FINAL ENVIRONMENTAL IMPACT STATEMENT

408 PERMISSION AND 404 PERMIT TO THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

FOR THE

FEATHER RIVER LEVEE REPAIR PROJECT, CALIFORNIA SEGMENT 2

APPENDIX G – CALIFORNIA DEPARTMENT OF FISH AND GAME, PERMIT APPLICATIONS

October 2008

FINAL ENVIRONMENTAL IMPACT STATEMENT

408 PERMISSION AND 404 PERMIT TO THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

FOR THE

FEATHER RIVER LEVEE REPAIR PROJECT, CALIFORNIA SEGMENT 2

APPENDIX G – CALIFORNIA DEPARTMENT OF FISH AND GAME, PERMIT APPLICATIONS

Application for Section 1602 Streambed Alteration Agreement, Segment 2, and Signed Agreement
(Notification No. 1600-2007-0294-R2)

Application for Section 2081(b) Incidental Take Permit, Segment 2

October 2008

Application for Section 1602 Streambed Alteration Agreement, Segment 2 and Signed Agreement (Notification No. 1600-2007-0294-R2)

EDAW | AECOM

EDAW Inc
2022 J Street, Sacramento, California 95814
T 916.414.5800 F 916.414.5850 www.edaw.com

August 13, 2007

Mr. Dale Watkins
California Department of Fish and Game, Region 2
1701 Nimbus Road
Rancho Cordova, CA 95670

SUBJECT: **Request for a Streambed Alteration Agreement, pursuant to Section 1602 of the California Fish and Game Code, as required for the Feather River Levee Repair Project, Segment 2**

Dear Mr. Watkins:

On behalf of the Three Rivers Levee Improvement Authority (TRLIA), we are hereby requesting a Streambed Alteration Agreement, pursuant to Section 1602 of the California Fish and Game Code, for the Feather River Levee Repair Project (FRLRP), Segment 2. Habitats that are potentially subject to jurisdiction by the Department of Fish and Game (DFG) include perennial drainages, intermittent drainages, and mixed riparian forest/scrub. The Streambed Alteration Notification form (Form 2023) is included as Attachment A and the application fee is included as Attachment B.

PROJECT LOCATION

The FRLRP, Segment 2 (proposed project) is located in southwestern Yuba County, south of the city of Marysville (Exhibit 1, Attachment C). The proposed project is one segment of the overall FRLRP, which includes a total of three segments (Exhibit 2, Attachment C). Segments 1 and 3 of the FRLRP are addressed as a separate project. DFG determined in a letter dated May 2, 2007 that a Lake or Streambed Alteration agreement is not required for Segments 1 and 3 (Attachment D). The focus of this application is Segment 2 of the FRLRP.

The proposed project is located in Townships 13 and 14 North, Ranges 3 and 4 East within the Olivehurst U.S. Geological Survey (USGS) 7.5-minute quadrangle (Mount Diablo Baseline and Meridian) (Exhibit 2, Attachment C). The proposed project includes the portion of the Feather River left (east) levee from Project Levee Mile (PLM) 17.2 to PLM 23.4 (approximately from Star Bend to just south of Shanghai Bend along the Feather River).

PROJECT PURPOSE

The primary purpose of the overall FRLRP, and consequently of the proposed project, is to correct identified deficiencies in the left (east) bank levee of the Feather River and the left (south) bank levee of the Yuba River, and consequently to improve flood protection for the Reclamation District (RD) 784 area of Yuba County. Studies by the California Department of Water Resources (DWR), the U.S. Army Corps of Engineers (USACE), RD 784, and TRLIA have found that several reaches of the levee system protecting the RD 784 area do not satisfy geotechnical criteria for seepage at the water surface elevation for the 100-year flood event. To a large extent, these levee “deficiencies” in the project area relate to the potential for water to seep under (underseepage) and through (through-seepage) the levee soils during flood events, potentially leading to levee failure. An analysis focused on the Feather River

levee was performed by Kleinfelder and is described in *Problem Identification Report, TRLIA Phase 4 Feather River and Yuba River Left Bank Levees, Reclamation District No. 784* (PIR) (Kleinfelder 2006). The conclusions of the PIR indicate that portions of the subject levee do not currently meet the geotechnical criteria for underseepage or through-seepage needed to bring the levee into compliance with Federal Emergency Management Agency (FEMA) requirements for accreditation.

To correct the deficiencies identified along the levee segments analyzed in the PIR and other studies, TRLIA is undertaking the FRLRP. The proposed project addresses levee problems within Segment 2 of the overall FRLRP and proposes to correct the problems by constructing a setback levee along this reach of the Feather River.

PROJECT DESCRIPTION

The proposed project involves constructing a setback levee, relocating a pump station adjacent to the existing levee, and degrading portions of the existing Feather River left bank levee (Exhibit 3, Attachment C). Approximately 5.7 miles of new setback levee would be constructed within Segment 2 to replace 6.2 miles of existing levee, and the new setback levee would tie into the existing levee at the north end of Segment 1 and the south end of Segment 3.

The proposed activities in Segment 2 will be completed in two stages: Stage 1 and Stage 2. The project is being divided into two stages to accommodate schedule challenges related to beginning construction of the setback levee (to replace the extremely deficient segment of existing levee) while undergoing the process for USACE and California State Reclamation Board approval to degrade the existing levee. If these processes were to take place at the same time (i.e., wait to construct the setback levee until approval to degrade the existing levee is obtained), it would delay the creation of a flood protection structure that could minimize flood damages should the existing levee fail during the approval process.

Stage 1 of the proposed project includes construction of the setback levee and associated stability berms, construction of a new Pump Station No. 3 and associated facilities, excavation of material within borrow sites (within the setback area and possibly on the land side of the setback levee), and removal and relocation of existing utilities and structures within the setback area. Stage 2 of the project includes degradation of all or portions of the existing Feather River east levee within Segment 2; filling of the Plumas Lake Canal on the water side from the setback levee to where the canal opens into the ponded area, and on the land side from the setback levee to the new Pump Station No. 3; decommissioning of the existing Pump Station No. 3; and recontouring of portions of the levee setback area and an existing drainage to facilitate drainage of water from the levee setback area after flood events. TRLIA is also discussing the feasibility of active restoration in the setback area with the various landowners and stakeholders in the setback area as well as with the various regulatory agencies. If restoration were conducted, it would be done as part of Stage 2.

Stage 1 Construction

<u>Setback Levee Construction</u>

The setback levee will be approximately 5.7 miles long. The new levee segment will generally be set back approximately 0.5 mile to the east of the existing Feather River levee, except near the northern and southern ends, where it will join the existing levee. The area between the east toe of the existing levee and the west toe of the setback levee (the levee setback area) will include approximately 1,300 acres. It is anticipated that the design crown elevation of the setback levee will be the same as the crown elevation of the existing levee at each given latitude along the alignment. The height of the setback levee will generally range from about 20 to 30 feet above the existing ground surface. The most common levee height above the adjacent land will be approximately 25 feet. The existing levee has

been reconstructed by the USACE to provide a minimum of 3 feet of freeboard above the 1957 design profile. Because the levee setback will lower most flow profiles by widening the flow channel, it follows that the setback levee, if constructed to the crown elevations described above, will have freeboard of at least 3 feet above the 1957 design profile. Other anticipated dimensions of the setback levee are: a crown width of 20 feet; a footprint width (levee toe to levee toe) of approximately 170 feet (depending on levee height); levee slopes at a 3:1 ratio (H:V); and a 12-foot-wide patrol road on the levee crown.

Construction of the setback levee will include three main design elements: preparation of the levee foundation, construction of a slurry cut-off wall for seepage control, and construction of the levee embankment. Preparation of the foundation of the setback levee will involve clearing and grubbing of all trees, brush, loose stone, abandoned structures, existing utilities, buried pipelines, and other deleterious materials that may exist within 10 feet of the levee toes. After clearing and grubbing, the setback levee foundation will be stripped to remove low-growing vegetation and topsoil to a depth of at least 6 inches, although local areas with extensive tree roots or deep organic soils may require excavation to a depth of 3 feet or greater. The topsoil will be placed in a designated “unsuitable material” spoil area and/or used for borrow area reclamation. Overall, the depth of stripping is expected to average about 1–3 feet. Construction of a slurry cutoff wall is proposed along those portions of the setback levee where widespread strata of permeable sands and gravels exist in the foundation. The purpose of the slurry cutoff wall is to dissipate the hydraulic gradient in the levee foundation and reduce seepage quantities. To achieve maximum effectiveness, the slurry cutoff wall must extend completely through the permeable strata and terminate some distance into an underlying, reasonably continuous layer with lower permeability. The slurry cutoff wall will be composed of a mixture of soil and bentonite clay, and, in some applications, cement. Finally, construction of the setback levee embankment will begin as soon as sufficient lengths of levee foundation are complete and weather conditions allow. The embankment will be constructed as an engineered fill, with the fill placed in horizontal lifts. Each lift will be moisture conditioned and compacted to the specified density using a suitable compactor, such as a sheepsfoot, tamping-foot, or rubber-tired roller. Stability berms integral to the levee embankment will be provided in portions of the southern alignment where the foundation of the levee contains soft clay and silt deposits.

New Pump Station No. 3

An existing pump station (Pump Station No. 3) will need to be relocated to the land side of the setback levee. The current location of Pump Station No. 3 experiences excessive seepage and boils during high-water events, making it desirable to relocate the pump station out of this area. In addition, after the setback levee is complete, the existing Pump Station No. 3 will be in the setback area and exposed to flooding after the existing levee is degraded. Therefore, as part of Stage 1 of the setback levee project, a new/replacement Pump Station No. 3 will be constructed on the land side of the setback levee, followed in Stage 2 by removal of the existing pump station. The location of the new pump station will be adjacent to the Plumas Lake Canal, south of Rich Road (Exhibit 3, Attachment C). The new Pump Station No. 3 will be a reinforced-concrete structure similar to the recently constructed Pump Station No. 2 in RD 784. The specific capacity of the new Pump Station No. 3 will be determined during detailed project design; however, preliminary design shows that the capacity of the current pump station will be able to accommodate high-water events without the threat of upstream flooding. Once the new Pump Station No. 3 is built, an “approach channel” will be excavated to connect the pump station to the Plumas Lake Canal. A gravity drain has been incorporated into the design of the pump station to allow summertime gravity discharges to the lowlands on the waterside of the setback levee and the Feather River. The drain will consist of a cast-in-place 4-foot by 4-foot clear-span box culvert. Waterside of the levee toe, precast culvert sections will likely be used instead of cast-in-place concrete.

Utility Relocation and Structure Removal

Implementation of the setback levee project will necessitate the removal of all structures (houses, trailers, sheds, barns, other agricultural outbuildings) from the levee setback area, which would be subject to periodic flooding following removal of the existing levee. Approximately 20 structures in the levee setback area will be displaced by the project. Displaced structures include six residential dwelling units, and remaining structures include associated agricultural use buildings and barns. Some utilities and other facilities located in the levee setback area will need to be relocated or reinforced with implementation of the levee setback. As discussed previously, RD 784 Pump Station No. 3 will be relocated to the land side of the proposed setback levee. A PG&E 115-kilovolt (kV) transmission line called the Bogue Loop crosses the levee setback area on four towers. The foundations for these steel structures will probably need to be reinforced or replaced so that their integrity will be maintained during times of flood water inundation. Other steel towers along the same transmission line are located on the water side of the existing Feather River levee and are supported by elevated steel pile foundations.

Other existing facilities that may need to be abandoned, reinforced, or relocated include roads, power distribution lines, irrigation pipelines, drainage ditches, wells, fill stations, and communications lines. Several private irrigation lines will be cut off by the construction of the setback levee, separating some lands on both sides of the setback levee that require irrigation from current water sources. The wells within the setback area may be retained to support continuing agricultural activities, may be retained to support potential environmental enhancement activities for several years after setback levee construction, or will be destroyed in accordance with California's water well regulations. Wells and fill stations in the levee setback area that will be abandoned will be removed and filled, and new wells will be dug and fill stations built outside the levee setback area to replace the abandoned facilities, as appropriate. Wells and fill stations that will be retained in the levee setback area will be retrofitted to accommodate periodic flooding. New power lines and power poles may be required for any new wells and fill stations.

Borrow Areas

Borrow material will be obtained locally from borrow areas developed inside and outside the levee setback area. It is currently estimated that a total of approximately 3.4 million cubic yards (cy) of compacted borrow material will be required to construct the setback levee in project Segment 2 and that borrow areas will be excavated to depths in the order of about of 5–10 feet.

Two general objectives are important in the selection of borrow areas: to minimize haul distances to the setback levee alignment and provide a continuous or nearly continuous borrow source, and to reduce the potential for seepage impacts at the foundation of the setback levee. Minimizing haul distances is important to minimize project construction costs, air emissions, and traffic impacts. To reduce the potential for seepage impacts at the foundation of the setback levee, a distance of 400 feet or greater from the edge of the borrow area to the toe of the proposed levee must be maintained unless there is an incised drainage channel between the setback levee alignment and the borrow area. If such an incised drainage exists, borrow excavation closer to the levee may be allowed, based on an evaluation of local site conditions. Borrow areas may also be developed closer than 400 feet from the toe of the setback levee if the borrow pit is to be subsequently backfilled.

Wide, shallow excavations (rather than deep trenches) are anticipated. At the conclusion of the work, the borrow areas will be graded to blend with the topography, leaving slopes flat enough to reduce erosion and promote conditions conducive to vegetative growth (slopes 3:1 [H:V] or flatter), or filled with material from removal of existing levees (during stage 2). If not filled, the bottom of the borrow areas will be regraded to drain away from the levee and toward the river or toward existing drainage ways.
The drainage of the borrow areas will also need to ensure fish movement out of the levee setback area

into the main channel of the Feather River when flood flows recede following inundating flood events. The borrow areas will be revegetated to conform to the surrounding landscape. The borrow sites will be reclaimed as appropriate. Some stockpiled topsoil, and other excess earth materials (organic soils, roots, and grass) from borrow areas and the setback levee foundation could be spread over borrow sites after excavation has been completed.

A detailed investigation of borrow areas suitable for levee embankment materials is currently underway. The location and limits of borrow areas will be determined and refined as a result of this effort. Borrow sites will be selected based on several criteria including right-of-way access, distance to the setback levee alignment, and environmental resources locations. Borrow sites will not be located where the sites could adversely affect sensitive species or habitats (i.e., wetlands or DFG jurisdictional habitats).

Stage 2 Construction

Fill of Portions of the Plumas Lake Canal

During Stage 1 the new setback levee will divide the Plumas Lake Canal with portions of the canal remaining intact on either side of the setback levee. To minimize potential for underseepage that could result from having an excavated feature too close to the levee, approximately 490 feet of the canal on the west (water) side of the setback levee will be completely filled (from the west side of the setback levee alignment to where the canal becomes ponded). Approximately 2,200 feet of canal on the east (land) side of the setback levee will be filled between the new Pump Station No. 3 and the setback levee alignment. An approximately 2-foot-deep ditch will remain along the canal alignment to drain surface runoff from landside areas at the southern end of the setback levee to the new Pump Station No. 3.

