Marsh Drive Bridge	Pressure flow	Open channel flow	Open channel flow	Pressure flow	Pressure flow	Open channel flow

Notes

1. Peak flow uses newest revised hydrology.
2. Span length of bridge = 318 feet
3. Option 6 is preferred due to lowest top of deck elevation, highest low chord elevation, and best hydraulic performance.

HEC-RAS output table data for Marsh Drive Bridge replacement with box girder deck bridge

Reach	River Sta	Profile	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
3 Abv Grayson	21547.1	Max WS	Alt1 Soffit 23.0	27968.6	6.76	23.11		24.13	0.0013	8.12	3446.22	353.92	0.46
3 Abv Grayson	21547.1	Max WS	Alt 1 Soffit 22	27953.9	6.76	24.14		24.98	0.00094	7.35	3813.89	363.61	0.39
3 Abv Grayson	21547.1	Max WS	Alt1 Soffit 24.0	28212.6	6.76	22.74		23.87	0.00149	8.51	3317.7	350.29	0.48
3 Abv Grayson	21443.7	Max WS	Alt1 Soffit 23.0	27968.9	6.68	22.9		24	0.00136	8.43	3346.93	354.9	0.47
3 Abv Grayson	21443.7	Max WS	Alt 1 Soffit 22	27953.9	6.68	23.99		24.88	0.00096	7.59	3739.59	367.27	0.4
3 Abv Grayson	21443.7	Max WS	Alt1 Soffit 24.0	28212.6	6.68	22.49		23.71	0.00159	8.87	3204.17	351.15	0.5
3 Abv Grayson	21321	Max WS	Alt1 Soffit 23.0	27969.1	6.53	22.81		23.84	0.0012	8.13	3466.75	351.09	0.44
3 Abv Grayson	21321	Max WS	Alt 1 Soffit 22	27953.9	6.53	23.93		24.77	0.00085	7.33	3862.21	354.96	0.38
3 Abv Grayson	21321	Max WS	Alt1 Soffit 24.0	28212.6	6.53	22.39		23.53	0.00141	8.55	3318.82	348.14	0.48
3 Abv Grayson	21205.3	Max WS	Alt1 Soffit 23.0	27969.1	6.37	22.6		23.69	0.0014	8.36	3350.86	354.89	0.47
3 Abv Grayson	21205.3	Max WS	Alt 1 Soffit 22	27953.9	6.37	23.8		24.66	0.00095	7.43	3779.98	360.72	0.4
3 Abv Grayson	21205.3	Max WS	Alt1 Soffit 24.0	28212.6	6.37	22.12		23.35	0.00169	8.87	3181.57	350.19	0.51
3 Abv Grayson	21137.8	Max WS	Alt1 Soffit 23.0	27969	6.26	22.6	17.58	23.6	0.0011	8.04	3480.56	485.62	0.43
3 Abv Grayson	21137.8	Max WS	Alt 1 Soffit 22	27953.9	6.26	23.79	17.57	24.6	0.00078	7.24	3858.69	485.62	0.37
3 Abv Grayson	21137.8	Max WS	Alt1 Soffit 24.0	28212.5	6.26	22.13	17.61	23.25	0.0013	8.47	3331.15	427.66	0.46
3 Abv Grayson	21111	Marsh Drive		Bridge									
3 Abv Grayson	21057	Max WS	Alt1 Soffit 23.0	27966.7	6.1	21.32		22.71	0.00188	9.46	2956.28	316.77	0.54
3 Abv Grayson	21057	Max WS	Alt 1 Soffit 22	27953.7	6.1	21.31		22.7	0.00189	9.47	2951.1	316.55	0.55
3 Abv Grayson	21057	Max WS	Alt1 Soffit 24.0	28212.5	6.1	21.38		22.77	0.00188	9.49	2972.24	317.46	0.55
3 Abv Grayson	21007.4	Max WS	Alt1 Soffit 23.0	27965.9	5.86	20.99		22.61	0.00253	10.22	2737.3	324.97	0.62
3 Abv Grayson	21007.4	Max WS	Alt 1 Soffit 22	27953.5	5.86	20.97		22.59	0.00255	10.24	2731.08	324.81	0.62
3 Abv Grayson	21007.4	Max WS	Alt1 Soffit 24.0	28212.5	5.86	21.04		22.67	0.00253	10.24	2753.87	325.42	0.62
3 Abv Grayson	20931.8	Max WS	Alt1 Soffit 23.0	27965.6	5.62	21.1		22.43	0.00201	9.28	3014.47	346.28	0.55
3 Abv Grayson	20931.8	Max WS	Alt 1 Soffit 22	27953.4	5.62	21.08		22.42	0.00202	9.29	3007.93	346.1	0.56
3 Abv Grayson	20931.8	Max WS	Alt1 Soffit 24.0	28212.6	5.62	21.15		22.49	0.00201	9.3	3032.72	346.7	0.55
3 Abv Grayson	20806	Max WS	Alt1 Soffit 23.0	27965.1	5.2	21	16.88	22.2	0.00162	8.82	3170.2	332.5	0.5
3 Abv Grayson	20806	Max WS	Alt 1 Soffit 22	27953.3	5.2	20.98	16.88	22.19	0.00163	8.84	3163.76	332.33	0.5
3 Abv Grayson	20806	Max WS	Alt1 Soffit 24.0	28212.4	5.2	21.05	16.92	22.26	0.00163	8.85	3187.51	332.93	0.5
3 Abv Grayson	20779	State Rt 4 EBnd		Bridge									
3 Abv Grayson	20755.5	Max WS	Alt1 Soffit 23.0	27963.4	5.05	20.64		21.89	0.0017	8.98	3113.03	329.64	0.52
3 Abv Grayson	20755.5	Max WS	Alt 1 Soffit 22	27952.5	5.05	20.61		21.87	0.00171	9	3105.19	329.51	0.52
3 Abv Grayson	20755.5	Max WS	Alt1 Soffit 24.0	28211	5.05	20.69		21.95	0.0017	9.01	3129.44	329.92	0.52
3 Abv Grayson	20699.3	Max WS	Alt1 Soffit 23.0	27962.8	4.88	20.52	16.53	21.79	0.00174	9.06	3085.07	326.83	0.52
3 Abv Grayson	20699.3	Max WS	Alt 1 Soffit 22	27952	4.88	20.49	16.52	21.77	0.00175	9.08	3076.93	326.66	0.52
3 Abv Grayson	20699.3	Max WS	Alt1 Soffit 24.0	28210.8	4.88	20.57	16.57	21.85	0.00174	9.1	3101.26	327.17	0.52
3 Abv Grayson	20676	State Rt 4 WBnd		Bridge									
3 Abv Grayson	20645.6	Max WS	Alt1 Soffit 23.0	27961.5	4.71	20.27		21.51	0.00166	8.91	3137.31	329.9	0.51
3 Abv Grayson	20645.6	Max WS	Alt 1 Soffit 22	27950.9	4.71	20.25		21.49	0.00167	8.94	3127.87	329.71	0.51
3 Abv Grayson	20645.6	Max WS	Alt1 Soffit 24.0	28209.5	4.71	20.32		21.56	0.00166	8.95	3152.26	330.21	0.51
3 Abv Grayson	20608.3	Max WS	Alt1 Soffit 23.0	27961.1	4.59	20.21		21.45	0.00168	8.92	3134.66	333.88	0.51
3 Abv Grayson	20608.3	Max WS	Alt 1 Soffit 22	27950.6	4.59	20.18		21.42	0.00169	8.94	3124.8	333.71	0.52
3 Abv Grayson	20608.3	Max WS	Alt1 Soffit 24.0	28209.5	4.59	20.26		21.5	0.00168	8.96	3149.82	334.16	0.51
3 Abv Grayson	20526.3	Max WS	Alt1 Soffit 23.0	27960	4.32	20.08		21.31	0.0016	8.91	3139.58	324.76	0.5
3 Abv Grayson	20526.3	Max WS	Alt 1 Soffit 22	27949.9	4.32	20.05		21.29	0.00162	8.93	3129.58	324.46	0.51
3 Abv Grayson	20526.3	Max WS	Alt1 Soffit 24.0	28209.2	4.32	20.12		21.37	0.00161	8.94	3154.04	325.2	0.51
3 Abv Grayson	20381.1	Max WS	Alt1 Soffit 23.0	27957.8	3.82	19.86		21.08	0.00155	8.87	3152.02	319.43	0.5
3 Abv Grayson	20381.1	Max WS	Alt 1 Soffit 22	27948.2	3.82	19.83		21.06	0.00156	8.9	3141.38	319.14	0.5
3 Abv Grayson	20381.1	Max WS	Alt1 Soffit 24.0	28209.2	3.82	19.9		21.14	0.00155	8.91	3165.85	319.8	0.5
3 Abv Grayson	20242	Max WS	Alt1 Soffit 23.0	27845.4	3.52	19.7		20.86	0.00152	8.63	3226.61	334.09	0.49
3 Abv Grayson	20242	Max WS	Alt 1 Soffit 22	27946.8	3.52	19.67		20.84	0.00155	8.69	3214.6	333.79	0.49
3 Abv Grayson	20242	Max WS	Alt1 Soffit 24.0	28209.5	3.52	19.75		20.92	0.00154	8.7	3241.02	334.45	0.49
3 Abv Grayson	20132.5	Max WS	Alt1 Soffit 23.0	27954.8	3.46	19.71		20.71	0.0013	8.03	3483.11	357.68	0.45
3 Abv Grayson	20132.5	Max WS	Alt 1 Soffit 22	27947.3	3.46	19.68		20.68	0.00131	8.05	3470.06	357.27	0.46

G:\fldctl\Watershed Planning - Engineering\Zone 3B - Walnut San Ramon\Lower WC\Hydraulics\2013 LWC Study\Marsh Drive Bridge\HEC-RAS model\Bridge replacement\alternative summary table

HEC-RAS output table data for Marsh Drive Bridge replacement with slab deck bridge

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
3 Abv Grayso	21547.1	Max WS	Alt2 Soffit 23.0	27798.8	6.76	23.57		24.49	0.001134	7.7	3610.5	357.23	0.43
3 Abv Grayso	21547.1	Max WS	Alt2 Soffit 24.5	28191.8	6.76	22.9		23.98	0.001434	8.36	3371.6	351.82	0.48
3 Abv Grayso	21547.1	Max WS	Alt2 Soffit 22.0	27837.9	6.76	24.33		25.13	0.000905	7.17	3883.2	370.38	0.38
3 Abv Grayso	21443.7	Max WS	Alt2 Soffit 23.0	27798.9	6.68	23.41		24.37	0.001218	7.88	3529	357.5	0.44
3 Abv Grayso	21443.7	Max WS	Alt2 Soffit 24.5	28191.8	6.68	22.67		23.83	0.001588	8.63	3267.7	352.94	0.5
3 Abv Grayso	21443.7	Max WS	Alt2 Soffit 22.0	27817.8	6.68	24.21		25.03	0.000979	7.28	3820.2	369.34	0.4
3 Abv Grayso	21321	Max WS	Alt2 Soffit 23.0	27799	6.53	23.33		24.23	0.001078	7.62	3647.2	352.63	0.42
3 Abv Grayso	21321	Max WS	Alt2 Soffit 24.5	28191.8	6.53	22.56		23.64	0.001411	8.34	3378.4	349.68	0.47
3 Abv Grayso	21321	Max WS	Alt2 Soffit 22.0	27813.5	6.53	24.14		24.92	0.000849	7.07	3935.5	359.34	0.37
3 Abv Grayso	21205.3	Max WS	Alt2 Soffit 23.0	27799	6.37	23.14		24.1	0.001191	7.86	3541.8	356.82	0.44
3 Abv Grayso	21205.3	Max WS	Alt2 Soffit 24.5	28191.8	6.37	22.29		23.47	0.001624	8.7	3240.8	353.77	0.5
3 Abv Grayso	21205.3	Max WS	Alt2 Soffit 22.0	27839.9	6.37	23.99		24.81	0.000915	7.24	3848.8	365.17	0.39
3 Abv Grayso	21137.8	Max WS	Alt2 Soffit 23.0	27798.9	6.26	23.12	17.55	24.03	0.00093	7.62	3646.9	485.62	0.4
3 Abv Grayso	21137.8	Max WS	Alt2 Soffit 24.5	28191.8	6.26	22.29	17.61	23.37	0.00123	8.34	3382.2	430.69	0.45
3 Abv Grayso	21137.8	Max WS	Alt2 Soffit 22.0	27830.7	6.26	23.97	17.55	24.75	0.000735	7.11	3916.2	485.62	0.36
3 Abv Grayso	21111	Marsh Drive		Bridge									
3 Abv Grayso	21057	Max WS	Alt2 Soffit 23.0	27793.2	6.1	21.28		22.67	0.001891	9.44	2943.7	316.22	0.55
3 Abv Grayso	21057	Max WS	Alt2 Soffit 24.5	28191.8	6.1	21.37		22.77	0.001893	9.49	2971.1	317.41	0.55
3 Abv Grayso	21057	Max WS	Alt2 Soffit 22.0	28559.2	6.1	21.41		22.84	0.001916	9.57	2984.4	317.99	0.55
3 Abv Grayso	21007.4	Max WS	Alt2 Soffit 23.0	27791	5.86	20.94		22.56	0.002539	10.2	2723.8	324.61	0.62
3 Abv Grayso	21007.4	Max WS	Alt2 Soffit 24.5	28191.8	5.86	21.03		22.66	0.002532	10.24	2752.4	325.38	0.62
3 Abv Grayso	21007.4	Max WS	Alt2 Soffit 22.0	28558.1	5.86	21.07		22.73	0.002563	10.33	2764.7	325.71	0.62
3 Abv Grayso	20931.8	Max WS	Alt2 Soffit 23.0	27791	5.62	21.05		22.39	0.002016	9.26	2999.7	345.88	0.55
3 Abv Grayso	20931.8	Max WS	Alt2 Soffit 24.5	28191.7	5.62	21.14		22.49	0.00201	9.3	3031.1	346.66	0.55
3 Abv Grayso	20931.8	Max WS	Alt2 Soffit 22.0	28560.4	5.62	21.19		22.55	0.002032	9.38	3045.9	346.98	0.56
3 Abv Grayso	20806	Max WS	Alt2 Soffit 23.0	27790	5.2	20.95	16.85	22.16	0.001624	8.81	3156.1	332.14	0.5
3 Abv Grayso	20806	Max WS	Alt2 Soffit 24.5	28191.3	5.2	21.04	16.92	22.26	0.001625	8.85	3185.9	332.89	0.5
3 Abv Grayso	20806	Max WS	Alt2 Soffit 22.0	28559.7	5.2	21.08	16.98	22.32	0.001646	8.93	3199.5	333.24	0.51
3 Abv Grayso	20779	State Rt 4 EBnd		Bridge									
3 Abv Grayso	20755.5	Max WS	Alt2 Soffit 23.0	27784.8	5.05	20.59		21.84	0.001704	8.96	3099.3	329.41	0.52
3 Abv Grayso	20755.5	Max WS	Alt2 Soffit 24.5	28190.6	5.05	20.68		21.94	0.001705	9.01	3127.9	329.89	0.52
3 Abv Grayso	20755.5	Max WS	Alt2 Soffit 22.0	28559.7	5.05	20.71		22	0.001734	9.1	3137.1	330.05	0.52
3 Abv Grayso	20699.3	Max WS	Alt2 Soffit 23.0	27783.5	4.88	20.47	16.49	21.74	0.001739	9.05	3071.5	326.55	0.52
3 Abv Grayso	20699.3	Max WS	Alt2 Soffit 24.5	28190.2	4.88	20.56	16.57	21.85	0.001741	9.09	3099.8	327.14	0.52
3 Abv Grayso	20699.3	Max WS	Alt2 Soffit 22.0	28559.1	4.88	20.59	16.63	21.9	0.001772	9.19	3107.8	327.31	0.53
3 Abv Grayso	20676	State Rt 4 WBnd		Bridge									
3 Abv Grayso	20645.6	Max WS	Alt2 Soffit 23.0	27779.8	4.71	20.24		21.46	0.001654	8.89	3124.4	329.64	0.51
3 Abv Grayso	20645.6	Max WS	Alt2 Soffit 24.5	28189	4.71	20.32		21.56	0.00166	8.95	3150.8	330.18	0.51
3 Abv Grayso	20645.6	Max WS	Alt2 Soffit 22.0	28559.1	4.71	20.33		21.6	0.001698	9.05	3154.1	330.25	0.52
3 Abv Grayso	20608.3	Max WS	Alt2 Soffit 23.0	27778.8	4.59	20.17		21.4	0.001675	8.9	3121.6	333.65	0.51
3 Abv Grayso	20608.3	Max WS	Alt2 Soffit 24.5	28189.2	4.59	20.25		21.5	0.00168	8.95	3148.3	334.13	0.51
3 Abv Grayso	20608.3	Max WS	Alt2 Soffit 22.0	28558.8	4.59	20.26		21.53	0.00172	9.06	3150.9	334.18	0.52
3 Abv Grayso	20526.3	Max WS	Alt2 Soffit 23.0	27777.3	4.32	20.04		21.27	0.0016	8.88	3127	324.38	0.5
3 Abv Grayso	20526.3	Max WS	Alt2 Soffit 24.5	28189.2	4.32	20.12		21.36	0.001609	8.94	3152.6	325.16	0.51
3 Abv Grayso	20526.3	Max WS	Alt2 Soffit 22.0	28554.2	4.32	20.12		21.4	0.001649	9.06	3153.3	325.18	0.51
3 Abv Grayso	20381.1	Max WS	Alt2 Soffit 23.0	27774.5	3.82	19.82		21.04	0.001544	8.85	3139.8	319.1	0.5
3 Abv Grayso	20381.1	Max WS	Alt2 Soffit 24.5	28189.1	3.82	19.9		21.13	0.001554	8.91	3164.5	319.76	0.5
3 Abv Grayso	20381.1	Max WS	Alt2 Soffit 22.0	28566	3.82	19.89		21.16	0.001599	9.03	3162.1	319.7	0.51

g. Survey and Utility Information

Jim Foster

From: Jim Stein <jstei@pw.cccounty.us>
Sent: Friday, May 23, 2014 2:55 PM
To: Neil Leary; Carolyn Davis; Jim Foster
Cc: Janine Hampton
Subject: Marsh Drive Bridge elevations

Point of Clarification

The elevations in the topographic & dtm files sent to you yesterday are based on the North American Vertical Datum of 1988 (NAVD88).
These elevation values are approximately 2.6 feet greater than those based on the National Geodetic Vertical Datum of 1929 (NGVD29).
i.e.: 20.0 NGVD29 = 22.6 NAVD88
This datum shift needs to be accounted for when comparing elevations from the original bridge plans to the digital files.

Jim Stein
County Surveyor
(925) 313-2343
jstei@pw.cccounty.us

From: Janine Hampton
Sent: Thursday, May 22, 2014 2:39 PM
To: Neil Leary; Carolyn Davis; Jim Foster [jimf@quincyeng.com]
Cc: Jim Stein
Subject: RE: Marsh Drive Bridge

Neil, Carolyn and Jim:

Attached are the topo files for Marsh Drive Bridge. If you have any questions, please call me at 925-313-2189.

Janine Hampton, PLS
Senior Land Surveyor, Contra Costa County

Jim Foster

From: Janine Hampton <jhamp@pw.cccounty.us>
Sent: Monday, June 02, 2014 8:34 AM
To: Carolyn Davis; Neil Leary; Jim Foster
Cc: Jim Stein; Jim Foster
Subject: RE: Marsh Drive Bridge
Attachments: F10B3_4.sdw; F10A2_4.sdw; F10A4_4.sdw; F10B2_4.sdw

2008 LiDAR data consisted of breaklines and masspoints, and the orthophotos.

I have uploaded the appropriate 4 ortho '.SID' files to Hightail, and links to these were sent to Carolyn Davis and Jim Foster in 4 emails (my current user authorization only allows me to upload one at a time). This account expires in two days: please download these immediately and check to ensure they attach to your CADD files.

The four world ".sdw" files are attached to this email. If Hightail does not work for you, I will overnight a disc with the ortho files (and world files). The ortho tiles are too large to email, and the bridge location falls in the middle of four ortho tile files.

Again, realize the limitations of LiDAR derived CADD files: the vendor supplied accuracy statement with these files of "1.2 foot vertical accuracy at 95% ....horizontal accuracy (location) of 1.5' at 1 sigma" and this translates that for the vertical, you can figure that 95% of the time that the elevation is correct to within 1.2' (but could be off by considerably more 5% of the time), and for the horizontal accuracy, the location of planimetric topo features are within 1.5' of true location 66% of the time, and could be off by considerably more 34% of the time.

As stated in the original transmittal cover letter, this data is not suitable for final engineering design work.

Janine Hampton, PLS
Senior Land Surveyor, Contra Costa County

From: Carolyn Davis [mailto:carolynd@quincyeng.com]
Sent: Friday, May 30, 2014 12:35 PM
To: Janine Hampton; Neil Leary; Jim Foster
Cc: Jim Stein; Jim Foster
Subject: RE: Marsh Drive Bridge

Hi Janine and Neil – In opening up the files you sent, we see that there are contours and a surface, but we aren't seeing any topo features such as edge of pavement, sidewalk, pavement delineation, driveways, above ground utilities, buildings etc.

With the Lidar data, are you able to extract these features and include the topo features? Or do you have an ortho rectified aerial photo that we can use to tie the road down so we can work on road alignment (matching existing etc). Can you please send over any of this information that you can obtain or already have?

Thanks!

Carolyn Davis, P.E. QSD/QSP | Senior Engineer | carolynd@quincyeng.com

High Risk Utility - Gas Line w/ prior rights - From County

Jim Foster

From: Neil Leary <nlear@pw.cccounty.us>
Sent: Tuesday, July 15, 2014 1:46 PM
To: Jim Foster; Carolyn Davis
Subject: FW: Marsh Drive Bridge pipelines

Please include the note below from Jim Stein, county surveyor, in your backup documents for the bridge assessment report—Marsh Drive over WC Channel.

