

**Meeting of the Central Valley Flood Protection Board
September 25, 2015**

Staff Report

**Sacramento Area Flood Control Agency
Site 18A Culvert Replacement and Fish Passage Enhancement Project,
Sacramento County**

1.0 – ITEM

Consider Central Valley Flood Protection Board (Board) approval to replace a culvert, place rip-rap, reconstruct a portion of the American River bike trail (Attachment A), regrade the riparian basin and re-vegetate with native grasses, and plant replacement trees and shrubs by draft Permit No. 19038 (Attachment B).

2.0 – APPLICANT

Sacramento Area Flood Control Agency (SAFCA)

3.0 – PROJECT LOCATION

The project, Site 18A, is located in the American River Parkway upstream from Discovery Park, immediately south of the Natomas East Main Drainage Canal (NEMDC) / Steelhead Creek low flow channel and directly east of Northgate Boulevard within the City of Sacramento (approximate population 470,000 per the 2010 Census) (Attachment A).

4.0 – PROJECT BACKGROUND

Site 18A is a seasonally flooded wetland and riparian habitat that encompasses approximately 17 acres in the American River parkway upstream from Discovery Park. Water from NEMDC/Steelhead Creek flows into the site through a 30-inch diameter culvert located at the northwest corner of the basin. During high flood stages in the Sacramento and Lower American Rivers, the NEMDC/Steelhead Creek and the American River can backup and overflow into Site 18A. As the floodwaters recede, the invert elevation of the culvert and depressions within the interior can cause shallow ponding to occur that can result in entrapment of juvenile salmonids and other fish.

SAFCA proposes to reduce the potential for fish stranding at site 18A by improving the exchange of flows into and out of the seasonal wetland. SAFCA also proposes to modify the gradient of the interior swales and increase the extent of seasonally submerged vegetation and overhead cover with the Site 18A floodplain to further reduce predation by birds and increase habitat for juvenile salmonids (Attachment A).

5.0 – AUTHORITY OF THE BOARD

California Water Code § 8534, 8590 – 8610.5, and 8700 – 8710

Title 23:

- § 6 – Need for a Permit
- § 108 – Existing Encroachments
- § 112 – Streams Regulated and Nonpermissible Work Periods
- § 113– Dwelling and Structures Within an Adopted Plan of Flood Control
- § 116 – Borrow and Excavation Activities
- § 121 – Erosion Control
- § 131 – Vegetation

6.0 – AGENCY COMMENTS AND ENDORSEMENTS

The comments and endorsements associated with this project from all pertinent agencies are shown below:

- The U.S. Army Corps of Engineers 33 USC 408 decision letter has not been received for this application. Staff anticipates receipt of a letter indicating that the USACE District Engineer has no objection to the project, subject to conditions. Upon receipt of the letter, staff will review to ensure conformity with the permit language and incorporate it into the permit as Exhibit A.
- Reclamation District 1000 (RD 1000) conditionally approved this project through Resolution No. 2010-02 dated January 8, 2010 (Attachment C).

Board staff incorporated the intent of RD 1000's endorsement conditions into the draft permit.

7.0 – PROJECT ANALYSIS

7.1 – Project Construction Details

The proposed project will replace the existing 30-inch diameter culvert with a 12-foot wide and seven (7)-foot tall arched culvert, regrading and modifying the depth and drainage gradients of portions of the drainage swales within Site 18A, and revegetation of disturbed areas (Attachment D)

To replace the culvert an open excavation of approximately 40-70 feet wide at the top and narrowing to fit a footing approximately 25 feet wide at the bottom will be needed to construct the new arched culvert. This excavation would extend north and south of the existing culvert to connect NEMDC/Steelhead Creek to the interior of the basin. The existing trees and shrubs within the footprint of the excavation would be removed as part of the project's clearing and grubbing activities. The existing culvert would be removed and replaced with a concrete arch culvert that will be 110 feet long, 12 feet wide, and 7 feet in height. The bottom of the culvert would consist of grouted rip-rap, with a flow line shaped at a gradient of 0.5 percent to the new elevation. Concrete headwalls and wingwalls would be constructed at each end of the culvert.

Approximately 3,000 cubic yards of soil will be excavated to construct the new culvert and appurtenances. Approximately one-third of this material will be replaced as backfill on the sides and top of the culvert. The remaining soil will be removed. Approximately 650 tons of imported rip-rap will be used to line the culvert invert (approximately three (3) feet deep) and the approach channels.

Planting and seeding would commence after completion of the replacement project. Areas disturbed during the construction and swale modification will be seeded with an erosion control grass mix. Riparian and willow scrub vegetation will be enhanced through planting a combination of nursery-grown container stock, oak acorns, and live cuttings of willow from harvest sites in the project vicinity.

7.2 – Hydraulic Summary

MBK Engineers conducted a hydraulic analysis of the project in a report dated March 6, 2015 (Attachment E). The critical cross-section for the NEMDC/Steelhead Creek blockage screening extends from the west levee to the American River bike trail. The total flow area for this cross-section at the SAFCA design water surface elevation of 38.2 feet is approximately 4,400 square feet. Assuming complete blockage of the guardrail in the critical cross-section, the area of blockage is approximately 40 square feet, which is less than 1% of the conveyance area. Since this blockage is less than

one (1) percent per USACE guidance threshold, a more detailed hydraulic analysis was not required.

MBK also calculated the maximum velocity within the proposed replacement culvert to determine scour potential in a report dated July 29, 2015 (Attachment F). A simple HEC-RAS model representing Site 18A and the culvert was developed. The maximum computed velocity in the culvert during the recession of water in the Site 18A is 0.8 feet per second. Based on this calculated velocity, erosion is not expected along the banks of the NEMDC channel as a result of flow through the culvert. The culvert will be lined with grouted rip-rap and soil-covered rip rap to protect the area from scour.

7.3 – Geotechnical Summary

A geotechnical analysis was not required for this project.

8.0 – CEQA ANALYSIS

Board staff has prepared the following California Environmental Quality Act (CEQA) determination:

The Board, as a Responsible Agency under CEQA, has reviewed the Initial Study, Mitigated Negative Declaration (IS/MND) (SCH No. 2015042009, April 2015) and Mitigation Monitoring and Reporting Program (MMRP) for the Site 18A Culvert Replacement and Fish Passage Enhancement Project prepared by the lead agency, SAFCA. These documents, including project design and the Mitigation Monitoring Plan, may be viewed or downloaded from the Central Valley Flood Protection Board website at <http://www.cvpfb.ca.gov/meetings/2015/09-25-2015.cfm> under a link for this agenda item. The documents are also available for review in hard copy at the Board and SAFCA offices.

SAFCA determined that the project would not have a significant effect on the environment and adopted Resolution 2015-057 on May 21, 2015 and subsequently filed a Notice of Determination on May 22, 2015 with the State Clearinghouse. Board staff finds the proposed project will not have a potentially significant effect on the environment because SAFCA, as lead agency, has required mandatory mitigation measures that will mitigate all potentially significant impacts to less than significant. These mandatory mitigation measures have been incorporated into the project plans to avoid identified impacts or to mitigate such impacts to a point where no significant impacts will occur. These mitigation measures are included in the project proponent's MMRP and address impacts biological resources, geology and soils, hazards and hazardous materials, hydrology and water quality, noise and transportation. The

description of the mitigation measures are further described in the adopted MMRP.

The documents and other materials which constitute the record of the Central Valley Flood Board's proceedings in this matter are in the custody of Leslie Gallagher, Executive Officer, Central Valley Flood Protection Board, 3310 El Camino Ave., Rm. 151, Sacramento, California 95821.

9.0 – CALIFORNIA WATER CODE SECTION 8610.5 CONSIDERATIONS

- Evidence that the Board admits into its record from any party, federal, State or local public agency, or nongovernmental organization with expertise in flood or flood plain management:

The Board will make its decision based on the evidence in the permit application and attachments, this staff report, and any other evidence presented by any individual or group.

- The best available science related to the scientific issues presented by the executive officer, legal counsel, the Department of Water Resources, or other parties that raise credible scientific issues:

The accepted industry standards for the work proposed under this permit as regulated by Title 23 have been applied to the review of this permit. On the issue of hydraulic impacts SAFCA used a HEC-RAS hydraulic model. This model is considered one of the best available scientific tool for the purpose of evaluating the maximum velocity developed by the proposed project.

- Effects of the decision on the facilities of the State Plan of Flood Control (SPFC), and consistency of the proposed project with the Central Valley Flood Protection Plan (CVFPP) as adopted by Board Resolution 2012-25 on June 29, 2012:

This project has no adverse effect on facilities of the State Plan of Flood Control and is consistent with the Central Valley Flood Protection Plan and current Title 23 standards because the proposed project is expected to cause no increase in water surface elevation, no substantial increase in channel velocities, and no adverse geotechnical impacts to the American River or any SPFC facilities.

- Effects of reasonable projected future events, including, but not limited to, changes in hydrology, climate, and development within the applicable watershed:

There are no foreseeable projected future events that would impact this project.

10.0 – STAFF RECOMMENDATION

Staff recommends that the Board:

Adopt: the CEQA findings;

Approve: Encroachment Permit No. 19038, in substantially the form provided, conditioned upon receipt of a U.S. Army Corps of Engineers 33 USC 408 decision letter indicating that the District Engineer has no objection to the project, subject to conditions;

Direct: the Executive Officer to take the necessary actions to execute the permit and file a Notice of Determination with the State Clearinghouse.

11.0 – LIST OF ATTACHMENTS

A – Project Maps and Photos

B – Draft Permit No. 19038

Exhibit A: USACE 408 Decision Letter

C – Endorsement Letter

D – Project Drawings

E – Hydraulic Impact Evaluation

F – Culvert Velocity Computation

Prepared By:	Ilene Wellman-Barbree, PE, Senior Engineer, Projects and Environmental Branch
Environmental Review:	Andrea Buckley, Senior Environmental Scientist (Specialist)
Staff Report Review:	Ali Porbaha, PE, Senior Engineer, Projects and Environmental Branch
	Len Marino, PE, Chief Engineer
	Carlos Mejia, Deputy Attorney General
	Leslie Gallagher, Acting Executive Officer

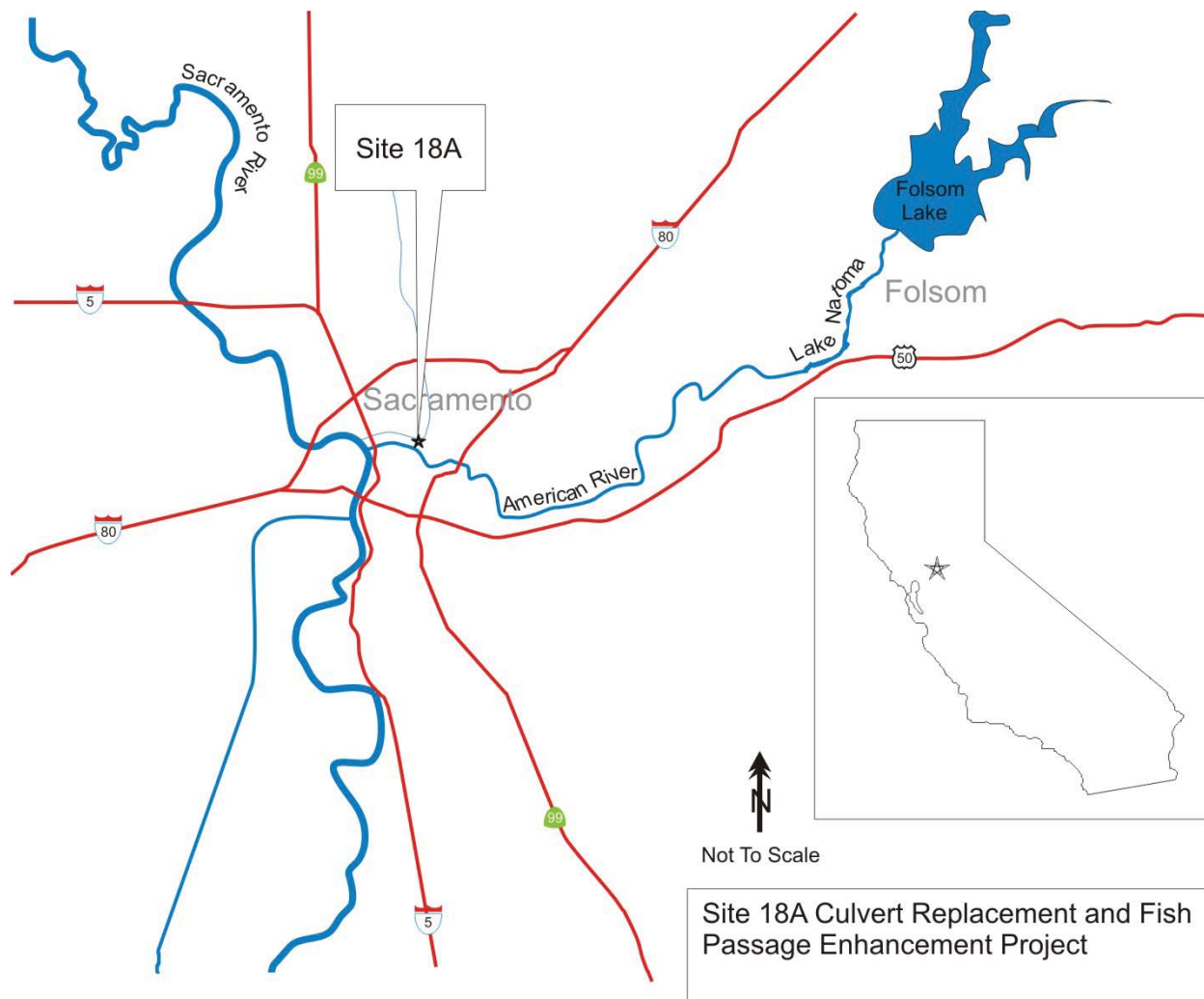
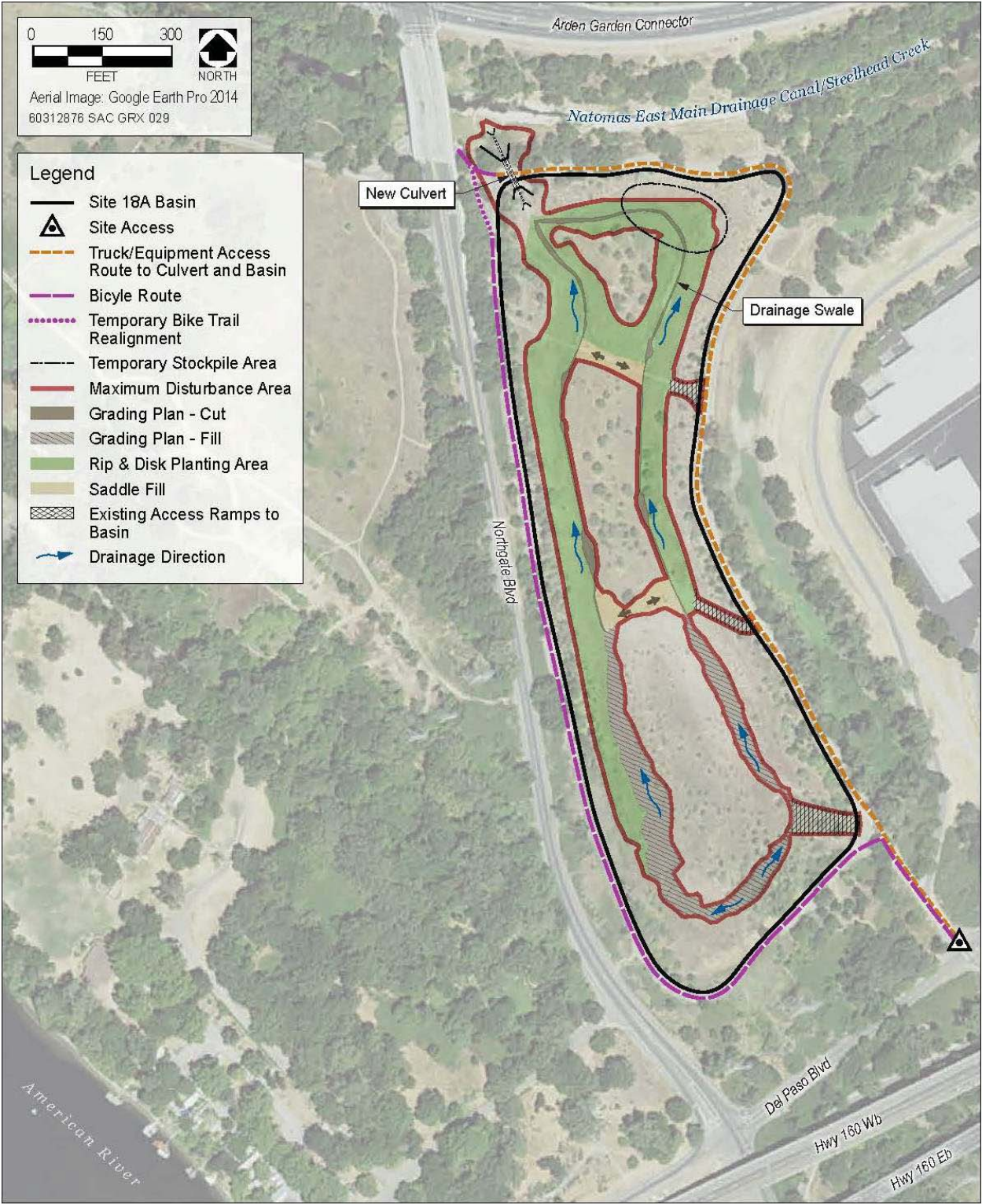


