Meeting of the Central Valley Flood Protection Board
May 29, 2015

Staff Report

Reclamation District No. 341 – Sherman Island
Landside Levee Improvements and Modifications
Sacramento County

1.0 – ITEM

Consider approval of Draft Permit No. 18985-1
(Attachment B).

2.0 – APPLICANT

Reclamation District No. 341 (RD-341)

3.0 – LOCATION

The project is located on the left (east) bank levee of the Sacramento River approximately 8-miles downstream from Rio Vista on Sherman Island. (Sacramento River, Sacramento County, see Attachment A).

4.0 – PROJECT DESCRIPTION

The applicant proposes to construct landside levee improvements and realign a county road (West Sherman Island Road) on Sherman Island to accommodate two (2) new fish release stations referred to as Little Baja (18985-3) and Manzo Ranch (18985-2), near Sacramento River Miles 4 and 4.5 respectively. Work includes removal of existing gates and fencing, adding fill to the landside levee slope, widening the levee crown to approximately 50-feet at each fish release site to include asphalt-concrete operation pads that will facilitate truck access, asphalt paving of the levee crown between the two (2) fish release sites; construction of a 0.75-mile long, approximately 100-foot wide landside levee toe berm; and the trenching of four (4) 2-inch diameter and two (2) 4-inch diameter electrical conduits at each fish release site above the design water surface elevation.

5.0 - AUTHORITY OF THE BOARD

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

California Code of Regulations, Title 23 (Title 23)

- § 6, Need for a Permit
- § 13, Evidentiary Hearings
- § 112, Streams Regulated and Nonpermissible Work Periods
- § 120, Levees
- § 126, Fences and Gates

6.0 – PROJECT ANALYSIS

The California Department of Water Resources proposes to construct the Little Baja and Manzo Ranch fish release sites on Sherman Island to comply with the National Marine and Fisheries Services' (NMFS) Biological Opinion (BiOp) on the Long-term Operations of the Central Valley Project and State Water Project (2009) and the California Department of Fish and Wildlife's (CDFW) Longfin Smelt Incidental Take Permit (ITP) for the California State Water Project Delta Facilities and Operations (2009). Specific requirements are to reduce predation of salvaged fish at the fish release sites and increase salvaged fish survival rates.

Prior to the construction of the two (2) fish release sites, landside levee improvements and county road realignment will be required to accommodate the facilities. These improvements are being made due to concerns regarding levee stability, settlement, seepage, and safety. Improvements to address these concerns include widening the levee crown at the location of the fish release sites, placement of a landside seepage/stability berm, and the relocation of West Sherman Island Road to accommodate the two (2) fish release sites and to improve traffic safety. The seepage/stability berm will increase the factor-of-safety for levee stability and reduce seepage through the levee. DWR and RD 341 have collaborated on this project to ensure that all aspects of the entire project are compatible. All of the proposed landside levee improvements meet Title 23 standards.

6.1 – Hydraulic Analysis

A hydraulic analysis was not required as there will be no work performed on the waterside of the levee.

6.2 – Geotechnical Analysis

The significant geotechnical considerations for the project levee reach on Sherman Island are lack of erosion protection for waterside slopes, the presence of marsh soils below the levee, and ongoing settlement of the levee crest. The existing county road along the levee toe will need to be relocated to accommodate the levee rehabilitation and the two (2) new fish release stations. DWR borings from the 1950's described the levee as having landside slope failures and described the presence of numerous active seeps and slope failures. The levee has been widened and is not currently showing evidence of seepage or instability. Extensive filling was required for the USACE improvements shown in the 1954 plans. The fill may have overstressed the peat and caused failure of the levee slopes.

A seepage analysis was performed at six (6) locations along the project levee reach. Locations were chosen based on the surface and subsurface conditions encountered and are intended to represent the range of conditions along the reach. The computer program SEEP/W was used to perform the seepage analysis. The model is a two-dimension model that considers horizontal and vertical seepage in the model plane. The permeability values were estimated based on available data with similar soil conditions and the presumptive values presented in the Guidance Document for DWR Geotechnical Analyses (Revision 9, 2011).

The seepage analysis indicates that the exit gradients at the levee meet the USACE criteria for levees of 0.5 or lower. The use of flatter slopes and a toe berm will provide protection from high seepage through the levee and from slope movements. The levee on Sherman Island is founded on weak marsh deposits consisting predominately of peat and organic soil. To buttress the levee between Stations 700 and 745, where the landside slope is steeper and the island interior is lower than the remainder of the levee reach, it was determined that a 150 feet wide toe berm measured from the new landside hinge is needed to control seepage and to increase the factor of safety for slope stability. The landside levee slope will be inclined at 4H:1V.

A settlement analysis was performed to estimate settlement of the levee based on the theory of one-dimensional consolidation. The ground settles from a combination of primary consolidation and secondary compression (creep). Primary consolidation

occurs from compression of the marsh soils beginning when weight is placed on the soil. The initial weight is transferred to the water within the soil. The water builds up pressure causing flow to occur. As the water flows out of the soil, the soil structure compresses and continues to compress until the water flow is complete and the water pressure returns to hydro-static levels. Secondary compression is deformation without flow of water. With most soils, the amount of secondary compression is small relative to the primary consolidation and is not a concern. With peat, secondary compression is a significant phenomenon and is a primary cause of long-term settlement of Delta levees and their loss of freeboard. The secondary compression will continue for many years at a diminishing rate with time.

It is estimated that the toe berm and slopes will settle approximately 2 to 3 feet under the weight of 5 feet of new fill. The landside edge of the toe berm will settle about 1.0 to 1.3 feet under the weight of 2 feet of fill. The levee crown is expected to settle about 0.3 to 1.7 feet. The settlement estimates are expected within 10 years after fill placement. Design of the landside levee improvements have accounted for this anticipated settlement.

7.0 – AGENCY COMMENTS AND ENDORSEMENTS

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

- The local maintain agency for the project area is RD-341, the applicant for this project.

- The U.S. Army Corps of Engineers 208.10 comment 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.

8.0 – CEQA ANALYSIS

Board staff has prepared the following CEQA findings:

The Board, as a responsible agency under CEQA, has reviewed an Initial Study/Mitigated Negative Declaration (IS/MND) (SCH Number: 2014052035, July 2014)

and Mitigation Monitoring and Reporting Program for the Sherman Island "Little Baja and Manzo Ranch" Fish Release Sites Project prepared by the lead agency, the Department of Water Resources. These documents, including project design, may be viewed or downloaded from the Central Valley Flood Protection Board website at http://www.cvfpb.ca.gov/meetings/2015/05-29-2015.cfm under a link for this agenda item. These documents are also available for review in hard copy at the Board and the Department of Water Resources offices.

The Department of Water Resources determined that the project would not have a significant effect on the environment on November 10, 2014 and filed a Notice of Determination on November 12, 2014 with the State. Board staff finds that although the proposed project could have a potentially significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. The project proponent has incorporated mandatory mitigation measures 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 IS/MND and address impacts to air quality, biological resources and hazards and hazardous materials. The description of the mitigation measures are further described in the adopted IS/MND.

9.0 – WATER CODE SECTION 8610.5 CONSIDERATIONS

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

   The Board has considered all the evidence presented in this matter, including the original and updated applications and supporting documents, this Staff Report and attachments, all other evidence presented by any individual or group, and all letters and other correspondence received by the Board and in the Board's files related to this matter.

2. The best available science that related to the scientific issues presented by the executive officer, legal counsel, the Department or other parties that raise credible scientific issues.

   The accepted industry standards for the earth work proposed and water delivery channels under this permit as regulated by Title 23 have been applied to the review of this permit.

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

   The proposed project will improve the structural stability of the levee; therefore there will be no adverse effect on facilities of the State Plan of Flood Control. In addition the project is consistent with the 2012 Central Valley Flood Protection Plan.

   The Delta Stewardship Council (DSC), and its authorizing statutes, requires that any actions in the Delta be consistent with the Delta Plan. DWR staff and DSC staff met to discuss the entire Sherman Island "Little Baja and Manzo Ranch" Fish Release Sites Project (Project) and it was determined that (under Step 3 of the DSC review process) the Project was not covered by any of the regulatory policies of the Delta Plan since the primary purpose of the Project was for releasing fish. It was further agreed that construction of the levee berm was an ancillary benefit to the Project and not the Project's primary purpose. Therefore, policies ER P4 (proposed actions that would construct or rehabilitate levees) and RR P1 (proposed actions that involve discretionary State investments in Delta flood risk management) would not be applicable to this Project.

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

   There will be no effects of reasonable projected future events as the project will be located on the landside of the levee. Rising sea levels due to global warming may result in the need to raise the crown elevation of the levee.

10.0 – STAFF RECOMMENDATION

Staff recommends that the Board:

Adopt:

- the CEQA findings;

Approve:

- draft Encroachment Permit No. 18985-1 in substantially the form provided; and

Direct:

- the Executive officer to take the necessary actions to execute the permit and file a Notice of Determination pursuant to CEQA with the State Clearinghouse.

11.0 – LIST OF ATTACHMENTS

A. Location Maps and Photos
B. Draft Permit No. 18985-1
C. Project Drawings
D. Geotechnical Report

Design Review:	Gary W. Lemon P.E.
Environmental Review:	Andrea Buckley, Senior Environmental Scientist
Document Review:	Mitra Emami P.E., Branch Chief - Permitting and Enforcement
	Len Marino P.E., Chief Engineer
Legal Review:	Nicole Rinke, Counsel

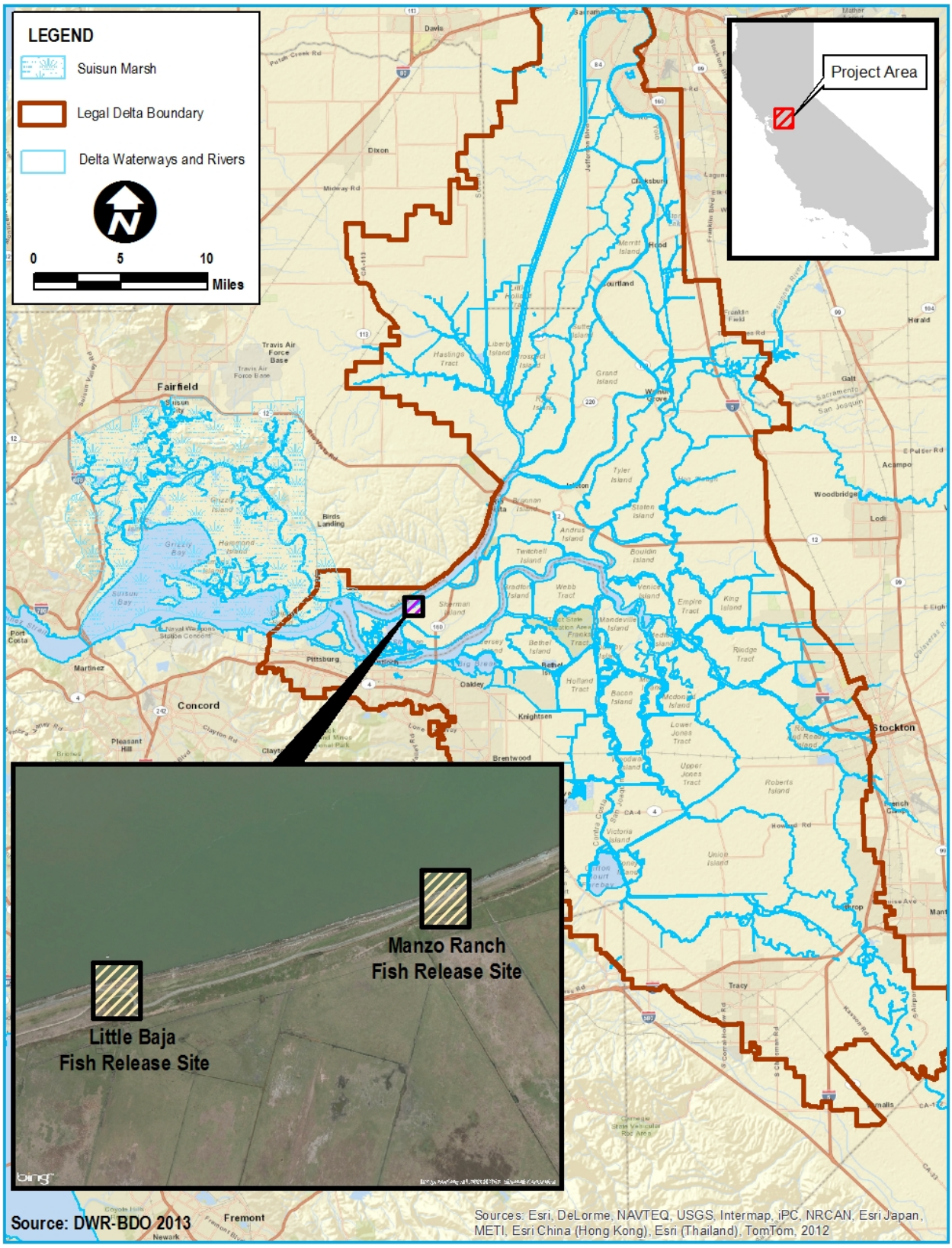
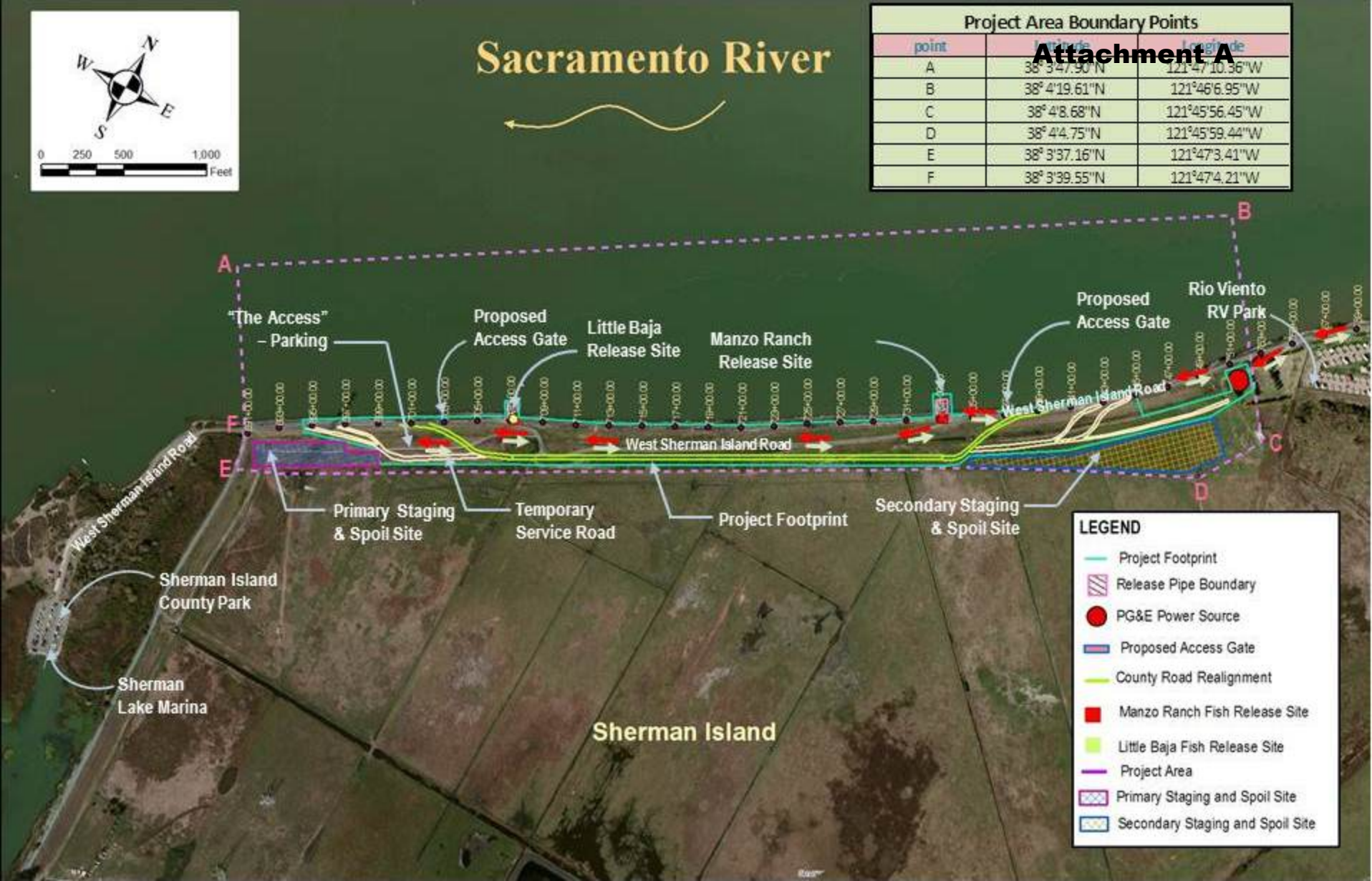


Figure 1: Little Baja and Manzo Ranch Fish Release Sites Location Map


Sacramento River
N
W
E
S
0 250 500 1,000
Feet
Project Area Boundary Points
point | Latitude | Longitude
A | 38° 3'47.90"N | 121°47'10.36"W
B | 38° 4'19.61"N | 121°46'6.95"W
C | 38° 4'8.68"N | 121°45'56.45"W
D | 38° 4'4.75"N | 121°45'59.44"W
E | 38° 3'37.16"N | 121°47'3.41"W
F | 38° 3'39.55"N | 121°47'4.21"W
Attachment A
A
B
C
D
E
F
"The Access" – Parking
Proposed Access Gate
Little Baja Release Site
Manzo Ranch Release Site
Proposed Access Gate
Rio Viento RV Park
West Sherman Island Road
West Sherman Island Road
West Sherman Island Road
Primary Staging & Spoil Site
Temporary Service Road
Project Footprint
Secondary Staging & Spoil Site
Sherman Island County Park
Sherman Lake Marina
Sherman Island
LEGEND
Project Footprint
Release Pipe Boundary
PG&E Power Source
Proposed Access Gate
County Road Realignment
Manzo Ranch Fish Release Site
Little Baja Fish Release Site
Project Area
Primary Staging and Spoil Site
Secondary Staging and Spoil Site

Attachment B

DRAFT

STATE OF CALIFORNIA
THE RESOURCES AGENCY

THE CENTRAL VALLEY FLOOD PROTECTION BOARD

PERMIT NO. 18985-1 BD

This Permit is issued to:

Reclamation District 341 (Sherman Island)
18419 Highway 160
Rio Vista, California 94571

To construct landside levee improvements and realign a county road (West Sherman Island Road) on Sherman Island to accommodate two (2) new fish release stations referred to as Manzo Ranch (18985-2) and Little Baja (18985-3), near Sacramento River Miles 4.5 and 4.0 respectively. Work includes removal and replacement of existing gates and fencing, adding fill to the landside levee slope, widening the levee crown to approximately 50-feet at each fish release site to include asphalt-concrete operation pads that will facilitate truck access, asphalt paving of the levee crown between the two (2) fish release sites; construction of a 0.75-mile long, approximately 100-foot wide landside levee toe berm; and the trenching of four (4) 2-inch diameter and two (2) 4-inch diameter electrical conduits at each fish release site above the design water surface elevation.

The project is located on the left (east) bank levee of the Sacramento River approximately 8-miles downstream from Rio Vista on Sherman Island (Section 28, 32, 33, T3N, R2E, MDB&M, Reclamation District 341, Sacramento River, 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. 18985-1 BD

LIABILITY AND INDEMNIFICATION

THIRTEEN: The permittee is responsible for all liability associated with construction, operation, and maintenance of the permitted facilities and shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California; including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), 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.

FOURTEEN: The permittee shall defend, indemnify, and hold the Central Valley Flood Protection Board and the State of California, including its agencies, departments, boards, commissions, and their respective officers, agents, employees, successors and assigns (collectively, the "State"), safe and harmless, of and from all claims and damages related to the Central Valley Flood Protection 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.

FIFTEEN: The Central Valley Flood Protection Board and Department of Water Resources 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: 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 Central Valley Flood Protection Board.

SEVENTEEN: Construction work of any type shall not be done on the levee or within the levee section during the flood season from November 1st to April 15th.

EIGHTEEN: The permittee shall be responsible for repair of any damages to the project levee and other flood control facilities due to construction, operation, or maintenance of the proposed project.

NINETEEN: The permittee shall comply with all conditions set forth in the letter from the Department of the Army (U.S. Army Corps of Engineers, Sacramento District) dated _____, which is attached to this permit as Exhibit __ and is incorporated by reference.

PRE-CONSTRUCTION

TWENTY: Upon receipt of a signed copy of the issued permit the permittee shall contact the Central Valley Flood Protection Board by telephone at (916) 574-0609, and submit the enclosed postcard, to schedule a preconstruction conference with the inspector that is assigned to your project. Failure to do so at least 10 working days prior to start of work may result in a delay of the project.

CONSTRUCTION

TWENTY-ONE: All cleared trees and brush shall be completely burned or removed from the project area and off all Project Works.

TWENTY-TWO: Prior to placement of fill for the toe berm and against the levee slope all surface vegetation shall be removed to a depth of 6 inches. Organic soil and roots larger than 1-1/2 inches in diameter shall be removed to a depth of 3 feet.

TWENTY-THREE: All fill material shall be imported impervious material with 20 percent or more passing the No. 200 sieve, a plasticity index of 8 or more, and a liquid limit of less than 50 and free of lumps or stones exceeding 3 inches in greatest dimension, vegetative matter, or other unsatisfactory material. Fill material shall be compacted in 4- to 6-inch layers to a minimum of 90 percent relative compaction as measured by ASTM Method D1557-91 or equivalent.

TWENTY-FOUR: Fill on the levee slope shall be keyed into the existing levee section with each lift.

TWENTY-FIVE: Positive drainage away from the levee toe shall be provided in all fill areas.

TWENTY-SIX: The invert of the electrical conduit through the levee section shall be above the design flood plane elevation of 8.7 feet, NGVD 29.

TWENTY-SEVEN: The electrical conduit shall be buried at least 12 inches below the landward levee slope.

TWENTY-EIGHT: Only impervious material shall be used for pipe bedding within the levee section.

VEGETATION / ENVIRONMENTAL MITIGATION

TWENTY-NINE: The mitigation measures approved by the CEQA lead agency and the permittee are found in its Mitigation and Monitoring Reporting Program (MMRP) adopted by the CEQA lead agency. The permittee shall implement all such mitigation measures.

POST-CONSTRUCTION

THIRTY: All debris generated by this project shall be disposed of outside the Project Works.

THIRTY-ONE: The project area shall be restored to at least the condition that existed prior to commencement of work.

THIRTY-TWO: The permittee shall replant or reseed the levee slopes to restore sod, grass, or other non-woody ground covers if damaged during project work.

THIRTY-THREE: Upon completion of the project, the permittee shall submit as-constructed drawings to: Department of Water Resources, Flood Project Inspection Section, 3310 El Camino Avenue, Suite 256, Sacramento, California 95821.

OPERATIONS AND MAINTENANCE

THIRTY-FOUR: The permittee shall maintain the permitted encroachment(s) and the project works within the utilized area in the manner required and as requested by the authorized representative of the Department of Water Resources or any other agency responsible for maintenance.

THIRTY-FIVE: The permitted encroachment(s) shall not interfere with operation and maintenance of the flood control project. If the permitted encroachment(s) are determined by any agency responsible for operation or maintenance of the flood control project to interfere, the permittee shall be required, at permittee's cost and expense, to modify or remove the permitted encroachment(s) under direction of the Central Valley Flood Protection Board or Department of Water Resources. If the permittee does not comply, the Central Valley Flood Protection Board may modify or remove the encroachment(s) at the permittee's expense.

PROJECT ABANDONMENT / CHANGE IN PLAN OF FLOOD CONTROL

THIRTY-SIX: If the project, or any portion thereof, is to be abandoned in the future, the permittee or successor shall abandon the project under direction of the Central Valley Flood Protection Board and Department of Water Resources, at the permittee's or successor's cost and expense.

THIRTY-SEVEN: 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 any present or future flood control plan or project or if damaged by any cause. If the permittee does not comply, the Central Valley Flood Protection Board may remove the encroachment(s) at the permittee's expense.

END OF CONDITIONS

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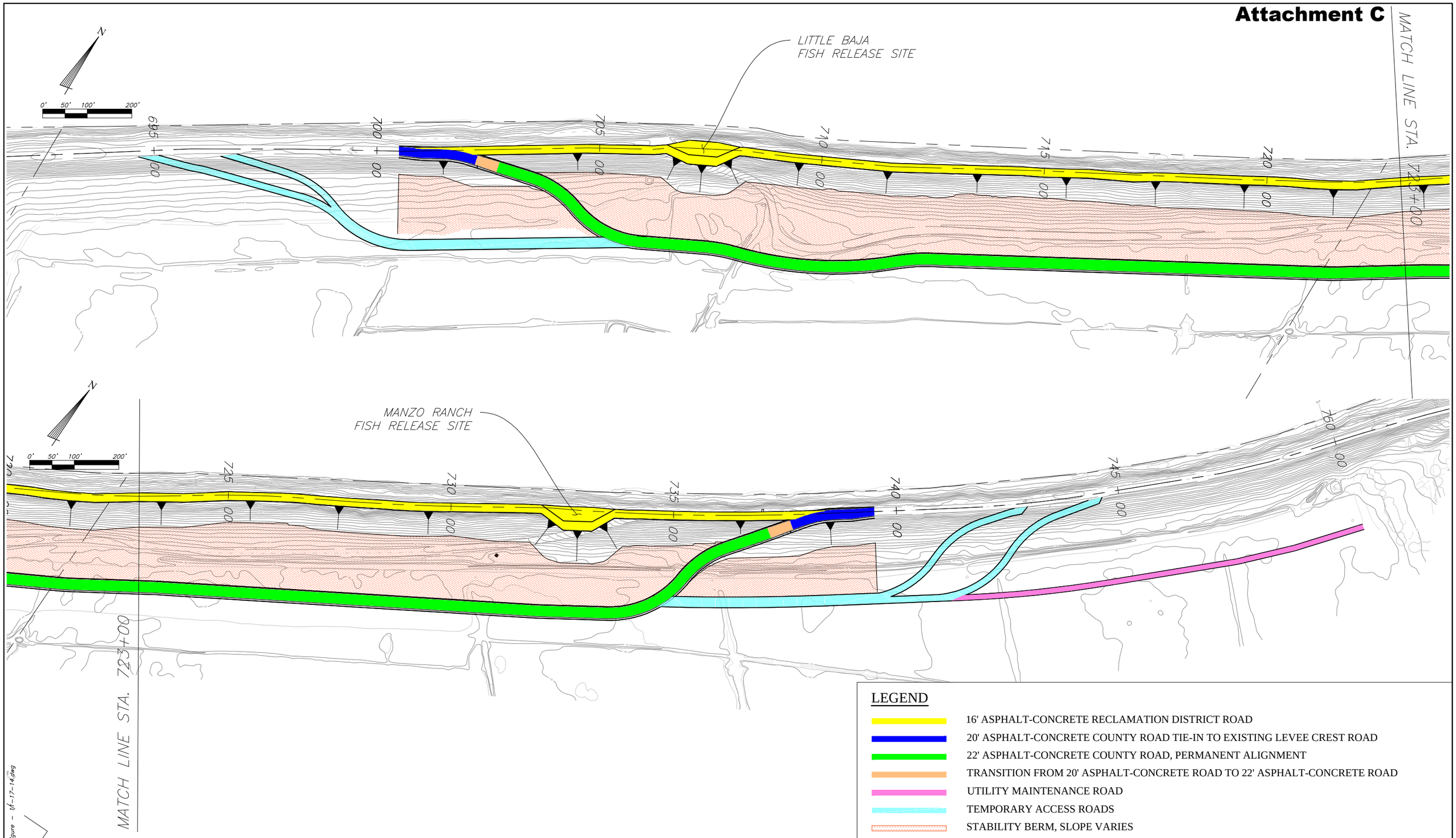
Attachment C



LEGEND

- 16' ASPHALT-CONCRETE RECLAMATION DISTRICT ROAD
- 20' ASPHALT-CONCRETE COUNTY ROAD TIE-IN TO EXISTING LEVEE CREST ROAD
- 22' ASPHALT-CONCRETE COUNTY ROAD, PERMANENT ALIGNMENT
- TRANSITION FROM 20' ASPHALT-CONCRETE ROAD TO 22' ASPHALT-CONCRETE ROAD
- UTILITY MAINTENANCE ROAD
- TEMPORARY ACCESS ROADS
- STABILITY BERM, SLOPE VARIES

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\CVFPB Project Overview Figure - 11-17-14.dwg

File Name: CVFPB Project Overview Figure - 11-17-14.dwg
Scale Factor: XX
Plot Date: 11-17-2014

NOTE:
BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 06/29/2010

NOT FOR PUBLIC USE OR DISTRIBUTION

REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-448-3866

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23013 EXP. 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PROJECT OVERVIEW

SHEET 1 OF 1 SHEETS

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RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND
"LITTLE BAJA" AND "MANZO RANCH"
FISH RELEASE SITES

Sacramento County **California**

WAGNER & BONSIGNORE • CONSULTING CIVIL ENGINEERS • A CORPORATION
2151 RIVER PLAZA DRIVE, SUITE 100 • SACRAMENTO, CALIFORNIA

Attachment C

SHEET INDEX

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File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOT FOR PUBLIC USE OR DISTRIBUTION

REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

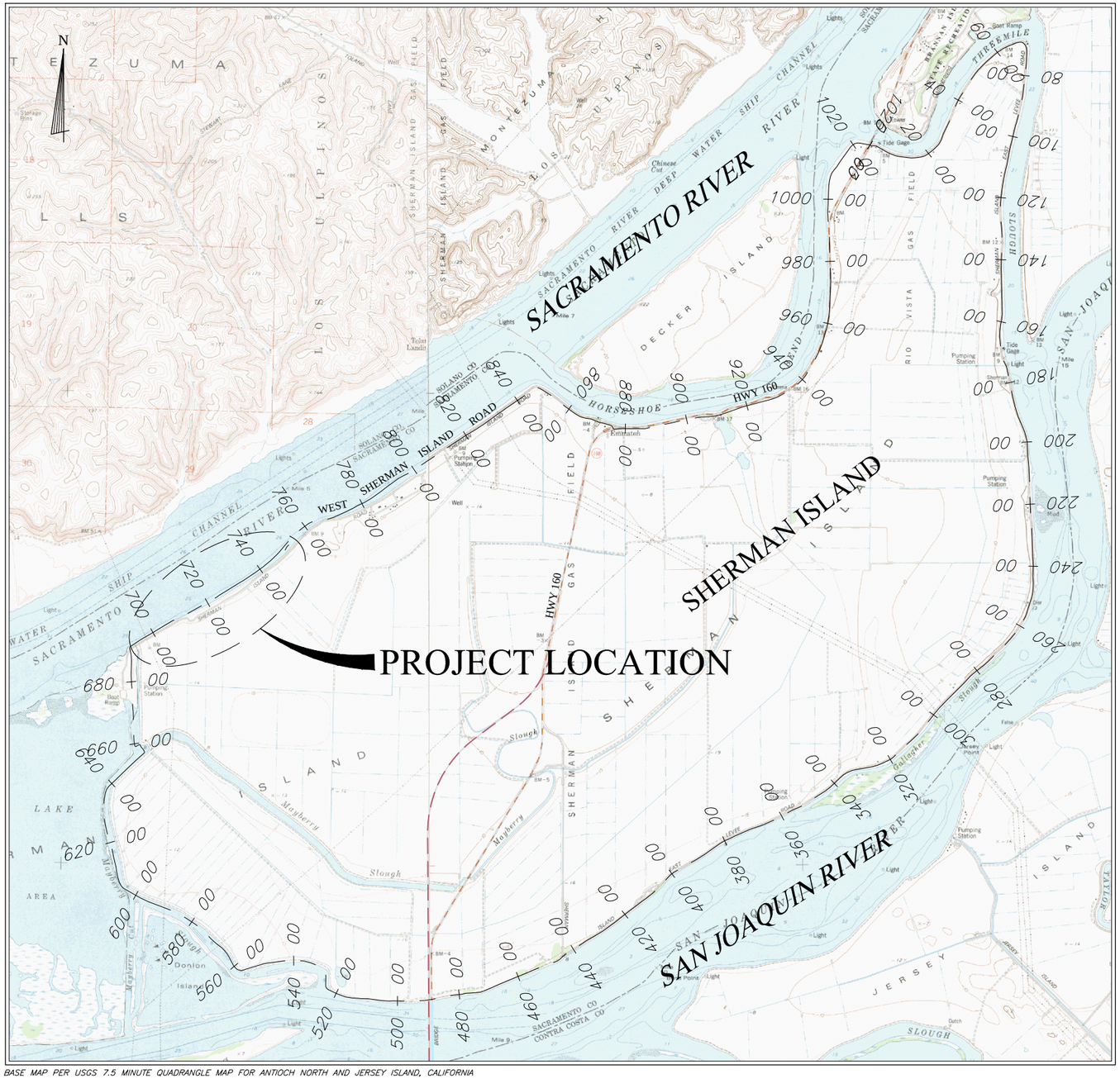
Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 25903
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
SHEET INDEX

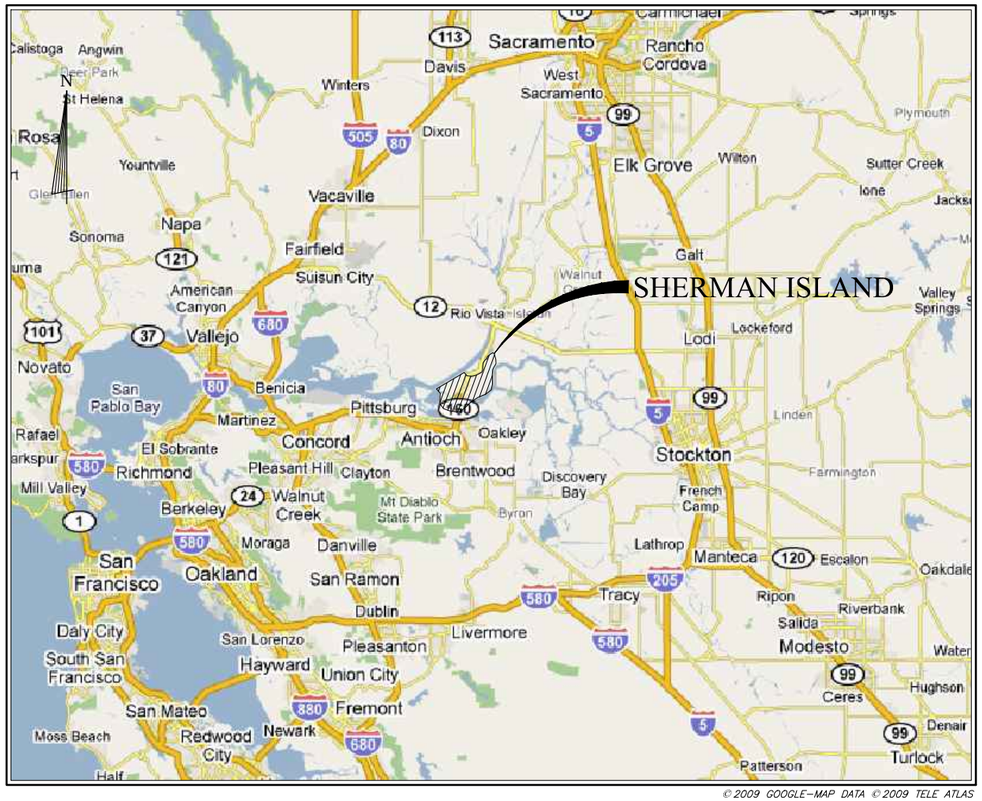
SHEET 1 OF 45 SHEETS



BASE MAP PER USGS 7.5 MINUTE QUADRANGLE MAP FOR ANTIOCH NORTH AND JERSEY ISLAND, CALIFORNIA

LOCATION MAP

0' 1000' 2000' 4000'



© 2009 GOOGLE–MAP DATA © 2009 TELE ATLAS

VICINITY MAP

N.T.S.

