U.S. ARMY CORPS OF ENGINEERS

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

(33 CFR 325)

OMB APPROVAL NO. 0710-0003
EXPIRES: 31 AUGUST 2012

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Katherine Middle - F. Last - Kelly	First - Jacob Middle - Last - McQuirk
Company - California Department of Water Resources	Company - California Department of Water Resources
E-mail Address - kkelly@water.ca.gov	E-mail Address - jacobmc@water.ca.gov
6. APPLICANT'S ADDRESS:	**9. AGENT'S ADDRESS:**
Address- 1416 Ninth Street, Room 215-37	Address- 1416 Ninth Street, Room 215-23
City - Sacramento State - CA Zip - 95814 Country - USA	City - Sacramento State - CA Zip - 95814 Country - USA
7. APPLICANT'S PHONE NOs. w/AREA CODE	**10. AGENTS PHONE NOs. w/AREA CODE**
a. Residence b. Business (916) 653-1099 c. Fax	a. Residence b. Business (916) 653-9883 c. Fax (916) 653-6077

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Jacob McQuirk to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

Katherine F Kelly — SIGNATURE OF APPLICANT — 11/05/12 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

2013-2017 South Delta Temporary Barriers Project (TBP)-Head of Old River (HOR) Barrier

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
San Joaquin River and Old River	Address
15. LOCATION OF PROJECT Latitude: °N 37.8078 Longitude: °W 121.3307	City - State- CA Zip-

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality San Joaquin County, CA

Section - 32 Township - 1 South Range - 6 East

17. DIRECTIONS TO THE SITE

To get to the HOR site, take I-5 South from Sacramento; exit onto SR-205 East. Exit MacAurthor Drive and turn right. Follow the road through one 90 degree turn where the road turns into Delta Ave. Turn left at the end of Delta Ave onto Paradise Road. The road will continue up onto the top of the levee and the project site will be on the left.

18. Nature of Activity (Description of project, include all features)

See attached sheets for further information.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

The primary purpose of the Spring HOR Rock Barrier is to improve migration conditions for salmonids originating in the San Joaquin River watershed during juvenile migrations by "blocking" migratory movements into the Old River channel from the mainstem San Joaquin River, which would expose them to State Water Project and Central Valley Project diversion operations and unscreened agricultural diversions. The primary purpose of the Fall HOR Rock Barrier is to improve migration conditions for adult salmonids by increasing dissolved oxygen levels in the Stockton Deepwater Shipping Channel.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

1) 3/4 " crushed rock would be discharged at Old River to create an underwater pad for the culverts
2) Six to eight 48-inch diameter culverts with slide gates secured within metal frames would be placed on the underwater rock pad.
3) Rock would be discharged over the culverts to reconstruct the rock barrier across Old River.
4) Clay would be placed on top of the spring rock barrier to form a four foot thick layer
5) Piles, Pier blocks, and anchors for spring Non-Physical Barrier
6) One scientific pile, up to 10 weighted stands and up to 50 railroad tie anchors for Temporary Barriers Project Fish Study

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
(See attached Tables 3 and 4)		

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres (See attached Tables 3 and 4)
or
Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

Avoidance: DWR will continue implementation of all applicable monitoring, avoidance, minimization, and compensation measures required as part of the BOs issued for the TBP (US FWS 2008, 2009; NMFS 2008, 2009, 2011). See attached sheets for additional avoidance, minimization and compensation. Compensation for impacts to Waters of the US: DWR purchased 6.0 acres of shallow water habitat credits for the TBP. DWR utilized a credit of 1.25 acres left over from the Kimball Island Mitigation Bank and an additional 4.75 acres of shallow water habitat credits was purchased at the Liberty Island Conservation Bank.

24. Is Any Portion of the Work Already Complete? ☐ Yes ☒ No IF YES, DESCRIBE THE COMPLETED WORK

The spring and fall HOR rock barriers have been installed and removed annually since 1991, with periodic exceptions.

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address- See attached sheets for further information.

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED
CA DFG	1602 SAA	1600-2010-0375-R3		May 10, 2011	
CVRWQCB	Section 401 WQC	WDID#5B39CR0019		May 6, 2011	
CA DFG	ITP	2081-2011-019-03		May 25, 2011	
See Attached Sheets:	Block 18				

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

Katherine Kelly — SIGNATURE OF APPLICANT — 11/05/12 DATE

Jack McGinnis — SIGNATURE OF AGENT — 11/5/12 DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Attachment to ENG 4345 Form

Temporary Barriers Project-HOR Barriers

Block 18. Nature of Activity

Introduction

The California Department Water Resources (DWR) initiated the South Delta Temporary Barriers Project (TBP) in 1991. The TBP involves the seasonal installation of three rock barriers in Middle River near Victoria Canal (MR), Old River near Tracy (ORT), and Grant Line Canal near Tracy Boulevard Bridge (GLC). These rock barriers are designed to act as flow control structures, "trapping" tidal waters behind them following a high tide. These barriers improve water levels and circulation for local south Delta farmers and are collectively referred to as Agricultural Barriers (ag barriers). A fourth barrier, installed at the head of Old River (HOR) at the divergence from the San Joaquin River, is designed to improve migration conditions for Central Valley fall-run Chinook salmon originating in the San Joaquin River watershed during adult and juvenile migrations, which occur annually in the fall and spring respectively. The fall HOR barrier also serves as a flow-control structure by keeping water in the San Joaquin River which improves downstream dissolved oxygen (DO) conditions. The spring barrier is intended to prevent downstream migrating salmonid smolts (smolt) in the San Joaquin River from entering Old River. The HOR barrier is often referred to as a Fish Barrier. In 2009 and 2010, DWR installed and operated a non-physical barrier (NPB) at the HOR as an alternative to the spring HOR rock barrier. The NPB employs the use of underwater bubbles, light, and sound to act as a fish behavioral deterrent which is intended to exclude smolt from entering the south Delta via Old River without having to physically block the flow of water into the channel with a rock structure. DWR retains the flexiblilty to install and operate the NPB at the HOR as an alternative to the spring HOR rock barrier.

The TBP was initiated with the intention that it would be a temporary program implemented only until permanent operable gates could be installed. However, the timing of implementation of permanent operable gates is uncertain and the TBP is proposed to continue until the permanent operable gates are implemented. Figures 1 and 2 are project vicinity and location maps.

TBP Regulatory Compliance History

The regulatory permit history of the TBP begins in 1991 and includes many separate consultations, take authorizations, and permits from the U.S. Army Corps of Engineers (Corps), U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), California Department of Fish and Game (DFG), and the Regional Water Quality Control Board (RWQCB). DWR is pursuing two multi-year U.S. Clean Water Act, Section 404 / Rivers and Harbor Act, Section 10 permits from the Corps to cover the construction of the TBP through the end of 2017. The two projects of the TBP that will be subject to separate permit applications to the Corps are:

- TBP-Ag Barriers
- TBP-HOR Barrier

Below is the recent consultation history and environmental permits applicable to the TBP:

- In 2004, the USFWS issued a Programmatic Biological Opinion (BIOP) on the Issuance of Section 10 and 404 Permits for Projects with Relatively Small Effects on the delta smelt and its Critical Habitat within the Jurisdiction of the Sacramento Fish and Wildlife Office of the USFWS, CA (USFWS File# 1-1-04-F-0345). This non-expiring Programmatic BIOP is still valid and was used in 2009 and 2010 to cover the HOR NPB, which was authorized under the Corps' Nationwide Permit 4.
- In 2008, the USFWS issued the Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan (OCAP) BIOP which addressed the effects of operations (i.e., hydrodynamic effects) of the MR, ORT, GLC and HOR rock barriers on delta smelt *(Hypomesus transpacificus)* (USFWS File# 81420-2008-F-1481-5). This non-expiring BIOP is still valid and covers the TBP-Ag Barriers and HOR Rock Barriers.
- In 2008, the NMFS issued a BIOP for the construction of the TBP (NMFS # 2007/07586).
- In 2009, the USFWS issued a BIOP which addressed the effects of construction of the MR, ORT, GLC and HOR rock barriers on delta smelt and its designated critical habitat (USFWS File# 81420-2008-F-0522) (U.S. Fish and Wildlife Service 2008). This non-expiring BIOP is still valid and covers the TBP-Ag Barriers and HOR Rock Barriers.
- In 2009, the USFWS issued a BIOP which addressed the effects of construction and operation of the 2009 HOR NPB on delta smelt that appended the project covered under the Corps Nationwide Permit 4 to the 2004 Programmatic BIOP for delta smelt (USFWS File# 1-1-04-F-0345).
- In 2009, the NMFS issued a BIOP for the construction of the non-physical barrier at the HOR (NMFS # 2009/01239).
- In 2010, the USFWS provided concurrence to the Corps that the 2010 HOR NPB would not likely adversely affect delta smelt and amended the 2009 HOR NPB BIOP with the 2010 HOR NPB project description (USFWS File# 81410-2010-F-0004).
- In 2011, the Central Valley Regional Water Quality Control Board (RWQCB) issued Clean Water Act Section 401 Water Quality Certification for the construction and removal of the four rock barriers and construction and removal of the HOR NPB (WDID# 5B39CR00191). This permit covers all three TBP projects listed above through 2016.
- In 2011, the California Department of Fish and Game (DFG) issued a Final Lake or Streambed Alteration Agreement for the construction and removal of the four rock barriers and construction and removal of the HOR NPB (DFG tracking # 1600-2010-0375-R3). This permit covers all three TBP projects listed above through 2016.
- In 2011, DFG issued an incidental take permit for the construction and removal of the four rock barriers, construction and removal of the HOR NPB, implementation of the predator study, and implementation of the Fish Monitoring Project. (DFG tracking # 2081-2011-019-03). This permit covers all three TBP projects listed above through 2016.
- In 2011, the NMFS issued a BIOP which addressed the effects of construction of the four rock barriers and the HOR NPB (NMFS # 2010/06485). This BIOP expired on December 31, 2011.
- In 2012, the USFWS amended the 2009 HOR BIOP with the updated 2012 project description and schedule and amended the Effects Analysis (USFWS File # 08FBDT00-2012-F-0010).

- In 2012, the NMFS issued a BIOP for the 2012 Temporary Barriers Project (NMFS File # 2012/00152), which included the construction and removal of the four rock barriers.
- In 2012, DFG amended the 2011 Lake and Streambed Alteration Agreement with the updated 2012 project description and schedule (DFG tracking # 1600-2010-0375-R3).
- In 2012, DFG amended the 2011 Incidental Take Permit with the updated 2012 project description and schedule (DFG tracking # 2081-2011-019-03).
- **In 2012, the USACE modified the 2001 Temporary Barriers Project- Agricultural Barriers, Clean Water Act Section 404 permit (SPK # 200100121) with the updated 2012 schedule for the construction of the three agricultural barriers.**
- **In 2012, the USACE modified the 2000 Temporary Barriers Project- HOR Rock Barriers, Clean Water Act Section 404 permit (SPK # 200000696) with the updated 2012 project description and schedule for the construction of the spring and fall HOR rock barriers.**
- In 2012, the Central Valley Regional Water Quality Control Board (RWQCB) amended the Clean Water Act Section 401 Water Quality Certification for the construction and removal of the four rock barriers and construction and removal of the HOR NPB (WDID# 5B39CR00191).

TBP-HOR Barriers Project

The HOR barrier is located at the divergence of Old River from the San Joaquin River near the City of Lathrop. The HOR barrier serves a dual purpose and may be installed in the spring and in the fall. In the spring, the barrier acts as a fish barrier to decrease the number of salmonid smolts entering Old River. This can be accomplished by installing a rock barrier or a Non Physical Barrier (NPB). In the fall, the barrier may be needed to increase flows and dissolved oxygen levels downstream in the San Joaquin River including the Stockton deepwater shipping channel; therefore, a rock barrier must be used.

The barriers are installed when ambient flows in the San Joaquin River are below 5,000 cubic feet per second (cfs). The installation process cannot be carried out when flows exceed 5,000 cfs.

Spring Rock Barrier

The spring HOR rock barrier is intended to prevent downstream-migrating salmon smolts in the San Joaquin River from entering Old River, which would expose them to State Water Project (SWP) and Central Valley Project (CVP) diversion operations and unscreened agricultural diversions. The spring HOR rock barrier is constructed with approximately 12,500 cy of rock to form a 225-foot long and 85-foot wide (at the base) berm (0.44 acre) (Figures 6a and 6b) and it has a crest elevation of 12.3 feet (NAVD88). Construction at the south end of the barrier includes the placement of six to eight, 48-inch diameter culverts with slide-gates into the barrier abutment. The middle section includes a 75-foot weir at an elevation of 8.3 feet that is capped with clay up to the barrier crest elevation (12.3 feet, NAVD88). Unlike the ORT and GLC barriers, there is no boat portage facility at this barrier. A ramp and dock may be secured to the shore in order to allow storage and safe access to small boats that may be used for construction, maintenance and research purposes.

Fall Rock Barrier

Installation of the fall HOR rock barrier may be needed to increase flows and dissolved oxygen levels downstream in the San Joaquin River. The fall HOR rock barrier is constructed similarly to the spring barrier, but using approximately 7,500 cy of rock to form a smaller 225-foot long and 65-foot wide (at the base) berm (0.34 acre) that is constructed to a crest elevation of 8.3 feet and includes a 30-foot wide notch at elevation 2.3 feet (NAVD88; Figures 7a and 7b) to allow the passage of adult salmonids.