Figure 1: Regional Location Map



Source: Adapted by AECOM 2015

Figure 2: Vicinity Map



Source: AECOM 2014

Figure 3: Schematic Improvement Plan



Photo 1. View looking north from within the basin towards the existing 30" culvert. The invert can be seen to be higher than some of its surroundings, forming fish entrapment pools when the basin has partially filled and then receded.



Photo 2: View looking south from atop the 30" culvert headwall.



Photo 3: View looking south from the north bank of the basin after the basin has filled by flows from the 30" culvert and over the bank and has subsequently partially receded.

DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY
THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 19038 BD**This Permit is issued to:**

Sacramento Area Flood Control Agency (SAFCA)
1007 7th Street, 7th Floor
Sacramento, California 95814

To remove and replace a culvert, to place riprap, reconstruct a portion of the American River Bike Trail, to re-grade the riparian basin, re-vegetate with native grasses, and plant replacement trees and shrubs.

The project is located along the left bank of the Natomas East Main Drainage Canal, southeast of the intersection of Arden Garden Connector and Northgate Boulevard in Sacramento.

(Section 1, T9N, R5E, MDB&M, Reclamation District 1000 and American River FCD, Natomas East Main Drainage Canal, Sacramento County).

NOTE: Special Conditions have been incorporated herein which may place limitations on and/or require modification of your proposed project as described above.

(SEAL)

Dated: _____

Executive Officer**GENERAL CONDITIONS:**

ONE: This permit is issued under the provisions of Sections 8700 – 8723 of the Water Code.

TWO: Only work described in the subject application is authorized hereby.

THREE: This permit does not grant a right to use or construct works on land owned by the Sacramento and San Joaquin Drainage District or on any other land.

FOUR: The approved work shall be accomplished under the direction and supervision of the State Department of Water Resources, and the permittee shall conform to all requirements of the Department and The Central Valley Flood Protection Board.

FIVE: Unless the work herein contemplated shall have been commenced within one year after issuance of this permit, the Board reserves the right to change any conditions in this permit as may be consistent with current flood control standards and policies of The Central Valley Flood Protection Board.

SIX: This permit shall remain in effect until revoked. In the event any conditions in this permit are not complied with, it may be revoked on 15 days' notice.

SEVEN: It is understood and agreed to by the permittee that the start of any work under this permit shall constitute an acceptance of the conditions in this permit and an agreement to perform work in accordance therewith.

EIGHT: This permit does not establish any precedent with respect to any other application received by The Central Valley Flood Protection Board.

NINE: The permittee shall, when required by law, secure the written order or consent from all other public agencies having jurisdiction.

TEN: The permittee is responsible for all personal liability and property damage which may arise out of failure on the permittee's part to perform the obligations under this permit. If any claim of liability is made against the State of California, or any departments thereof, the United States of America, a local district or other maintaining agencies and the officers, agents or employees thereof, the permittee shall defend and shall hold each of them harmless from each claim.

ELEVEN: The permittee shall exercise reasonable care to operate and maintain any work authorized herein to preclude injury to or damage to any works necessary to any plan of flood control adopted by the Board or the Legislature, or interfere with the successful execution, functioning or operation of any plan of flood control adopted by the Board or the Legislature.

TWELVE: Should any of the work not conform to the conditions of this permit, the permittee, upon order of The Central Valley Flood Protection Board, shall in the manner prescribed by the Board be responsible for the cost and expense to remove, alter, relocate, or reconstruct all or any part of the work herein approved.

SPECIAL CONDITIONS FOR PERMIT NO. 19038 BD

LIABILITY AND INDEMNIFICATION

THIRTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board (Board), the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), and Reclamation District (RD) 1000 safe and harmless, of and from all claims and damages related to the Board's approval of this permit, including but not limited to claims filed pursuant to the California Environmental Quality Act. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

FOURTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Board, the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), and RD 1000 safe and harmless, of and from all claims and damages arising from the project undertaken pursuant to this permit, all to the extent allowed by law. The State expressly reserves the right to supplement or take over its defense, in its sole discretion.

FIFTEEN: The Board, Department of Water Resources (DWR), and RD 1000 shall not be held liable for any damages to the permitted encroachment(s) resulting from flood fight, operation, maintenance, inspection, or emergency repair.

AGENCY CONDITIONS

SIXTEEN: The permittee shall comply with all conditions set forth in the letter from the U.S. Army Corps of Engineers District Engineer dated September XX, 2015, which is attached to this permit as Exhibit A and is incorporated by reference.

SEVENTEEN: The permittee agrees to incur all costs for compliance with local, State, and Federal permitting. If any conditions issued by other agencies conflict with any of the conditions of this permit, then the permittee shall resolve conflicts between any of the terms and conditions that agencies might impose under the laws and regulations it administers and enforces.

EIGHTEEN: If the permittee does not comply with the conditions of the permit and enforcement by the Board is required, the permittee shall be responsible for bearing all costs associated with the enforcement action, including reasonable attorney's fees. Permittee acknowledges that State law allows the imposition of fines in enforcement matters.

PRE-CONSTRUCTION

NINETEEN: The permittee shall contact the Board by telephone at (916) 574-0609, and submit the enclosed postcard to schedule a preconstruction conference. Failure to do so at least 20 working days prior to start of work may result in delay of the project.

TWENTY: Prior to commencement of work, the permittee shall create a photo record, including associated descriptions of project conditions. The photo record shall be certified (signed and stamped) by a licensed land surveyor or licensed civil engineer registered in the State of California and submitted to the Board within thirty (30) calendar days of beginning the project.

TWENTY-ONE: The permittee shall provide construction supervision and inspection services acceptable to the Board.

CONSTRUCTION

TWENTY-TWO: All work approved by this permit shall be in accordance with the submitted drawings and specifications except as modified by special permit conditions herein. No further work, other than that approved by this permit, shall be done in the area without prior approval of the Board.

TWENTY-THREE: All addenda and contract change orders made to the approved plans and / or specifications by the permittee after Board approval of this permit shall be submitted to the Board's Chief Engineer for review and approval prior to incorporation into the permitted project. The submittal shall include all supplemental plans, specifications, and necessary supporting geotechnical, hydrology and hydraulics, or other technical analyses. The Board shall acknowledge receipt of the addendum or change submittal in writing within ten (10) working days of receipt, and shall work with the permittee to review and respond to the request as quickly as possible. Time is of the essence. The Board may request additional information as needed and will seek comment from the U.S. Army Corps of Engineers and / or local maintaining agencies when necessary. The Board will provide written notification to the permittee if the review period is likely to exceed forty five (45) calendar days.

Upon approval of submitted documents the permit shall be revised, if needed, prior to construction related to the proposed changes.

TWENTY-FOUR: No construction work of any kind shall be done during the flood season from November 1 to April 15 without prior approval of the Board, and shall be removed after completion of the project.

TWENTY-FIVE: Backfill material for excavations shall be placed in four (4) to six (6) inch layers and compacted to at least the density of the adjacent, firm, undisturbed material.

TWENTY-SIX: Revetment shall be uniformly placed and properly transitioned into the bank, levee slope, or adjacent revetment and in a manner which avoids segregation.

TWENTY-SEVEN: The revetment shall not contain any reinforcing steel, floatable, or objectionable material. Asphalt or other petroleum-based products may not be used as fill or erosion protection on the levee section or within the floodway.

TWENTY-EIGHT: No material stockpiles, temporary buildings, or equipment shall remain in the floodway during the flood season from November 1 to April 15.

VEGETATION / ENVIRONMENTAL MITIGATION

TWENTY-NINE: The permittee will be responsible for securing any necessary permits incidental to habitat manipulation and restoration work completed in the flood control project, and will provide any biological surveying, monitoring, and reporting needed to satisfy those permits.

THIRTY: Areas where plantings are lost to erosion may be replanted to the level of plantings in the approved project plans and specifications.

THIRTY-ONE: Cleared trees and brush (or pruning therefrom) shall be completely burned or removed from the floodway, and downed trees or brush shall not remain in the floodway during the flood season from November 1st to April 15th.

THIRTY-TWO: If any feature of the project adversely impacts the successful execution, functioning, maintenance, or operation of facilities of the Sacramento River Flood Control Project, the permittee must either remove the feature, or mitigate for the adverse impact of the feature at the permittee's expense after approval of the proposed mitigations by the Board. If the permittee does not comply, the Board may modify or remove the feature at the permittee's expense.

POST-CONSTRUCTION

THIRTY-THREE: Except with respect to the activities expressly allowed under this permit, the work area shall be restored to the condition that existed prior to start of work.

THIRTY-FOUR: Any damage to the levee crown roadway or access ramps that will be utilized for access for this project shall be promptly repaired to the condition that existed prior to this project.

THIRTY-FIVE: All debris generated by this project shall be disposed of outside the floodway.

THIRTY-SIX: Within 120 days of completion of the project, the permittee shall submit to the Board and DWR a mylar copy of as-built drawings, stamped and signed by a licensed civil engineer registered in the State of California, certifying the work was performed and inspected in accordance with the Board permit conditions and submitted drawings and specifications.

OPERATIONS AND MAINTENANCE

THIRTY-SEVEN: The permittee shall be responsible for repair of any damages to the channel, banks, levees, and floodway due to construction, operation, or maintenance of the proposed project.

THIRTY-EIGHT: The permittee shall maintain the permitted encroachment(s) within the utilized area in the manner required and as requested by the authorized representative of the Board, DWR, or any other agency responsible for maintenance.

THIRTY-NINE: If erosion occurs adjacent to the permitted encroachment(s), the permittee shall repair the eroded areas and place adequate mitigation on the affected areas to prevent further erosion.

FORTY: At the request of either the permittee or the Board, the permittee and the Board shall conduct joint inspections of the project site to assess the integrity and operation of the project, and to assess and respond to any adverse impacts on the floodway or adjacent properties.

PROJECT ABANDONMENT, CHANGE IN PLAN OF FLOOD CONTROL

FORTY-ONE: If the project, or any portion thereof, is to be abandoned in the future, the permittee shall abandon the project under direction of the Board, at the permittee's cost and expense.

FORTY-TWO: Any additional encroachment(s) require an approved permit from the Board and shall be in compliance with the Board's regulations (Title 23 California Code of Regulations).

FORTY-THREE: The permittee shall operate and maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the Board or authorized representative. Maintenance may include actions to preserve the integrity of the flood control system under emergency conditions. These actions will be taken at the sole expense of the permittee.

FORTY-FOUR: The permittee may be required, at permittee's cost and expense, to remove, alter, relocate, or reconstruct all or any part of the permitted encroachment(s) if removal, alteration, relocation, or reconstruction is necessary as part of or in conjunction with implementation of the Central Valley Flood Protection Plan or other future flood control plan or project, or if damaged by any cause. If the permittee does not comply, the Board may perform this work at the permittee's expense.

FORTY-FIVE: This permit shall run with the land and all conditions are binding on permittee's successors and assigns.

END OF CONDITIONS



RECLAMATION
DISTRICT 1000

Permit Conditions

Permit Application No. Unnumbered

Location: Natomas East Main Drain Canal (NEMDC) vicinity of Northgate Blvd

Applicant: Sacramento Area Flood Control Agency (SAFCA)

Description: Site 18A Culvert Replacement and Fish Passage Enhancement Project

CONDITIONS:

1. Maintenance of all encroaching structures, facilities, vegetation or any other items or matters approved under this permit shall remain the responsibility of the Permittee unless otherwise agreed to by the District.
2. Permittee shall obtain all necessary permits and regulatory approvals for the proposed work.
3. Permittee hereby agree(s) to indemnify and hold and save the District and its employees harmless from any damage, costs or liability, including all costs of defense, which may arise as result of the exercise of this Permit
4. Work on the levee or within the floodway shall be done outside of the flood season (November 1 to April 15) unless otherwise approved by the Central Valley Flood Protection Board and the District.
5. Permittee shall repair any damages to District facilities to the reasonable satisfaction of the District upon completion of the work..

Resolution No. 2010-02

WHEREAS, Reclamation District No. 1000 (District) operates and maintains levees under the authority of the California Central Valley Flood Protection Board (CCVFPB) and the California Water Code; and

WHEREAS, the CCVFPB and Title 23 of the California Water Code require any encroachment on or adjacent to the levee or within the designated floodway have an encroachment permit be issued by the CCVFPB with appropriate conditions to insure they do not impede or impair the operations and maintenance of the flood control system; and

WHEREAS, such permit applications are reviewed and endorsed by the local maintaining agency responsible for the operations and maintenance of the levee system where the encroachment is proposed and allows for conditions to be included in the permits to address issues including, but not limited to, operations, maintenance, public safety and flood emergency response; and

WHEREAS, endorsement of the permit applications for levees surrounding the Natomas basin are the purview of the District and various actions through the years by past District Boards have granted authority to the General Manager to endorse permit applications; and

WHEREAS, the Board desires to enumerate a clear policy on how future permit applications are to be reviewed and endorsed by the District

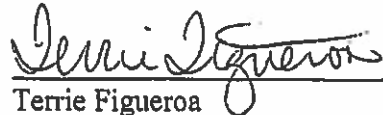
NOW, THEREFORE BE IT RESOLVED:

The Reclamation District No. 1000 Board of Trustees desires to delegate their authority to endorse encroachment permit applications to the District General Manager for routine encroachments and those which do not involve District policy issues. A determination as to which permits will be endorsed by the General Manager shall be left to his or her judgment, provided however, that all such endorsements shall be presented to the Board of Trustees at the next scheduled Board meeting.