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File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23903 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

LOCATION MAP AND VICINITY MAP

SHEET 2 OF 45 SHEETS

Attachment C

Station	Levee Embankment		Stability Toe Berm		New County Road	Utility Easement Road	Misc.
	Distance from Construction Reference Line to Compacted Embankment Control Point	Elevation at Compacted Embankment Control Point	Approximate Distance from Construction Reference Line to Toe of Existing Levee	Approximate distance from Construction Reference Line to Stability Toe Berm Hinge	Approximate Distance from Construction Reference Line to CL of New County Road	Approximate Distance from Construction Reference Line to CL of Utility Easement Road	Approximate Distance from Construction Reference Line to Waterside Hinge of Existing Levee
694+00	-	-	-	-	-	-	20.5 *
695+00	-	-	-	-	-	-	21.2 *
696+00	-	-	-	-	-	-	26.4 *
697+00	-	-	-	-	-	-	27.0 *
698+00	-	-	-	-	-	-	25.6 *
699+00	-	-	-	-	-	-	22.8 *
700+00	Match Existing Levee	Match Existing Levee	50	-	-	-	15.8 *
701+00	21.4	13.8	53	167	5	-	11.7 *
702+00	32.7	13.8	58	160	16	-	10.6 *
703+00	12.0	13.8	59	160	49	-	15.9 *
704+00	12.0	13.8	68	160	92	-	12.2 *
705+00	12.0	13.8	60	160	178	-	10.1 *
706+00	12.0	13.8	62	160	209	-	19.0 *
707+00	35.6	16.0	84	184	218	-	18.0 *
708+00	19.3	14.4	84	186	221	-	20.3 *
709+00	12.0	13.8	75	160	217	-	11.4 *
710+00	12.0	13.8	108	160	211	-	17.3 *
711+00	12.0	13.8	109	160	207	-	18.8 *
712+00	12.0	13.8	116	160	205	-	17.9 *
713+00	12.0	13.8	117	160	206	-	11.7 *
714+00	12.0	13.8	114	160	206	-	14.1 *
715+00	14.0	13.8	118	162	207	-	8.4 *
716+00	12.0	13.8	113	160	206	-	9.9 *
717+00	16.0	13.8	116	164	205	-	6.7 *
718+00	12.0	13.8	112	160	204	-	11.6 *
719+00	12.0	13.8	102	160	203	-	8.8 *
720+00	12.0	13.8	100	160	203	-	9.0 *
721+00	16.0	13.8	96	164	204	-	5.4 *
722+00	17.0	13.8	96	165	202	-	4.3 *
723+00	12.0	13.8	100	160	203	-	8.4 *
724+00	15.0	13.8	107	163	210	-	5.2 *
725+00	12.0	13.8	94	160	217	-	8.6 *
726+00	12.0	13.8	92	160	220	-	10.5 *
727+00	12.0	13.8	105	160	220	-	9.0 *
728+00	12.0	13.8	99	160	219	-	9.0 *
729+00	13.0	13.8	93	161	219	-	7.3 *
730+00	12.0	13.8	85	160	222	-	10.0 *
731+00	12.0	13.8	103	160	227	-	10.0 *
732+00	13.0	13.8	106	195	232	-	7.2 *
733+00	45.4	16.3	110	193	228	-	11.0 *
734+00	13.0	13.8	89	168	222	-	12.6 *
735+00	12.0	13.8	81	160	168	195	15.6 *
736+00	12.0	13.8	81	160	80	195	13.6 *
737+00	12.0	13.8	72	160	45	195	15.2 *
738+00	28.5	13.8	98	160	11	195	19.0 *
739+00	19.8	13.8	96	165	3	195	13.8 *
740+00	Match Existing Levee	Match Existing Levee	94	-	-	200	11.5 *
741+00	-	-	-	-	-	200	17.6 *
742+00	-	-	-	-	-	200	12.6 *
743+00	-	-	-	-	-	200	15.3 *
744+00	-	-	-	-	-	200	13.6 *
745+00	-	-	-	-	-	200	14.2 *
746+00	-	-	-	-	-	200	13.9 *
747+00	-	-	-	-	-	200	12.9 *
748+00	-	-	-	-	-	200	11.1 *
749+00	-	-	-	-	-	200	6.1 *
750+00	-	-	-	-	-	200	10.3 *

PROJECT CONTROL

* WATERSIDE LIMIT OF CONSTRUCTION. FIELD VERIFY LOCATION PRIOR TO CONSTRUCTION ACTIVITIES.

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOT FOR PUBLIC USE OR DISTRIBUTION

REVISIONS

REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By: S.R. HERINGER
Drawn By: S.R. HERINGER
Checked By: H.S. MATSUNAGA
Approved By: R.C. WAGNER
Date: NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
PROJECT CONTROL

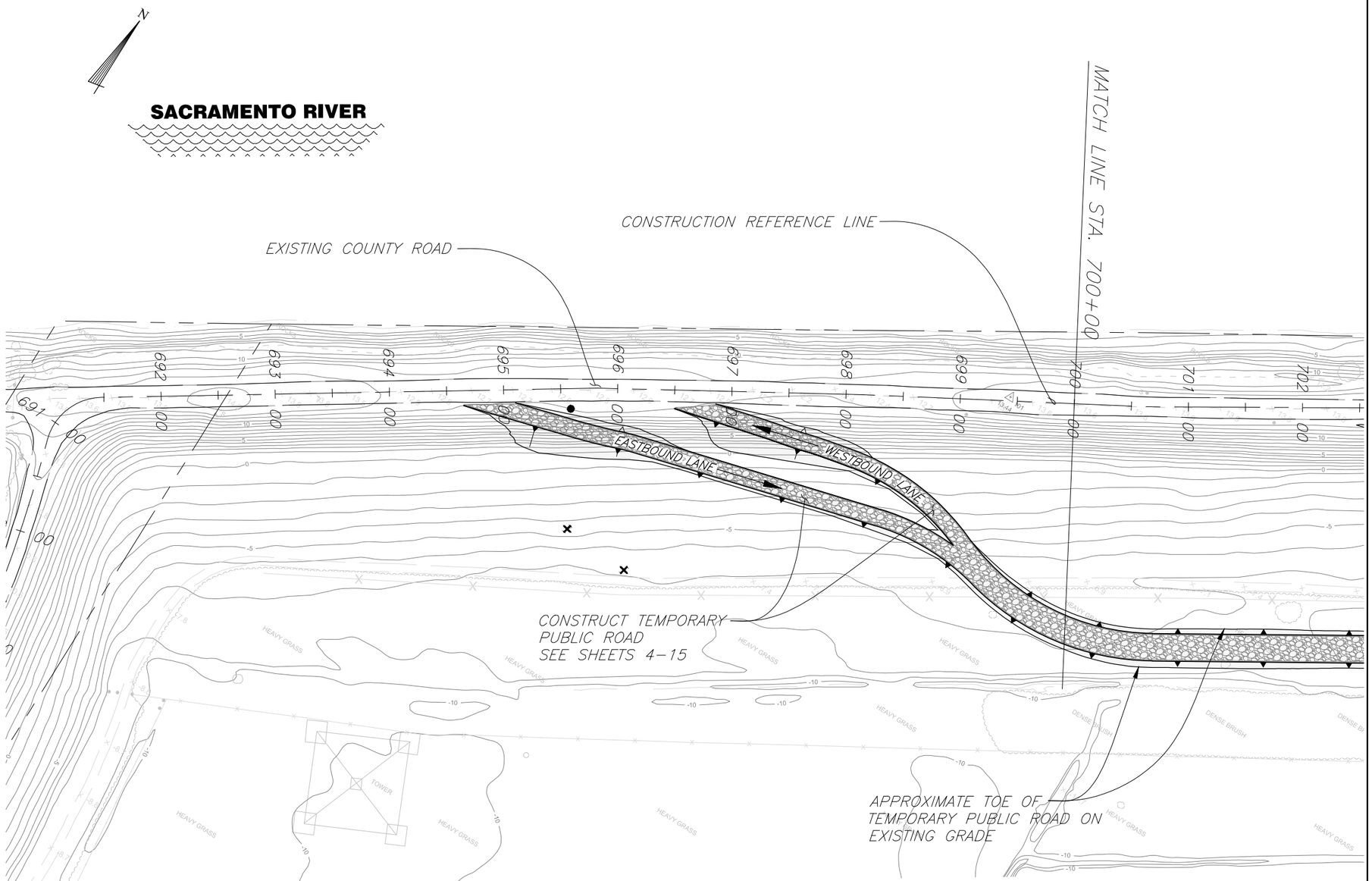
SHEET 3 OF 45 SHEETS

Attachment C

Station	Temporary Road: Approximate Distance from Construction Reference Line to CL of Temporary Road
694+00	-
695+00	19
696+00	45
697+00	23, 71
698+00	54, 99
699+00	118, 138
700+00	198
701+00	211
702+00	211
703+00	212
704+00	212
705+00	212
706+00	209
707+00	218
708+00	226
709+00	236
710+00	239
711+00	230
712+00	208
713+00	206
714+00	206
715+00	207
716+00	206
717+00	205
718+00	204
719+00	203
720+00	203
721+00	204
722+00	202

Station	Temporary Road: Approximate Distance from Construction Reference Line to CL of Temporary Road
723+00	203
724+00	210
725+00	217
726+00	220
727+00	220
728+00	219
729+00	219
730+00	222
731+00	227
732+00	232
733+00	228
734+00	222
735+00	195
736+00	195
737+00	195
738+00	195
739+00	195
740+00	176, 200
741+00	89, 200
742+00	31, 158
743+00	58
744+00	25
745+00	-
746+00	-
747+00	-
748+00	-
749+00	-
750+00	-

TEMPORARY ROAD CONTROL



APN: 158-0080-008-0000
STATE OF CALIFORNIA

TEMPORARY ROAD PLAN

0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
- EXISTING INCLINOMETER – TO BE REMOVED BY ENGINEER
- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- APPROXIMATE PARCEL BOUNDARY

H:\CH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:
1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.

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NOT FOR CONSTRUCTION

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Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42983 12/31/14 CIVIL STATE OF CALIFORNIA

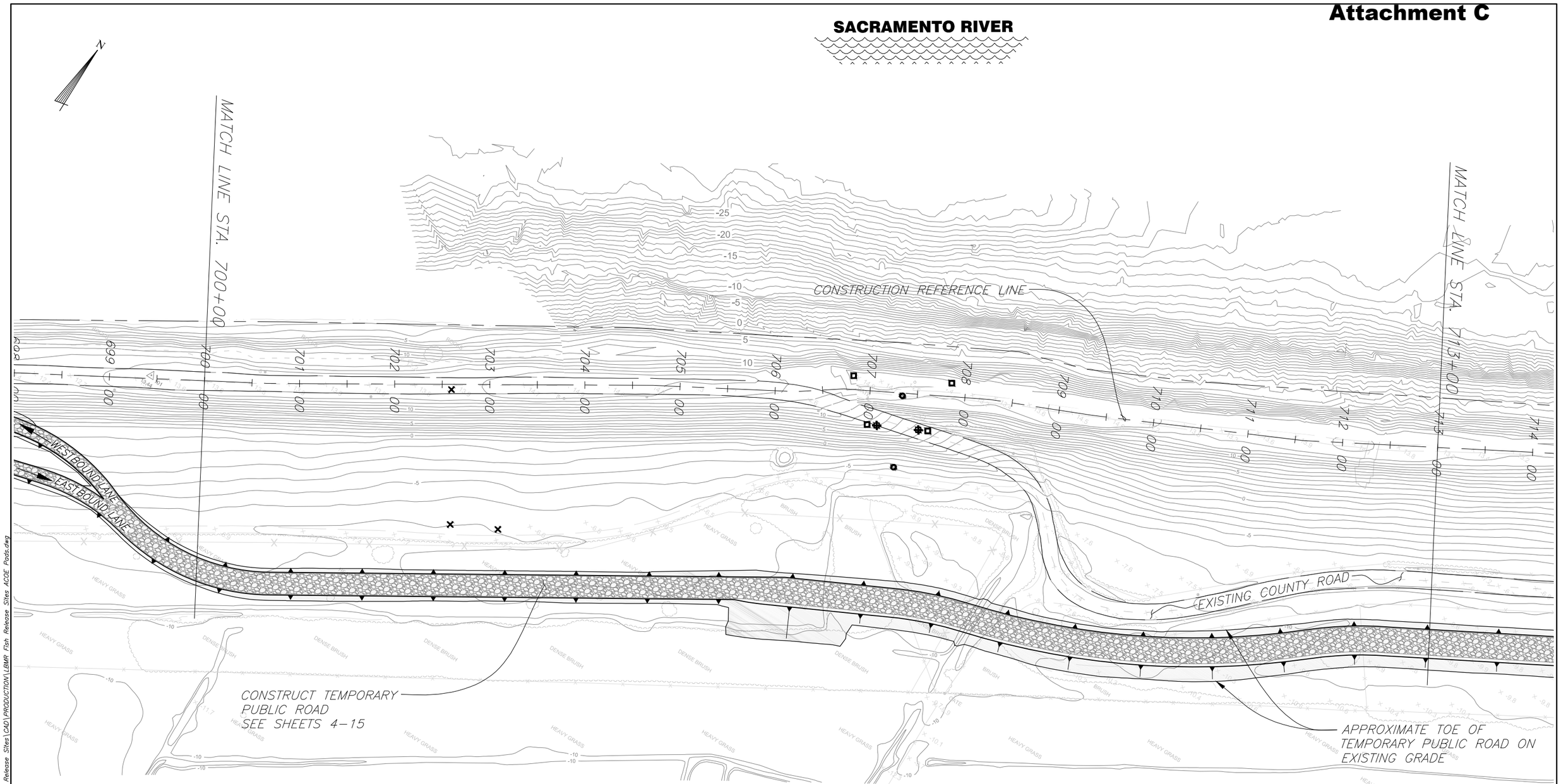
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

TEMPORARY ROAD PLAN STATIONS 687+00 - 700+00 AND PROJECT CONTROL

SHEET 4 OF 45 SHEETS

Attachment C



APN: 158-0080-008-0000
STATE OF CALIFORNIA

TEMPORARY ROAD PLAN

0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
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- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- APPROXIMATE PARCEL BOUNDARY

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Site ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:
1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.
2) BATHYMETRIC TOPOGRAPHY FROM DEPARTMENT OF WATER RESOURCES, SURVEYED MARCH 2014

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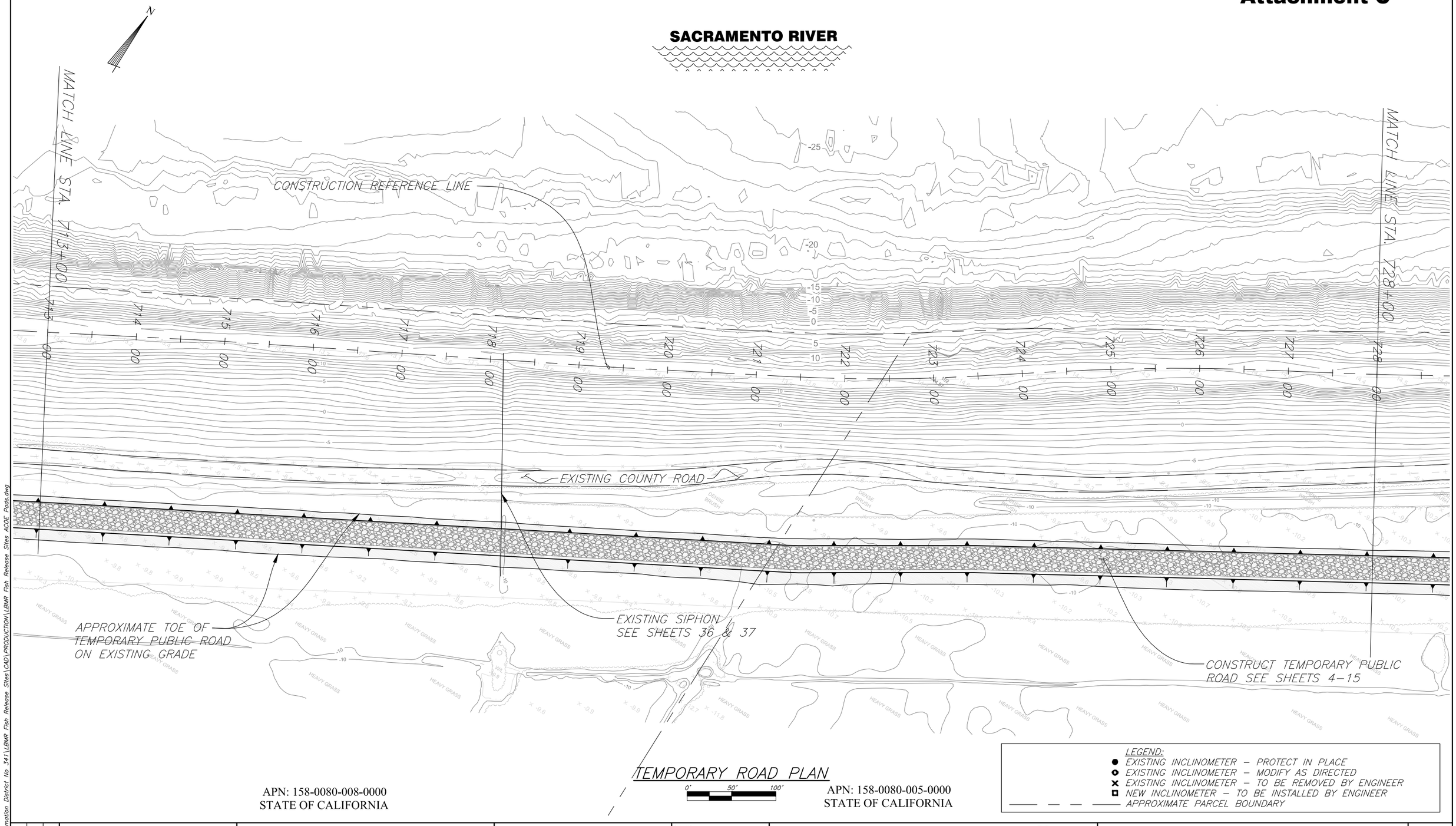
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23903 CIVIL STATE OF CALIFORNIA
DRAFT
12/31/14

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
TEMPORARY ROAD PLAN
STATIONS 700+00 - 713+00

SHEET 5 OF 45 SHEETS



TEMPORARY ROAD PLAN

0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
- EXISTING INCLINOMETER – TO BE REMOVED BY ENGINEER
- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- APPROXIMATE PARCEL BOUNDARY

H:\CH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Site ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:
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Approved By	R.C. WAGNER
Date	NOVEMBER 2014

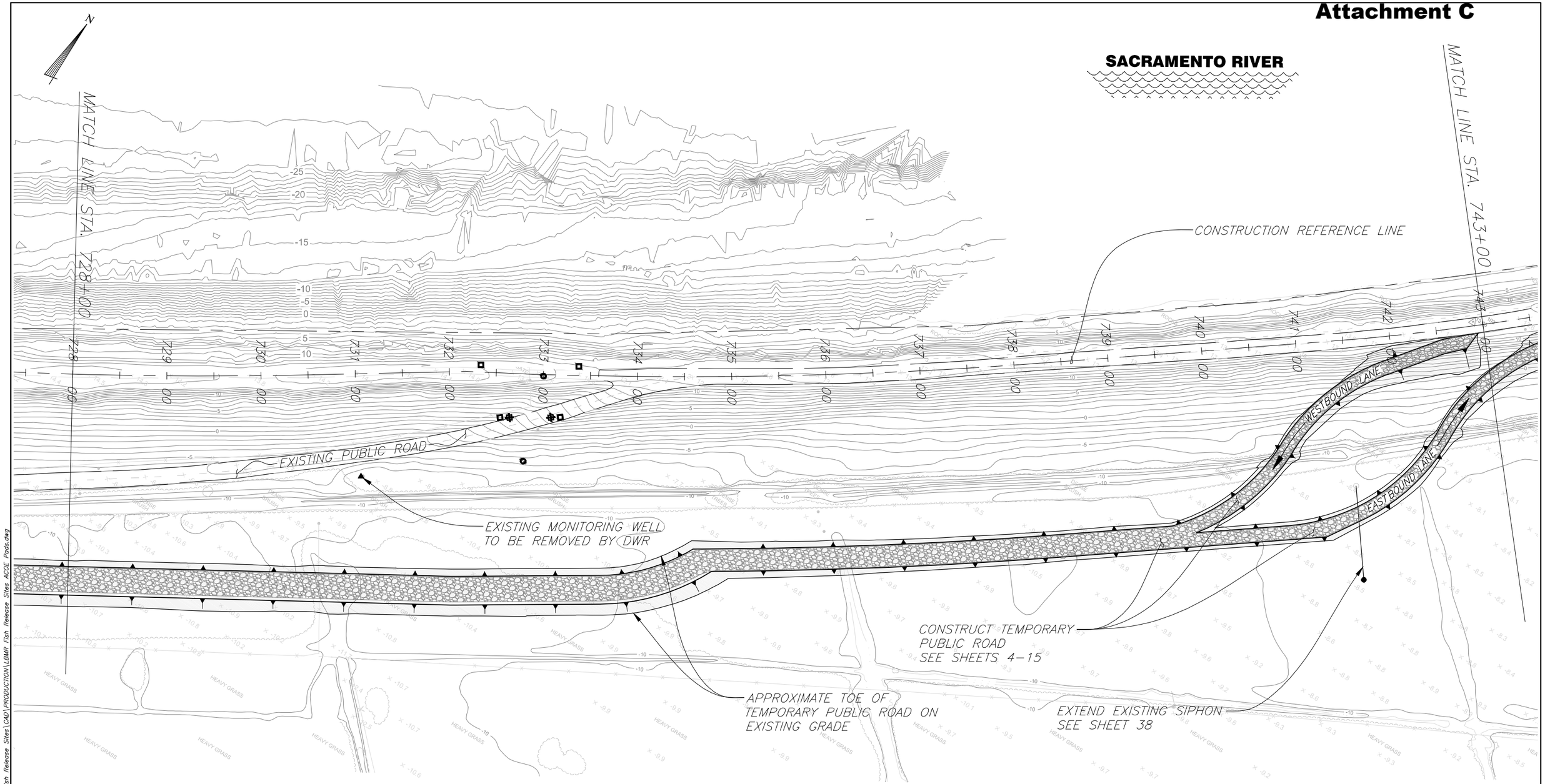
Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 CIVIL STATE OF CALIFORNIA 11/30/14

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
TEMPORARY ROAD PLAN
STATIONS 713+00 - 728+00

SHEET 6 OF 45 SHEETS

Attachment C



TEMPORARY ROAD PLAN

0' 50' 100'

APN: 158-0080-005-0000
STATE OF CALIFORNIA

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
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- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- APPROXIMATE PARCEL BOUNDARY

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:
1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.
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Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

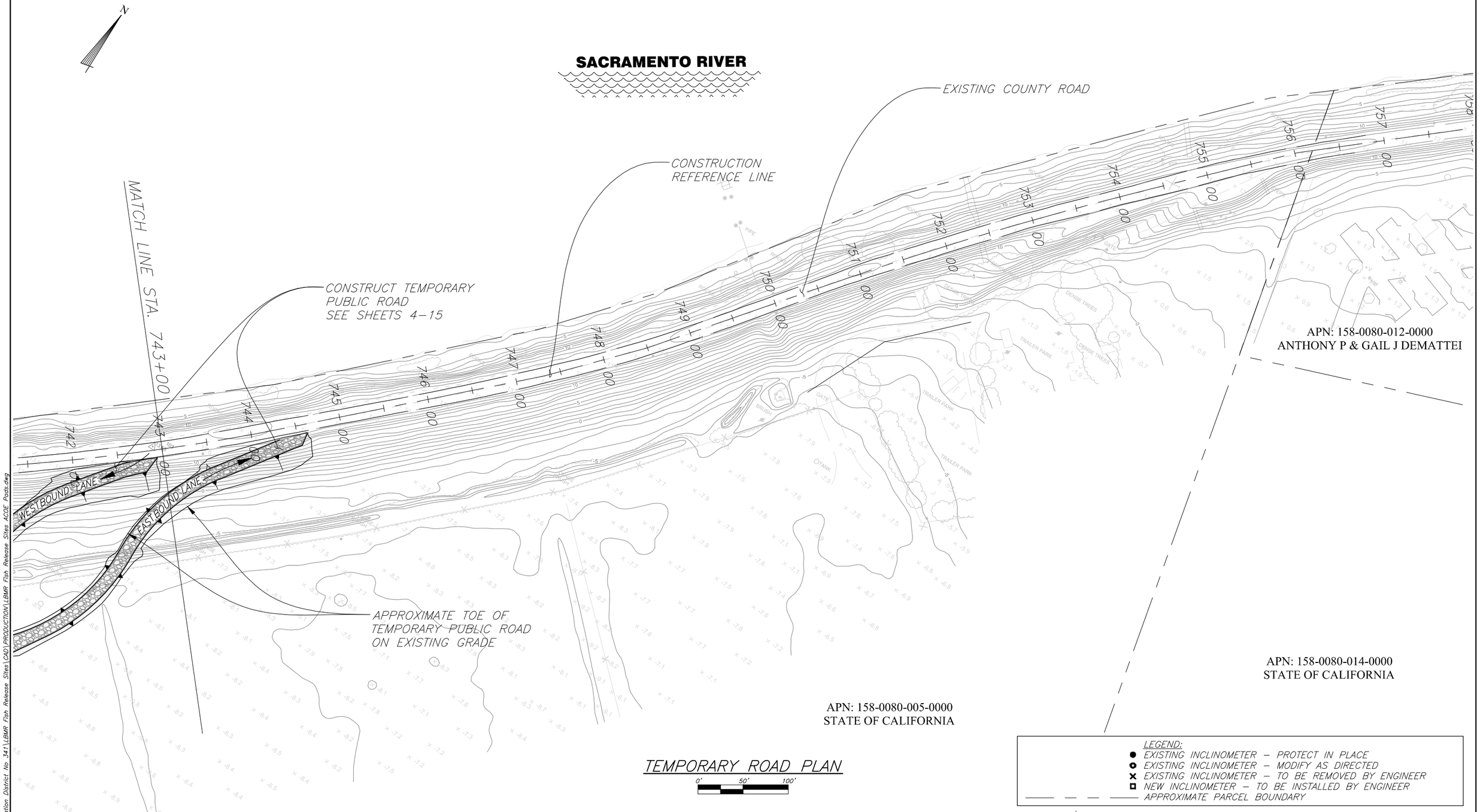
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

TEMPORARY ROAD PLAN
STATIONS 728+00 - 743+00

SHEET 7 OF 45 SHEETS

Attachment C



TEMPORARY ROAD PLAN

0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
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- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- APPROXIMATE PARCEL BOUNDARY

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1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.

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Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 CIVIL STATE OF CALIFORNIA

RECLAMATION DISTRICT NO. 341

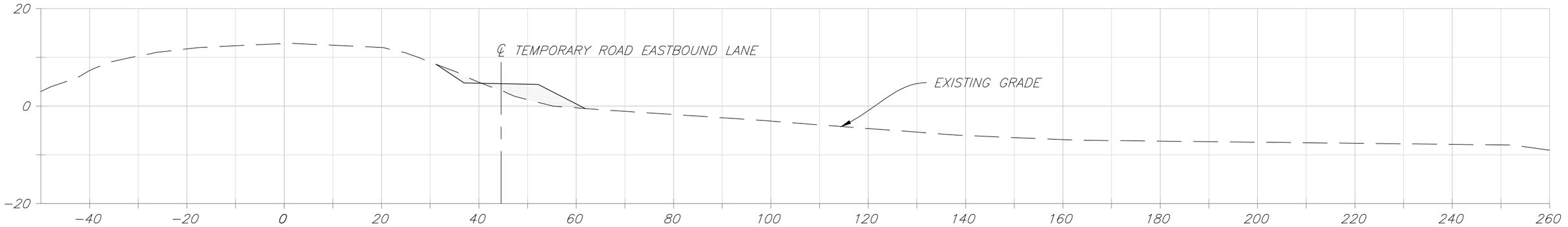
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

TEMPORARY ROAD PLAN
STATIONS 743+00 - 758+00

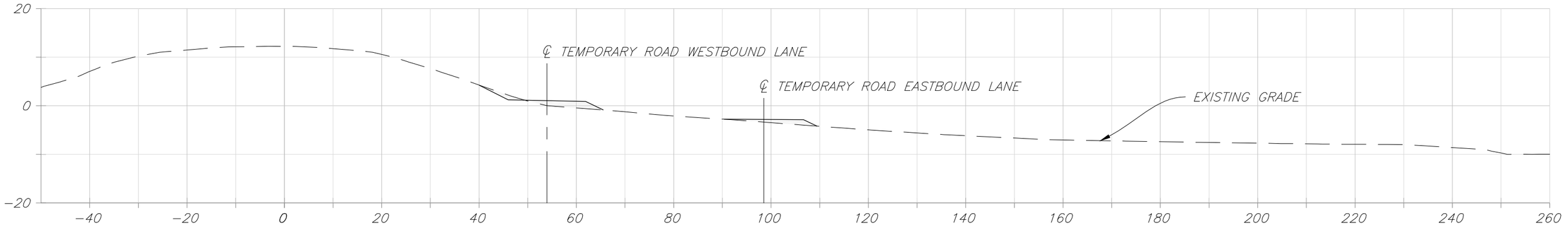
SHEET 8 OF 45 SHEETS

H:\CH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg
File Name: LBMR Fish Release Site ROE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

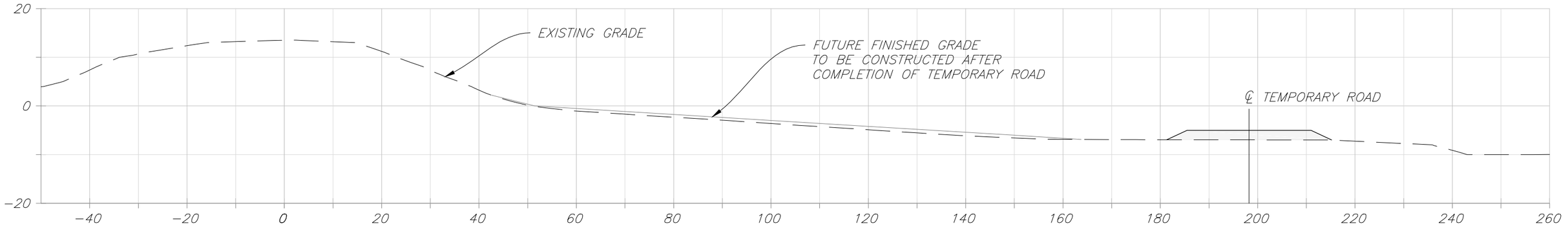
Attachment C



SECTION AT 696+00



SECTION AT 698+00



SECTION AT 700+00

TEMPORARY ROAD CROSS SECTIONS

0' 10' 20'

*TEMPORARY ROAD TO BE CONSTRUCTED PRIOR TO REMOVING EXISTING AC COUNTY ROAD WHERE REQUIRED AND PLACING FIRST LIFT.

H:\CH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
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Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 42983
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

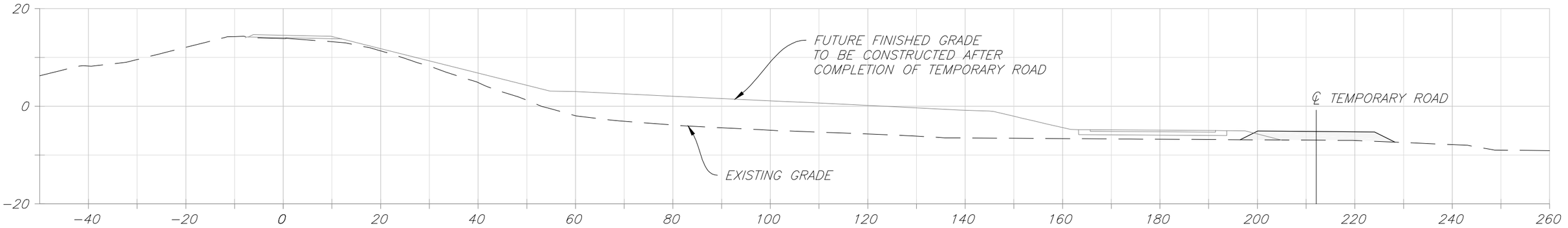
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

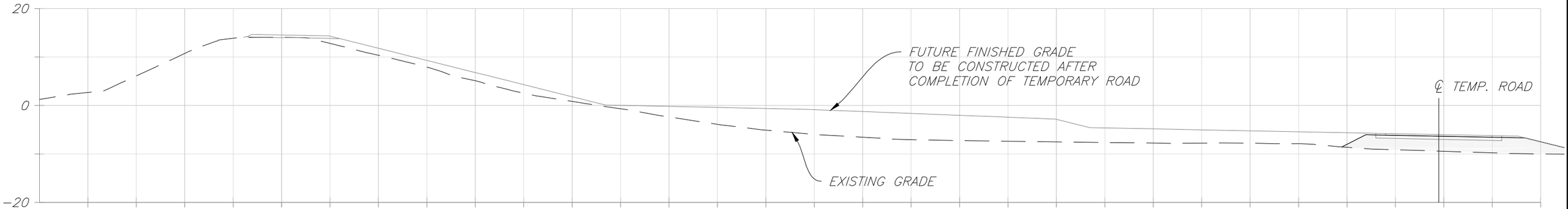
TEMPORARY ROAD CROSS SECTIONS
STATIONS 696+00 - 700+00

SHEET 9 OF 45 SHEETS

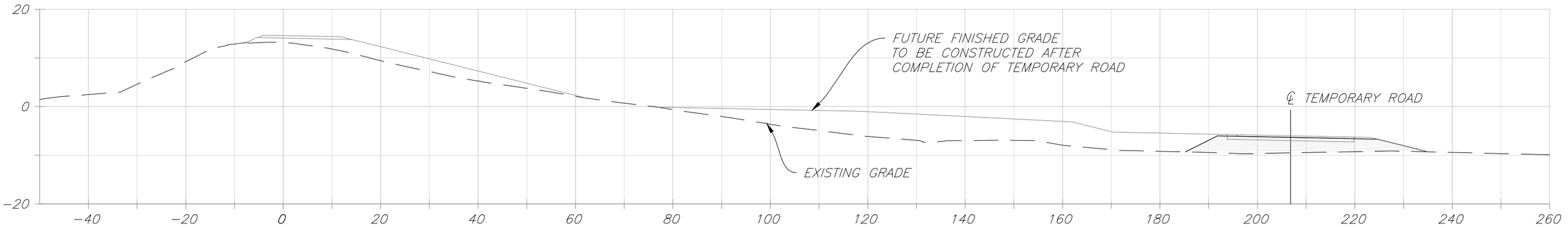
Attachment C



SECTION AT 705+00



SECTION AT 710+00



SECTION AT 715+00

TEMPORARY ROAD CROSS SECTIONS

0' 10' 20'

*TEMPORARY ROAD TO BE CONSTRUCTED PRIOR TO REMOVING EXISTING AC COUNTY ROAD WHERE REQUIRED AND PLACING FIRST LIFT.