Decommission of Existing Pump Station No. 3

After the setback levee and Pump Station No. 3 construction is complete, the existing Pump Station No. 3 will continue to operate until the existing levee is degraded. At that time, the existing Pump Station No. 3 will be decommissioned and dismantled.

Setback Area Drainage Swale

A floodplain swale will be constructed along the alignment of the existing Pump Station No. 3 discharge channel from the existing Pump Station No. 3 location to the Feather River. This swale will connect the setback area lowlands to the Feather River and thus facilitate drainage and allow flood waters to recede from the setback area in a manner that minimizes fish stranding. The existing channel will have to be enlarged and deepened to accommodate flood flows leaving the setback area and to minimize the potential for fish stranding as flood waters recede. The channel will be constructed in a manner that minimizes vegetation disturbance, fish stranding, and other environmental impacts. A site-specific drainage plan for the entire setback area will be developed in final design.

The swale will also act to allow backwater to flow into the setback area from the Feather River, increasing the inundation frequency of the setback area and resulting in high quality habitat. It is estimated that the 40-foot stage will be inundated in two out of every three years for a period of at least one week between March 15 and May 15. Floodplain land at or below this elevation will provide a broad suite of valuable ecosystem functions, including provision of nutrients and seasonal habitat for aquatic species.

Degradation of Existing Levee

All or portions of the existing levee in Segment 2 will be removed to achieve the maximum hydraulic benefits of the levee setback by allowing water to flow into and out of the levee setback area during high river stages. Where the existing levee will be excavated to allow flood waters to pass into and out of the levee setback area, the existing embankment will be excavated to the level of the adjoining ground surface in the levee access corridor. Specific sections to be retained, if any, will be determined in final project design and will be based on factors that include possible mitigation value for project impacts on sensitive species. Those sections of the existing levee that may be left in place will not be maintained. There are no plans to use material in the existing Feather River left bank levee as borrow material for the new setback levee. It is expected that for some period of time, the existing levee and the new setback levee will be in place concurrently. During this period, the setback levee will function as a “backup” levee, providing a second line of levee protection if the existing levee in Segment 2 were to breach during a flood event.

Other Associated Activities (Stages 1 and 2)

Staging Areas and Access Routes

It is anticipated that several staging areas will be developed along the setback levee alignment to allow for efficient use and distribution of materials and equipment. Staging areas will be located within the construction corridor and near active construction areas, so they may be relocated as construction progresses. Because the work area is essentially flat, suitable sites for construction staging are abundant. Final selection of staging areas will be based on contractor preference and environmental and land use constraints such as avoiding placing staging areas within or adjacent to waters of the United States. Personnel, equipment, and imported materials will reach the project site via State Route (SR) 70 and Feather River Boulevard. At the project site, the primary construction corridor will include the setback levee alignment, soil borrow areas, and roads used for access to the work areas, including Feather River Boulevard. Access roads will consist mainly of the existing east-west lateral roads between SR 70, Feather River Boulevard, and the levee setback area.

Disposal of Excess Materials

Excess earth materials (organic soils, roots, and grass from borrow areas and the setback levee foundation; excavated material that does not meet levee embankment criteria) will be used in the reclamation of borrow areas or will be placed in a surplus material berm at the waterside toe of the setback levee. In addition, excess material could be used in the contouring of the setback area to facilitate drainage to the Feather River and prevent fish stranding. Cleared vegetation (i.e., trees, brush) will be hauled off-site. Debris from structure demolition, power poles, piping, and other materials requiring disposal will be hauled off-site to a suitable landfill.

Project Schedule

A period of up to approximately 22 months is planned for construction of the setback levee project, with contractor mobilization beginning in late September 2007, the setback levee embankment completed in December 2008, the existing levee breached in spring/summer 2009, and final clean-up and contractor demobilization in fall 2009. A detailed schedule showing project activities by stage is provided below.

Stage 1 Construction Activities

- Mobilization: Mobilization will include setting up construction offices and transporting heavy earthmoving equipment to the site. These activities may take about 1 month.

- Levee Foundation Preparation: This activity will begin soon after mobilization. Construction will take approximately 8–9 months depending on the amount of equipment working simultaneously, weather conditions, and permit requirements.

- Slurry Cutoff Wall Construction: Installation of slurry cutoff walls along the setback levee alignment will occur simultaneously with levee foundation preparation.

- Levee Embankment Construction (including stability berms): Because the setback levee alignment is nearly 6 miles long, levee embankment construction could begin in some areas while foundation preparation is underway along other portions of the alignment. Levee embankment construction is anticipated to take approximately 8 months.

- Borrow Material Excavation: Excavation of borrow materials for use in the construction of the setback levee embankment could begin simultaneously with levee foundation preparation or slurry wall construction and will occur for the duration of levee embankment construction.

- Tie-ins to Existing Levees: Elements of tying in the setback levee to the existing levees will take place during levee foundation preparation, levee embankment construction, and potentially during slurry cutoff wall construction.

- Pump Station No. 3 Construction: Pump Station No. 3 will be constructed concurrent with levee embankment construction. Procurement of long-lead items (e.g., pumps, motors, valves, and generator) could begin as early as 2007.

Stage 2 Construction Activities

- Fill of Plumas Lake Canal: The portion of Plumas Lake Canal within the levee embankment footprint will be filled during levee foundation preparation. The portion of canal downstream of the setback levee and between the setback levee and Pump Station No. 3 will be filled concurrent with removal of the existing levee.

- Removal of the Existing Levee: The existing Feather River levee in the setback area will not be removed until the setback levee is complete. Removal activities will take place outside the identified Feather River flood season. It is expected that levee removal will take place in spring/summer 2009.

- Decommission of the Existing Pump Station No. 3: Removal of the existing pump station will be done concurrent with removal of the existing levee.

- Setback Area Drainage Swale: Grading of the setback area to facilitate drainage of floodwaters back to the Feather River and enhancement of the setback area drainage swale will be conducted concurrent with removal of the existing levee.

- Demobilization: Demobilization will include removal of equipment and materials from the project site, disposal of excess materials at appropriate facilities, and restoration of staging areas and temporary access roads to pre-project conditions. Demobilization activities will likely occur in various locations as construction proceeds along the project alignment, but will be completed in fall 2009 after removal of the existing Feather River levee is complete.

REQUEST FOR STREAMBED ALTERATION AGREEMENT

EDAW, on behalf of TRLIA, is requesting a Streambed Alteration Agreement, pursuant to Section 1602 of the California Fish and Game Code, for the FRLRP, Segment 2.

DFG Jurisdiction within the Project Site

A preliminary wetland delineation for the proposed project was prepared by EDAW and submitted to USACE on March 30, 2007, with the latest revisions submitted June 27, 2007. Based upon recent conversations with USACE, additional revisions to the delineation will be submitted to USACE soon. The wetland delineation has not yet been verified by USACE.

Based on the preliminary delineation, the study area encompassed by the delineation includes 116.11 acres of potentially jurisdictional waters of the United States. Potentially jurisdictional habitat types include mixed riparian forest/scrub, perennial drainages, intermittent drainages, and lacustrine habitat. Other potentially jurisdictional habitats identified in the delineation are those that do not meet the three parameter wetland criteria (from the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual), such as developed areas, orchard, and ruderal habitats, but are potentially subject to USACE jurisdiction under Section 404 of the CWA because these habitats are located within the ordinary high water mark (OHWM) of the Feather River (i.e., waterside of the existing levee) (Table 1 below and Attachment E). There is one additional 1.7-acre area that contains riparian vegetation (located just south of the existing Pump Station No. 3 and depicted as a linear band of riparian forest/scrub southwest of RPW-1 on the preliminary wetland delineation maps in Attachment E) which is considered non-jurisdictional to USACE. It is our opinion that the 116.11 acres of potentially jurisdictional waters of the United States and the 1.7-acre additional riparian area qualify as habitats subject to DFG jurisdiction.

Table 1
Acreage of Potential DFG Jurisdictional Habitats

Habitat Type	Feature ID	Acres
Intermittent Drainage (ID)	ID-1	0.82
	ID-4	0.47
	ID-5	0.31
ID Total:		
Perennial Drainage (PD)	PD-1	19.81
PD Total:		
Lacustrine		1.37
Riparian Forest/Scrub		45.92
Riparian Forest/Scrub within OHWM		30.09
Developed		0.04
Elderberry Savanna		9.56
Orchard		8.06
Ruderal		1.36
Total Potentially DFG Jurisdictional Habitats:		**117.81**

Source: EDAW 2007

Effects to DFG Jurisdictional Habitats within the Project Site

Jurisdictional acreage potentially affected by the proposed activity was evaluated by placing the CAD engineering design information (provided by TRLIA's civil engineer GEI Consultants) over the aerial photograph of the project site and the wetland delineation information (including the OHWM line). DFG jurisdictional habitats (including wetlands), were considered to be adversely affected if they were present within the proposed construction boundaries.

Based on the CAD and GIS data, the proposed project is anticipated to permanently affect 10.94 acres of potential DFG jurisdictional habitats (including 2.4 acres of effects to perennial drainages, 0.09 acre of effects to intermittent drainages, and 8.45 acres of effects to riparian forest/scrub). The proposed project is also expected to indirectly affect 56.89 acres of potential DFG jurisdictional habitats.
As mentioned previously, the proposed project is anticipated to be completed in two stages. Permanent effects to DFG jurisdictional habitats will take place in both stages. Indirect effects to DFG jurisdictional habitats will be the result of occasional flooding of the setback area after completion of Stage 2.

Stage 1 Effects

As part of Stage 1 of the project, construction of the setback levee alignment (including levee crown, levee slopes and stability berms, and the land side maintenance road and drainage ditch) will require the filling of portions of the Plumas Lake Canal and a portion of a perennial drainage that flows into the Plumas Lake Canal, and removal of riparian forest/scrub associated with these streams. Riparian habitat removed as a result of construction of the setback levee will total 2.3 acres. Construction of the setback levee will also result in filling of 0.74 acre of the Plumas Lake Canal and 0.05 acre of the perennial drainage (Table 2 below).

Construction of the new Pump Station No. 3 will require four steps. The first step will be clearing of vegetation and soil grubbing along the banks of the Plumas Lake Canal at the approach channel and at the outfall. Next, the pump station and the drainage culvert under the setback levee will be constructed entirely within upland (Exhibit 4, Attachment C). Once the drainage culvert is constructed, the outfall structure will be formed and cast of concrete. The outfall structure will be approximately 125 feet wide by 50 feet long (0.14 acre). Water from the land side of the setback levee will discharge into the ponded section of the Plumas Lake Canal through the culvert to the outfall. The final portion of the pump station to be constructed is the inlet or approach channel for the station that connects to the Plumas Lake Canal. Construction of the approach channel will begin adjacent to the pump station. The channel will be excavated up to approximately 10–20 feet from the existing west bank of the Plumas Lake Canal. Once this portion of the approach channel is constructed and graded to the appropriate slope, the remainder of the channel will be constructed. A 400-foot (0.07-acre) portion of the existing west bank of the Plumas Lake Canal will be excavated last to connect the Plumas Lake Canal to the approach channel and new pump station (see Exhibit 4, Inset 3). Additionally, grading of a small portion of the bed of the Plumas Lake Canal (0.17-acre) in the approach channel will be required to create the appropriate slope for flows to descend to the pump station.

Stage 2 Effects

Stage 2 of the project will affect a total of 7.46 acres of DFG jurisdictional habitats including portions of the Plumas Lake Canal, an intermittent drainage on the water side of the existing levee that flows into the Feather River, a backwater to the Feather River, and riparian forest/scrub associated with these waters. To prevent the potential for underseepage or through-seepage in the new setback levee, approximately 0.93 acre (490 feet) of the Plumas Lake Canal must be filled in on the west (water) side of the setback levee alignment (from the setback levee alignment to the beginning of the ponded section of the canal). The portion of the Plumas Lake Canal on the east (land) side of the setback levee

Table 2
Acreages of DFG Jurisdictional Habitats
Affected by the Feather River Levee Repair Project, Segment 2

Project Element	Habitat Type	Acreage	Total
PERMANENT EFFECTS			
STAGE 1			
Setback Levee Alignment			
	Perennial Drainage (Plumas Lake Canal)	0.79	
	Mixed Riparian Forest/Scrub	2.30	
Setback Levee Alignment Total			3.09
Pump Station No. 3			
	Perennial Drainage	0.17	
	Mixed Riparian Forest/Scrub	0.07	
Pump Station No. 3 Total			0.24
Pump Station Channel (Inside Setback Area)			
	Mixed Riparian Forest/Scrub	0.14	
Pump Station Channel Total			0.14
Total Stage 1 Permanent Effects			3.47
STAGE 2			
Fill of Plumas Lake Canal Outside Setback Area			
	Perennial Drainage	0.93	
	Mixed Riparian Forest/Scrub	1.37	
Plumas Lake Canal Outside Setback Area Total			2.30
Fill of Plumas Lake Canal Inside Setback Area			
	Perennial Drainage	0.20	
	Mixed Riparian Forest/Scrub	0.73	
Plumas Lake Canal Inside Setback Area Total			0.93
Decommission of Existing Pump Station No. 3			
	Mixed Riparian Forest/Scrub	0.17	
	Perennial Drainage	0.11	
Decommission of Existing Pump Station Total			0.28
Setback Area Drainage Swale			
	Mixed Riparian Forest/Scrub	3.67	
	Intermittent Drainage	0.09	
	Perennial Drainage (Feather River Backwater)	0.20	
Setback area drainage swale Total			3.96
Total Stage 2 Permanent Effects			**7.47**
INDIRECT EFFECTS			
STAGE 2			
Setback Area Flooding			
	Mixed Riparian Forest/Scrub	39.09	
	Perennial Drainage	16.98	
	Intermittent Drainage	0.82	
Setback Area Flooding Total			**56.89**
Total Stage 2 Indirect Effects			**56.89**
Sub-Total Permanent Effects (Stage 1 and Stage 2)			**10.94**
Sub-Total Indirect Effects (Stage 2)			**56.89**
Grand Total of DFG Jurisdictional Habitats Affected by the Feather River Levee Repair Project, Segment 2			**67.82**
Source: EDAW 2007			

alignment will also be filled from the setback levee alignment to the new Pump Station No. 3 (totaling 2.3 acres). A shallow ditch will be retained along the canal alignment to carry storm runoff from landside areas along the southern portion of the setback levee alignment to Pump Station No. 3. Riparian forest/scrub habitat will be maintained along the top bank of the canal/drainage ditch as much as possible; however riparian vegetation growing along the banks of the canal will be removed. Once the drainage ditch is created, it will operate as a seasonally wet/intermittent stream and will be vegetated with grasses. This ditch will be maintained by RD 784.

Decommissioning of the existing Pump Station No. 3 will also affect a portion of the ponded section of Plumas Lake Canal. The existing pump station will be dismantled and removed at the same time as degradation of the existing levee. Removal of the pump station will require construction of a temporary cofferdam upstream of the pump station in the ponded section of Plumas Lake Canal. The portion of the canal between the pump station and temporary cofferdam (0.11 acre) will be dewatered so that the pump station structure can be removed. Excavation and grading in the dewatered channel will be required to create the head of the floodplain swale, which will drain the setback area to the Feather River.