Neil Leary
Senior Civil Engineer - Design/Construction Division

Contra Costa County
Public Works
Department

255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2278
Fax: (925) 313-2333
Email: nlear@pw.cccounty.us

From: Jim Stein
Sent: Tuesday, July 15, 2014 11:59 AM
To: Neil Leary
Cc: Janine Hampton
Subject: FW: Marsh Drive Bridge pipelines

Neil,

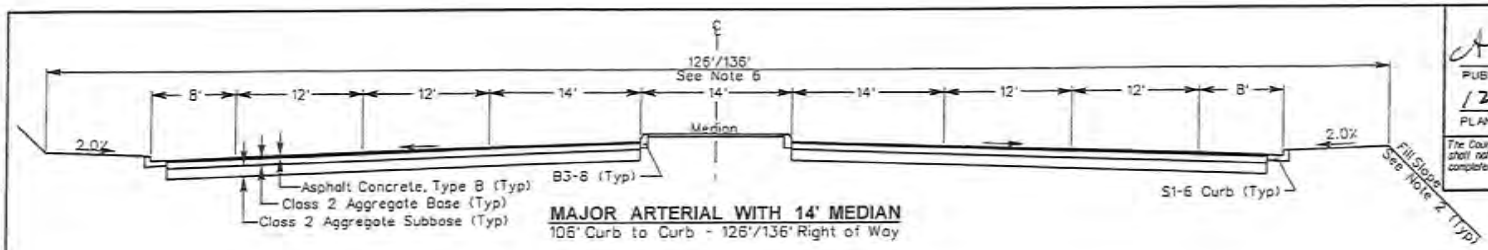
Further explanation:

The Union Oil (now Phillips 66) pipeline has prior easement rights. The pipeline was relocated by a Joint use Agreement with Cal-Trans into the existing/new frontage road right of way. This relocation was done prior to Cal-Trans relinquishing the frontage road back to the County (and to the City). We don't know if the old pipe was removed or abandoned in place. The dashed lines in the Cadd file (and pdf)are the recorded easement locations. A field review of pipeline markers and paint dots confirm the new alignment.

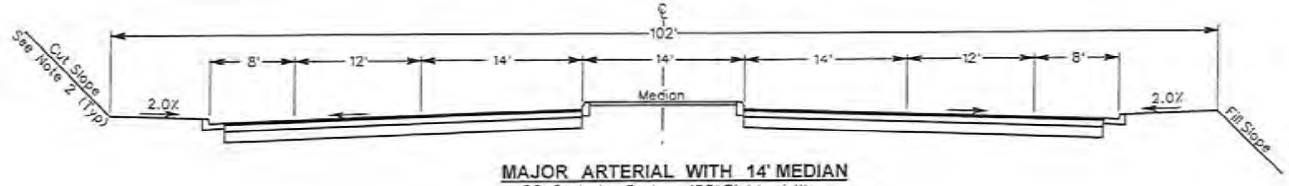
The Kinder Morgan line (based on markers and paint) appears to be southerly of the road right of way as it crosses the airport property and the creek channel. Just east of the bridge it crosses the roadway and then runs easterly inside of the northerly road right of way. We have not found any references to recorded documents for this alignment. East of the bridge (crossing & within the frontage road) it may be City of Concord franchise.

Jim Stein
County Surveyor
(925) 313-2343
jstei@pw.cccounty.us

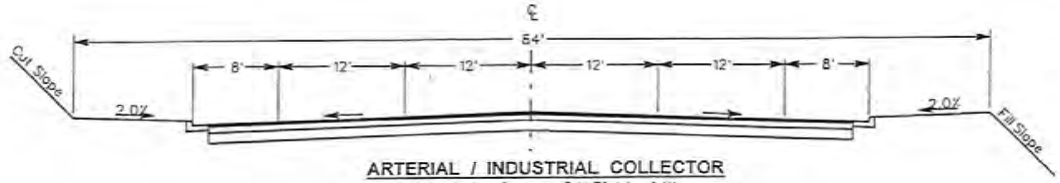
From: Janine Hampton
Sent: Monday, July 14, 2014 7:24 PM



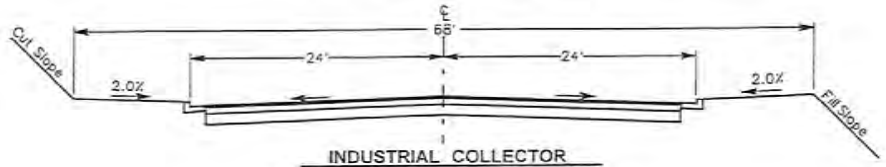
MAJOR ARTERIAL WITH 14' MEDIAN
106' Curb to Curb - 126'/136' Right of Way



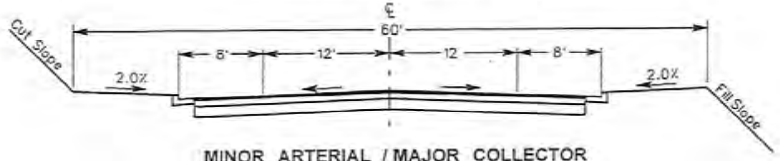
MAJOR ARTERIAL WITH 14' MEDIAN
82' Curb to Curb - 102' Right of Way



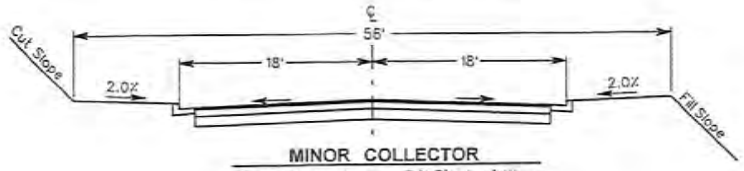
ARTERIAL / INDUSTRIAL COLLECTOR
64' Curb to Curb - 84' Right of Way



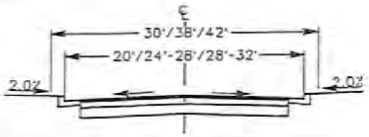
INDUSTRIAL COLLECTOR
48' Curb to Curb - 68' Right of Way



MINOR ARTERIAL / MAJOR COLLECTOR
40' Curb to Curb - 60' Right of Way



MINOR COLLECTOR
36' Curb to Curb - 56' Right of Way



PRIVATE ROADS
20',24'-28',28'-32' Curb to Curb - 30',38',42' Right of Way

LOCAL ROAD
32' Curb to Curb - 52' Right of Way

NOTES:

1. Typical cross slope for new construction shall be 2%
2. Cut and fill slopes beyond R/W may vary with a maximum of 1½ horizontal to 1 vertical, for cut slopes, and 2 horizontal to 1 vertical for fill slopes.
3. Pavement structural section shall be designed in accordance with the latest Caltrans Design Manual or "Subdivision Sheet Section" charts maintained by Public Works Department, with minimum asphalt concrete thickness of 0.20', and a minimum aggregate base thickness of 0.50'. ◇2
4. For street widths, refer to Section 98-4 of the County Ordinance Code. ◇2
5. Roads are defined by guidelines set in the "County Road Standards Matrix", exceptions shall be considered when supported by Section 92-6.002 of the County Ordinance Code.
6. Roads defined as "Parkways" shall have a Right of Way width of 136 feet.

PUBLIC WORKS DIRECTOR
12/11/02
PLANS APPROVAL DATE

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

REGISTERED PROFESSIONAL ENGINEER
MAURICE M. SHIU
No. 23204
Exp. 12/31/05
CIVIL
STATE OF CALIFORNIA

NO.	DATE	REVISION DESCRIPTION	BY
◇1	2-02	Supersedes Standard Plan CA50 dated 11-99	P.W.
◇2	12-05	Change in County Ordinance Code section callout	H.H.

COUNTY OF CONTRA COSTA
PUBLIC WORKS DEPARTMENT
MARTINEZ, CALIFORNIA

STANDARD PLAN

TYPICAL ROAD SECTIONS FOR SUBDIVISIONS & ROAD ACCEPTANCE

SCALE: NO SCALE | DATE: 12-02
DRAWN BY: H. HUSSEY | PLAN NO. CA50i
CHECKED BY: M. HOLLINGSWORTH

STD. PLAN CA50i

h. Maintenance Reports and As-Built Plans

DEPARTMENT OF TRANSPORTATION
Structure Maintenance & Investigations

Bridge Number : 28C0442
Facility Carried: MARSH DRIVE
Location : 0.2 MI W OF SOLANO WAY
City : CONCORD
Inspection Date : 01/28/2013

Bridge Inspection Report

Inspection Type

Routine	FC	Underwater	Special	Other
X				

STRUCTURE NAME: WALNUT CREEK

CONSTRUCTION INFORMATION

Year Built : 1938
Year Widened: 1965
Length (m) : 99.1

Skew (degrees): 5
No. of Joints : 3
No. of Hinges : 2

Structure Description: 1938 Original (Spans 5 - 10) - Six span RC slab (Three continuous frames with hinges in Spans 6 and 9) on RC six pile bents at Bents 6 - 10 and a RC diaphragm abutment founded on RC piles (Abutment 10). Abutment 1 was replaced with a bent, Bent 5, during the extension.

1965 Extension (Spans 1 - 4) - Four continuous RC slab spans on a RC diaphragm abutment (Abutment 1) and RC five column bents (Bents 2 - 5). Abutment 1 and Bents 2 - 4 are founded on steel shell pile cans filled with concrete. The Bent 5 columns are founded on a RC pile cap on 9 RC piles (6 existing from the old abutment and 3 new).

Span Configuration : 1 @ 7.9 m, 2 @ 10.7 m, 1 @ 8.2 m, 1 @ 8.3 m, 4 @ 11.1 m, 1 @ 8.4 m

LOAD CAPACITY AND RATINGS

Design Live Load: M-13.5 OR H-15
Inventory Rating: RF=0.63 =>20.4 metric tons Calculation Method: LOAD FACTOR
Operating Rating: RF=1.05 =>34.0 metric tons Calculation Method: LOAD FACTOR
Permit Rating : GGGGG
Posting Load : Type 3: Legal Type 3S2: Legal Type 3-3: Legal

DESCRIPTION ON STRUCTURE

Deck X-Section: 0.3 m br, 0.8 m sw, 8.2 m, 0.8 m sw, 0.3 m br
Total Width: 10.4 m Net Width: 8.2 m No. of Lanes: 2 Speed: 45 mph
Min. Vertical Clearance: Unimpaired

Rail Code: 0000

Rail Type	Location	Length (ft)	Rail Modifications
Concrete Baluster	Right/Left	708	

DESCRIPTION UNDER STRUCTURE

Channel Description: Wide trapezoidal shaped channel with sandy silt and clay slopes and bottom with light vegetation. There is grouted rock on the Abutment 1 slope within Spans 1 and 2 as well as light rock riprap on the Abutment 11 slope and around Bents 6 and 7.

INSPECTION COMMENTARY

REVISIONS

Element #220 " Reinforced Conc Submerged Pile Cap/Footing" - Quantity = 1 each has been added to represent the exposed pile cap footing at Bent 5.

INSPECTION COMMENTARY

INSPECTION ACCESS

The bridge elements within Span 10 could not be inspected due to a homeless encampment that that closed off the entire span with cardboard, refer to Photo 3. The main flow in creek was within Span 5 with stagnant water within a few of the other spans. Besides Span 10, a complete inspection was performed by walking on and around the structure.

DECK AND RAILS

The AC approach pavement adjacent to the abutments is cracked with potholes forming at Abutment 1. Refer to Photo 4 and 5 for the approach pavement adjacent to Abutment 1 and Photo 6 for Abutment 11.

There are multiple small spalls and incipient spalls, a few with exposed rebar, in the rail posts of the right bridge railing. Approximately 10% of the rail posts are affected.

The pourable joint seal at Bent 5 has failed in adhesion and cohesion along the entire length of the joint. Refer to Photo 7. There is a 3/30/2004 outstanding work recommendation to replace this joint seal after cleaning out the joint opening.

There is some dirt within the steel sliding joint seal assemblies at the Span 6 and Span 9 hinges, but appear to be functioning as intended.

The bare concrete deck has transverse and pattern cracks throughout that are spaced as close as 6 inches (0.15 m) on center and are between 1/32 to 1/16 inches (1 and 2 mm) wide at the deck surface due to edge spalling. Refer to Photo 8. There are also a few intermittent longitudinal and diagonal cracks in the deck near the joints that are between 3 and 6 feet (1 and 2 m) long and up to 1/16 inches (2 mm) wide at the deck surface due to edge spalling. In addition, there are areas of rock pockets caused by the loss of coarse aggregate the deck surface that are concentrated in Spans 5, 6 and 10. For example, refer to Photos 9 and 10 for the deck in Spans 5 and 6 respectively. There is a 1/9/2007 outstanding work recommendation to treat the deck with methacrylate.

There are 1/32 to 1/16 inches (1 and 2 mm) wide horizontal cracks on both exterior sides of the bridge at the construction joint between the bridge railing and the slab within Spans 5 through 10. There have been no changes in this previously reported condition and is not structurally significant.

SUPERSTRUCTURE

The slab soffit in Span 9 is covered with black soot due to fires from previous homeless camps with no significant fire damage observed in the concrete. The black soot was also previously reported on the soffit of Span 10, which could not be seen on this date. Otherwise, there were no significant defects noted on the slab soffit.

SUBSTRUCTURE

On the date of this inspection, stagnant water up to 1 foot (0.3 m) deep was present near the columns of Bents 3, 4, 5 and the Span 7 side of Bent 7. Stagnant water up to 3 feet (1 m) deep was also present within Span 6 with all the Bent 6 and Bent 7 columns outside the water level within this span. Bents 2, 8, 9 and 10 as well as the abutments were dry.

There were no significant defects observed on Abutment 1 or the columns at the bents. Abutment 11 could not be viewed on this date.

INSPECTION COMMENTARY

Due to heavy deterioration of the columns at Bent 3 and 4, all the columns were encased with reinforced concrete from a few feet below the channel bottom to within 3 feet (1 m) from the slab soffit. The damage to the columns was reported in the 1/13/2009 Bridge Inspection Report and repairs were completed by September 2009. The repairs are in good condition.

Stagnant water up to 1.5 feet (0.5 m) was present on both sides of Bent 5. The pile cap is vertically exposed by up to 2 feet (0.6 m) on both sides over the entire length and is slightly undermined on the Span 5 side within a few areas. Refer to Photos 11 and 12 for the Span 4 and 5 sides of Bent 5 reespectively. There has been no significant changes in this previously noted condition and no scour protection is required at this time.

With the exception of the exposed pile cap at Bent 5 and the undermining of the concrete casing at Bent 7 Column 2, there was no significant scour observed. Refer to the Scour section of this report for more details.

Since the last routine inspection on 2/3/2011, the large amount of drift reported in the 2/3/2011 Bridge Inspection Report on the upstream side of Bents 4 through 8 at Column 6 has either been removed or has washed away. Drift is still present on the upstream side of Bent 9 Column 6, but is not causing any scour issues at this time.

SCOUR

According to the 7/19/2006 Hydraulics report, this bridge is scour critical based on a scour evaluation and a stability analysis conducted by the Office of Structure Maintenance and Investigation Ratings Branch on 6/02/2002. It was indicated that Bent 6 was potentially unstable during a large hydraulic event if significant scour should occur. As previously reported, all the columns of Bents 6 and 7 have received moderate sized rip-rap around the base. There is a Bridge Scour Evaluation - Plan of Action form on file dated 6/2/2008.

During this inspection the rock protection for the columns of Bents 6 and 7 was still functioning as intended. However, the bottom of the concrete casing at Bent 7 Column 2 is undermined by up to 3 inches (75 mm) vertically and 9 inches (0.2 m) horizontally on the Span 7 side. This will be monitored during future inspections.

SAFE LOAD CAPACITY

The load rating for this structure is being reviewed by the SMI Ratings Branch. An updated Load Rating Summary will be archived when this review is complete. The current rating is based on BDS computer output dated 5/14/1978.

ELEMENT INSPECTION RATINGS

Elem No.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4	St. 5
38	Concrete Slab - Bare	2	812	sq.m.	812	0	0	0	0
205	Reinforced Conc Column or Pile Extension	2	50	ea.	50	0	0	0	
215	Reinforced Conc Abutment	2	21	m.	21	0	0	0	0
220	Reinforced Conc Submerged Pile Cap/Footing	2	1	ea.	1	0	0	0	0
227	Reinforced Conc Submerged Pile	2	1	ea.	1	0	0	0	0
234	Reinforced Conc Cap	2	94	m.	94	0	0	0	0

Elem No.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4	St. 5
256	Slope Protection	2	4	ea.	4	0	0	0	0
301	Pourable Joint Seal	2	8	m.	0	0	8	0	0
310	Elastomeric Bearing	2	2	ea.	2	0	0	0	0
339	Concrete Railing (aesthetic/masonry)	2	216	m.	208	0	0	8	
349	Sliding Steel Plates	2	16	m.	16	0	0	0	0
358	Deck Cracking	2	1	ea.	0	0	0	1	
361	Scour	2	1	ea.	0	1	0		

WORK RECOMMENDATIONS

RecDate: 01/09/2007
Action : Deck-Methacrylate
Work By: LOCAL AGENCY
Status : PROPOSED
EstCost:
StrTarget: 2 YEARS
DistTarget:
EA:

Treat the deck with methacrylate.

RecDate: 03/30/2004
Action : Joints-Repair/Clean
Work By: LOCAL AGENCY
Status : PROPOSED
EstCost:
StrTarget: 2 YEARS
DistTarget:
EA:

Remove existing damaged joint seal, pressure wash and clean expansion joint opening and replace joint seal at Bent 5.

CHANNEL X-SECTION

Side : Upstream
Measured From :Top of right concrete rail
X-Section Date: 01/28/2013

Location	Horiz(m)	Vert(m)	Comments
Abutment 1 (W)	0.00	1.07	face of abutment
Bent 2	7.64	2.98	
Bent 3	18.30	5.66	local scour hole
	24.90	5.52	
Bent 4	28.80	5.31	
	33.27	5.69	
Bent 5	37.26	5.15	
	47.70	5.85	Edge of water
	50.80	6.76	thalweg
	55.50	5.80	Edge of water
Bent 7	56.70	4.50	
Bent 8	68.12	4.93	
	74.21	4.99	
Bent 9	79.00	4.27	on debris
	80.00	4.97	Span 9 side of Bent 9
	86.25	3.80	
Bent 10	90.06	3.09	
Abutment 11 (E)	97.90	1.78	face of abutment

Team Leader : Catherine A. Tarala

Report Author : Catherine A. Tarala

Inspected By : CA.Tarala/H.Kuntz

3-19-13

Catherine A. Tarala (Registered Civil Engineer)

STRUCTURE INVENTORY AND APPRAISAL REPORT

********** IDENTIFICATION **********

(1) STATE NAME- CALIFORNIA 069
(8) STRUCTURE NUMBER 28C0442
(5) INVENTORY ROUTE(ON/UNDER)- ON 1S00A0520
(2) HIGHWAY AGENCY DISTRICT 04
(3) COUNTY CODE 013 (4) PLACE CODE 16000
(6) FEATURE INTERSECTED- WALNUT CREEK
(7) FACILITY CARRIED- MARSH DRIVE
(9) LOCATION- 0.2 MI W OF SOLANO WAY
(11) MILEPOINT/KILOMETERPOINT 0
(12) BASE HIGHWAY NETWORK- NOT ON NET 0
(13) LRS INVENTORY ROUTE & SUBROUTE
(16) LATITUDE 37 DEG 59 MIN 56 SEC
(17) LONGITUDE 122 DEG 03 MIN 21 SEC
(98) BORDER BRIDGE STATE CODE % SHARE %
(99) BORDER BRIDGE STRUCTURE NUMBER

******** STRUCTURE TYPE AND MATERIAL *********

(43) STRUCTURE TYPE MAIN:MATERIAL- CONCRETE CONT CODE 201
TYPE- SLAB
(44) STRUCTURE TYPE APPR:MATERIAL- OTHER/NA CODE 000
TYPE- OTHER/NA
(45) NUMBER OF SPANS IN MAIN UNIT 10
(46) NUMBER OF APPROACH SPANS 0
(107) DECK STRUCTURE TYPE- CIP CONCRETE CODE 1
(108) WEARING SURFACE / PROTECTIVE SYSTEM:
A) TYPE OF WEARING SURFACE- NONE CODE 0
B) TYPE OF MEMBRANE- NONE CODE 0
C) TYPE OF DECK PROTECTION- NONE CODE 0

********** AGE AND SERVICE **********

(27) YEAR BUILT 1938
(106) YEAR RECONSTRUCTED 1965
(42) TYPE OF SERVICE: ON- HIGHWAY-PEDESTRIAN 5
UNDER- WATERWAY 5
(28) LANES:ON STRUCTURE 02 UNDER STRUCTURE 00
(29) AVERAGE DAILY TRAFFIC 2000
(30) YEAR OF ADT 1984 (109) TRUCK ADT 4 %
(19) BYPASS, DETOUR LENGTH 8 KM

********** GEOMETRIC DATA **********

(48) LENGTH OF MAXIMUM SPAN 11.1 M
(49) STRUCTURE LENGTH 99.1 M
(50) CURB OR SIDEWALK: LEFT 0.8 M RIGHT 0.8 M
(51) BRIDGE ROADWAY WIDTH CURB TO CURB 8.2 M
(52) DECK WIDTH OUT TO OUT 10.4 M
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 12.2 M
(33) BRIDGE MEDIAN- NO MEDIAN 0
(34) SKEW 5 DEG (35) STRUCTURE FLARED NO
(10) INVENTORY ROUTE MIN VERT CLEAR 99.99 M
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR 8.2 M
(53) MIN VERT CLEAR OVER BRIDGE RDWY 99.99 M
(54) MIN VERT UNDERCLEAR REF- NOT H/RR 0.00 M
(55) MIN LAT UNDERCLEAR RT REF- NOT H/RR 0.0 M
(56) MIN LAT UNDERCLEAR LT 0.0 M

********** NAVIGATION DATA **********

(38) NAVIGATION CONTROL- NOT APPLICABLE CODE N
(111) PIER PROTECTION- CODE
(39) NAVIGATION VERTICAL CLEARANCE 0.0 M
(116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR M
(40) NAVIGATION HORIZONTAL CLEARANCE 0.0 M

****

SUFFICIENCY RATING = 61.2
STATUS STRUCTURALLY DEFICIENT
HEALTH INDEX 99.8
PAINT CONDITION INDEX = N/A

********** CLASSIFICATION ********** CODE

(112) NBIS BRIDGE LENGTH- YES Y
(104) HIGHWAY SYSTEM- NOT ON NHS 0
(26) FUNCTIONAL CLASS- MINOR ARTERIAL URBAN 16
(100) DEFENSE HIGHWAY- NOT STRAHNET 0
(101) PARALLEL STRUCTURE- NONE EXISTS N
(102) DIRECTION OF TRAFFIC- 2 WAY 2
(103) TEMPORARY STRUCTURE-
(105) FED.LANDS HWY- NOT APPLICABLE 0
(110) DESIGNATED NATIONAL NETWORK - NOT ON NET 0
(20) TOLL- ON FREE ROAD 3
(21) MAINTAIN- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(22) OWNER- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(37) HISTORICAL SIGNIFICANCE- NOT ELIGIBLE 5

********** CONDITION ********** CODE

(58) DECK 4
(59) SUPERSTRUCTURE 7
(60) SUBSTRUCTURE 6
(61) CHANNEL & CHANNEL PROTECTION 7
(62) CULVERTS N

********* LOAD RATING AND POSTING ********* CODE

(31) DESIGN LOAD- M-13.5 OR H-15 2
(63) OPERATING RATING METHOD- LOAD FACTOR 1
(64) OPERATING RATING- 34.0
(65) INVENTORY RATING METHOD- LOAD FACTOR 1
(66) INVENTORY RATING- 20.4
(70) BRIDGE POSTING- EQUAL TO OR ABOVE LEGAL LOADS 5
(41) STRUCTURE OPEN, POSTED OR CLOSED- A
DESCRIPTION- OPEN, NO RESTRICTION

********** APPRAISAL ********** CODE

(67) STRUCTURAL EVALUATION 5
(68) DECK GEOMETRY 4
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N
(71) WATER ADEQUACY 7
(72) APPROACH ROADWAY ALIGNMENT 7
(36) TRAFFIC SAFETY FEATURES 0000
(113) SCOUR CRITICAL BRIDGES 3

********** PROPOSED IMPROVEMENTS **********

(75) TYPE OF WORK- SUP/SUB REHAB CODE 35
(76) LENGTH OF STRUCTURE IMPROVEMENT 99.1 M
(94) BRIDGE IMPROVEMENT COST $1,032,000
(95) ROADWAY IMPROVEMENT COST $206,400
(96) TOTAL PROJECT COST $1,733,760
(97) YEAR OF IMPROVEMENT COST ESTIMATE 2010
(114) FUTURE ADT 4121
(115) YEAR OF FUTURE ADT 2029

********** INSPECTIONS **********

(90) INSPECTION DATE 01/13 (91) FREQUENCY 24 MO
(92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
A) FRACTURE CRIT DETAIL- NO MO A)
B) UNDERWATER INSP- NO MO B)
C) OTHER SPECIAL INSP- NO MO C)

Jim Foster

From: Danny Mossman
Sent: Thursday, February 13, 2014 9:03 AM
To: Jim Foster
Subject: RE: Marsh Drive Bridge over WC Channel

Jim,

Based on a curb to curb width of 8.2 meters and an ADT of 5700 the deck geometry code would change to a 3 (based on being longer than 60 meters). This would trigger the Functionally Obsolete tag. Thanks.