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

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ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA

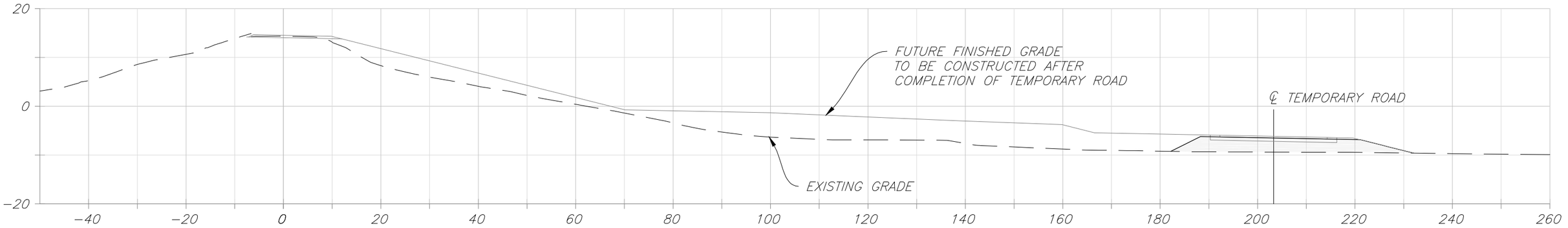
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

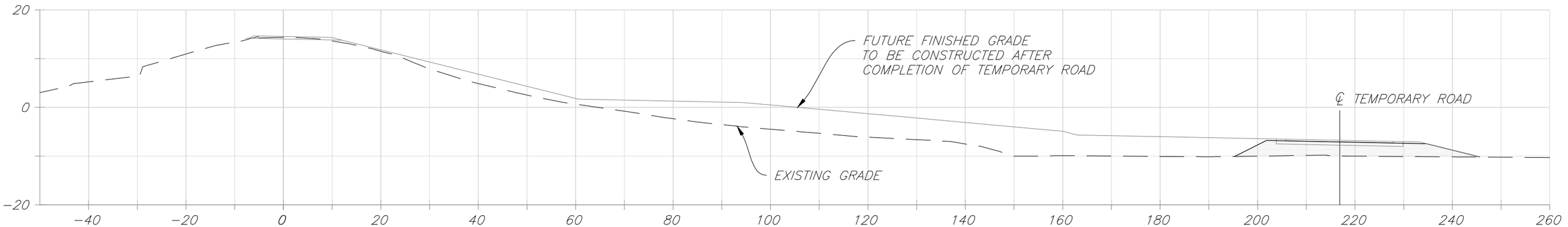
TEMPORARY ROAD CROSS SECTIONS
STATIONS 705+00 - 715+00

SHEET 10 OF 45 SHEETS

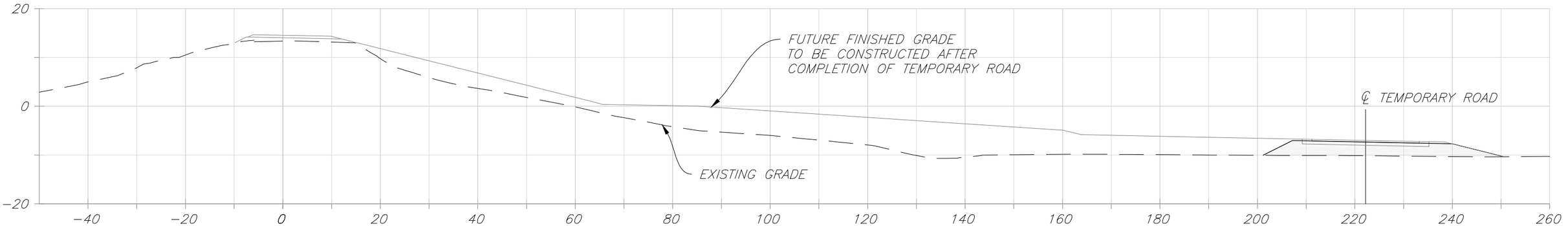
Attachment C



SECTION AT 720+00



SECTION AT 725+00



SECTION AT 730+00

TEMPORARY ROAD CROSS SECTIONS

0' 10' 20'

*TEMPORARY ROAD TO BE CONSTRUCTED PRIOR TO REMOVING EXISTING AC COUNTY ROAD WHERE REQUIRED AND PLACING FIRST LIFT.

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
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Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

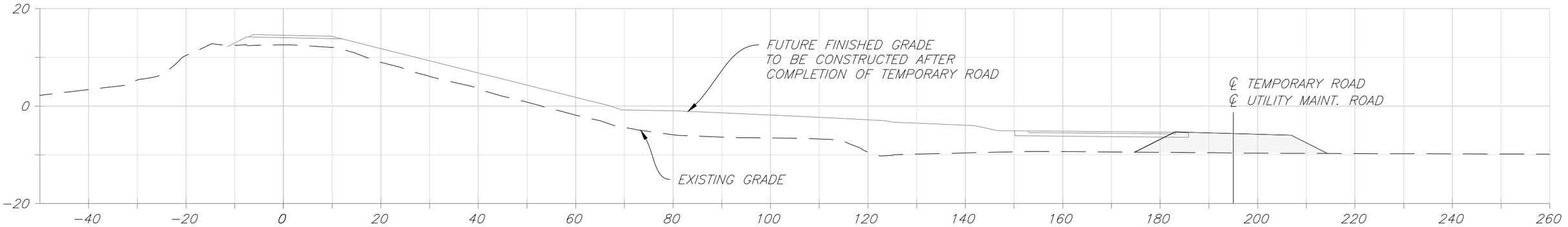
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

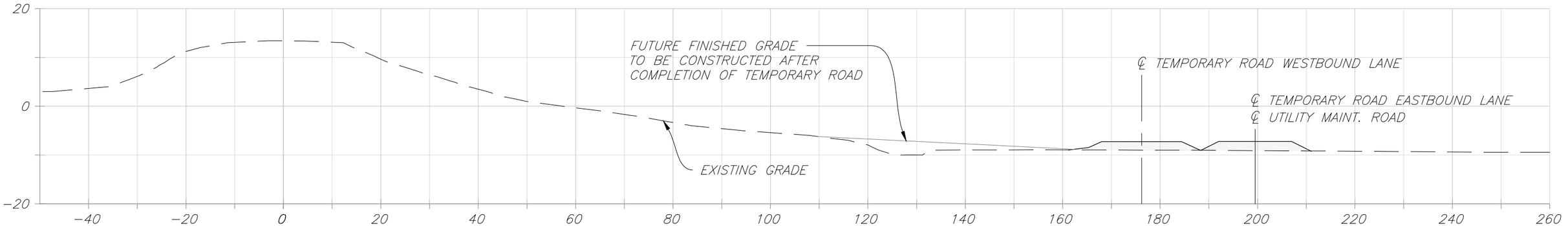
TEMPORARY ROAD CROSS SECTIONS
STATIONS 720+00 - 730+00

SHEET 11 OF 45 SHEETS

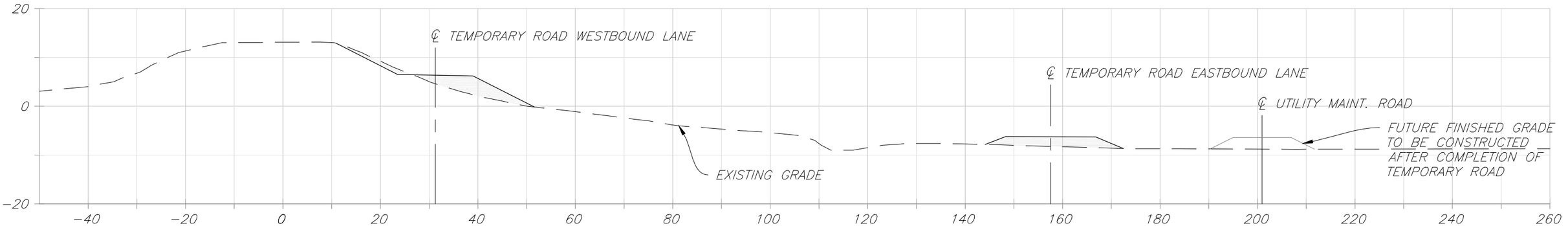
Attachment C



SECTION AT 735+00



SECTION AT 740+00



SECTION AT 742+00

TEMPORARY ROAD CROSS SECTIONS

0' 10' 20'

*TEMPORARY ROAD TO BE CONSTRUCTED PRIOR TO REMOVING EXISTING AC COUNTY ROAD WHERE REQUIRED AND PLACING FIRST LIFT.

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOT FOR PUBLIC USE OR DISTRIBUTION

REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 35903
12/31/14
CIVIL
STATE OF CALIFORNIA

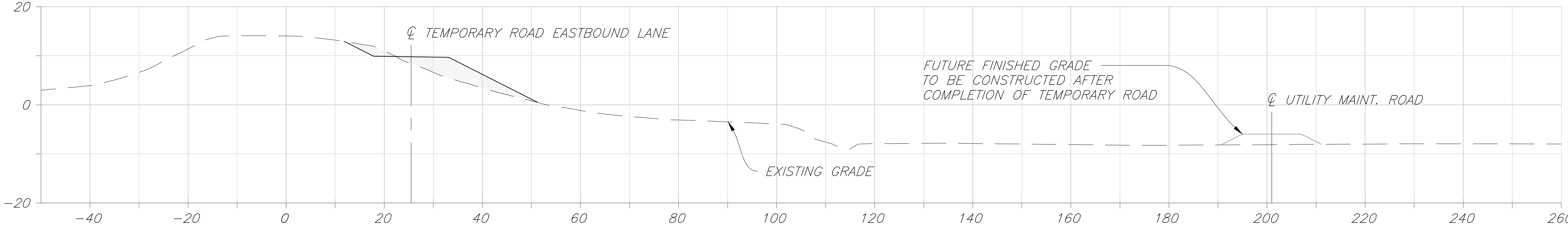
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

TEMPORARY ROAD CROSS SECTIONS
STATIONS 735+00 - 742+00

SHEET 12 OF 45 SHEETS

Attachment C



SECTION AT 744+00

TEMPORARY ROAD CROSS SECTIONS

0' 10' 20'

*TEMPORARY ROAD TO BE CONSTRUCTED PRIOR TO REMOVING EXISTING AC COUNTY ROAD WHERE REQUIRED AND PLACING FIRST LIFT.

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name	Plot Date	Revision Date
LBMR Fish Release Sites ACOE Pads.dwg	11/24/2014	11/24/2014

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Drawn By	S.R. HERINGER
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Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation

2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

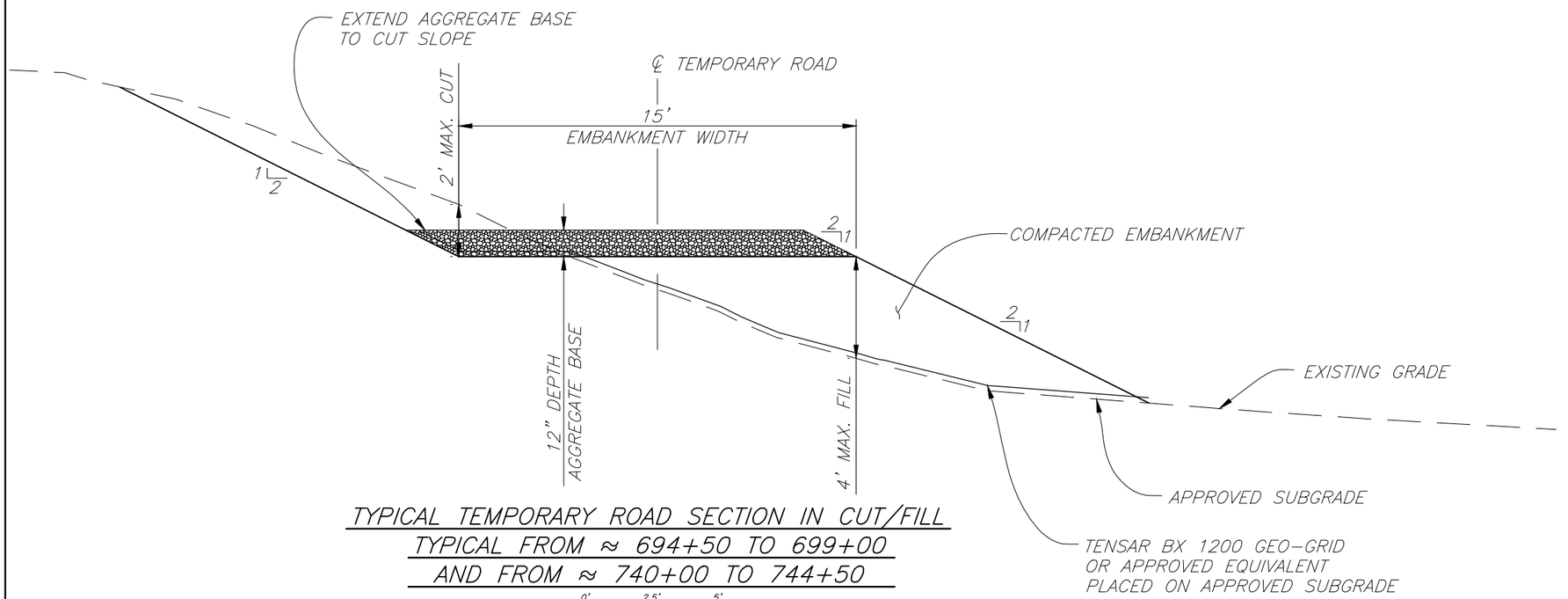
REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 22903 12/31/14 CIVIL STATE OF CALIFORNIA DRAFT

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

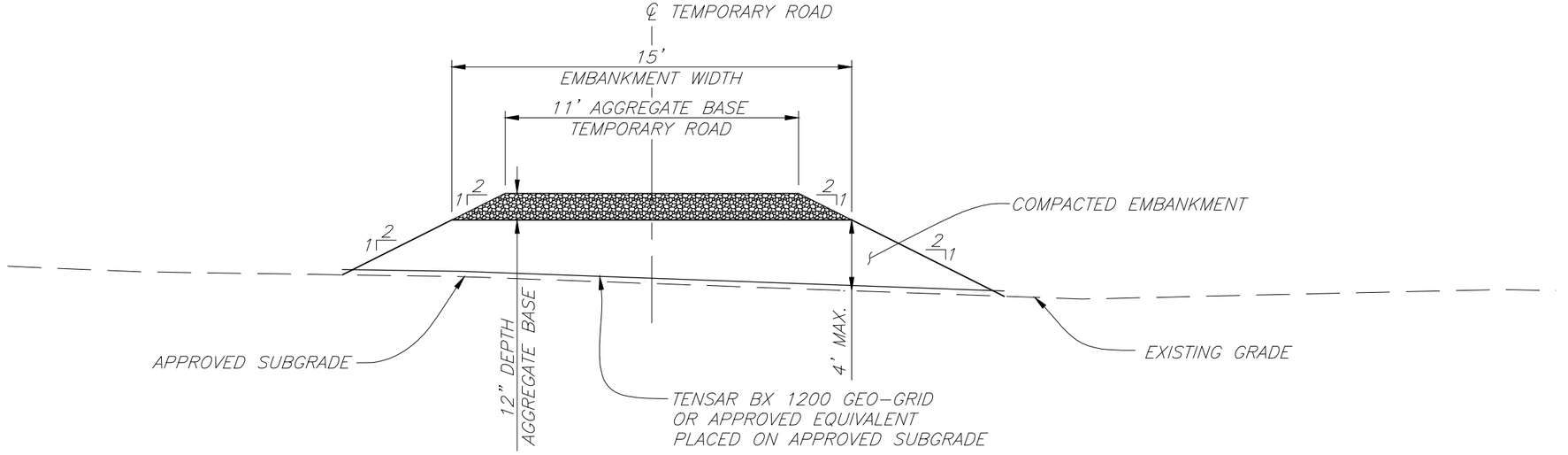
TEMPORARY ROAD CROSS SECTIONS
STATION 744+00

SHEET 13 OF 45 SHEETS



TYPICAL TEMPORARY ROAD SECTION IN CUT/FILL
TYPICAL FROM ≈ 694+50 TO 699+00
AND FROM ≈ 740+00 TO 744+50

0' 2.5' 5'



TYPICAL TEMPORARY ROAD SECTION IN FILL
TYPICAL FROM ≈ 694+50 TO 699+00
AND FROM ≈ 740+00 TO 744+50

0' 2.5' 5'

H:\CH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Site ACOE Pods.dwg
Plot Date: 11/24/2014
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Date	NOVEMBER 2014

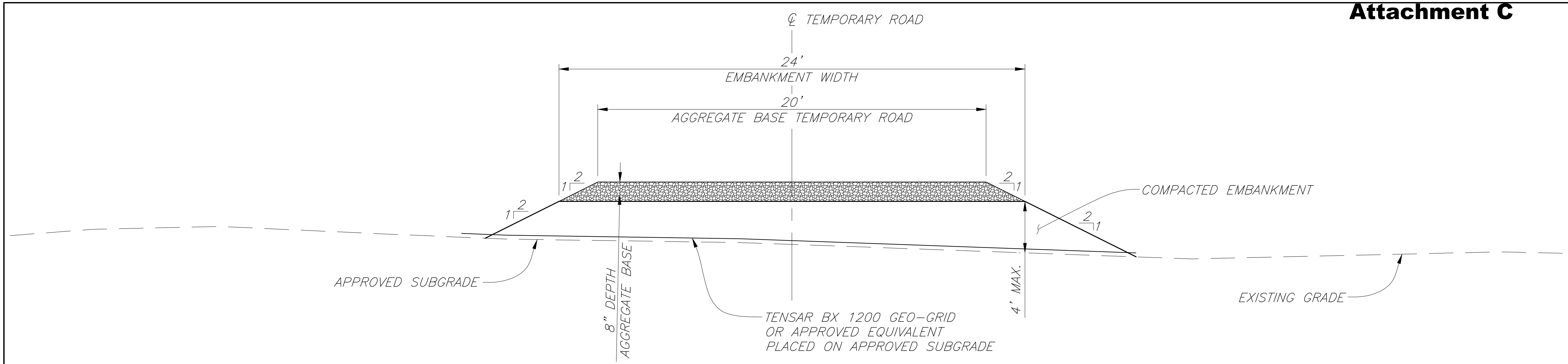
Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 42903
12/31/14
CIVIL
STATE OF CALIFORNIA

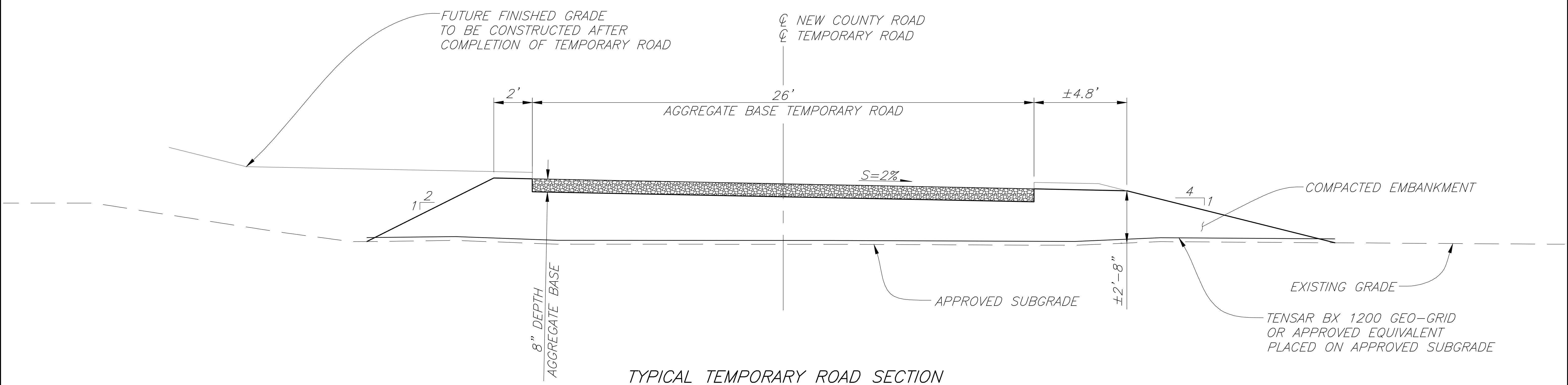
RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES
TYPICAL TEMPORARY ROAD SECTIONS

SHEET 14 OF 45 SHEETS

Attachment C



TYPICAL TEMPORARY ROAD SECTION
TYPICAL FROM ≈ 699+00 TO 705+00
AND FROM ≈ 735+00 TO 740+00



TYPICAL TEMPORARY ROAD SECTION
TYPICAL FROM ≈ 705+00 TO 735+00

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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REVISIONS

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PRELIMINARY
NOT FOR CONSTRUCTION

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Drawn By: S.R. HERINGER
Checked By: H.S. MATSUNAGA
Approved By: R.C. WAGNER
Date: NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 22903 12/31/14 CIVIL STATE OF CALIFORNIA
DRAFT

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES
TYPICAL TEMPORARY ROAD SECTIONS

SHEET 15 OF 45 SHEETS

Attachment C

SACRAMENTO RIVER

EXISTING COUNTY ROAD

CONSTRUCTION REFERENCE LINE

20' ASPHALT-CONCRETE COUNTY ROAD SEE SHEET 34

MATCH LINE STA. 700+00

692 00 | 693 00 | 694 00 | 695 00 | 696 00 | 697 00 | 698 00 | 699 00 | 700 00 | 701 00 | 702 00

691 + 00

690 + 00

689 + 00

688 + 00

687 + 00

686 + 00

685 + 00

684

S=10:1

STABILITY TOE BERM SLOPE VARIES

TEMPORARY PUBLIC ROAD PREVIOUSLY CONSTRUCTED

TOE +15' LIMIT OF A.C.O.E. EASEMENT

APPROXIMATE TOE OF COMPACTED EMBANKMENT ON PREVIOUSLY CONSTRUCTED TEMPORARY PUBLIC ROAD

APN: 158-0080-001-0000
U.S. BUREAU OF RECLAMATION

APN: 158-0080-008-0000
STATE OF CALIFORNIA

TOWER

DENSE BRUSH | DENSE TREES | HEAVY GRASS | ROCKS | WL 6.5

PLAN
0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
- EXISTING INCLINOMETER – TO BE REMOVED BY ENGINEER
- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- NEW PIEZOMETER – TO BE INSTALLED BY ENGINEER
- E — APPROXIMATE NEW OVERHEAD UTILITY POLE ALIGNMENT
- APPROXIMATE BURIED ELECTRICAL TRENCH ALIGNMENT
- APPROXIMATE PARCEL BOUNDARY

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:

1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.

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NOT FOR CONSTRUCTION

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Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 25803 12/31/14 CIVIL STATE OF CALIFORNIA

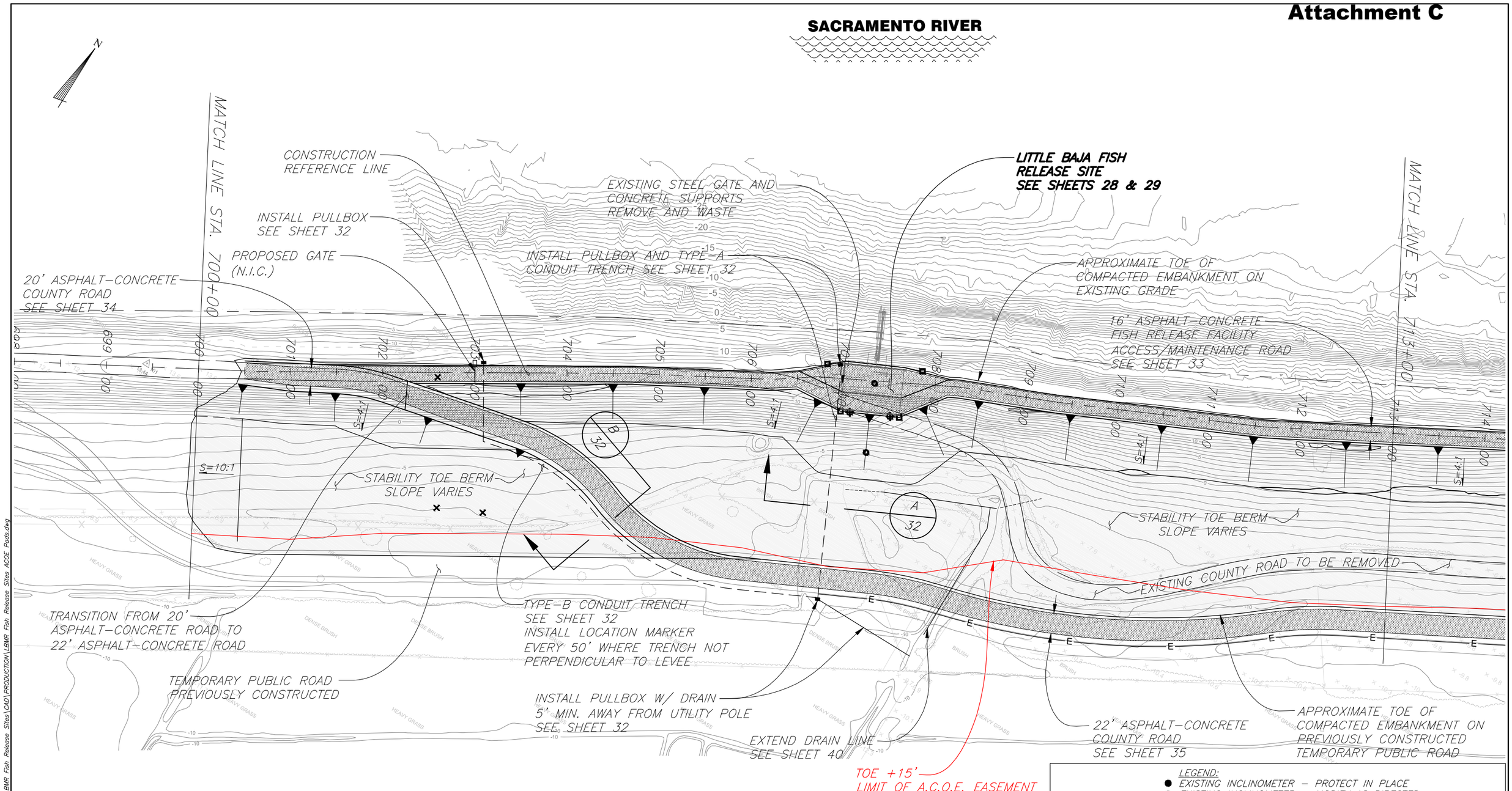
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN
STATIONS 687+00 - 700+00

SHEET 16 OF 45 SHEETS

Attachment C



APN: 158-0080-008-0000
STATE OF CALIFORNIA

PLAN
0' 50' 100'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
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- APPROXIMATE PARCEL BOUNDARY

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg
File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOTES:
1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.
2) BATHYMETRIC TOPOGRAPHY FROM DEPARTMENT OF WATER RESOURCES, SURVEYED MARCH 2014

NOT FOR PUBLIC USE OR DISTRIBUTION

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PRELIMINARY
NOT FOR CONSTRUCTION

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Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

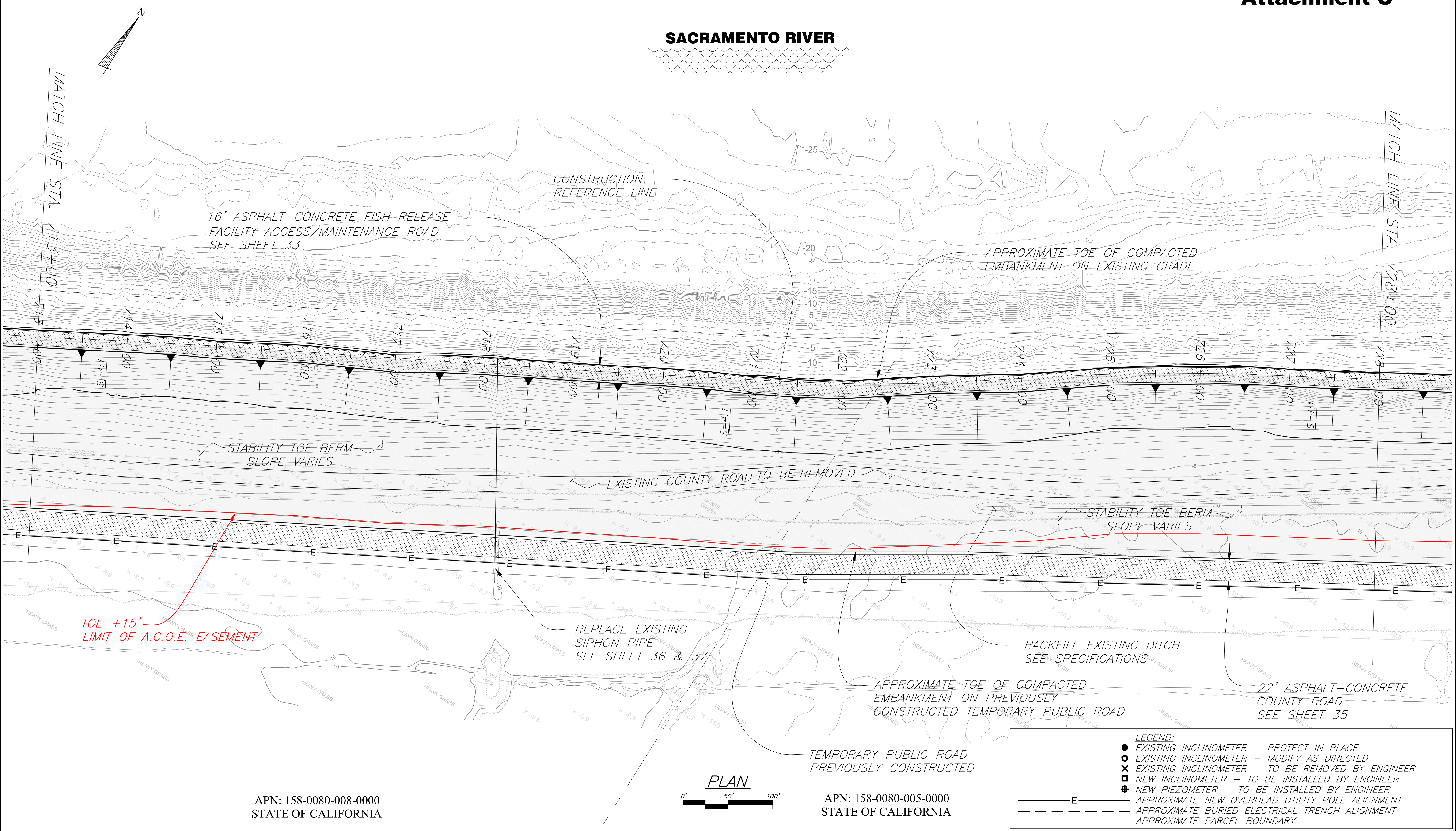
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN
STATIONS 700+00 - 713+00

SHEET 17 OF 45 SHEETS

Attachment C



File Name: H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

Plot Date: 11/24/2014

Revision Date: 11/24/2014

NOTES:

1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.