Degradation of the existing levee (in Segment 2) will result in an increase in the floodway for the Feather River. The topography of the setback area presents the potential for fish stranding following high flow events. Out-of-bank flows will pass over the left bank of the Feather River and into the lower-lying southern portion of the setback area, ponding against the setback levee. The relatively high ground to the west of the existing Feather River levee would prevent the receding flows from the setback area from completely draining to the Feather River. To address this potential problem a swale to guide fish from the setback area to the Feather River has been included in the project design. The swale has been aligned with the outfall channel of the existing Pump Station No. 3 to minimize disturbance to riparian habitat waterside of the existing levee. The swale will have its upstream end at the existing pump station, which will be removed, and will be constructed by widening and deepening the existing pump station outfall channel. The swale will be about 200 feet wide and approximately 1,000 feet long. It will drain northwest, cutting through the area of higher floodplain adjacent to the Feather River to join the river channel at an elevation of 18 feet (Exhibit 4, Attachment C). Based on the wetland delineation maps (Attachment D), the outfall channel of the existing Pump Station No. 3 consists of an intermittent channel that flows into a perennial backwater channel connected to the Feather River. Approximately 0.09 acre of the intermittent channel and 0.2 acre of the backwater to the Feather River will need to be widened and deepened to create the new swale. An additional 3.67 acres of adjacent riparian forest/scrub will need to be removed to create the new swale.

<u>Indirect Effects</u>

Indirect effects to waters of the state (totaling 56.89 acres) will be a result of the seasonal flooding of the setback area during and after Stage 2 of the project. When river stage exceeds the elevation of the existing levee alignment (approximately 50 feet mean sea level), Feather River flood water will flow into the setback area. MBK Engineers indicates that flows passing downstream will enter the levee setback area approximately once every 3 years on average, when the rate of flow is approximately 50,000 cubic feet per second (cfs) (TRLIA 2007). This is similar to the frequency of flooding now experienced in areas that are within the currently leveed channel of the Feather River but are outside the low-flow channel. Existing streams and riparian habitat in the setback area will be influenced by the flood water such that the hydrology of these waters will be temporarily changed. Intermittent waters that will normally recede or dry up quickly after a storm pulse will be fully inundated with flood water for a longer period of time.

However, the setback area will be designed to facilitate drainage of the flood water back to the Feather River as soon as upstream flows decrease in the river. It is expected that by the end of the wet season,

the waters of the state in the setback area will return to normal conditions. It is also expected that seasonal flooding will not result in a loss of functions and values within those waters; rather the seasonal flooding will improve ecosystem functions in the setback area.

Effects to Trees

As stated previously, riparian habitat in several places on the project site will be removed for construction of the setback levee, relocation of Pump Station No. 3, and construction of the setback area drainage swale. The riparian habitat that will be removed contains several species of trees including valley oak (*Quercus lobata*), Fremont cottonwood (*Populus fremontii*), box elder (*Acer negundo*), and three species of willow (*Salix laviegata*, *S. lasiolepis*, *S. exigua*). Although these species of tree were determined to be present in the riparian vegetation on the project site, an accurate quantification of the number of trees that will be removed, and the diameter of their trunks, cannot be determined at present. A detailed accounting of removed trees will be completed during construction and will be sent to DFG.

Avoidance and Minimization Measures

Temporary erosion/runoff control measures would be implemented during construction to minimize stormwater pollution resulting from erosion and sediment migration from the construction, borrow, and staging areas. These temporary control measures may include implementing construction staging in a manner that minimizes the amount of area disturbed at any one time; secondary containment for storage of fuel and oil; and the management of stockpiles and disturbed areas by means of earth berms, diversion ditches, straw wattles, straw bales, silt fences, gravel filters, mulching, revegetation, and temporary covers as appropriate. Erosion and stormwater pollution control measures would be consistent with National Pollutant Discharge Elimination System (NPDES) permit requirements and would be included in a stormwater pollution prevention plan (SWPPP).

After completion of construction activities, the temporary facilities would be demobilized and the site would be restored and reclaimed as appropriate. Site restoration activities for areas disturbed by construction activities, including borrow areas and laydown/staging areas, may include regrading, reseeding, construction of permanent diversion ditches, use of straw wattles and bales, application of straw mulch, and other measures deemed appropriate.

Compensatory Mitigation

Compensatory mitigation for adverse effects to DFG jurisdictional habitats is proposed to be based on mitigation for adverse effects to waters of the United States. Per USACE definition of “permanent” effect, the project will result in 10.93 acres of permanent effects to water of the United States. However, the permanent effects associated with this project will not necessarily result in permanent loss of these water features. As a result, our opinion is that some of the permanent effects and the indirect effects described previously are self-mitigating. It is our opinion that the 0.28-acre of effects to waters of the United States from decommissioning the existing Pump Station No. 3 and the 3.95 acres of effects to waters of the United States from enhancement of the setback area drainage swale are self-mitigating. The effects in the setback area drainage swale will include removal of 3.67 acres of riparian habitat and excavation and grading in 0.29 acre of waters of the United States. However, these effects will not result in permanent loss of waters of the United States. These effects are a result of expansion and enhancement of the existing drainage swale. Riparian habitat will be removed to allow for widening and deepening of the existing channel. Excavation of the bed and banks of the existing channel will be required to increase the size of the channel. These disturbances would affect existing waters of the United States, but would also result in an increase and enhancement of the water channel. Riparian habitat disturbed but not removed for enhancement of the drainage swale will be allowed to revegetate

naturally. Thus, the enhancement of the setback area drainage swale will increase the acreage of open water even though it may decrease the acreage of adjacent riparian habitat. Therefore, it is our opinion that these effects are self-mitigating.

Decommissioning of the existing Pump Station No. 3 will result in the removal of 0.17 acre of riparian habitat and grading and excavation of approximately 0.11 acre of the ponded section of the Plumas Lake Canal. However these effects will not result in permanent loss of waters of the United States. The grading and excavation in the 0.11 acre of the ponded section of the Plumas Lake Canal will be done to remove the existing pump station and to facilitate connection of the Plumas Lake Canal to the setback area drainage swale. Once the existing levee is degraded, the existing Pump Station No. 3 outfall channel will be improved, thus hydraulically connecting the setback area with the Feather River. This will result in the addition of approximately 1.84 acre (400 linear feet) of jurisdictional water of the United States. Therefore, it is our opinion that these effects are self-mitigating.

As stated previously, seasonal flooding of the setback area will indirectly affect existing waters of the United States in the setback area. However, the seasonal flooding is temporary and is not expected to result in the loss of acreage or functions and values of the existing waters within the setback area. Additionally, by allowing flood waters to enter the setback area, the proposed project will expand the Feather River floodway by approximately 1,300 acres. It is expected that the ordinary high water mark of the Feather River will extend some distance into portions of the setback area thus expanding the jurisdictional acreage of the Feather River. Therefore, it is our opinion that these effects are self-mitigating.

Therefore, TRLIA is proposing compensatory mitigation for only the 6.7 acres of effects to waters of the United States that will result in permanent loss of waters. Mitigation for the loss of the 6.7 acres of waters of the United States is proposed to be satisfied through purchase of credits at an USACE-approved mitigation bank. Mitigation is also expected to be required for effects to federal and state-listed species and California Department of Fish and Game (DFG) jurisdictional habitats. TRLIA is proposing to establish a letter of credit with a local mitigation bank and is anticipating close coordination with USACE, U.S. Fish and Wildlife Service, Regional Water Quality Control Board (RWQCB), and DFG to ensure that the mitigation bank meets all mitigation requirements of these agencies.

DEPARTMENT OF THE ARMY PERMIT TO THE U.S. ARMY CORPS OF ENGINEERS

TRLIA is seeking an Individual Permit from USACE for the FRLRP Segment 2. The application for an Individual Permit was sent to USACE on June 13, 2007. A copy of the Individual Permit application (Form 4345) is provided as Attachment F.

APPLICATION TO THE RWQCB FOR WATER QUALITY CERTIFICATION

A request for Water Quality Certification, pursuant to Section 401 of the Clean Water Act, was submitted to the Central Valley Regional Water Quality Control Board on August 13, 2007. A copy of the Water Quality Certification application form is provided as Attachment G.

CALIFORNIA ENVIRONMENTAL QUALITY ACT DOCUMENTATION

An Environmental Impact Report was prepared for the FRLRP (including Segment 2) to comply with the California Environmental Quality Act. A Notice of Determination was issued for the project on February 6, 2007 (SCH # 2006062071). A copy of the Notice of Determination and the receipt for payment of the DFG review fee is included as Attachment H.

We look forward to hearing from you regarding the Streambed Alteration Agreement for the Feather River Levee Repair Project, Segment 2. Please contact Eric Htain at (916) 414-5800 if you have any questions regarding this submission.

Respectfully submitted,

Eric Htain
Regulatory Specialist

cc: Paul G. Brunner, TRLIA
Ric Reinhardt, MBK Engineers
Larry Dacus, MBK Engineers
Alberto Pujol, GEI Consultants
Dan Wanket, GEI Consultants
Anja Kelsey, EIP Associates
Chris Huitt, DWR

Attachments:
A— Streambed Alteration Notification (2023)
B— Check for Application fee – $12,000.00
C— Exhibits 1–4
D— Letter from DFG Regarding FRLRP Segments 1 and 3
E— Maps of the Preliminary Delineation of Waters of the United States
F— USACE Individual Permit Application
G— RWQCB Water Quality Certification Application
H— Notice of Determination for the Feather River Levee Repair Project
I— Information for Property Owners within the Project Site
J— Copy of the California Endangered Species Act Section 2081(b) Incidental Take Permit Application for the Feather River Levee Repair Project
K— Copy of the Hydrological Study for the Feather River Levee Repair Project

LITERATURE CITED

Kleinfelder, Inc. 2006 (February 20). Problem Identification Report, TRLIA Phase 4 Feather River and Yuba River Left Bank Levees, Reclamation District No. 784. Sacramento, CA.

Three Rivers Levee Improvement Authority. 2007 (July). *Hydraulic and Hydrologic Analysis of the Three Rivers Levee Improvement Authority's Phase IV Project, Feather River Project*. Marysville, CA. Prepared by MBK, Engineers, Sacramento, CA.

ATTACHMENT A

Streambed Alteration Notification (2023)

FOR DEPARTMENT USE ONLY				
Date Received	Amount Received	Amount Due	Date Complete	Notification No.
	$	$		

STATE OF CALIFORNIA

DEPARTMENT OF FISH AND GAME

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

1. APPLICANT PROPOSING PROJECT

Name	Paul G. Brunner		
Business/Agency	Three Rivers Levee Improvements Authority (TRLIA)		
Street Address	1114 Yuba Street, Suite 218		
City, State, Zip	Marysville, CA 95901		
Telephone	(530) 749-7841	Fax	(530) 749-6990
Email	pbrunner@co.yuba.ca.us		

2. CONTACT PERSON (*Complete only if different from applicant*)

Name	Eric Htain, EDAW, Inc.		
Street Address	2022 J Street		
City, State, Zip	Sacramento, CA 95811		
Telephone	(916) 414-5800	Fax	(916) 414-5850
Email	eric.htain@edaw.com		

3. PROPERTY OWNER (*Complete only if different from applicant*)

Name	Multiple property owners in project site - please see Attachment I for list of property owners		
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

4. PROJECT NAME AND AGREEMENT TERM

A. Project Name	Feather River Levee Repair Project, Segment 2
B. Agreement Term Requested	☑ Regular (*5 years or less*) ☐ Long-term (*greater than 5 years*)

C. Project Term		D. Seasonal Work Period		E. Number of Work Days
Beginning (*year*)	Ending (*year*)	Start Date (*month/day*)	End Date (*month/day*)	
2007	2009	09/01	10/31	730.00

5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment.		
A.	☑ Standard *(Most construction projects, excluding the categories listed below)*	
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*)	*Mine I.D. Number:* _____
C.	☐ Timber Harvesting (*Attachment B*)	THP *Number:* _____
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*)	*SWRCB Number:* _____
E.	☐ Routine Maintenance (*Attachment D*)	
F.	☐ DFG Fisheries Restoration Grant Program (FRGP)	*FRGP Contract Number:* _____
G.	☐ Master	
H.	☐ Master Timber Harvesting	

6. FEES

Please see the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: The Department may not process this notification until the correct fee has been received.***

	A. Project	B. Project Cost	C. Project Fee
1	Construct setback levee and fill portions of Plumas Lake Canal	$500,000.00	$4,000.00
2	Construct new Pump Station No. 3 and pump station channel	$500,000.00	$4,000.00
3	Decommission existing Pump Station No. 3 and create setback area channel	$500,000.00	$4,000.00
4			
5			
		D. Base Fee *(if applicable)*	
		E. TOTAL FEE ENCLOSED	$12,000.00

7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☐ Yes (*Provide the information below*) ☑ No

Applicant: _____ Notification Number: _____ Date: _____

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

☑ No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

8. PROJECT LOCATION

A. Address or description of project location.

(Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway)

The Feather River Levee Repair Project, Segment 2 is located in southwestern Yuba County, California. The project site encompasses approximately 1,600 acres and is generally bounded by the Feather River to the west, Shanghai Bend and the Yuba County Airport to the north, Feather River Blvd to the east, and Star Bend to the south. The project is located in Townships 13 and 14 North, Ranges 3 and 4 East, on the U.S. Geological Survey 7.5-minute Olivehurst quadrangle.

☐ *Continued on additional page(s)*

B. River, stream, or lake affected by the project.	Plumas Lake Canal, other perennial and intermittent streams
C. What water body is the river, stream, or lake tributary to?	Feather River
D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts?	☐ Yes ☑ No ☐ Unknown
E. County	Yuba

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Olivehurst	13 N, 14 N	3 E, 4E		

☐ *Continued on additional page(s)*

K. Meridian (*check one*) ☐ Humboldt ☑ Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

Multiple, please see Attachment I for a list of APNs

☐ *Continued on additional page(s)*

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes*)

Latitude/Longitude	*Latitude:*	39.090676°	*Longitude:*	-121.584302°
	☐ Degrees/Minutes/Seconds		☑ Decimal Degrees	☐ Decimal Minutes
UTM	*Easting:*	*Northing:*	☐ Zone 10 ☐ Zone 11	
Datum used for Latitude/Longitude or UTM	☐ NAD 27		☑ NAD 83 or WGS 84	

9. PROJECT CATEGORY AND WORK TYPE *(Check each box that applies)*

PROJECT CATEGORY	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR/MAINTAIN EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☐	☐
Bank stabilization – rip-rap/retaining wall/gabion	☐	☐	☐
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☐
Culvert	☐	☐	☐
Debris basin	☐	☐	☐
Dam	☐	☐	☐
Diversion structure – weir or pump intake	☐	☐	☐
Filling of wetland, river, stream, or lake	☑	☐	☐
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	☐	☐	☐
Levee	☑	☐	☐
Low water crossing	☐	☐	☐
Road/trail	☐	☐	☐
Sediment removal – pond, stream, or marina	☐	☐	☐
Storm drain outfall structure	☐	☐	☐
Temporary stream crossing	☐	☐	☐
Utility crossing : Horizontal Directional Drilling	☐	☐	☐
Jack/bore	☐	☐	☐
Open trench	☐	☐	☐
Other *(specify)*:	☐	☐	☐

10. PROJECT DESCRIPTION

A. Describe the project in detail. Photographs of the project location and immediate surrounding area should be included.