-----Original Message-----
From: Jim Foster
Sent: Thursday, February 13, 2014 8:53 AM
To: Danny Mossman
Subject: FW: Marsh Drive Bridge over WC Channel

Hi Danny,

With an ADT of 5700, would this bridge be considered FO?

-----Original Message-----
From: Neil Leary [mailto:nlear@pw.cccounty.us]
Sent: Thursday, February 13, 2014 8:37 AM
To: Jim Foster
Cc: Adelina Huerta
Subject: RE: Marsh Drive Bridge over WC Channel

Jim, Attached is the 2013 BIR for 28c0442. The condition of the repairs at Piers 3 and 4 are stated as in good condition--no issue. The SR = 61. The three strikes against this structure other than general age are noted as---severe deck cracking, poor railing condition, and scour crit condition at pier 6.

I have passed on the recommendation to initiate a task order with qei to do the bridge assessment. As soon as I get the go ahead I'll let you know.

Thanks
Neil

Neil Leary
Senior Civil Engineer - Design/Construction Division Contra Costa County Public Works Dept.
255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2278
Fax: (925) 313-2333
Email: nlear@pw.cccounty.us

-----Original Message-----
From: Jim Foster [mailto:jimf@quincyeng.com]
Sent: Tuesday, February 11, 2014 5:46 PM

Jim Foster

From: Jim Foster
Sent: Wednesday, February 19, 2014 3:39 PM
To: Neil Leary
Subject: Fwd: Bridge Inspection report-- 28c-0442
Attachments: image001.jpg

FYI
Maybe verify with CT that both FO and SD apply via E-mail and wait for the next updated BIR

Sent from my iPhone

Begin forwarded message:

> **From:** Danny Mossman <dannym@quincyeng.com>
> **Date:** February 18, 2014 3:02:55 PM PST
> **To:** Jim Foster <jimf@quincyeng.com>
> **Subject: RE: Bridge Inspection report-- 28c-0442**
>
> Jim,
> Neil may or may not already realize this but the SD code overrides the FO tag. Since the deck condition is causing the bridge to be Structurally Deficient it will always show as SD until the deck is fixed. Thus, even though changing the ADT doesn't show up as FO on the SI&A sheet, the bridge is still FO if that makes sense. Thanks.
>
> Danny
>
> **From:** Neil Leary [mailto:nlear@pw.cccounty.us]
> **Sent:** Tuesday, February 18, 2014 2:44 PM
> **To:** Jim Foster
> **Cc:** Danny Mossman
> **Subject:** FW: Bridge Inspection report-- 28c-0442
>
> Jim, Danny, see response from CT ABME concerning the revisions to bridge report for 28c-0442... see email below.
>
> We are meeting in-house tomorrow concerning the city's proposal. I'll let you know how it goes.
>
> Thanks
> Neil
>
> **From:** Tarala, Catherine@DOT [mailto:catherine.a.tarala@dot.ca.gov]
> **Sent:** Tuesday, February 18, 2014 1:55 PM
> **To:** Neil Leary
> **Subject:** RE: Bridge Inspection report-- 28c-0442
>
> Hello Neil,

Thanks,
Cathy T.

Catherine Tarala, P.E.
Area Bridge Maintenance Engineer
Office of Structure Maintenance and Investigations
Office: 916-227-8246
Cell: 916- 803-2743

From: Neil Leary [mailto:nlear@pw.cccounty.us]
Sent: Monday, February 10, 2014 9:26 AM
To: Tarala, Catherine@DOT
Subject: Bridge Inspection report-- 28c-0442

Hi Cathy, can you forward the last BIR for 28c-0442? The is for Marsh Drive over WC Channel. We seemed to have misplaced the routine BIR dated January 2013.

Thanks
Neil

Neil Leary
Senior Civil Engineer - Design/Construction Division

255 Glacier Drive
Martinez, CA 94553
Phone: (925) 313-2278
Fax: (925) 313-2333
Email: nlear@pw.cccounty.us

DEPARTMENT TRANSPORTATION
Structure Maintenance & Investigations

Bridge Numbe. : 28C0442
Facility Carried: MARSH DRIVE
Location : 0.2 MI W OF SOLANO WAY
City : CONCORD
Inspection Date : 02/03/2011

Bridge Inspection Report

Inspection Type

Routine	FC	Underwater	Special	Other
X				

STRUCTURE NAME: WALNUT CREEK

CONSTRUCTION INFORMATION

Year Built : 1938
Year Widened: 1965
Length (m) : 99.1

Skew (degrees): 5
No. of Joints : 3
No. of Hinges : 2

Structure Description: 1938 Original (Spans 5 - 10) - Six span RC slab (Three continuous frames with hinges in Spans 6 and 9) on RC six pile bents at Bents 6 - 10 and a RC diaphragm abutment founded on RC piles (Abutment 10). Abutment 1 was replaced with a bent during the extension.

1965 Extension (Spans 1 - 4) - Four continuous RC slab spans on a RC diaphragm abutment (Abutment 1) and RC five column bents (Bents 2 - 5). Abutment 1 and Bents 2 - 4 are founded on steel shell pile cans filled with concrete. The Bent 5 columns are founded on a RC pile cap on 9 RC piles (6 existing from the old abutment and 3 new).

Span Configuration : 1 @ 7.9 m, 2 @ 10.7 m, 1 @ 8.2 m, 1 @ 8.3 m, 4 @ 11.1 m, 1 @ 8.4 m

LOAD CAPACITY AND RATINGS

Design Live Load: M-13.5 OR H-15
Inventory Rating: 20.4 metric tonnes — Calculation Method: LOAD FACTOR
Operating Rating: 34 metric tonnes — Calculation Method: LOAD FACTOR
Permit Rating : GGGGG
Posting Load : Type 3: Legal — Type 3S2: Legal — Type 3-3: Legal

DESCRIPTION ON STRUCTURE

Deck X-Section: 0.3 m br, 0.8 m sw, 8.2 m, 0.8 m sw, 0.3 m br
Total Width: 10.4 m — Net Width: 8.2 m — No. of Lanes: 2
Rail Description: RC baluster rail. — Rail Code : 0000
Min. Vertical Clearance: Unimpaired

DESCRIPTION UNDER STRUCTURE

Channel Description: Wide trapezoidal shaped channel with sandy silt slopes and bottom with light vegetation. There is grouted rock on the Abutment 1 slope and light rock riprap on the Abutment 10 slope and around Bents 6 and 7.

CONDITION TEXT

WORK DONE

The damaged 2 m long portion of the left bridge railing in Span 8 has been repaired since the previous inspection.

The deteriorated columns at Bents 3 and 4 have been repaired. Reinforced concrete column jackets have been placed around the columns.

REVISIONS

The entire quantity of Element 205 "Reinforced Concrete Column or Pile Extension" has been placed back into condition state 1 due to the recent work at Bents 3 and 4.

CONDITION TEXT

Previously there was quantity 8 in condition state 3 and quantity 2 in condition state 4 due to the deteriorated columns at these bents.

CONDITION OF STRUCTURE

There was approximately 1 m of standing water in the channel in Span 6 and up to 0.3 m of standing water around the piles at Bents 4 and 5 during this inspection. A complete wade and visual inspection through clear water was performed at Bents 4 and 5.

Both the abutments and all the bents except Bent 4 and 5 were dry during this inspection. No underwater investigation was necessary at these locations.

There are multiple small spalls and incipient spalls, a few with exposed rebar, in the rail posts of the right bridge railing. Approximately 10% of the rail posts are affected. (Previously reported)

There are fine to moderate size (up to 2 mm wide at the deck surface due to edge spalling) moderate to severe density (spaced less than 300 mm apart in multiple areas) transverse cracks throughout the deck. There are fine to moderate size (up to 1 mm wide at the deck surface due to edge spalling) moderate to severe density (mostly spaced less than 300 mm apart) pattern cracks throughout the deck. There are also a few intermittent fine to moderate size (up to 2 mm wide at the deck surface due to edge spalling) longitudinal cracks in the deck and a few same size 1 to 2 m long diagonal cracks concentrated near the joints. (Previously reported)

There are rock pockets caused by the loss of coarse aggregate throughout the deck surface concentrated in Spans 5, 6 and 10. (Previously reported)

The pourable joint seal at Bent 5 has failed in adhesion and cohesion along the entire length of the joint. (Previously reported)

There are 1 mm to 2 mm wide horizontal cracks on both exterior sides of the bridge at the construction joint between bridge railing and slab, in spans 5 through 10. There have been no changes in this previously reported condition. This condition is not structurally significant.

The soffit in Spans 9 and 10 is covered with black soot due to fires from previous homeless camps. No fire damage other than the discoloration to the soffit was found.

There are up to 1 mm wide vertical and horizontal cracks in the concrete casing at Columns 3 and 4 at Bent 6 on the Span 6 side. This condition is not structurally significant at this time and no repairs are necessary.

The following conditions of the RC columns at Bents 3 and 4 were noted during the previous Routine Inspection dated 1/13/2009:

Column 3 at Bent 3 - The cover concrete at the bottom 0.3 m (height) of the pile extension just above the steel shell has delaminated and is unsound. The exposed portion of the steel shell has heavy flaking rust with section loss ranging from 25% to 100%.

Column 4 at Bent 3 - The cover concrete at the bottom 1 m (height) of the pile extension just above the steel shell has delaminated and is unsound around 50% of the circumference on the Span 3 side. A portion of the cover concrete had spalled prior to this inspection. A portion of the cover concrete was removed with a geology pick during this inspection to determine the extent of the deterioration. This inspection exposed the core of the column and the column reinforcement. The core concrete appeared sound but is soft and easily penetrated when struck with a geology pick. The exposed longitudinal steel has heavy corrosion with section loss estimated at 50% of the section. The exposed transverse steel

CONDITION TEXT

(spiral wire) has heavy corrosion with section loss estimated at 50% to 100% of the section. The exposed portion of the steel shell has heavy flaking rust with section loss ranging from 25% to 100%. This condition has deteriorated significantly since the previous inspection. During the previous inspection the column was sounded with a geology pick and determined to be sound. A 10 mm wide X 0.6 m long vertical crack with minor spalling at the base of the column adjacent to the steel shell was also noted.

Columns 1, 2 and 5 at Bent 3 - The exposed portion of the steel shells has heavy flaking rust with section loss ranging from 25% to 100%.

Column 1 at Bent 4 - The exposed portion of the steel shell has heavy flaking rust with section loss ranging from 25% to 100%.

Columns 2 and 3 at Bent 4 - The cover concrete at the bottom 0.3 m (height) of the pile extensions just above the steel shells has delaminated and is unsound. In addition there are 1 mm to 1.5 mm wide vertical cracks in the columns just above the steel shells. The exposed portion of the steel shells has heavy flaking rust with section loss ranging from 25% to 100%.

Column 4 at Bent 4 - The cover concrete at the bottom 0.3 m to 0.5 m (height) of the pile extension just above the steel shell has delaminated and is unsound. In addition there are 1 mm to 2 mm wide vertical cracks in the columns just above the steel shells. The exposed portion of the steel shells has heavy flaking rust with section loss ranging from 25% to 100%.

Column 5 at Bent 4 - The cover concrete at the bottom 1 m (height) of the pile extension just above the steel shell has delaminated and is unsound around the entire circumference of the column. A portion of the cover concrete was removed with a geology pick during this inspection to determine the extent of the deterioration. This inspection exposed the core of the column and the column reinforcement. The core concrete appeared sound but is soft and easily penetrated when struck with a geology pick. The exposed longitudinal steel has heavy corrosion with section loss estimated at 50% to 75% of the section. The exposed transverse steel (spiral wire) has heavy corrosion with section loss estimated at 50% to 75% of the section. The exposed portion of the steel shell has heavy flaking rust with section loss ranging from 25% to 100%. This condition has deteriorated significantly since the previous inspection. The previous inspection did not indicate that the cover concrete was unsound. 3 mm wide X 1 m long vertical cracks were noted at the base of the column.

At this time the deteriorated columns at Bents 3 and 4 are adequate to sustain traffic loads; however the columns have little or no capacity to resist lateral loads from earthquakes or large hydraulic events. Neil Leary at Contra Costa County was notified on 1/15/2009 by telephone and email of the condition. The county was informed that the columns should be repaired as soon as possible and that the bents should be monitored closely during large hydraulic events. Neil indicated that outrigger bents are going to be placed at all the bents in the near future.

All the columns at Bents 3 and 4 have been encased with reinforced concrete from a few feet below the channel bottom to within 1 m from the soffit since the previous Routine Inspection dated 1/13/2009.

SCOUR

The previous report noted the following scour condition at Bents 3 and 4: "The steel shell pile cans at Columns 1-4 at Bent 3 are exposed up to 100 mm. There have been no changes in this previously noted condition. The steel shell pile cans at all the columns at Bent 4 are now exposed up to 0.6 m. The previous report noted that the steel shells were exposed up to 0.5 m." The steel shell pile cans are no longer exposed at Bents 3 and

CONDITION TEXT

4 due to being encased in reinforced concrete to a few feet below the channel bottom.

The pile cap (founded on RC piles) at Bent 5 is exposed up to 0.6 m vertically on both sides over the entire length. The pile cap is slightly undermined on the Span 5 side in a few areas. There has been no significant change in this previously noted condition. No scour protection is needed at this time.

According to the 07/19/2006 hydraulics report, this bridge became scour critical based on scour evaluation and a stability analysis conducted by Division of Structure Maintenance and Investigation - Ratings on 06/02/2002. It was indicated that Pier 6 was potentially unstable during a large hydraulic event if significant scour should occur.

As previously reported, all the columns of Bents 6 and 7 have received moderate sized rip rap around the base with no exposure of the bottoms of the steel column collars.

During this inspection the rock protection for the columns at Bents 6 and 7 was still functioning as intended.

As previously reported, 1 to 2 square meter of drift has accumulated on the upstream columns of Bents 4 through 9.

The previous Channel X-section taken on 07/19/2006 was spot checked during this inspection. No significant changes have occurred in the channel since the previous X-section.

ELEMENT INSPECTION RATINGS

Elem No.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4	St. 5
38	Concrete Slab - Bare	2	812	sq.m.	812	0	0	0	0
205	Reinforced Conc Column or Pile Extension	2	50	ea.	50	0	0	0	
215	Reinforced Conc Abutment	2	21	m.	21	0	0	0	0
227	Reinforced Conc Submerged Pile	2	1	ea.	1	0	0	0	0
234	Reinforced Conc Cap	2	94	m.	94	0	0	0	0
256	Slope Protection	2	4	ea.	4	0	0	0	0
301	Pourable Joint Seal	2	8	m.	0	0	8	0	0
310	Elastomeric Bearing	2	2	ea.	2	0	0	0	0
339	Concrete Railing (aesthetic/masonry)	2	216	m.	208	0	0	8	
349	Sliding Steel Plates	2	16	m.	16	0	0	0	0
358	Deck Cracking	2	1	ea.	0	0	0	1	
361	Scour	2	1	ea.	0	1	0		

WORK RECOMMENDATIONS

RecDate: 01/09/2007
Action : Deck-Methacrylate
Work By: LOCAL AGENCY
Status : PROPOSED

EstCost:
StrTarget: 2 YEARS
DistTarget:
EA:

Treat the deck with methacrylate.

RecDate: 03/30/2004
Action : Sub-Misc.
Work By: LOCAL AGENCY
Status : PROPOSED

EstCost:
StrTarget: 2 YEARS
DistTarget:
EA:

Remove drift from the bent columns as needed. There is accumulated drift from 1 to 2 square meters of frontal around the upstream columns at Bents 4 through 9.

WORK RECOMMENDATIONS

RecDate: 03/30/2004
Action : Joints-Repair/Clean
Work By: LOCAL AGENCY
Status : PROPOSED

EstCost:
StrTarget: 2 YEARS
DistTarget:
EA:

Remove existing damaged joint seal, pressure wash and clean expansion joint opening and replace joint seal at Bent 5.

Inspected By : Tim Campbell

Tim Campbell (Registered Civil Engineer)

STRUCTURE INVENTORY AND APPRAISAL REPORT

********** IDENTIFICATION **********

(1) STATE NAME- CALIFORNIA 069
(8) STRUCTURE NUMBER 28C0442
(5) INVENTORY ROUTE(ON/UNDER) - ON 1500A0520
(2) HIGHWAY AGENCY DISTRICT 04
(3) COUNTY CODE 013 (4) PLACE CODE 16000
(6) FEATURE INTERSECTED- WALNUT CREEK
(7) FACILITY CARRIED- MARSH DRIVE
(9) LOCATION- 0.2 MI W OF SOLANO WAY
(11) MILEPOINT/KILOMETERPOINT 0
(12) BASE HIGHWAY NETWORK- NOT ON NET 0
(13) LRS INVENTORY ROUTE & SUBROUTE
(16) LATITUDE 37 DEG 59 MIN 56 SEC
(17) LONGITUDE 122 DEG 03 MIN 21 SEC
(98) BORDER BRIDGE STATE CODE % SHARE %
(99) BORDER BRIDGE STRUCTURE NUMBER

******** STRUCTURE TYPE AND MATERIAL *********

(43) STRUCTURE TYPE MAIN:MATERIAL- CONCRETE CONT
TYPE- SLAB CODE 201
(44) STRUCTURE TYPE APPR:MATERIAL- OTHER/NA
TYPE- OTHER/NA CODE 000
(45) NUMBER OF SPANS IN MAIN UNIT 10
(46) NUMBER OF APPROACH SPANS 0
(107) DECK STRUCTURE TYPE- CIP CONCRETE CODE 1
(108) WEARING SURFACE / PROTECTIVE SYSTEM:
A) TYPE OF WEARING SURFACE- NONE CODE 0
B) TYPE OF MEMBRANE- NONE CODE 0
C) TYPE OF DECK PROTECTION- NONE CODE 0

********** AGE AND SERVICE **********

(27) YEAR BUILT 1938
(106) YEAR RECONSTRUCTED 1965
(42) TYPE OF SERVICE: ON- HIGHWAY-PEDESTRIAN 5
UNDER- WATERWAY 5
(28) LANES:ON STRUCTURE 02 UNDER STRUCTURE 00
(29) AVERAGE DAILY TRAFFIC 2000
(30) YEAR OF ADT 1984 (109) TRUCK ADT 4 %
(19) BYPASS, DETOUR LENGTH 8 KM

********** GEOMETRIC DATA **********

(48) LENGTH OF MAXIMUM SPAN 11.1 M
(49) STRUCTURE LENGTH 99.1 M
(50) CURB OR SIDEWALK: LEFT 0.8 M RIGHT 0.8 M
(51) BRIDGE ROADWAY WIDTH CURB TO CURB 8.2 M
(52) DECK WIDTH OUT TO OUT 10.4 M
(32) APPROACH ROADWAY WIDTH (W/SHOULDERS) 12.2 M
(33) BRIDGE MEDIAN- NO MEDIAN 0
(34) SKEW 5 DEG (35) STRUCTURE FLARED NO
(10) INVENTORY ROUTE MIN VERT CLEAR 99.99 M
(47) INVENTORY ROUTE TOTAL HORIZ CLEAR 8.2 M
(53) MIN VERT CLEAR OVER BRIDGE RDWY 99.99 M
(54) MIN VERT UNDERCLEAR REF- NOT H/RR 0.00 M
(55) MIN LAT UNDERCLEAR RT REF- NOT H/RR 0.0 M
(56) MIN LAT UNDERCLEAR LT 0.0 M

********** NAVIGATION DATA **********

(38) NAVIGATION CONTROL- NOT APPLICABLE CODE N
(111) PIER PROTECTION- CODE
(39) NAVIGATION VERTICAL CLEARANCE 0.0 M
(116) VERT-LIFT BRIDGE NAV MIN VERT CLEAR M
(40) NAVIGATION HORIZONTAL CLEARANCE 0.0 M

****
SUFFICIENCY RATING = 61.2
STATUS STRUCTURALLY DEFICIENT
HEALTH INDEX 99.8
PAINT CONDITION INDEX = N/A

********** CLASSIFICATION ********** CODE

(112) NBIS BRIDGE LENGTH- YES Y
(104) HIGHWAY SYSTEM- NOT ON NHS 0
(26) FUNCTIONAL CLASS- MINOR ARTERIAL URBAN 16
(100) DEFENSE HIGHWAY- NOT STRAHNET 0
(101) PARALLEL STRUCTURE- NONE EXISTS N
(102) DIRECTION OF TRAFFIC- 2 WAY 2
(103) TEMPORARY STRUCTURE-
(105) FED.LANDS HWY- NOT APPLICABLE 0
(110) DESIGNATED NATIONAL NETWORK - NOT ON NET 0
(20) TOLL- ON FREE ROAD 3
(21) MAINTAIN- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(22) OWNER- CITY OR MUNICIPAL HIGHWAY AGENCY 04
(37) HISTORICAL SIGNIFICANCE- NOT ELIGIBLE 5