2) BATHYMETRIC TOPOGRAPHY FROM DEPARTMENT OF WATER RESOURCES, SURVEYED MARCH 2014

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REVISIONS

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NOT FOR CONSTRUCTION

Designed By: S.R. HERINGER
Drawn By: S.R. HERINGER
Checked By: H.S. MATSUNAGA
Approved By: R.C. WAGNER
Date: NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER — ROBERT C. WAGNER — No. 22903 — Exp. 12/31/14 — CIVIL — STATE OF CALIFORNIA — DRAFT

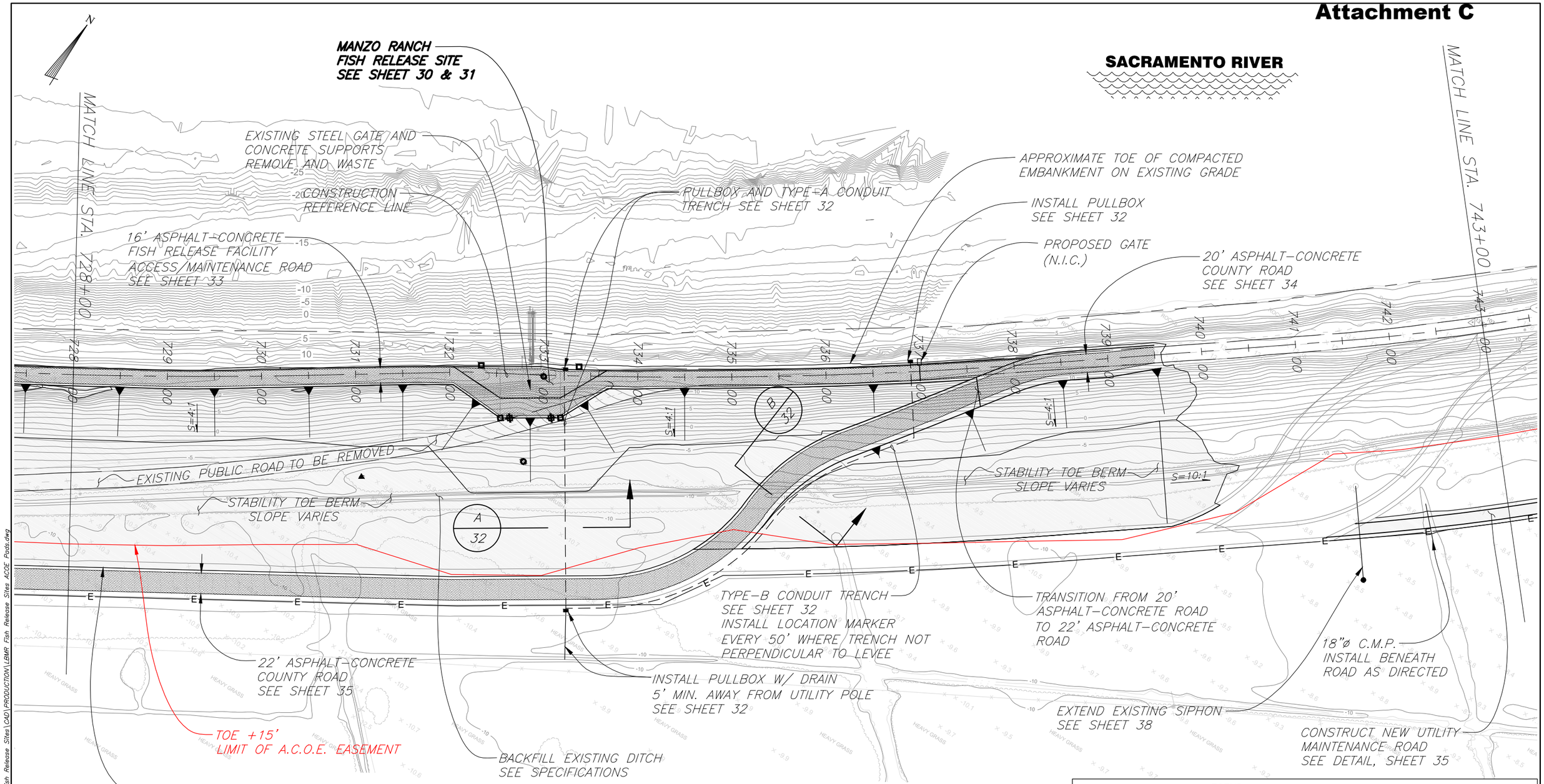
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN
STATIONS 713+00 - 728+00

SHEET 18 OF 45 SHEETS

Attachment C



PLAN

0' 50' 100'

APN: 158-0080-005-0000
STATE OF CALIFORNIA

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
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H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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Plot Date: 11/24/2014
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NOTES:
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Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23903 12/31/14 CIVIL STATE OF CALIFORNIA

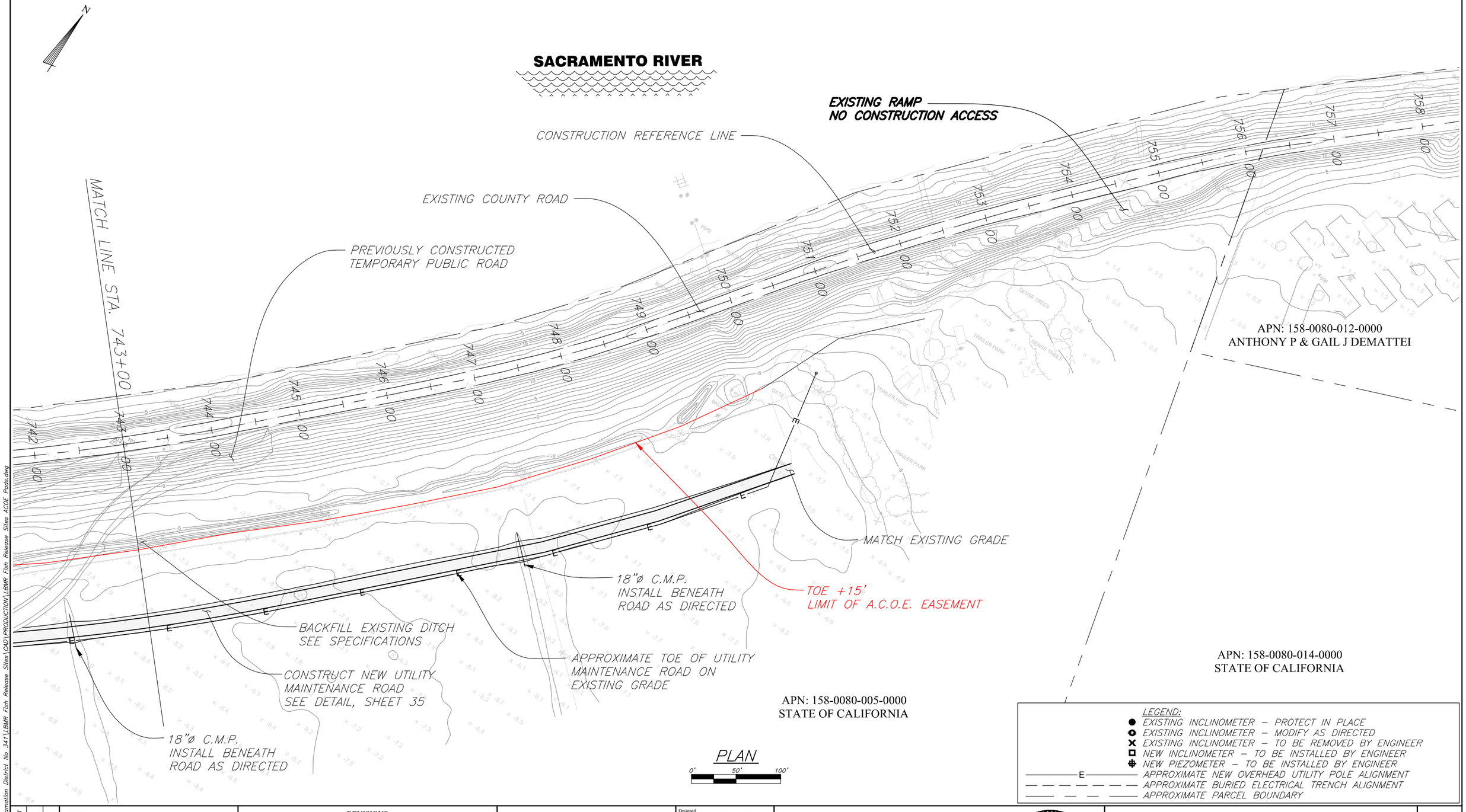
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN
STATIONS 728+00 - 743+00

SHEET 19 OF 45 SHEETS

Attachment C



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Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23903 CIVIL STATE OF CALIFORNIA 12/31/14

DRAFT

RECLAMATION DISTRICT NO. 341

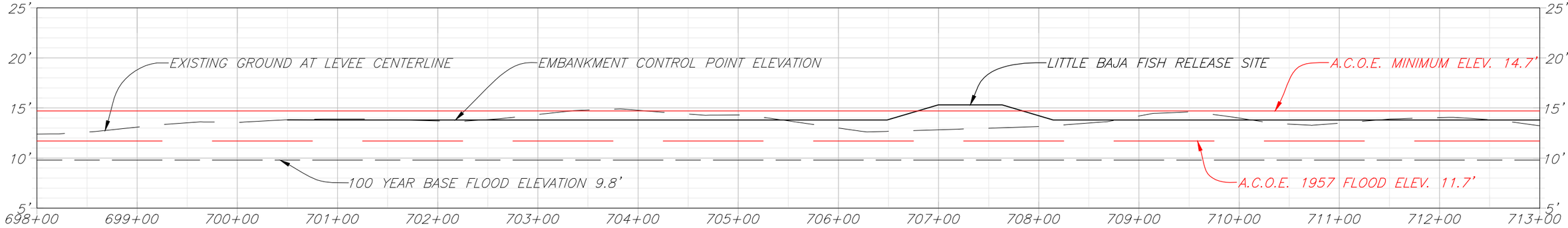
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN
STATIONS 743+00 - 758+00

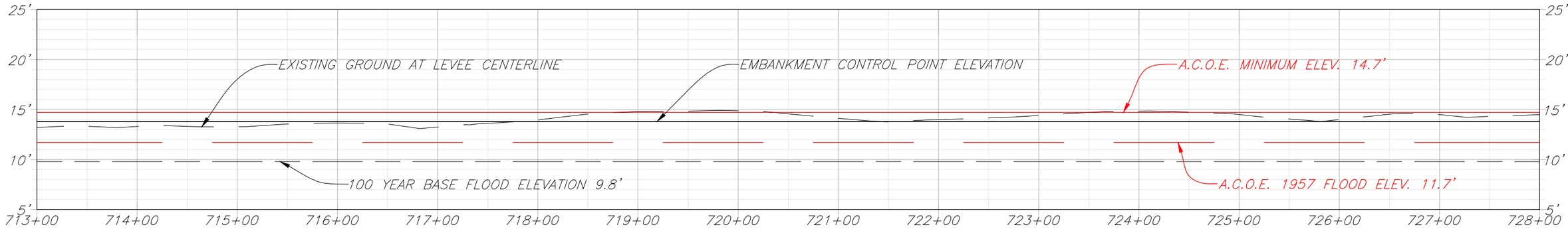
SHEET 20 OF 45 SHEETS

Attachment C

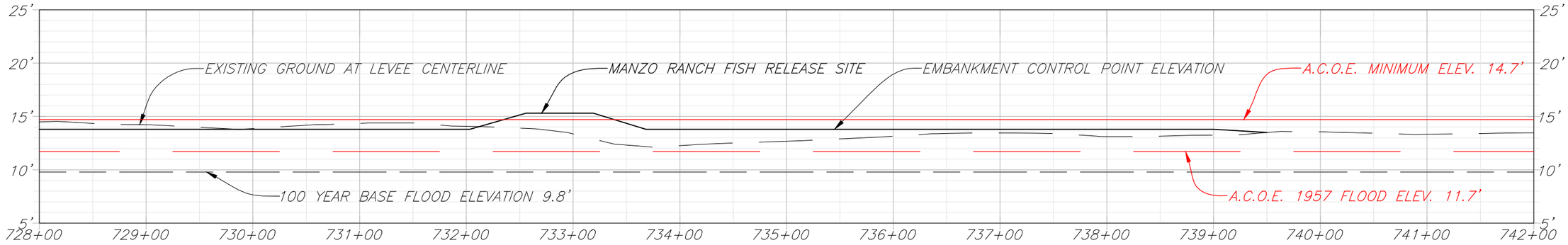
LEVEE PROFILE
STA. 698+00 TO STA. 713+00



LEVEE PROFILE
STA. 713+00 TO STA. 728+00



LEVEE PROFILE
STA. 728+00 TO STA. 742+00



PROFILES

HORIZ. SCALE: 0' 50' 100'

VERT. SCALE: 0' 5' 10'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 25093 CIVIL 12/31/14 STATE OF CALIFORNIA

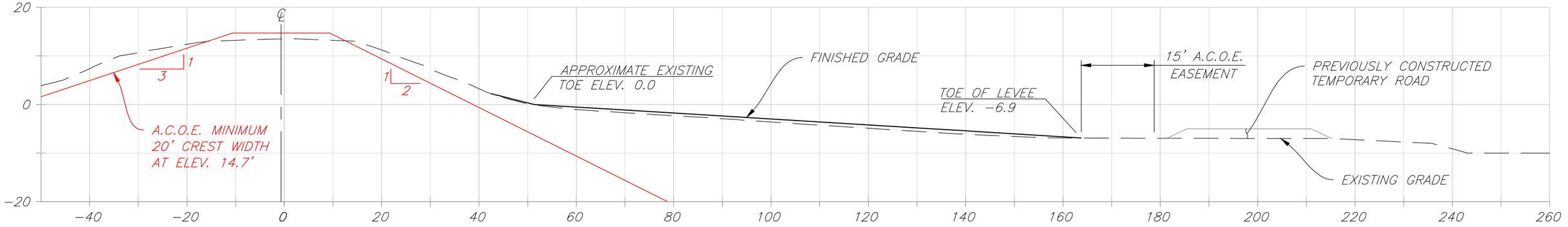
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

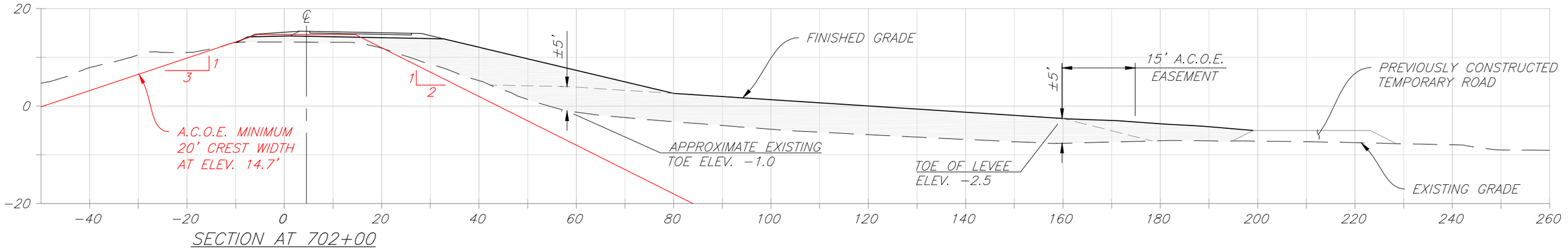
PROFILES

SHEET 21 OF 45 SHEETS

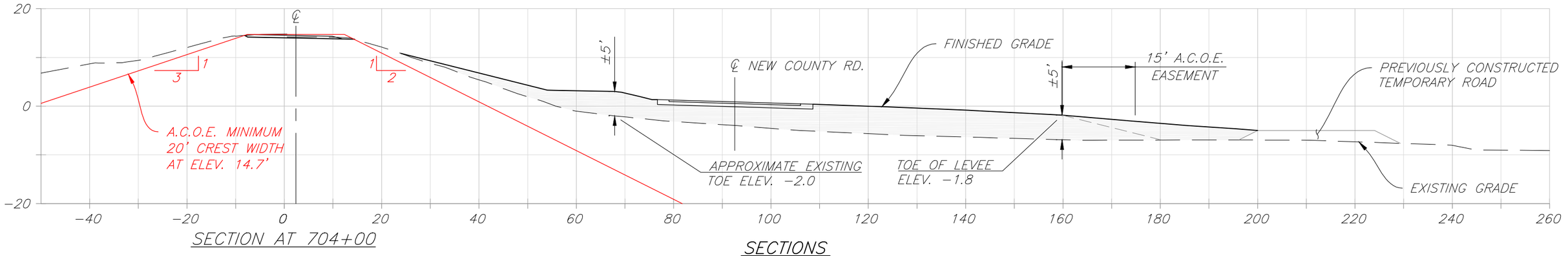
Attachment C



SECTION AT 700+00



SECTION AT 702+00



SECTION AT 704+00

SECTIONS

0' 10' 20'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

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Plot Date: 11/24/2014
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Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 26303
12/31/14
CIVIL
STATE OF CALIFORNIA

DRAFT

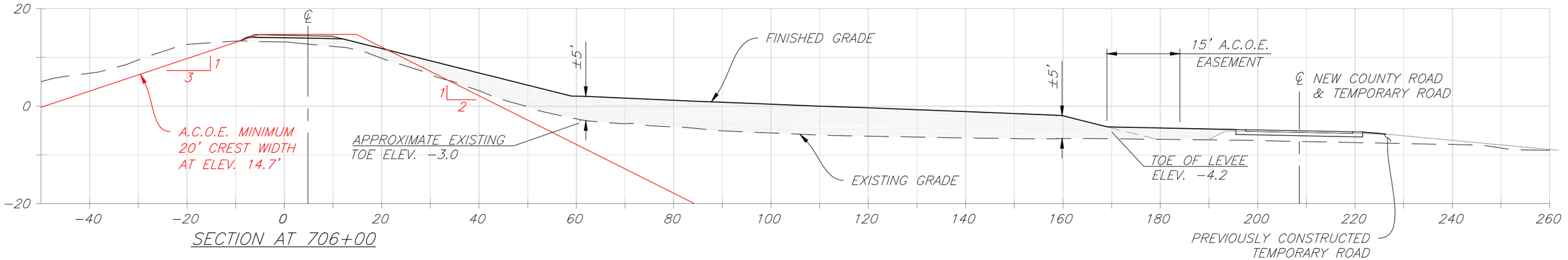
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

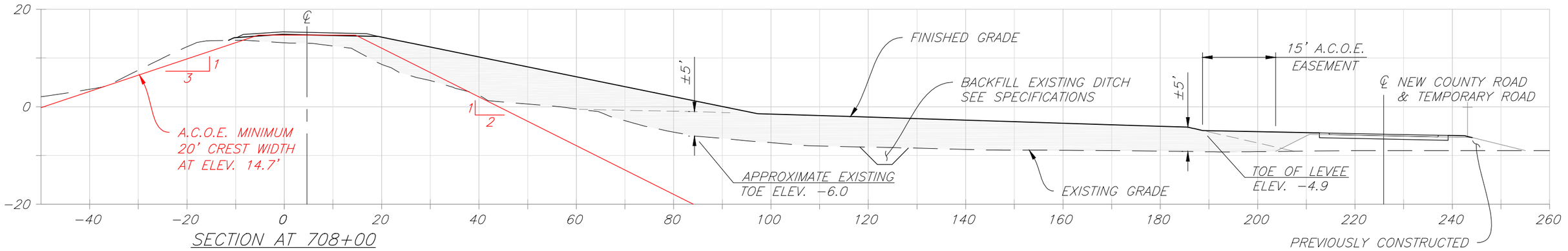
CROSS SECTIONS
STATIONS 700+00 - 704+00

SHEET 22 OF 45 SHEETS

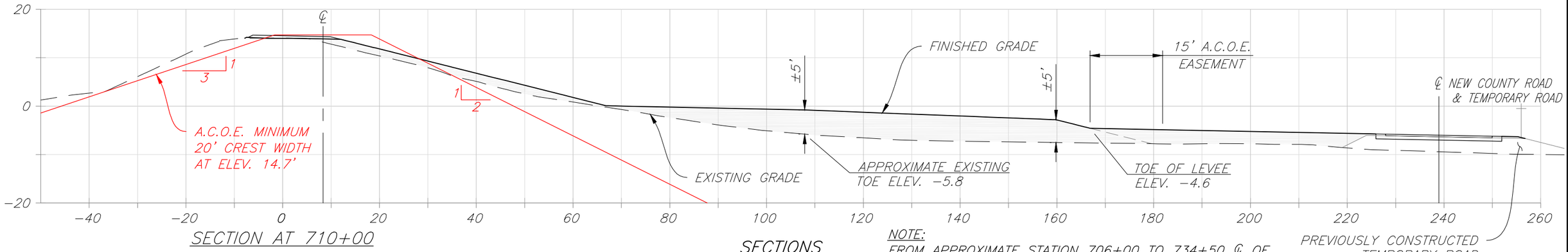
Attachment C



SECTION AT 706+00



SECTION AT 708+00



SECTION AT 710+00

SECTIONS
0' 10' 20'

NOTE:
FROM APPROXIMATE STATION 706+00 TO 734+50 ℄ OF TEMPORARY ROAD BECOMES ℄ OF NEW COUNTY ROAD

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Plot Date: 11/24/2014
Revision Date: 11/24/2014

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REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA

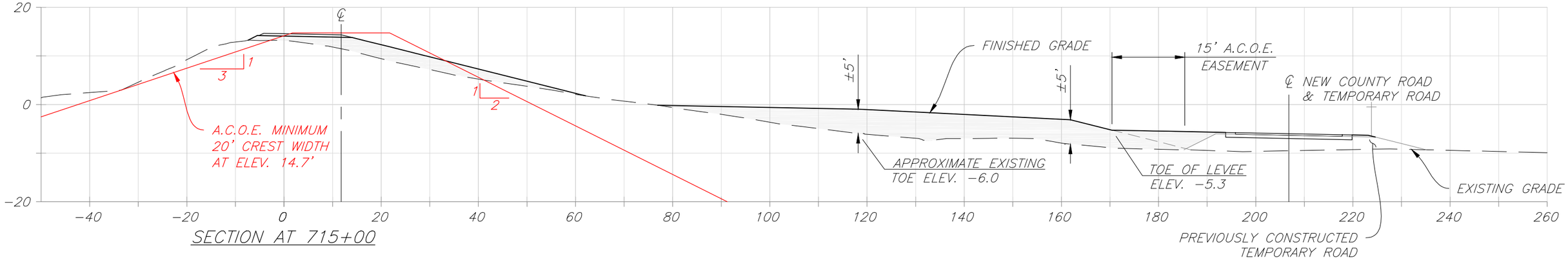
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

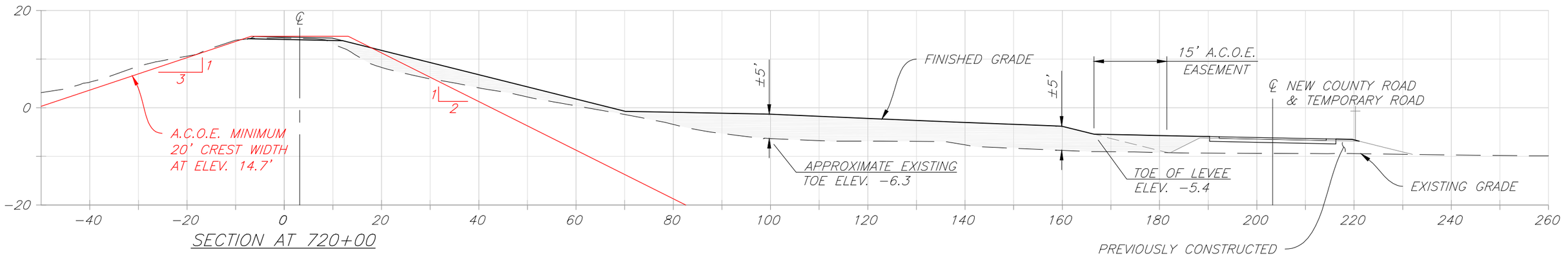
CROSS SECTIONS
STATIONS 706+00 - 710+00

SHEET 23 OF 45 SHEETS

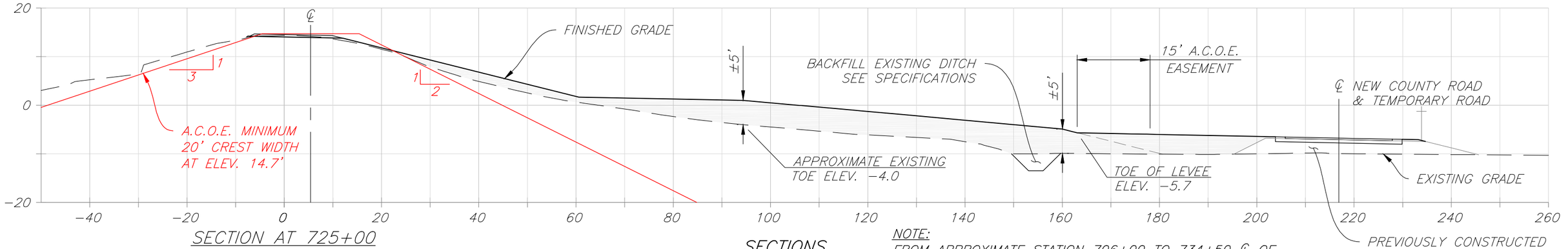
Attachment C



SECTION AT 715+00



SECTION AT 720+00



SECTION AT 725+00

SECTIONS

0' 10' 20'

NOTE:
FROM APPROXIMATE STATION 706+00 TO 734+50 ℄ OF TEMPORARY ROAD BECOMES ℄ OF NEW COUNTY ROAD

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
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Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 25883
12/31/14
CIVIL
STATE OF CALIFORNIA

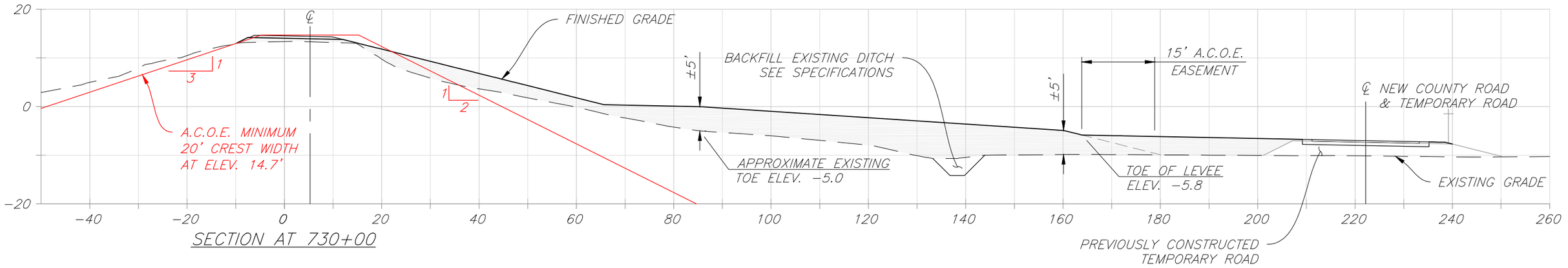
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

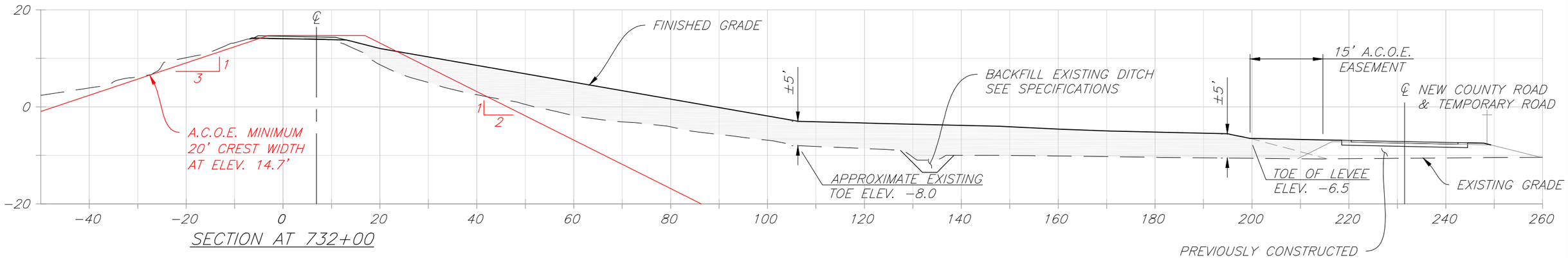
CROSS SECTIONS
STATIONS 715+00 - 725+00

SHEET 24 OF 45 SHEETS

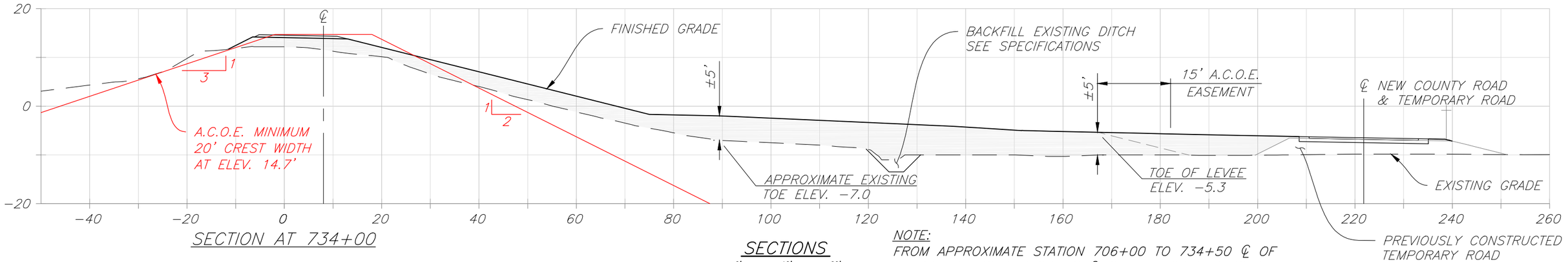
Attachment C



SECTION AT 730+00



SECTION AT 732+00



SECTION AT 734+00

SECTIONS

0' 10' 20'

NOTE:
FROM APPROXIMATE STATION 706+00 TO 734+50 ℄ OF TEMPORARY ROAD BECOMES ℄ OF NEW COUNTY ROAD

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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Plot Date: 11/24/2014
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Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 25803
12/31/14
CIVIL
STATE OF CALIFORNIA

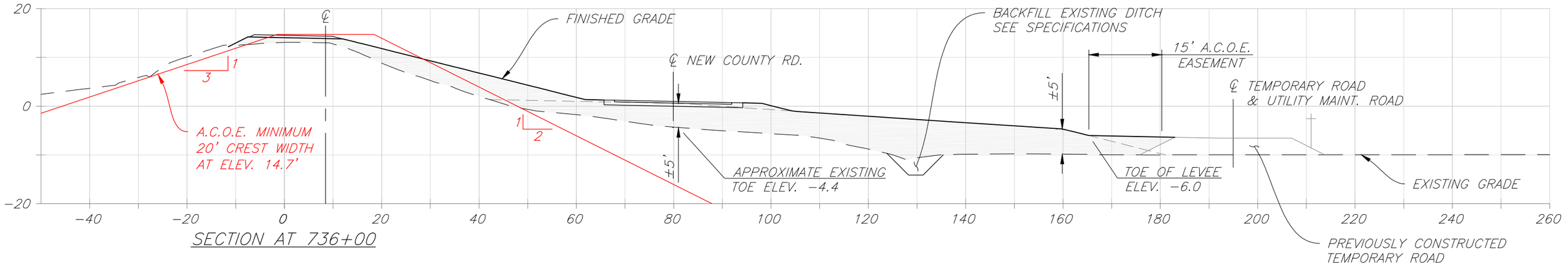
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

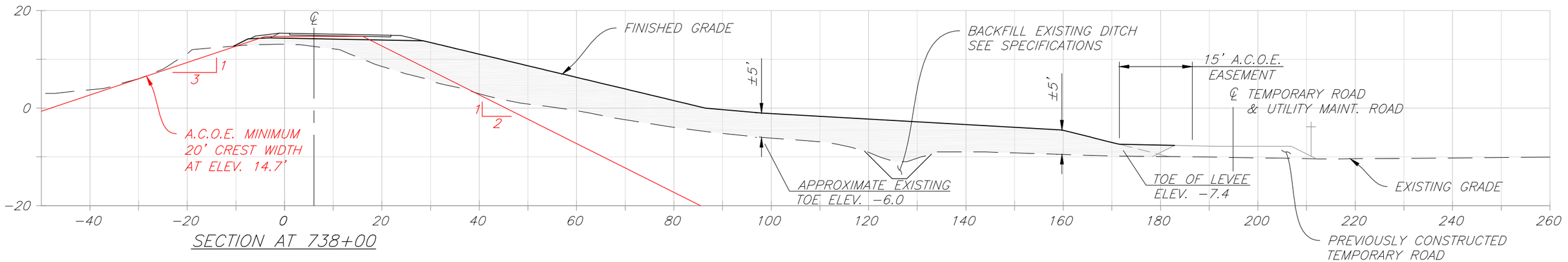
CROSS SECTIONS STATIONS 730+00 - 734+00

SHEET 25 OF 45 SHEETS

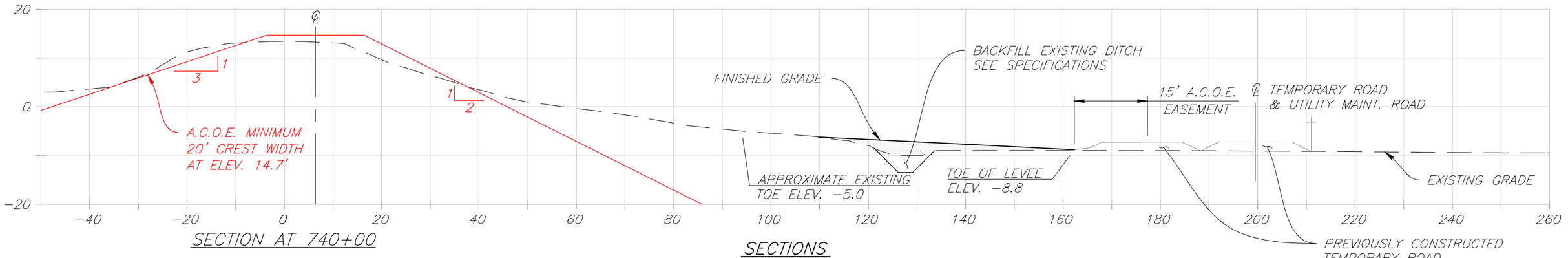
Attachment C



SECTION AT 736+00



SECTION AT 738+00



SECTION AT 740+00

SECTIONS

0' 10' 20'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 25933 12/31/14 CIVIL STATE OF CALIFORNIA

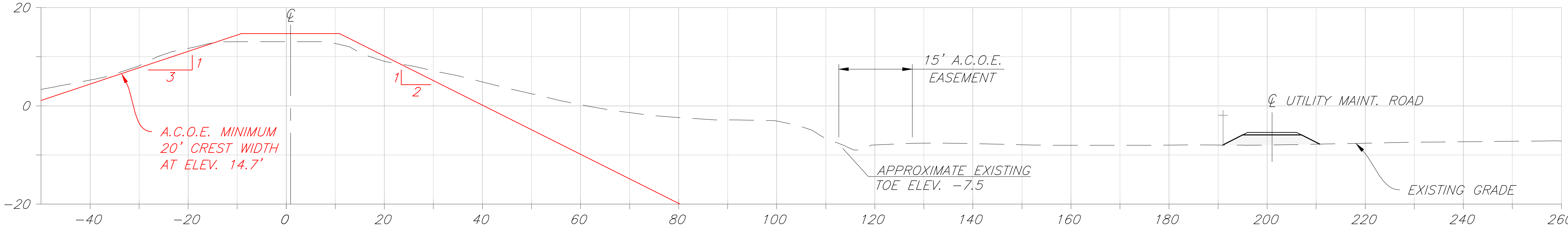
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

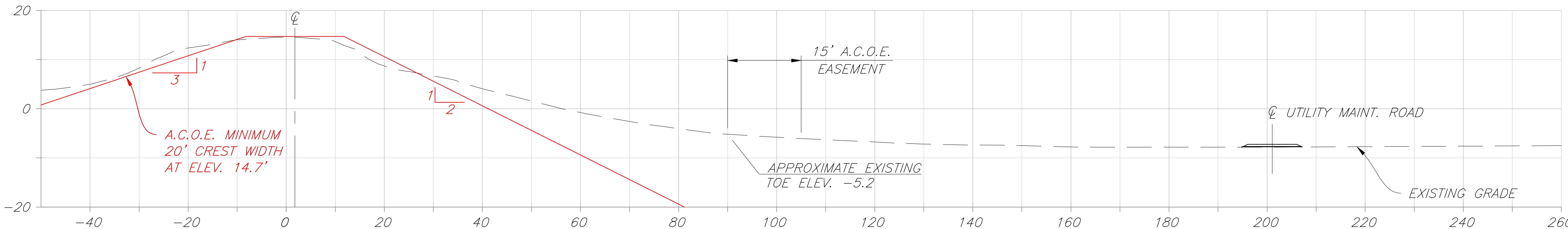
CROSS SECTIONS
STATIONS 736+00 - 740+00

SHEET 26 OF 45 SHEETS

Attachment C



SECTION AT 745+00



SECTION AT 750+00

SECTIONS

0' 10' 20'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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PRELIMINARY
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Designed By: S.R. HERINGER
Drawn By: S.R. HERINGER
Checked By: H.S. MATSUNAGA
Approved By: R.C. WAGNER
Date: NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