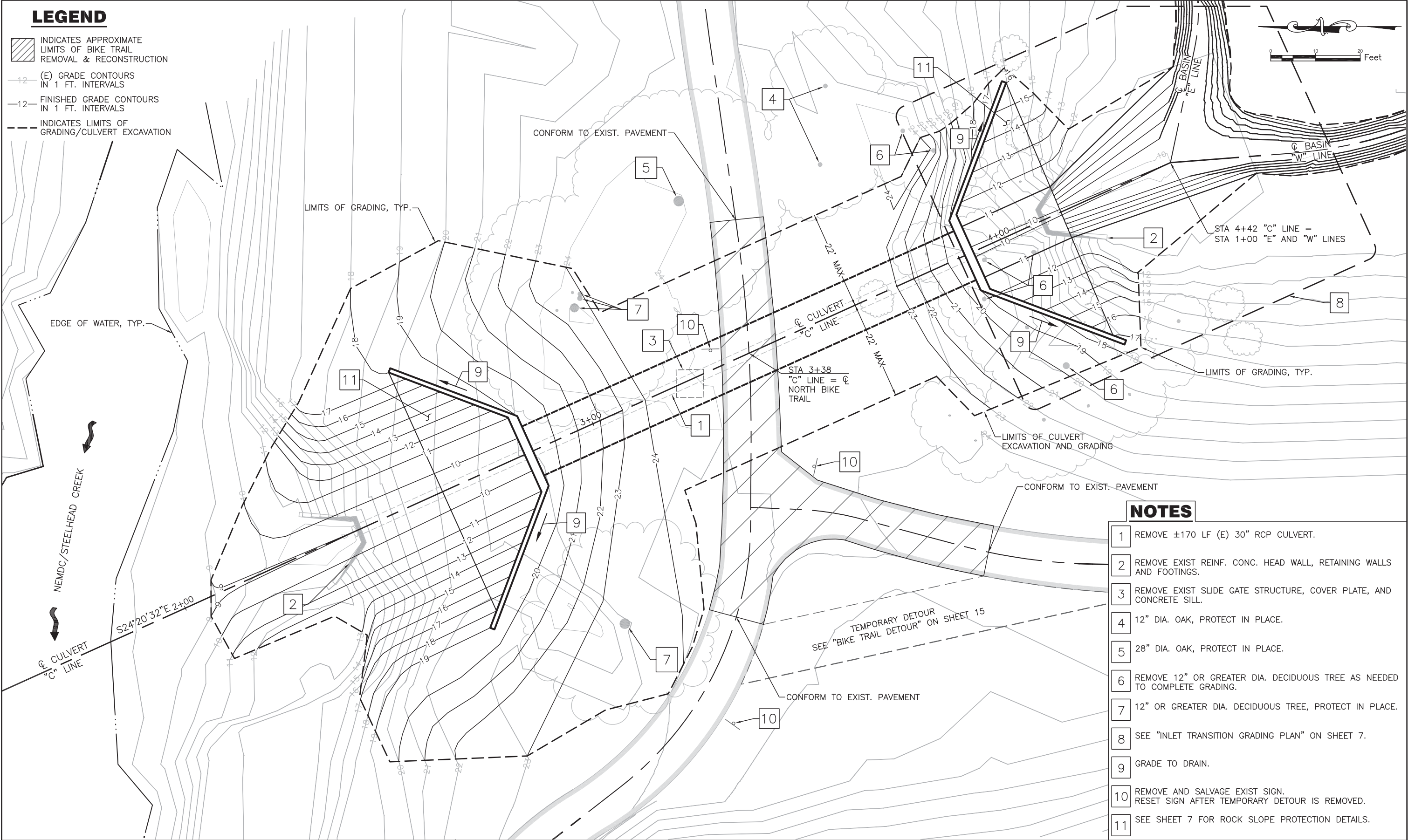
Those permit applications which are not routine in nature, present policy issues or are likely to be controversial shall be brought to the Board for consideration and action at which time the Board may delegate signature authority to the General Manager if approved. This will include all permit applications where the General Manager is recommending denial to the California Central Valley Flood Protection Board.

CERTIFICATION

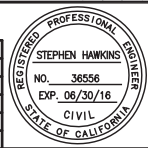
I, Terrie Figueroa, Secretary of Reclamation District No, 1000, hereby certify that the foregoing Resolution 2010-02 was duly adopted by the Board of Trustees of Reclamation District No, 1000 at a regular meeting held January 8, 2010 and made a part of the minutes thereof.



Terrie Figueroa
District Secretary



REVISIONS			
NO	DESCRIPTION	BY	DATE



STEPHEN R. HAWKINS
PROJECT ENGINEER

PLANS APPROVAL DATE

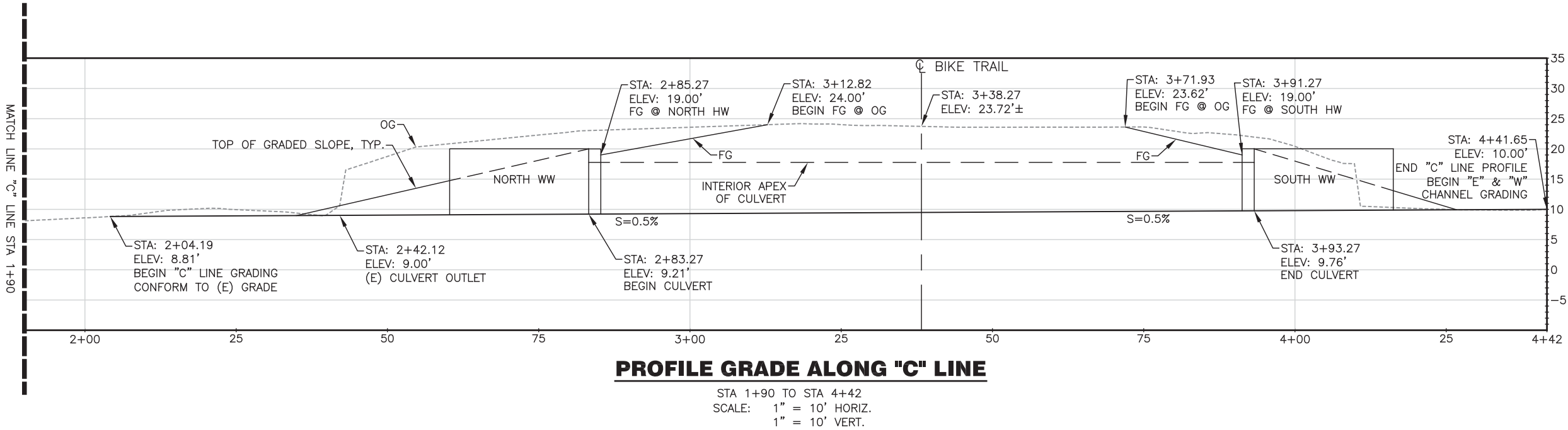
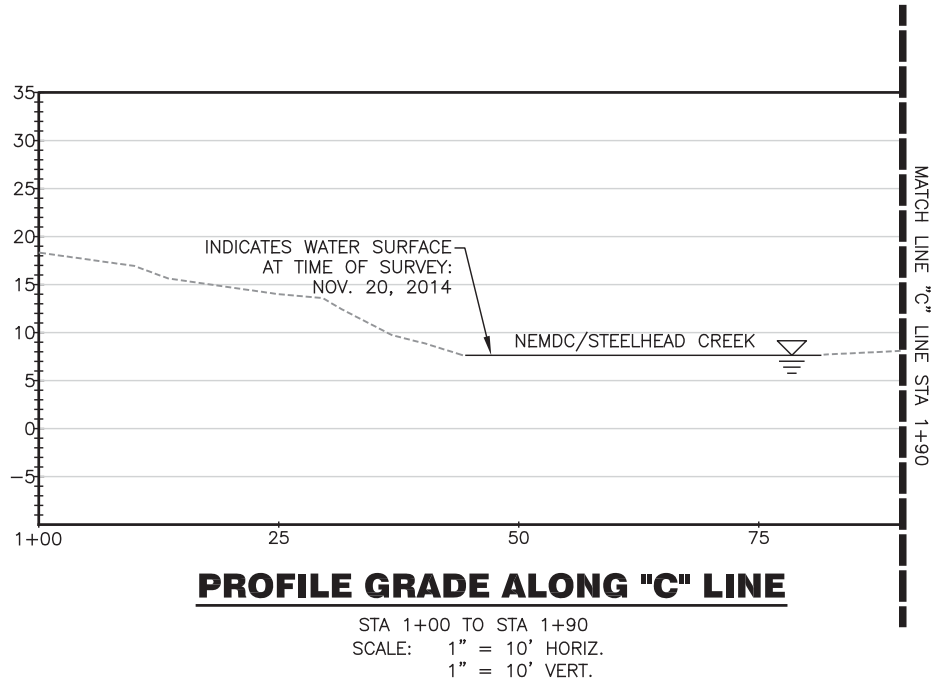
MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

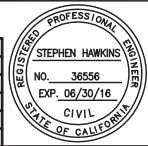
DES.:	CMM
DRAWN:	CMM
CHKD.:	SRH
DATE:	MAR 25, 2015
SCALE:	1"=10'
FLD. BK.	

**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

CULVERT LAYOUT	
FILE NO.	SHEET 5 OF 22
FILE NAME:	PEN TBL:



REVISIONS			
NO	DESCRIPTION	BY	DATE



STEPHEN R. HAWKINS
PROJECT ENGINEER

PLANS APPROVAL DATE

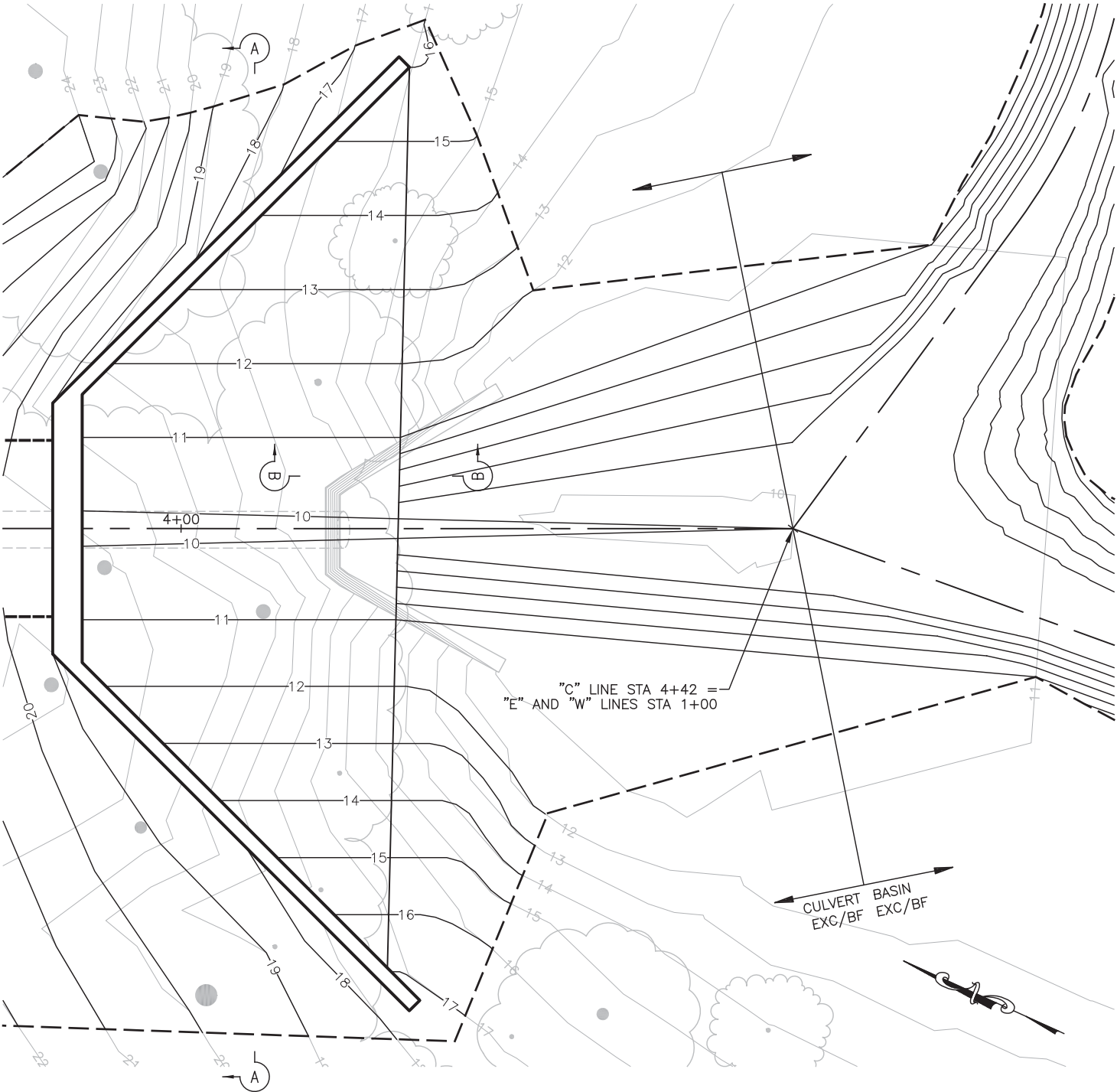
MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.:	CMM
DRAWN:	CMM
CHKD.:	SRH
DATE:	MAR 25, 2015
SCALE:	H: 1"=10' V: 1"=10'
FLD. BK.	