Spring Non-Physical Barrier

The HOR NPB is a multi-stimulus fish barrier that combines high-intensity light-emitting diode (LED) Modulated Intense Lights (MILs), an air bubble "curtain," and sound at frequencies and levels that are repellent to Chinook salmon (Bowen et al. 2009; Bowen and Bark 2010). The sound system and MIL flash rate can be tuned to known sensitivities of various fish species. Investigations have indicated that the most effective acoustic deterrents for multiple fish species fall within the sound frequency range of 5 to 600 hertz (Hz) (Bowen and Bark 2010). Studies with Chinook salmon and delta smelt have shown that when the sound and strobe light flash rate were tuned according to these species' sensitivities, the barrier was particularly effective as a deterrent for Chinook salmon smolts (Bowen et al. 2008). Based on these studies, it has been hypothesized that the sound is the deterrent. The sound is trapped by refraction within the bubble curtain, producing a sharply defined sound field that fish do not detect until within a few meters of the barrier. The flashing MILs are aligned such that the light beam projects onto the bubble curtain. This helps identify the bubbles so that the source of the sound can be determined by the fish. A narrow, vertical MIL beam minimizes light saturation within the experimental area.

Modifications to the length and orientation of the HOR NPB may be made each year based on acoustic telemetry data obtained during operation. The 2009 HOR NPB was approximately 367 linear feet and spanned across the mouth of the Old River. The 2010 HOR NPB was 450 linear feet and was oriented further out in San Joaquin River than the 2009 NPB. Future HOR NPB's, if constructed, may have varying orientations in order to improve the barriers effectiveness on deterring and protecting smolts.

Current ideas on barrier design have been refined based on information collected in 2009 and 2010. The barrier may be up to 700 feet long and may be comprised of as many as 30 metal framed sections. The sections will be positioned along the barrier line such that, during average annual flow conditions, as much of the barrier as possible is at a depth where the height of the bubble curtain is less than 12 feet. The frames will be placed approximately 18 inches from the channel bottom. The top of the frame sections will be at 5–10 feet below the water surface elevation at low tide during average annual flow conditions. The barrier frames will be supported and secured with steel piles and concrete pier blocks. The NPB will require as many as 8 piles (including one scientific pile) and 30 pier blocks. Figures 9 a-d show plan and profile views of one option for a HOR NPB.

Each barrier frame section will have approximately four sound projectors spaced 6.5 feet apart, eight strobe lights, and a perforated "bubble" pipe. The bubble pipe will be positioned along each frame below and upstream of the sound projectors. A bubble curtain will be created by passing compressed air into the perforated pipe. The air flow rate will typically be 1.38 cubic feet per minute (cfm) per linear foot for the length of the barrier. The MILs will be powered from an "accumulator" positioned on each frame section. A mounting plate will be attached to the support tray to house the

accumulators. The junction of each frame section can pivot with the adjacent section, and where needed, each frame section will be supported at either end with a piling or pier block.

Light cables, sound cables, and air lines will run from generators and air compressors located on the water side berm along the south bank of the San Joaquin River adjacent to the NPB, where a portion of the stockpile for the HOR rock barrier is stored. Approximately 120 amps (115 volts) of an inductively –rated power supply will be required to run the complete electrical system. A small trailer will house the control units, signal generators and amplifiers. A temporary floating dock will be installed near the trailer to tether a small boat used for operation, maintenance, and monitoring. See Figure 9e, for an example of placement locations of air lines, cables, and onshore equipment. All generators, air compressors, trailers and fuel storage containers will be placed such that it can be removed quickly and most equipment will be readily towable while staged.

In addition to the NPB structure, warning signs, lighted warning buoys, high visibility float rope, and ball buoys will be deployed around the barrier to alert boaters of its location. Up to 40 concrete anchors would be placed on the river bottom or on river banks to anchor the warning buoys and signs in place. Figure 9d show an example of the buoy layout and Figure 9f shows details of the example buoys, signs, and concrete anchors and pier blocks.

Temporary Barriers Project Fish Study

In general, the program includes tagging and releasing salmon and steelhead in the south Delta, installing an acoustic receiver network including a two-dimensional (2-D) biotelemetry system, implementing a mobile monitoring effort to find acoustic tags on the river bottom using global positioning system (GPS), monitoring fish using Dual-Frequency Identification Sonar (DIDSON) cameras, placement of hydroacoustic and other scientific instrumentation and sampling, tagging and releasing predatory fish. Scientific equipment will be affixed to several types of mounting brackets depending on equipment type, barrier type and location. Up to 50 anchors made from sections of railroad track will be used to anchor floating scientific equipment, such as hydrophones (Figure 10 and Figure 11) in the water column using tensioned lines. Additionally, up to 10 weighted stands and one scientific pile will be used for placing stationary equipment such as ADCP's and DIDSON cameras. A scientific pile will only be placed if the NPB is used at the HOR. The minimum required number of railroad track anchors and weighted stands will be placed each year and scientific equipment will be placed using barrier related structure, as much as possible. All scientific equipment will be affixed to anchors and stands similar in nature and impacts to those used for ADCP's, DIDSON cameras and hydrophones. Additional studies of salmonid smolts and predatory fish may occur, however, techniques used to capture predatory fish will be limited to electrofishing, hook and line sampling and fyke trapping.

Study techniques used in the past and likely to be used for future studies include 2-D tracking of acoustically tagged Chinook salmon and steelhead smolts in the vicinity of the HORB, 2-D tracking of acoustically tagged predatory fish in the vicinity of the HORB, acoustic tagging of salmonid smolts and predatory fish, capture of predatory fish using multiple techniques, placement of a 2-D hydrophone array within ½ mile of barrier locations, placement of hydrophone nodes at strategic locations within the south Delta (e.g. peripheral nodes to determine migration paths; See Figure 13), placement of ADCP's within ½ mile of barrier locations, placement of DIDSON cameras within ½ mile of barrier locations, and mobile hydroacoustic monitoring within the south Delta. Advanced technologies and monitoring techniques may be used in the future, as they are developed.

Construction and Removal

Construction activities for all of the barriers would begin as early as March 1 and removal would be completed no later than November 30 of each year. Any rock barrier operating on or after September 15 will be notched beginning September 15 to allow for passage of adult salmon. At GLC, flashboards will be removed to create the notch in the barrier. Approximate construction durations are included in Table 1.

Table 1: Construction and removal requirements for each of the temporary barriers.

		Construction (Days)	Removal (Days)
HORB	Spring Rock	24	24
	Spring NPB	20	15
	Fall Rock	18	18

Head of Old River Rock Barriers

Construction of the HOR rock barrier may entail the placement of a rock barrier in the spring and/or fall within the channel of Old River. Minor sediment removal may be required in order to prepare the area for barrier installation. The removal of sediment in the vicinity to the HOR barrier will be limited to the minimum amount necessary that will allow for the installation of the crushed rock bed for the culverts and will not extend beyond 200 feet in any direction from the barrier footprint. All removed sediment will be deposited and retained in an area that has no connection to waters of the United States. The culverts and articulated mats for the HOR rock barriers are stockpiled offsite at Howard Road storage area, while the rock is stockpiled adjacent to the HOR site. Heavy construction equipment will be mobilized to move the stockpiled culverts, articulated mats and rock from its storage location into the channel to form the barrier. Large front loaders, dump trucks, long reach excavators and barges with spuds and tug boat are used to move and place the materials. Typically, machinery works from both banks of the channel and from a barge within the channel to place the rock, as well as any additional materials such as culverts, concrete reinforcing mats, clay or other structures or materials. Depending on the design of the barrier, the 48-inch diameter steel pipes used as culverts are placed by crane from shore or from a barge after the gravel pad of the barrier is constructed. As the rock barrier is extended into the channel, machinery can utilize the crown of the barrier to move farther into the channel on top of the barrier to place additional materials. The barrier will be adequately marked with navigational aids and warning signs approved for placement by the U.S. Coast Guard (Private Aids Permit #s 2832-2839).

Barrier installation, including in-water work, and associated construction activities such as mobilization and site clean-up, typically takes approximately 24 working days for the spring HOR rock barrier and 18 working days for the fall HOR rock barrier. However, extreme weather, tide, and river flow conditions may impact the barriers construction schedule.

Removal of the barriers can occur in the spring and/or fall and the installation procedure is reversed. Removal of the spring HOR rock barrier can take up to 24 days and the removal of the fall HOR rock barrier can take up to 18 working days. The rock barriers will be removed with an excavator and a dragline or a crane with clamshells. Equipment will work both from shore and from a barge with spuds and a tug boat. The excavator and/or crane will remove the majority of the rock down to the underwater pad of the culvert frames. A dragline with a bucket may be necessary to remove the remainder of the underwater rock associated with the barriers. The removed rock is

stockpiled outside of the waterway until used again. At the barrier site, the channel bottom is restored to pre-project conditions after the barrier is removed. Confirmation that the channel bottom has been restored to pre-project conditions is accomplished via bathymetric surveys which are conducted each year before construction (pre-construction) and after removal.

Head of Old River Non-Physical Barrier

In 2010 construction of the barrier took a total of 11 days including pile driving, assembly and installation. However, the nature of in-water work makes it highly dependent on weather and flow conditions. Wet weather, high river flows, and increased pile driving requirements have the potential to make in-water work conditions unsafe during the construction period, thus halting work and delaying the construction completion date. Installation will be completed in approximately 20 days including up to 10 days of in-water work. Removal of the NPB and piles will take approximately 15 days including up to 5 days of in water work. Construction and related site cleanup activities may occur during daylight hours, up to 12 hours per day, 7 days per week.

Construction vehicles will access the project site using existing roads, including those on the levee crown, that are typically used during installation and removal of the HOR rock barriers. It is anticipated that the following equipment will be used during construction and installation of the non-physical barrier: flatbed tractor/trailer; off-road forklift; barge with spuds and tug boat; barge-mounted crane; vibratory hammer pile driver; work boat; diesel or liquid petroleum gas generator; and air compressors.

The pile foundation and concrete pier blocks for the non-physical barrier frames will be installed first. Up to eight, 8- to 12-inch diameter steel piles will be driven with a vibratory driver in the wetted channel from a barge. It is anticipated it will take about 30 minutes to position each pile and the driving will occur in one to two days resulting in less than 80 minutes total driving time. Each pile will be driven approximately 15 to 30 feet into the river bed. It will require approximately one hour between pile driving to position the barge and load the next pile.

The NPB frame sections will be assembled on land, in sets of two, with pier blocks positioned between adjacent frame modules. The pier blocks and frame sets are then lowered into the water with the crane. Divers will attach the frame sets to the piles and pier blocks and then attach the air lines and power cords to the non-physical barrier.

Temporary Barriers Project Fish Study

Construction activities associated with the fish studies are minimal due to the nature of these studies' designs, however, yearly placement of anchors, weighted stands, cabling and one temporary pile may occur. DWR may study the "no barrier", NPB, or the rock barrier condition at the HOR depending on the barrier used in any given year, however, fish studies may not occur in all years.

Acoustic Telemetry Tracking System:

An acoustic telemetry tracking system consisting of hydrophone arrays will be used to monitor juvenile salmonids and predatory fish. Juvenile salmonids obtained from local hatcheries (e.g., Mokulumne River Fish Hatchery) will be surgically implanted with bio-acoustic tags and then released upstream from the HOR. Each acoustic tag transmits an underwater sound signal (i.e., acoustic "ping") that sends identification information about the tagged fish to strategically placed hydrophones, onshore receivers, data loggers, and data processing computers that listen for, and record the location of the tagged fish as they move through the study area. Up to 50 hydrophones

will be deployed in the rivers to detect the tagged fish. Each hydrophone would be secured to an anchor made from a short section of railroad track with a section of rope and a floating buoy (See Figure 10 and 11). The data will be analyzed to determine the barrier's effectiveness and predatory fish behavior. The hydrophone placement will likely include an array to collect 2-D tracks around the HORB and several other hydrophone node placements further from the barriers to determine the fates of tagged fish (See Figure 12 and 13) .

Visual Tracking System:

DIDSON cameras may be installed with weighted stands or attached to structures associated with the installed barrier. One temporary pile may be installed adjacent to the HORB on years that a NPB is constructed to support components of a visual tracking system consisting of a DIDSON camera and/or other scientific equipment. DIDSON cameras are intended to regularly monitor fish behavior around the barrier and will be operated to obtain data to achieve defined study objectives. The objectives may include gaining a better understanding of how predatory fish interact with the barrier, how other fish interact with the barriers, predation events near the barriers, and juvenile salmonid response to the barriers. DIDSON cameras are likely to be placed within ½ mile of the HORB, however, no more than 10 weighted stands will be placed during any study year.

Installation and Operation of the HOR Barriers

The HORB serves a dual purpose. In the spring, the barrier acts as a fish barrier to decrease the number of salmonid smolts entering Old River. This can be accomplished by installing a rock barrier or a NPB. In the fall the barrier may be needed to increase flows and dissolved oxygen levels downstream in the San Joaquin River including the Stockton deepwater shipping channel, therefore, a rock barrier must be used.

The spring HORB may be operated from April 1 through May 31 and installation of the fall HORB will be at the timing and discretion of the DFG, NMFS and FWS based on DO levels in the San Joaquin River. The Spring and Fall HORB will be installed and operated following the criteria listed in Table 2.