DRAFT

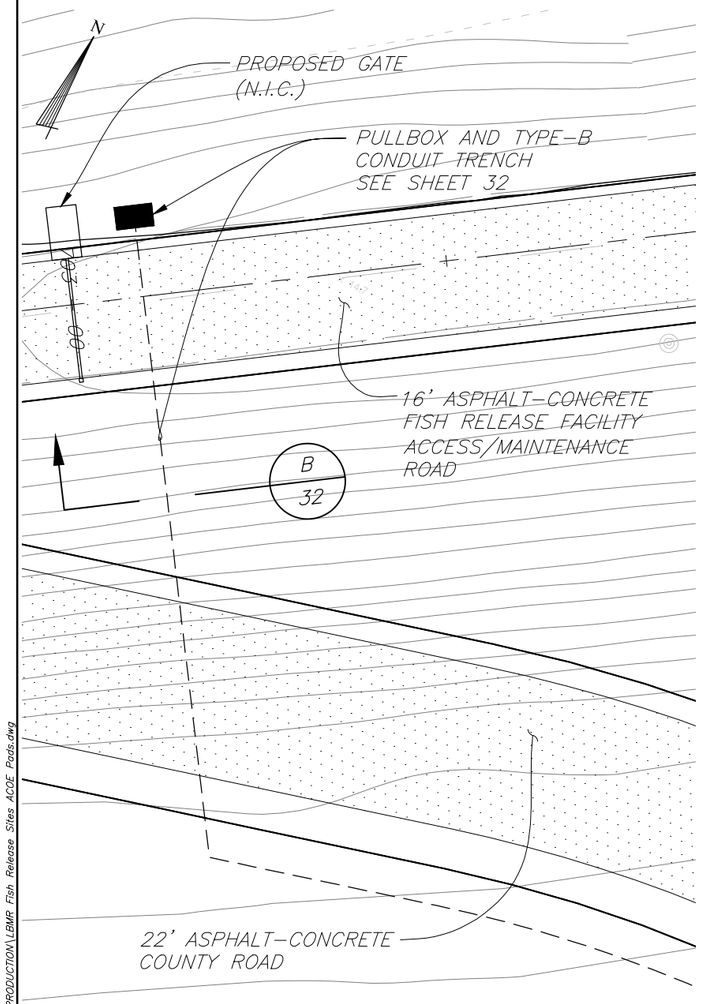
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

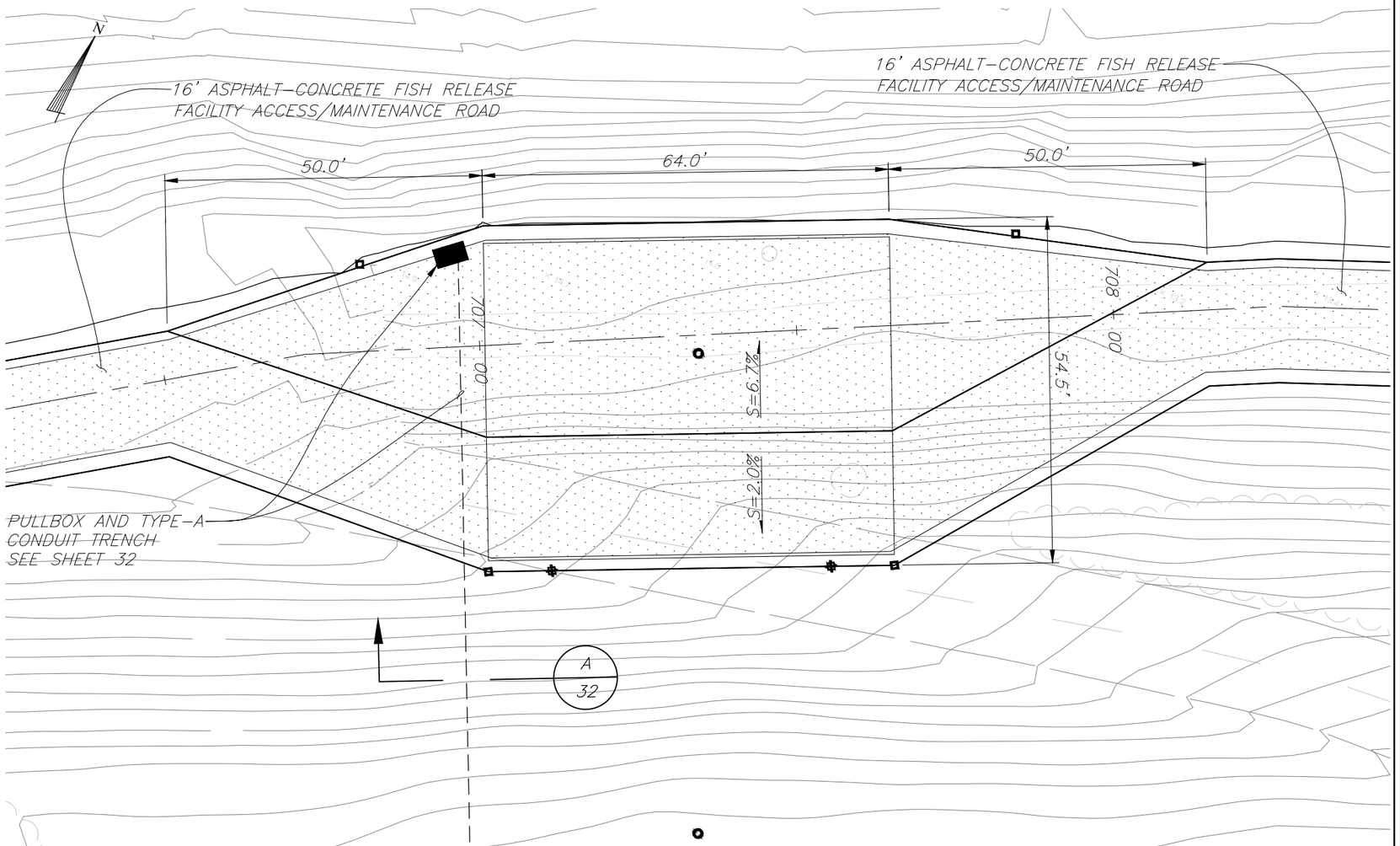
CROSS SECTIONS
STATIONS 745+00 - 750+00

SHEET 27 OF 45 SHEETS

Attachment C



PLAN
LITTLE BAJA ACCESS GATE
0' 10' 20'



PLAN
LITTLE BAJA FISH RELEASE PAD
0' 10' 20'

LEGEND:
- EXISTING INCLINOMETER – PROTECT IN PLACE
- EXISTING INCLINOMETER – MODIFY AS DIRECTED
- EXISTING INCLINOMETER – TO BE REMOVED BY ENGINEER
- NEW INCLINOMETER – TO BE INSTALLED BY ENGINEER
- NEW PIEZOMETER – TO BE INSTALLED BY ENGINEER

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg
File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
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Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

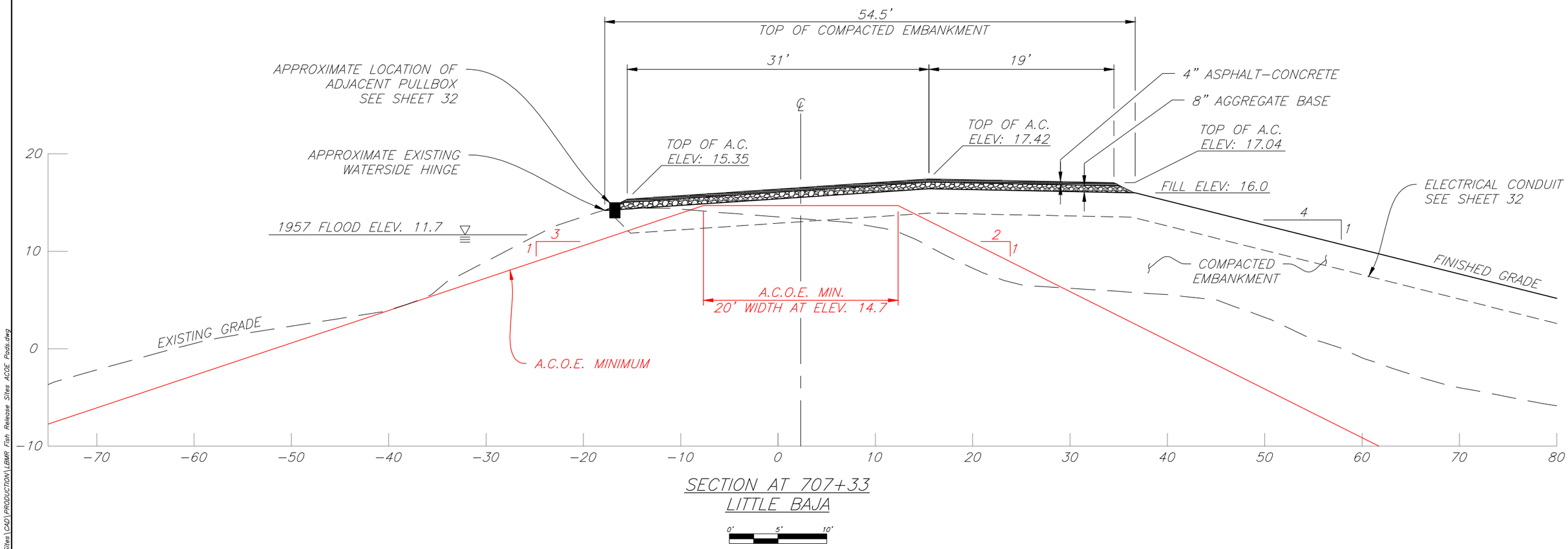
REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23033
11/24/14
CIVIL
STATE OF CALIFORNIA

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN - LITTLE BAJA ACCESS GATE &
PLAN - LITTLE BAJA FISH RELEASE PAD

SHEET 28 OF 45 SHEETS



SECTION AT 707+33
LITTLE BAJA

0' 5' 10'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
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PRELIMINARY
NOT FOR CONSTRUCTION

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Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

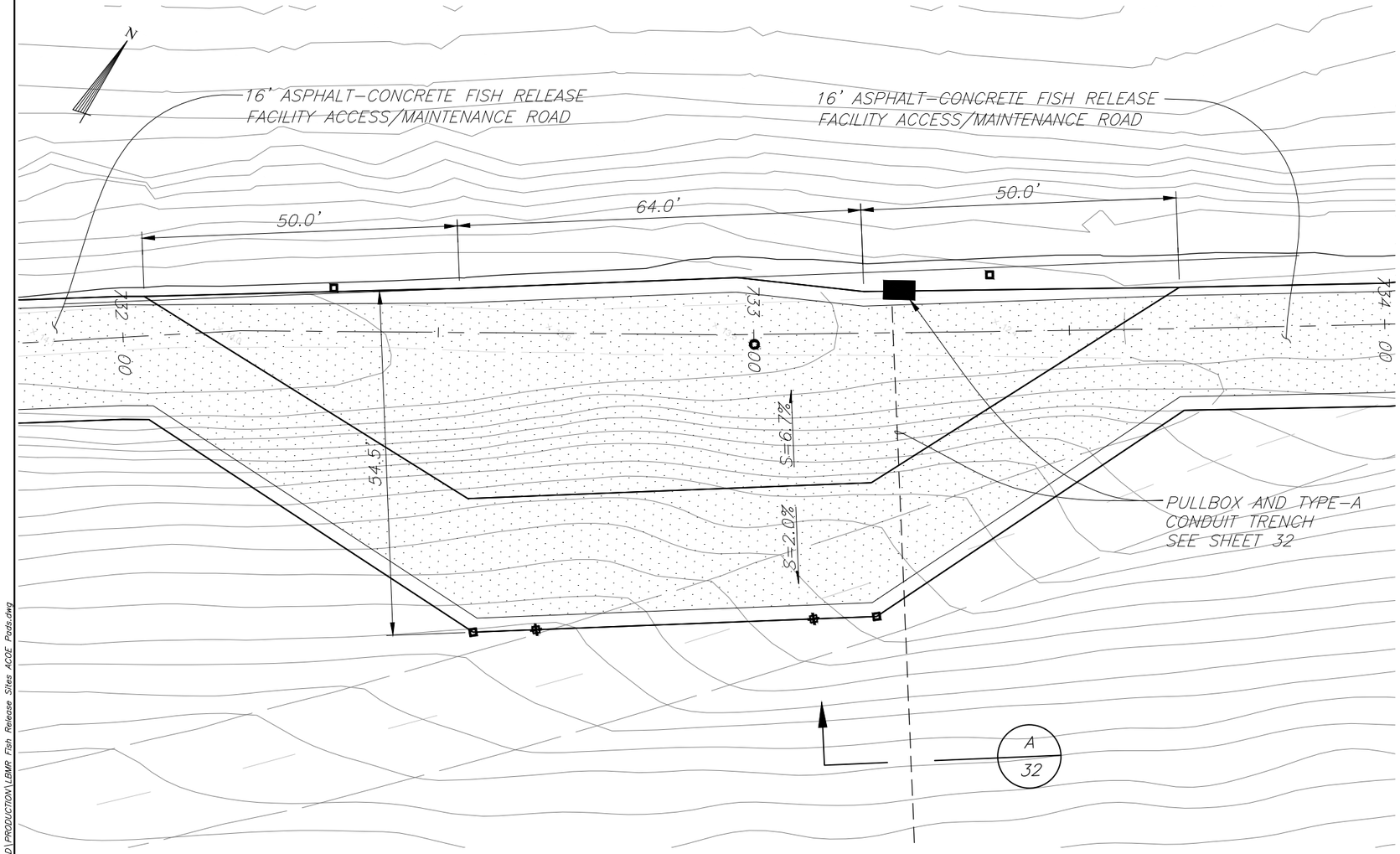
Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 42903
12/31/14
CIVIL
STATE OF CALIFORNIA

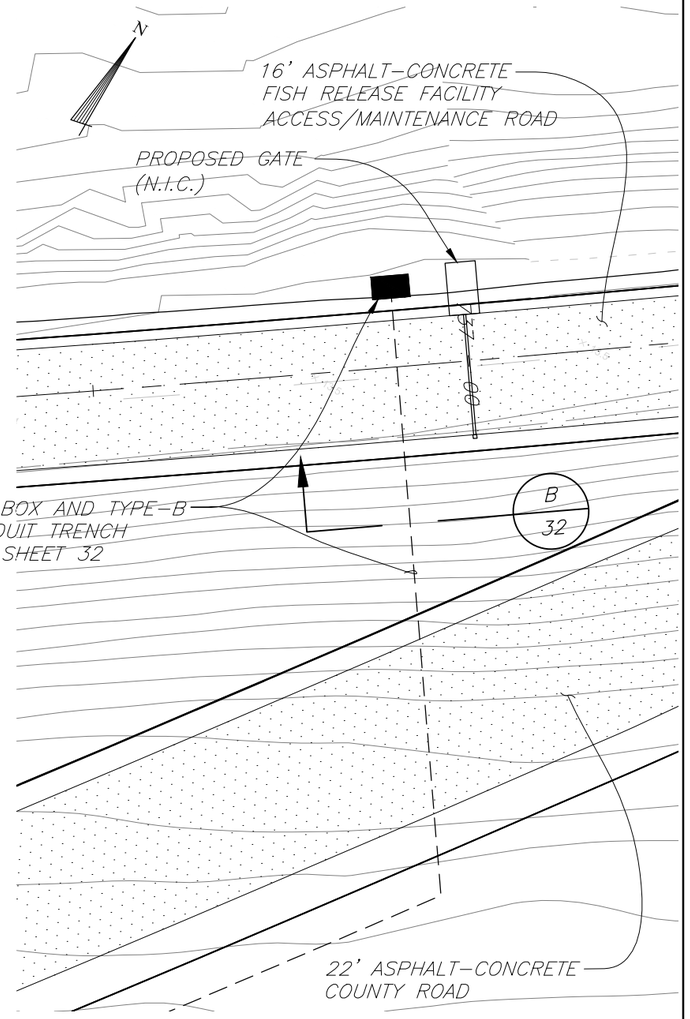
RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
SECTION AT 707+33, LITTLE BAJA

SHEET 29 OF 45 SHEETS

Attachment C



PLAN
MANZO RANCH FISH RELEASE PAD
0' 10' 20'



PLAN
MANZO RANCH ACCESS GATE
0' 10' 20'

LEGEND:
- EXISTING INCLINOMETER - PROTECT IN PLACE
- EXISTING INCLINOMETER - MODIFY AS DIRECTED
- EXISTING INCLINOMETER - TO BE REMOVED BY ENGINEER
- NEW INCLINOMETER - TO BE INSTALLED BY ENGINEER
- NEW PIEZOMETER - TO BE INSTALLED BY ENGINEER

H:\CH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

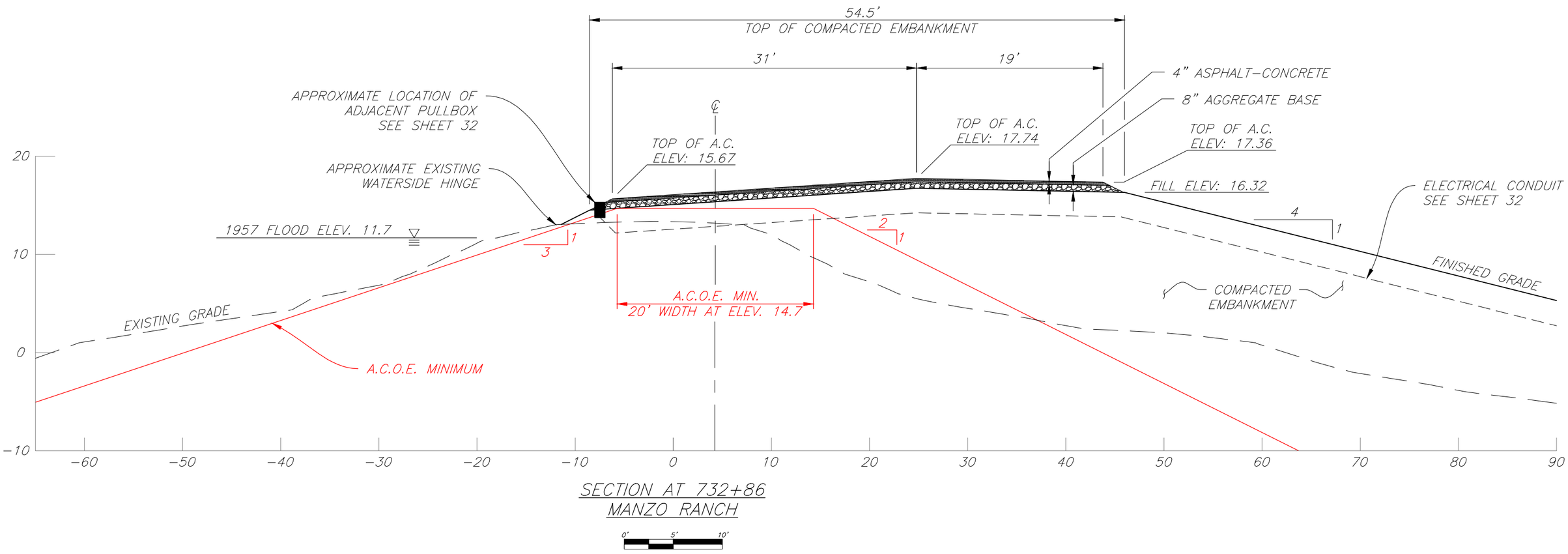
REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 29013 CIVIL STATE OF CALIFORNIA DRAFT 12/31/14

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PLAN - MANZO RANCH ACCESS GATE &
PLAN - MANZO RANCH FISH RELEASE PAD

SHEET 30 OF 45 SHEETS



SECTION AT 732+86
MANZO RANCH

0' 5' 10'

H:\CH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg
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Plot Date: 11/24/2014
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Date	NOVEMBER 2014

Wagner&Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 12/31/14 CIVIL STATE OF CALIFORNIA

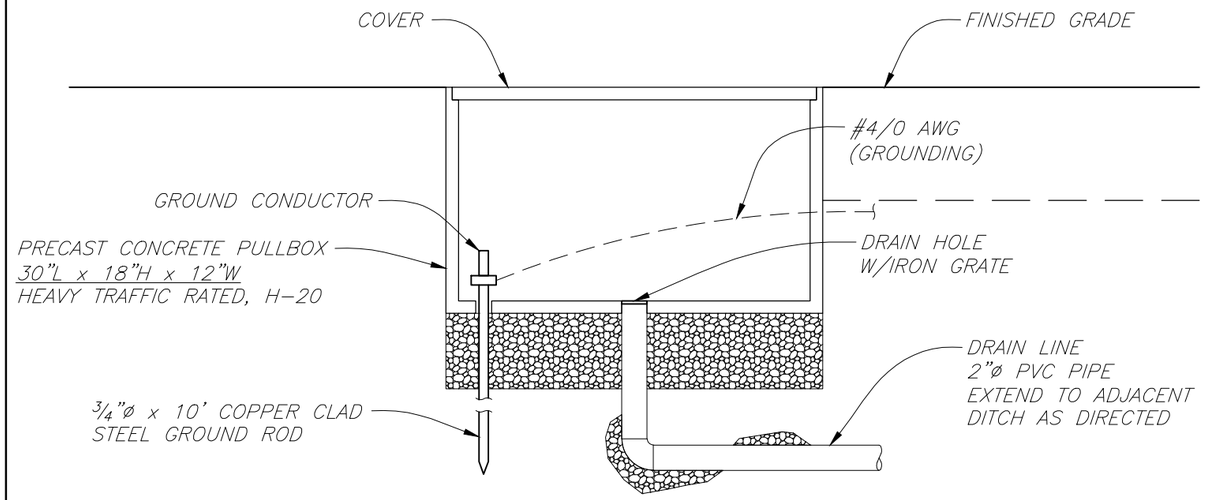
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

SECTION AT 732+86, MANZO RANCH

SHEET 31 OF 45 SHEETS

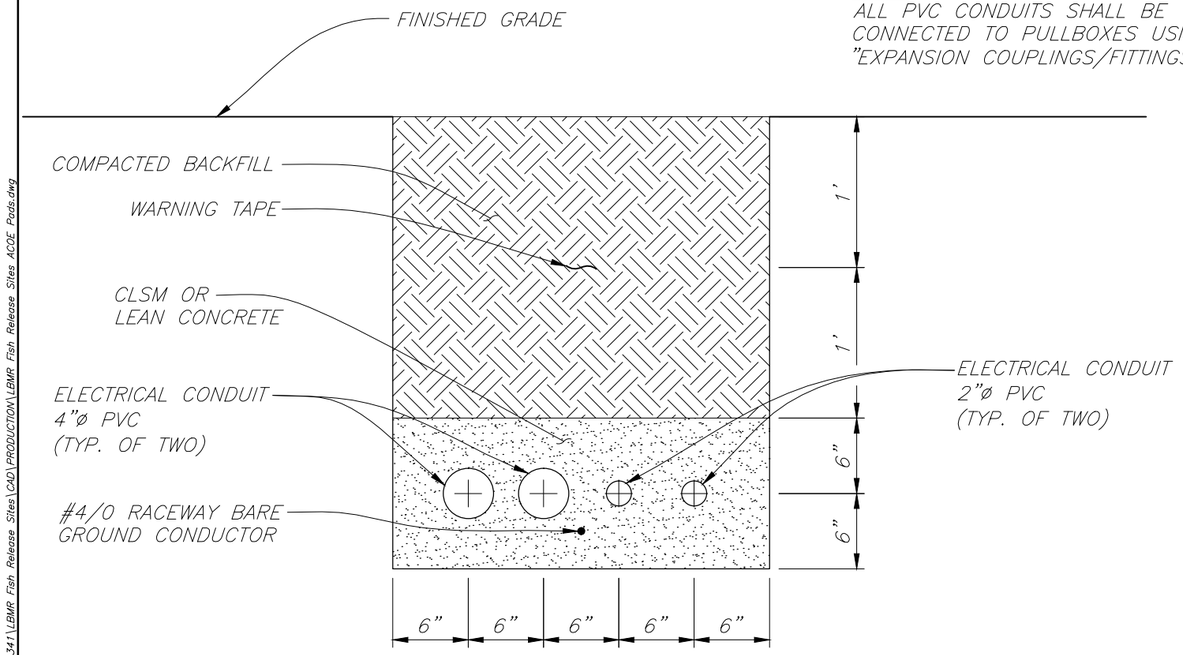
Attachment C



PULLBOX W/ DRAIN DETAIL

0' 0.5' 1'

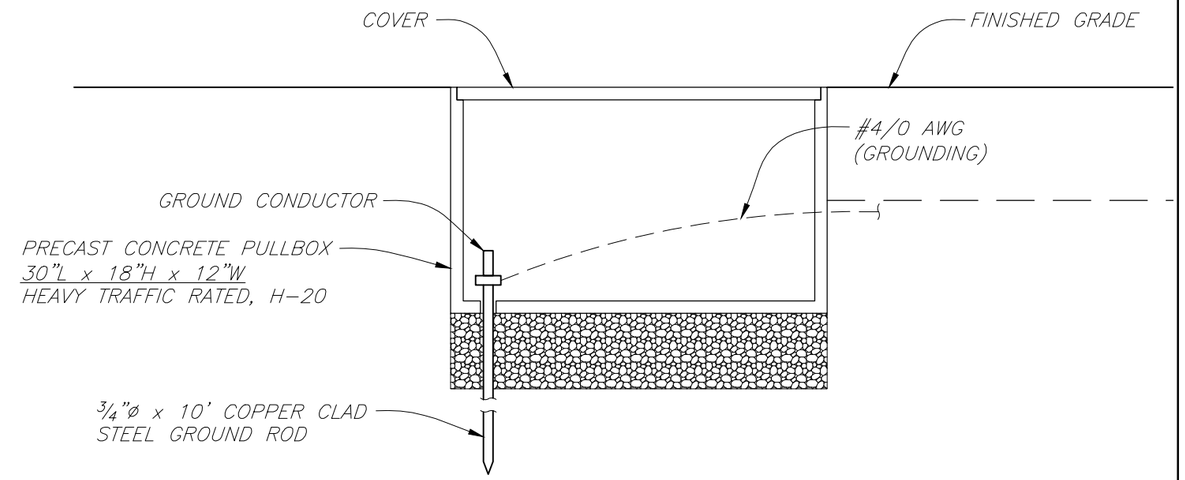
NOTE:
ALL PVC CONDUITS SHALL BE CONNECTED TO PULLBOXES USING "EXPANSION COUPLINGS/FITTINGS"



TYPE-A CONDUIT TRENCH SECTION

A
17,19
28,30

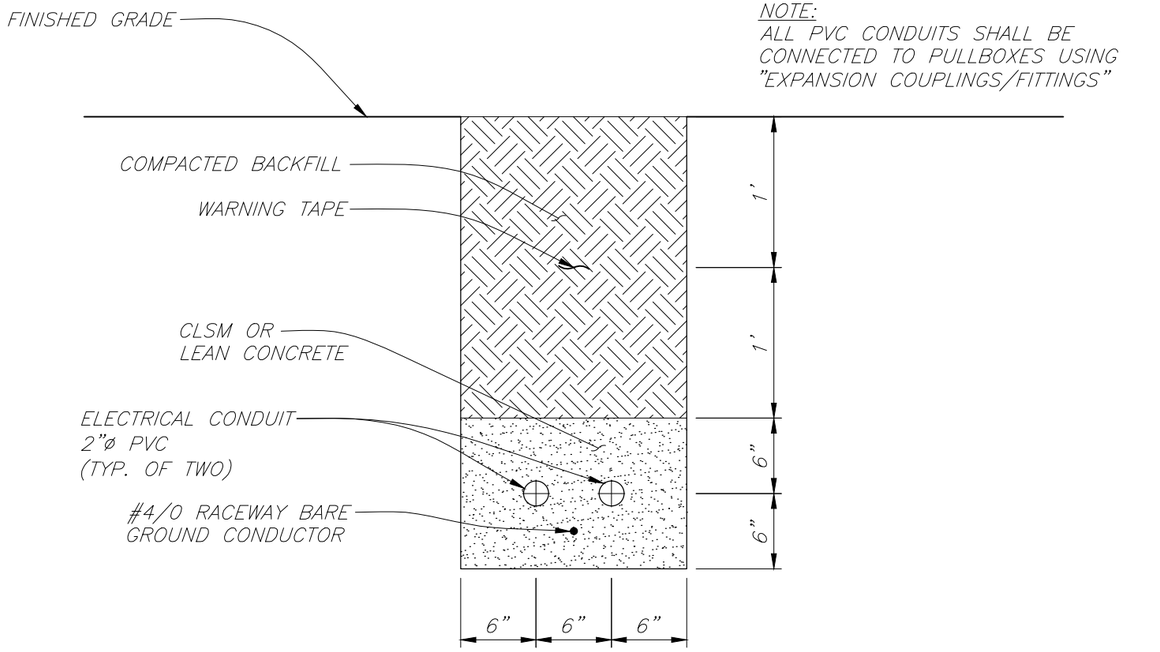
0' 0.5' 1'



PULLBOX DETAIL

0' 0.5' 1'

NOTE:
ALL PVC CONDUITS SHALL BE CONNECTED TO PULLBOXES USING "EXPANSION COUPLINGS/FITTINGS"



TYPE-B CONDUIT TRENCH SECTION

B
17,19
28,30

0' 0.5' 1'

H:\CH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
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Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 12/31/14 CIVIL STATE OF CALIFORNIA

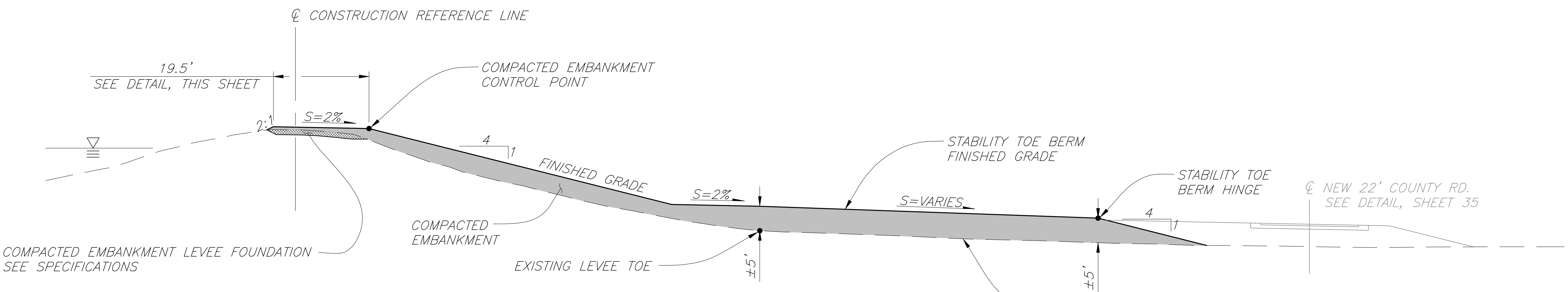
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

PULLBOX DETAILS & CONDUIT TRENCH SECTIONS

SHEET 32 OF 45 SHEETS

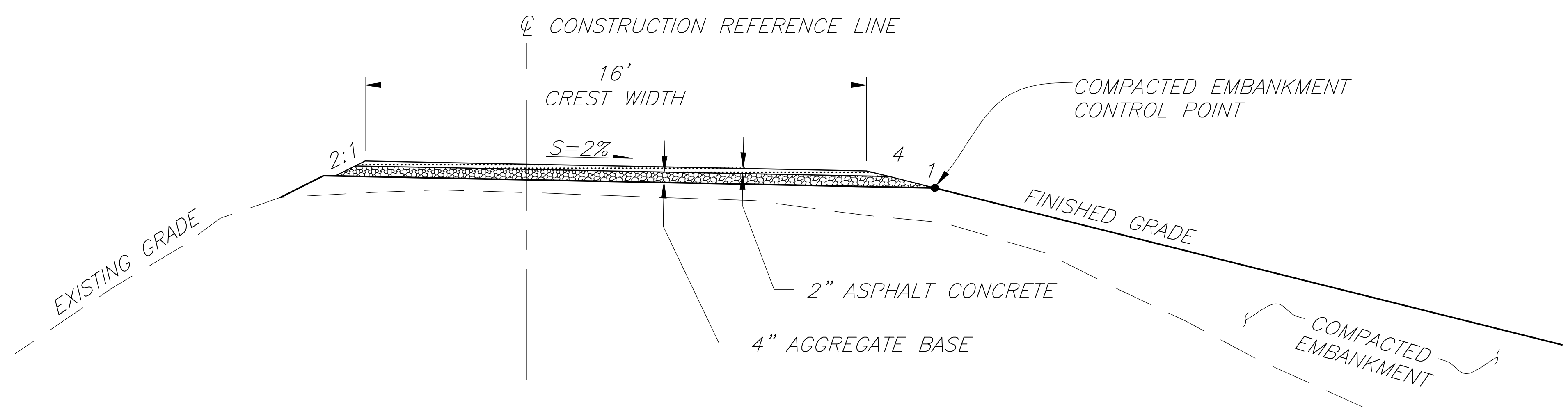
Attachment C



NOTE:
SEE TABLE, SHEET 3 FOR ELEVATION AND DISTANCES FROM CONSTRUCTION REFERENCE LINE TO CONTROL POINTS

TYPICAL SECTION
TYPICAL OF APPROXIMATE STA. 702+00 TO 738+00

0' 5' 10' 20'



16' ASPHALT-CONCRETE FISH RELEASE FACILITY ACCESS/MAINTENANCE ROAD DETAIL

0' 2.5' 5'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name	Plot Date	Revision Date
LBMR Fish Release Sites ACOE Pads.dwg	11/24/2014	11/24/2014

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Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

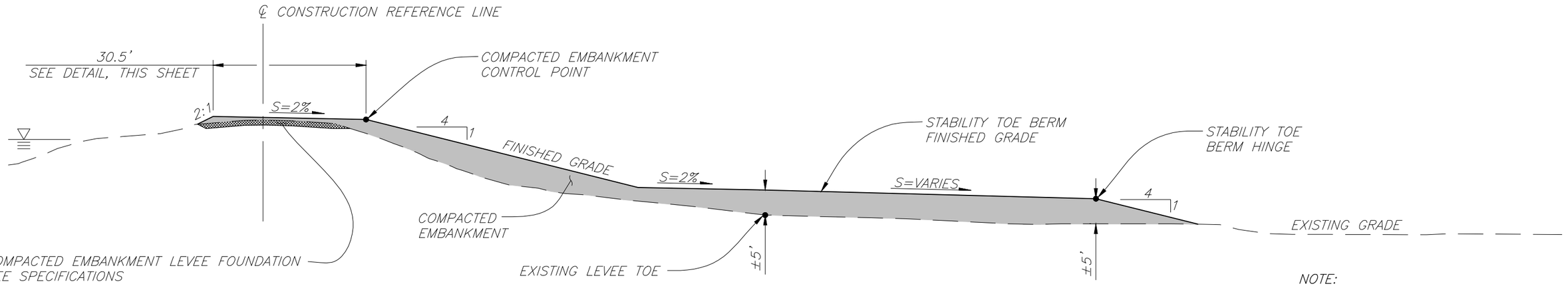
REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 52903
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