- Include any structures (e.g., rip-rap, culverts, or channel clearing) that will be placed, built, or completed in or near the stream, river, or lake.
- Specify the type and volume of materials that will be used.
- If water will be diverted or drafted, specify the purpose or use.

Enclose diagrams, drawings, plans, and/or maps that provide all of the following: site specific construction details; the dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; an overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, and where the equipment/machinery will enter and exit the project area.

Please see the cover letter for a detailed project description.

☐ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

Scrapers, bulldozers, excavators with a long-reach boom, tanks for water storage, dump trucks, bulk bag supplies of bentonite, bentonite and cement storage silos, a cyclone mixer, pumps, generators, slurry tanks to store the blended slurries, motor graders, sheepsfoot compactors, and trailers.

☐ *Continued on additional page(s)*

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).	☑ Yes ☐ No (*Skip to box 11*)
D. Will the proposed project require work in the wetted portion of the channel?	☑ Yes (*Enclose a plan to divert water around work site*) ☐ No

11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

Impacts to streams and riparian habitat would result from the construction of the setback levee, including construction of the levee in a portion of a perennial drainage and in the Plumas Lake Canal; construction of the new Pump Station No. 3; fill of portions of the Plumas Lake Canal near the setback levee; decommissioning of the existing Pump Station No. 3; and construction of the setback area drainage channel. See the cover letter for more information on project impacts.

☐ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No

Vegetation Type	Temporary Impact	Permanent Impact
Riparian	Linear feet: N/A Total area: N/A	Linear feet: N/A Total area: 8.44 acres
	Linear feet: Total area:	Linear feet: Total area:

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)
Quercus lobata		
Populus fremontii		
See cover letter for additional information		

☐ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

valley elderberry longhorn beetle, giant garter snake, Central Valley steelhead, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon

☐ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

CNDDB, EDAW technical surveys

☐ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☑ Yes (*Enclose the biological study*) ☐ No

Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.

F. Has a hydrological study been completed for the project or project site?

☑ Yes (*Enclose the hydrological study*) ☐ No

Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.

12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

Sediment, aside from fill necessary for project activities, will be limited in watercourses through use of standard BMPS such as silt fence and weed-free straw bales and booms. BMPs used for the project will be identified in the Stormwater Pollution prevention Plan prepared by the construction contractor. Additionally, the project applicant and contractors will abide by any requirements of the National Pollutant Discharge Elimination System permit, the Water Quality Certification, and other regulatory permits.

☐ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

A number of measures will be implemented to avoid and minimize the potential for adverse effects to giant garter snake, Swainson's hawk, and valley elderberry longhorn beetle. These measures are incorporated into the California Endangered Species Act Section 2081(b) Incidental Take Permit application for the project (Attachment J).

☐ *Continued on additional page(s)*

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

Mitigation for the loss of waters of the United States, riparian habitat, and habitat for special-status species is proposed to be satisfied through purchase of credits at an approved mitigation bank. TRLIA is proposing to establish a letter of credit with a local mitigation bank and is anticipating close coordination with USACE, USFWS, and DFG to ensure that the mitigation bank meets all mitigation requirements of these agencies.

In addition, there may be opportunities for native habitat enhancement in the setback area.

☐ *Continued on additional page(s)*

13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. California Regional Water Quality Control Water Quality Certification ☑ Applied ☐ Issued

B. State Reclamation Board Encroachment Permit ☑ Applied ☐ Issued

C. USACE Section 404 Individual Permit ☑ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☐ *Continued on additional page(s)*

14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

☑ Yes (*Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each*)

☐ No (*Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared*)

☐ Notice of Exemption	☐ Mitigated Negative Declaration	☐ NEPA document (*type*):
☐ Initial Study	☑ Environmental Impact Report	☐ CESA document (*type*):
☐ Negative Declaration	☑ Notice of Determination (*Enclose*)	☑ ESA document (*type*): Bio Assessements
☐ THP/ NTMP	☑ Mitigation, Monitoring, Reporting Plan	

B. State Clearinghouse Number (*if applicable*)	2006062071		
C. Has a CEQA lead agency been determined?	☑ Yes (*Complete boxes D, E, and F*)	☐ No (*Skip to box 14.G*)	
D. CEQA Lead Agency	Three Rivers Levee Improvement Authority		
E. Contact Person	Paul G. Brunnner	F. Telephone Number	(530) 749-7841

G. If the project described in this notification is part of a larger project or plan, briefly describe that larger project or plan.

The Feather River Levee Repair Project (FRLRP) is an element of the Yuba-Feather Supplemental Flood Control Project (Y-FSFCP). The Y-FSFCP is intended to improve flood protection for the entire Reclamation District 784 (RD 784) area in southern Yuba County and includes levee repairs and improvements on the Yuba River, Bear River, Feather River, and WPIC.

☐ *Continued on additional page(s)*

H. Has an environmental filing fee (Fish and Game Code section 711.4) been paid?

☑ Yes (*Enclose proof of payment*) ☐ No (*Briefly explain below the reason a filing fee has not been paid*)

Provided in Attachment H

Note: If a filing fee is required, the Department may not finalize a Lake or Streambed Alteration Agreement until the filing fee is paid.

15. SITE INSPECTION

Check one box only.

☐ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.

☑ I request the Department to first contact (*insert name*) Paul G. Brunnner at (*insert telephone number*) (530) 749-7841 to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☐ Yes (Please enclose the information via digital media with the completed notification form)

☑ No

17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

Paul G. Brunner

Signature of Applicant or Applicant's Authorized Representative

Date 31 July 2007

Paul G. Brunner, TRLIA Executive Director

Print Name

ATTACHMENT B

Check for Application fee – $12,000.00

SUMMARY OF DEMAND 17-374080

805-3350-425.23-01 7/18/07 F&G	12,000.00
	******12,000.00

COUNTY OF YUBA - MARYSVILLE, CALIFORNIA

DOCUMENT HAS A COLORED BACKGROUND ON WHITE PAPER AND A VOID PANTOGRAPH ON THE FACE

TO THE TREASURER
COUNTY OF YUBA
MARYSVILLE, CALIFORNIA

usbank. 24-Hour Banking 1-800-673-3555

THIS WARRANT VOID 6 MONTHS FROM DATE ISSUED

90-2267
1211

17-374080

DATE	CHECK NO	AMOUNT
08/02/07	374080	$******12,000.00

TWELVE THOUSAND AND 00/100 DOLLARS

TO THE ORDER OF

DEPARTMENT OF FISH & GAME
REGION 2
1701 NIMBUS ROAD, SUITE A
RANCHO CORDOVA CA 95670

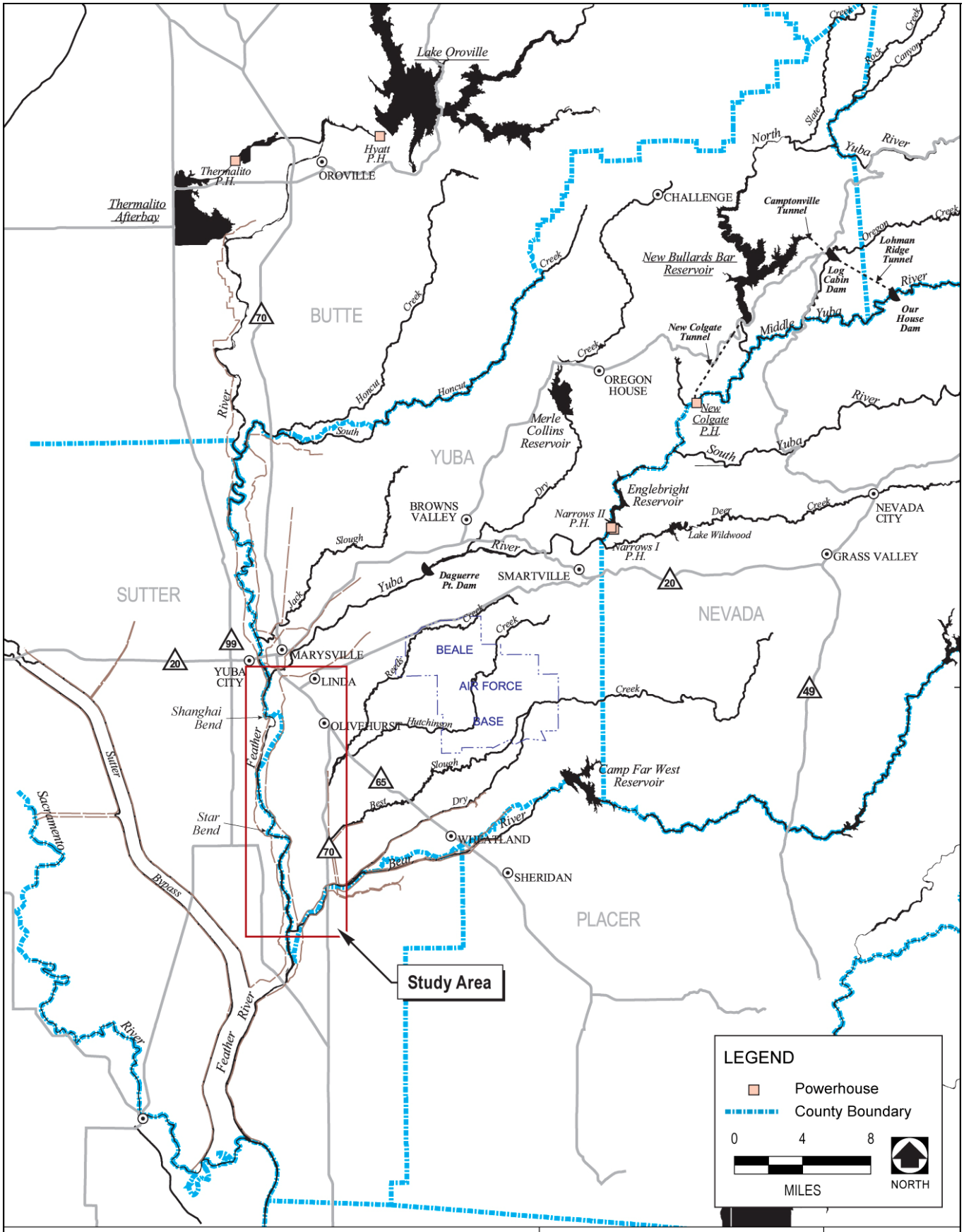
DEAN E. SELLERS, COUNTY AUDITOR-CONTROLLER

Dean E. Sellers

⑈374080⑈ ⑆121122676⑆ 153401958779⑈

ATTACHMENT C

Exhibits 1–4



Feather River Levee Repair Project

Regional Setting

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

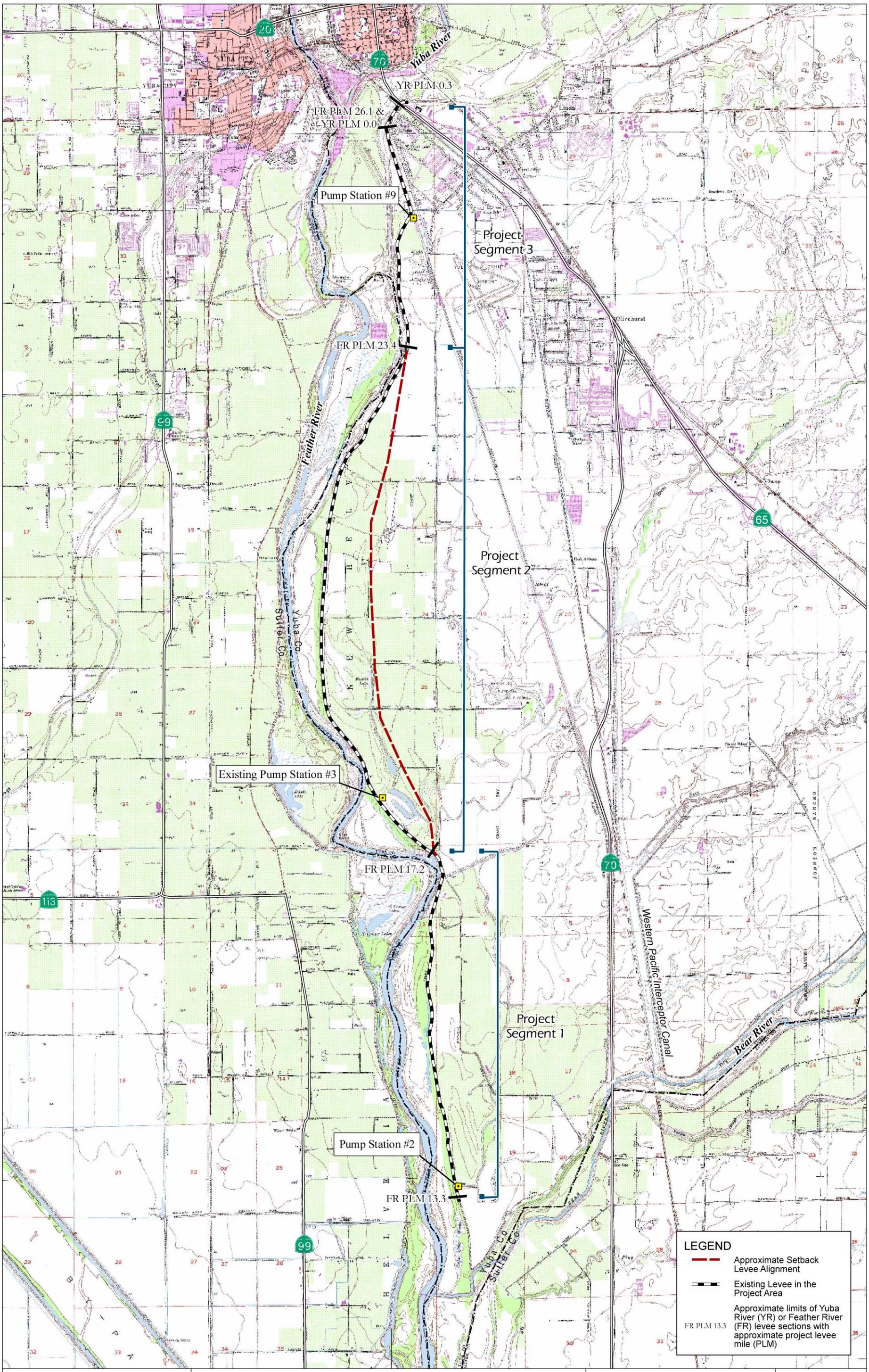
114 Yuba Street, Suite 218
Marysville, CA 95901