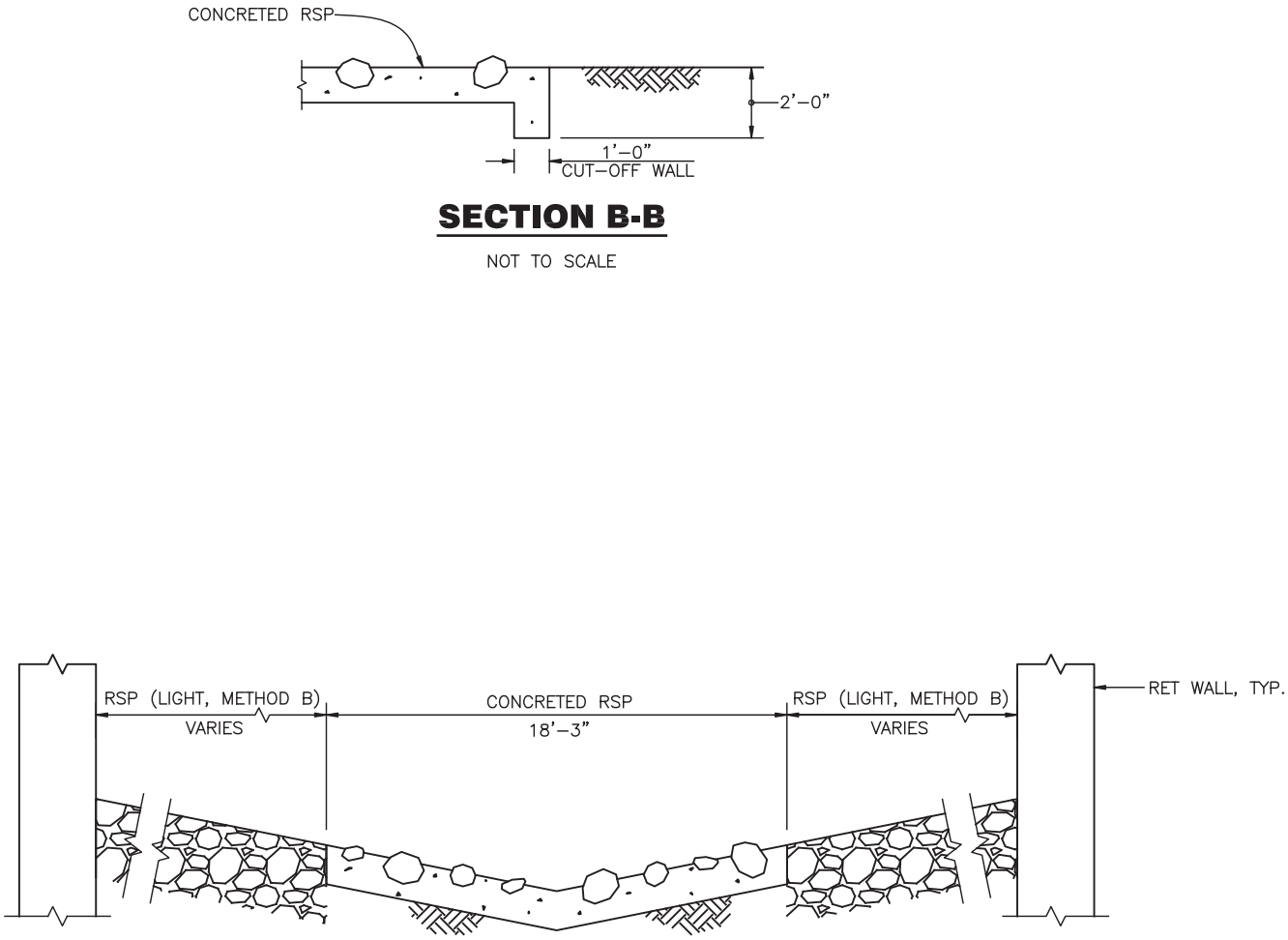
**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

CULVERT PROFILE	
FILE NO.	SHEET 6 OF 22
FILE NAME:	PEN TBL:



INLET TRANSITION GRADING PLAN

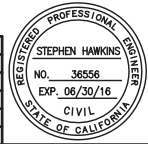
SCALE: 1" = 5'



SECTION A-A

NOT TO SCALE

REVISIONS			
NO	DESCRIPTION	BY	DATE



STEPHEN R. HAWKINS
PROJECT ENGINEER

PLANS APPROVAL DATE

MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

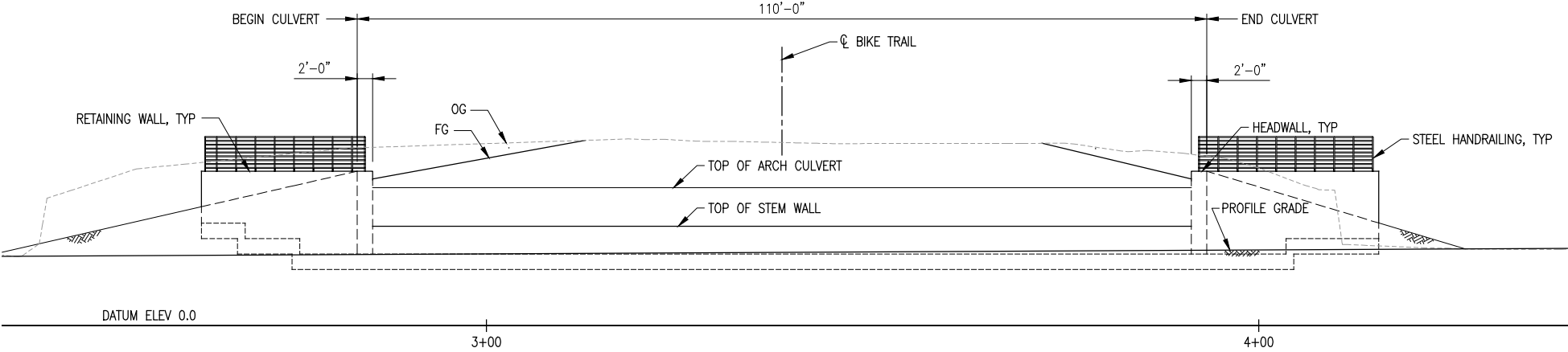
SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.: CMM
DRAWN: CMM
CHKD.: SRH
DATE: MAR 25, 2015
SCALE: AS SHOWN
FLD. BK.

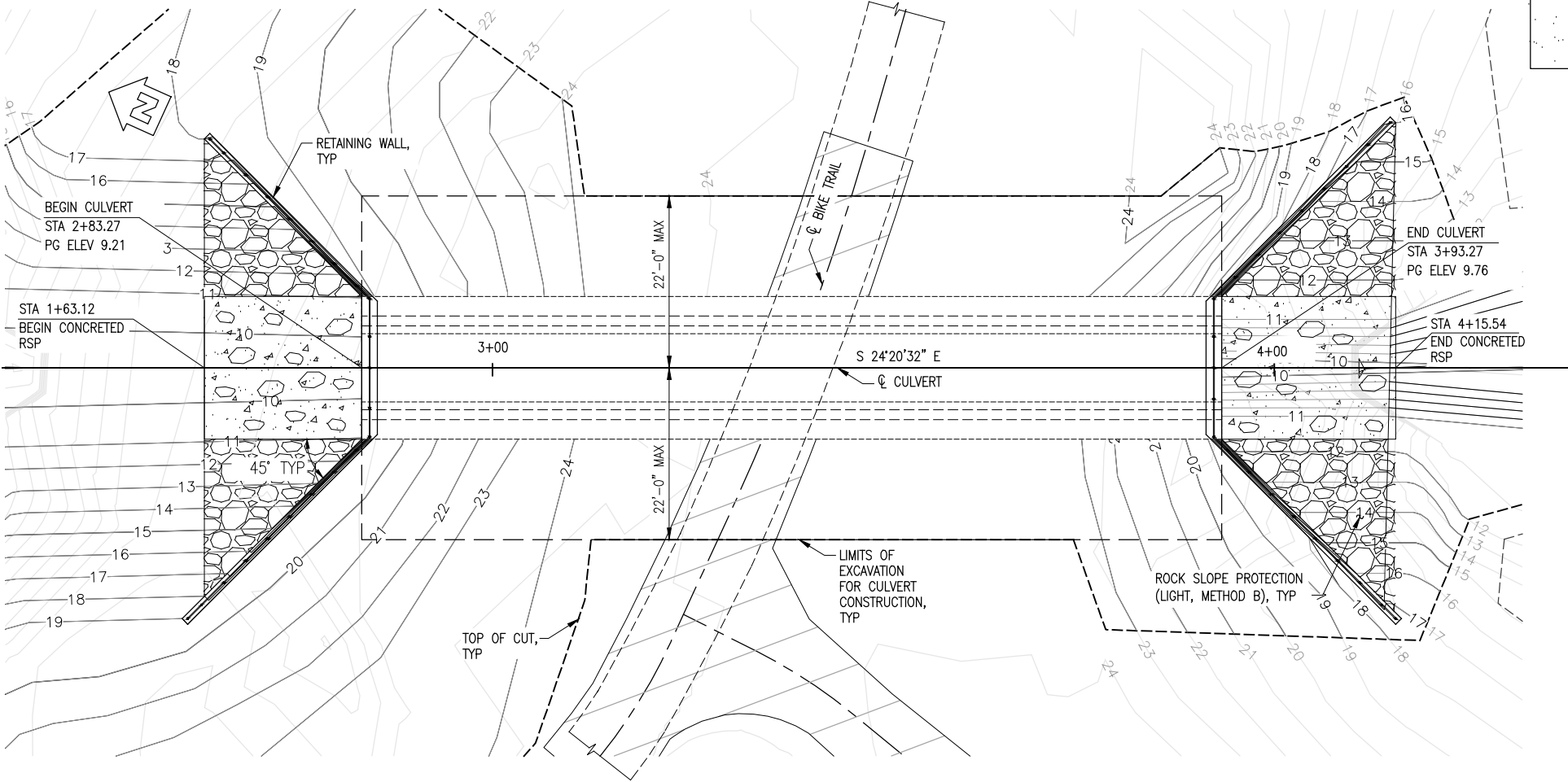
**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

**INLET TRANSITION
GRADING PLAN**

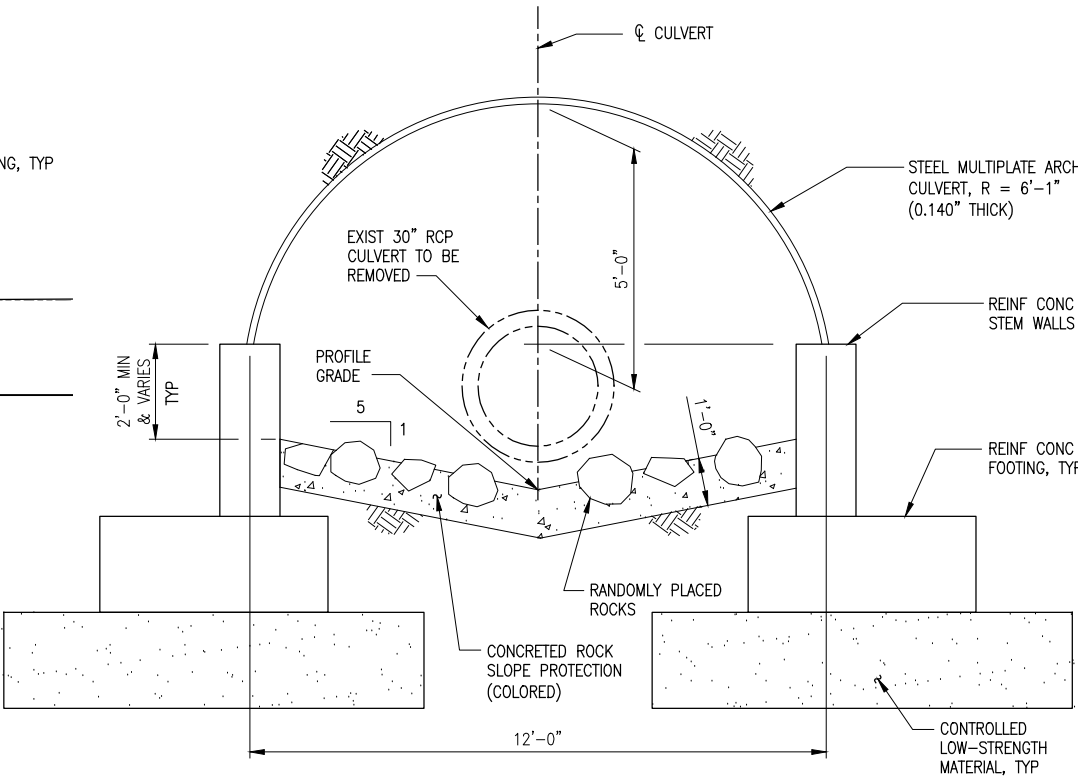
FILE NO. SHEET **7** OF **22**
FILE NAME: PEN TBL:



ELEVATION ALONG ϕ CULVERT
1" = 10'



PLAN
1" = 10'



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

- NOTES:**
- FOR FINAL GRADING, SEE "CULVERT GRADING PLAN" SHEET

REVISIONS			
NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

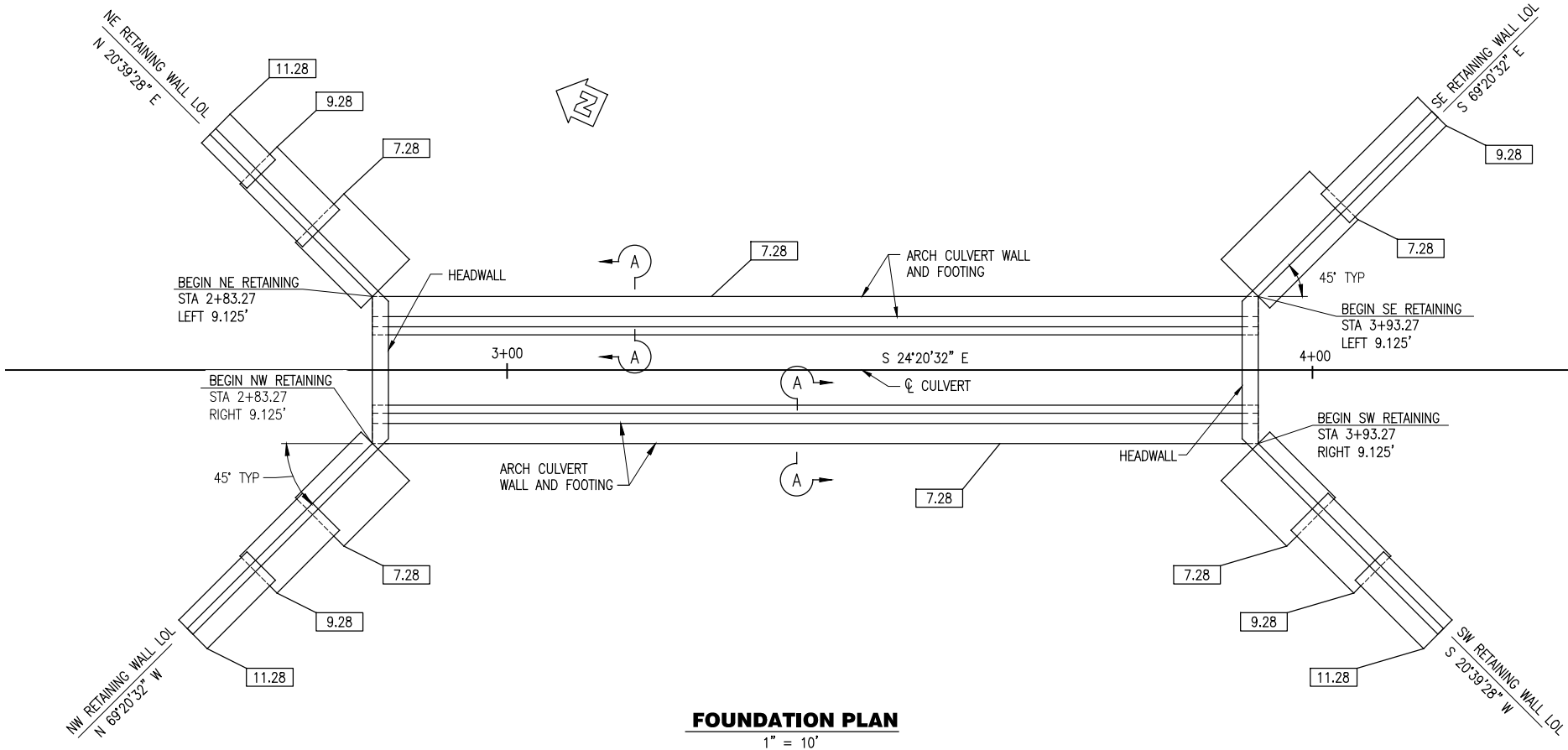
MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.: WS
DRAWN: KW
CHKD.: RS
DATE: 3/25/2015
SCALE: AS SHOWN
FLD. BK.