TYPICAL SECTION AND DETAIL
APPROXIMATE STA. 702+00 TO 738+00

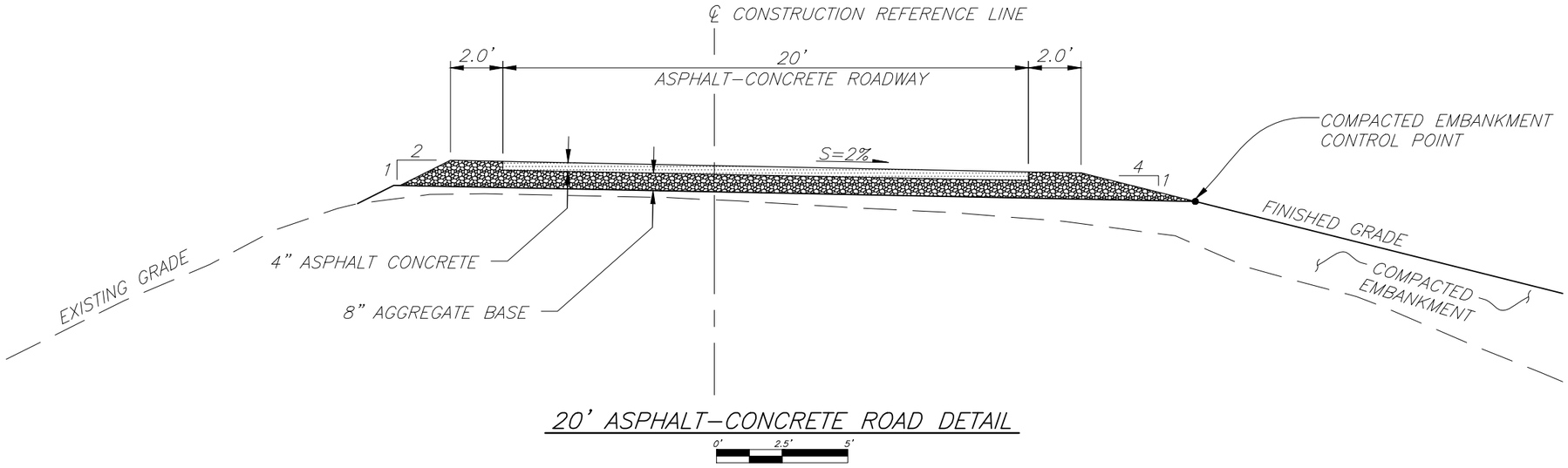
SHEET 33 OF 45 SHEETS



NOTE:
SEE TABLE, SHEET 3 FOR ELEVATION AND DISTANCES FROM CONSTRUCTION REFERENCE LINE TO CONTROL POINTS

TYPICAL SECTION
TYPICAL OF APPROXIMATE STA. 700+00 TO 702+00 & 738+00 TO 740+00

0' 5' 10' 20'



20' ASPHALT-CONCRETE ROAD DETAIL

0' 2.5' 5'

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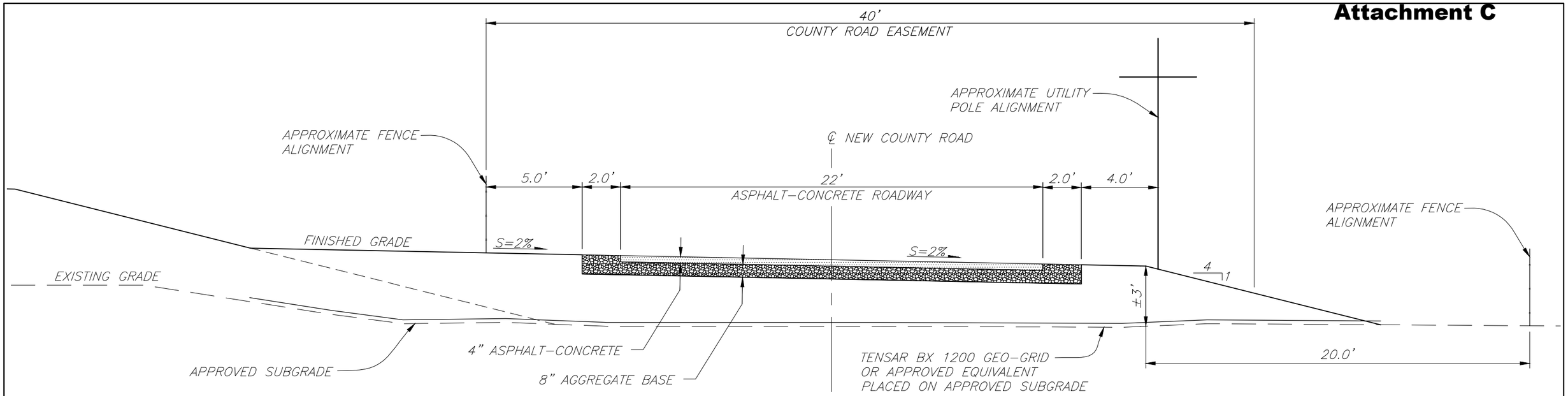
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 42903
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
TYPICAL SECTION AND DETAIL
APPROX. STA. 700+00 TO 702+00 AND 738+00 TO 740+00

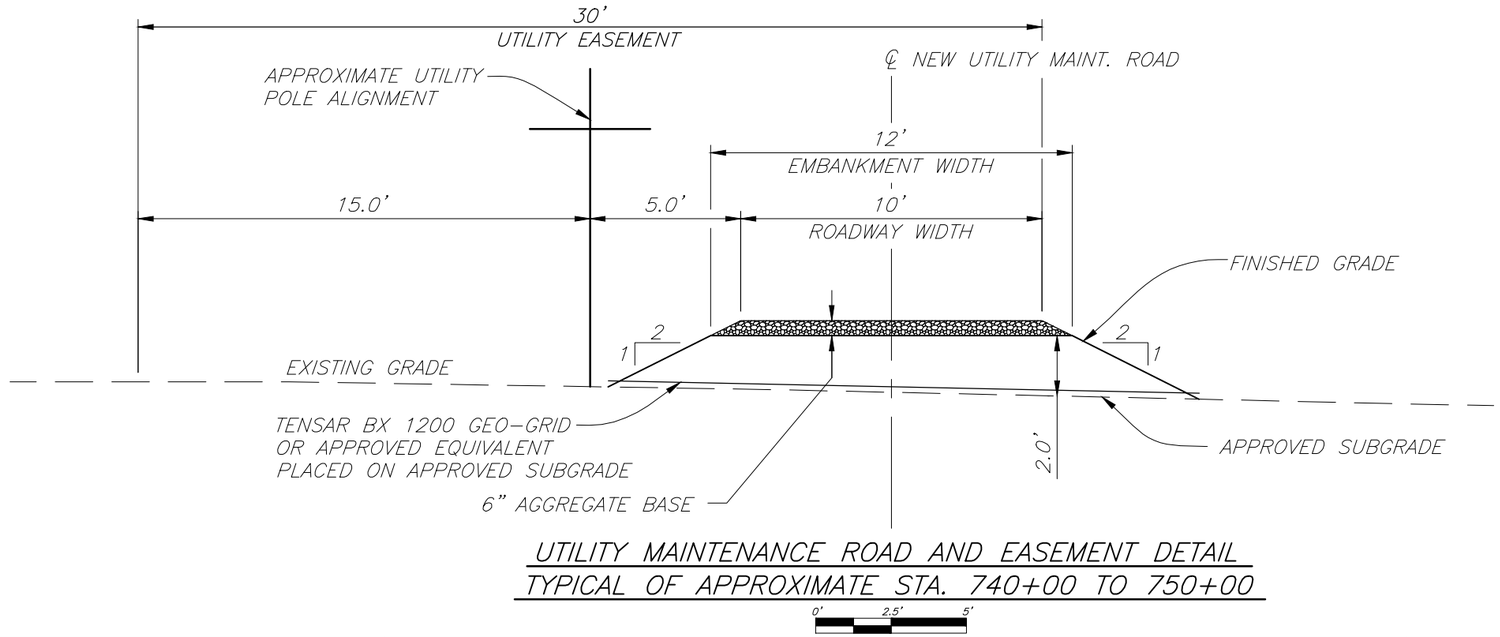
SHEET 34 OF 45 SHEETS

Attachment C



22' ASPHALT-CONCRETE COUNTY ROAD AND EASEMENT DETAIL
TYPICAL OF APPROXIMATE STA. 703+00 TO 737+00

0' 2.5' 5'



UTILITY MAINTENANCE ROAD AND EASEMENT DETAIL
TYPICAL OF APPROXIMATE STA. 740+00 TO 750+00

0' 2.5' 5'

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

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REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 Exp. 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

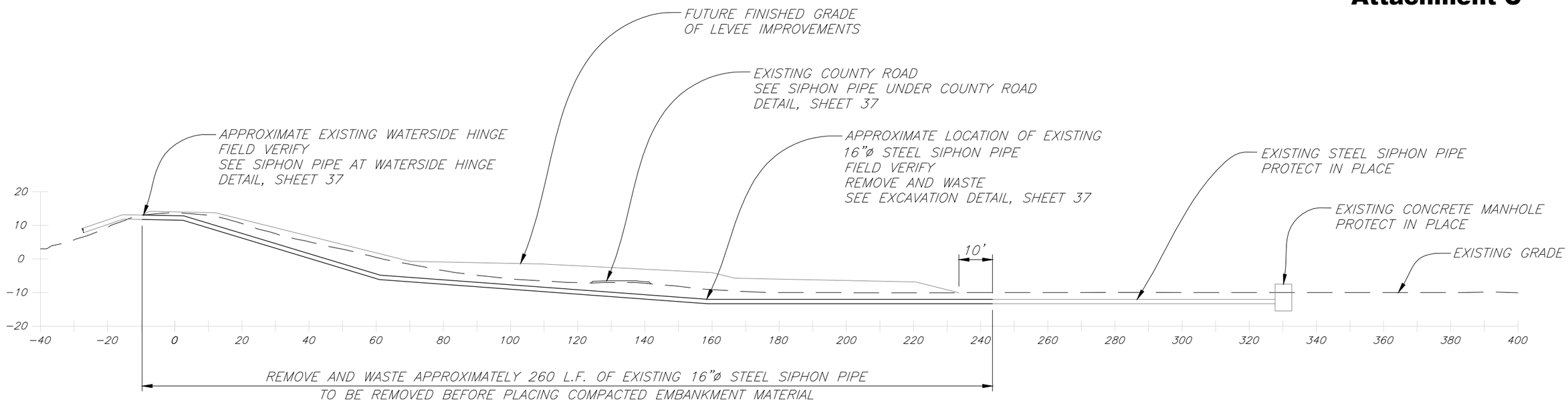
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

22' ASPHALT-CONCRETE COUNTY ROAD AND EASEMENT DETAIL APPROX. STA. 703+00 TO 737+00, UTILITY MAINTENANCE ROAD AND EASEMENT DETAIL APPROX. STA. 740+00 TO 750+00

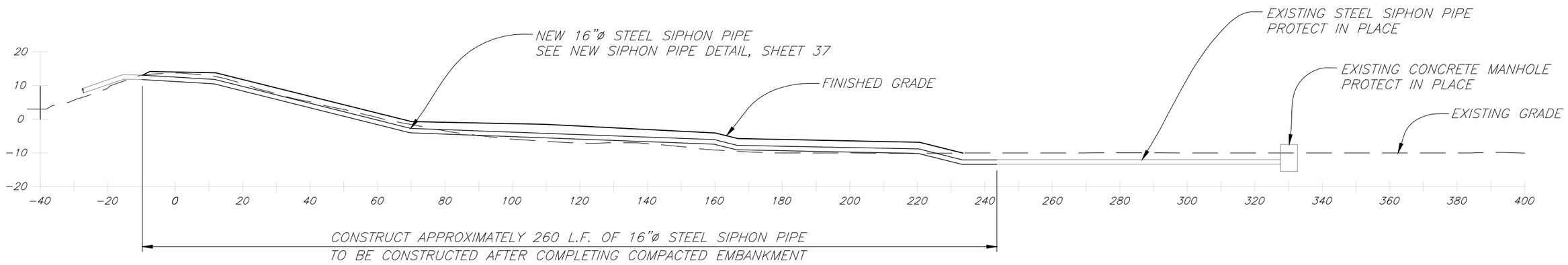
SHEET 35 OF 45 SHEETS

Attachment C



EXISTING SIPHON AT ≈ STA. 718+13
PROFILE

0' 15' 30'



NEW SIPHON AT ≈ STA. 718+13
PROFILE

0' 15' 30'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 25903
12/31/14
CIVIL
STATE OF CALIFORNIA

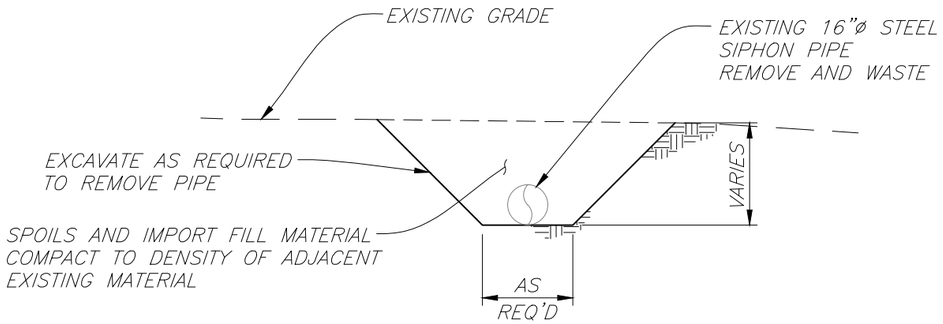
DRAFT

RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

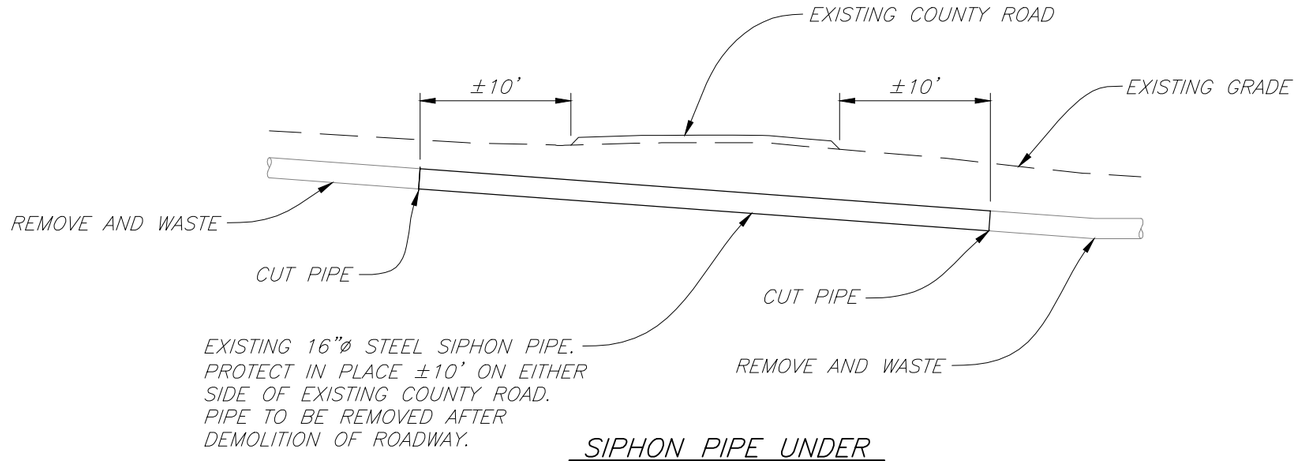
EXISTING SIPHON AT ≈ 718+13
PROFILES

SHEET 36 OF 45 SHEETS



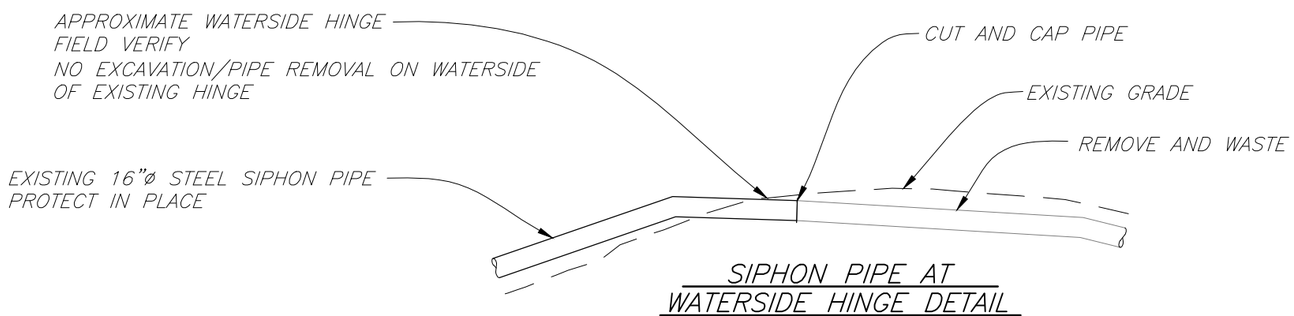
EXCAVATION DETAIL

0' 2.5' 5'



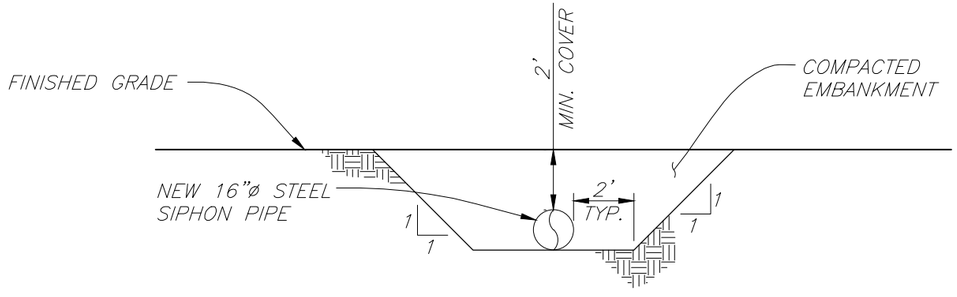
SIPHON PIPE UNDER COUNTY ROAD DETAIL

0' 5' 10'



SIPHON PIPE AT WATERSIDE HINGE DETAIL

0' 5' 10'



NEW SIPHON PIPE DETAIL

0' 2.5' 5'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23303 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

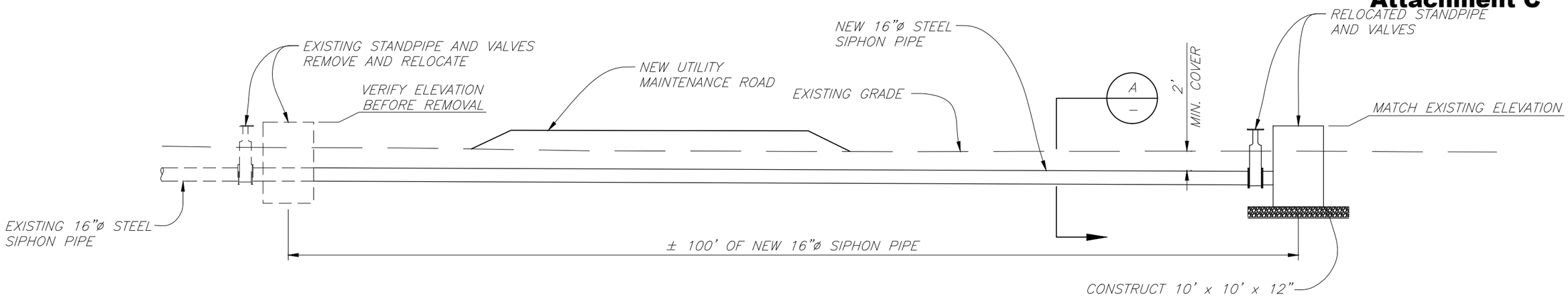
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

NEW SIPHON AT ≈ 718+13 DETAILS

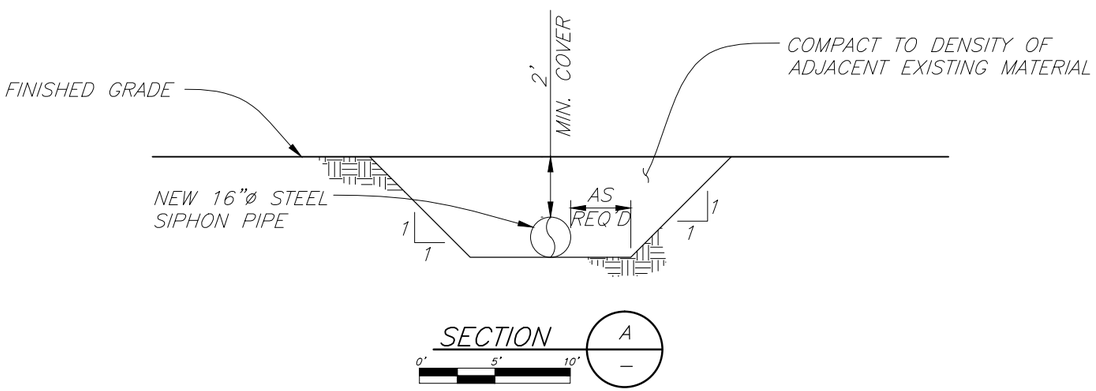
SHEET 37 OF 45 SHEETS

Attachment C



EXISTING SIPHON AT ≈ STA. 741+51
PROFILE

0' 5' 10'



SECTION A—A

0' 5' 10'

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

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Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

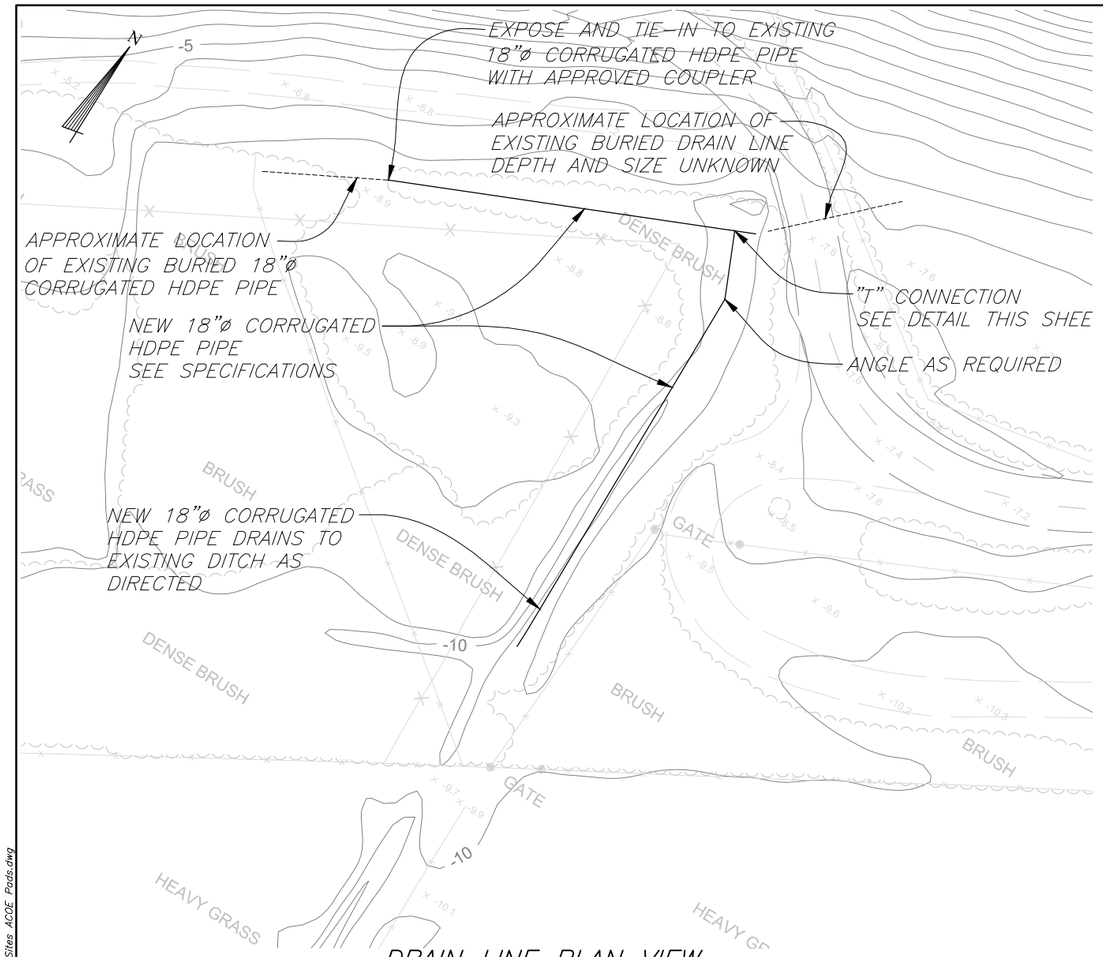
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

EXISTING SIPHON AT ≈ 741+51
PROFILE AND SECTIONS

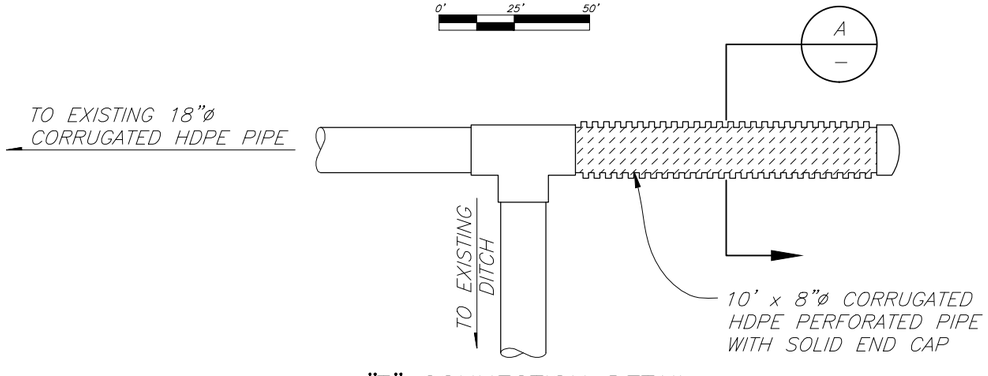
SHEET 38 OF 45 SHEETS

Attachment C



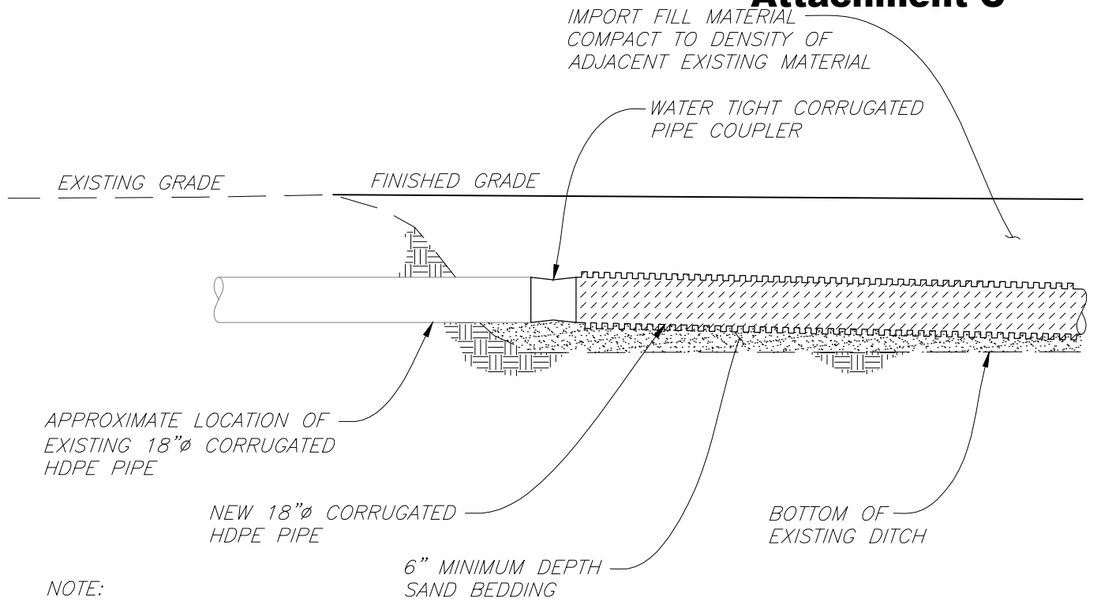
DRAIN LINE PLAN VIEW

0' 25' 50'



"T" CONNECTION DETAIL

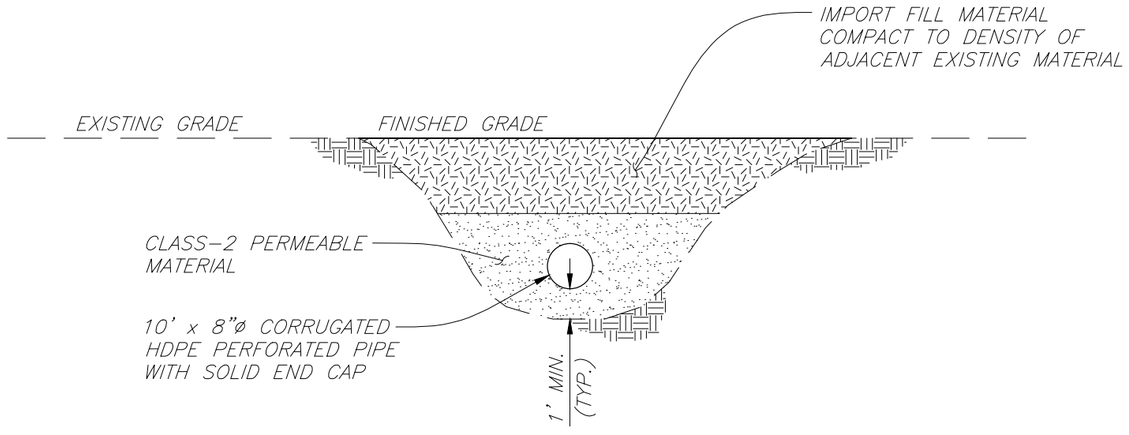
0' 2.5' 5'



NOTE:
REMOVE VEGETATION FROM EXISTING DITCH BEFORE PLACING NEW PIPE

PIPE CONNECTION DETAIL
CONNECTION TO EXISTING 18"ø PIPE

0' 2.5' 5'



SECTION A

0' 2.5' 5'

NOTES:

1) BASE TOPOGRAPHY FROM AMERICAN AERIAL MAPPING, INC. FLOWN 6/29/2010.

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Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 42903 EXP. 12/31/14 CIVIL STATE OF CALIFORNIA

RECLAMATION DISTRICT NO. 341

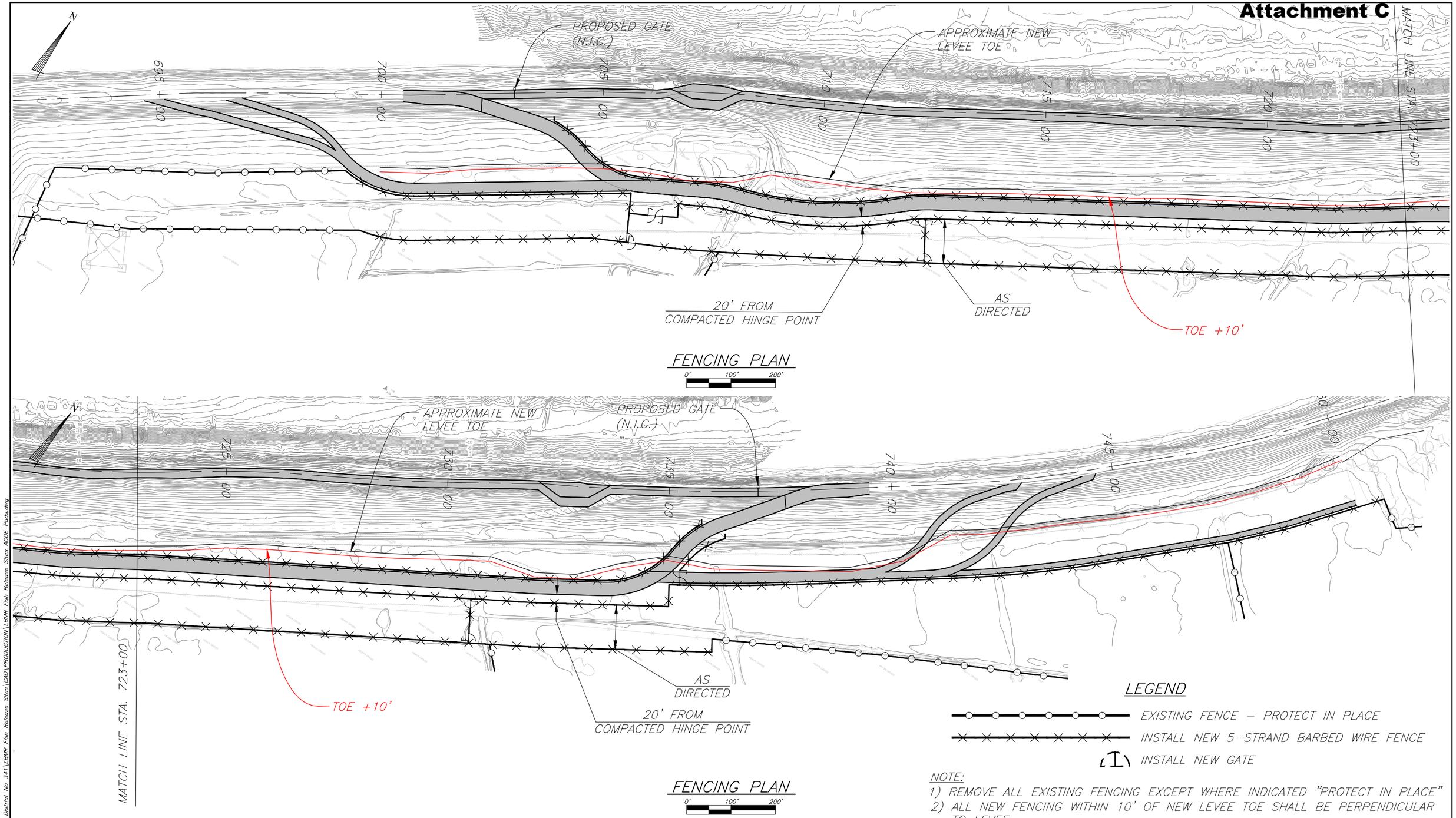
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

DRAIN LINE PLAN VIEW, DETAILS AND SECTION

SHEET 39 OF 45 SHEETS

File Name: LBMR Fish Release Sites ACOE Pods.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg



FENCING PLAN
0' 100' 200'

FENCING PLAN
0' 100' 200'

LEGEND

- EXISTING FENCE – PROTECT IN PLACE
- INSTALL NEW 5–STRAND BARBED WIRE FENCE
- INSTALL NEW GATE

NOTE:
1) REMOVE ALL EXISTING FENCING EXCEPT WHERE INDICATED "PROTECT IN PLACE"
2) ALL NEW FENCING WITHIN 10' OF NEW LEVEE TOE SHALL BE PERPENDICULAR TO LEVEE

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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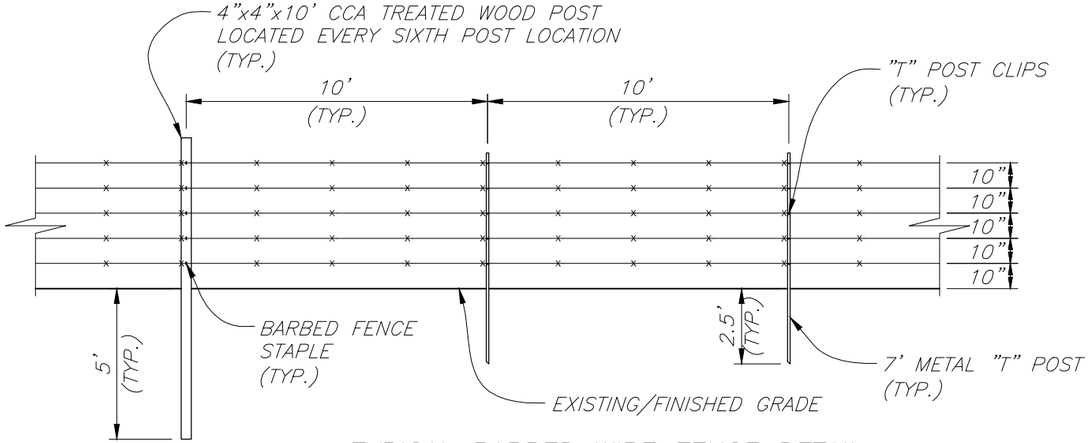
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 25803 12/31/14 CIVIL STATE OF CALIFORNIA

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
FENCING PLAN

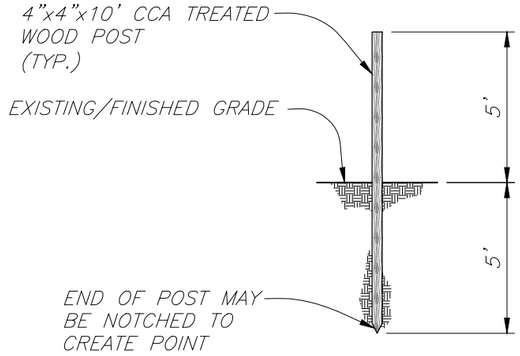
SHEET 40 OF 45 SHEETS

Attachment C



TYPICAL BARBED WIRE FENCE DETAIL

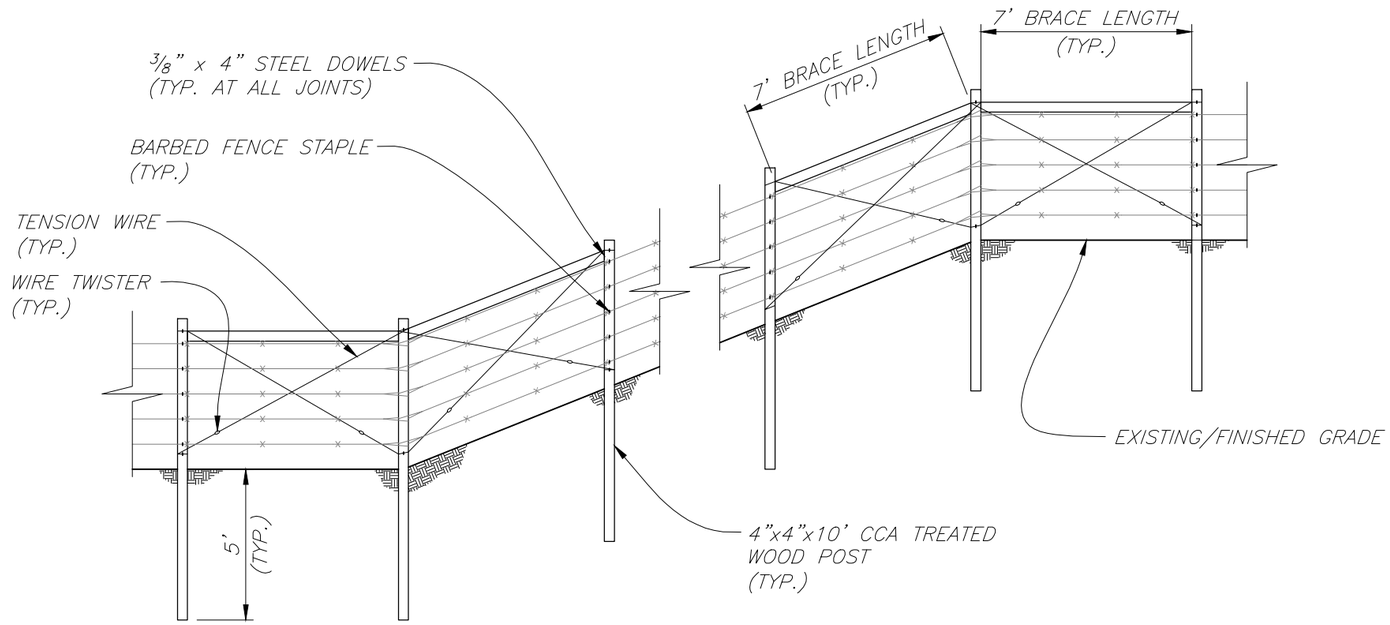
0' 2.5' 5'



TYPICAL WOOD POST INSTALLATION DETAIL

0' 2.5' 5'

NOTE:
4"ø x 10' GALVANIZED PIPE MAY BE SUBSTITUTED FOR WOOD POSTS AT CONTRACTORS OPTION. ALL CUTS AND WELDS SHALL BE COLD SPRAYED GALVANIZED.