********** CONDITION ********** CODE

(58) DECK 4
(59) SUPERSTRUCTURE 7
(60) SUBSTRUCTURE 6
(61) CHANNEL & CHANNEL PROTECTION 7
(62) CULVERTS N

********* LOAD RATING AND POSTING ********* CODE

(31) DESIGN LOAD- M-13.5 OR H-15 2
(63) OPERATING RATING METHOD- LOAD FACTOR 1
(64) OPERATING RATING- 34
(65) INVENTORY RATING METHOD- LOAD FACTOR 1
(66) INVENTORY RATING- 20.4
(70) BRIDGE POSTING- EQUAL TO OR ABOVE LEGAL LOADS 5
(41) STRUCTURE OPEN, POSTED OR CLOSED- A
DESCRIPTION- OPEN, NO RESTRICTION

********** APPRAISAL ********** CODE

(67) STRUCTURAL EVALUATION 5
(68) DECK GEOMETRY 4
(69) UNDERCLEARANCES, VERTICAL & HORIZONTAL N
(71) WATER ADEQUACY 7
(72) APPROACH ROADWAY ALIGNMENT 7
(36) TRAFFIC SAFETY FEATURES 0000
(113) SCOUR CRITICAL BRIDGES 3

********** PROPOSED IMPROVEMENTS **********

(75) TYPE OF WORK- SUP/SUB REHAB CODE 35
(76) LENGTH OF STRUCTURE IMPROVEMENT 99.1 M
(94) BRIDGE IMPROVEMENT COST $1,032,000
(95) ROADWAY IMPROVEMENT COST $206,400
(96) TOTAL PROJECT COST $1,733,760
(97) YEAR OF IMPROVEMENT COST ESTIMATE 2010
(114) FUTURE ADT 4121
(115) YEAR OF FUTURE ADT 2029

********** INSPECTIONS **********

(90) INSPECTION DATE 02/11 (91) FREQUENCY 24 MO
(92) CRITICAL FEATURE INSPECTION: (93) CFI DATE
A) FRACTURE CRIT DETAIL- NO MO A)
B) UNDERWATER INSP- NO MO B)
C) OTHER SPECIAL INSP- NO MO C)

102 - PHOTO-DECK DAMAGE/DETERIORATION

Photo No. 1

Typical deck condition in Spans 5, 6 and 10

102 - PHOTO-DECK DAMAGE/DETERIORATION

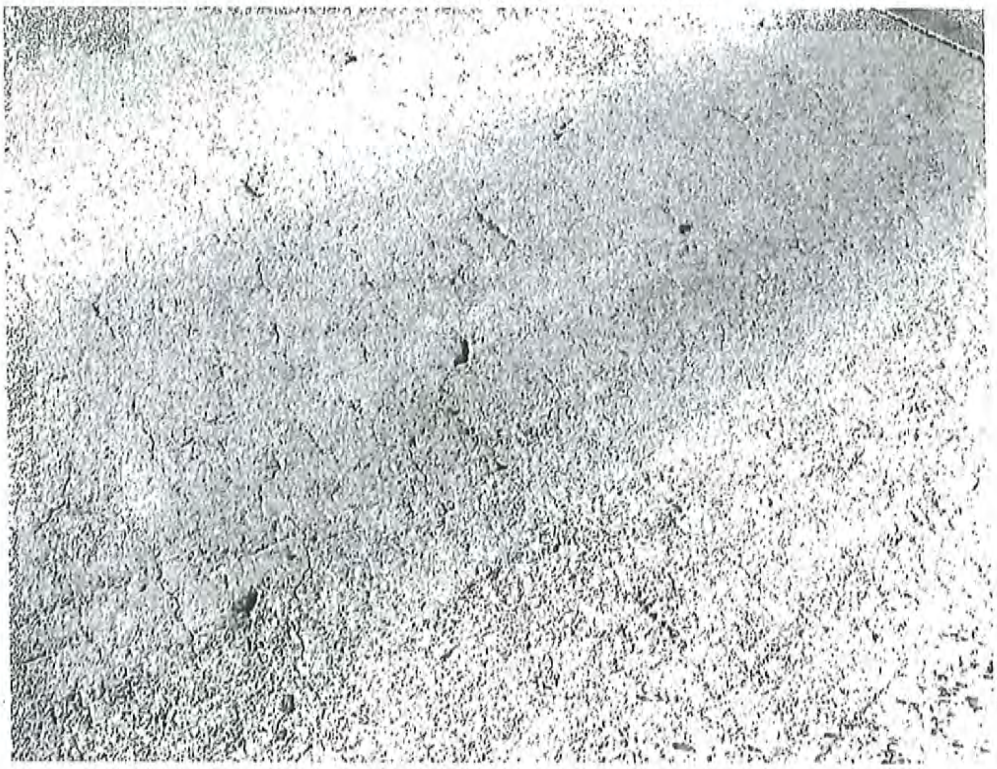


Photo No. 1

Typical deck cracking

118 - PHOTO-SUB REPAIRS

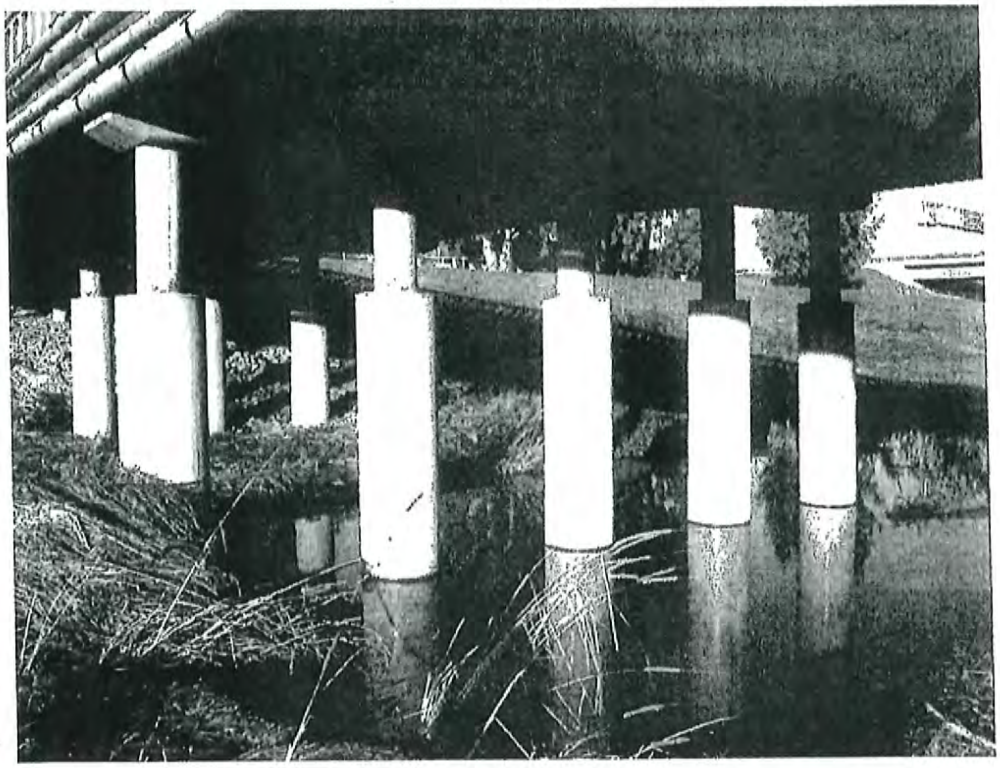


Photo No. 1

RC column jackets at Bents 3 and 4

118 - PHOTO-SUB REPAIRS

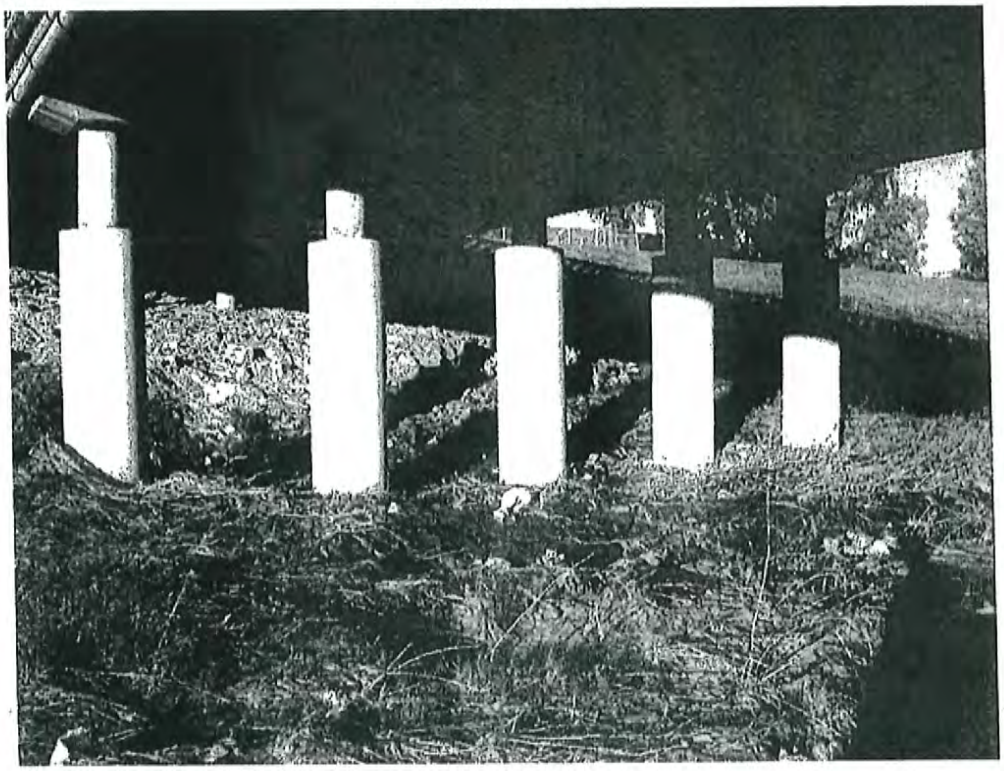
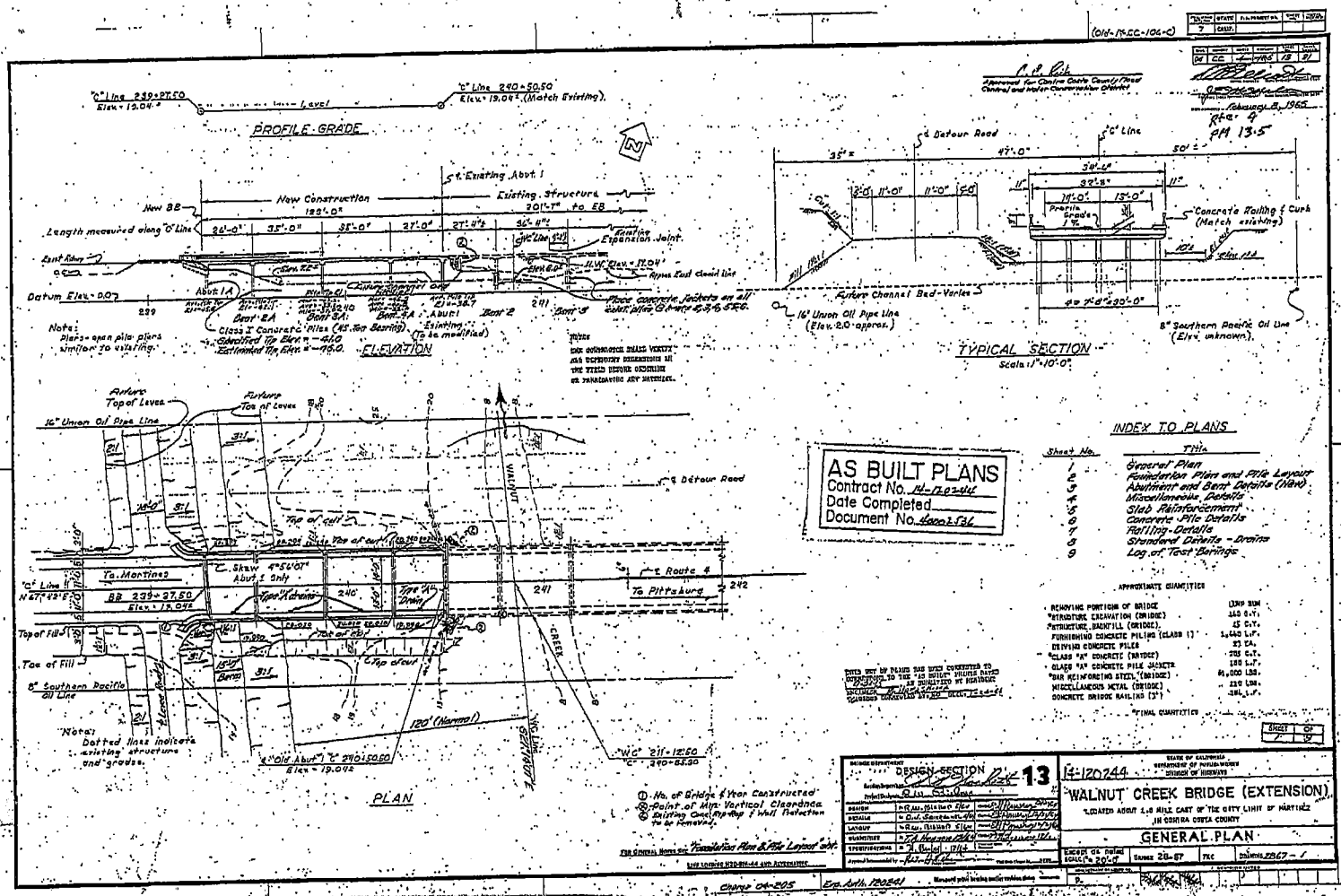


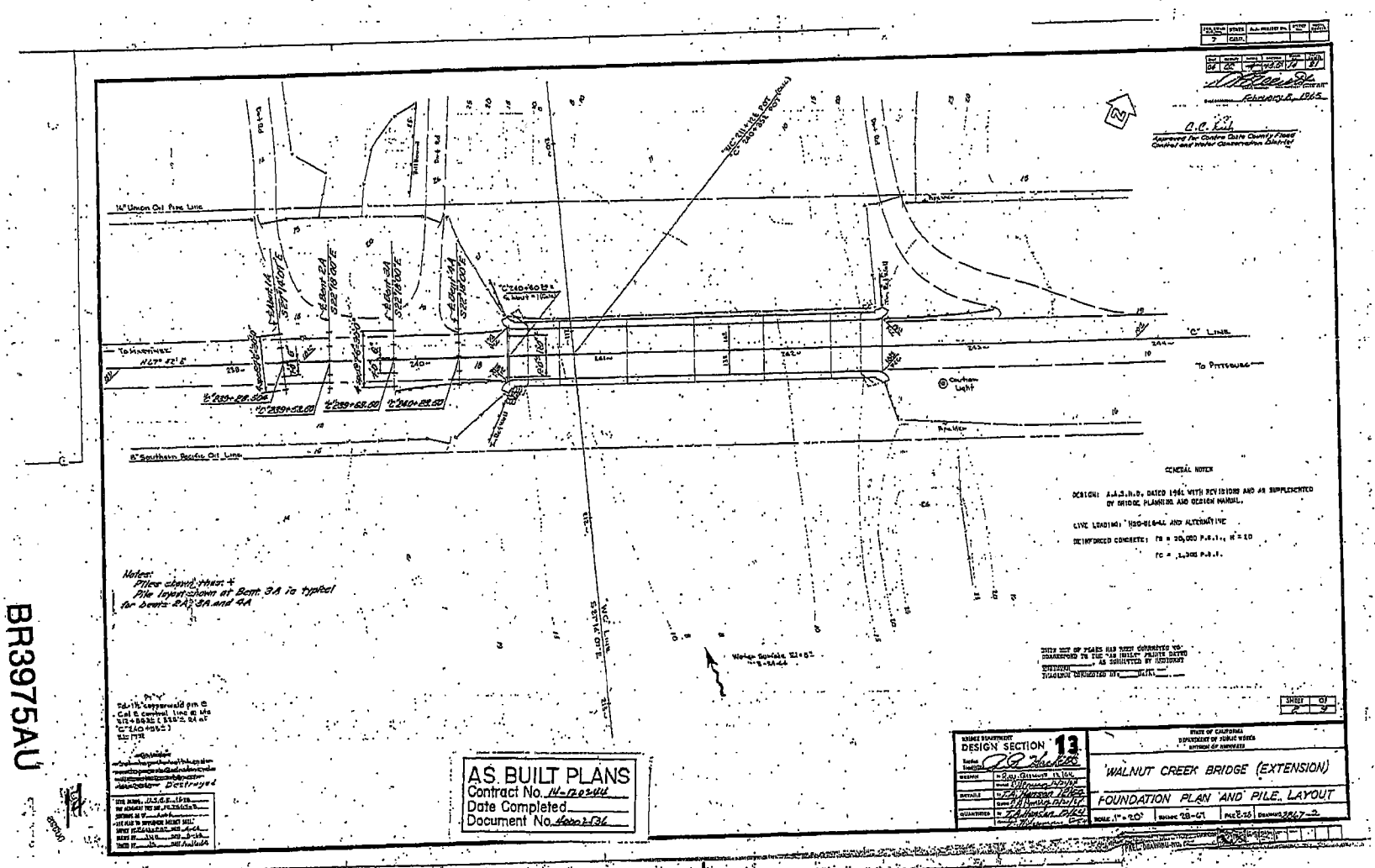
Photo No. 1

RC column jackets at Bent 3

1965 plans
ext+a

BR3975AU




14" Union Oil Pipe Line
8" Southern Pacific Oil Line
"C" Line
To Martinez
To Pittsburg
Notes:
Piles shown thus: +
Pile layout shown at Bent 3A is typical for bents 2A, 3A and 4A
GENERAL NOTES
DESIGN: A.A.S.H.O. DATED 1961 WITH REVISIONS AND AS SUPPLEMENTED BY BRIDGE PLANNING AND DESIGN MANUAL.
LIVE LOADING: H20-S16-44 AND ALTERNATIVE
REINFORCED CONCRETE: f'c = 3,000 P.S.I., n = 10
fc = 1,350 P.S.I.
AS BUILT PLANS
Contract No. 14-120244
Date Completed
Document No. 4000-136
DESIGN SECTION 13
WALNUT CREEK BRIDGE (EXTENSION)
FOUNDATION PLAN AND PILE LAYOUT
STATE OF CALIFORNIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS
February 8, 1965
Approved for Contra Costa County Flood Control and Water Conservation District

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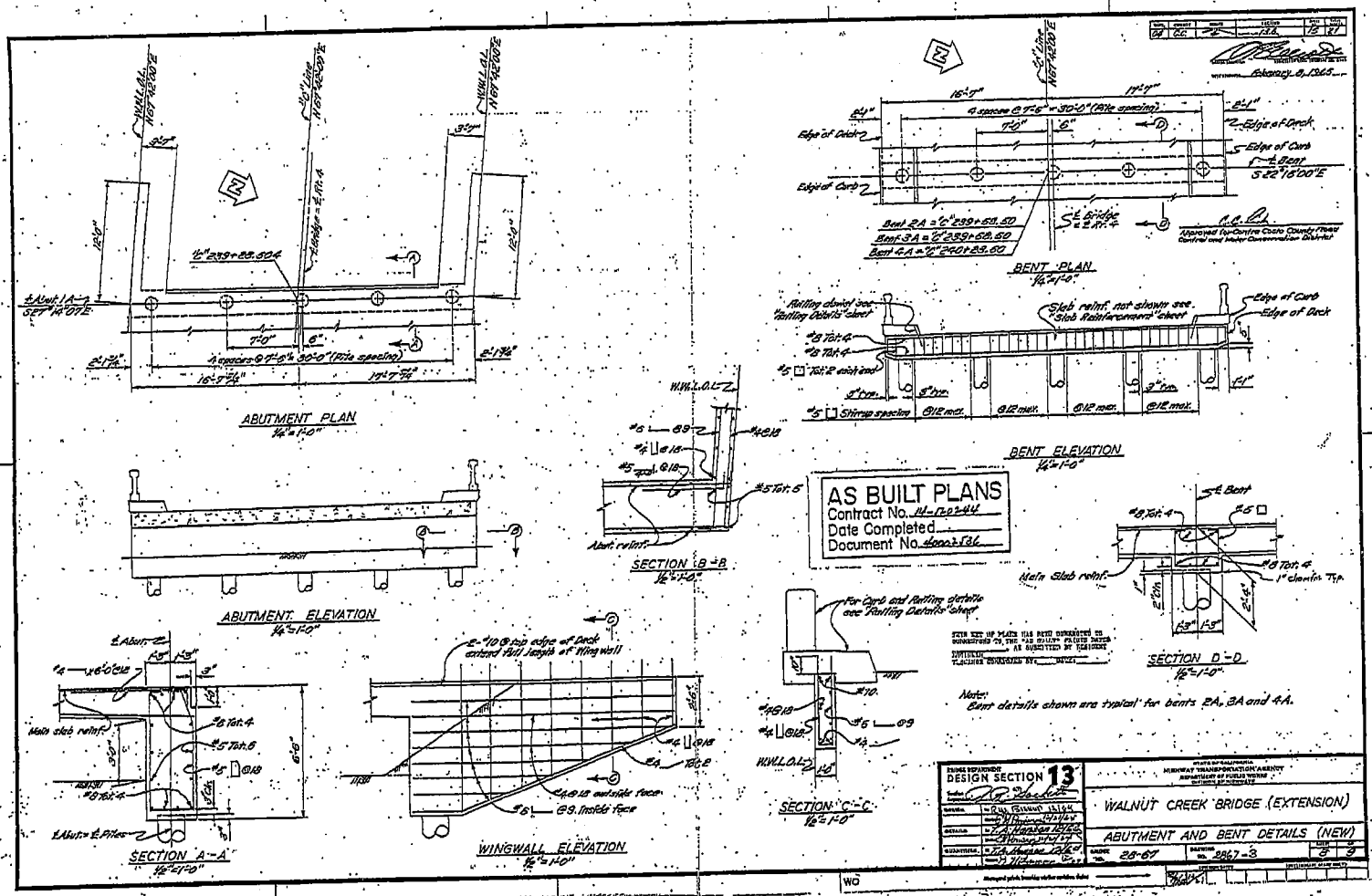
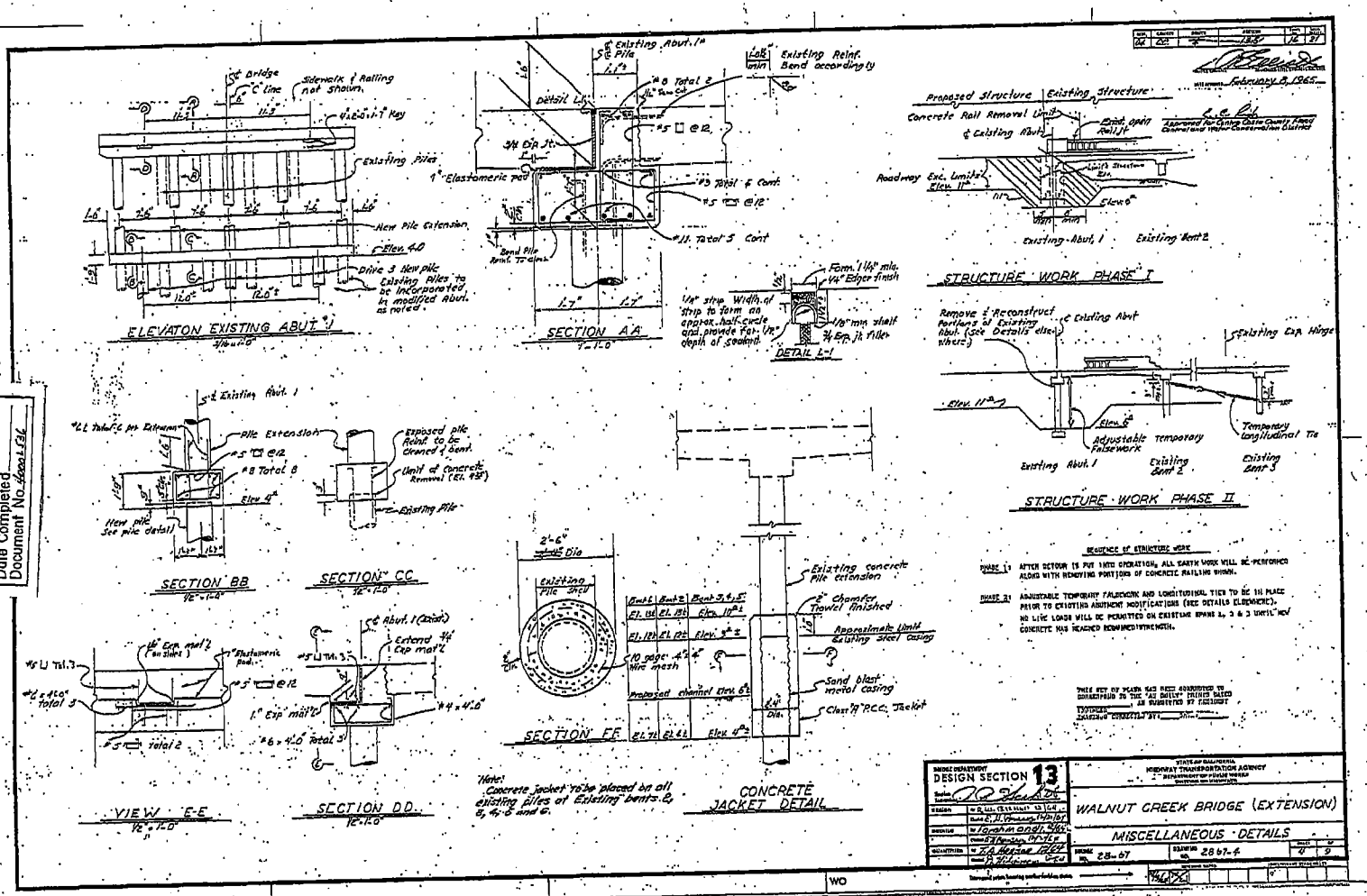