Table 2: Installation and operation of the HORB

	HORB
October 1 of preceding year	Spring barrier type (rock barrier or NPB) to be used must be determined in coordination with DFG, NMFS and USFWS. Default barrier type is the rock barrier if no determination is made by this date.
March 1	Spring installation of rock barrier or NPB may begin.
April 1-May 31	Full closure and/or operation of the spring barrier may occur.
	If a physical HORB is used and 1) the GLC is breached due to Delta Smelt concerns **OR:** 2) the GLC cannot be closed when the need is clearly demonstrated by DWR, the HORB must be breached and removed as soon as possible, unless otherwise instructed by the DFG, NMFS and USFWS.
May 15-May 31	Full closure and/or operation may continue, at the discretion of the DFG, NMFS and USFWS.
On or after September 1	Fall barrier installation may begin at the discretion of DFG, NMFS and USFWS.
November 30	Barrier must be completely removed.

Block 21. Type of Material Being Discharged

The material quantities and impacts for each barrier are listed in Table 3 and 4 below.

Block 22. Surface Areas of Waters Filled

The material quantities and impacts resulting from the HOR NPB are listed in Table 3 below.

Table 3. Summary of Materials Discharged to Waters of the U.S. and Surface Areas Affected by the HOR NPB and the TBP Fish Study

Type of Discharge	Amount of Fill Discharged	Total Surface Area Affected
Spring HOR NPB		
Eight, 8 to 12 inch diameter piles		287 square feet (0.01 acre) (T)
Concrete pier blocks (up to 30)	7.8 CY (T)	
Concrete anchor blocks (up to 40)	6.0 CY (T)	
HORB Fish Study		
Eight, 8 to 12 inch diameter piles	1.0 CY (T)	141 square feet (0.01 acre) (T)
Railroad tie anchors	1.0 CY (T)	
Weighted Stands	1.0 CY (T)	
(T) = temporary, (P) = permanent, CY = cubic yards, lf = linear feet.		

Table 4. Summary of Materials Discharged to Waters of the U.S. and Surface Areas Affected by the HOR spring and fall rock barrier

Type of Discharge	Amount of Fill Discharged	Total Surface Area Affected
Spring HORB		
Rock, including rip rap, and crushed rock	12,500 CY (T)	19,125 square feet (0.44 acre) (T); 85 lf
Eight, 48 inch diameter culverts in metal frames		
Articulated concrete mats	15 CY (T)	
Clay	48 CY (T)	
Fall HORB		
Rock, including rip rap, and crushed rock	7,500 CY (T)	14,625 square feet (0.34 acre) (T); 65 lf
(T) = temporary, (P) = permanent, CY = cubic yards, lf = linear feet.		

Block 23. Description of Avoidance, Minimization, and Mitigation

The following measures will be implemented as part of the HOR NPB project to minimize and avoid impacts to waters of the United States:

- Construction personnel will participate in a worker environmental awareness program that has been reviewed by NMFS, USFWS, and CDFG. As part of this program, workers will be informed of the best management practices that will be employed to protect water quality and about the presence of special status species in the area, which are protected under the federal Endangered Species Act (ESA), Migratory Bird Treaty Act, and/or California Endangered Species Act (CESA), and the habitats associated with the species occurring in the area.
- DWR will use staging and channel access areas that are limited to only the area necessary to construct the barrier and accommodate land-based barrier operation equipment.
- Construction impacts will be confined to the minimum area necessary to complete installation and operation of the barriers.
- DWR will monitor turbidity levels during ground-disturbing activities, including pile driving according to the Section 401 Water Quality Certification issued for the project by the Central Valley Regional Water Quality Control Board.
- Stockpiling of construction materials will be restricted to designated construction staging areas and exclusive of the riparian areas.
- All areas disturbed by project activities will be protected from washout or erosion. An effective combination of erosion and sediment control Best Management Practices (BMPs) will be implemented and adequately working during all phases of construction.
- Erosion and sediment control structures will be monitored for effectiveness and will be repaired or replaced as needed.
- DWR will have readily available plastic sheeting or Visqueen and will cover exposed spoil piles and exposed areas to prevent these areas from losing loose soil into the river. The covering materials will be applied when it is evident rainy conditions threaten to erode loose soils into the stream.
- All heavy equipment will be fueled, maintained, and stored at a safe distance from any adjacent waterways. Standard construction best management practices (BMPs), as described in the current California Department of Transportation Construction Site Best Management Practices Manual, will be implemented so that no oil, grease, fuel or other fluids contaminate the waterways around the work sites.
- Any equipment or vehicles driven and/or operated within or adjacent to the stream will be checked and maintained daily to prevent leaks.
- A spill prevention and control plan that includes actions to contain any fuel or chemical leaks will be implemented at all times during the operation of the NPB.
- Stationary equipment such as motors, pumps, generators, and welders located within or adjacent to the stream will be positioned over drip pans.

- Following the completion of the study, the concrete anchors and pier blocks will be removed and the riverbed will be returned to pre-construction contours.
- All previously vegetated exposed or disturbed areas and access points within the stream zone left barren of vegetation as a result of the construction activities will be restored by seeding with a blend of locally collected native erosion control grass seeds. Seeded areas will be mulched. All other areas of disturbed soil which drain toward the stream channel will be seeded with erosion control grass seeds. Revegetation will be completed as soon as possible after project activities in those areas cease. Seeding placed after October 15 will be covered with broadcast straw, coconut fiber blanket or similar erosion control blanket.
- DWR purchased 6.0 acres of shallow water habitat credits for the TBP. DWR utilized a credit of 1.25 acres left over from the Kimball Island Mitigation Bank and an additional 4.75 acres of shallow water habitat credits was purchased at the Liberty Island Conservation Bank.

25. Addresses of Adjoining Property Owners

Head of Old River		
APN	Property Owner	Address
191-180-02	Carolyn Cordes Trust, et al	1677 Park View Lane Chico, CA 95926
213-240-01; -02	Califia, LLC	c/o Ms. Susan Dell'Osso, Project Director 73 West Stewart Road Lathrop, CA 95331

References

California Department of Water Resources 2000. South Delta Temporary Barriers Project Action Specific Implementation Plan

National Marine Fisheries Service. 2008. Biological opinion on the construction and operation of the South Delta Temporary Barriers Program for 2008, 2009, and 2010. May 2008. National Marine Fisheries Service, Southwest Region. Long Beach, CA.

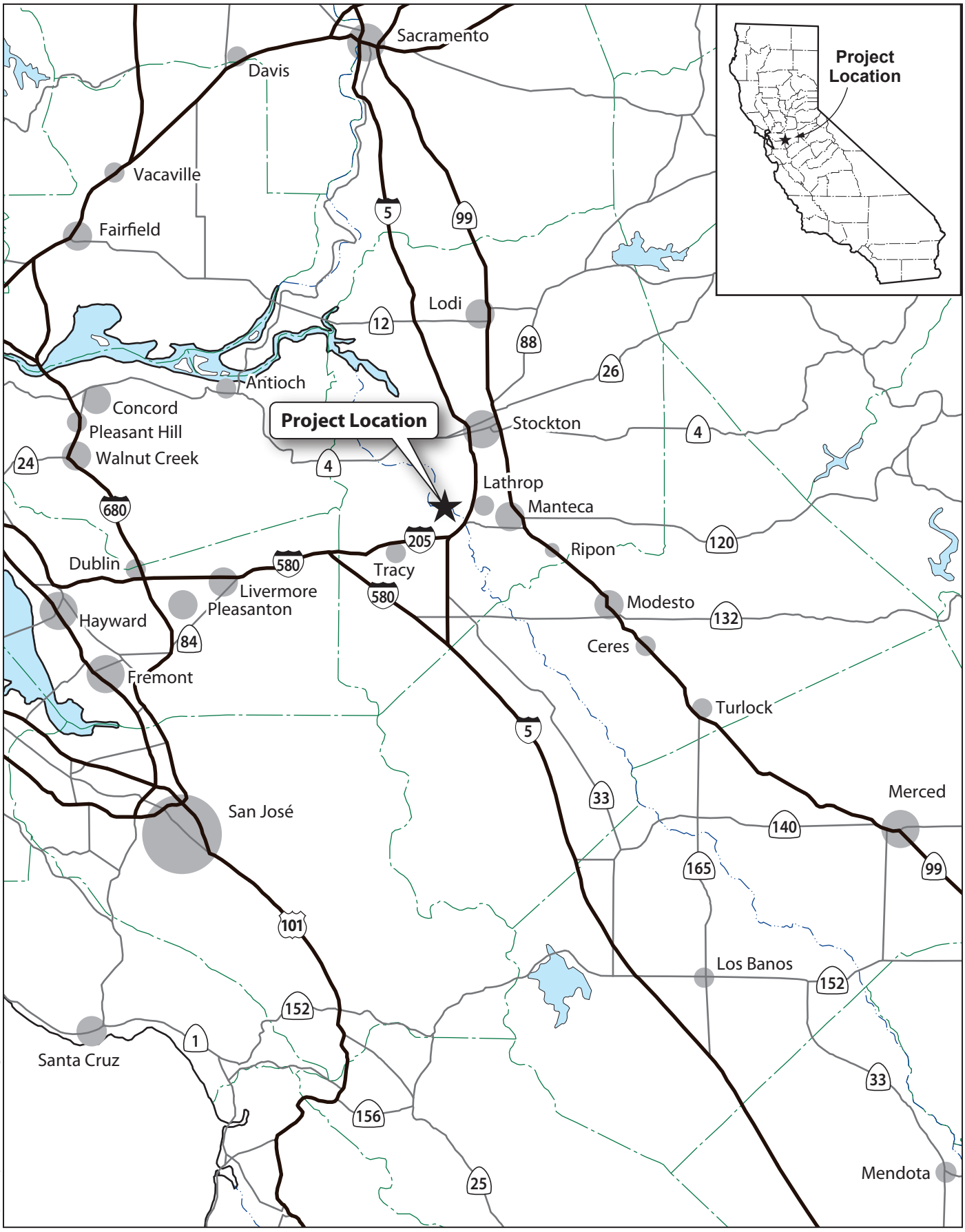
National Marine Fisheries Service. 2009. Biological and conference opinion on the reinitiation of formal consultation for the South Delta Temporary Barriers Project. April 3. National Marine Fisheries Service, Southwest Region. Long Beach, CA.

National Marine Fisheries Service. 2011. Biological opinion on the construction and operation of the South Delta Temporary Barriers Program for 2011. May 2013. National Marine Fisheries Service, Southwest Region. Long Beach, CA.

U.S. Fish and Wildlife Service. 2008. Formal endangered species act consultation on the proposed coordinated operations of the Central Valley Project (CVP) and State Water Project (SWP). December 15, 2008. Sacramento, CA.

U.S. Fish and Wildlife Service. 2009. Biological opinion on the effects of the construction of the Temporary Barriers Program. April. Sacramento, CA.