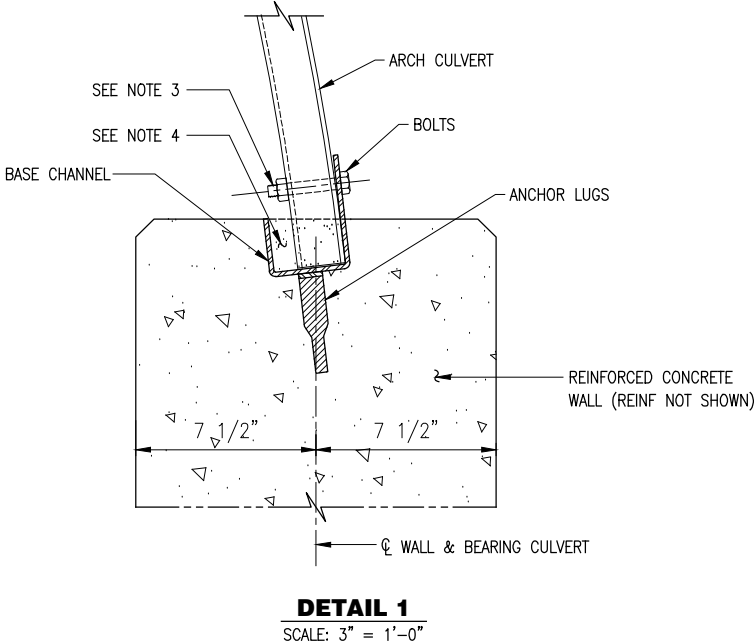
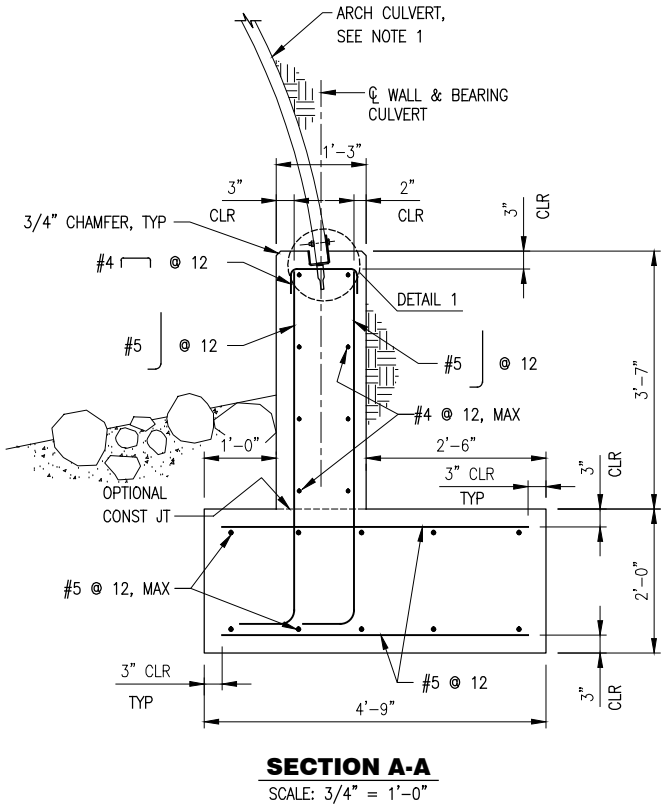
**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

GENERAL PLAN
FILE NO. SHEET **16** OF **22**
FILE NAME: [PEN TBL]



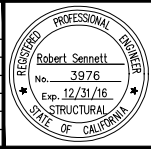
LEGEND:

 BOTTOM OF FOOTING ELEVATION



- NOTES:**
1. FOR CULVERT DETAILS AND HARDWARE NOT SHOWN, SEE MANUFACTURER DETAILS.
 2. FOR HEADWALL DETAILS AND RETAINING WALL FOUNDATION DETAILS, SEE "HEADWALL DETAILS" SHEET AND "RETAINING WALL DETAILS" SHEETS.
 3. APPLY THREAD LOCKING SYSTEM TO ALL FASTENERS.
 4. FILL BASE CHANNEL VOID WITH GROUT TO TOP OF WALL.

REVISIONS			
NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

MGE
ENGINEERING INC.

7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA

SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

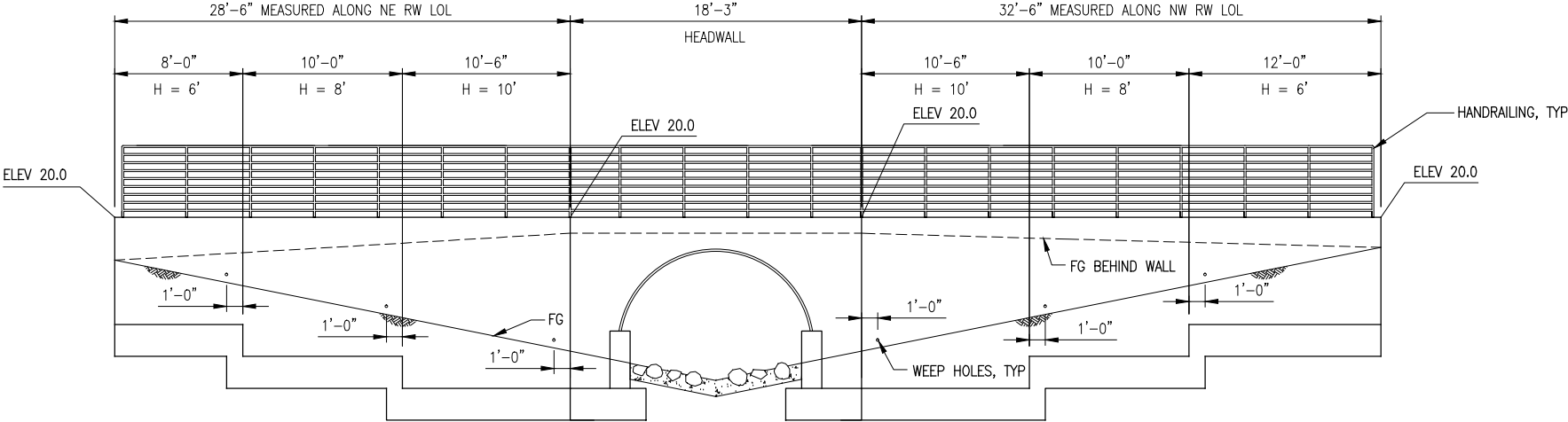
DES.: WS
DRAWN: KW
CHKD.: RS
DATE: 3/25/2015
SCALE: AS SHOWN
FLD. BK.

**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

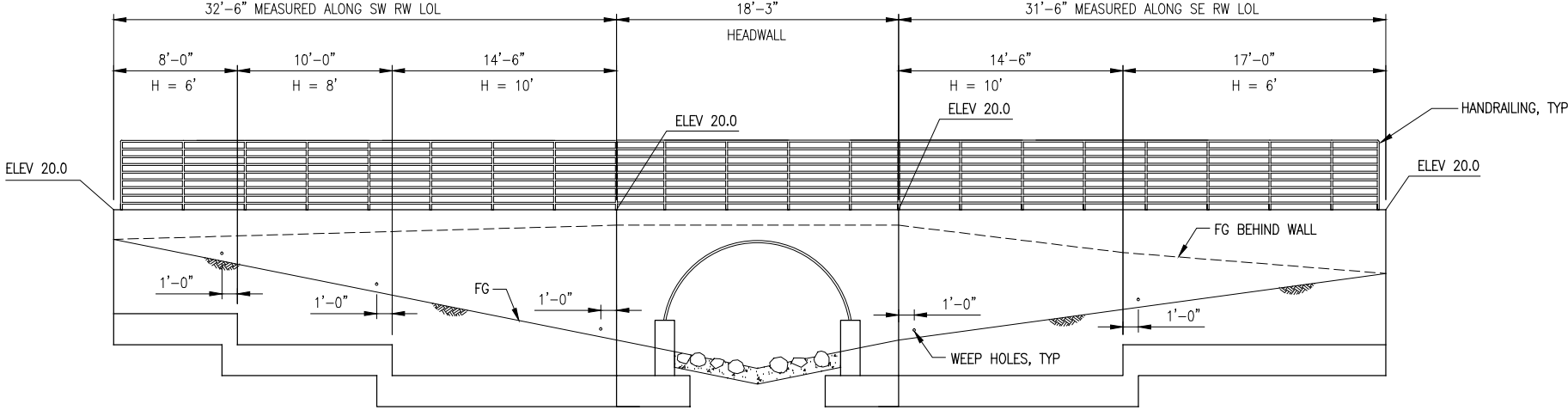
**FOUNDATION PLAN
AND DETAILS**

FILE NO. SHEET 17 OF 22

FILE NAME: PEN TBL:



ELEVATION - NORTH HEADWALL & RETAINING WALLS
3/16" = 1'-0"



ELEVATION - SOUTH HEADWALL & RETAINING WALLS
3/16" = 1'-0"

NOTES:

1. FOR BOTTOM OF RETAINING WALL FOOTING ELEVATIONS, SEE "FOUNDATION PLAN & DETAILS" SHEET.
2. FOR OVEREXCAVATION AND LIMITS OF CONTROLLED LOW STRENGTH MATERIAL, SEE "EXCAVATION AND BACKFILL PAY LIMITS" SHEET.

REVISIONS			
NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

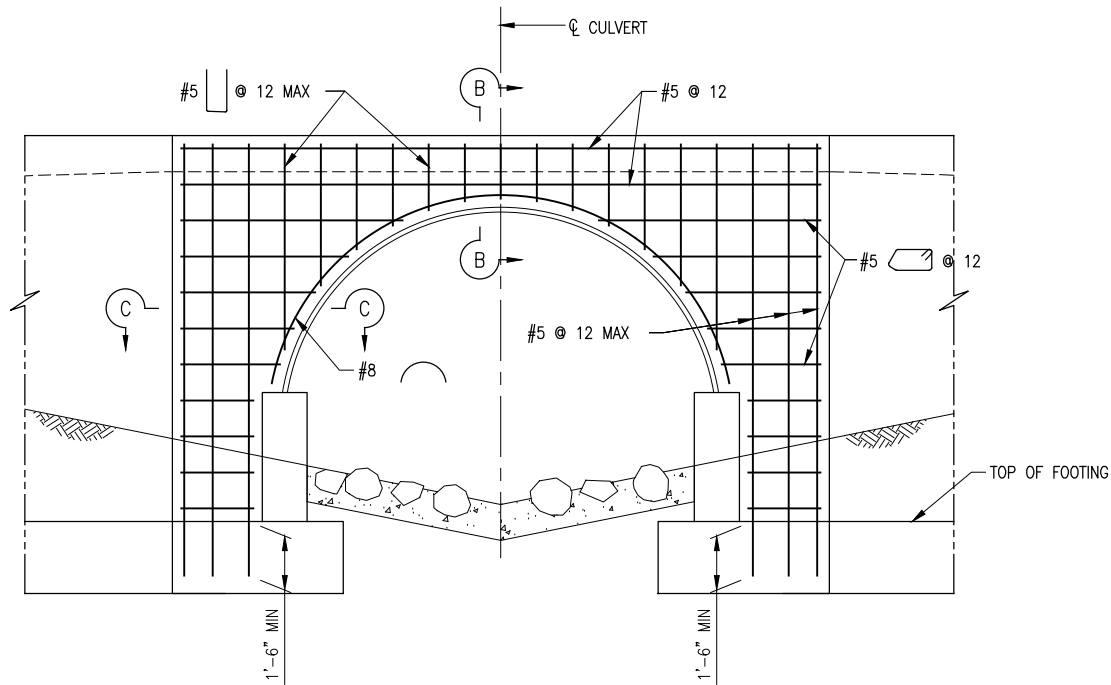
SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.:	WS
DRAWN:	KW
CHKD.:	RS
DATE:	3/25/2015
SCALE:	AS SHOWN
FLD. BK.	

**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

**HEADWALL AND RETAINING
WALL ELEVATIONS**

FILE NO.	SHEET 18 OF 22
FILE NAME:	PEN TBL:

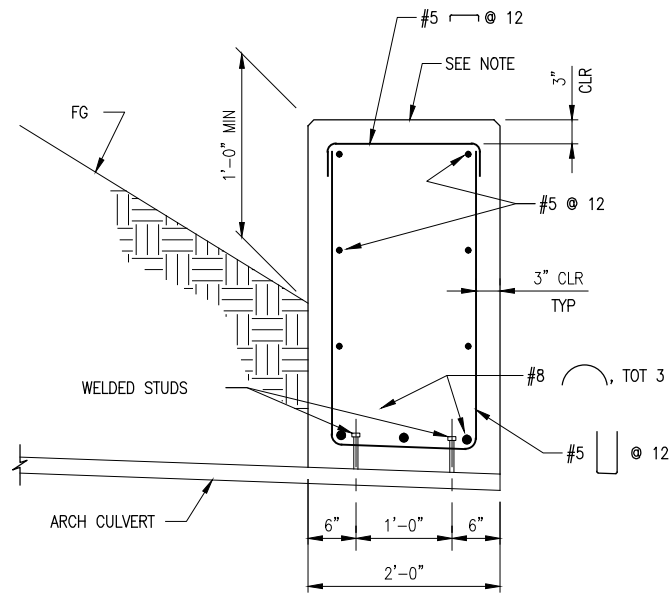


NOTE:

RETAINING WALL REINF AND HANDRAILING NOT SHOWN FOR CLARITY.

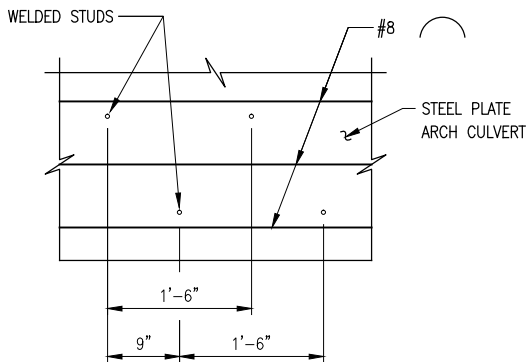
HEADWALL REINFORCEMENT

3/8" = 1'-0"



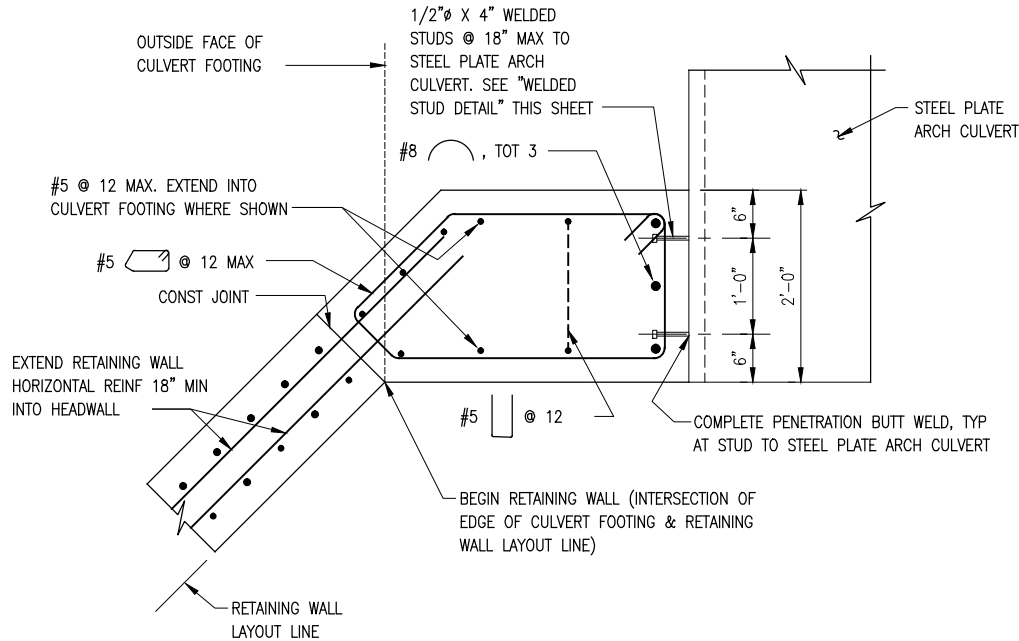
SECTION B-B

1" = 1'-0"



WELDED STUD DETAIL

1" = 1'-0"



NOTE:

SOUTHEAST CORNER SHOWN, OTHER 3 CORNERS SIMILAR.