ABUTMENT PLAN
1/4"=1'-0"
ABUTMENT ELEVATION
1/4"=1'-0"
SECTION A-A
1/4"=1'-0"
SECTION B-B
1/2"=1'-0"
WINGWALL ELEVATION
1/2"=1'-0"
BENT PLAN
1/4"=1'-0"
BENT ELEVATION
1/4"=1'-0"
SECTION C-C
1/2"=1'-0"
SECTION D-D
1/2"=1'-0"
AS BUILT PLANS
Contract No. 04-170244
Date Completed
Document No. 4000-536
DESIGN SECTION 13
WALNUT CREEK BRIDGE (EXTENSION)
ABUTMENT AND BENT DETAILS (NEW)
28-67
28G7-3



AS BUILT PLANS
Contract No. 04-183444
Date Completed
Document No. 4200143K

BR3975AU

DESIGN SECTION 13

WALNUT CREEK BRIDGE (EXTENSION)

MISCELLANEOUS DETAILS

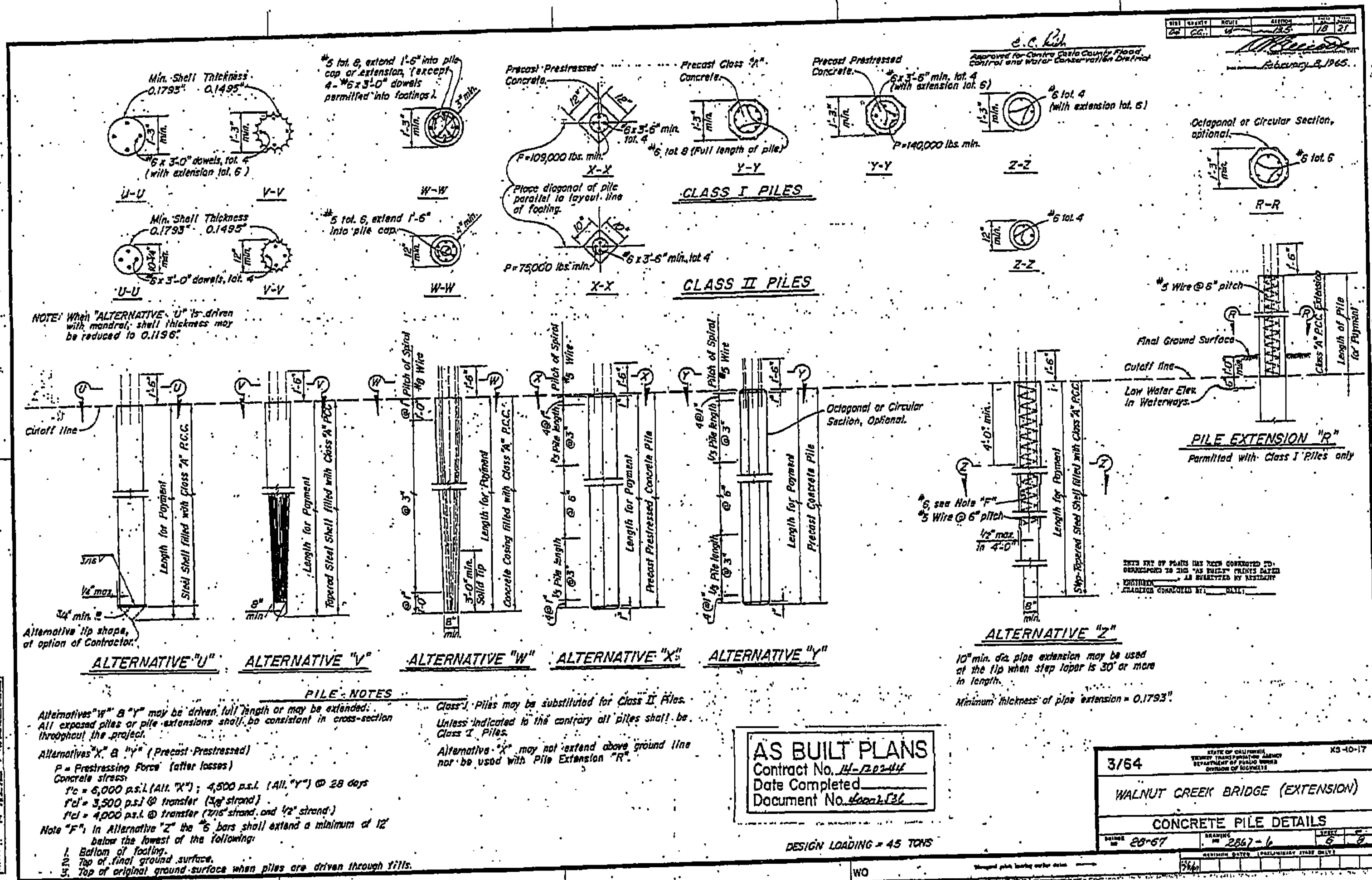
28-67

28 67-4

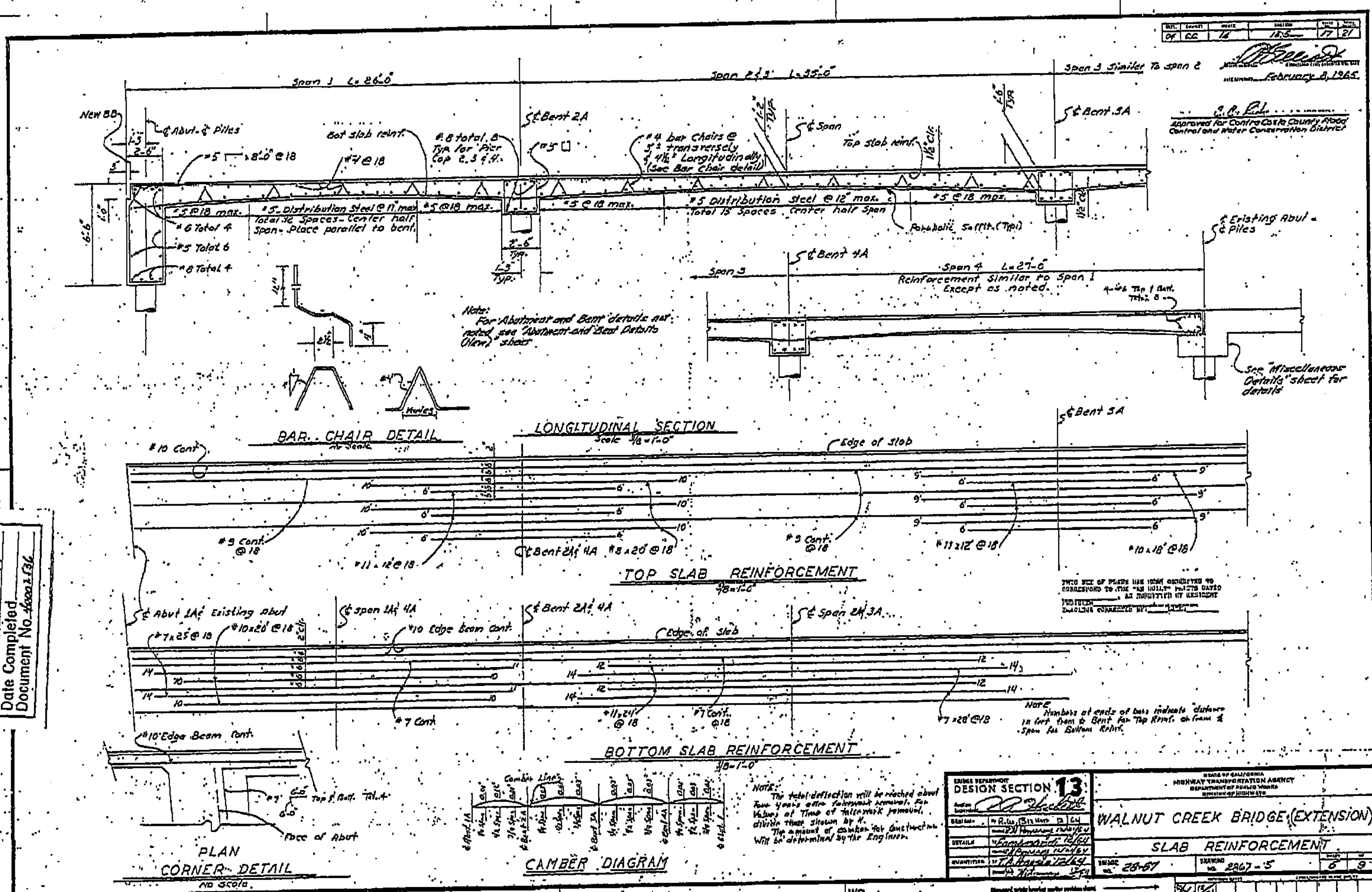
February 8, 1965

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT WHICH WAS ISSUED BY DIVISION AND SIGNED OF THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION OF THE DIRECTOR OF PUBLIC WORKS.

DATE 2-13-72 SIGNATURE James F. Cook SR. DRFTR


Min. Shell Thickness 0.1793" 0.1495"
#6 x 3'-0" dowels, tot. 4 (with extension tot. 6)
U-U
V-V
#5 tot. 8, extend 1'-6" into pile cap or extension, (except 4-#6 x 3'-0" dowels permitted into footings).
W-W
#5 tot. 6, extend 1'-6" into pile cap.
Precast Prestressed Concrete
P=109,000 lbs. min.
6 x 3'-6" min. tot. 4
Place diagonal of pile parallel to layout line of footing.
X-X
P=75,000 lbs. min.
#6 x 3'-6" min. tot. 4
Precast Class "A" Concrete
#6 tot. 8 (Full length of pile)
Y-Y
CLASS I PILES
CLASS II PILES
Precast Prestressed Concrete
#6 x 3'-6" min. tot. 4 (with extension tot. 6)
P=140,000 lbs. min.
#6 tot. 4 (with extension tot. 6)
Z-Z
#6 tot. 4
Approved for Contra Costa County Flood Control and Water Conservation District
February 8, 1965.
Octagonal or Circular Section, optional.
#6 tot. 6
R-R
NOTE: When "ALTERNATIVE U" is driven with mandrel, shell thickness may be reduced to 0.1196.
Cutoff line
Length for Payment
Steel Shell filled with Class "A" P.C.C.
Alternative tip shape, at option of Contractor.
Tapered Steel Shell filled with Class "A" P.C.C.
Pitch of Spiral
#8 Wire
Concrete Casing filled with Class "A" P.C.C.
Solid tip
3'-0" min.
#5 Wire
1/3 Pile length
Precast Prestressed Concrete Pile
Precast Concrete Pile
Octagonal or Circular Section, Optional.
#6 see Note "F"
#5 Wire @ 6" pitch
1/2" max. in 4'-0"
Step-Tapered Steel Shell filled with Class "A" P.C.C.
Final Ground Surface
Cutoff line
Low Water Elev. in Waterways.
Class "A" P.C.C. Extension
Length of Pile for Payment
PILE EXTENSION "R"
Permitted with Class I Piles only
ALTERNATIVE "U"
ALTERNATIVE "V"
ALTERNATIVE "W"
ALTERNATIVE "X"
ALTERNATIVE "Y"
ALTERNATIVE "Z"
10" min. dia. pipe extension may be used at the tip when step taper is 30' or more in length.
Minimum thickness of pipe extension = 0.1793".
PILE NOTES
Alternatives "W" & "Y" may be driven full length or may be extended.
All exposed piles or pile extensions shall be consistent in cross-section throughout the project.
Alternatives "X" & "Y" (Precast Prestressed)
P = Prestressing Force (after losses)
Concrete stress:
f'c = 6,000 p.s.i. (Alt. "X"); 4,500 p.s.i. (Alt. "Y") @ 28 days
f'ci = 3,500 p.s.i. @ transfer (3/8" strand)
f'ci = 4,000 p.s.i. @ transfer (7/16" strand and 1/2" strand)
Note "F": In Alternative "Z" the #6 bars shall extend a minimum of 12' below the lowest of the following:
1. Bottom of footing.
2. Top of final ground surface.
3. Top of original ground surface when piles are driven through fills.
Class I Piles may be substituted for Class II Piles.
Unless indicated to the contrary all piles shall be Class I Piles.
Alternative "X" may not extend above ground line nor be used with Pile Extension "R".
AS BUILT PLANS
Contract No.
Date Completed
Document No.
DESIGN LOADING = 45 TONS
3/64
WALNUT CREEK BRIDGE (EXTENSION)
CONCRETE PILE DETAILS
WO

BR3975AU


Span 1 L=26'-0"
Span 2 & 3 L=35'-0"
Span 3 Similar to Span 2
February 8, 1965
Approved for Contra Costa County Flood Control and Water Conservation District
New BB
¢ Abut-¢ Piles
Bot slab reinf.
#8 total, 8 Typ. for Pier Cap 2, 3 & 4.
¢ Bent 2A
#4 bar Chairs @ 3' ± Transversely & 4½' ± Longitudinally (See Bar Chair detail)
¢ Span
Top slab reinf.
¢ Bent 3A
#5 Distribution Steel @ 11' max. Total 16 Spaces - Center half Span - Place parallel to bent.
#5 Distribution Steel @ 12" max. Total 15 Spaces center half Span
Parabolic Soffit (Typ.)
#6 Total 4
#5 Total 6
#6 Total 4
¢ Existing Abut - ¢ Piles
¢ Bent 4A
Span 3
Span 4 L=27'-0"
Reinforcement Similar to Span 1 Except as noted.
Note: For Abutment and Bent details not noted, see "Abutment and Bent Details (New)" sheet
See "Miscellaneous Details" sheet for details
BAR CHAIR DETAIL
No Scale
LONGITUDINAL SECTION
Scale 1/8"=1'-0"
#10 Cont.
Edge of Slab
#9 Cont. @ 18
#11 x 12' @ 18
¢ Bent 2A & 4A
#8 x 20' @ 18
#9 Cont. @ 18
#11 x 12' @ 18
#10 x 18' @ 18
TOP SLAB REINFORCEMENT
1/8"=1'-0"
¢ Abut 1A & Existing Abut
#7 x 25' @ 18
#10 x 20' @ 18
¢ Span 1A & 4A
#10 Edge Beam Cont.
¢ Bent 2A & 4A
Edge of Slab
¢ Span 2A & 3A
#7 Cont.
#11 x 24' @ 18
#7 Cont. @ 18
#7 x 28' @ 18
Note: Numbers at ends of bars indicate distance in feet from ¢ Bent for Top Reinf. or from ¢ Span for Bottom Reinf.
#10 Edge Beam Cont.
Face of Abut
BOTTOM SLAB REINFORCEMENT
1/8"=1'-0"
PLAN
CORNER DETAIL
No Scale
Camber Line
CAMBER DIAGRAM
Note: The total deflection will be reached about two years after falsework removal. For values at time of falsework removal, divide those shown by 4. The amount of camber for construction will be determined by the Engineer.
DESIGN SECTION 13
STATE OF CALIFORNIA
HIGHWAY TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
WALNUT CREEK BRIDGE (EXTENSION)
SLAB REINFORCEMENT
BRIDGE NO. 28-67
DRAWING NO. 2967-5
6 9
WO

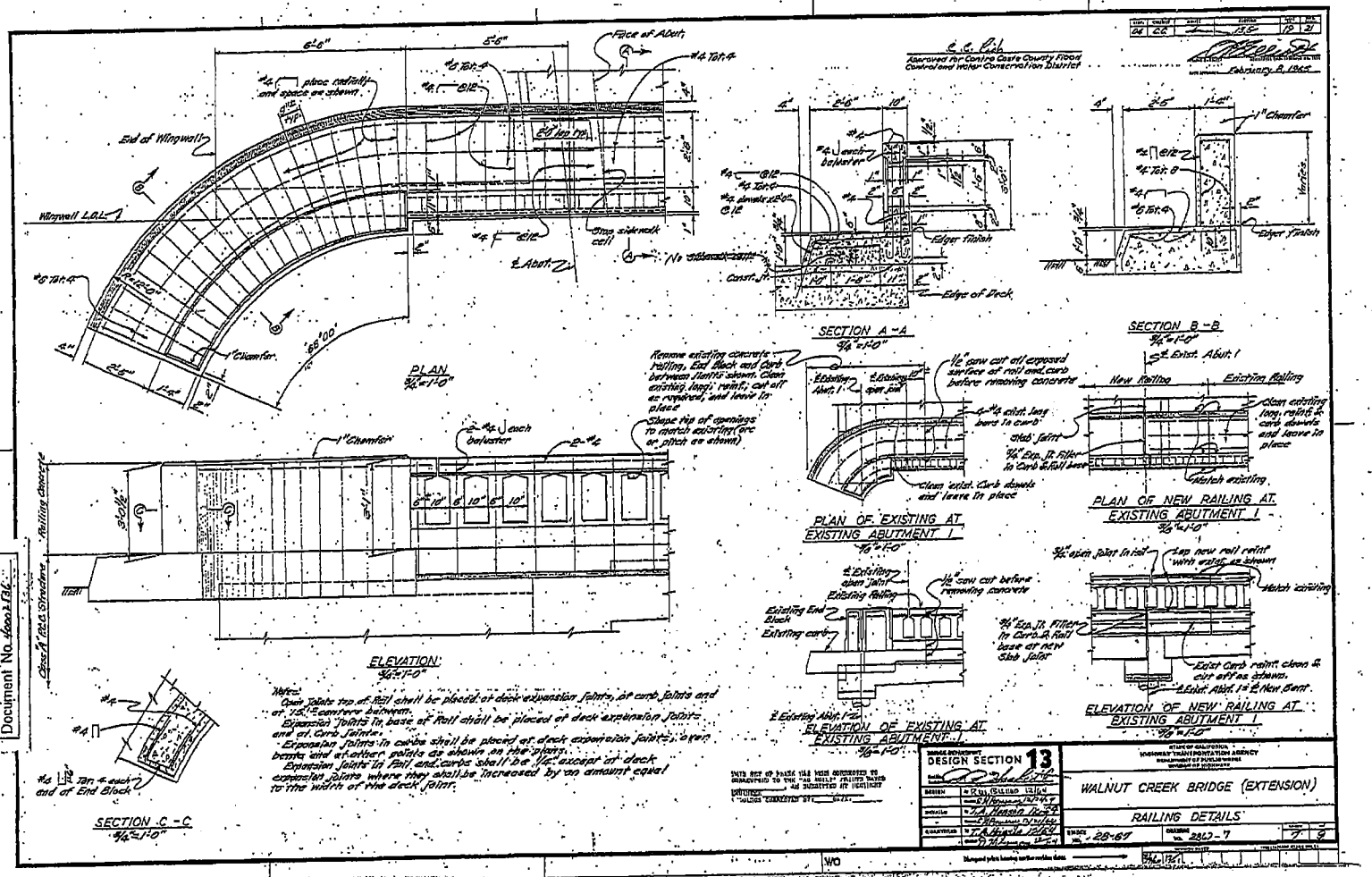
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA, PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 2-15-77 SIGNATURE [signature] TITLE SR. DMO

AS BUILT PLANS
Contract No. 14-120344
Date Completed
Document No. 4000 1136

BR3975AU

BR3975AU

AS BUILT PLANS
Contract No. 41-10-56
Date Completed
Document No. 4000136



Vertical Curb Joints top of Rail shall be placed at deck expansion joints, at curb joints and at 15'-0" centers between.
Expansion Joints in base of Rail shall be placed at deck expansion joints and at Curb Joints.
Expansion joints in curb-line shall be placed at deck expansion joints, over bents and at other points as shown on the plans.
Expansion Joints in Rail and Curbs shall be 1/2" except at deck expansion Joints where they shall be increased by an amount equal to the width of the deck joint.

DESIGN SECTION 13

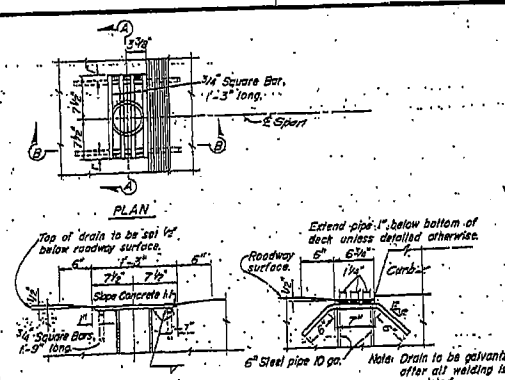
WALNUT CREEK BRIDGE (EXTENSION)

RAILING DETAILS

DISTRICT 10 | COUNTY Cal. | ROUTE 28 | POST MILE 25.67 | DRAWING NO. 2812-7 | SHEET 7 | 8

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL AT THIS DEPT IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.
DATE 7-15-72 SIGNATURE [illegible] SR. DITR.