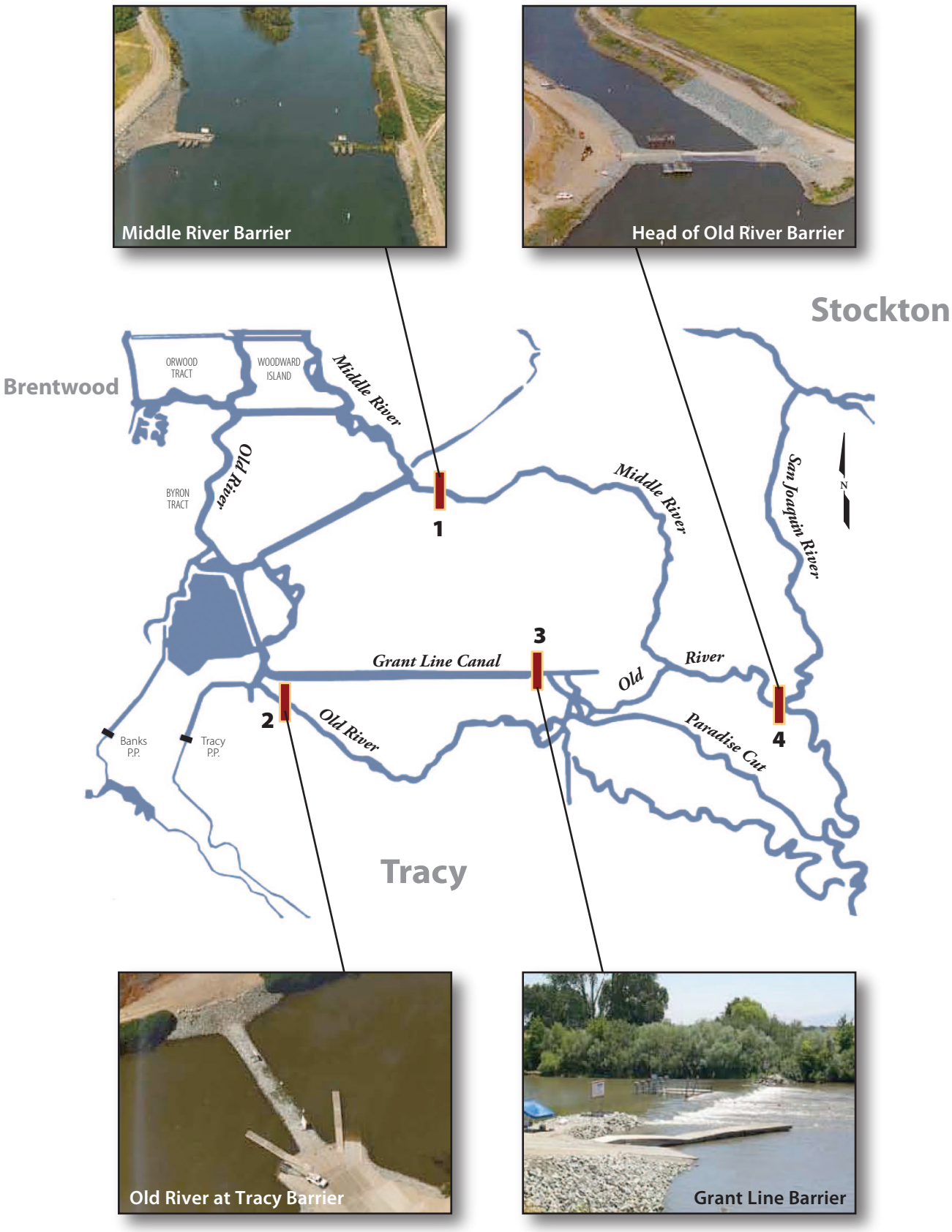
APPENDIX A: FIGURES



Graphics/Projects/00135.10 Permitting TBP (11-11) JD

ICF INTERNATIONAL

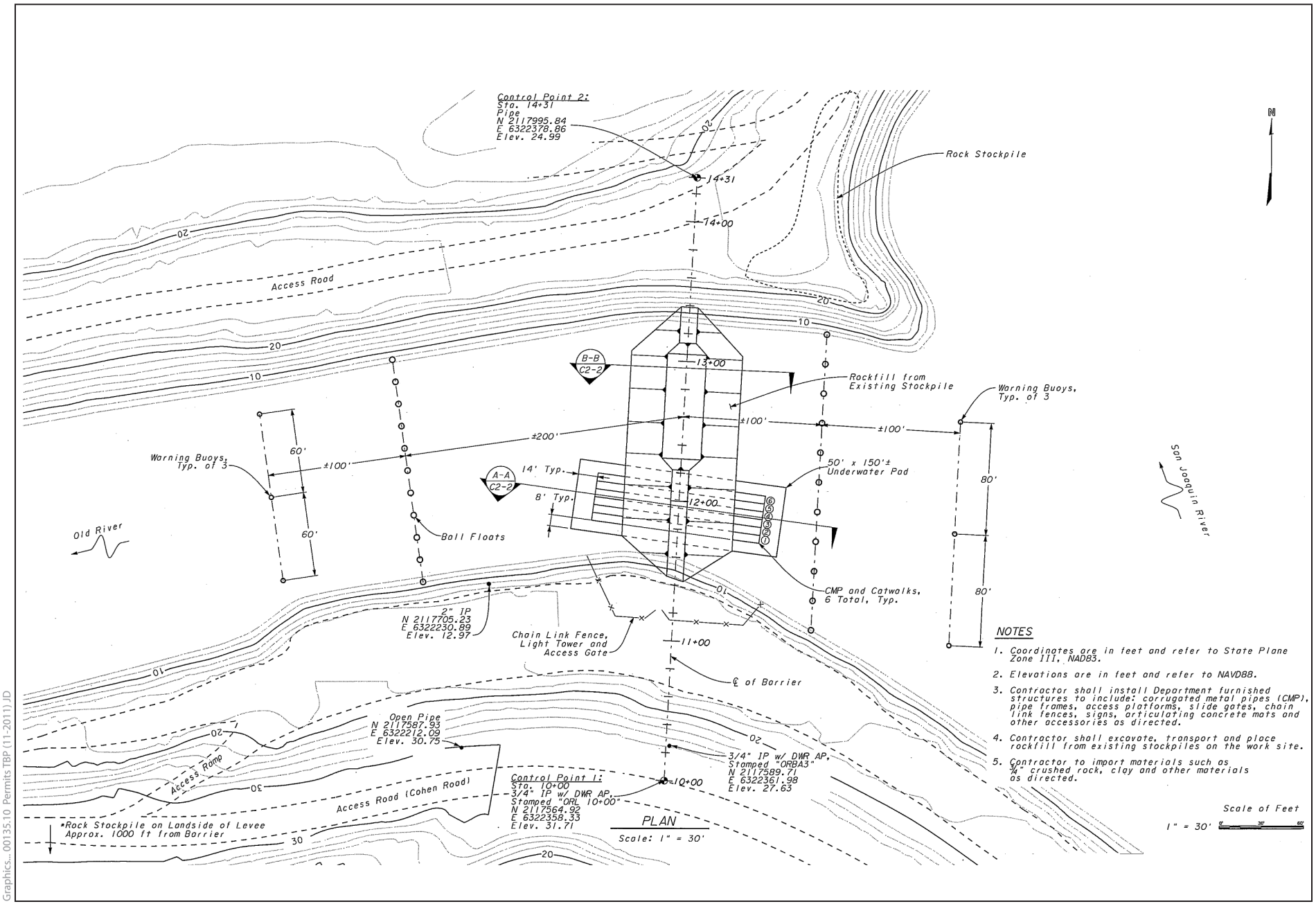
Figure 1
Project Vicinity



Graphics/Projects/00135.10 Permitting TBP (11-11) JD

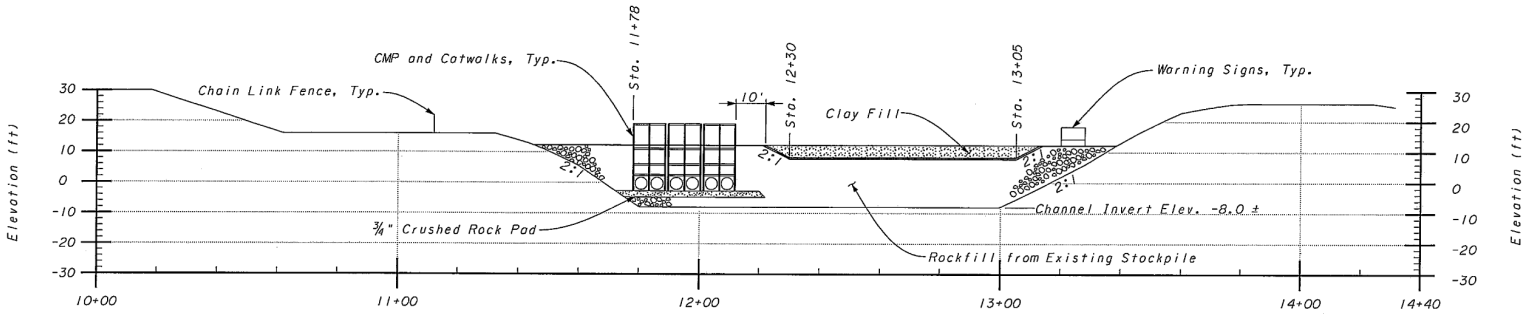
ICF INTERNATIONAL

Figure 2
Project Location Map



Graphics... 00135.10 Permits TBP (11-2011) JD

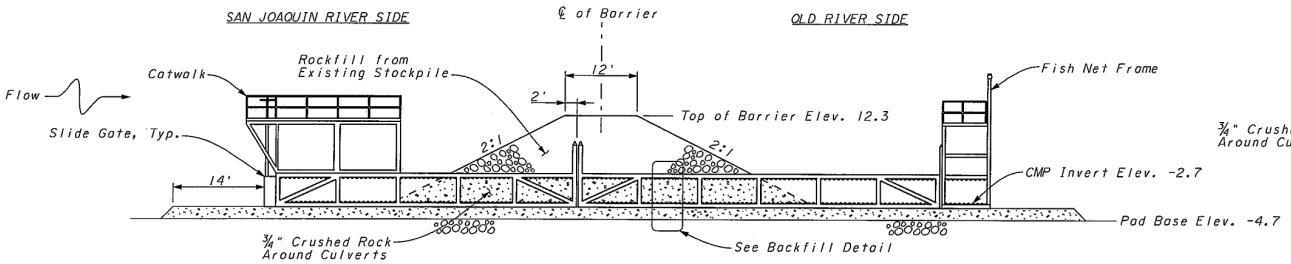
Figure 6a
Head of Old River Barrier (Spring)
Plan



PROFILE

Scale: 1" = 20'

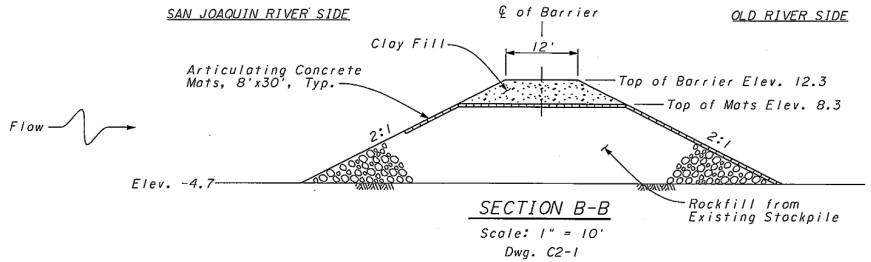
Dwg. C2-1



SECTION A-A

Scale: 1" = 10'

Dwg. C2-1

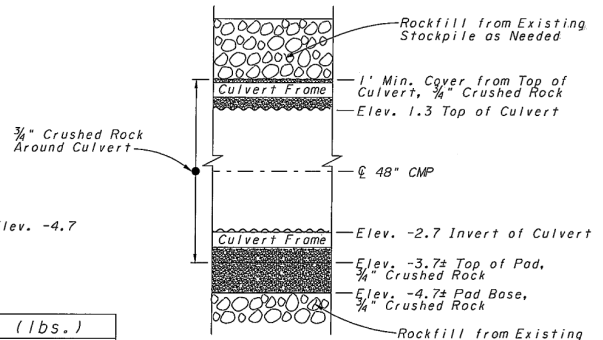


SECTION B-B

Scale: 1" = 10'

Dwg. C2-1

Weight Table (lbs.)	
U/S Culvert Frame	18,000 ea.
D/S Culvert Frame	20,000 ea.
U/S Riser Section	3,800 ea.
U/S Catwalk	2,500 ea.
D/S Fish Net Frame	7,000 ea.
Slide Gate Valve	900 ea.
Articulating Mats	7,500 ea.
Mat Spreader Bar	4,500



BACKFILL DETAIL

Not to Scale

NOTES

1. Elevations are in feet and refer to NAVD88.
2. Upstream (U/S), Downstream (D/S)

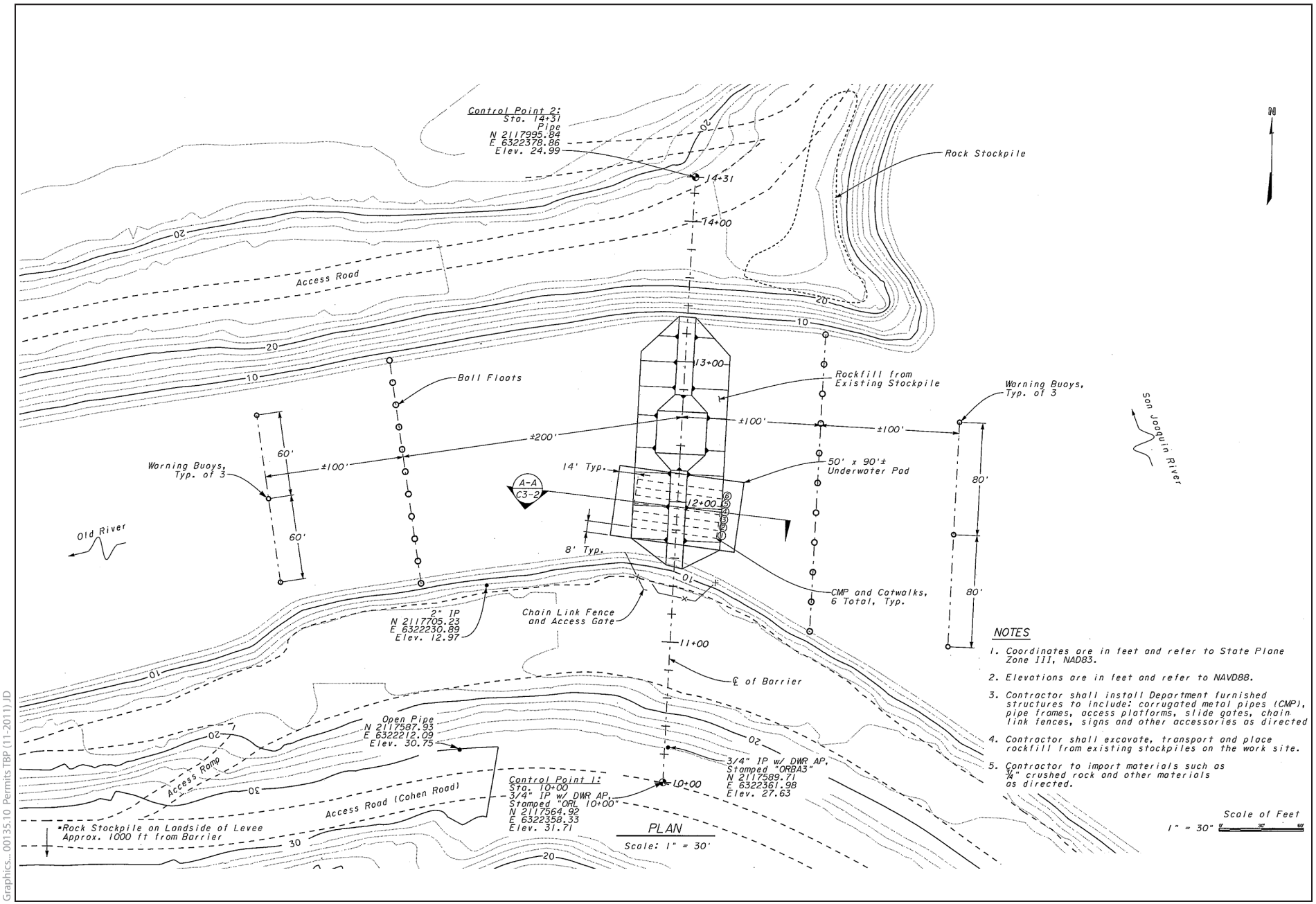
Scale of Feet

1" = 10'