TYPICAL FENCE ON SHARP GRADE BREAK DETAIL

0' 2.5' 5'

H:\JCH Job Drawings\Reclamation District No. 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pods.dwg

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Suite 100
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Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 23013 12/31/14 CIVIL STATE OF CALIFORNIA

DRAFT

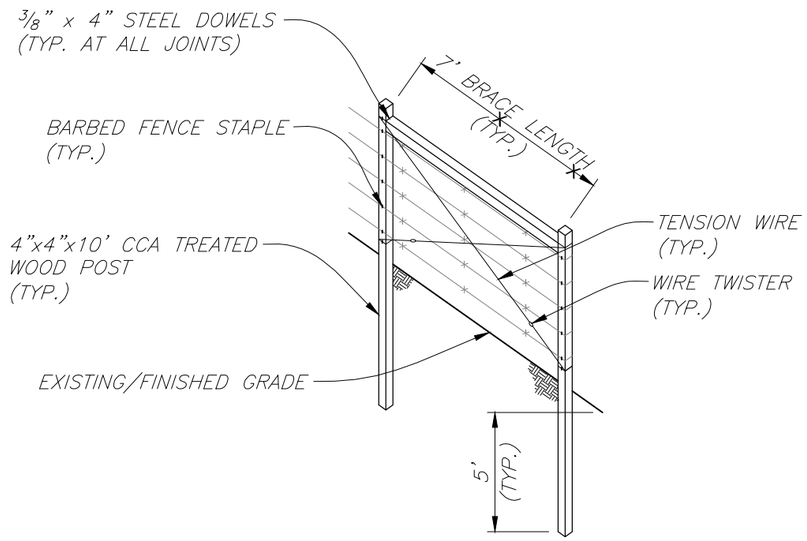
RECLAMATION DISTRICT NO. 341

SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES

NEW BARBED WIRE FENCE DETAILS

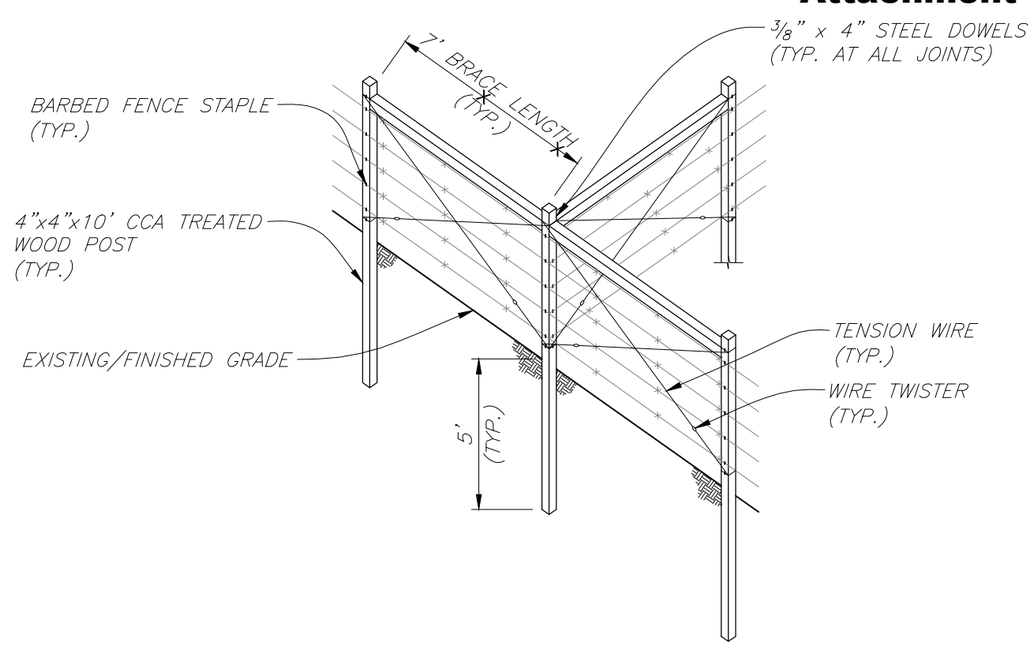
SHEET 41 OF 45 SHEETS

Attachment C



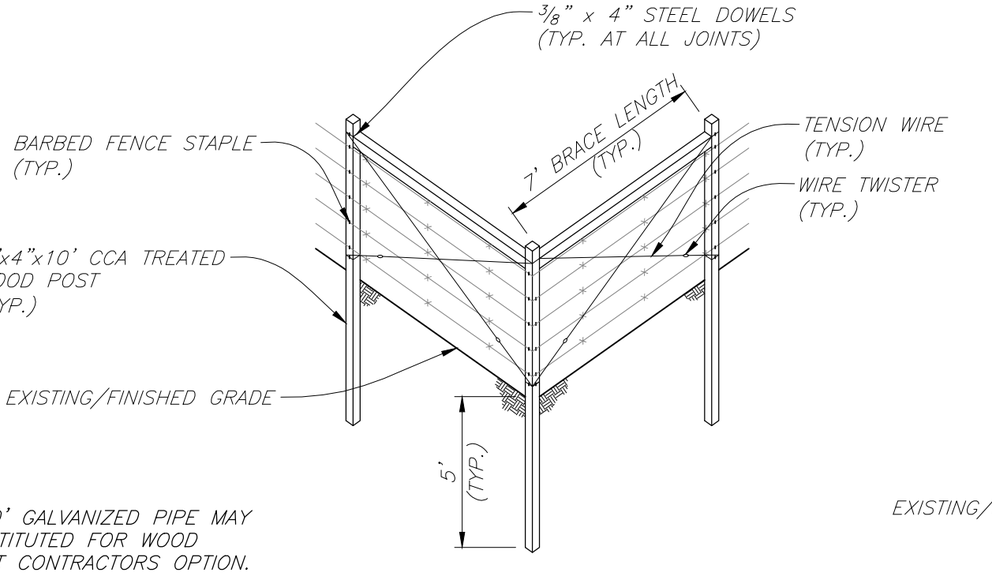
TYPICAL END POST DETAIL

0' 2.5' 5'



TYPICAL "T-INTERSECTION" POST DETAIL

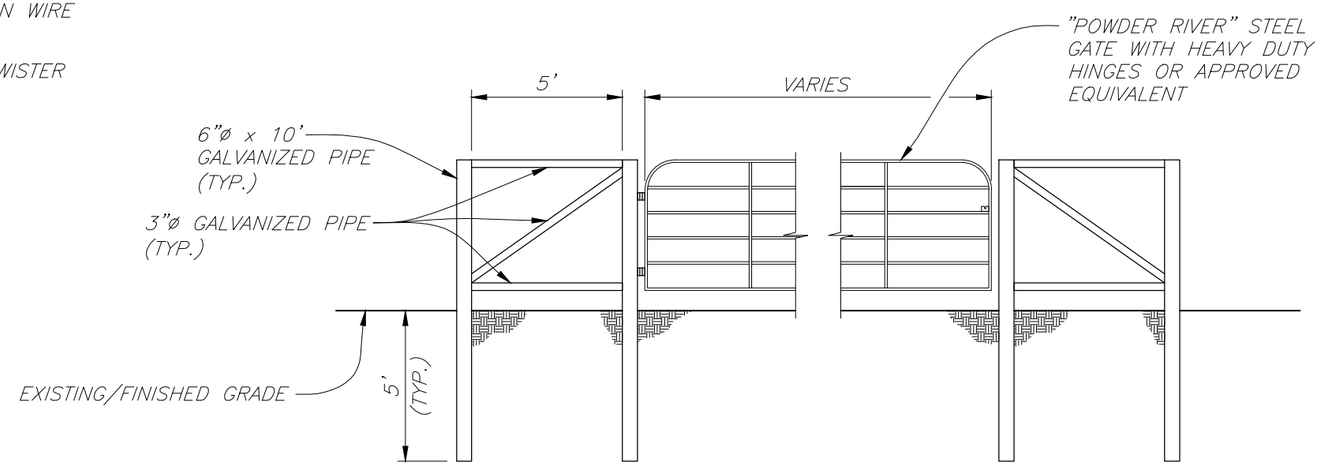
0' 2.5' 5'



NOTE:
4"ø x 10' GALVANIZED PIPE MAY BE SUBSTITUTED FOR WOOD POSTS AT CONTRACTORS OPTION. ALL CUTS AND WELDS SHALL BE COLD SPRAYED GALVANIZED.

TYPICAL CORNER POST DETAIL

0' 2.5' 5'



TYPICAL GATE DETAIL

0' 2.5' 5'

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2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
Exp. 6/30/14
CIVIL
STATE OF CALIFORNIA

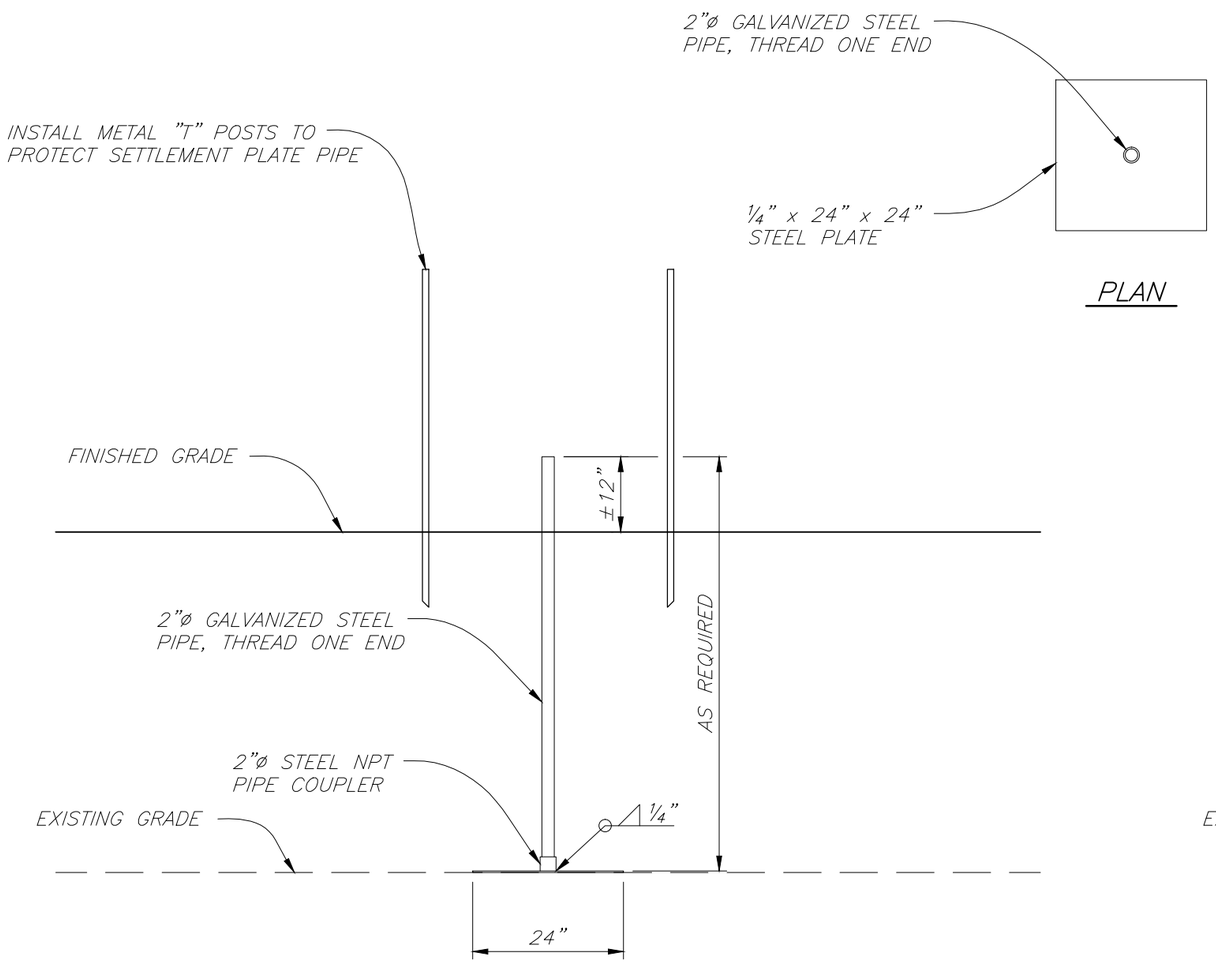
DRAFT

RECLAMATION DISTRICT NO. 341

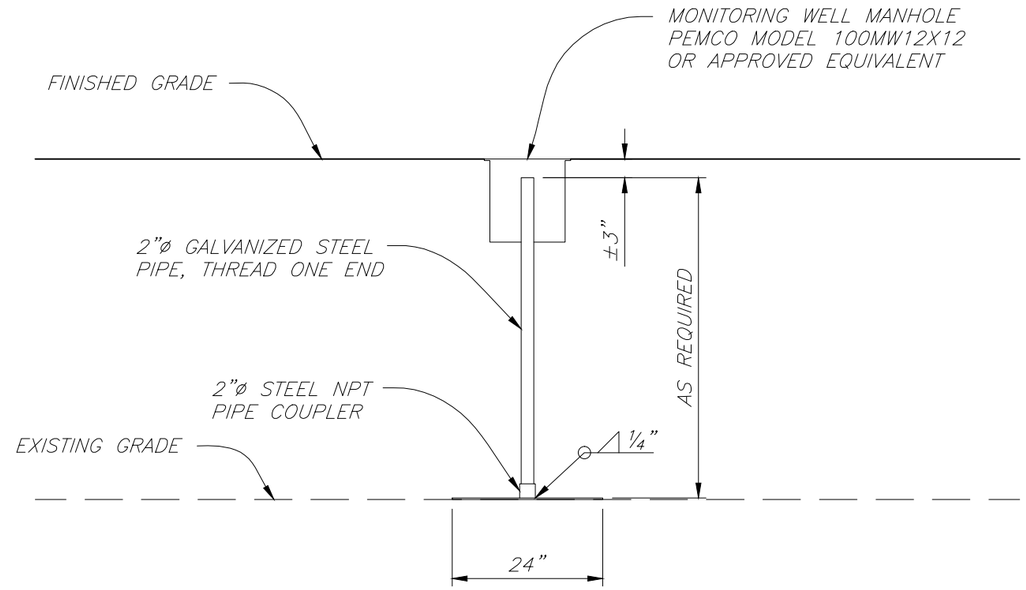
SHERMAN ISLAND "LITTLE BAJA"
AND "MANZO RANCH" FISH RELEASE SITES

NEW BARBED WIRE FENCE DETAILS
NEW GATE DETAIL

SHEET 42 OF 45 SHEETS



ELEVATION
SETTLEMENT PLATE ON BENCH
TYPICAL OF 5 INSTALLATIONS



ELEVATION
SETTLEMENT PLATE ON CREST
TYPICAL OF 5 INSTALLATIONS

NOTE:
INSTALL SETTLEMENT PLATES AT LOCATIONS AS DIRECTED BY ENGINEER

SETTLEMENT PLATE DETAIL

0' 1' 2'

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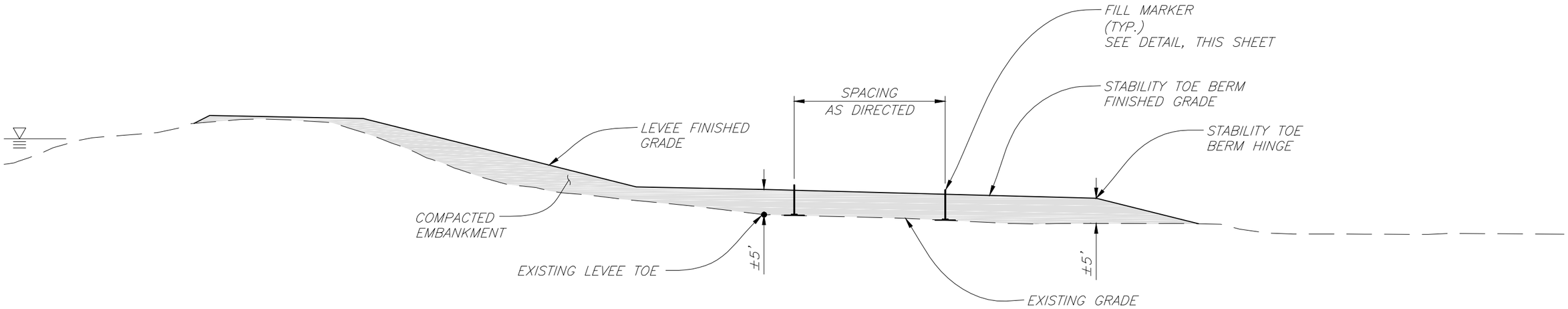
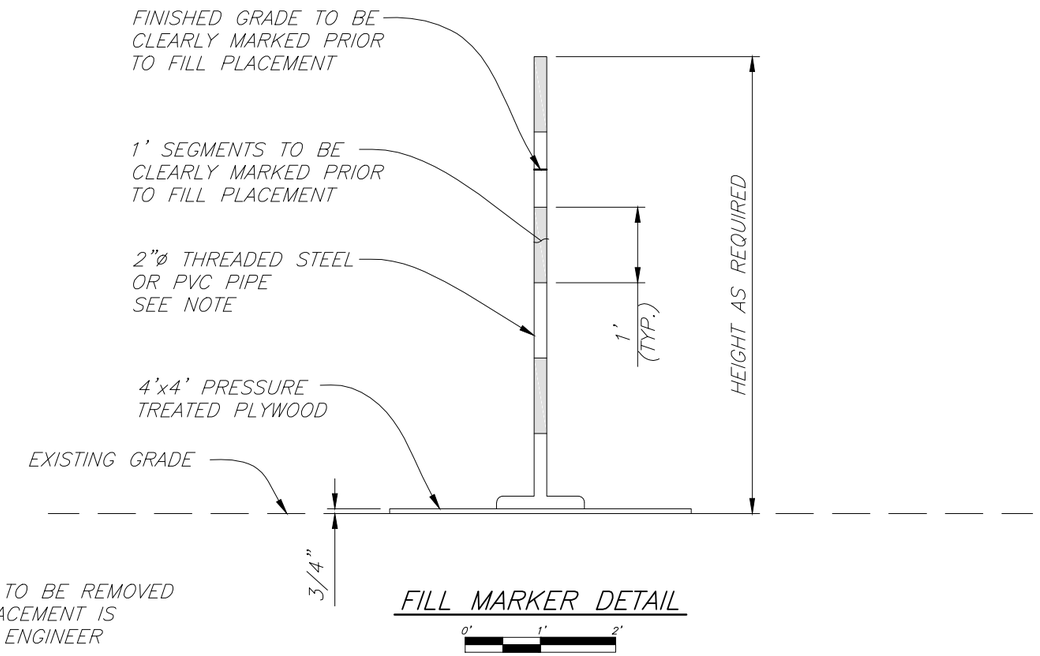
RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
SETTLEMENT PLATE DETAIL

SHEET 43 OF 45 SHEETS



TYPICAL FILL MARKER PLACEMENT SECTION

0' 5' 10' 20'



NOTE:
FILL THICKNESS MARKER POLE TO BE REMOVED TO FULL DEPTH AFTER FILL PLACEMENT IS COMPLETED AND ACCEPTED BY ENGINEER

FILL MARKER DETAIL

0' 1' 2'

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Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER
ROBERT C. WAGNER
No. 23903
12/31/14
CIVIL
STATE OF CALIFORNIA
DRAFT

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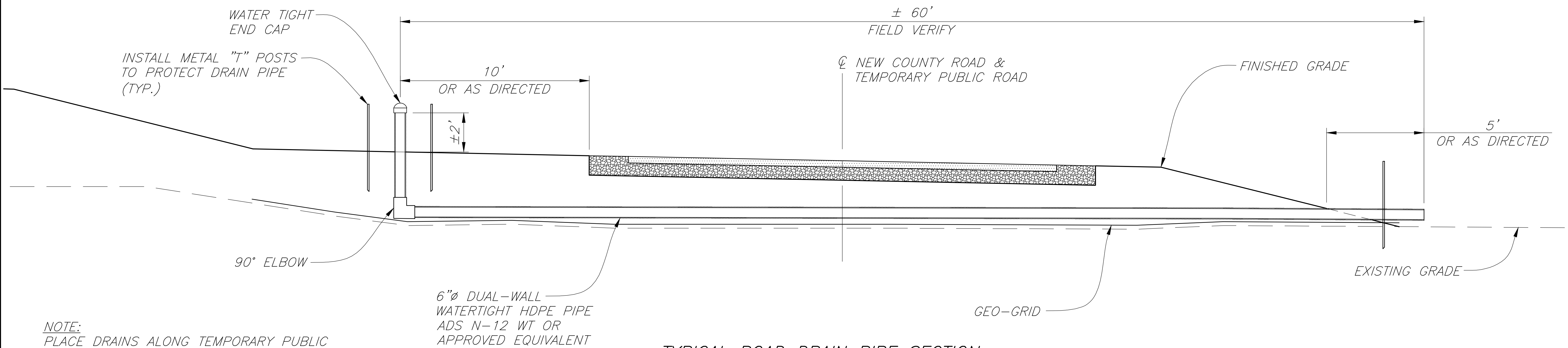
TYPICAL FILL MARKER PLACEMENT SECTION
AND FILL MARKER DETAIL

SHEET 44 OF 45 SHEETS

Attachment C



NOTE:
PLACE DRAINS ALONG TEMPORARY PUBLIC ROAD AND NEW COUNTY ROAD EVERY 400' OR AS DIRECTED.
APPROXIMATELY TEN REQUIRED.

TYPICAL ROAD DRAIN PIPE SECTION

0' 2.5' 5'

H:\JCH Job Drawings\Reclamation District No 341\LBMR Fish Release Sites\CAD\PRODUCTION\LBMR Fish Release Sites ACOE Pads.dwg

File Name: LBMR Fish Release Sites ACOE Pads.dwg
Plot Date: 11/24/2014
Revision Date: 11/24/2014

NOT FOR PUBLIC USE OR DISTRIBUTION

REVISIONS			
REF.	DESCRIPTION	APVD.	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

Designed By	S.R. HERINGER
Drawn By	S.R. HERINGER
Checked By	H.S. MATSUNAGA
Approved By	R.C. WAGNER
Date	NOVEMBER 2014

Wagner & Bonsignore
Consulting Civil Engineers, A Corporation
2151 River Plaza Drive
Suite 100
Sacramento, California 95833
Ph: 916-441-6850
Fx: 916-779-3120

REGISTERED PROFESSIONAL ENGINEER ROBERT C. WAGNER No. 22903 12/31/14 CIVIL STATE OF CALIFORNIA — DRAFT

RECLAMATION DISTRICT NO. 341
SHERMAN ISLAND "LITTLE BAJA" AND "MANZO RANCH" FISH RELEASE SITES
TYPICAL ROAD DRAIN PIPE SECTION

SHEET 45 OF 45 SHEETS

Attachment D

GEOTECHNICAL EVALUATION

SHERMAN ISLAND – STATIONS 700 TO 850
RECLAMATION DISTRICT 341
SACRAMENTO COUNTY, CALIFORNIA

Project No. 789.06
November 11, 2014

Prepared by

Hultgren – Tillis Engineers

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I. INTRODUCTION

This report presents the results of our geotechnical evaluation for levee rehabilitation for Reclamation District 341 (District) on Sherman Island in Sacramento County, California. The District plans to improve the erosion protection on the waterside slopes, widen the county road on the levee crest and construct other slope modifications to meet the Project Levee requirements between Stations 700 and 850. As part of the modifications the existing county road between District Stations 707 and 733 will be realigned. The limits of levee rehabilitation for this project extend from District Stations 700 to 850, covering approximately 2.8 miles of levee located along the Sacramento River on the northwest side of Sherman Island. This levee reach is a U.S. Army Corps Engineers (USACE) project levee and is part of the State Plan of Flood Control facilities and subject to permitting through the Central Valley Flood Control Board (CVFCB). The existing levee crest serves as a two-lane county road, except the reach between Stations 707 and 733 where the county road is located at the landside slope toe. The California Department of Water Resources (DWR) plans to construct and operate two new salvaged fish release facilities at Stations 707 and 733. The levee between the two fish release sites will be improved as part of the fish release facilities construction. This report addresses levee rehabilitation between Stations 700 to 850. Our geotechnical evaluation for the fish release sites are presented in a separate report.

The criteria for this levee reach is outlined in the Operation and Maintenance (O&M) Manual for Reclamation District No. 341 dated February 1962. The O&M Manual indicates that the design prism for the reach is a 20 foot wide crest with maximum landside and waterside slopes of 2H:1V (horizontal to vertical) and 3H:1V, respectively. The freeboard requirement is 3 feet above the adopted design flood level. The adopted flood level for this reach is Elevation +11.7 feet North American Vertical Datum of 1988 (NAVD88).

Sherman Island and the surrounding areas are shown on the Vicinity Map, Plate 1. The project area and District stationing are shown on the Site Plan, Plate 2. The elevations in this report are referenced to the NAVD88. However, some of the published data (Geologic map and previous boring/drill logs) were recorded using the National Geographic Vertical Datum of 1929 (NGVD29). A correction of +2.4 feet may be used to convert from NGVD29 to NAVD88 elevations for this project by the design team.

Our scope of services was outlined in our proposal dated October 9, 2013. Our scope of services consisted of reviewing existing geotechnical data, performing engineering analysis, and developing conclusions and recommendations regarding geotechnical aspects of the project. The results of our geotechnical investigation are presented in this report.

II. FIELD EXPLORATION AND LABORATORY TESTING

A. Existing Data

As part of our evaluation of the levee, we reviewed data from two sources: The Salinity Control Barrier Investigation by DWR in the 1950's; and the New Salvaged Fish Release Facilities project. DWR collected subsurface data for the Salinity Control Barrier Investigation project between 1955 and 1958 along the perimeter levee of Sherman Island. Data relevant to the project area includes seventeen (17) borings drilled on the levee crest. DWR recently performed subsurface exploration for the planned two fish release sites and presented the subsurface data in the Project Geology Report 80-10-39 dated January 2014. Subsurface data included six (6) soil borings, fifteen (15) cone penetration test soundings (CPT), two (2) field vane shear tests, and associated laboratory testing results. The laboratory testing performed by DWR included sieve analysis, Atterberg limits, moisture and dry density measurements, organic content, specific gravity, consolidated undrained triaxial compression tests, and a consolidation test.

The DWR 1950's data is presented in Appendix A, including the Site Plan, Plate A-1; the Profile of Borings (graphic logs), Plate A-2; the Legend to Borings, Plate A-3; and the boring/drill logs of borings 100 through 116, Plates A-4 through A-53. The Logs of Borings and CPT's from the Project Geology Report are presented in Appendix B. The approximate boring locations are presented on the Site Plans, Plates 1 and 2 in Appendix B.

The USACE performed a levee rehabilitation as shown on plans from 1954. The rehabilitation included raising the levee to Elevation +16.7 (NAVD88) with a 20 foot wide crest.

B. Hand Auger Borings

To gain information on the existing fill between Stations 707 and 733, we explored shallow subsurface conditions with a hand auger. We explored subsurface conditions on March 28 and March 31, 2014 by hand augering 12 borings to depths of 4 to 8 feet below existing grade. The approximate boring locations are shown on the Site Plan in Appendix E, Plate E-1. We collected samples from the soil cuttings.

Our engineer logged the borings and recovered samples from the borings for further visual classification and for selection of materials for laboratory testing. The laboratory

testing program consisted of moisture content and dry density measurements, Atterberg limits and sieve analysis.

Soil descriptions and the laboratory test data are shown on the Logs of Boring, Plates E-2 through E-13. The soil descriptions are presented in general accordance with the Soil Classification System presented on Plate E-14 with laboratory test results presented in the manner described by the Key to Test Data. Atterberg limits test results are shown on Plate E-15. Sieve analysis test results are shown on Plates E-16 and E-17.

III. SITE CONDITIONS

A. Geology

The United States Geological Survey (USGS) has published geologic maps for the Sacramento-San Joaquin Delta (Atwater 1982). The Atwater geologic map that includes Sherman Island and the geologic descriptions of the map units is presented on Plate 3. The geologic map shows that the island is mostly covered by peat and mud (Qpm) except one relatively small area (between approximately Stations 755 and 805) along the Sacramento River where hydraulic fill (Qds) blankets the surface.

The present configuration of the Sacramento-San Joaquin River Delta began to form after the last ice age, about 10,000 years ago. During the ice age, sea levels were 200 to 300 feet below present levels. Sea levels rose rapidly for several thousand years then the rate of sea level rise slowed. As sea levels rose, the Delta was inundated. The sea level rise was slow enough to allow for the accretion of marsh vegetation and formation of a widespread peat marsh (mapped as Qpm).

The peat continued to accumulate as sea levels rose. The marsh formation was halted upon reclamation of land in the late 1800's and early 1900's within the Delta.

The reclamation of the Delta allowed the peat materials to dry. The process of drying an organic material such as the peat causes it to oxidize and deplete. The ground surface within Sherman Island has subsided since the island was reclaimed predominately due to soil oxidation and disappearance of the peat. Oxidation continues to occur throughout the Delta.

B. History

Based on notes shown on the 1950's DWR drill logs (Appendix A), landside slope instability and seepage were observed at several locations from approximately 200 feet west of Boring 100 (about Station 697) to Boring 104 (about Station 728). The drill logs indicated observations of slope failures and active seepage areas at the levee toes and in the fields (up to 300 yards measured from the levee toe). The DWR borings were drilled in 1956, about 2 years after the USACE rehabilitation.

The existing county road is located at the landside toe between Stations 707 and 733. While we do not have records indicating the reason for moving the road off the levee crest, the location is coincident with the reported instability and seepage. The existing levee has been widened several times since the 1950's and a 4H:1V slope has been used by the District. No visual evidence of seepage or instability was noted during our field visit and no seepage or slope failure has been reported recently.

C. Surface Conditions

Sherman Island comprises approximately 10,000 acres of agricultural land and is protected by 19.4 miles of levee. The survey data indicates that the centerline of the levee crest varies from a low of Elevation +12.1 feet at Station 734 to a high of Elevation +17.6 feet at Station 846. The levee crest width varies and generally ranges from 16 feet to 30 feet. A two-lane county road consisting of asphalt concrete pavement covers the levee crest except the reach from Stations 707 to 733. Beside the county road, numerous structures are located along the levee including houses between Stations 765 and 800, an RV park between Stations 755 and 765, a trailer park between Stations 752 and 755, a pump station and associated pipelines at Station 811, trees, brush, and overhead utility lines.

The island interior near the levee reach varies from Elevation -10 feet to +11 feet. The island interior is lower between Stations 700 and 740 and ranges from Elevation -7 feet to -10 feet. The landside slopes are steepest between Stations 700 and 740 and incline at about 2.5H:1V to 3H:1V. The rest of the landside slopes are flatter with typical inclinations near 4H:1V or flatter. In the house and RV park areas, the island interior is relatively high ranging from Elevation -2 feet to +11 feet and the slope inclination is 10H:1V or flatter. In the area to the north of the house area (from Stations 800 to 850), the island interior ranges from Elevation -3 feet to +1 feet. The landside levee slope and toe are covered by vegetation that consists of grass and brush. Trees and dense brush are located on the landside and waterside levee slopes at several locations. Drainage ditches are present beyond the existing levee toe.