BR3975AU

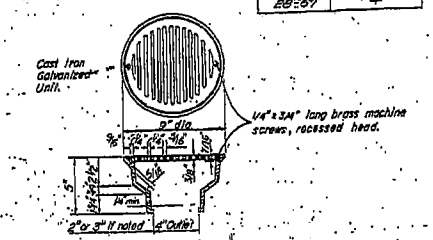


DRAIN DETAIL - TYPE "A"

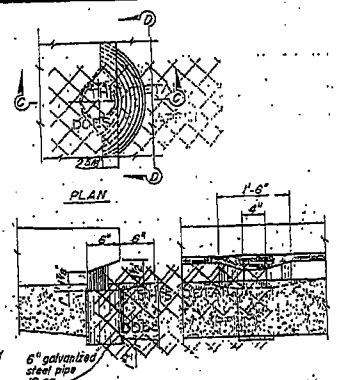
Scale: 1½" = 1'-0"

Note: For Type 'A' drain locations see 'General Plan' sheet.

Bridge Number	Type 'A' Drain No. Required
28-67	4

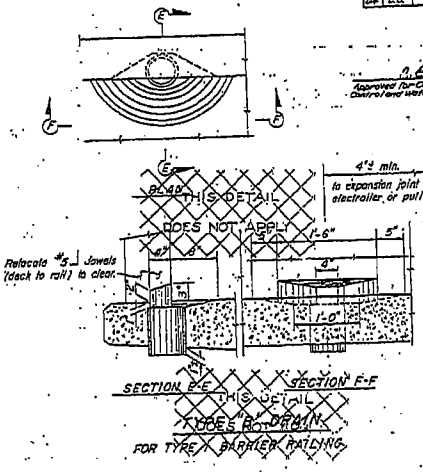


AREA DRAIN



DRAIN DETAIL - TYPE "B"

FOR TYPES 2 AND 5 BARRIER RAILINGS



FOR TYPE 'A' BARRIER RAILING

Approved for Contra Costa County Flood Control and Water Conservation District

February 6, 1963

AS BUILT PLANS
Contract No. 14-12.03-144
Date Completed
Document No. 4000-136

THIS SHT OF PLANS HAS BEEN CORRECTED TO CONFORM TO THE "AS BUILT" PLANS-DATED ... AS SUBMITTED BY RESIDENT
DISTRICT
TRACINGS CORRECTED BY: DATE:

3/64 — STATE OF CALIFORNIA HIGHWAY TRANSPORTATION AGENCY DEPARTMENT OF PUBLIC WORKS — File 28-15-60

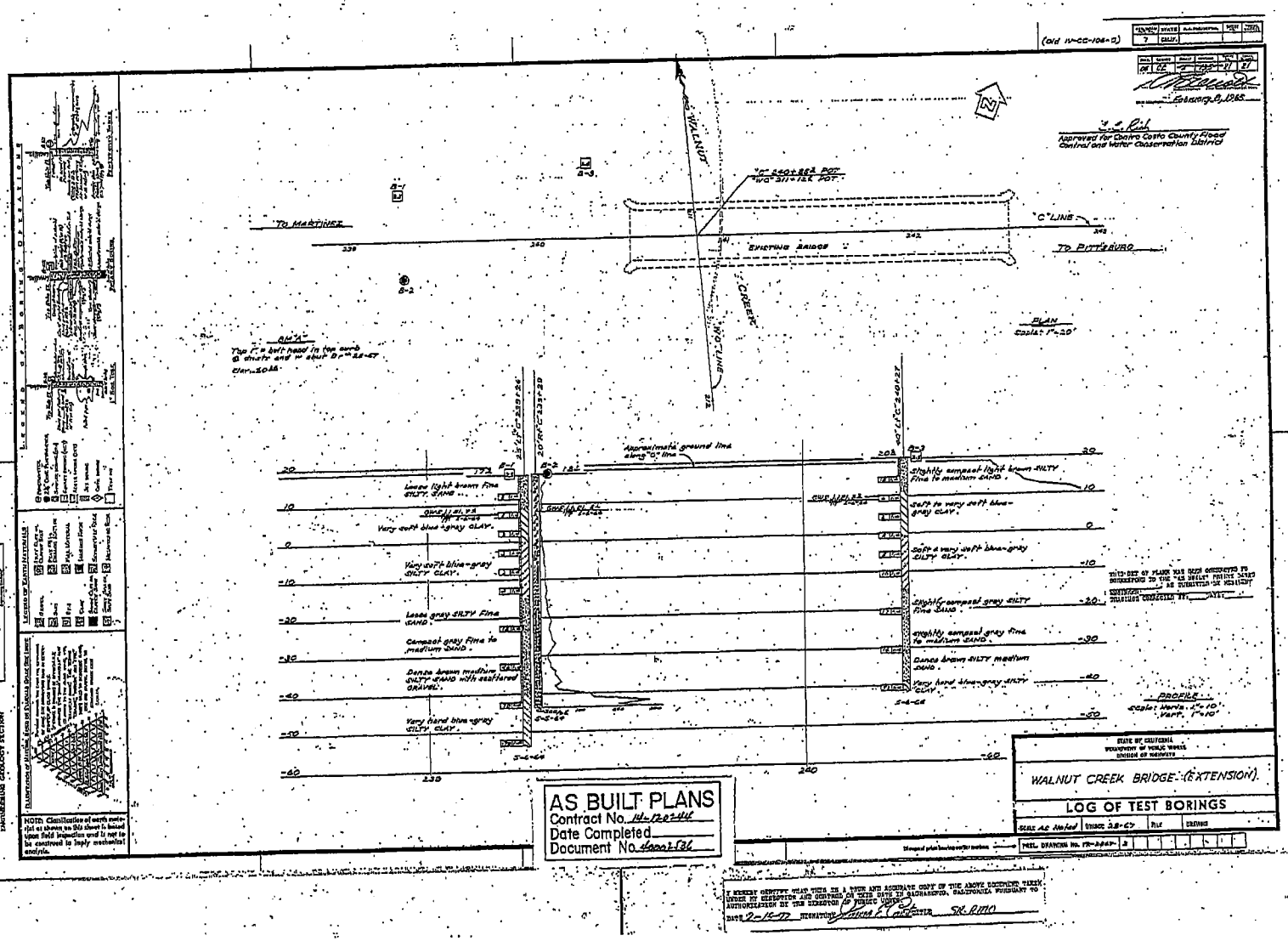
WALNUT CREEK BRIDGE (EXTENSION)

STANDARD DETAILS - DRAINS

BRIDGE NO. 28-67 — DRAWING NO. 2867-8 — SHEET 8 OF 9

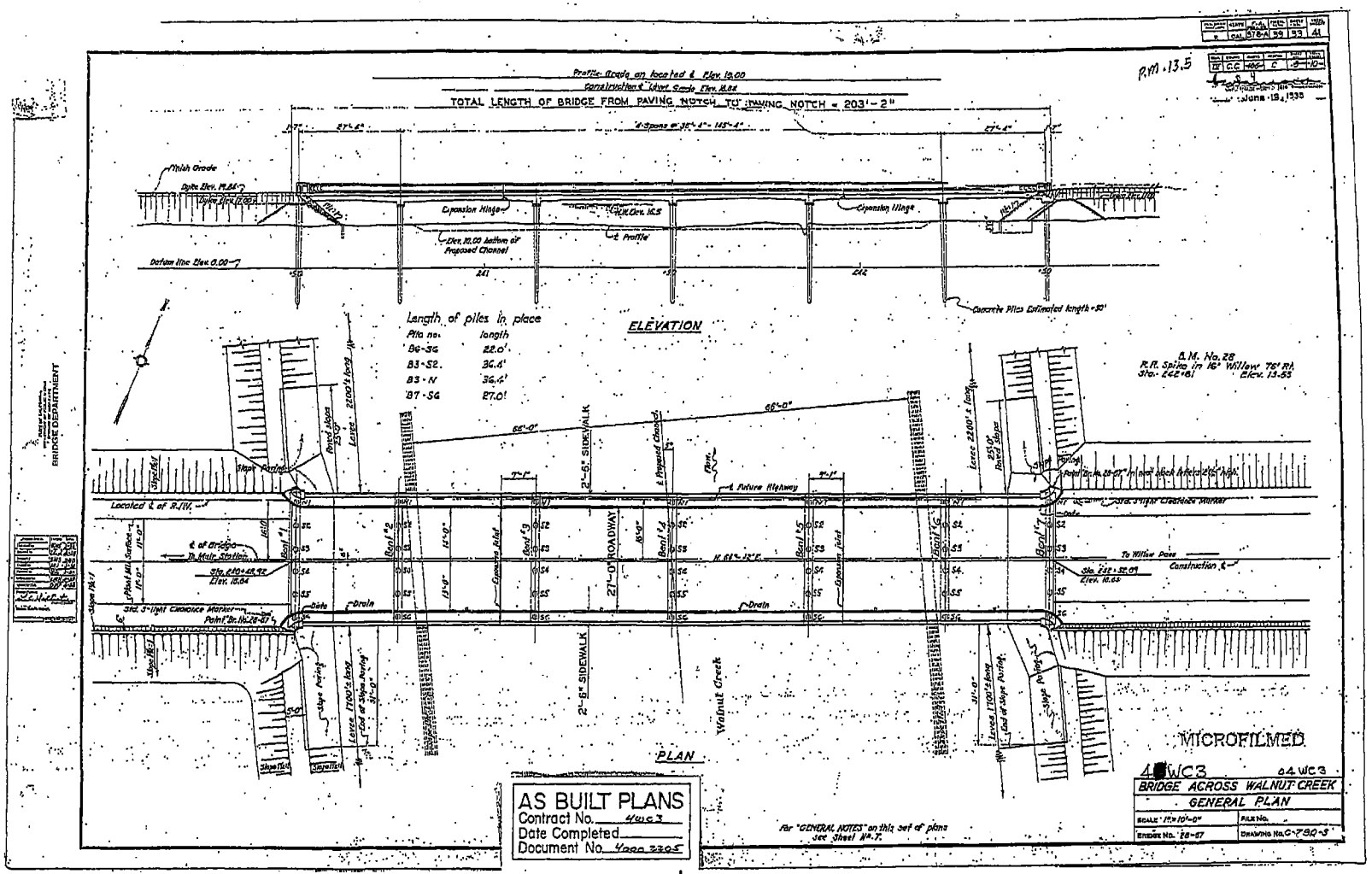
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CHECKED BY THIS OFFICE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 2-15-72 SIGNATURE ... SR. ENGR.

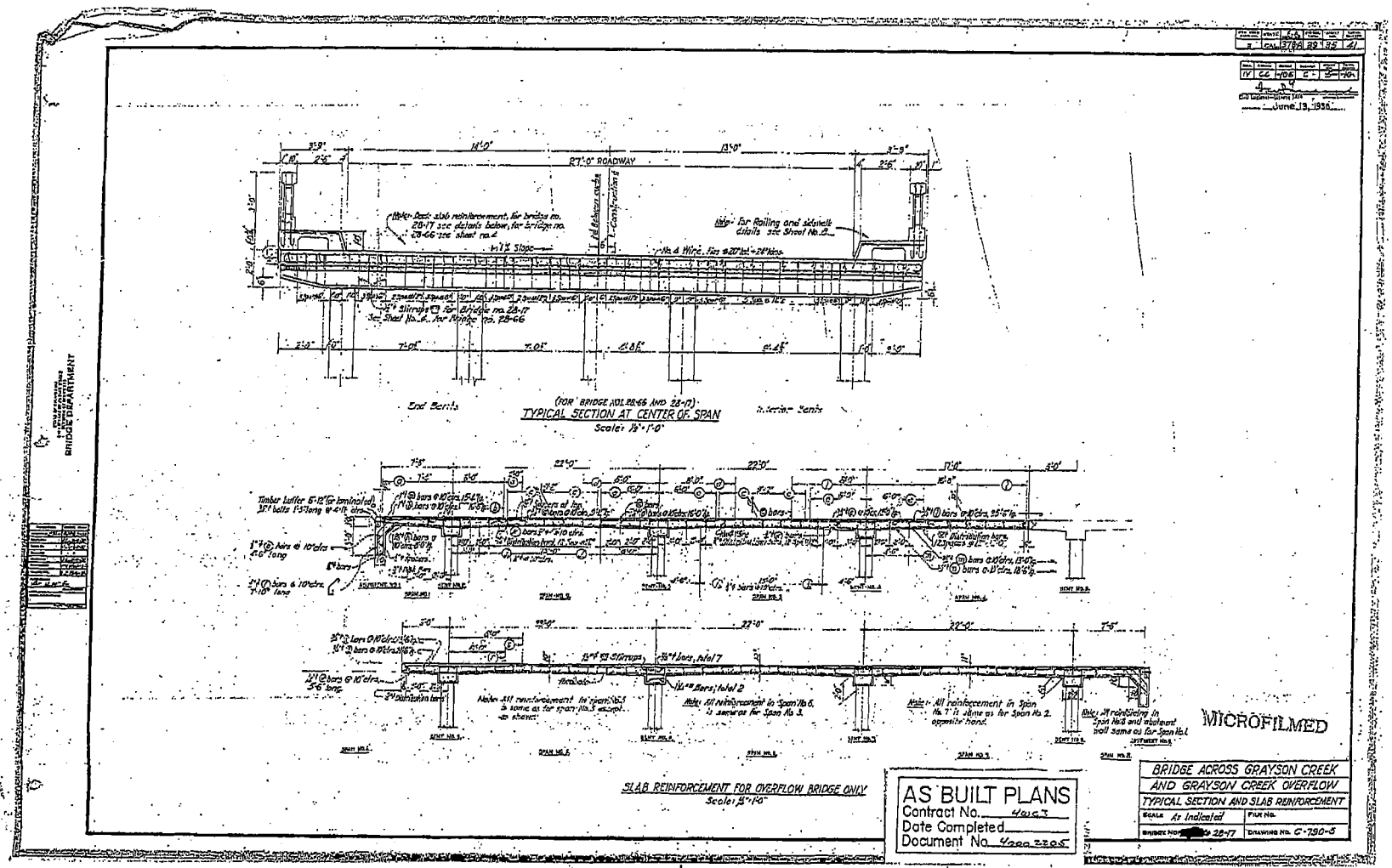


BR3975AU

extra - 1938 Plans

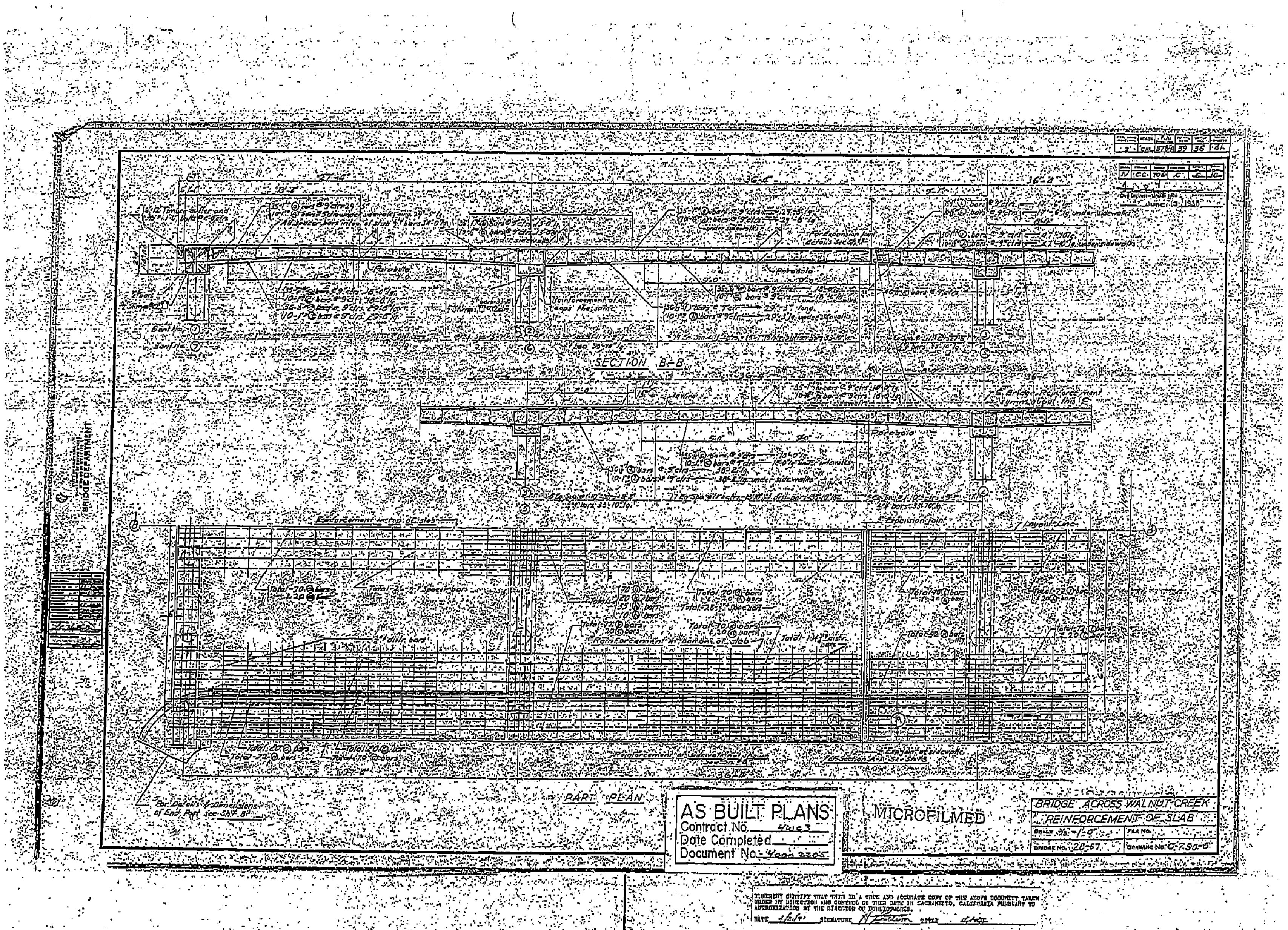


BR3975AU

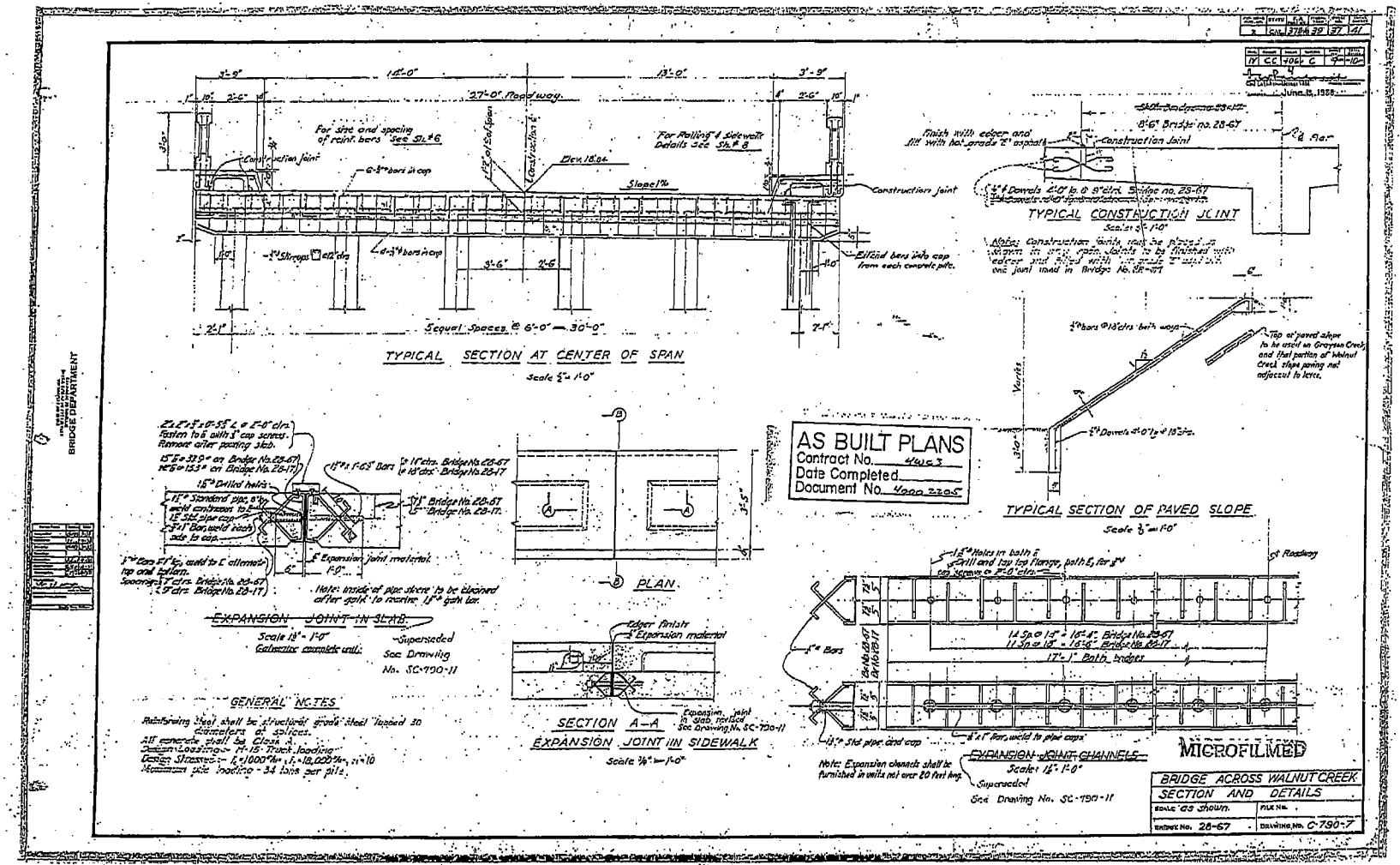


I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL OR TITLED DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 1/5/01 SIGNATURE [illegible] TITLE [illegible]