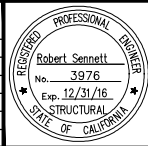
SECTION C-C

1" = 1'-0"

NOTES:

1. SEE "HANDRAILING DETAILS" SHEET FOR POST ANCHORAGE DETAILS AND HANDRAILING DETAILS.

REVISIONS			
NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

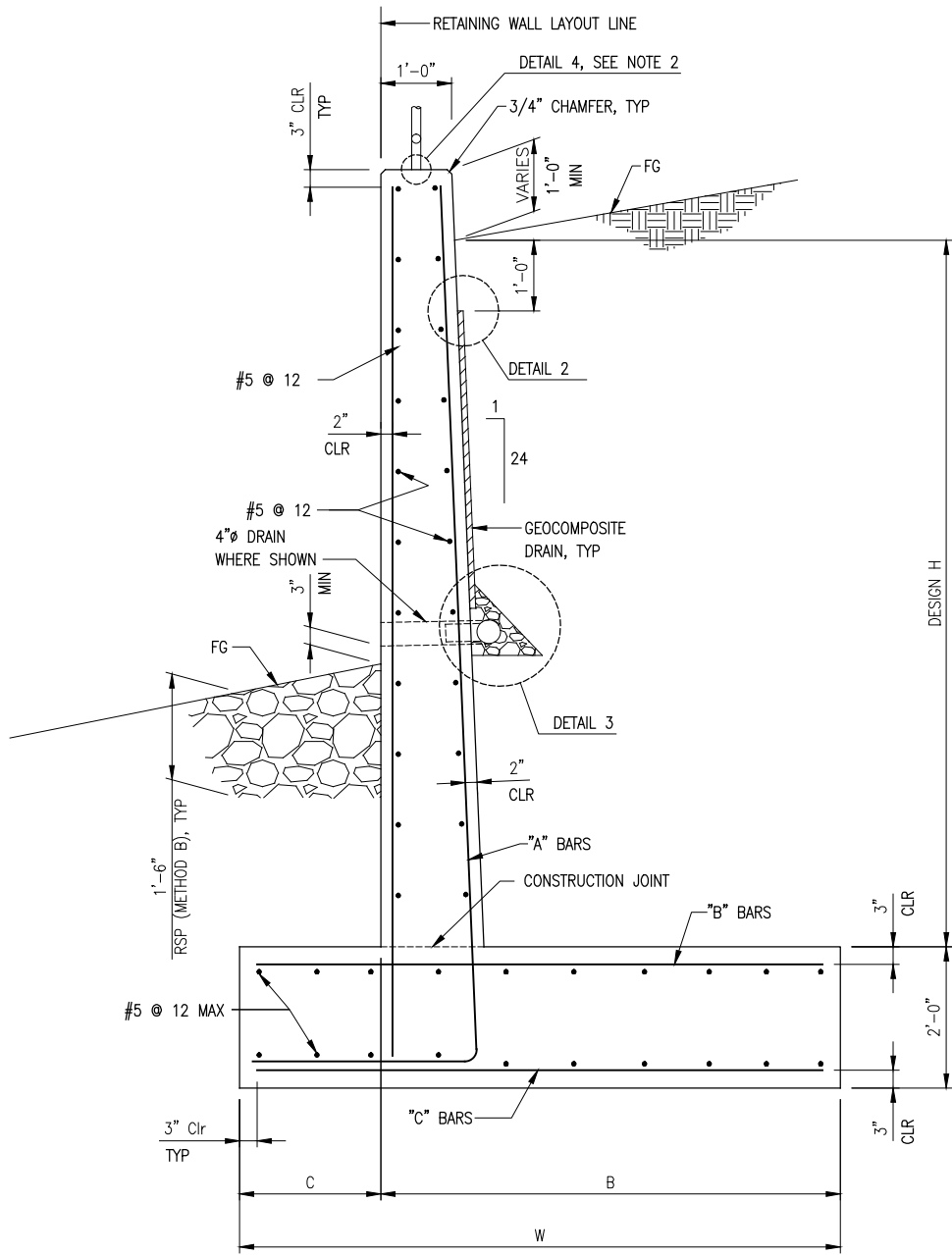
MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.: WS
DRAWN: KW
CHKD.: RS
DATE: 3/25/2015
SCALE: AS SHOWN
FLD. BK.

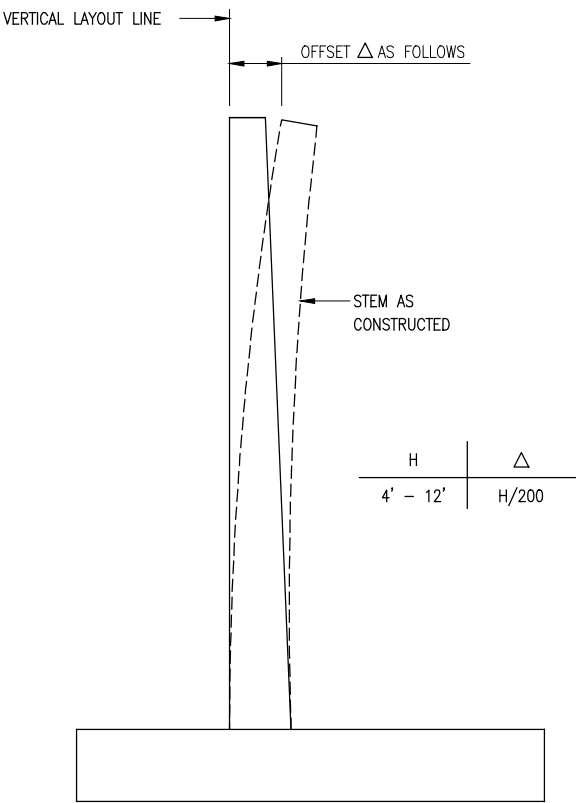
**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

HEADWALL DETAILS
FILE NO. SHEET 19 OF 22
FILE NAME: PEN TBL:



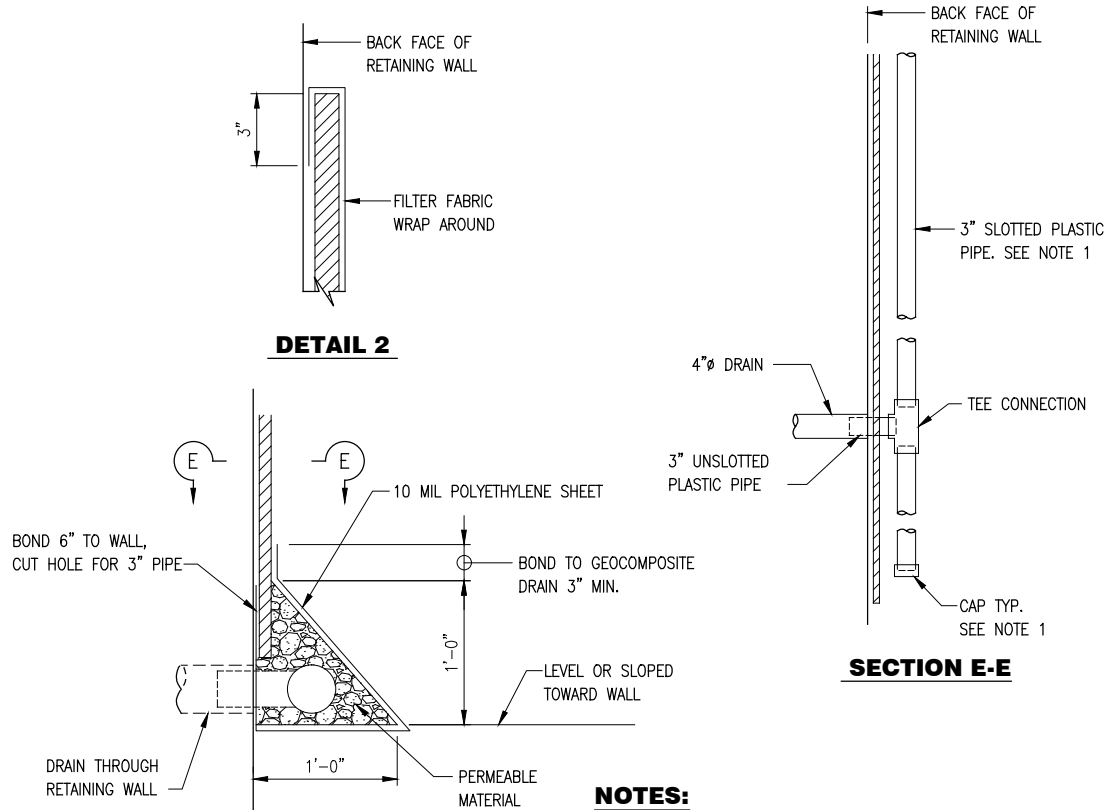
NOTE:
HANDRAILING NOT SHOWN FOR CLARITY.

RETAINING WALL TYPICAL SECTION
3/4" = 1'-0"



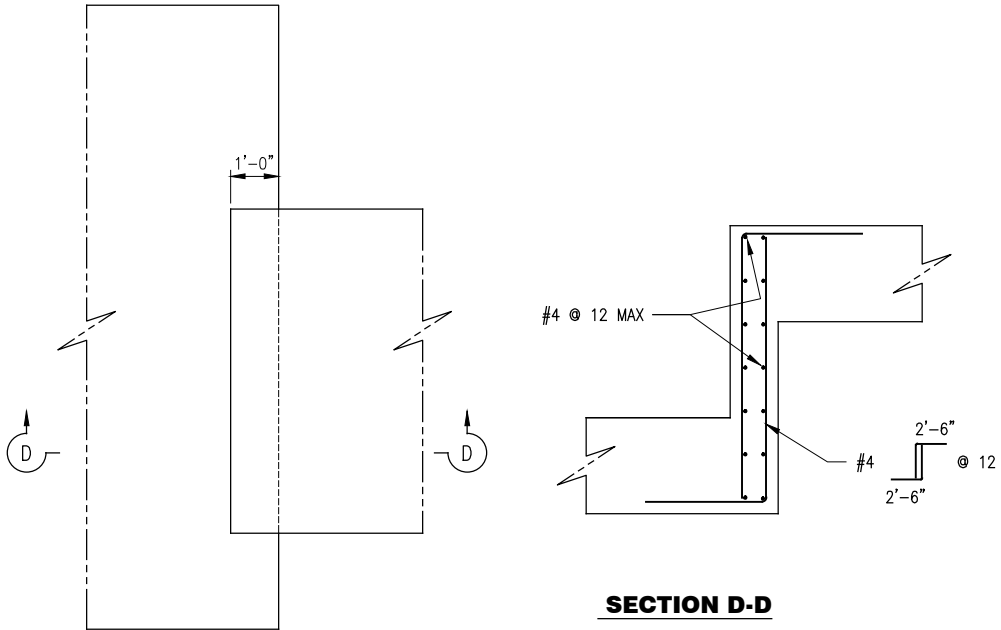
WALL OFFSET VALUES
NOT TO SCALE

REINFORCING STEEL AND DIMENSIONS TABLE			
DESIGN H	10'	8'	6'
W	8'-6"	6'-6"	5'-0"
C	2'-0"	1'-9"	1'-6"
B	6'-6"	4'-9"	3'-6"
"A" BARS	#5 @ 12	#5 @ 12	#5 @ 12
"B" BARS	#5 @ 12	#5 @ 12	#5 @ 12
"C" BARS	#5 @ 12	#5 @ 12	#5 @ 12



- NOTES:**
- GEOCOMPOSITE DRAIN, PERMEABLE MATERIAL, AND 3" Ø SLOTTED PLASTIC PIPE CONTINUOUS BEHIND RETAINING WALL. CAP ENDS OF PIPE. PROVIDE "TEE" CONNECTION AT EACH 4" Ø DRAIN.
 - FOR DETAIL 4, SEE "HANDRAILING DETAILS" SHEET.

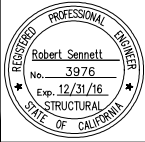
WEEP HOLE AND GEOCOMPOSITE DRAIN
NOT TO SCALE



FOOTING STEP DETAIL
1/2" = 1'-0"

REVISIONS

NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831



SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

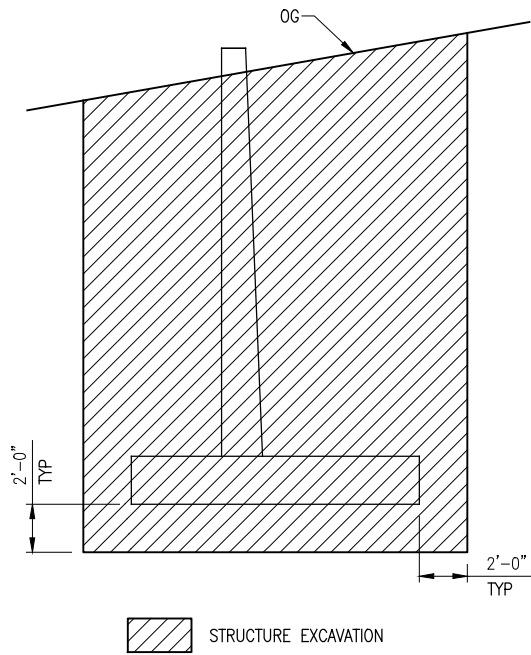
DES.: WS
DRAWN: KW
CHKD.: RS
DATE: 3/25/2015
SCALE: AS SHOWN
FLD. BK.