June 2007

Exhibit 1

Sources: Data Provided by EDAW and GEI 2007

G024



0 0.5 1
MILES
NORTH

Feather River Levee Repair Project

Project Segments

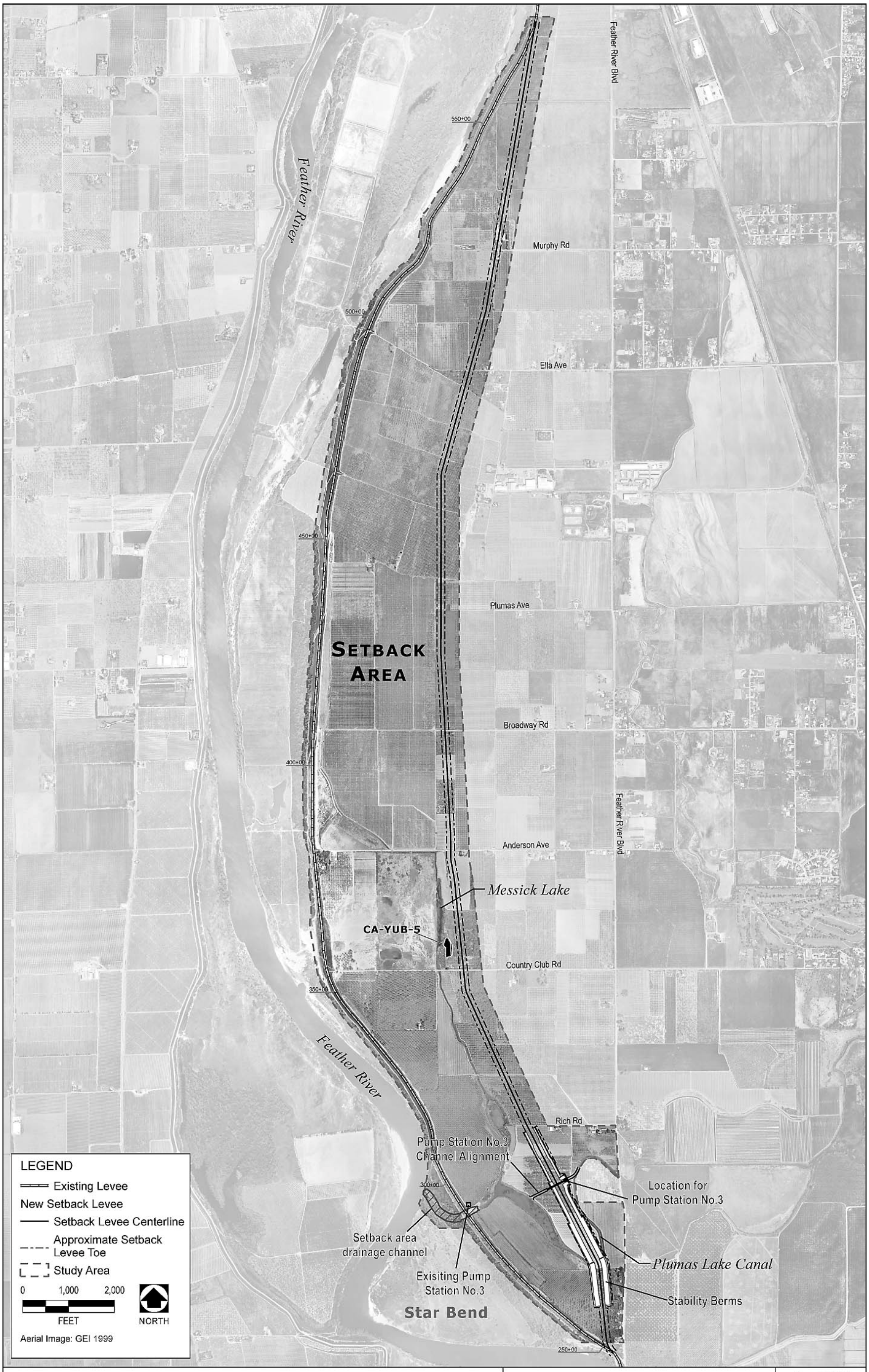
Source: Data Provided by EDAW and GEI 2007

G025

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
114 Yuba Street, Suite 218
Marysville, CA 95901

August 2007

Exhibit 2



Feather River Levee Repair Project
Setback Levee in Project Segment 2

Feather River Setback Levee Segment 2 Alignment

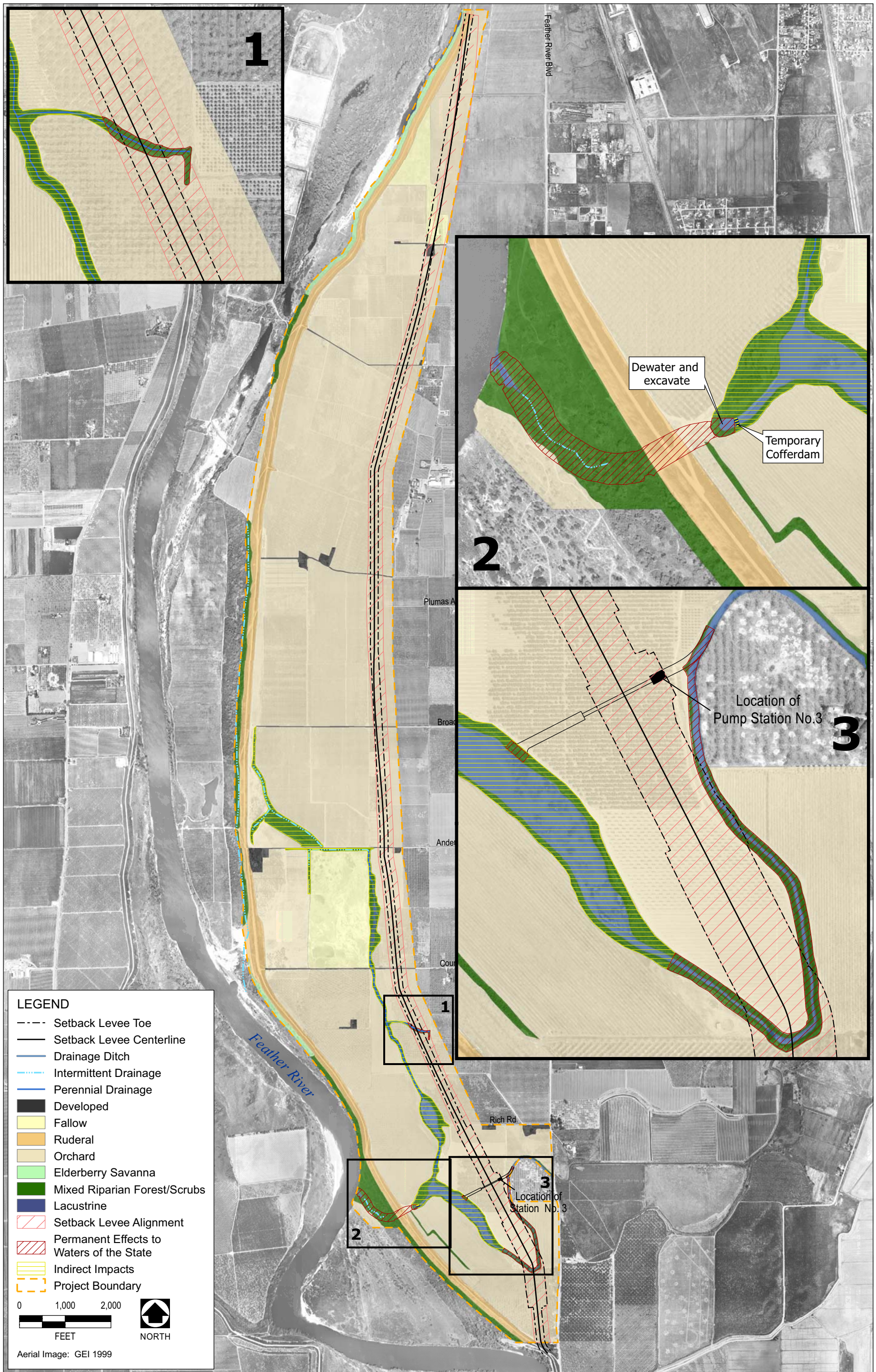
Source: Data Provided by EDAW and GEI 2007

X080

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 3



Feather River Levee Repair Project

Setback Levee in Project Segment 2

Effects to Waters of the State

Source: Data Provided by EDAW and GEI 2007

X119

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

1114 Yuba Street, Suite 218
Marysville, CA 95901

July 2007

Exhibit 4

ATTACHMENT D

Letter from DFG Regarding FRLRP Segments 1 and 3

State of California – The Resources Agency
DEPARTMENT OF FISH AND GAME
North Central Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670
(916) 358-2900

ARNOLD SCHWARZENEGGER, Governor

RECEIVED
MAY 14 2007
BY

May 2, 2007

Sean Bechta
EDAW, Inc.
2022 J Street
Sacramento, CA 95818

Re: Lake or Streambed Alteration Notification
Notification No.: 1600-2007-0096-R2
Project Name: Feather River Levee Repair Segments 1 and 3
County: Yuba

Dear Applicant:

The Department of Fish and Game (Department) received your notification package. The Department determined that your notification package was complete on May 2, 2007.

Based on the Department's review of the information you submitted, the Department has determined that a **Lake or Streambed Alteration agreement is not required for your project or activity because the project or activity you described in your notification package will not:**

1. Substantially divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake; or

2. Substantially adversely affect existing fish or wildlife resources.

As a result, you may begin your project or activity if you have obtained all other necessary permits. If the project changes from that stated in the notification package specified above, a new notification shall be submitted to the Department of Fish and Game.

Nothing in this letter authorizes the operator to trespass on any land or property, nor does it relieve the Operator of responsibility for compliance with applicable federal, state, or local laws ordinances. This letter does not constitute the Department's endorsement of the proposed operation, or assure the Department's concurrences with permits required from other agencies.

Sincerely,

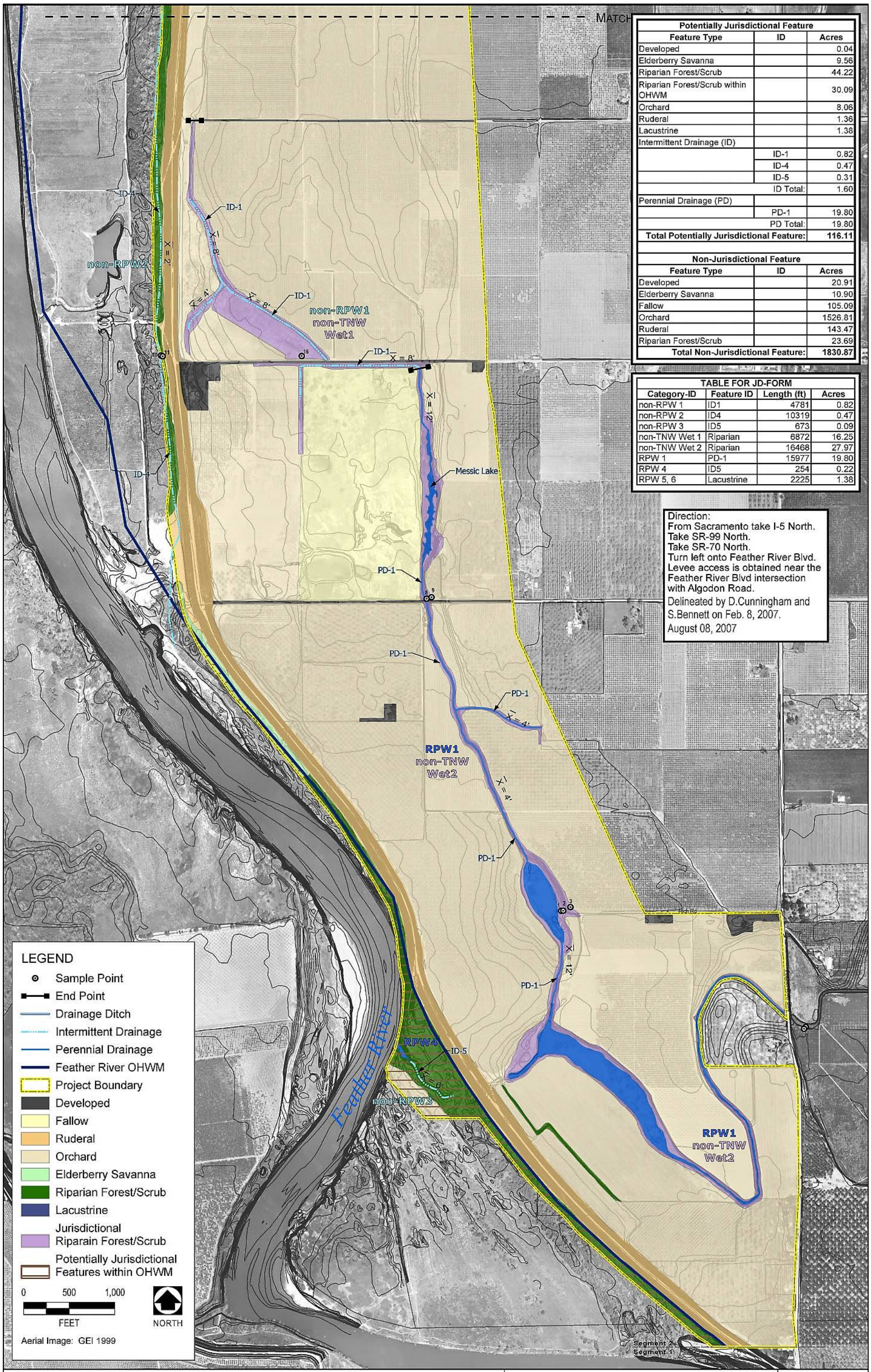
Dale Watkins
Lake and Streambed Alteration Program

cc: Paul G. Brunner
Three Rivers Levee Improvements Authority
915 Eighth Street, Suite 115
Marysville, CA 95901

Conserving California's Wildlife Since 1870

ATTACHMENT E

Maps of the Preliminary Delineation of Waters of the United States



Potentially Jurisdictional Feature		
Feature Type	ID	Acres
Developed		0.04
Elderberry Savanna		9.56
Riparian Forest/Scrub		44.22
Riparian Forest/Scrub within OHWM		30.09
Orchard		8.06
Ruderal		1.36
Lacustrine		1.38
Intermittent Drainage (ID)		
	ID-1	0.82
	ID-4	0.47
	ID-5	0.31
	ID Total:	1.60
Perennial Drainage (PD)		
	PD-1	19.80
	PD Total:	19.80
Total Potentially Jurisdictional Feature:		**116.11**

Non-Jurisdictional Feature		
Feature Type	ID	Acres
Developed		20.91
Elderberry Savanna		10.90
Fallow		105.09
Orchard		1526.81
Ruderal		143.47
Riparian Forest/Scrub		23.69
Total Non-Jurisdictional Feature:		**1830.87**

TABLE FOR JD-FORM			
Category-ID	Feature ID	Length (ft)	Acres
non-RPW 1	ID1	4781	0.82
non-RPW 2	ID4	10319	0.47
non-RPW 3	ID5	673	0.09
non-TNW Wet 1	Riparian	6872	16.25
non-TNW Wet 2	Riparian	16468	27.97
RPW 1	PD-1	15977	19.80
RPW 4	ID5	254	0.22
RPW 5, 6	Lacustrine	2225	1.38