R1E____.3XJ(26026.bridge20) bridge@bridge20. Tue Mar 16 07:43:43 PST 1999



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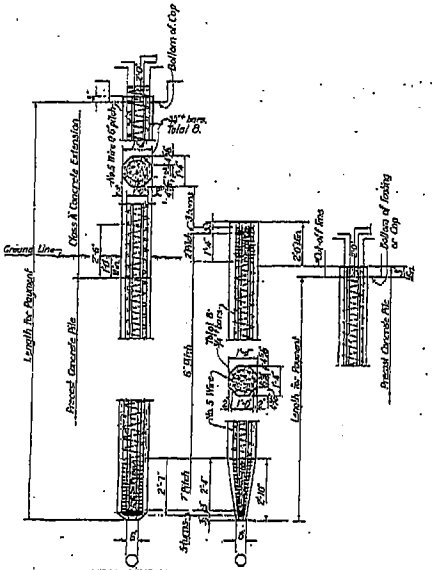
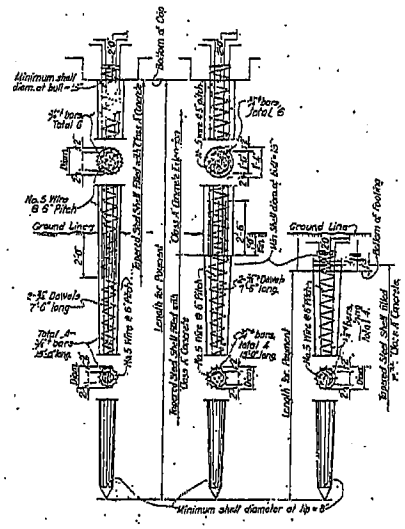
BR3975AU



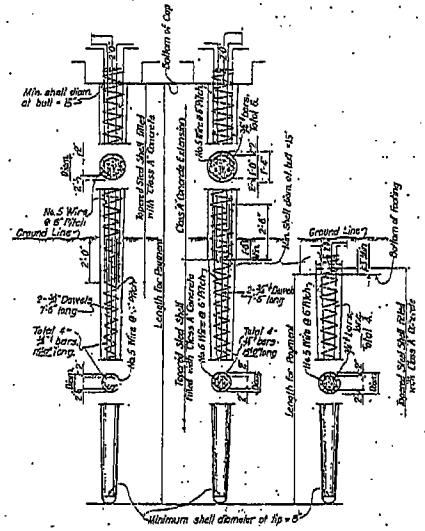
ALTERNATIVE TIP
Not used on contract

PRECAST CONCRETE PILE
ALTERNATIVE "A"



Not used on contract

CAST-IN-PLACE CONCRETE PILE
ALTERNATIVE "B"



Used on contract

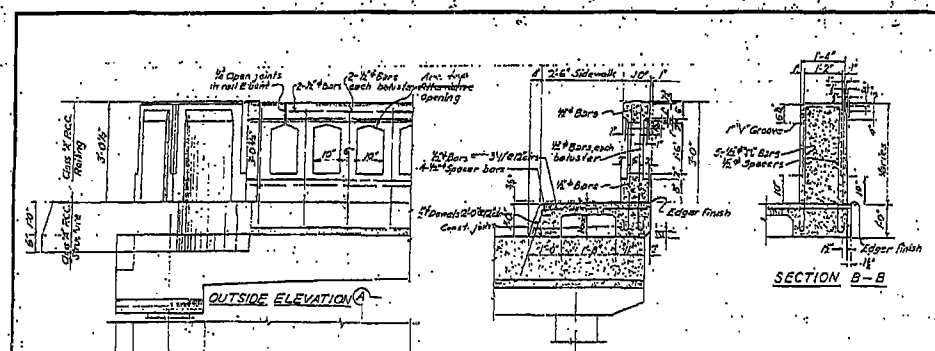
CAST-IN-PLACE CONCRETE PILE
ALTERNATIVE "C"

AS BUILT PLANS
Contract No. 4403
Date Completed
Document No. 4990 7205

GRAYSON CREEK, OVERFLOW AND WALNUT CREEK BRIDGES
PILE DETAILS

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT WHICH WAS ISSUED BY STRADLING AND CURTIS, OF THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF PUBLIC WORKS.

DATE 3-5-01 SIGNATURE [illegible] TITLE Architect



CONCRETE SIDEWALK, RAILING AND END POST DETAILS

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

For Bridge No. 28-67 & Bridge No. 28-17

Note: See sheet no. 4 for plan of railing and sidewalk on bridges no. 28-66.

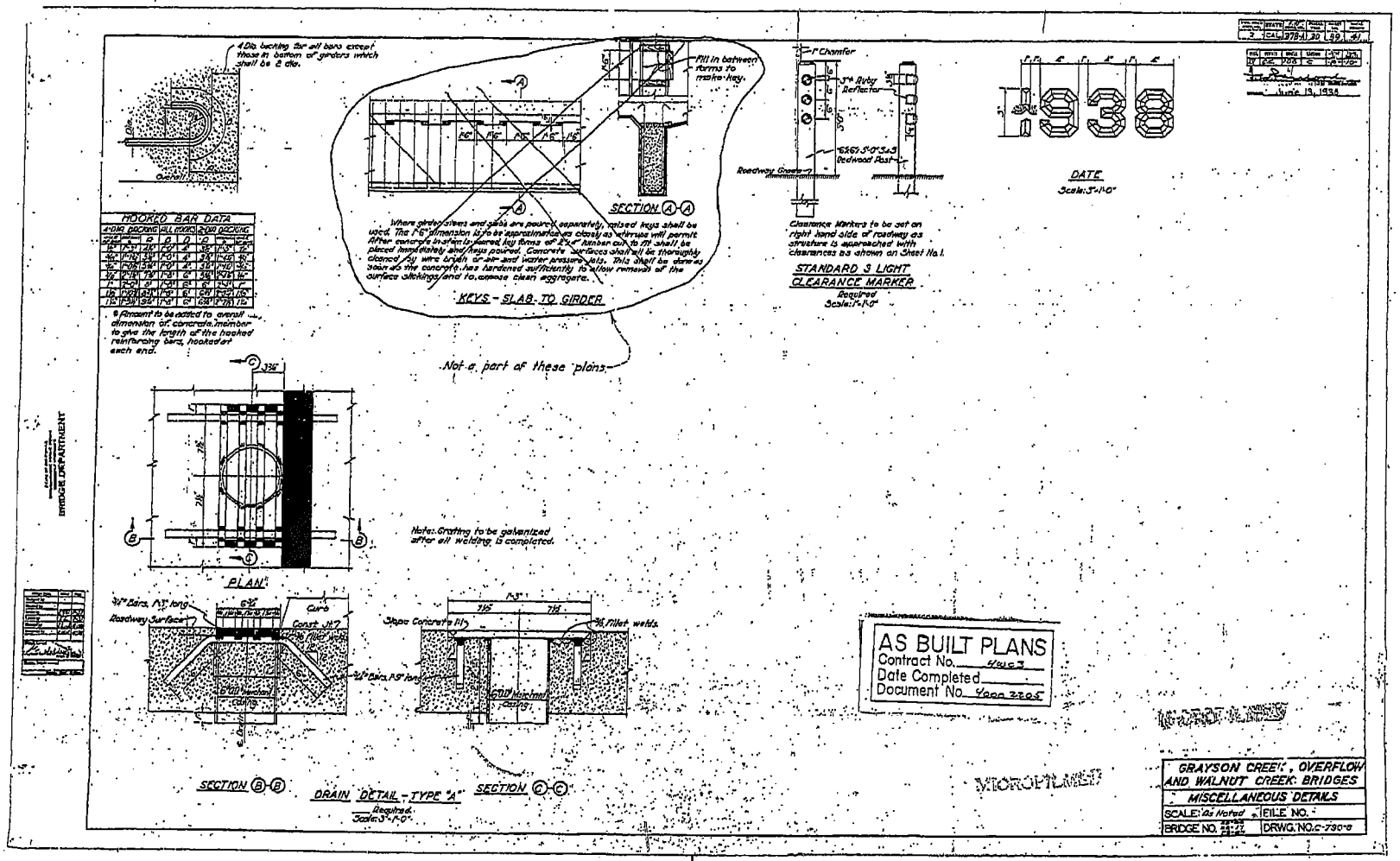
AS BUILT PLANS
Contract No. 4402
Date Completed
Document No. 4000 7205

MICROFILMED

GRAYSON CREEK OVERFLOW, AND WALNUT CREEK BRIDGES
RAILING DETAILS
Scale: 3/4"=1'-0" | File No.
Bridge No. 28-17 | Drawing No. C-790-18

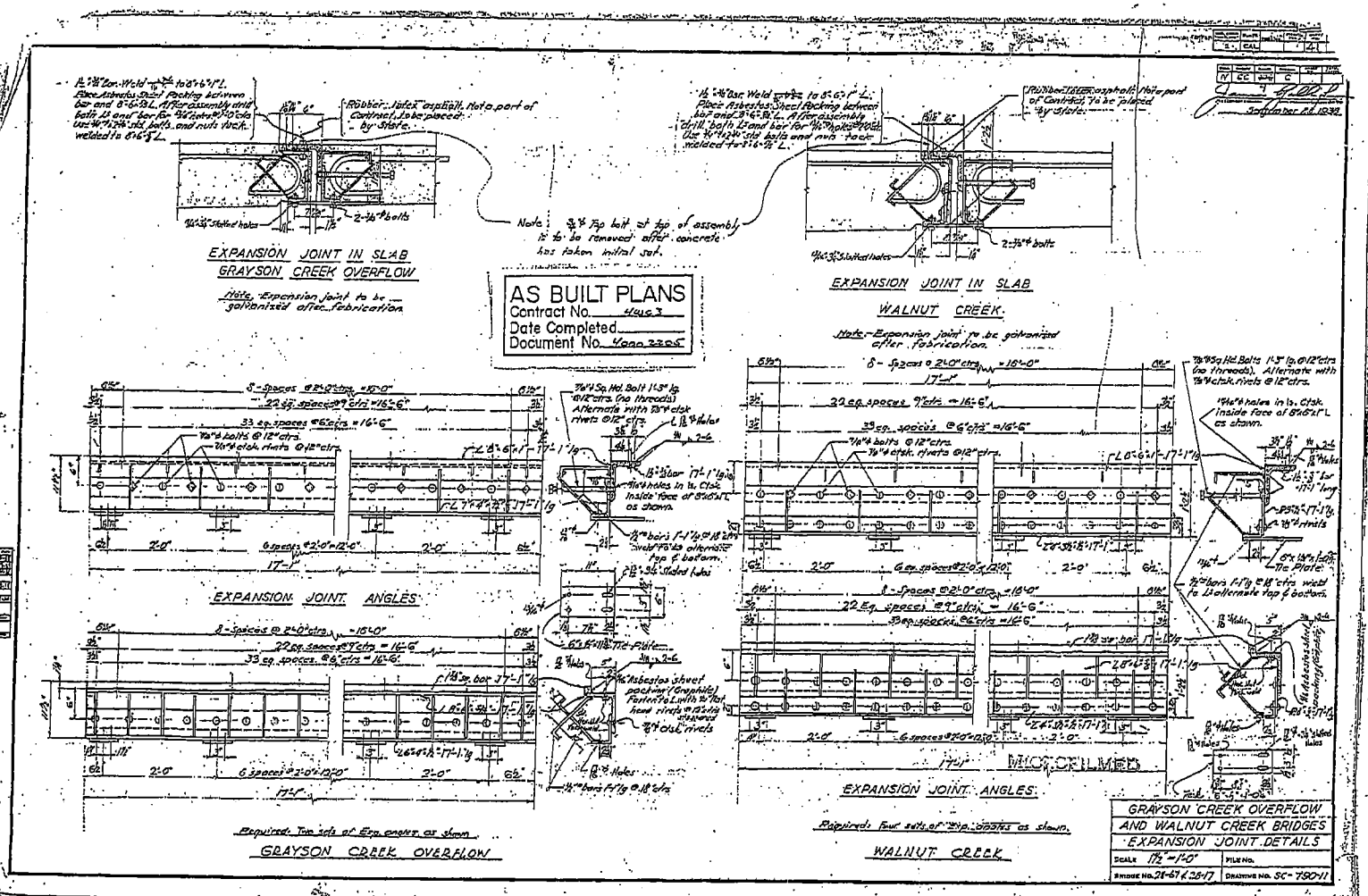
BR3975AU

BR3975AU



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 OF THE DIRECTOR OF PUBLIC WORKS.

DATE 5/6/41 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 12/1/91 SIGNATURE [signature] TITLE [illegible]

i. Comment and Responses on Administrative Draft Feasibility Report

QUINCY ENGINEERING

Project No.: C05-900-03 Project Name: Marsh Drive Bridge over Walnut Creek

Project Manager: JF Project Engineer: RF

RESPONSE TO COMMENTS WORKSHEET

Type of Review: Feasibility Study Report

Reviewer: Contra Costa County (Adelina Huerta) Date: 09/09/2014

REFERENCE PAGE/SHEET No.	COMMENT	TYPE	RESOLUTION/INITIAL
Title	Revise title of report to "Marsh Drive Bridge over Walnut Creek Feasibility Study Report" to match title shown in footer of report.	M	Revised per Comment
Page 4, Executive Summary	1. First paragraph, Replace 'Marsh Road' with 'Marsh Drive' in second to last sentence. 2. Third paragraph, third bullet point; include "concrete" before column jackets; Revise 2007 to 2009. In 2009, concrete column jackets were placed on the ten columns at Bent Numbers 3A and 4A, which were experiencing deterioration due to localized failure of the concrete cover and expansive rebar corrosion.	M	Revised per Comment
Page 5	First paragraph; Clarify first sentence to state that the review occurred in 2010; revise reference to Contra Costa County Flood Protection District to Contra Costa County Flood Control District and clarify that the Flood Control District determined that the impacts were significant. This bridge falls under the jurisdiction of the Army Corps of Engineers, which would not approve any improvements in the creek which resulted in impacts to the Water surface elevation without mitigations to upstream channel.	M	Revised per comments, added a sentence about ACOE mitigation requirements for improvements within the Creek. Also added levee mitigation costs to alternative 4 retrofit since the existing bridge soffit would create a backwater effect.
Page 5	Second paragraph; clarify what the '18 years' is referencing. On page 6, 13 years is referenced and it's unclear what this timeline is for. Revise caption for Figure 2 to reference Marsh Drive not Marsh Drive Road Include statement in Executive Summary regarding this bridge's potential candidacy for HBP funding. Include discussion on structural deficiency and other pertinent information that would make this bridge ideal candidate for HBP bridge replacement programming.	M	Revised "18 years" to "Recent years". Revised to be more general. "13 years" refers to when the seismic deficiencies were identified. Revised "13 years" to "10-15 years" to generalize the intent of the sentence. Added a paragraph at end of Executive Summary stating that the retrofit costs higher than replacement when considering life cycle costs.
Page 7, Existing Information	First paragraph indicates that As-Built plans for bridge are included. There were no As-Built plans included in the submitted report.		Appended to the Maintenance Reports and added to Table of Contents
Page 8	Revise 2007 to 2009 in the first paragraph. Second paragraph, It's not clear what figure is being referenced. Figure 5 does not show any information related to the current seismic retrofit project.	M	Added a figure from the seismic retrofit plans.
Page 9, Feasibility Report Development Process	Revise review process discussion to state that staff from Traffic Engineering and the Flood Control District was involved in preliminary review of report.	M	Revised per Comment
Page 10	The second and fourth bullet refers to hydraulic clearance at elevation 24. The correct hydraulic clearance should be 24.5.	M	Added notes to clarify the various minimum soffit elevations for the different alternatives
Page 11, Replacement Alternatives	First paragraph; revise third sentence to read "The bridge types considered were a CIP/PS Concrete Box girder bridge and a CIP/PS Concrete Slab Bridge."	M	Revised per Comment. Also, revised sentence to clear up about how bridge length is will be set (includes holding the existing length). We will revise the

			proposed bridge lengths.
Page 12	Revise last sentence in first paragraph to read "The approach fill height increased one to two feet and conform point was extended one to two hundred feet as the design speed increased." The minimum soffit elevation shown in Figure 9 should be 24.5 feet to be consistent with the elevation shown in Figure 10.	M	Revised per Comment Soffit elevation varies between alternatives. Clarifications have been made to distinguish each soffit elevation.
Page 13	Figure 11 indicates that the new bridge will be built at existing bridge abutments and the bridge length is shown to be 318 feet. However, the existing bridge length is 325 feet. Please clarify if the new bridge design and approaches are based on a reduced length. If so, we may need to consider increasing to match existing bridge length to provide adequate hydraulic capacity.		Final bridge length will be set during preliminary engineering phase based on additional/refined design constraints, however, length will be changed in these drawings to reflect at least the existing bridge opening.
Page 16, Retrofit and Rehabilitation Alternatives	While Figure 14 is a typical section from the City's current retrofit plans set, the City has conveyed that they can provide 30-inch CISS piles to attempt to match the existing piles and reduce their hydraulic impact. Include a statement that reflects this information. Revise second sentence in the second paragraph, "It also creates an unacceptable backwater effect and increases the risk of flooding upstream. Any work within the channel will need to be approved by Army Corps of Engineers. The Flood Control District's experience with the Army Corps of Engineers is that any increase in water surface elevation is unacceptable and will need to be mitigated. This mitigation could include costly measures such as levee raising and additional channel work."	M	Added an asterisk to note the 30" piles. Added discussion on mitigations as commented.
Page 17, Cost	Revise first sentence to clarify that the estimated costs were developed for the alternatives based on the noted items that follow.	M	Revised as Commented
Page 18	Confirm sum for Alternative 2, it should read $4,984,180 based on the numbers provided.	M	Revised as Commented
Page 21, Recommendations	This section should be expanded to discuss eligibility of this structure for HBP funding. With a SR rating of 61.2, is it eligible?	M	The structure is eligible for rehab but with sufficiency rating over 50, we need to justify replacement. Based on the cost and alternatives analysis, we have that justification. Discussion on "rehabilitation by replacement" has been added.
Page 21, Replacement Project Cost and Schedule	Verify correct construction cost. These numbers do not match those numbers shown in another portion of the report.	S	All Cost estimates have been revised for updated replacement bridge length (325' instead of 318') and all cost references have been verified.
Page 24, Project Personnel	Replace Neil Leary with Adelina Huerta as Project Manager-planning phase. Contact information is ahuer@pw.cccounty.us (925) 313-2305. Include Neil Leary as County project Manager-Design/Construction phase Revise Paul Detjens' Position to Senior Civil Engineer. His telephone number is (925) 313-2394. Include Brian Louis and Craig Standafer as Civil Engineers for County Flood Control District. Brian's contact information is bloui@pw.cccounty.us, (925) 313-2245. Craig's contact information is cstan@pw.cccounty.us, (925) 313-2018.	M	Added contacts

Page 25, Appendix	Include reference for As Built plans.	M	Added to the back of the BIRIS report Appendix
Marsh Drive Bridge over Walnut Creek Plans by Quincy Engineering Sheet 2 of 9,	Minimum soffit elevation should be 24.5. Revise plans to reflect correct minimum soffit elevation.	N	Soffit Elevation 24.5 is correct. Elevation varies for each alternative based on number of supports in the channel.
Sheet 3 of 9	The typical section appears to show a super elevated bridge deck. Revise slope arrow accordingly. This is consistent for all typical section on Sheets 3, 6 and 9.	M	Changed per comment
Sheet 4 of 9	Design Criteria states a 5-span concrete slab bridge, it should read 6-span per the profile on sheet 5.	M	Revised.
Cost estimates	Cost Summary; verify total for alternative 1 and 2. The number listed doesn't match other references to this total. Division II, Structural Items; footing types listed for alternatives 1, 2 and 3 indicate driven steel piles will be used. However, the plan sheets indicate that this will cast in drilled holes piers.		All cost estimates have been updated and verified. Cost estimates now reflect CIDH piling.
Life Cycle Cost Analysis report Page 1	Need and Purpose; replace 'Walnut Creek Bridge' with 'Marsh Drive Bridge over Walnut Creek Channel.'	M	Revised per Comment
Page 1,	Existing Bridge; Revise section to reflect latest bridge inspection report dated January 28, 2013.	M	Revised per Comment
Page 1,	History and Condition; Clarify seventh bullet point regarding load. Revise to state current bridge loading capacity less than current legal or permitted loads.	M	Legal loads are allowed and there is therefore no posting. Revised bullet point 7 be more clear
Page 1,	Geometry and Function; revise clear roadway width for bridge to 27 feet, bridge width to 34.5 feet, and 6 spans to 10 spans. The bridge was originally a 6 span but was widened to 10 spans. Revise ADT to 6000 to be consistent with Feasibility Study Report.	M	Bridge Roadway width revised to 27' and overall to 34.5'. Revised total number of spans to 10. Revised ADT o match Feasibility Report.
Page 2,	Replacement/Rehabilitation Alternatives; this section appears redundant as the alternatives we discussed in great detail in the Feasibility Study Report. As this is a life cycle report it does not appear that any discussion on preference or design constraint should be included.	M	This section is necessary to properly describe the reasons for the difference in costs for each alternative. Any subjective discussions which do not relate to cost, have been removed to eliminate some of the redundancy that was mentioned in the comments.
Page 8	Life Cycle Analysis Timeline; given the 120 year window of analysis, it appears that the analysis of retrofit alternatives 4 and 5 do not include a second bridge replacement. Without the costs of the second bridge replacement, the lifecycle costs identified in Figure 15, Alternative Comparison Table in the Feasibility Study Report imply that Alternative 5 is the least expensive option over the life cycle. Clarify in the narrative in both the Feasibility Study Report and Life Cycle Cost Analysis report that all costs do not include the same replacement actions.	S	Instead of clarifying the 120 year cycle, we have revised the cycle to 100 years. This way each alternative only has a single bridge replacement for the 100 year cycle.

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PHASE: 1 - PREDESIGN 2 - DESIGN 3 - BID TO AWARD 4 - CONSTRUCTION

QUINCY ENGINEERING

Project No.: C05-900-03 Project Name: Marsh Drive Bridge over Walnut Creek

Project Manager: JF Project Engineer: RF

RESPONSE TO COMMENTS WORKSHEET

Type of Review: Feasibility Study Report, Review #2

Reviewer: Contra Costa County (Adelina Huerta) Date: 10/20/2014

REFERENCE PAGE/SHEET No.	COMMENT	TYPE	RESOLUTION/INITIAL
Page 6, Last Paragraph	Remove "Road" after Marsh Drive in last sentence.	M	Revised per comment
Page 9, Figure 7	Adjust scale to include the text from the leaders pointing to existing and new bents, etc.	M	Revised per comment
Page 10, "Review"	Remove "Emergency" from name of Flood Control District	M	Revised per comment
Page 11, Fourth Bullet	Revise second bullet to state "including raising the bridge…"versus "include raising the bridge..."	M	Revised per comment
Page 14, first paragraph	Remove "Emergency" from name of Flood Control District	M	Revised per comment
Page 17, last paragraph & Life Cycle Cost Analysis	Revised Levee Mitigation costs to $3,000,000 per Flood Control District rough estimate.	M	Revised last paragraph or page 17 to reflect the assumptions that went into the flood control districts cost estimate for levee work. Revised LCCA per comment.