**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

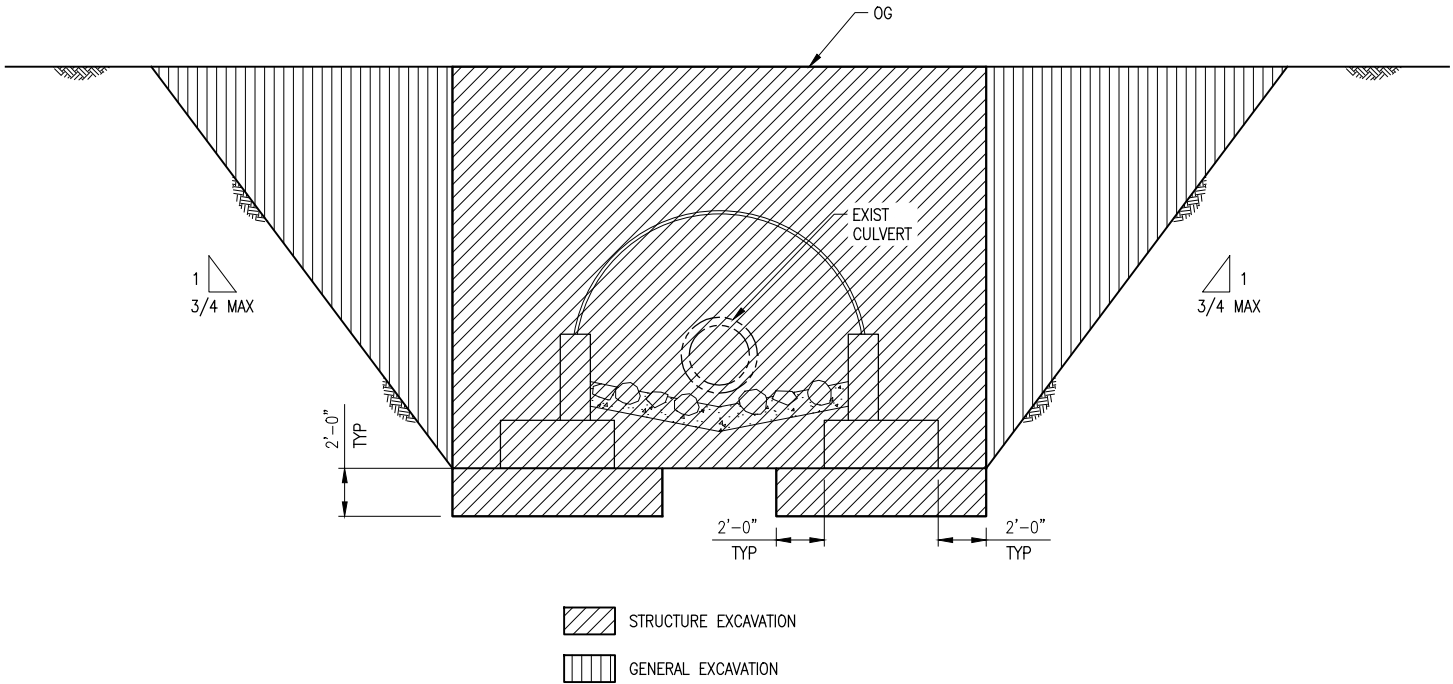
RETAINING WALL DETAILS

FILE NO. SHEET 20 OF 22

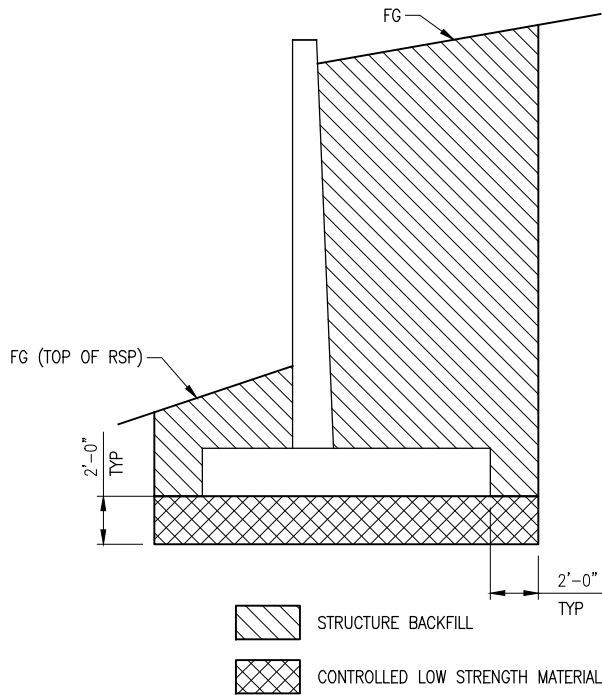
FILE NAME: PEN TBL:



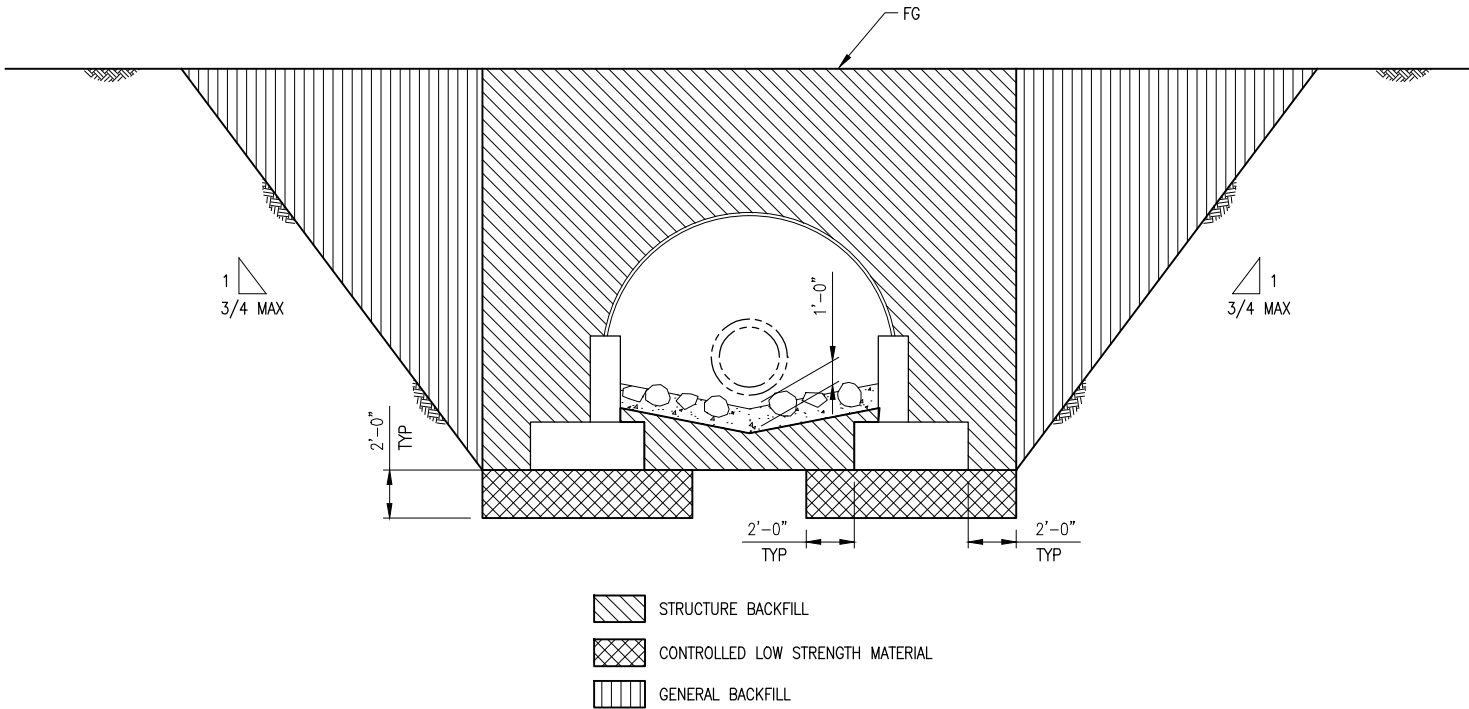
RETAINING WALL STRUCTURE EXCAVATION LIMITS
1/4" = 1'-0"



CULVERT EXCAVATION PAY LIMITS
NOT TO SCALE

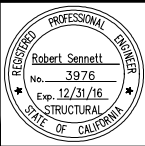


RETAINING WALL STRUCTURE BACKFILL LIMITS
1/4" = 1'-0"



CULVERT BACKFILL PAY LIMITS
NOT TO SCALE

REVISIONS			
NO.	DESCRIPTION	BY	DATE



ROBERT SENNETT
PROJECT ENGINEER

PLANS APPROVAL DATE

MGE
ENGINEERING INC.
7415 GREENHAVEN DRIVE, SUITE 100
SACRAMENTO, CA 95831

SARCA
SACRAMENTO AREA FLOOD CONTROL AGENCY
1007 7TH STREET SACRAMENTO, CA 95814

DES.: WS
DRAWN: KW
CHKD.: RS
DATE: 3/25/2015
SCALE: AS SHOWN
FLD. BK.

**SITE 18A CULVERT
REPLACEMENT AND FISH
PASSAGE ENHANCEMENT
PROJECT**

EXCAVATION AND BACKFILL PAY LIMITS	
FILE NO.	SHEET 22 OF 22
FILE NAME:	[PEN TBL:



Water Resources • Flood Control • Water Rights

M E M O R A N D U M

DATE: March 6, 2015

TO: John Bassett, SAFCA

FROM: Michael Archer, P.E.

SUBJECT: Hydraulic Impact Evaluation for Site 18A Culvert Replacement and Fish Passage Enhancement Project

The project involves replacing the existing culvert connecting the Site 18A basin to the Natomas East Main Drainage Canal (NEMDC)/Steelhead Creek low flow channel. A location map is shown in Figure 1. The culvert is located on the left bank of NEMDC/Steelhead Creek about 100 feet upstream of Northgate Boulevard. A project site map with grading plan is shown in Figure 2. The purpose of this memo is to evaluate the potential hydraulic impacts for the following objectives:

1. Satisfying the Central Valley Flood Protection Board (CVFPB) encroachment permit application requirement for applicants to provide enough information to allow Board staff to “adequately determine the proposed work[‘s]... effect upon any project facilities or adopted plan of flood control” [California Code of Regulations Title 23, Article 3, Section 8(a)], and
2. Providing enough information to enable the U.S. Army Corps of Engineers (USACE) to determine, when reviewing a request to make alterations in the American River floodplain pursuant to 33 USC 408 (Section 408) that a full Hydrologic and Hydraulics System Performance Analysis is not needed because of the lack of potential hydrologic and hydraulics impacts of the proposed alterations as described in Engineering Circular EC 1165-2-216 paragraph 7.c.(3)(b) and Appendix F.

This evaluation addresses the following two issues:

- A. Potential for induced erosion on right bank of NEMDC/Steelhead Creek opposite of the culvert outlet.
- B. Potential effects on maximum water surface elevations for design level flood events in the Lower American River.

The existing culvert is a 170 foot long 30 inch diameter reinforced concrete pipe. The proposed replacement culvert would be an arch culvert that would be 10 to 12 feet wide, about 7 feet high, and 110 feet long. A typical section of the replacement culvert is shown in Figure 3. The fish passage enhancement portion of the project will replace existing trees that are removed for construction of the culvert as well as amend and regrade the soil in the bottom of the Site 18A basin to improve the growth of grasses and sedges and reduce the potential for fish stranding during the timeframe when the basin is flooded.

A. Potential for Bank Erosion

The culvert serves as a source of water for Site 18A for seasonal flooding. As water in NEMDC/Steelhead Creek rises above the invert of the culvert, water flows into the Site 18A basin. As NEMDC/Steelhead Creek recedes, water will flow out of Site 18A back into NEMDC/Steelhead Creek. The velocity of the flow returning to NEMDC/Steelhead Creek from Site 18A is dependent on the difference in the water surface elevations between Site 18A and NEMDC/Steelhead Creek, but can also be limited by the size and length of the culvert. With the proposed replacement culvert, which is much larger and shorter than the existing culvert, the difference in water surface elevations should be small. That is, the larger and shorter culvert provides a more direct connection between NEMDC/Steelhead Creek and Site 18A so it would be expected that the water surfaces in both should closely follow each other up and down, and the flow and velocity in the culvert will be small. For this reason, it is my opinion that the proposed culvert will not produce flows or velocities sufficient to induce erosion or scour on the opposite bank of NEMDC/Steelhead Creek at the culvert outlet; therefore additional bank armoring for NEMDC/Steelhead Creek will be unnecessary.

B. Potential for Changes in Flood Elevations

In July 2014, USACE provided guidance for the level of screening and analysis that the CVFPB should include in encroachment permit applications that are sent to USACE for review (see Attachment A). The guidance specifies that “if the blockage screening calculation indicates a floodway conveyance blockage of less than 1% at the design discharge, typically no additional analysis will be required.”

The following information was used to evaluate the potential effects of the culvert replacement on the maximum water surface elevation for design level events:

- Invert elevation of the proposed culvert and basin interior = ~10 feet NAVD88
- Top elevation of the proposed culvert = ~17 feet NAVD88
- Elevation at which most of embankment separating NEMDC/Steelhead Creek and Site 18A is submerged = 24 feet NAVD88

- FEMA 1% base flood elevation at culvert = 37 feet NAVD88 (effective FIRM, 8/16/2012)
- SAFCA design water surface elevation at culvert = 38.2 feet NAVD88 (Urban Levee Design Criteria 200-year flood event with Folsom Joint Federal Project with 160,000 cfs peak American River flow)
- Velocity at culvert with American River flow of 160,000 cfs = 1 to 2 feet per second (see Figure 4; computed with RMA2 2-dimensional hydraulic model of Lower American River, MBK Engineers, 2008)

Designs for the replacement culvert (see Figure 5) show that the culvert ends and associated headwall structures will be recessed into the existing embankment, with portions of guardrails extending slightly above existing ground. The critical cross-section for the NEMDC/Steelhead Creek blockage screening extends from the west levee to the bike trail as shown in Figure 6. The total flow area for this cross-section at the SAFCA design water surface elevation of 38.2 feet (NAVD88) is approximately 4,400 square feet. Assuming complete blockage of the guardrail in the critical cross-section, the area of blockage is approximately 40 square feet, which is less than 1% of the conveyance area, therefore no additional analysis is required.

We can also see that the proposed replacement culvert will be submerged by over 20 feet of water for both the FEMA 1% water surface and the SAFCA design water surface. Also of note is that the embankment separating Site 18A and NEMDC/Steelhead Creek will be submerged by 13 to 14 feet of water, so there will be no difference in water surface between Site 18A and NEMDC/Steelhead Creek. Based on this information, the low velocities at the project site, and lack of encroachment, it is my opinion that the proposed replacement culvert will have no effect on the water surface elevations associated with design level events.

Similarly, we can also see that the proposed replacement tree and vegetation plantings will be submerged by 10 to 20 feet of water for both the FEMA 1% water surface and the SAFCA design water surface. Also of note is that the embankment separating Site 18A and NEMDC/Steelhead Creek is about 10 feet above the bottom of the basin. The grasses, the replacement shrubs, and the low stature replacement trees, which are to be planted predominantly in the bottom of the basin, would all be below the top elevation of the perimeter embankment. Based on this information, the low velocities at the project site, and lack of encroachment, it is my opinion that the proposed replacement tree and vegetation plantings will have no effect on the water surface elevations associated with design level events.



Water Resources • Flood Control • Water Rights

MEMORANDUM

DATE: July 29, 2015

TO: John Bassett, SAFCA

FROM: Michael Archer, P.E.

SUBJECT: Culvert Velocity Computation for the Site 18A Culvert Replacement and Fish Passage Enhancement Project

In response to a request from U.S. Army Corps of Engineers (USACE), MBK has calculated the maximum velocity within the proposed Site 18A replacement culvert in order to address the concerns for potential for localized scour as floodwaters recede from the Site 18A overbank storage area. The project location is shown in Figure 1. A site map and grading plan is provided in Figure 2. A plan and profile view of the proposed culvert is provided in Figure 3, and a typical section of the culvert is provided in Figure 4.

Site 18A is a basin of about 17 acres within the American River floodway at the confluence of the American River and the Natomas East Main Drainage Canal (NEMDC)¹ that is separated from the floodway by a berm with a crest elevation range of about 24 to 26 feet (NAVD88). The proposed replacement culvert is located at the north end of Site 18A and discharges water from Site 18A into the NEMDC low flow channel. The proposed culvert has an invert elevation that ranges from about 9 to 10 feet (NAVD88) and is the only source of water into and out of Site 18A when water in the floodway is lower than the lowest point on the berm. The velocity in the culvert is dependent on the difference in water surface elevation between Site 18A and the floodway, and the water surface elevation in Site 18A is dependent on the capacity of the culvert.