Feather River Levee Repair Project

Segment 2

Wetland Delineation - Map 1

Source: Data Provided by EDAW and GEI 2007

X121

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

1114 Yuba Street, Suite 218
Marysville, CA 95901

August 2007

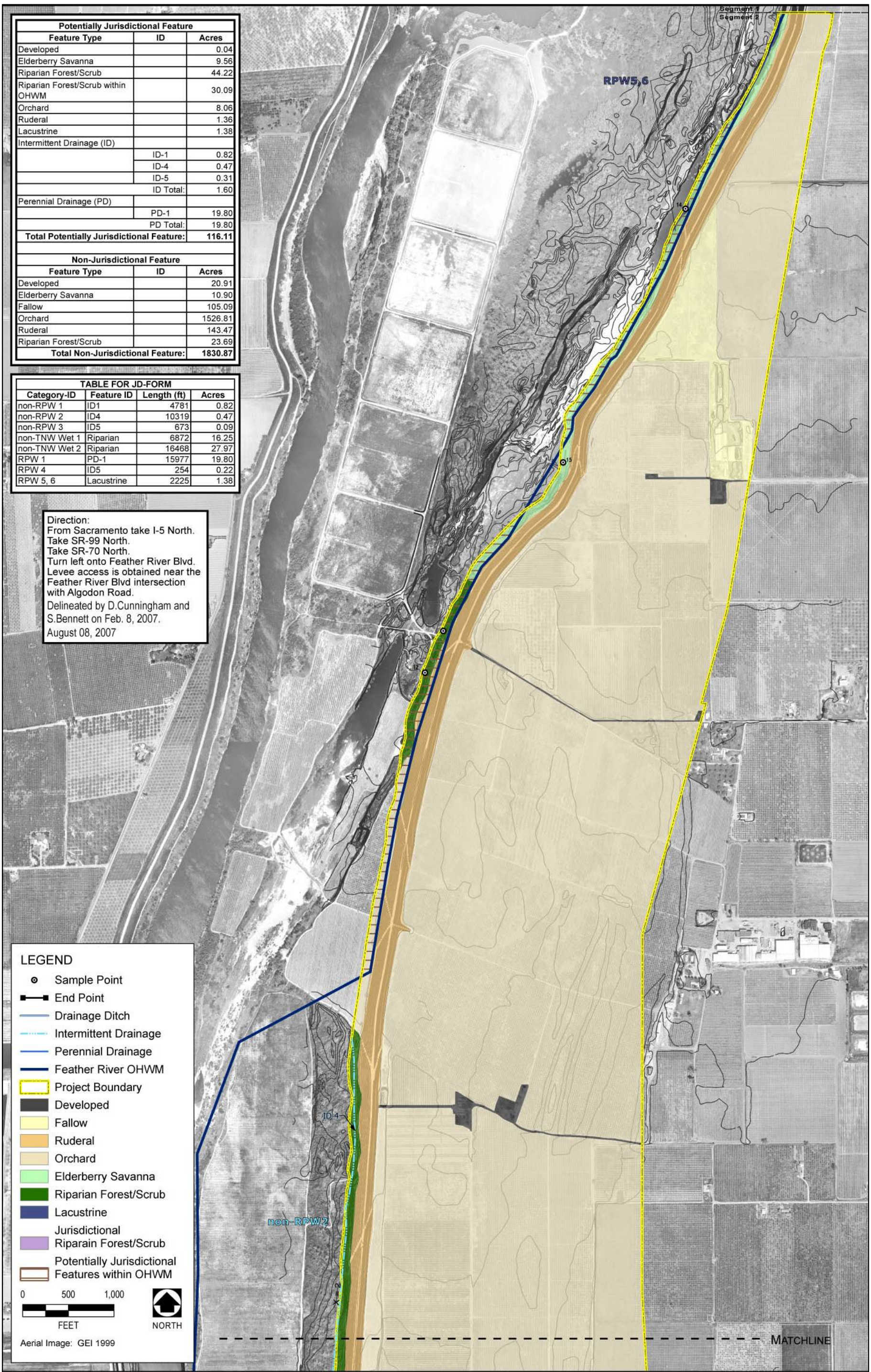
Attachment D1

Potentially Jurisdictional Feature		
Feature Type	**ID**	**Acres**
Developed		0.04
Elderberry Savanna		9.56
Riparian Forest/Scrub		44.22
Riparian Forest/Scrub within OHWM		30.09
Orchard		8.06
Ruderal		1.36
Lacustrine		1.38
Intermittent Drainage (ID)		
	ID-1	0.82
	ID-4	0.47
	ID-5	0.31
	ID Total:	1.60
Perennial Drainage (PD)		
	PD-1	19.80
	PD Total:	19.80
Total Potentially Jurisdictional Feature:		**116.11**

Non-Jurisdictional Feature		
Feature Type	**ID**	**Acres**
Developed		20.91
Elderberry Savanna		10.90
Fallow		105.09
Orchard		1526.81
Ruderal		143.47
Riparian Forest/Scrub		23.69
Total Non-Jurisdictional Feature:		**1830.87**

TABLE FOR JD-FORM			
Category-ID	**Feature ID**	**Length (ft)**	**Acres**
non-RPW 1	ID1	4781	0.82
non-RPW 2	ID4	10319	0.47
non-RPW 3	ID5	673	0.09
non-TNW Wet 1	Riparian	6872	16.25
non-TNW Wet 2	Riparian	16468	27.97
RPW 1	PD-1	15977	19.80
RPW 4	ID5	254	0.22
RPW 5, 6	Lacustrine	2225	1.38

Direction:
From Sacramento take I-5 North.
Take SR-99 North.
Take SR-70 North.
Turn left onto Feather River Blvd.
Levee access is obtained near the Feather River Blvd intersection with Algodon Road.
Delineated by D.Cunningham and S.Bennett on Feb. 8, 2007.
August 08, 2007



Feather River Levee Repair Project

Segment 2

Wetland Delineation - Map 2

Source: Data Provided by EDAW and GEI 2007

X122

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

1114 Yuba Street, Suite 218
Marysville, CA 95901

August 2007

Attachment D2

ATTACHMENT F

USACE Individual Permit Application

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT ENG FORM 4345 (33 CFR 325)	OMB APPROVAL NO.0710-003 Expires October 1996

Public reporting burden for this collection of information is estimated to average 5 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 this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information0perations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-00031, Washington, DC 20503. Please DO NO 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

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses. Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed 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 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 COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required)
Three Rivers Levee Improvement Authority Contact: Paul G. Brunner	EDAW, Inc. Contact: Eric Htain, Regulatory Biologist
6. APPLICANT'S ADDRESS	9. AGENT'S ADDRESS
1114 Yuba Street, Suite 218 Marysville, CA 95901	2022 J Street Sacramento, CA 95814
7. APPLICANT'S PHONE NUMBERS W/AREA CODE	10. AGENT'S PHONE NUMBER W /AREA CODE
a. Residence b. Business (530) 749-7841	a. Residence b. Business (916) 414-5800

11. STATEMENT OF AUTHORIZATION

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

Paul G. Brunner — APPLICANT'S SIGNATURE

June 11, 2007 — DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

Feather River Levee Repair Project, Segment 2

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
Plumas Lake Canal, perennial drainage (Messick Lake), unnamed intermittent drainage – tributaries to the Feather River	N/A
15. LOCATION OF PROJECT Yuba (COUNTY) California (STATE)	

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

Segment 2 of the Feather River Levee Repair Project is located in southwestern Yuba County (Exhibit 1), and encompasses a portion of the Feather River levee and lands to the east from approximately Star Bend to just south of Shanghai Bend (west of the Yuba County Airport) (Exhibit 2). The project area encompasses approximately 1,947 acres and is located in Townships 13 and 14 North, Ranges 3 and 4 East, on the U.S. Geological Survey 7.5-minute Olivehurst quadrangle. Approximate latitude and longitude coordinates at the north and south ends of the project area are: 39.090676N, -121.584302W and 39.009461N, -121.578301W. The setback levee right-of-way would consist of the setback levee (approximately 170 feet wide from toe of levee to toe of levee), a 50-foot-wide access corridor on each side of the levee, and an approximately 65-foot-wide utility corridor to the east of the landside access corridor.

17. DIRECTIONS TO THE SITE

From Sacramento, take I-5 north. Follow I-5 north and take the SR-99 north turn-off. Take the SR-70 north turn-off from SR-99. Turn left on Feather River Blvd from SR-70. Follow Feather River Blvd to the intersection of Feather River Blvd and Algodon Road. Access to the southern limit of the project is across from the intersection at the Star Bend river access. The upper limit of the project can be accessed by continuing along Feather River Blvd to a farm road approximately 0.9 mile north of Murphy Road. Turn left on the farm road and follow to the Feather River levee.

18. NATURE OF ACTIVITY (Description of Project, include all features)

See attached Supplemental Sheets for a full description of the project (nature of activity).

19. PROJECT PURPOSE (Describe the reason or purpose of the project, see instructions)

See attached Supplemental Sheets for a full description of the project purpose.

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. REASON(S) FOR DISCHARGE

Discharge of fill materials to waters of the United States will be required for the construction of a new setback levee along a portion of the Feather River and relocation of a pump station in project stage 1. The setback levee is being constructed to improve flood control along a segment of the Feather River from approximately Shanghai Bend to Star Bend (north to south respectively). Additional discharge of fill materials will be required in project stage 2 to fill in portions of the Plumas Lake Canal adjacent to the new setback levee when the relocated pump station becomes operable. See the Supplemental Sheets for more details on the reason for discharge.

21. TYPE(S) OF MATERIAL BEING DISCHARGED AND THE AMOUNT OF EACH TYPE IN CUBIC YARDS

Soil from local borrow sites, native soil. See Supplemental Sheets for further details on types of materials being discharged and amount.

22. SURFACE AREA IN ACRES OF WETLANDS OR OTHER WATERS FILLED (see instruction)

The proposed project includes permanently affecting 2.11 acres of perennial drainage (including the Plumas Lake Canal), 0.09 acre of intermittent drainage, 10.05 acres of mixed riparian forest/scrub associated with the perennial and intermittent drainages, and 0.22 acre of a backwater to the Feather River (connected to the intermittent drainage). The proposed project also includes indirectly affecting 16.98 acres of perennial drainage, 39.13 acres of mixed ripaian forest/scrub, and 082 acre of intermittent drainage. See Supplemental Sheets for further details.

23. IS ANY PORTION OF THE WORK ALREADY COMPLETE? YES NO X IF YES DESCRIBE THE COMPLETED WORK

24. ADDRESSES OF ADJOINING PROPERTY OWNERS, LESSEES, ETC., WHOSE PROPERTY ADJOINS THE WATERBODY (if you have more that can be here, please attach a supplemental list).

See attached Individual Permit Application Mailing List for a complete list of the names and addresses of adjacent property owners to the waterbodies affected by the proposed project .

25. LIST OF OTHER CERTIFICATIONS OR APPROVAL/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
U.S. Fish and Wildlife Service	ESA Section 7 consultation	N/A	To be submitted June 2007		
National Marine Fisheries Service	ESA Section 7 consultation	N/A	To be submitted June 2007		
Regional Water Quality Control Board	Water Quality Certification	N/A	To be submitted July 2007		
Regional Water Quality Control Board	NPDES Permit	N/A	To be submitted August 2007		
Department of Fish and Game	Streambed Alteration Agreement	N/A	To be submitted July 2007		
Department of Fish and Game	CESA consultation	N/A	To be submitted June 2007		
Reclamation Board	Encroachment Permit	N/A	May 1, 2007		

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the 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.

Paul J Brunner June 11, 2007

Signature of Applicant Date Signature of Agent 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 G

RWQCB Water Quality Certification Application

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

SECTION 401 WATER QUALITY CERTIFICATION
APPLICATION FORM

A minimum of $500.00 processing fee is required however additional fees in accordance with Title 23 CCR § 2200 (a)(2) may also be required. Please use the fee calculator at http://www.swrcb.ca.gov/cwa401/docs/feecalculator.xls to determine the total fee. Please include a check payable to the **State Water Resources Control Board**. Attach additional sheets as necessary. Submit the complete form to the appropriate Regional Board office.

1. APPLICANT INFORMATION	**2. AGENT INFORMATION***
Applicant: Three Rivers Levee Improvement Authority (TRLIA)	Agent*: EDAW, Inc.
Contact Name: Paul G. Brunner	Contact Name: Eric Htain
Address: 1114 Yuba Street, Suite 218 Marysville, CA 95901	Address: 2022 J Street Sacramento, CA 95811
Phone No: (530) 749-7841	Phone No: (916) 414-5800
Fax No: (530) 749-6990	Fax No: (916) 414-5850

*Complete only if applicable

3. PROJECT DESCRIPTION

a) Project Title: Feather River Levee Repair Project, Segment 2

b) Project Location:
Street location_____ (nearest intersection) _____
County: Yuba Section: ____ Township: 13N, 14N Range: 3E and 4E

Latitude: 39.090676 Longitude: -121.584302
*Attach site map with "waters" clearly indicated (e.g., USGS 7 ½ quadrangle map)

c) Project Description: (include purpose and final goal):

Please see cover letter for detailed project description.

d) Proposed Schedule: *(start-up, duration, and completion dates)*:
September 2007 – October 2009

e) Total Project size: *(clearing, grading, other construction activities)*
1,600 acres 30,096 linear feet *(if appropriate)*

4. IMPACTED WATER BODIES

a) Name*(s)* of Receiving Water Body*(ies)*:
Plumas Lake Canal, tributary to Feather River

b) Anticipated potential stream flow during project activity:
1-3 cfs

c) Describe potential impacts to water quality:
Potential impacts to water quality include discharge of fill and excavated materials into waters of the state. See the project description in the cover letter for further details.

d) Indicate in ACRES and LINEAR FEET *(where appropriate)* the proposed **waters of the United States** to be impacted by <u>any discharge other than dredging</u>, and identify the impacts*(s)* as permanent and/or temporary for each water body type listed below:

Water Body Type	Permanent Impacts		Temporary Impacts	
	(acres)	(linear feet)	(acres)	(linear feet)
Jurisdictional Wetland	0.00	0.00	0.00	0
Riparian	8.44	0.00	0.00	0
Streambed unvegetated	2.49	0.00	0.00	0
Lake/Reservoir	0.00	0.00	0.00	0

c) Indicate the volume of the <u>dredged</u> material (cubic yards) to be discharged to waters of the United States:
No **dredged** material is expected to be discharged to waters of the state. Approximately 62,000 cubic yards of material will be used to fill in waters of the state and 140,000 cubic yards of material will be excavated from waters of the state.

d) Indicate type(s) of material proposed to be discharged to waters of the United States:
Native soil, local soil from borrow areas.

5. COMPENSATORY MITIGATION

a) Indicate in ACRES and LINEAR FEET *(where appropriate)* the total quantity of **waters of the United States** proposed to be Created, Restored and/or Enhanced for purposes of providing Compensatory Mitigation:
Mitigation for loss of waters of the state is proposed to be conducted through purchase of credits at a Mitigation Bank. The details of the bank, bank agency, and cost of credits have not yet been determined.