1" = 20'

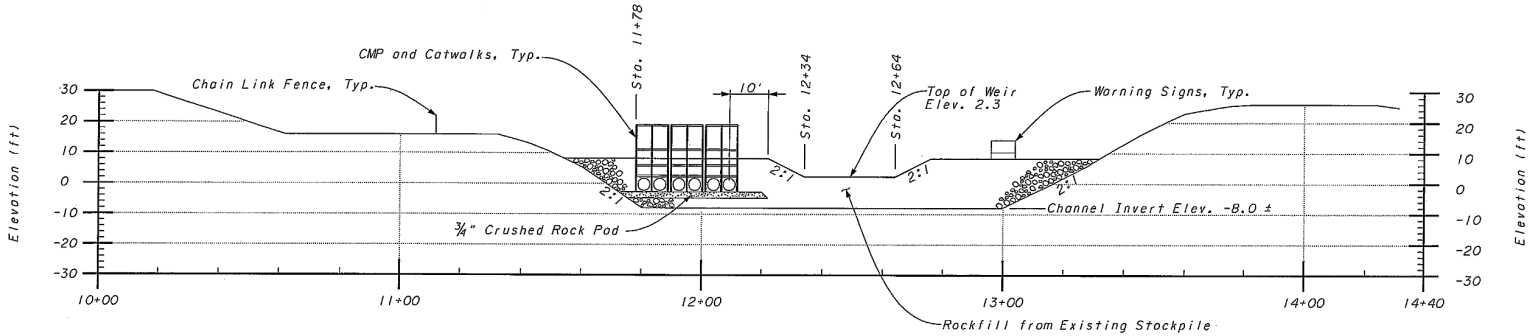
Graphics... 00135.10 Permits TBP (11-2011) JD

Figure 6b
Head of Old River (Spring)
Profile, Section and Details



Graphics... 00135.10 Permits TBP (11-2011) JD

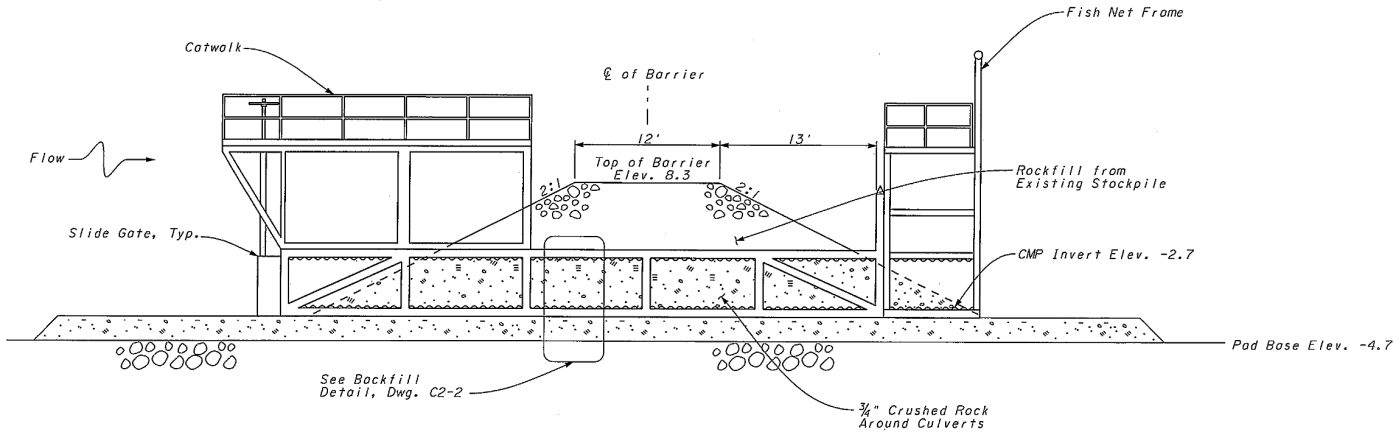
Figure 7a
Head of Old River Barrier (Fall)
Plan



PROFILE

Scale: 1" = 20'

Dwg. C3-1



SECTION A-A

Scale: 1" = 5'

Dwg. C3-1

Weight Table (lbs.)	
U/S Culvert Frame	18,000 ea.
U/S Riser Section	3,800 ea.
U/S Catwalk	2,500 ea.
D/S Fish Net Frome	7,000 ea.
Slide Gate Valve	900 ea.
Articulating Mats	7,500 ea.
Mat Spreader Bar	4,500

NOTES

1. Elevations are in feet and refer to NAVD88.
2. Upstream (U/S), Downstream (D/S)

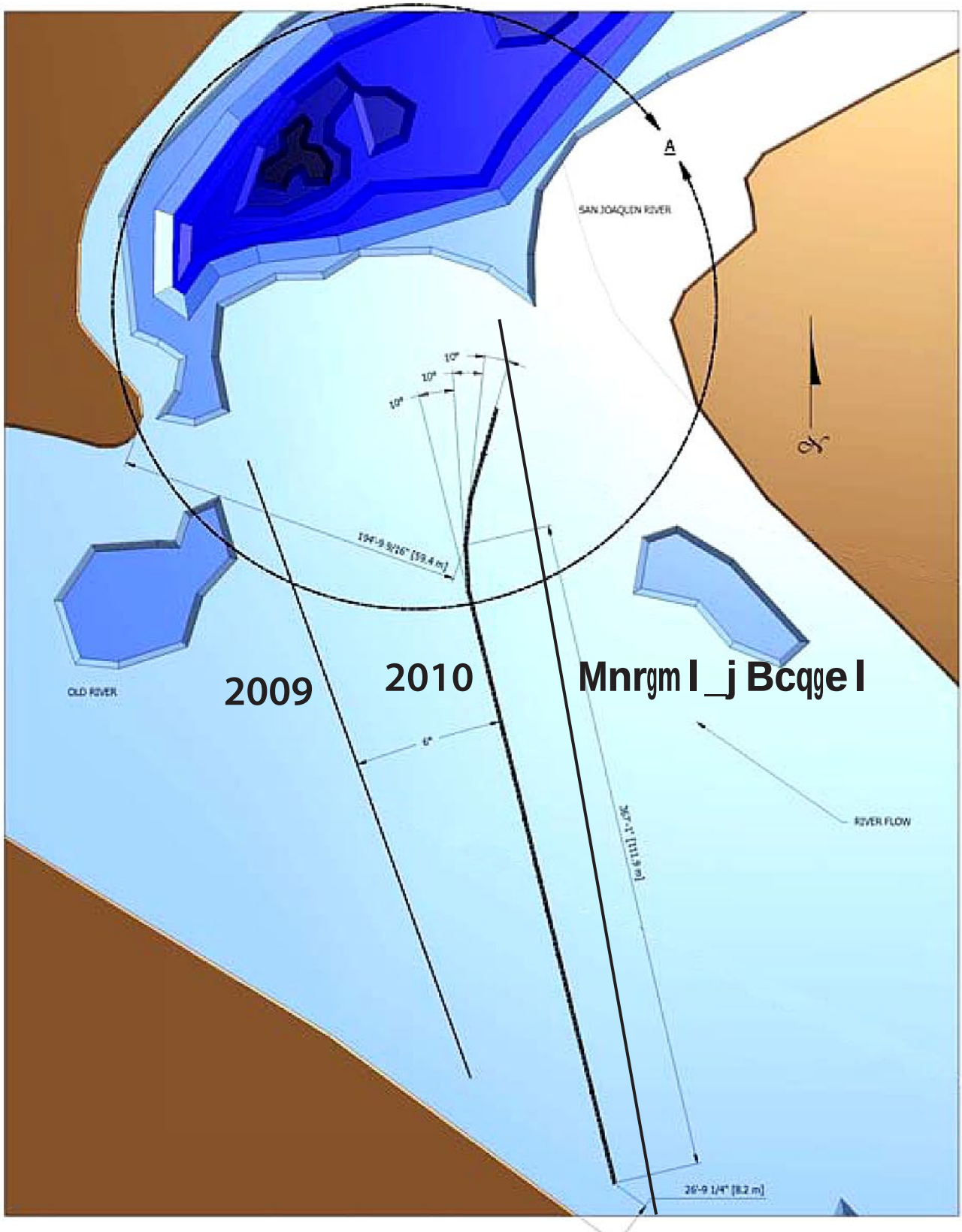
Scale of Feet

1" = 5'

1" = 20'

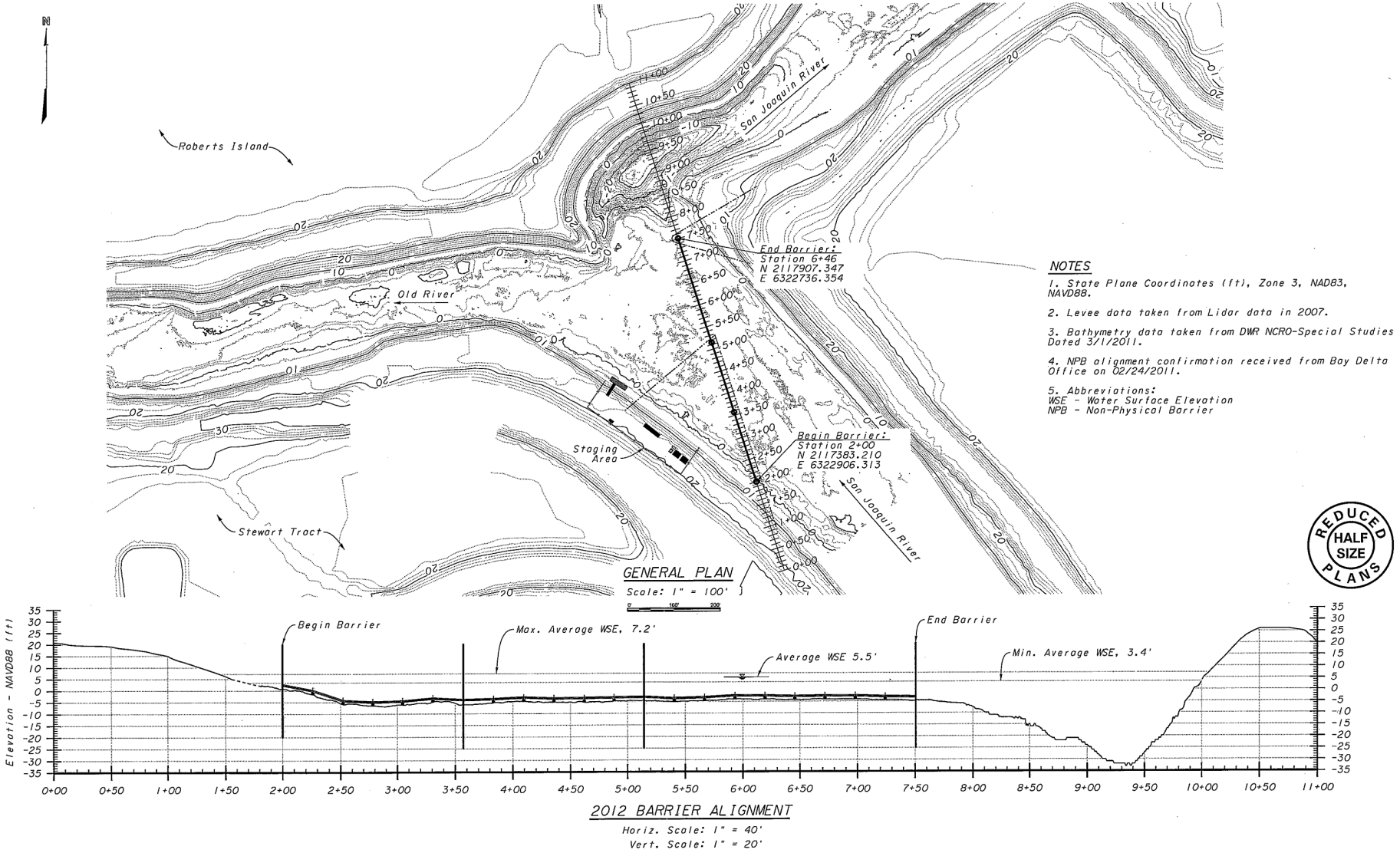
Graphics... 00135.10 Permits TBP (11-2011) JD