The waterside slope generally varies in inclination from 2H:1V to 5H:1V. Between Stations 761 and 765, the lower portion (below Elevation +0 feet) of the waterside slope is steeper with an inclination of approximately 1H:1V to 1.5H:1V. The mudline near the waterside slope is generally between Elevation -14 feet to -30 feet. Two depressions exist near Stations 763 and 847, respectively, with the base of the depression at approximately Elevation

-50 feet. The upper portion of most of the waterside slope is not covered by riprap. The riprap has eroded and slumped over portions of the reach. Erosion within the waterside slope has occurred.

The typical daily tidal range at Sherman Island varies from about Elevation +2 feet to +6 feet. Extreme low tides are near Elevation +1 foot and extreme high tides are near Elevation +7 feet. The 100-year base flood level used by the District and the design team is Elevation +9.8 feet.

D. Subsurface Conditions

The levee consists of fill over marsh deposits. The upper portion of fill below the levee crest consists of asphalt concrete pavement over road base (gravel). Beneath the road base is a heterogeneous mixture of fill consisting predominately of silty sand, lean clay, and clayey sand. The consistency of the silty sand fill ranges from very loose to very dense. The fill thickness generally ranges from 15 to 25 feet at the boring locations.

The fill is underlain by marsh deposits, except between Stations 760 and 845, where zones of sand were encountered beneath the levee fill. No standard penetration tests (SPTs) were performed during the DWR 1950's investigation. The consistency of the sand beneath the levee fill is unknown. The marsh deposits consist predominately of weak and compressible peat and organic silt. The base of the marsh deposits range from Elevation -40 feet to -62 feet. The marsh soil beneath the levee is much thicker than below typical levees in the Delta. Our interpretation of the elevation of the base of marsh deposits beneath the levee is presented on Plate 4.

The material beneath the marsh deposits varies with several locations underlain by sand to the depths explored and with other locations underlain by variable zones of silt and sand. The consistency of the sand is variable and ranges from loose to dense. The loosest sand is typically located directly below the marsh soils.

The island is below sea level and groundwater levels within the island are artificially controlled by evapo-transpiration and pumping. Conditions are expected to vary across the site with time, and depend on several factors including changes in moisture content resulting from seasonal precipitation, irrigation practices, and tides.

IV. DISCUSSION AND CONCLUSIONS

A. General

The significant geotechnical considerations for the levee reach are lack of erosion protection for waterside slopes, the presence of marsh soils below the levee, and on-going settlement of the levee crest.

The District's focus is to improve the erosion protection for the waterside slopes along with evaluating the levee for general conformance with the PL 84-99 design standard. The levee is well below the adopted standard in the O&M Manual. We focused on evaluating an interim level of protection for the levee that is consistent with the PL 84-99 standard that includes 3 feet of freeboard above the 100-year flood. The 100-year flood level used by the District is at Elevation +9.8 feet. The O&M flood level is 11.7 feet. It is not clear how the O&M level was developed by the USACE but it is well above historic levels within the Delta. The intent of our analysis is to provide for an interim level of improvements (first phase) for the levee. The ground has subsided since the 1954 construction and the levee is much taller now. The funding is not available to raise the levee to Elevation +16.7 feet and meet the O&M requirements. The District plans to raise the levee to at least 12.8 feet and provide 3 feet of freeboard above the 100-year flood level.

DWR plans to construct two fish release facilities within this levee reach (Stations 707 and 733). This report includes recommendations for levee rehabilitation for Stations 700 to 850 and includes the levee rehabilitation at the two fish release sites. Specific recommendations for the fish release facilities are presented in a separate report.

The existing county road along the levee toe will need to be relocated to accommodate the levee rehabilitation. We understand that the county road is located along the levee toe from about Stations 707 to 733 due to past concerns with the performance of the levee. The DWR borings from the 1950's described the levee as having landside slope failures and described the presence of numerous active seeps and slope failures.

The levee has been widened and is not showing evidence of seepage or instability. The exact cause of the previous slope movement is not known. Extensive filling was required for the USACE improvements shown in the 1954 plans. The fill may have overstressed

the peat and caused failure of the levee slopes.

The rehabilitation for the levee reach should include provisions that recognize past concerns. The seepage analysis indicates that the exit gradients at the levee meet the USACE criteria for levees. The use of flatter slopes and a toe berm will provide protection from high seepage through the levee and from slope movements.

The levee on Sherman Island is founded on weak marsh deposits consisting predominately of peat and organic soil. The presence of the marsh deposits has a significant effect on the safety of the levee relative to levees constructed on firm soil. The presence of the marsh soil requires consideration of principles for design and construction on soft ground. Routine practices include broad landside berms to buttress slopes, construction in stages, and allowing for long-term settlement and deformation. Peat exhibits creep (long-term deformation under sustained loading) that must be considered in design. Levees on marsh deposits continually settle requiring successive episodes of filling to raise and maintain the minimum crest elevation and crest settlement will be an on-going concern for this levee reach.

To buttress the levee between Stations 700 and 745, where the landside slope is steeper and the island interior is lower than the remainder of the levee reach, we conclude that a 150 feet wide toe berm measured from the new landside hinge is needed. The landside slope should be inclined at 4H:1V. Typical design configurations are presented on Plates 5 and 6. To fit the existing geometry, some adjustment to the toe berm dimensions may be needed.

B. Erosion

The waterside slope lacks adequate protection from erosion from wind-generated waves or boat wakes. The levee will be vulnerable during high wind events particularly during high tides and flood events. We conclude that the levee reach does not meet USACE criteria for protection of the waterside slope from erosion.

C. Seepage

We performed seepage analysis to evaluate the potential for underseepage and to compare with the USACE guidance criteria for underseepage. The gradients for the existing levee and rehabilitation configuration are at 0.19 or below. The calculated values are below the USACE criteria of 0.5 or lower.

A discussion of the seepage analysis and the results of our seepage analysis are presented in Appendix C. The seepage analysis results from the analysis are also presented in Table 1.

Table 1: Seepage Analysis Summary Results

Station	Design Water Surface Elevation (ft)	Existing Levee		Rehabilitated Levee	
		Exit Y-Gradient (Avg.) Slope Toe or Berm Toe	Seepage Flow Rate / Flux (gpm)	Exit Y-Gradient (Avg.) Slope Toe or Berm Toe	Seepage Flow Rate / Flux (gpm)
700	9.8	0.18	0.02	0.18	0.02
715	9.8	0.15	0.01	0.16	0.01
724	9.8	0.19	0.01	0.19	0.01
740	9.8	0.19	0.02	0.18	0.01
761	9.8	0.06	0.03	0.06	0.02
839	9.8	0.10	0.02	0.10	0.02

D. Slope Stability

We performed stability analysis to evaluate the safety of the levee for stability and to develop a rehabilitation scheme for the levee. The site is underlain by a thick deposit of marsh soil. The factor of safety for the landside slope is below the minimum USACE criteria of 1.4 for Stations 715 and 724 for the existing levee (effective stress). To increase the factor of safety, a toe berm is needed to provide a buttress for the levee. The toe berm was used in the analysis for Stations 715, 724 and 740. The factor of safety is above 1.4 for the rehabilitated levee. The analysis indicated that a toe berm is needed from Stations 700 to 745 and a uniform slope inclined at 4H:1V meets the criteria for the remainder of the reach.

A discussion of the stability analysis and the results are presented in Appendix D. The factors of safety from the analysis are also presented in Tables 2 through 4.

Table 2: Factors of Safety for Landside Slopes

Station	Existing Levee		Rehabilitated Levee		
	Effective Strength	Undrained Strength	End of Construction	Long Term Consolidated	
			Undrained Strength	Effective Strength	Undrained Strength
700	1.85	2.10	1.95	1.99	2.06
715	1.39	1.66	1.63	1.62	1.83
724	1.21	1.48	1.55	1.44	1.68
740	1.60	1.75	1.78	1.83	2.12
761	2.01	2.04	2.52	2.46	2.55
839	2.27	2.57	2.46	2.62	2.52

Table 3: Factors of Safety for Waterside Slopes

Station	Existing Levee		Rehabilitated Levee		
	Effective Strength	Undrained Strength	End of Construction	Long Term Consolidated	
			Undrained Strength	Effective Strength	Undrained Strength
700	1.84	1.58	1.57	1.83	1.57
715	1.59	1.42	1.39	1.58	1.42
724	1.57	1.40	1.40	1.57	1.40
740	2.20	1.89	1.85	2.18	1.87
761	1.68	1.58	1.58	1.68	1.58
839	3.12	2.50	2.50	3.12	2.50

Table 4: Yield Coefficients (K_y) from Pseudo-Static Loading

Station	Landside		Waterside	
	Existing Levee	Rehabilitated Levee	Existing Levee	Rehabilitated Levee
700	0.16	0.15	0.09	0.09
715	0.12	0.12	0.09	0.09
724	0.11	0.11	0.08	0.08
740	0.15	0.16	0.14	0.14
761	0.28	0.28	0.12	0.12
839	0.15	0.15	0.12	0.12

E. Settlement and Lateral Deformation

The levee is underlain by deep marsh deposits. The marsh deposits are highly compressible. We performed analysis to estimate settlement of the levee based on the theory of one-dimensional consolidation. The ground settles from a combination of primary consolidation and secondary compression (creep). Primary consolidation occurs from compression of the marsh soils beginning when weight is placed on the soil. The initial weight is transferred to the water within the soil. The water builds up pressure causing flow to occur. As the water flows out of the soil, the soil structure compresses and continues to compress until the water flow is complete and the water pressure returns to hydro-static levels.

Secondary compression is deformation without flow of water. With most soils, the amount of secondary compression is small relative to the primary consolidation and is not a concern. With peat, secondary compression is a significant phenomenon and is a primary cause of long-term settlement of Delta levees and their loss of freeboard. The secondary compression will continue for many years at a diminishing rate with time.

We performed analysis at five stations and our estimate of settlement at each station is presented in Table 5. The estimates are provided for settlement expected within 10 years after fill placement. The settlement estimates are based on raising the crest 12-inches above the minimum crest level.

Table 5: Settlement Estimate – Crest Centerline

Station	Settlement within 10 years (feet)
700	0.6 to 0.9
715	1.4 to 1.7
724	0.5 to 0.7
740	0.8 to 1.1
761	0.5 to 0.7
839	0.3 to 0.5

The toe berm and slopes will also settle under the weight of new fill. We estimate the toe berm will settle 2 to 3 feet under the weight of 5 feet of fill. We estimate that the landside edge of the toe berm will settle about 1.0 to 1.3 feet under the weight of 2 feet of fill.

Deformation of the levee can lead to cracking in the levee crest and slopes. Cracks are prevalent throughout the Delta levee system. The cracking is undesirable and, coupled with an inadequate seepage barrier (core), will be a continuing concern for the levee. Deformation cannot be avoided and cracking should be expected.

F. County Road

The new county road alignment is within the interior of the island and will be founded on the marsh deposits. We conclude that a layer of geogrid should be placed and covered with at least 2 feet of fill prior to placement of the aggregate base. The road will settle under the weight of fill and paving materials. We estimate settlement in the range of 1.5 to 2 feet.

G. Existing Vegetation and Encroachments

As a general practice, trees, brush, heavy vegetation, and encroachments located within the footprint of the levee is undesirable. After trees die, the root system decays and may leave a void. The active or decayed root system of a tree could provide a convenient path for seepage to flow through a levee. Trees and other dense vegetation make it difficult to inspect levees and can obscure problems with the levee. The vegetation also makes it difficult to repair or rehabilitate the levee because the vegetation must be removed first. We conclude that trees and dense vegetation should be removed from the footprint of the levee, including the toe berm, and not be allowed in the future.

V. RECOMMENDATIONS

A. Levee Configuration

We recommend that the design generally conform to the configurations and details shown on Plates 5 and 6. The design of the levee should include provisions for raising and widening as needed in the future to meet the criteria for the levee established in the O&M Manual. The design shown on Plates 5 and 6 is intended for phase 1 of these improvements. We recommend that the levee rehabilitated configuration consist of landside slopes inclined at 4H:1V or flatter. Between Stations 700 to 745, the levee rehabilitated configuration should consist of landside slopes inclined at 4H:1V with a toe berm extending at least 150 feet from the final landside hinge point. The toe berm thickness and inclination may need to vary to account for variation in existing slopes, levee toe elevations, and depth of marsh deposits.

The design of the riprap is not in our scope of work. The slopes need to be covered with riprap to provide protection from wind-generated waves and boat wakes and meet USACE criteria. The toe berms should be constructed before the levee crest is raised or slopes graded.

B. Earthwork

1. Site Preparation

The footprint of the levee and toe berm should be cleared and grubbed of surface and subsurface deleterious matter including trees, grasses, other vegetation, and debris designated for removal. The site should be stripped to sufficient depth to remove vegetation and soil containing roots. Tree roots greater than 1-inch in diameter should be removed. Stripped and grubbed materials should be removed from the site and should not be used as fill. The existing asphalt concrete and aggregate base should be removed from the crest where new fill is planned for the crest. Where possible, the existing asphalt concrete and aggregate base may be reused on the levee crest to reduce the thickness of new imported aggregate base if allowed by the District and the County. In areas where existing ditches are within the planned toe berm, the ditches should be filled and new ditches should be located with a minimum setback of 20 feet landside of the new toe berm. Soft sediment in the existing ditches should be removed prior to placement of fill.

2. Compaction

Surfaces exposed by stripping or excavation should be scarified to a depth of at least 8-inches except where peat is exposed. Scarification is not required where peat exists at the ground surface. The scarified soil should be moisture conditioned to at least optimum moisture content and compacted to at least 95 percent relative compaction. ASTM D698 should be used to establish the reference values for computing optimum moisture content and relative compaction.

Fill should be placed in lifts 8-inches or less in loose thickness and moisture conditioned to between one percent below optimum moisture content and 3 percent over optimum moisture content. Moisture conditioning should be performed prior to compaction. Each lift should be methodically compacted to at least 95 percent relative compaction. Material that fails to meet the moisture or compaction criteria should be loosened by ripping or scarifying, moisture conditioned, and then recompacted. Fill should be placed on horizontal surfaces. The fill should be benched into the existing landside levee slope to allow recompaction of some of the existing soil. The horizontal bench width into the existing slopes should not exceed 5 feet.

In pavement areas subject to vehicle traffic, the upper 6-inches of subgrade should be compacted to at least 95 percent relative compaction and rolled to provide a smooth, non-yielding surface. Subgrade soils should be proof-rolled before placing aggregate base. Proof-rolling should be performed with the heaviest available rubber-tired construction equipment and should be observed by the geotechnical engineer. Soft or pumping areas should be aerated or excavated and recompacted.

On the levee crest and ramps, the upper 6-inches of subgrade should be compacted to at least 95 percent relative compaction and rolled to provide a smooth, non-yielding surface. Subgrade soils should be proof-rolled prior to placing aggregate base. Soft or pumping areas should be aerated or excavated and recompacted.

Aggregate base should be placed in thin lifts no greater than 8-inches in loose thickness and in a manner that avoids segregation, moisture conditioned as necessary, and compacted to at least 95 percent relative compaction.

3. Slopes

Fill slopes should be inclined at 4H:1V or flatter except as noted. Fill slopes should be constructed fat and trimmed back to expose well-compacted fill. Finished slopes and toe berms should be trackwalked perpendicular to the slope face with a bulldozer after completion. The slopes should be hydroseeded to promote vegetation. Vegetation should be limited to grasses or other vegetation that can be mowed or disced to allow inspection of the landside levee slope. Trees, bushes, and brush should not be allowed within the footprint of the levee slopes and toe berms.

4. County Road and Levee Toe

Prior to construction of the county road, new fill 2 feet thick should be placed 5 feet beyond the footprint of the roadway. The fill should be compacted as described in the Earthwork section of this report. The county road should be supported on a layer of geogrid placed below the fill. The geogrid should be Tensar BX 1200 or equivalent.

5. Fill

The existing fill is a mixture of materials. We recommend that new fill conform to the typical fill requirements from the CVFCB. Fill placed at the site should be a soil or soil/rock mixture free of deleterious matter and contain no rocks or hard fragments larger than 4-inches in maximum dimension with less than 15 percent larger than 1-inch in maximum dimension. The fill should have at least 20 percent passing the No. 200 sieve. The fill should have a liquid limit below 50 and a minimum plasticity index of 8.

C. Geotechnical Services During Construction

Before construction, we should review project grading plans and specifications for conformance with the intent of our recommendations. During construction, we should observe and/or test the geotechnical aspects of grading including but not limited to subgrade preparation, placement and compaction of fill, and finish grading. If conditions are encountered during construction that are not consistent with those described herein, we should be contacted to review our recommendations and provide alternatives, if appropriate.

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REFERENCES

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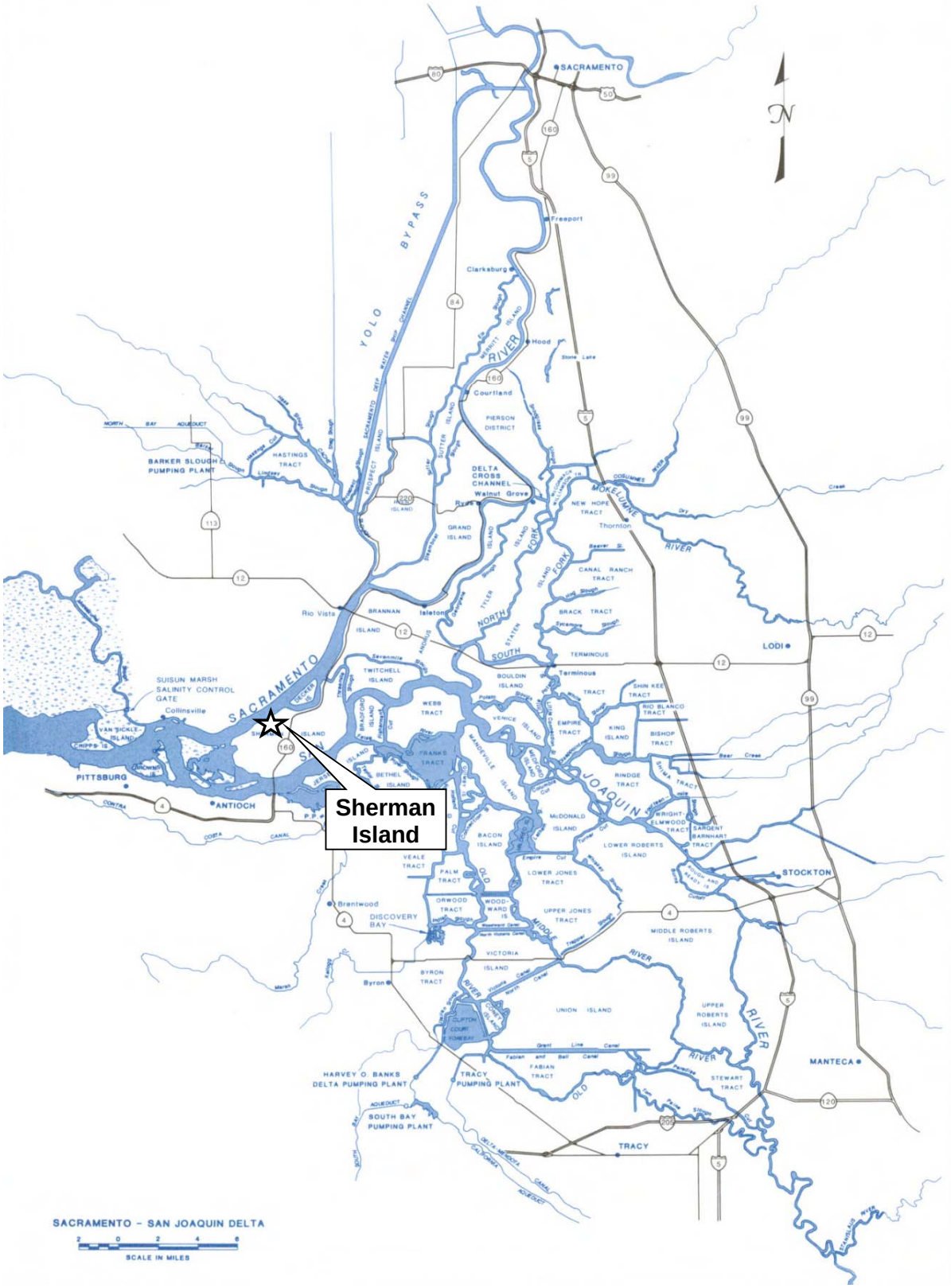
PLATES



Not to Scale

Sherman Island - Stations 700 to 850
Reclamation District 341
Sacramento County, California

Vicinity Map

Hultgren - Tillis Engineers	Project No. 789.06	Plate No. 1

Attachment D

Approximate Location of Boring
(DWR 1958 - Salinity Control Barrier Investigation)

Note: Boring/CPT location Maps of Two Fish Release Sites are presented on Plates B-1 and B-2.

Source: Google Earth 2013

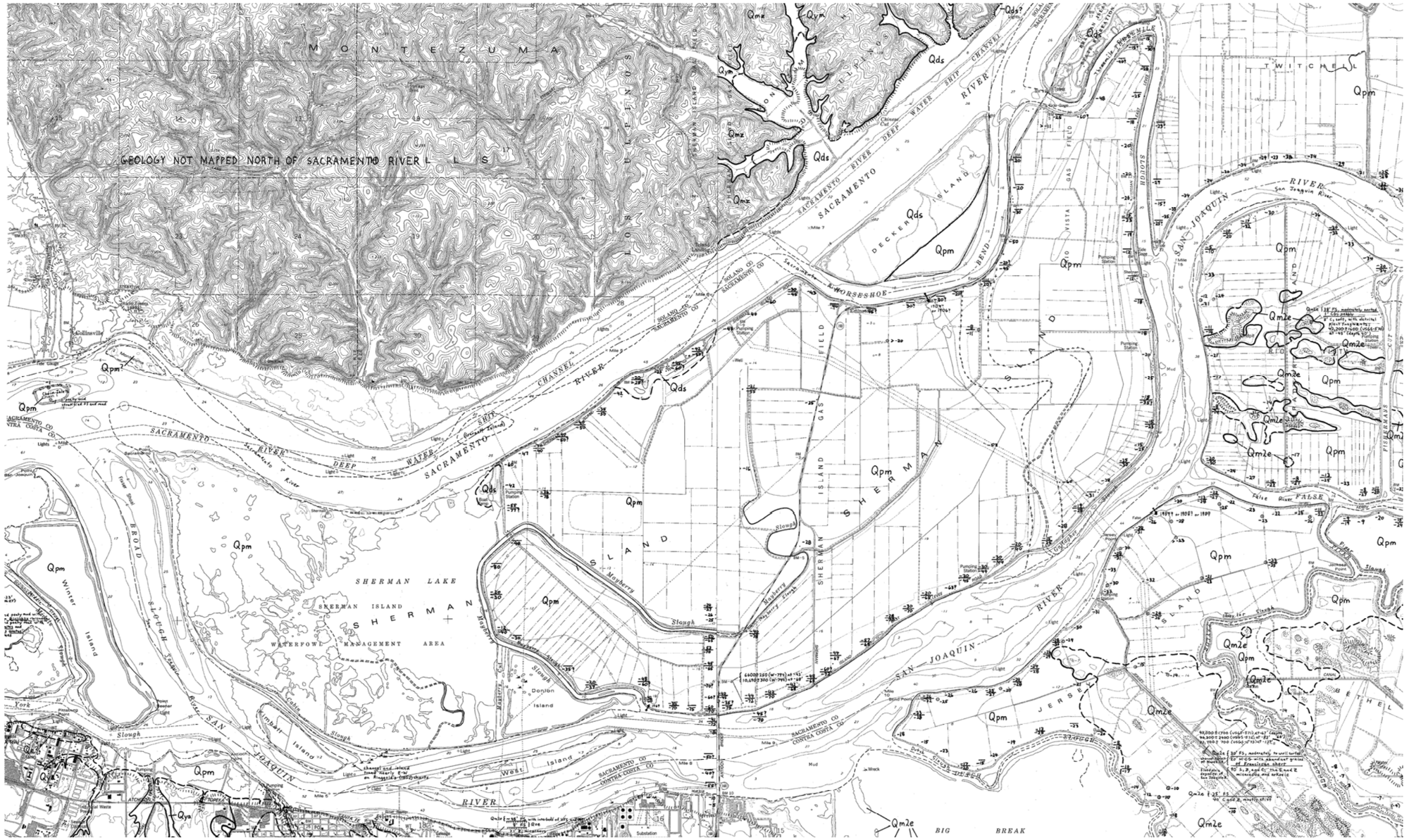
0 4000 feet

SCALE: 1" = 4000'

Sherman Island - Stations 700 to 850
Reclamation District 341
Sacramento County, California

Site Plan

Hultgren - Tillis Engineers	Project No. 798.06	Plate No. 2



Qds: Hydraulic-dredge soils (Holocene; post-1900)
Qpm: Peat and mud of tidal wetlands and waterways (Holocene)
Qm2e: Eolian deposits of upper member of Modesto Formation (Upper Pleistocene)
Qym: Younger alluvium of Montezuma Hills and vicinity (Holocene)
Qya: Youngest alluvium of Antioch and vicinity (Holocene)
Qmz: Montezuma Formation (Pleistocene)

Source: Map by Brian F. Atwater 1982.

Not to Scale

Elevations at base of soft deposits
-11: Basal deposits peat or peaty mud
-16: Basal deposits mud
(-1): Soft deposits missing; firm or stiff deposits at ground surface at indicated elevation

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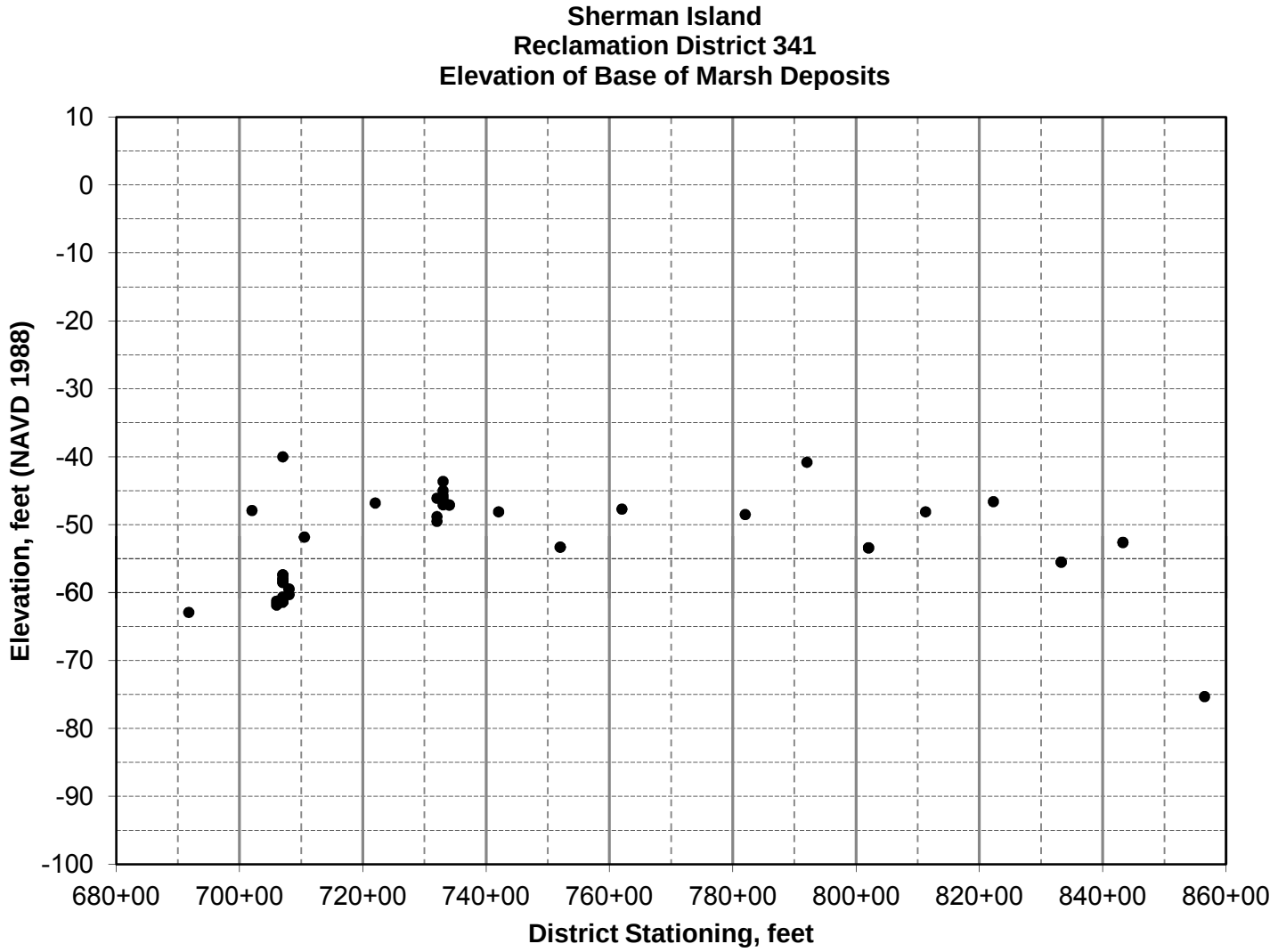
Geologic Map

Hultgren - Tillis Engineers	Project No. 789.06	Plate No. 3



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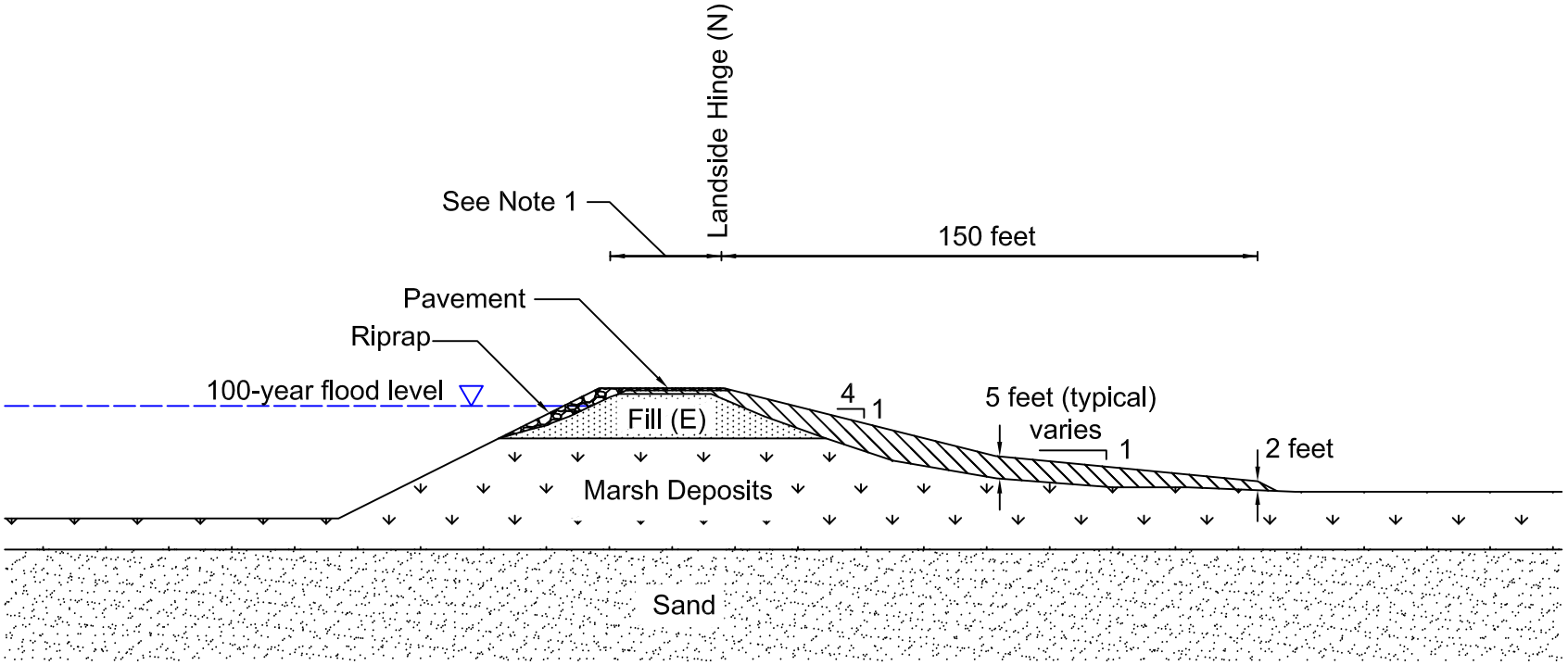
Base of Marsh Deposits

Hultgren - Tillis Engineers	Project No. 789.06	Plate No. 4



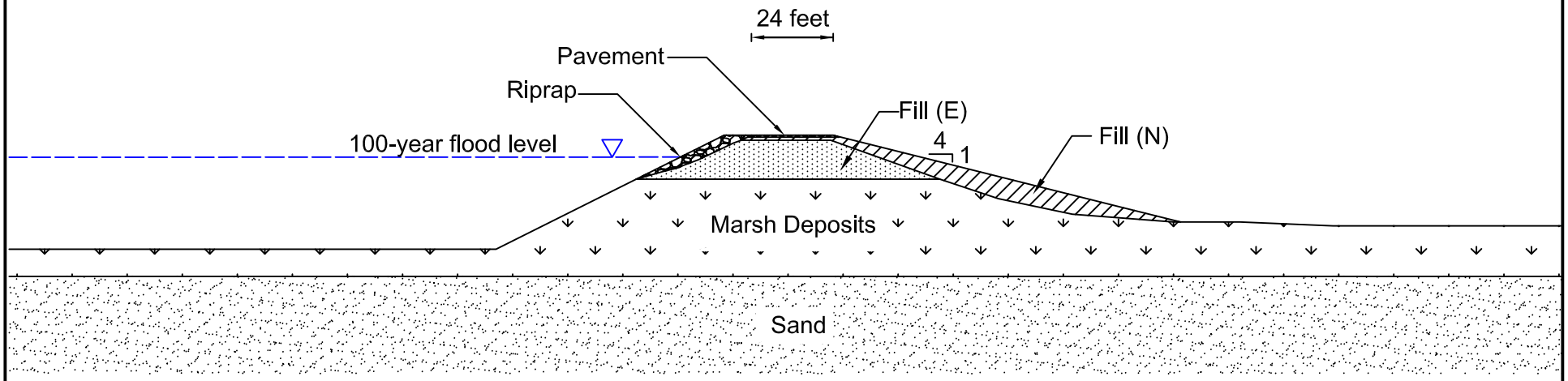
Note:

(1) Crest width should conform to County's standard.

(2) This typical design configuration does not cover the two fish release sites at Stations 707 and 733. Design sections for the two fish release sites are presented in a separate report.

NOT TO SCALE	Sherman Island - Stations 700 to 850 Reclamation District 341 Sacramento County, California	**Typical Design Configuration Stations 700 to 745**	
	Hultgren - Tillis Engineers	Project No. 789.06	Plate No. 5

Attachment D



Note: (1) Crest width should conform to County's standard.

NOT TO SCALE	Sherman Island - Stations 700 to 850 Reclamation District 341 Sacramento County, California	**Typical Design Configuration Stations 745 to 850**	
	Hultgren - Tillis Engineers	Project No. 789.06	Plate No. 6