Water Body Type	Created		Restored		Enhanced	
	(acres)	(linear ft)	(acres)	(linear ft)	(acres)	(linear ft)
Jurisdictional Wetland	0.0	0.0	0.0	0.0	0.0	0.0
Riparian	4.61	0.0	0.0	0.0	0.0	0.0
Streambed	2.09	0.0	0.0	0.0	0.0	0.0
Lake/Reservoir	0.0	0.0	0.0	0.0	0.0	0.0

b) If contributing to a Mitigation or Conservation Bank, indicate the agency, dollar amount, acreage, and water body type *(if applicable)*:
Conservation Agency _____
$_____ for_____ acres of _____ *(water body type)*
How many acres of this mitigation area qualify as waters of the United States?_____

c) Other Mitigation *(omit if not applicable)*:

How many acres of this mitigation area qualify as waters of the United States?_____

d) Location of Compensatory Mitigation Site*(s) (attach map of suitable quality and detail)*:

City of Area _____ County_____

Longitude/Latitude __Township/Range ____

6. OTHER ACTIONS/BEST MANAGEMENT PRACTICES (BMPs)

Briefly describe other actions/BMPs to be implemented to Avoid and/or Minimize impacts to waters of the United States, including preservations of habitats, erosion control measures, project scheduling, flow diversions, etc.

Use of best management practices to limit sedimentation and erosion effects that could result from construction, including perimeter controls such as silt fencing and erosion control weed-free berms and bales.
Preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) and all sedimentation, erosion, and water quality measures contained within.
Implementation of measures provided in regulatory agency permits such as the USACE Section 404 permit, Section 1602 Streambed Alteration Agreement, and NPDES permit.

7. OTHER PERMITS/AGREEMENTS/ETC

a) U.S. Army Corps of Engineers Permit
Indicate the type of ACOE permit *(check one)*
Nationwide Permit No(s)___ Individual Permit No*(s)*:_SPK-2007-00578-SA Regional Permit No*(s)*:_____

Have you notified ACOE of project? Yes

Have you reviewed the General Conditions for your ACOE permit? Yes

Have you attached a copy of the application/notification to ACOE? Yes

b) California Department of Fish and Game Lake or Streambed Alteration Agreement

Date of Application: ___August 13, 2007___

Have you attached a copy of the application? ___Yes___

Has the Agreement been issued? ___No___ if so, list Agreement number:_____

8. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

a) Indicate the type of CEQA Document required for project and Lead Agency:

Categorical Exemption ___ Negative Declaration ___ Environmental Impact Report ___X___

Has the document been certified/approved, or has a Notice of Exemption been filed? Yes the document was certified (SCH# 2006062071)

If yes date of approval/filing February 6, 2007

If no, expected approval/filing date: _____

Lead Agency Three Rivers Levee Improvement Authority
Submit final or draft copy if available*

b) Threatened or Endangered Species impacted by this project *(list potential)*:

Valley elderberry longhorn beetle, giant garter snake, Central Valley steelhead, Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon

9. PAST/FUTURE PROPOSALS BY THE APPLICANT

Briefly list/describe any projects carried out in the last 5 years or planned for implementation in the next 5 years that are in any way related to the proposed activity or may impact the same receiving body of water. Include the estimated adverse impacts from the past or future projects.

The Feather-Bear Rivers Levee Setback Project began in 2006 and levee construction is complete. The project involves the construction of a 2-mile long setback levee along the north end of the Bear River, degradation of portions of the Bear River levee and Feather River levee south of the setback levee, and restoration of riparian habitat along the Bear River south of the new setback levee. This project work resulted in permanent effects to 13.5 acres of waters of the United States. However, adverse effects were mitigated by increasing the acreage of waters of the United States by removing orchard and farmland between the old levee and the new setback levee along the Bear River and by restoring the previous orchard and farmland to riparian habitat.

10. CERTIFICATION

"I certify under penalty of law that this document, including all attachments and supplemental information, were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

Print Name: Paul G. Brunner Title: Executive Director

Signature: Paul G. Brunner Date: 31 July 2007

ATTACHMENT H

Notice of Determination for the Feather River Levee Repair Project

Notice of Determination

Form C

To:

☐ Office of Planning and Research

For U.S. Mail: P.O. Box 3044, Sacramento, CA 95812-3044

Street Address: 1400 Tenth St., Sacramento, CA 95814

☒ County Clerk
County of: Yuba
Address: 915 Eighth Street, Suite 107
Marysville, CA 95901

From:
Public Agency: Three Rivers Levee Improvement Authority
Address: 1114 Yuba Street, Suite 218
Marysville, CA 95901
Contact: Paul Brunner, Exective Director
Phone: (530) 749-5679

Lead Agency (if different from above):
Address:
Contact:
Phone:

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number (if submitted to State Clearinghouse): 2006062071

Project Title: Feather River Levee Repair Project, An Element of the Yuba-Feather Supplemental Flood Control Project

Project Location (include county): Yuba and Feather Rivers, north of the confluence of the Bear River with the Feather River, in Yuba County

Project Description:

The project, as approved, will correct deficiencies in the left bank levees of the Feather and lower Yuba Rivers. The project extends northward from approximately Pump Station No. 2 on the Feather River to near the State Route 70 crossing of the Yuba River. The southern and northern levee segments will be strengthened in place, and the middle levee segment will be set back from approximately Algodon Road to just southwest of the Yuba County Airport.

This is to advise that the Three Rivers Levee Improvement Authority ☒ Lead Agency or ☐ Responsible Agency has approved the above described project on February 6, 2007 (Date) and has made the following determinations regarding the above described project:

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
4. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
5. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the negative Declaration, is available to the General Public at: the Three Rivers Levee Improvement Authority offices at the address listed above.

Signature (Public Agency) Paul G. Brunner Title Executive Director

Date 2/7/07 Date Received for filing at OPR

ENDORSED FILED

FEB 08 2007

TERRY A. HANSEN, County Clerk
BY AMANDA RUIZ
Deputy Clerk

Authority cited: Sections 21083, Public Resources Code.
Reference Section 21000-21174, Public Resources Code.

Revised 2005

SUMMARY OF DEMAND 17-363233

305-3350-425.23-01 NOD 2/7/07 2,550.00

*******2,550.00

COUNTY OF YUBA - MARYSVILLE, CALIFORNIA

02/08/2007 03:46PM
VITALS CUSTOMER

TRANSACTION # 49872
DOCUMENT # 2007FG-00010

NOTES:

ENVIR ADMIN FEE: $50.00
NOTICE OF DETERM FEE: $2500.00
TOTAL: $2,550.00
CHECK: $2550.00 173532

DEPUTY INITIALS: ALR

THANK YOU

TERRY A. HANSEN
COUNTY RECORDER
COUNTY OF YUBA
MARYSVILLE, CA 95901

ATTACHMENT I

Information for Property Owners within the Project Site

FEATHER RIVER LEVEE REPAIR PROJECT, SEGMENT 2 Property Owners and APN List for Streambed Alteration Agreement July 27, 2007	
Landowner	Mailing Address
John M. & Marilee Smith, et al. 013-010-046, 013-010-026	c/o Mike Smith 523 J Street Marysville, CA 95901
Danna Investment Company 13-010-010, 013-010-035, 013-010-034	Stephen Danna P.O. Box 729 Yuba City, CA 95992
State of California Reclamation Board	Attn: Jeffrey Fong California Department of Water Resources Division of Engineering Real Estate Branch 1416 Ninth Street, Room 425 Sacramento, CA 95814
Joga S. Mann & Rikki A. K. Mann 013-010-013, 013-010-016	2210 Watt Avenue, Suite B Sacramento, CA 95825
Sacramento San Joaquin Drainage District 013-010-011, 013-010-012, 014-250-022, 014-290-001, 014-370-001, 014-037-002, 016-010-013	Attn: Jeffrey Fong California Department of Water Resources Division of Engineering Real Estate Branch 1416 Ninth Street, Room 425 Sacramento, CA 95814
Satinder N. Davit 013-010-014	535 Jones Road Yuba City, CA 95991
Nora Lee Terry, Trustee 014-240-022	3928 Ella Avenue Marysville, CA 95901
Naumes, Inc. 014-250-027, 014-250-028	Attn: Robert Boggess P.O. Box 996 Medford, OR 97501
Thomas A. Rice & Jeanette L. Young 014-250-029	671 Plumas Avenue Marysville, CA 95901
Baldev S. Heir, et al. 014-290-004	4683 Windsong Street Sacramento, CA 95835
Patricia Wiggins	3920 Hoopa Place Davis, CA 95618
Sarinder Thiara	1512 Meadowlark Way Yuba City, CA 95991
Kummel Heir	809 Dederick Court San Jose, CA 95125
James R. & Mary L. Pearson, Trustees	798 Plumas Avenue Marysville, CA 95901
Daljit Hundal, SDS Farms	1793 Tuscany Drive Yuba City, CA 95993
Jacob E. Platter	60775 Moon Avenue Marysville, CA 95901
Quinn X. Dang & Andy N. Dang 014-290-033	5 Parnell Court Sacramento, CA 95835

FEATHER RIVER LEVEE REPAIR PROJECT, SEGMENT 2 Property Owners and APN List for Streambed Alteration Agreement July 27, 2007	
Landowner	Mailing Address
Rajinderjit & Sukhminder Uppal, et al. 014-290-034	1734 Marin Court Plumas Lake, CA 95961
Richard & Ruby Webb 014-370-026	256 Anderson Avenue Marysville, CA 95901
Surjit & Jaspal Clar 014-370-037	2127 Railroad Avenue Yuba City, CA 95991
Nordic Industries 014-370-036	Attn: Jens Karlshoej 1437 Furneaux Road Marysville, CA 95901
David Anderson 014-370-039, 014-370-006	618 Anderson Avenue Marysville, CA 95901
Berdina Anderson 014-370-039, 014-370-006	644 Woodruff Lane Marysville, CA 95901
Gurdawar S. Bains 014-370-010	790 Anderson Avenue Marysville, CA 95901
Pat Freeman Rice 014-037-007	1630 Paula Drive Yuba City, CA 95993
H & H Trenching 014-0370-003	Attn: Paul G. Hawes 2350 Mage Avenue Marysville, CA 95901
Steve & Madeline Maxey 014-037-024	P.O. Box 2353 Marysville, CA 95901
Tom O. Miller, Trustee 014-370-033	P.O. Box 304 Olivehurst, CA 95961
Harold D. Hadley Jr. Trust, et al. 014-370-020	c/o Sheldon Hadley P.O. Box 1308 Marysville, CA 95901
Pritam Kaur Heir, Trustee 014-370-017	2127 Pepperwood Drive Yuba City, CA 95993
Foster Ranch Ltd. Partnership, et al. 014-370-030, 014-370-029, 016-020-005, 016-010-002, 016-010-007, 016-010-008, 016-060-001	2160 Feather River Boulevard Marysville, CA 95901
JTS Communities, Inc.	Attn: Rob Aragon 401 Watt Avenue Sacramento, CA 95864
E. Platter and Sons, Inc.	1233 Country Club Road Marysville, CA 95901
Susanna Nieschulz 016-010-016	1339 Country Club Road Marysville, CA 95901
Frances Dunn Souza, Trustee 016-010-015	2350 Feather River Boulevard Marysville, CA 95901
Lloyd & Patricia Nieschulz 016-010-006	2667 Feather River Boulevard Marysville, CA 95901
Eleanor Herold 016-010-009	2052 Feather River Boulevard Marysville, CA 95901

FEATHER RIVER LEVEE REPAIR PROJECT, SEGMENT 2 Property Owners and APN List for Streambed Alteration Agreement July 27, 2007	
Landowner	Mailing Address
Mark Aldrin Flores & Hermanita Flores 016-010-010	c/o Lorna Flores 2971 Azevedo Drive Sacramento, CA 95833
State of California 016-010-017	Attn: Dale Whitmore 2034 Feather River Boulevard Marysville, 95901
Robert Zwissig 016-010-019	1266 – 44th Avenue San Francisco, CA 94122
Reclamation District 784	1594 Broadway Marysville, CA 95901-9632
County of Yuba	915 Eighth Street, Suite 105 Attn: Auditors Office Marysville, CA 95901-5273

ATTACHMENT J

Copy of the California Endangered Species Act Section 2081(b) Incidental Take Permit Application for the Feather River Levee Repair Project

(Contained in the last section of this Appendix)

ATTACHMENT K

Copy of the Hydrological Study for the Feather River Levee Repair Project

DRAFT

Hydraulic and Hydrologic Analysis of the Three Rivers Levee Improvement Authority's Phase IV Project

Basis of Design for Feather River Setback Levee Project

July 2007

Prepared by

MBK ENGINEERS
2450 Alhambra Blvd., 2nd Floor
Sacramento, CA 95817
916/456-4400
916/456-0253 (fax)

TABLE OF CONTENTS

1. Background 1

2. Hydraulic Model 1
   A. Software 1
   B. Sources of Data 1
   C. Mesh Development 1
   D. Calibration 2
      D.1 Calibration Boundary Conditions 2
      D.2 Calibration Process 2
      D.3 Calibration Results 3
   E. Verification 3
      E.1 Verification Boundary Conditions 3
      E.2 Verification Results 3

3. Existing Conditions 4
   A. Model Development 4

4. Project Conditions 4
   A. Purpose 4
   B. Model Development 4
   C. Sources of Data 4
   D. Project Features 4
      D.1 Scenario 1: All Levees Degraded 4
      D.2 Scenario 2: Partial Levee Degrade 5
      D.3 Habitat Enhancement for Scenario 1 and 2 5
   E. Hydrology/Boundary Conditions 5

5. Results 6

LIST OF TABLES

Table 1 January 1997 Calibration Boundary Conditions 2
Table 2 February 1986 Flood Verification Boundary Conditions 3
Table 3 RMA-2: Project Condition 1-100 AEP Shanghai-Yuba Centering Boundary Condition 6
Table 4 RMA-2: Project Condition 1-200 AEP Shanghai-Yuba Centering Boundary Condition 6
Table 5 January 1997 Calibration Results – (Feet-NGVD) ..... Table Section
Table 6 February 1986 Verification Results – (Feet-NGVD) ..... Table Section
Table 7 Project Condition Model Results ..... Table Section

LIST OF FIGURES

Figure 1 Calibration and Verification RMA-2 Finite Element Mesh
Figure 2 Calibration and Verification RMA-2 Finite Element Mesh
Figure 3 RMA-2 Finite Element Model Calibration Roughness Values
Figure 4 RMA-2 Finite Element Model Calibration Roughness Values
Figure 5 January 1997 Calibration Results
Figure 6 January 1997 Calibration Results
Figure 7 Feather River – Left Bank (RM 7.4 to 12.2) Maximum Water Surface Profile (2-D Model) – January 1997 Calibration
Figure 8 Feather River – Right Bank (RM 7.6 to 28.7) Maximum Water Surface Profile (2-D Model) – January 1997 Calibration
Figure 9 Feather River – Left Bank (RM 0.6 to 4.9) Maximum Water Surface Profile (2-D Model) – January 1997 Calibration
Figure 10 Calibration and Verification Water Surface Profile Alignments
Figure 11 Calibration and Verification Water Surface Profile Alignments
Figure 12 February 1986 Verification Results
Figure 13 February 1986 Verification Results
Figure 14 Feather River – Left Bank (RM 12.3 to 27.1) Maximum Water Surface Profile (2-D Model) – February 1986 Calibration
Figure 15 Feather River –Right Bank (RM 0.6 to 4.9) Maximum Water Surface Profile (2-D Model) – February 1986 Calibration
Figure 16 Bear River – Left Bank (RM 12.3 to 27.1) Maximum Water Surface Profile (2-D Model) – February 1986 Calibration
Figure 17 Bear River – Right Bank (RM 0.8 to 4.9) Maximum Water Surface Profile (2-D Model) – February 1986 Calibration
Figure 18 Existing Condition RMA-2 Finite Element Mesh
Figure 19 Existing Condition RMA-2 Finite Element Mesh
Figure 20 RMA-2 Finite Element Model Existing Condition Roughness Values
Figure 21 RMA-2 Finite Element Model Existing Condition Roughness Values
Figure 22 Project Condition RMA-2 Finite Element Mesh
Figure 23 Project Condition RMA-2 Finite Element Mesh
Figure 24 RMA-2 Finite Element Model Project Condition Roughness Values
Figure 25 RMA-2 Finite Element Model Project Condition Roughness Values
Figure 26 Project Condition Scenario 1 All Levees Degraded
Figure 27 Project Condition Scenario 2 Partial Levee Degrade
Figure 28 1-in-100 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Existing Condition
Figure 29 1-in-200 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Existing Condition
Figure 30 1-in-100 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Project Condition Scenario 1
Figure 31 1-in-200 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Project Condition Scenario