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PHASE: 1 - PREDESIGN 2 - DESIGN 3 - BID TO AWARD 4 - CONSTRUCTION

QUINCY ENGINEERING

Project No.: C05-900-03 Project Name: Marsh Drive Bridge over Walnut Creek

Project Manager: JF Project Engineer: RF

RESPONSE TO COMMENTS WORKSHEET

Type of Review: Feasibility Study Report, Review #3

Reviewer: Contra Costa County (Adelina Huerta) Date: 10/20/2014

REFERENCE PAGE/SHEET No.	COMMENT	TYPE	RESOLUTION/INITIAL
General 1	Provide Dates for pictures included in the report.	M	Added
General 2	Clarify that the backwater effect is an existing condition and include language to state that the seismic retrofit project adds to the existing condition by 0.11 feet.	M	Revised as requested
General 3	The discussion of alternatives should be revised to eliminate any language on preference and any discussion on preference should be included in the Alternative Comparison Discussion.	M	The two paragraphs following the summary table in the executive summary have been removed. These paragraphs were preference oriented and redundant considering arguments made in the recommendations section.
Page 4 4	Item #5 states that the bridge is considered functionally obsolete. Provide reference and briefly discuss on what basis the bridge is considered functionally obsolete.	M	Revised item #5 to reference a clarifying statement. The bridge is not classified as functionally obsolete with its ADT = 2000. However, using ADT at 5688 per recent traffic count, then FO is triggered.
Page 4 5	The first sentence in the last paragraph indicates the structure was identified as seismically deficient about 13 years ago. Provide reference for this classification.	M	The project was approved in June 1998 by City of Concord Council. Removed reference to '13 years' and replaced with this date.
Page 4 6	Replace 32 inch with 36 inch to correctly identify the proposed cast in place pile diameters.	M	Revised as requested.
Page 5 7	Revise first sentence of the first paragraph as follows: "Hydraulic Capacity Concerns - Flow through the Walnut Creek Channel is constricted by the existing bridge structure resulting in a backwater effect. The proposed retrofit project will add additional piles in the channel which will increase the 100-year storm event water surface elevation by 0.11 feet. The Walnut Creek Channel falls under the jurisdiction of the Army Corps of Engineers (ACOE)…"	M	Revised as requested.
Page 6 8	Please remove the Flood Plain Liability from the Cons column for Alternative 4 as the assumption is that the levees will be raised which will address the floodplain issues	M	Revised as requested.
Page 7 9	Insert Step 3, Review Retrofit and Replacement alternatives	M	Revised as requested
Page 8 10	Replace "Maintenance Report" with Inspection Report to reference the Caltrans Bridge Inspection reports.	M	Revised as requested
Page 8 11	Revise last sentence in paragraph to read "The concrete bridge deck cracking will need to be addressed. The 2007 inspection report recommended the bridge deck be treated with Methacrylate to address the cracking issues."	M	Revised as requested.
Page 9 12	Revise the text in the first paragraph to read "…existing structure currently obstructs the design flood flow by 2 feet creating a backwater effect. The proposed retrofit would increase the upstream water surface elevation by 0.11 feet."	M	Revised as requested.
Page 9 13	Provide reference for Functionally Obsolete classification and provide additional clarity on why Bridge is considered functionally	M	Revised to explain why functionally obsolete might be applicable due to increase in ADT.

	obsolete.		
Page 10 14	Revise forth bullet under roadway to read "…for this classification and will include striped bike lanes and sidewalks."	M	Revised as requested.
Page 10 15	Revise second to last sentence in last bullet to read "…elevation 24.5 (for the six span replacement alternative) based on preliminary modeling for the 100-year flood event…"	M	Revised as requested
Page 11 15	Replace "Departments" with "Divisions" in Review heading.		Revised as requested
Page 14 16	Revise typical section to reflect 12-foot travel lanes and a 5-foot striped bike lane within the proposed 8-foot shoulder.		Revised all typical sections in each alternative to reflect this change.
Page 14 17	Delete final sentence in the last paragraph.	M	Revised as requested.
Page 16 18	Revise the paragraph to include statement that pedestrian access will be maintained during the staged construction of Alternative 3.	M	Revised as requested. Note that in stage 1, pedestrian access will be maintained on a temporary bridge.
Page 17 19	Revise last paragraph to read "This alternative would add to the existing backwater effect and increase the risk of flooding. …to be approved by the ACOE. Although the increase in water surface elevation is 0.11', the Flood Control Districts experience with…"	M	Revised as requested
Page 17 20	Revise Construction only cost for levee mitigation to $2,000,000 to bring total to $3,000,000.	M	Revised as requested
Page 18 21	Revise last sentence of the first paragraph to read "This alternative does not address the structural and functional deficiencies.	M	Revised as requested.
Page 18 22	Specify that Environmental Mitigation is included in the cost estimate. Include the statement.	M	Revised as requested.
Page 18 23	Revise right of way unit cost to $35.00 per square foot and include an additional 20% to account for real property labor costs.	M	Revised as requested
Page 19 24	Clarify that cost estimates are for construction items and right of way costs only.	M	Revised as requested
Page 19 25	Revise "Approach Roadway" term. Based on the 6-page estimate format used this costs represents not just cost for the approach roadway construction but also costs for work within the channel, water pollution and environmental mitigation. Revise term to "Non-structure construction items", or similar.	M	Revised as requested
Page 19 26	Revise right of way costs to reflect new unit cost and real property labor cost cited on page 17 revisions.	M	Revised as requested
Page 19 27	Revise levee mitigation costs to $2,000,000 for Alternative 4.	M	Revised as requested
Page 21 28	Include additional discussion on the criteria used to compare and evaluate the alternatives developed and presented in the report. The criteria and discussion should include schedule comparison, right of way impacts and costs at a minimum and provide additional clarity on why one alternative was chosen over other alternatives. The hydraulic impacts from the retrofit project should be included as a criteria provided the impacts is quantitatively stated. For example the last sentence in the paragraph should be revised to state that the while the retrofit increases the water surface elevation by 0.11 feet and does not address the existing impacts to the flood plain.		Added a bulleted listing of the factors used to determine the recommended alternative.

Page 21 29	Remove Floodplain liability from the cons column for alternative 4		Revised as requested
Page 22 30	Item 1 referenced bridge replacement and bridge rehabilitation. Per HBP program the bridge is either eligible for replacement or rehabilitation, not rehabilitation by replacement. Revise paragraph accordingly.		There is a provision in the program guidelines which allows for replacement when rehabilitation is warranted. See LAPG chapter 6.2.1 item 5. The paragraph has been revised to more clearly identify this provision.
Page 22 31	Prior to heading 'Replacement project costs and Schedule' include additional heading for benefits of Alternative 4. Such benefit will include providing continued access to Airport, construction of bike lanes, space for disabled vehicles and improved pedestrian facilities and safety features (railing).		Should this be for Alternative 3? Added a bulleted list of benefits to Alternative 3.
Page 22 32	Revise timeline to reflect reasonable start in January 2015.	M	Agreed.
Page 24 33	Revise second sentence to read "…temporary pedestrian facility as an additional cost. Alternative 3 may accommodate pedestrian access over the creek during both stages at no additional cost.		During stage 1, pedestrians would continue to use the narrow sidewalk which forms part of the rail.
Appendix 34	Revise cost estimates to reflect changes requested above.		Revised as needed.

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PHASE: 1 - PREDESIGN 2 - DESIGN 3 - BID TO AWARD 4 - CONSTRUCTION

Memorandum

DATE: May 11, 2015

TO: Council Committee on Infrastructure and Franchise

FROM: Ray Kuzbari, Transportation Manager

VIA: Victoria Walker, Director of Community and Economic Development

RE: **Proposal to Install New Bus Shelters in the City of Concord**

County Connection has recently approached CED Transportation staff with a proposal to install new bus shelters in the City using federal funds obtained from the Federal Transit Administration by County Connection under the Transit Productivity Improvement (TPI) program.

The City has a bus shelter agreement with Outfront Media (previously CBS Outdoor) to install and maintain bus shelters for the use of the general public at designated County Connection bus stops within the City. The bus shelters are installed and maintained at no cost to the City and contain advertising material of which the City approves.

Using the TPI program, County Connection has offered to pay Outfront Media approximately $8,000 for any new shelter installed within the City of Concord as an incentive for Outfront Media to invest in new bus shelters in the area. Upon reviewing existing shelters in Concord with County Connection staff, it is recommended that new shelters be installed at the locations listed in Table 1 to replace old County Connection shelters or benches, or to establish a new shelter where no seating amenities currently exist. The new bus shelters will be solar powered for nighttime lighting.

Additionally, the manufacturer of the bus shelters for Outfront Media (TOLAR Manufacturing) offers four basic designs to choose from and a variety of colors available. The design choices are attached for review by the Committee. It should be noted that, in the past, the City specified Todos Santos Blue Dupont L9656 for painting street lights, traffic signal poles and controller cabinets in downtown Concord.

The bus shelters are custom built and provide choices on basic style, bench design, roof material (metal vs acrylic), trash receptacles, perforated back metal vs glass walls, and color. Staff recommends that the new shelters in Concord be customized with the following specifications:

- The **"Signature"** style shelter with aluminum grey color as shown in the attachment for minimum visual intrusion *(design variations maybe available with this style and will be shared with the Committee)*;
- Single bench with dividers and back support;
- Metal roof painted with Todos Santos Blue Dupont L9656 paint;
- A trash receptacle beside the shelter as shown in the attachment; and
- Perforated back metal walls.

In total, there are nine existing bus shelters that contain adverting space within the City of Concord. These shelters have been installed by CBS Outdoor or its predecessors at various times since 1997 and are not due for replacement. The following table lists seven other locations where staff is recommending that a new or replacement shelter be installed. Of these seven locations, four have older bus shelters (County Connection style shelters) without advertising space, two locations have only a bench, and one location has neither a bench nor a bus shelter.

TABLE 1
Proposed New Bus Shelters in the City of Concord

Bus Stop Location		Direction	Replacing Existing	
			Shelter w/out Advertising and Bench	Bench Only
1	CLAYTON RD / FRY WAY	West Bound		Yes
2	CLAYTON RD / WASHINGTON BLVD	East Bound	Yes	
3	CLAYTON RD / WEST ST	West Bound	Yes	
4	CONTRA COSTA BLVD / VIKING DR	North Bound	Yes	
5	DETROIT AVE / SUNSHINE DR / LYNN AVE	South Bound		Yes
6	DETROIT AVE / WALTERS WAY	North Bound	No	No
7	MONUMENT BLVD / REGANTI DR	East Bound	Yes	

Staff recommends that the Committee review the proposal to install new bus shelters in Concord as outlined in this memorandum and provide comments and/or direction to staff.

Attachment: Bus Shelter Design Brochures

THE PERFECT FIT. YOUR COMMUNITY. OUR SHELTERS.

THE SIERRA.

THE LEADER. THE ORIGINAL.

The Sierra Shelter line is one of Tolar's initial, and still most popular, shelter designs that was originally engineered for a project in San Diego in 1991. As styles and community expectations have evolved over the years, we have added even more choices to the line.

Sierra Shelters still represent our flagship line: Striking style. Functional design. Exceptional value. Consider these key features:

- Lengths that range from 9 to 24 feet; widths up to 5 foot 8 inches
- Choose from walls of tempered glass or tough, transparent Lexan
- Perforated metal options include Victorian and Herringbone styles
- Mansard roof options available
- Available with or without advertising kiosks

Crafted by the category leader, the Sierra Shelter line's roof design also features two horizontal circular shapes, one that serves as a rain gutter, and the other that houses wiring for optional security lighting.

TOLAR'S SIERRA SHELTERS: FUNCTIONAL DESIGNS, CLASSIC APPEARANCE, RENOWNED RELIABILITY.

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SIERRA SHELTERS

TECHNICAL SPECIFICATIONS AND DESIGN OPTIONS

Sierra Shelters are offered in an array of design and style options, depending on your project aesthetics, shelter requirements and style preferences.

SIZING OPTIONS

- Lengths range from 9', 13', 17', 20' and 24'
- Widths range from 4 feet 6 inches to 5 feet 8 inches

ROOF STYLE OPTIONS

- Dome style
- Low peak
- High peak
- Hip roof
- Mansard

ROOF PANEL OPTIONS

- Bronze
- White
- Lexan (high-strength transparent thermoplastic)
- Powder-coated aluminum

END WALL OPTIONS

- 3/8" clear tempered safety glass
- Framed acrylic or polycarbonate
- Wire grid
- Perforated metal, including standard, Victorian and Herringbone
- Glass options, including bronze, yellow dot, Victorian and custom logos
- End walls available in a variety of widths

AD KIOSK CHOICES (FOR ALL SHELTERS)

- Two-door back-to-back style
- V-angled kiosks in sizes 24", 48" and 52"
- Top- or side-hinged doors

ILLUMINATION OPTIONS

- Conventional 110-volt lighting
- Solar-powered lighting
- Low-draw LED lighting

COLOR OPTIONS

- Variety of durable, baked powder-coat finish colors
- Standard RAL options or custom-matched color
- Durable wet paint options to match project aesthetics

COMPLEMENTARY STREET FURNITURE

We have a wide variety of bench, trash receptacle, kiosks, bike racks and map case options to complete your street furniture design.

FOR ADDITIONAL OPTIONS AND MORE INFORMATION, VISIT WWW.TOLARMFG.COM.

13' Mansard roof shelter with Lexan roof panels, Semi-V advertising kiosk, no walls, 6' wire grid contour bench with back, street plaque

13' High peak roof shelter with aluminum roof panels and raised battens, perforated metal rear wall with acrylic inserts. 3/8" clear tempered safety glass in the end walls, 6' perforated metal bench with back, 30 gallon perforated metal trash receptacle

13' non-advertising shelter with dome roof, aluminum roof panels, decorative raised battens, integrated map case, 8' pert bench with bars, pole-mounted trash receptacle, solar lighting

18' dome roof shelter with dome roof, bronze Lexan roof panels perforated metal at the bottom, 3/8" glass in the top with integrated map case, integrated bike bars on both ends, 3' perforated metal benches, no back

TOLAR MANUFACTURING

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LET IT FLOW.
LIKE NIAGARA.

Light, ventilation, simplicity, and visibility are all optimized in Tolar's Niagara Series shelter.

The clean, open appearance, design flexibility, ease of maintenance and simple installation make the line a favorite for shelter buyers nationwide. The advantages are as powerful as the falls that lend the line its name:

- Roof lines and styles to suit any streetscape
- Wide range of complementary accessories
- Variety of glass treatments and wall panels
- Variety of illumination options
- Exceptional weather protection

The Niagara Series shelters are engineered from a minimal number of parts, which makes for fast, easy installation. All Niagara Series shelters can be shipped in a kit to reduce freight charges.

ENHANCE YOUR COMMUNITY WITH THE ELEGANCE AND FUNCTIONALITY OF THE NIAGARA SERIES.

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NIAGARA SHELTER LINE

TECHNICAL SPECIFICATIONS AND DESIGN MODEL OPTIONS

As with all of Tolar's shelter, furniture and display models, our Niagara series offers a wide range of size, design and style options. Tolar is ready to meet your project requirements. Our Niagara Series shelters, as with all Tolar models, can be fabricated in advertising and non-advertising models as well as a wide variety of roof, wall and illumination options. All shelters are finished with our durable backed powder-coat process.

SIZING OPTIONS
- Shelter lengths from 8 to 24 feet
- Widths from 4 to 8 feet

ROOF STYLE OPTIONS
- Dome
- Hip Peak
- Mansard
- Palladium
- Gable peak

ROOF PANEL OPTIONS
- Bronze Lexan Thermoclear
- Powder-coated aluminum
- White Lexan Thermoclear

WALL OPTIONS
- 3/8" clear or bronze tempered safety glass Custom glass, including yellow dot, Victorian, custom city or transit agency logos
- Perforated metal
- Custom perforated metal, including Victorian and herringbone patterns
- Framed acrylic or polycarbonate
- Half- or full-end wall options

OPTIONAL AD KIOSK CHOICES
- All designed to accommodate the standard 4' X 6' shelter posting size
- Two-door back-to-back kiosks
- V-angled kiosks in a wide variety of sizes including 24", 48" and 52"
- Top-and side-hinged door options
- Wide variety of glazing options

COLOR OPTIONS
- Variety of durable, baked powder-coat finish colors
- Standard RAL options or custom-matched color
- Durable wet paint options to match project aesthetics

ILLUMINATION AND LIGHTING OPTIONS
- Conventional 110-volt
- Low-draw LED
- Solar Lighting

COMPLEMENTARY STREET FURNITURE

We have a wide variety of bench, trash receptacle, kiosks, bike racks and map case options to complete your street furniture design.

VISIT WWW.TOLARMFG.COM FOR ADDITIONAL IDEAS, OPTIONS AND SPECIFICATIONS.

16' Niagara hip peak ad shelter with a flat back-to-back ad kiosk, 3/8" yellow dot glass at the rear, end and partial front wall and benches with recycled seat slats

10' 6" dome roof non-ad shelter with perforated metal panels at the rear and end walls and a bench with recycle slats

12' dome roof ad shelter flat back-to-back ad kiosk, custom glass at the rear and end wall, bench with recycled seat slats

8' Hip peak roof non-ad shelter with perforated metal panels at the rear and end walls, custom Star of Texas treatment at front of shelter and a bench with recycled slats

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EURO STYLE.
AMERICAN QUALITY.

Sleek and stylish, yet strong and sturdy. That's the combination of design and durability embodied in Tolar's new Euro Shelter line.

Consider just some of the advantages:

- Distinctive new profile and rooflines for a modern look.
- Choose from models with or without ad displays.
- Opt for special cold-climate shelter design options.
- Choose from custom Herringbone or standard perforated metal walls.
- Unique custom glass treatments available.

The Euro Shelter line from Tolar is both beautiful and well-built, a functional, eye-catching addition to the streetscape of your community. Cutting-edge looks combined with unsurpassed craftsmanship. Our Euro models now incorporate an optional integrated channel for water drainage.

EURO SHELTER LINE: THE DISTINCTIVE CHOICE IN COSMOPOLITAN STYLE AND CLASSIC SUBSTANCE.

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EURO SHELTERS

Tolar's Euro Shelter line can be tailored to your project, your budget and your community with the following choices:

CONSTRUCTION OPTIONS

- All-aluminum construction
- Optional 4" diameter lamp posts available
- Optional spun (metal) escutcheon shoe covers available
- Standard rear wall or optional cold-weather design
- Integrated channel for water drainage

SIZING OPTIONS

- Shelter lengths range from 8 to 24 feet
- Widths available from 4 to 6 feet

WALL OPTIONS

- 3/8" bronze or clear-tempered safety glass
- Durable Lexan available
- Custom frit or sandblast glass options

ROOF OPTIONS

- Bronze
- Lexan
- Opaque Lexan
- Clear Lexan
- Powder-coated aluminum

AD KIOSK OPTIONS

- Top-hinged or side-hinged door options available

ILLUMINATION OPTIONS

- Conventional 110-volt lighting
- Low-draw 110-volt option
- Solar-powered lighting available

COLOR OPTIONS

- Variety of durable, baked powder-coat finish colors
- Standard RAL options or custom-matched color
- Durable wet paint options to match project aesthetics

COMPLEMENTARY STREET FURNITURE

We have a wide variety of bench, trash receptacle, kiosks, bike racks and map case options to complete your street furniture design.

TO VIEW ADDITIONAL DESIGN OPTIONS AND FIND OUT MORE VISIT WWW.TOLARMFG.COM.

13' Euro shelter with bronze Lexan roof panels, Herringbone style perforated metal walls, escutcheons and a 6' perforated metal bench

13' Euro MAX shelter with white Lexan roof panels, City decal and 8' perforated metal bench

22' Euro model advertising shelter with ad kiosk display, escutcheons, 3/8" custom glass, front wind screen and perforated metal benches

10' Euro ad shelter with advertising kiosk, Lexan MR-10 roof panels, 4" spun posts with escutcheons and 3/8" glass

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YOUR LOOK. YOUR STYLE.
YOUR SIGNATURE.

The Signature Shelter line delivers the best of Tolar's proven capability: A look that's unique to your project and reflects your community. For shelters that add value to the streetscape, and create a connection with their users, rely on Tolar to work with you in developing a custom, yet modular shelter style that's distinctive to the community in which they reside.

The line's key features provide buyers with an affordable choice combining Tolar's distinctive looks and durable designs, including:

- An exciting alternative to a "generic" style
- A collaborative design process
- Quality materials and engineering
- Custom accessories and colors
- Total support from end-to-end

Why settle for off-the-shelf? With Tolar's Signature line, your community's outdoor environment can be enhanced with shelters that make memorable first impressions for users, earn accolades from community stakeholders, and most importantly grow your ridership.

THE SIGNATURE SHELTER LINE: WHEN YOU WANT THE LOOK THAT'S UNIQUE TO YOU.

TOLAR
MANUFACTURING

258 Mariah Circle, Corona, CA. 92879-1751 | www.tolarmfg.com | 800-339-6165

SIGNATURE SHELTERS

Some examples of the unique designs and creative styles developed for clients who wanted a look that emphasized their community's distinctive appeal and outdoor environment.

TOLAR SIGNATURE PACIFIC-STYLE SHELTER

Simple and strong, this modern look is a bright addition to any community's streetscape.

- Radius roof with white Lexan roof panels
- Flat back-to-back advertising kiosk
- 8' perforated metal bench and integrated trash receptacle
- Also available in a non-advertising configuration

SIGNATURE FOR LITTLE ROCK

A design that reflects the community's history, with supporting lamp posts with acorn lamps.

- 17' dome roof with aluminum panels
- Twin solar-lit back-to-back advertising kiosks on end walls
- Etched ducks on the 3/8" rear glass walls
- Trolley stop identification sign
- 6' steel strap bench with back

TOLAR SIGNATURE FOR HIGHLANDS RANCH

Designed like an open-beam lodge, this design is a modification to our Tolar Sierra Shelter line.

- 17' dome roof shelter
- Simulated open beams and log support poles
- 48" V-angled advertising kiosk
- Window pane style perforated metal walls
- 6' steel strap bench and matching trash receptacle

TOLAR SIGNATURE RADIUS ROOF

This shelter features brushed aluminum construction for durability and a sleek contemporary look.

- 18' open-style shelter with clear panels
- Semi-cantilever surface mount design
- Premium powder-coat finish
- Flat back-to-back pedestal-style ad kiosk and integrated map case
- LED roof lighting and 10' perforated metal bench

TOLAR SIGNATURE RADIUS CURVES

Designed for the new millennium, this shelter features radius curves in roof and support posts.

- Radius roof shelter with Berridge roof panels
- Lights integrated into the ceiling
- Semi-V ad kiosk with top-hinged doors supported by gas shocks
- 8' perforated metal bench with anti-vagrant bars
- Complementary trash receptacle

VISIT WWW.TOLARMFG.COM FOR ADDITIONAL IDEAS, OPTIONS AND SPECIFICATIONS FOR TOLAR SMOKING SHELTERS AND WALKWAYS.

Signature Pacific-Style Shelter

Signature Custom Lamppost Historic Shelter

Signature Custom Empire Shelter

Signature Radius Roof

Signature Radius aluminum shelter, flat back-to-back advertising display kiosk

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