Figure 7b
Head of Old River (Fall)
Profile and Section



Graphics/Projects/00135.10 Permitting TBP (11-11) JD

Figure 8
2009, 2010 and Mnrgm l _j Barrier Comparison

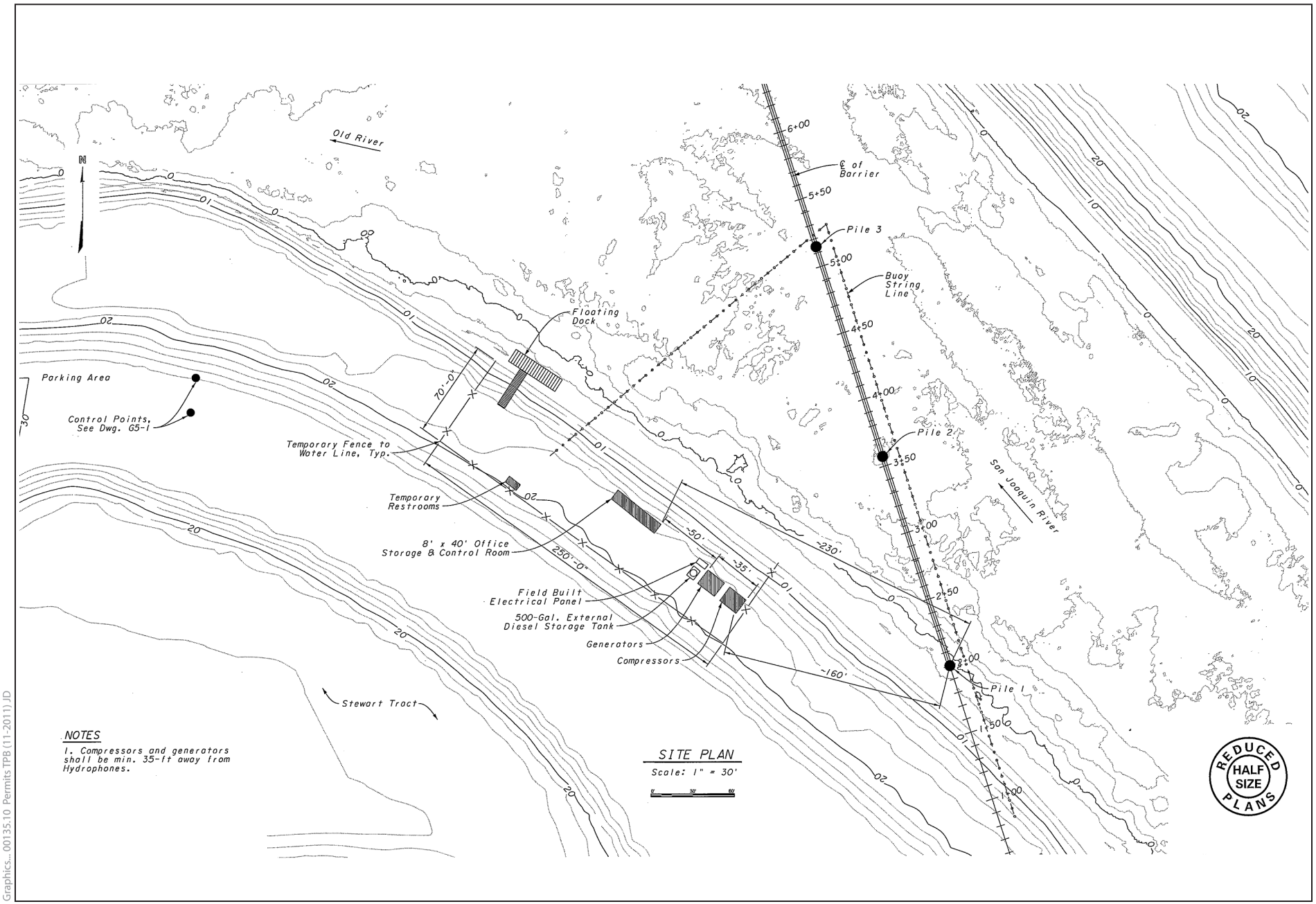


REDUCED PLANS HALF SIZE

Graphics... 00135.10 Permits TPB (11-2011) JD

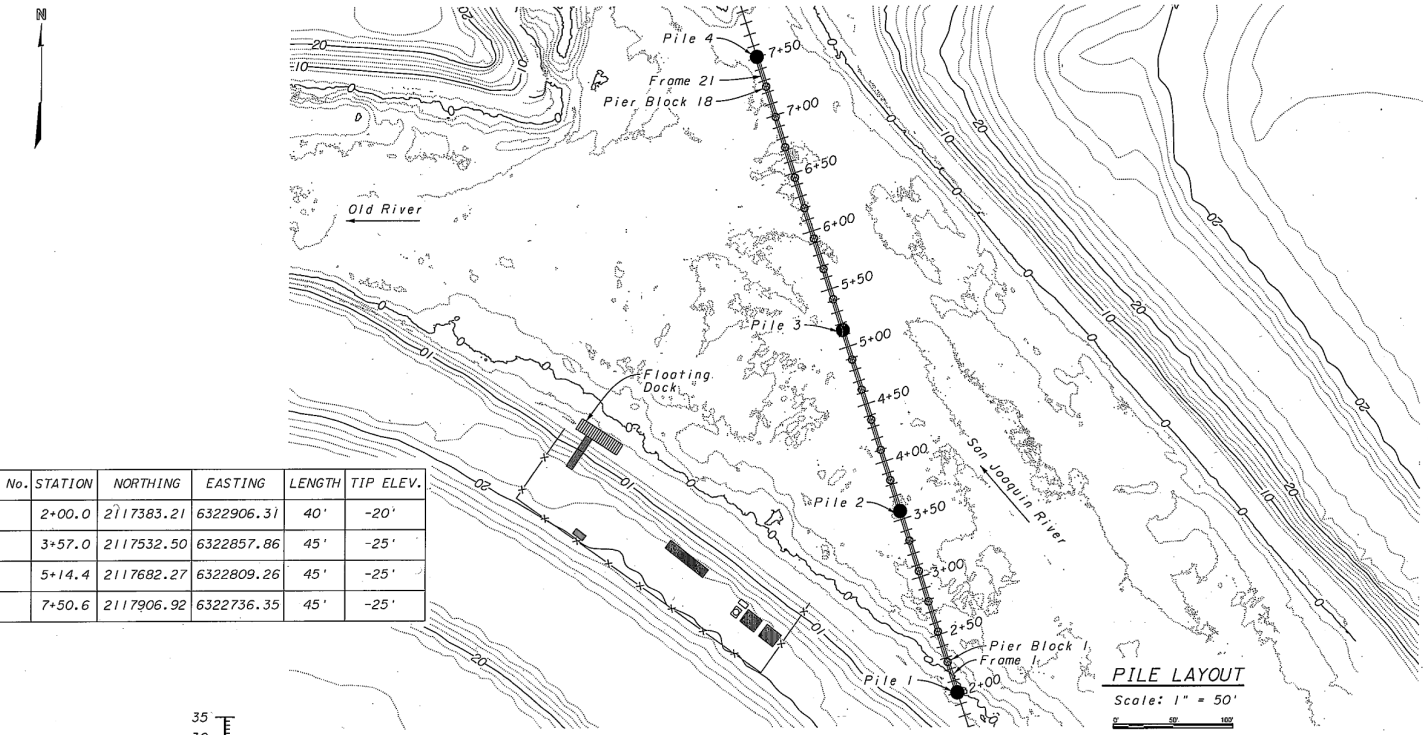
A-9

Figure 9a
Head of Old River Non-Physical Barrier
Plan and Profile



Graphics... 00135.10 Permits TPB (11-2011) JD

Figure 9b
Head of Old River Non-Physical Barrier
Staging Area - Plan



PILE No.	STATION	NORTHING	EASTING	LENGTH	TIP ELEV.
1	2+00.0	2117383.21	6322906.31	40'	-20'
2	3+57.0	2117532.50	6322857.86	45'	-25'
3	5+14.4	2117682.27	6322809.26	45'	-25'
4	7+50.6	2117906.92	6322736.35	45'	-25'

NOTES

1. State Plane Coordinates (ft), Zone 3, NAD83, NAVD88.

2. Pile Material Specifications:
Pipe 8 Std.: fy=35ksi; O.D. 8.625"; t=0.322; ASTM A53

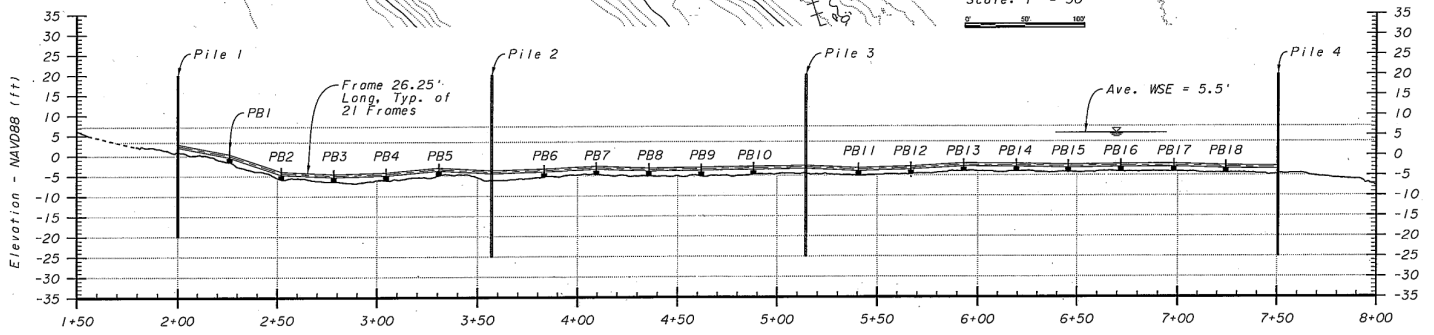
3. Pier blocks to be located between adjoining frames, except where pile is located.

4. Data collected from CDEC station "OHI" and analyzed from April-May of 2010:

Flow Range:
Minimum 1200 cfs
Maximum 3748 cfs

Stage Data:
Max WSE= 7.2'
Min WSE= 3.4'
Ave Max WSE= 5.9'
Ave Min WSE= 5.1'5.

5. Abbreviations:
PB - Pier Block
ASTM - American Society for Testing & Materials
WSE - Water Surface Elevation
O.D. - Outside Diameter
t - Thickness



2012 BARRIER ALIGNMENT

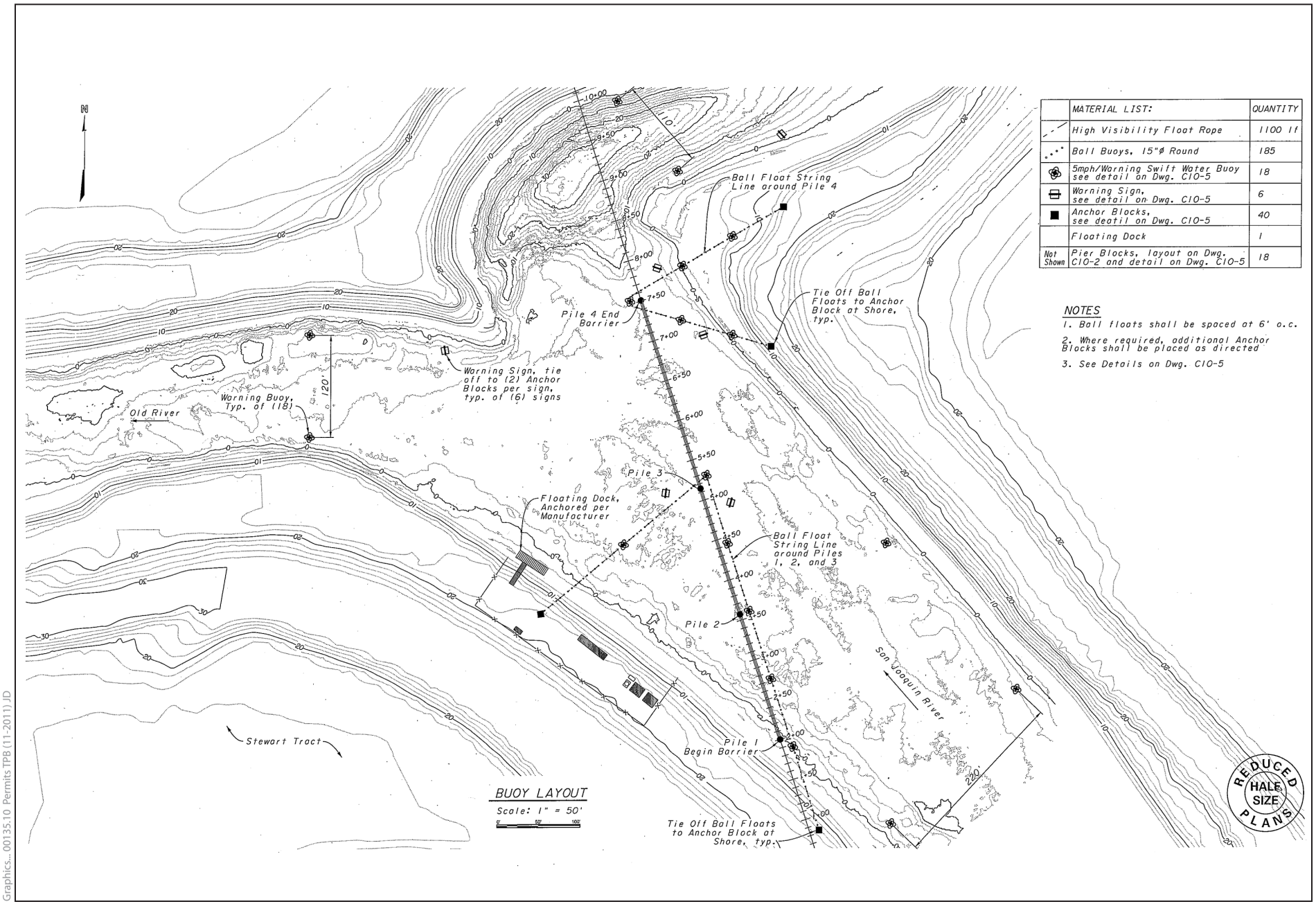
Horiz. Scale: 1" = 30'
Vert. Scale: 1" = 15'