In order to compute the culvert velocity, a simple HEC-RAS² model representing the floodway, Site 18A, and the culvert was developed. A schematic of the model is shown in Figure 5. River reaches are represented in HEC-RAS with discrete channel cross-sections. Floodplains and areas of ponding can be represented in HEC-RAS with “storage areas,” which are defined by the relationship of the area’s elevation and volume. In this model, the floodway is represented by a combination of reaches and a storage area. Site 18A is represented by a storage area, and the culvert is represented by a connection between the floodway and Site 18A. The following parameters were used to define the culvert in the model:

¹ The NEMDC is also known as Steelhead Creek.

² USACE Hydrologic Engineering Center River Analysis System software, Version 4.1.

Length:	110 feet (from Figure 3)
Culvert shape:	Arch (from Figure 4)
Culvert height:	7 feet (from Figure 4)
Culvert width:	12 feet (from Figure 4)
Culvert invert, NEMDC side:	9.205 feet NAVD88 (from Figure 3)
Culvert invert, Site 18A side:	9.755 feet NAVD88 (from Figure 3)

A water surface elevation hydrograph representing the water surface elevation in the floodway was entered into the model at the upstream and downstream boundaries of the floodway. The HEC-RAS model calculates the corresponding flow in the culvert and water surface elevation in Site 18A.

The rate of rise and fall of the floodway water surface elevation hydrograph used for the analysis input was based on review of observed data from the American River at H Street stream gage. The starting and ending elevations for the input hydrograph was set lower than the culvert invert so that Site 18A and the culvert are dry at the start and end of the study period. The input hydrograph is shown in Figure 6.

Results

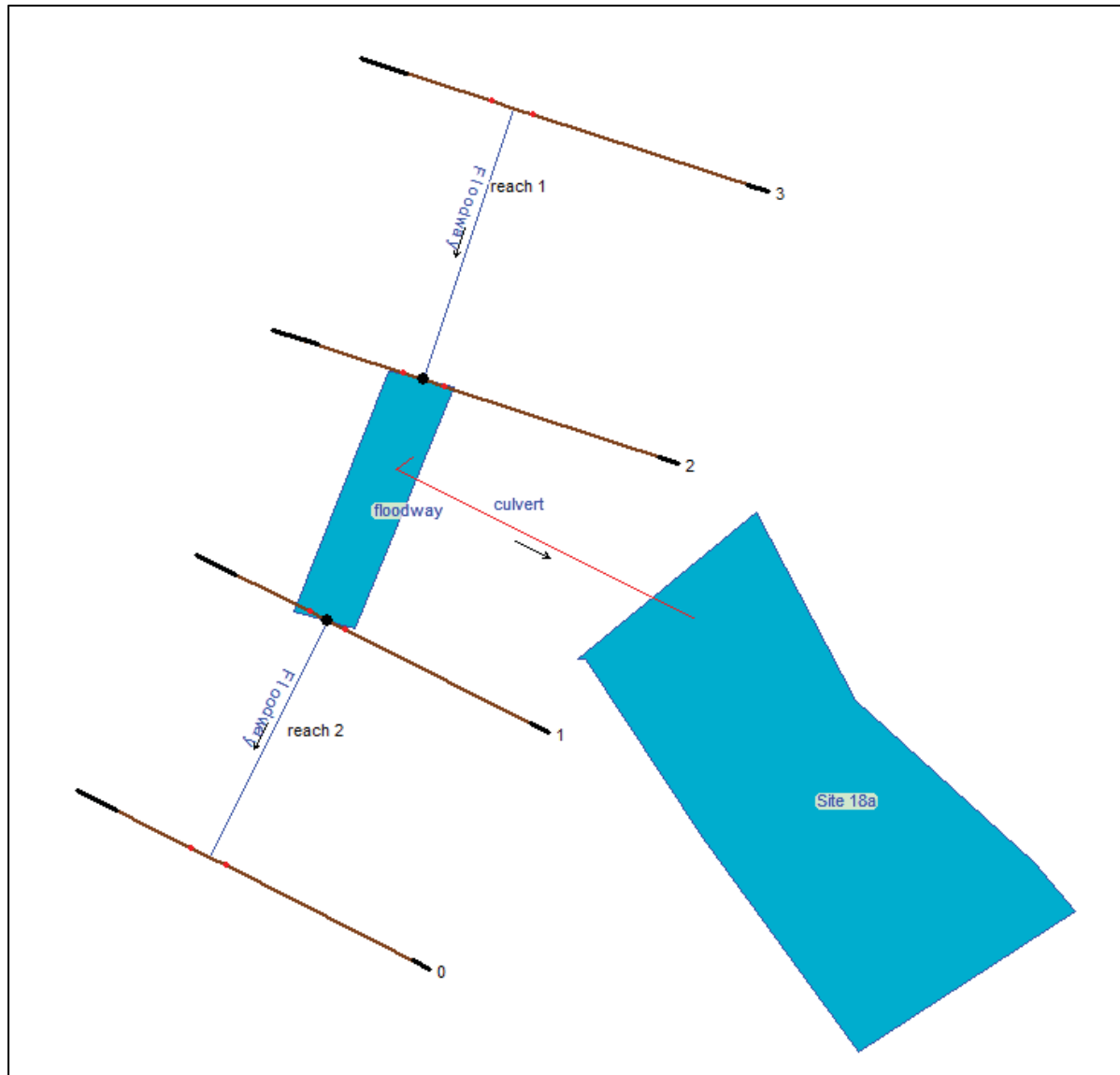
The results of the analysis indicate that there is very little difference in the water surface elevations in the floodway and Site 18A, with the difference never exceeding 0.02 feet during the recession of the water in the floodway (see Figure 7). The small difference indicates that the capacity of the culvert is not a constraint to flow. Due to the small difference in the water surface elevations, the flow and velocity through the culvert is also small. The maximum computed velocity in the culvert during the recession of the water in the floodway is 0.8 feet per second (see Figure 8).

Based on the maximum computed culvert velocity, we do not expect any erosion of the banks of the NEMDC channel as a result of flow through the culvert. In addition, as is shown in Figures 3 and 4, the culvert itself is lined with grouted rip-rap and the inlet and outlet areas at the ends of the culvert are protected from scour using grouted rip-rap and soil-covered rip-rap. Please contact me at (916) 456-4400 or archer@mbkengineers.com if you have any questions on the above.

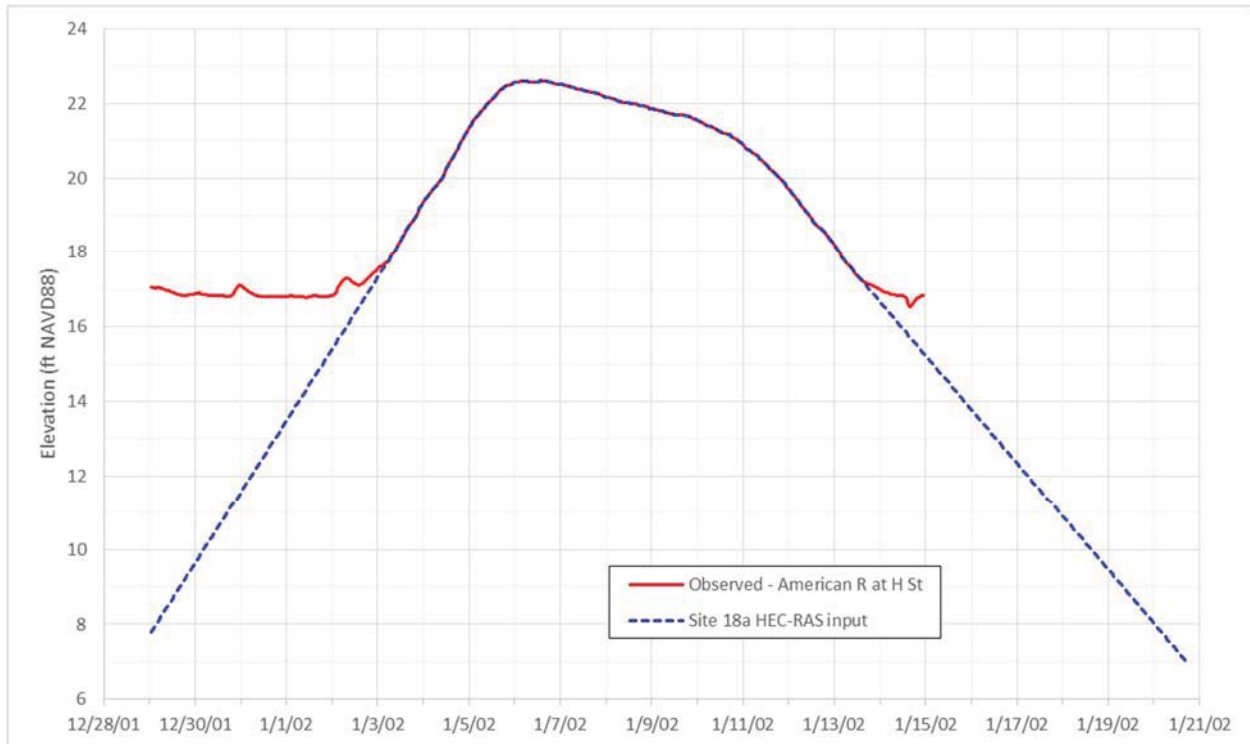
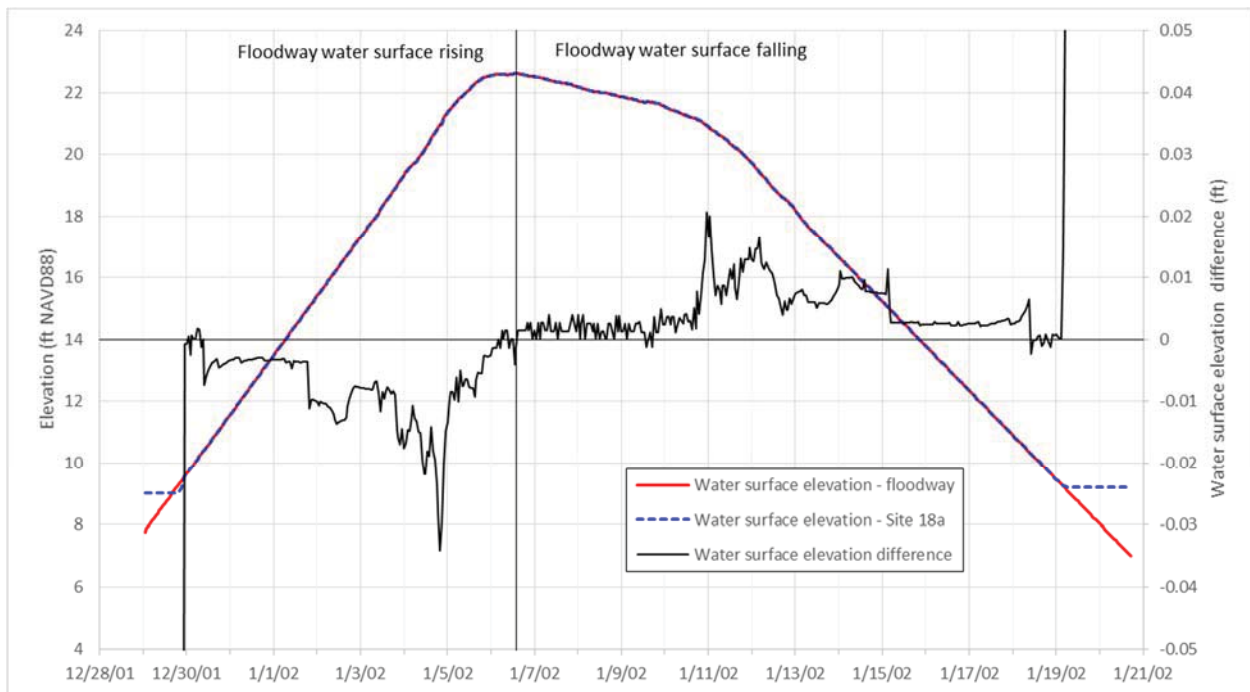


Michael Archer, P.E.

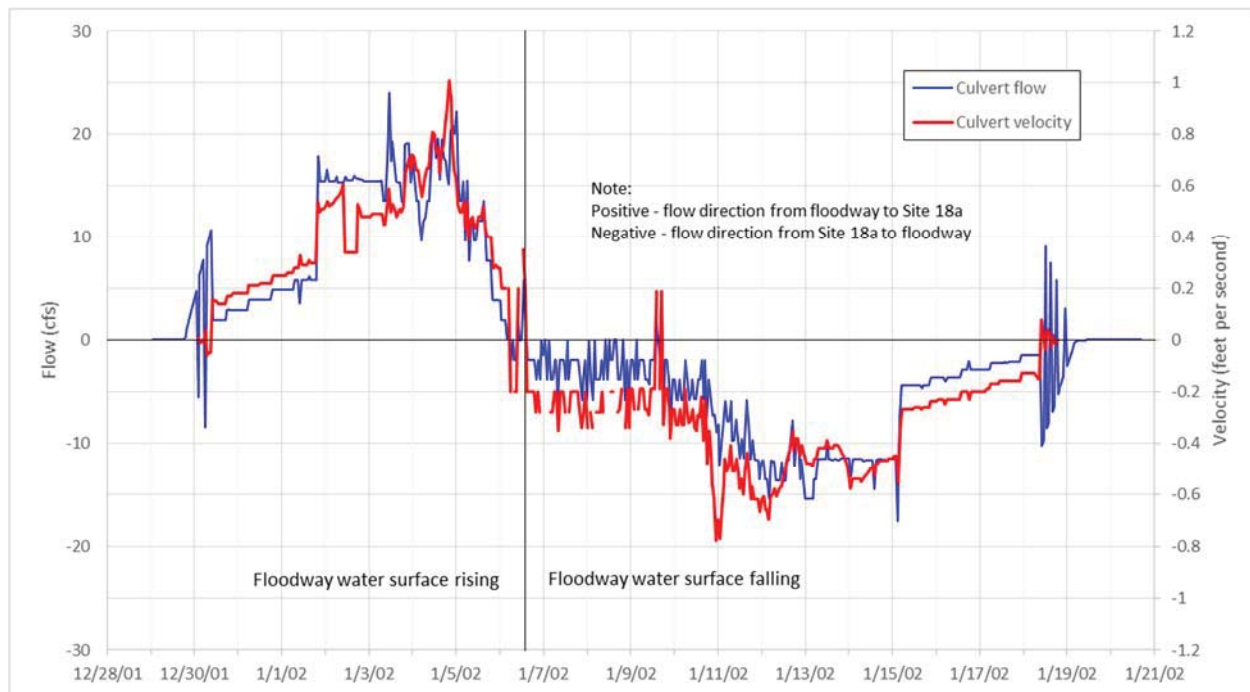
John Bassett

Culvert Velocity Computation for the Site 18A Culvert Replacement
and Fish Passage Enhancement Project**Figure 5. Culvert HEC-RAS Model Schematic**

John Bassett

Culvert Velocity Computation for the Site 18A Culvert Replacement
and Fish Passage Enhancement Project**Figure 6. Culvert HEC-RAS Model Schematic****Figure 7. Computed water surface elevations across culvert**

John Bassett

Culvert Velocity Computation for the Site 18A Culvert Replacement
and Fish Passage Enhancement Project**Figure 8. Computed culvert flow and velocity**