REDUCED HALF SIZE PLANS

Graphics... 00135 10 Permits TPB (11-2011) JD

A-11

Figure 9c
Head of Old River Non-Physical Barrier
Pile and Pier Block Layout - Plan and Profile



Graphics... 00135.10 Permits TPB (11-2011) JD

Figure 9d
Head of Old River Non-Physical Barrier
Buoy Layout - Plan

Supplier	MATERIAL LIST:	QUANTITY
Cal-Neva	Sound Projector Cable 12GA / 3C	3135' (Total)
	Line 1, Frames 1-2	226'
	Line 2, Frames 3-4	223'
	Line 3, Frames 5-6	232'
	Line 4, Frames 7-8	178'
	Line 5, Frames 9-10	206'
	Line 6, Frames 11-12	263'
	Line 7, Frames 13-14	285'
	Line 8, Frames 15-16	310'
	Line 9, Frames 17-18	359'
	Line 10, Frames 19-20	413'
	Line 11, Frame 21	440'
Cal-Neva	Intense Light Power Cable 6GA / 3C	932' (Total)
	Line 1, Frames 1-6	156'
	Line 2, Frames 7-12	156'
	Line 3, Frames 13-18	235'
	Line 4, Frames 19-21	385'
OVIVO	Intense Light Signal Cable (no specification provided)	840' (Total)

CABLE NOTES

1. All cable lengths are measured as shown on the drawing from the barrier to the control room.

3. Approximate distance from control room to pile 1 is shown on Dwg. C10-1.

4. Intense Light Signal Cable is supplied by OVIVO Water. Intense Light Signal Cable Length from Control Room to Start of barrier is Approximately 220' as shown.

Supplier	MATERIAL LIST:	QUANTITY
Cal-Neva	2" PVC, Schedule 40	1159' (Total)
	Line 1, Pile 1 to shore	185'
	Line 2, Frames 1-6	161'
	Line 3, Frames 7-12	163'
	Line 4, Frames 13-17	255'
	Line 5, Frames 18-21	395'

PVC NOTES

1. All PVC lengths are measured as shown on the drawing from the barrier to the compressor.

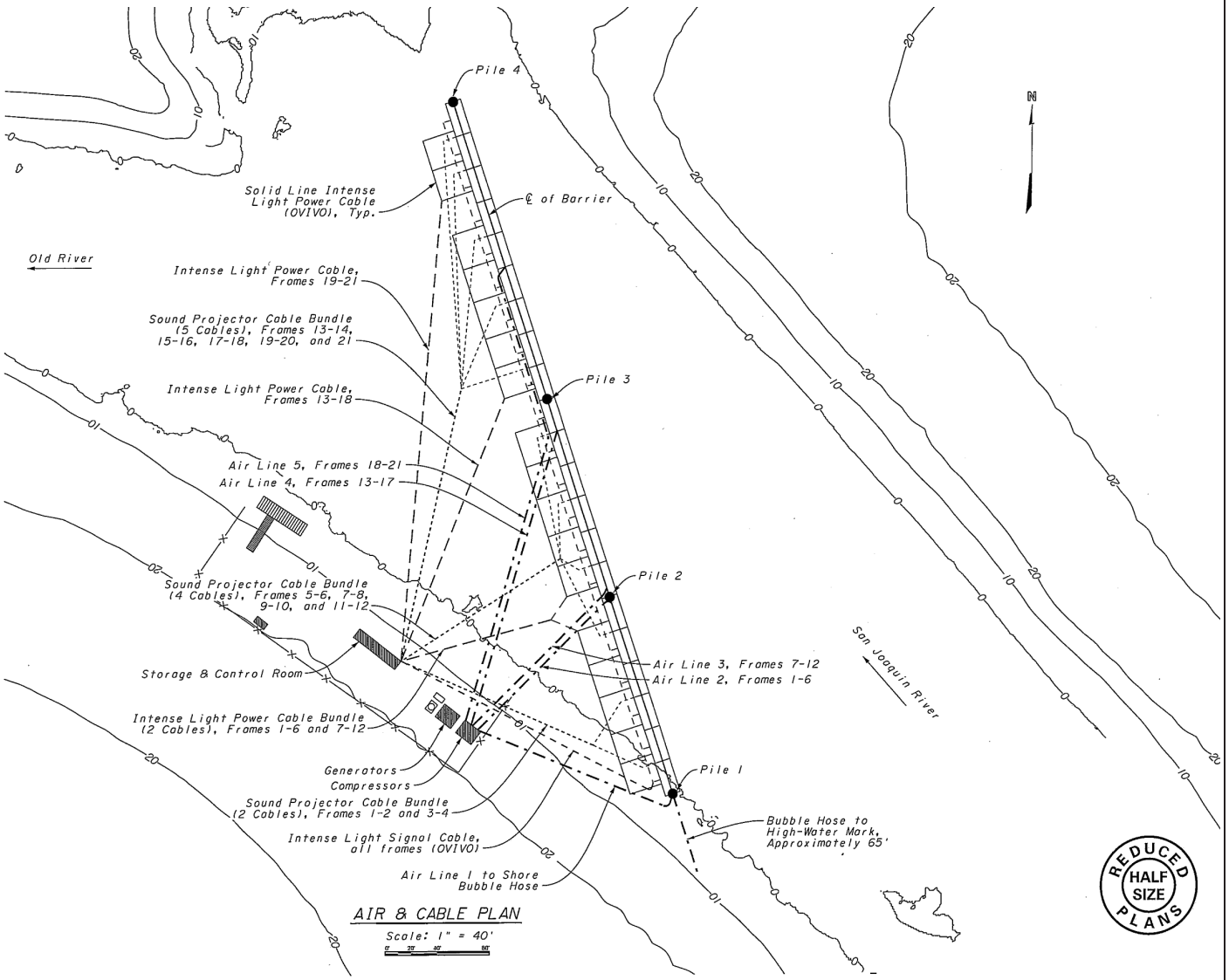
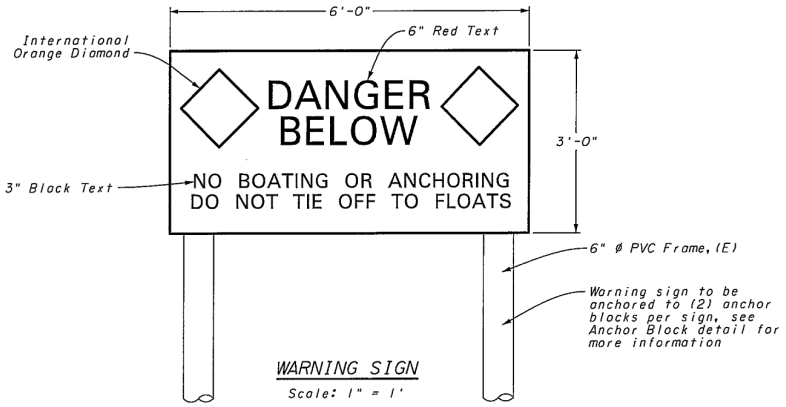
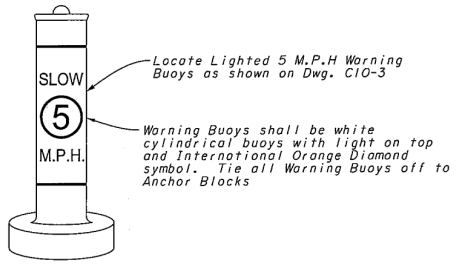


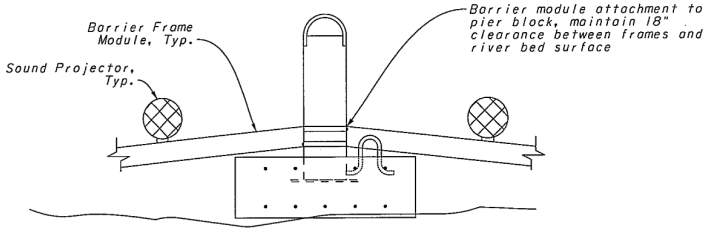
Figure 9e
Head of Old River Non-Physical Barrier
Air and Cable Schematic - Plan



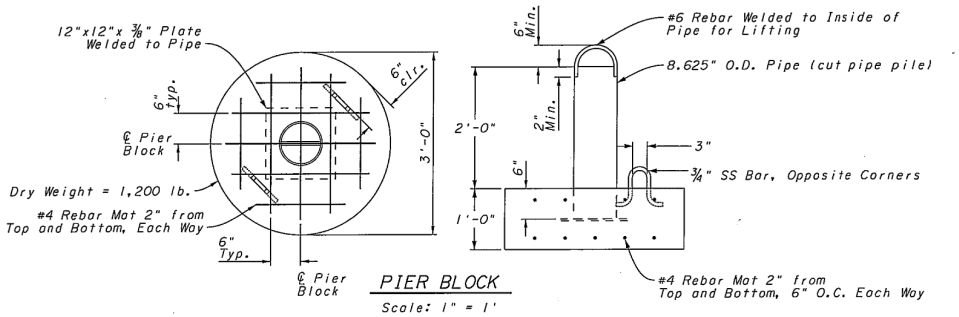
WARNING SIGN
Scale: 1" = 1'



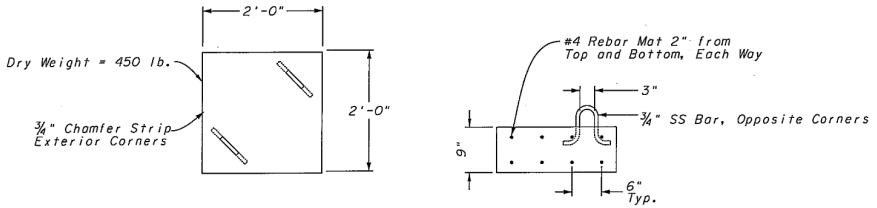
WARNING BUOY
Scale: 1" = 1'



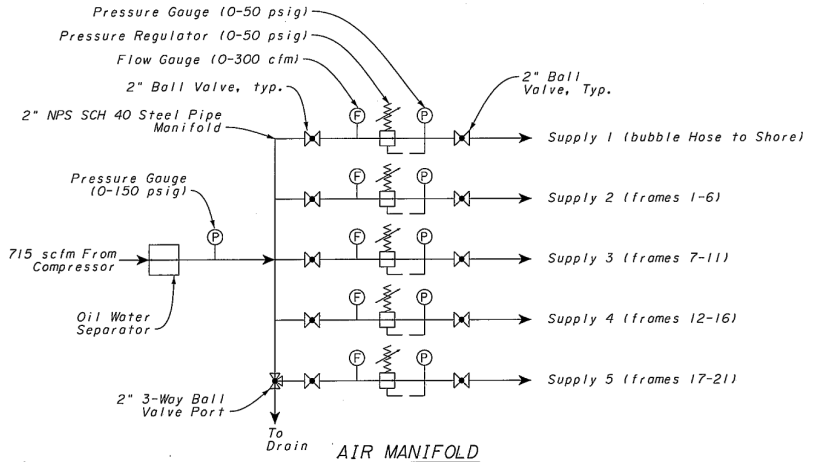
BARRIER ATTACHMENT
Scale: 1" = 1'



PIER BLOCK
Scale: 1" = 1'



ANCHOR BLOCK
Scale: 1" = 1'



AIR MANIFOLD
Scale: 1" = 1'

REDUCED HALF SIZE PLANS

Figure 9f
Head of Old River Non-Physical Barrier
Pier and Anchor Blocks, Signs, and Buoy - Detail

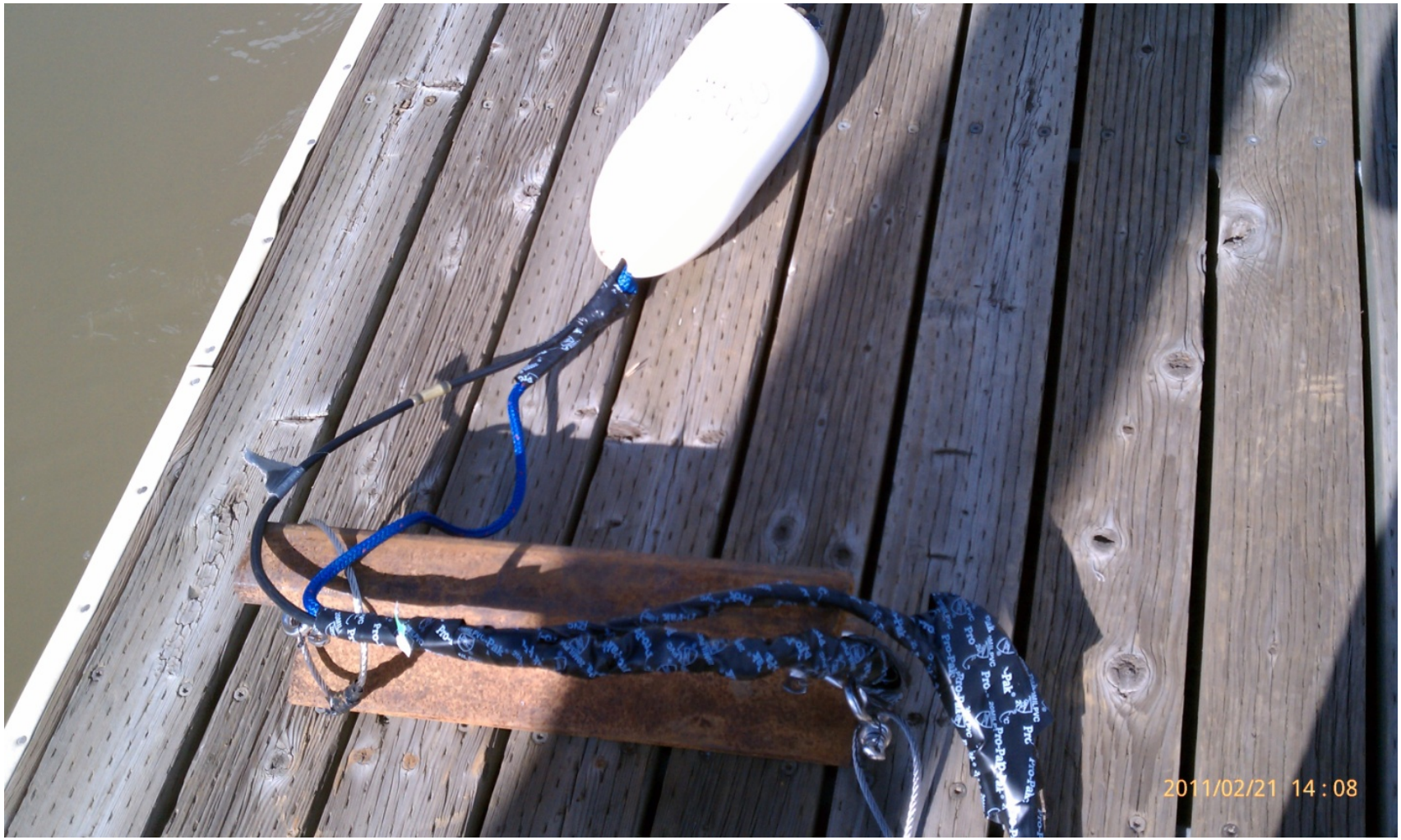


Figure 10: Photo of a railroad track anchor, line and buoy setup used to deploy a hydrophone.

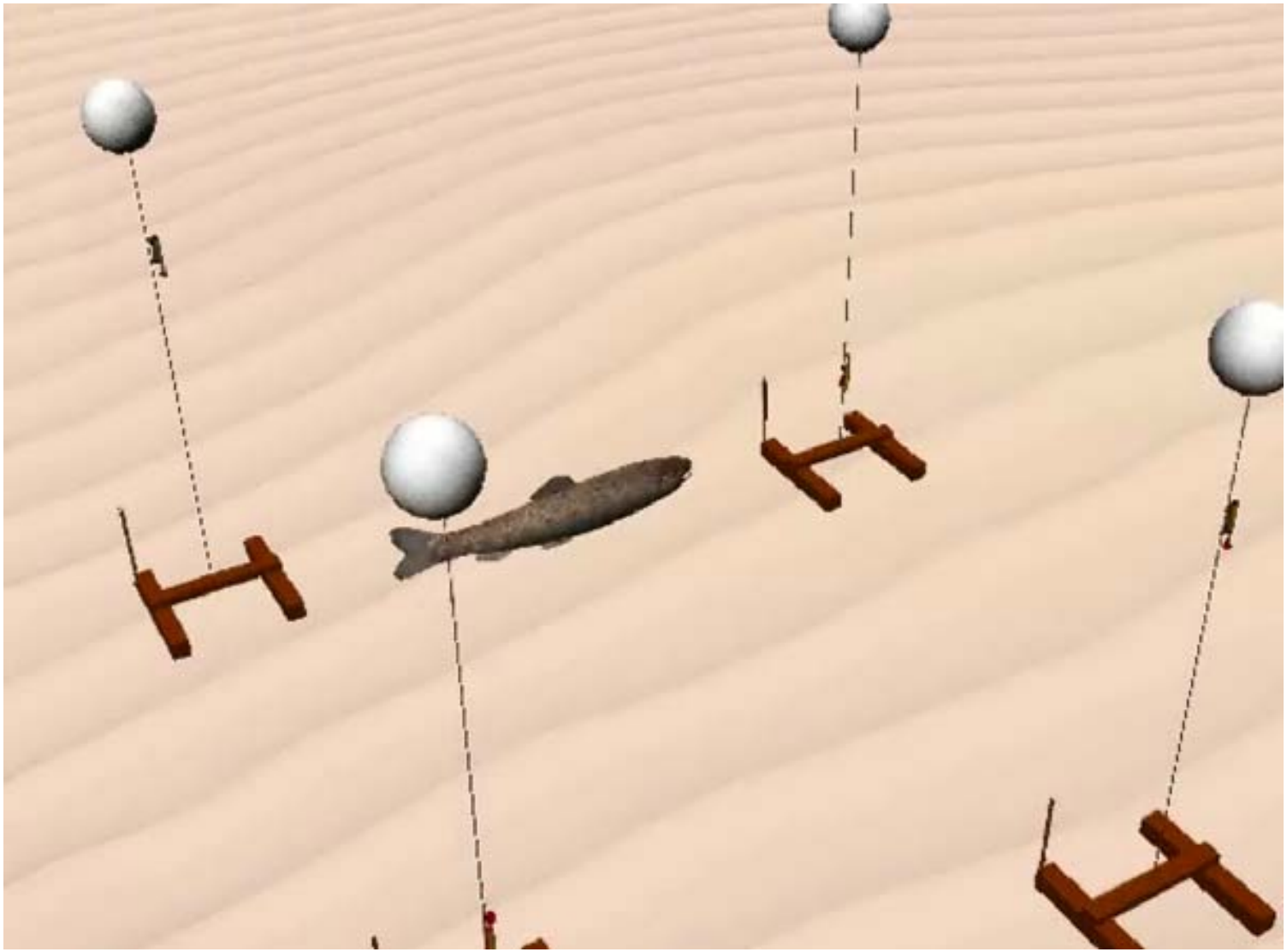


Figure 11: Example of hydrophone bottom mounts with tensioned lines used for the 2-D hydroacoustic study and the HOR.

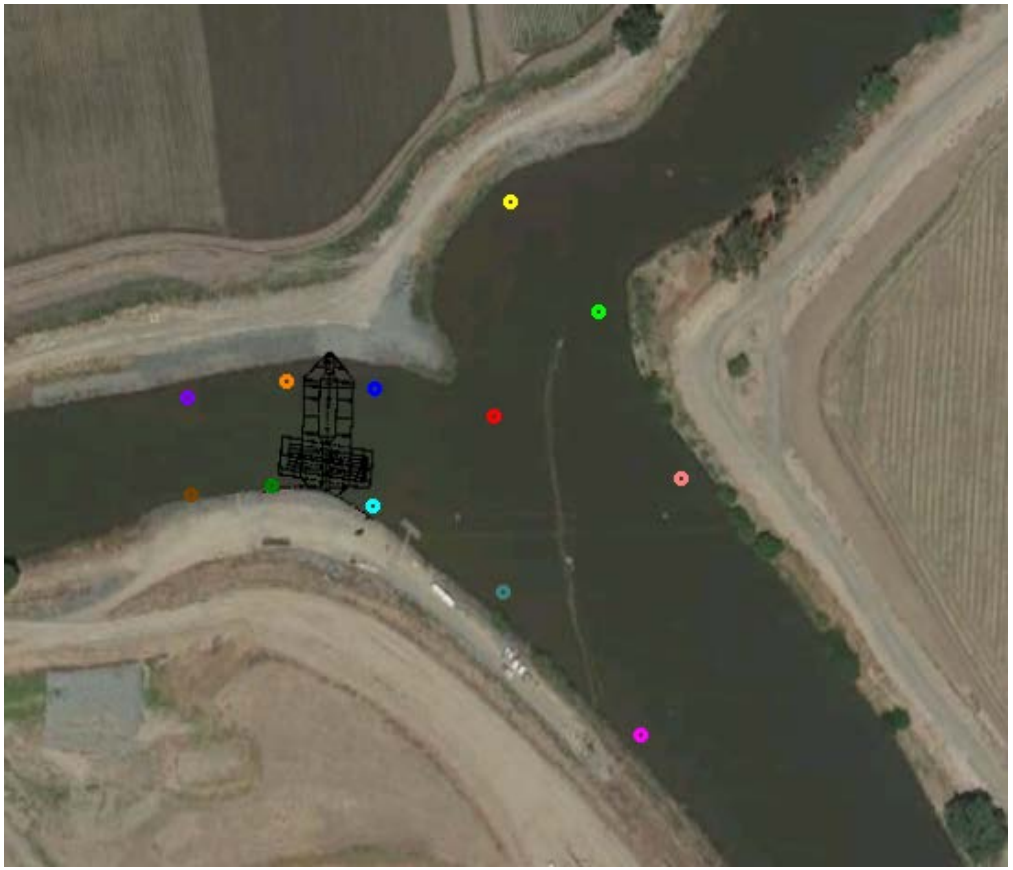


Figure 12: Example of hydrophone layout for a 2-D array around the HOR barrier.

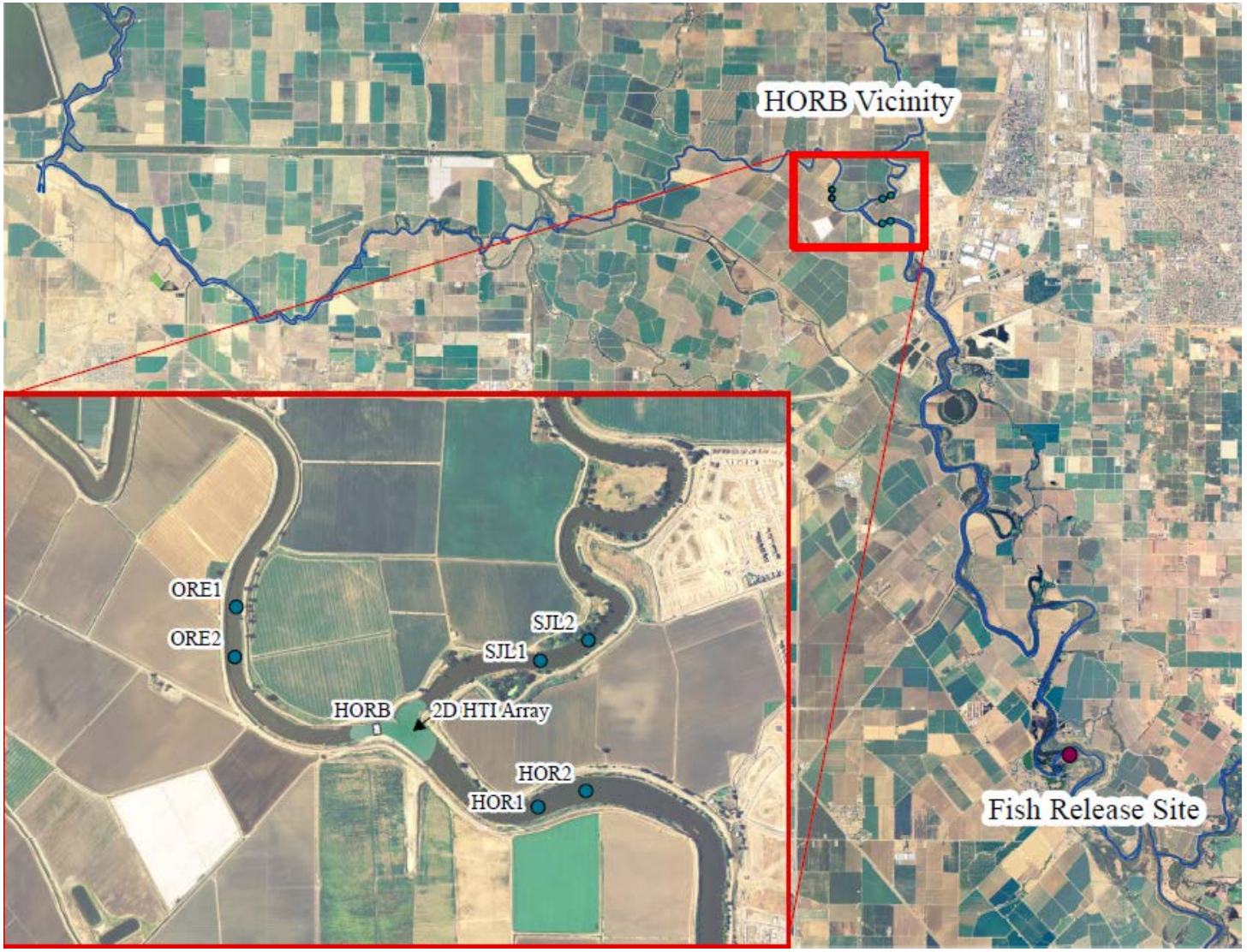


Figure 13: Example of peripheral node placement around the HORB showing a potential upstream tagged salmonid smolt release site.