Figure 32 1-in-100 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Project Condition Scenario 2
Figure 33 1-in-200 AEP Shanghai Centering Feather River – Left Bank (RM 13.2 to 27.1) Maximum Water Surface Profiles (2-D & 1-D Models) – Project Condition Scenario 2
Figure 34 Existing Condition 1-in-100 AEP Velocity
Figure 35 Existing Condition 1-in-100 AEP Velocity
Figure 36 Existing Condition 1-in-200 AEP Velocity
Figure 37 Existing Condition 1-in-200 AEP Velocity
Figure 38 Project Condition – Scenario 1 1-in-100 AEP Velocity
Figure 39 Project Condition – Scenario 1 1-in-100 AEP Velocity
Figure 40 Project Condition – Scenario 1 1-in-200 AEP Velocity
Figure 41 Project Condition – Scenario 1 1-in-200 AEP Velocity
Figure 42 Project Condition – Scenario 2 1-in-100 AEP Velocity
Figure 43 Project Condition – Scenario 2 1-in-100 AEP Velocity
Figure 44 Project Condition – Scenario 2 1-in-200 AEP Velocity
Figure 45 Project Condition – Scenario 2 1-in-200 AEP Velocity

1. Background

This document explains the hydraulic analysis performed for the basis of design for the Reclamation District No. 784 (RD 784) Feather River Setback Levee Project that is proposed by the Three Rivers Levee Improvement Authority (TRLIA) under the Phase IV program. Included in this document are:

- Background on the hydraulic model used for the analysis.
- A description of the hydrology.
- Description of the baseline and project conditions that were modeled.
- Water surface profiles derived from the hydraulic analysis.
- Velocity contours derived from the hydraulic analysis.

2. Hydraulic Model

A. Software

The software used to assemble the model was SMS (Surface Water Modeling System) version 9.2. SMS is a pre- and post-processor for surface water modeling and analysis. The software provides a graphical user interface to develop the two dimensional model to visualize and analyze results.

The software used to analyze the finite element model assembled in SMS was RMA-2 version 4.5. RMA-2 is a two dimensional depth averaged finite element hydrodynamic numerical model. It computes water surface elevation and horizontal velocity components for sub-critical, free-surface two-dimensional flow fields.

B. Sources of data

Topographic and hydrographic data used for development of the model were from surveys performed by the Corps of Engineers, Sacramento District for the Sacramento-San Joaquin Rivers Comprehensive Study, 1999.

C. Mesh Development

A finite element mesh of the Feather, Bear, and Yuba Rivers was developed using the SMS software. The finite element mesh consists of triangular and quadrilateral elements which represent the topography of the study reach. Three finite element meshes were developed to simulate the calibration & verification condition, existing condition, and project condition.

The study reach begins at river mile (RM) 28.7 on the Feather River and extends down to Feather River near Nicolaus gage at RM 8.0. The Bear River was simulated from RM 5.0 to the Feather River. A short portion of the Yuba River was simulated from RM 1.4 to the Feather River.

D. Calibration

A finite element model was developed which represents the Feather-Yuba-Bear flood control system as of 1997. Figure 1 and 2 shows the finite element mesh. The 2-D finite element model was calibrated to the January 1997 flood event. This flood was chosen because of the substantial amount of hydrologic and hydraulic data available. It was also the year in which the hydrographic and topographic data used in the model was surveyed.

D.1 - Calibration Boundary Conditions

The January 1997 flood boundary conditions used in the 2-D model were obtained from observed gage data and the Corps of Engineers Yuba-Feather River HEC-RAS model (MBK Re-calibration Version). The MBK re-calibration of the Corps Yuba-Feather HEC-RAS model is documented in *"Hydraulic and Hydrologic Documentation for FEMA Certification of the Three Rivers Levee Improvement Authority Project", MBK Engineers, March 2007.* The January 1997 flood event was simulated under steady state conditions in the 2-D model and values were extracted from the HEC-RAS model corresponding to the timestep with the maximum water surface profile. The upstream boundary conditions require a peak flow and are at the Feather River at RM 28.7, Yuba River RM 1.2, and Bear River at RM 3.95. The downstream boundary condition on the Feather River at Nicolaus, RM 8.0 requires a peak stage. The peak stage was estimated from gage records. Shown below are the boundary conditions used for the calibration.

Table 1. January 1997 Calibration Boundary Conditions

Boundary Condition	Stage (feet-NGVD)	Peak flow (cfs)
Feather River at RM 28.7	N/A	141,000
Yuba River at RM 1.2	N/A	161,000
Bear River at RM 3.95	N/A	31,500
Feather River at Nicolaus	47.2	N/A

D.2 - Calibration Process

The calibration analysis involved adjusting the Manning's roughness coefficients in the model until the computed water surface elevation closely matched the surveyed high water marks. The Army Corps of Engineers surveyed high water marks elevations on the Feather and Bear River following the January 1997 flood. Most of the high water marks in the study reach were taken on the right bank of the Feather River and the left bank of the Bear River. Aerial photography taken following the January 1997 flood was used as an initial estimate of the roughness values in the modeled river reach. Roughness values for various vegetation types were selected based on previous experience and guidelines established by *"Open Channel Hydraulics", Chow (1959).* Figure 3 and 4 show the calibrated roughness values for the finite element mesh. The roughness values range from 0.022 to 0.12.

D.3 - Calibration Results

The results of the calibration are presented in Table 5 and Figure 5 and 6. Computed values compare closely with the surveyed high water marks and the majority of the computed values fall within plus or minus one foot of the observed high water. Figure 7 shows the water surface profile along the left bank of the Feather River from RM 7.4 to 12.2 versus the surveyed high water marks. The computed water surface profile on the right bank of the Feather River from RM 7.6 to 28.7 is plotted on Figure 8. The Bear River water surface profile and high water marks are plotted on Figure 9. Alignments for the profiles are shown on Figure 10 and 11.

E. Verification

Following the calibration process, the 2-D finite element model was verified by simulating the February 1986 flood. The February 1986 was the only other recent significant flood event where hydrologic and high water mark data were available. The verification mesh and roughness values remained unchanged from the calibration mesh and roughness values shown in Figures 1 to 4.

E.1 - Verification Boundary Conditions

The February 1986 flood event was simulated in steady-state condition. The boundary conditions for the 2-D model were estimated from hydrographs from a variety of sources. The upstream boundary condition for the Feather and Yuba River were estimated from flood routings performed by MBK for the Paterno case, while flows for the Bear River were estimated from the UNET model developed by the Corps for the Yuba River Investigation, October 1997. The downstream boundary condition was estimated from observed gage data for the Feather River at Nicolaus.

Table 2. February 1986 Flood Verification Boundary Conditions

Boundary Condition Location	Stage (feet-NGVD)	Peak flow (cfs)
Feather River at RM 28.7	N/A	158,000
Yuba River at RM 1.2	N/A	108,000
Bear River at RM 3.95	N/A	19,000
Feather River at Nicolaus	45.8	N/A

E.2 - Verification Results

The results of the February 1986 verification simulation are presented in Table 6 and shown on a map in Figures 12 and 13. Water surface profiles for the Feather River are shown in Figures 14 to 17. The computed values compare closely with the surveyed high water marks with a majority of the computed values falling within plus or minus one foot of the observed high water. Of particular importance is that the model verifies well within the project reach, Feather River RM 17 to 24.

3. Existing Conditions

A. Model Development

The 2-D finite element calibration model was modified to reflect existing conditions in the Feather-Yuba Rivers for simulation of existing conditions. Modifications made to the mesh included setting back the levee at Shanghai Bend on the right bank. The Corps partially degraded the levee at Shanghai Bend following the January 1997 flood. As-built plans were reviewed to modify the mesh. The mesh was also modified to include the Bear River setback levee as constructed by TRLIA under Phase III, October 2006. Other modifications included modifying the roughness values in the area just downstream of Star Bend to reflect habitat enhancement performed by River Partners in 2005. The existing condition mesh and roughness values are shown in Figure 18 & 19 and 20 & 21, respectively.

4. Project Conditions

A. Purpose

The 2-D finite element project condition model of the Feather, Bear, and Yuba Rivers was used for hydraulic analysis to (1) determine a design water surface profile for the Feather River setback levee, (2) develop channel and floodplain velocities and (3) determine the amount of levee degradation of the existing Feather River left bank levee in the setback levee reach.

B. Model Development

The existing condition 2-D finite element mesh was modified to reflect project conditions. The Feather River Setback Levee Project consists of setting back the Feather River left levee from RM 17 to 24.3 and habitat enhancement in the setback levee area. The project condition finite element mesh is shown in Figure 22 and 23. Roughness values used in the project condition mesh are shown in Figure 24 and 25.

C. Sources of Data

Topographic data used for the development of the setback levee area was from the Corps Comprehensive Study, 1999. Levee alignments were provided by GEI, 2007.

D. Project Features

D.1 – Scenario 1: All Levees Degraded

Scenario 1 is with project condition consisting of setting back the Feather River left bank levee from RM 17.1 to 24.3. The length of the setback levee is approximately 5.7 miles. It also includes de-grading approximately 6.2 linear miles of the levee along the left bank of the Feather River. The existing levee was degraded to approximately the existing levee toe elevation. Figure 26 shows the setback levee alignment and the levees degraded in Scenario 1.

D.2 – Scenario 2: Partial Levee Degrade

Scenario 2 is with project condition consisting of setting back the Feather River left bank levee from RM 17.1 to 24.3. The length of the setback levee is approximately 5.7 miles. It also includes de-grading approximately 5.0 linear miles, in 3 segments, of the levee along the left bank of the Feather River to the approximate levee toe elevation (Figure 27). The two segments of the Feather River left bank levee retained are near GEI levee station 440+00 to 415+00 and 390+00 to 355+00.

D.3 – Habitat Enhancement for Scenario 1 and 2

It is assumed that the areas between the new setback levee and the existing levee, referred to as the setback area, would be re-vegetated for habitat enhancement. Approximately 1400 acres would be re-vegetated in the setback area. A Manning's roughness value of 0.1 was used for the setback area in the model. This roughness corresponds to a non-maintained vegetation area of dense trees with branches above the flood stage and little undergrowth. The project condition roughness values were selected based on Chow (1959). The reference provides a range of values (0.08 to 0.12) for the vegetation type of dense trees with branches above the flood stage. Figure 26 and 27 show the habitat enhancement area.

E. Hydrology/Boundary Conditions

The boundary conditions used for the RMA-2 model under project conditions were developed using the Feather-Yuba River HEC-RAS model (MBK Re-calibration Version). The HEC-RAS model was modified to reflect the project condition as described above and simulated using hydrology developed by the Corps.

The hydrology used for the analysis of the project conditions was developed using the synthetic inflow hydrographs developed by the Corps of Engineers. Details of the development of the hydrology can be found in the *"Lower Feather River Floodplain Mapping Study, Corps of Engineers; February 17, 2005"*. Feather River at Shanghai with Yuba River emphasis (SHY) storm centering was developed by the Corps and used in this analysis.

Simulations for this analysis used the 1-in-100 AEP and 1-in-200 AEP.

The boundary conditions used in the RMA-2 model for the 1-in-100 AEP and 1-in-200 AEP are shown in Table 3 and 4. Review of the maximum water surface profile from the HEC-RAS model showed that the maximum water surface profile along the Feather River between the Yuba and Bear River corresponds to the timestep with the maximum flow in the reach. The flow and stage values at the RMA-2 boundary locations were extracted from the hydrographs from HEC-RAS corresponding to the maximum flow timestep.

Table 3. RMA-2: Project Condition 1-in-100 AEP Shanghai-Yuba Centering Boundary Condition

Boundary Condition Location	Stage (feet-NGVD)	Peak flow (cfs)
Feather River at RM 28.7	N/A	127,182
Yuba River at RM 1.2	N/A	153,937
Bear River at RM 3.95	N/A	40,213
Feather River at Nicolaus	46.7	N/A

Table 4. RMA-2: Project Condition 1-in-200 AEP Shanghai-Yuba Centering Boundary Condition

Boundary Condition Location	Stage (feet-NGVD)	Peak flow (cfs)
Feather River at RM 28.7	N/A	157,704
Yuba River at RM 1.2	N/A	195,697
Bear River at RM 3.95	N/A	45,723
Feather River at Nicolaus	49.0	N/A

5. Results

Figures 28 through 33 show the water surface profiles from both the HEC-RAS model and RMA-2 model for the Feather River left bank levee. These figures show the following profiles:

- 1-in-100 AEP Project Condition Scenario 1 and 2.
- 1-in-200 AEP Project Condition Scenario 1 and 2.
- 1-in-100 AEP Existing Condition.
- 1-in-200 AEP Existing Condition.

Table 7 tabulates the water surface elevation for Scenario 1 and 2 for the 1-in-100 and 1-in-200 AEP events.

Velocities from the RMA 2 model are plotted for existing and project conditions. Figures 34 to 45 show the velocity plots.

TABLES

Table 5

January 1997 Calibration Results – (Feet-NGVD)							
HWM	**Observed**	**Computed**	**Difference (ft)**	**HWM**	**Observed**	**Computed**	**Difference (ft)**
Right Bank Feather River				**Left Bank Lower Feather River**			
Point 122	74.8	75.4	0.6	F27	53.1	52.3	-0.8
Point 123	75.1	75.3	0.2	F26	51.2	51.9	0.7
Point 124	74.8	75.3	0.5	F25	51.2	51.6	0.4
Yuba City Gage	75.2	75.2	0.0	F24	43.0	50.8	7.8
Point 125	70.9	74.7	3.8	F23	48.6	50.3	1.7
Point 126	73.2	73.6	0.4	F22	48.6	49.4	0.8
Point 127	72.5	72.8	0.3	F21	45.3	49.3	4.0
Point 128	72.5	72.5	0.0	F20	45.6	49.3	3.7
Point 129	72.5	72.3	-0.2	F19	47.2	49.1	1.9
Point 130	71.2	72.2	1.0	F18	47.2	47.8	0.6
Point 131	70.5	70.0	-0.5	F17	42.7	47.2	4.5
RF35	69.9	69.9	0.0	**Left Bank Upper Feather River**			
RF34	69.6	69.6	0.0	Point 119	75.1	75.5	0.4
RF33	68.9	68.8	-0.1	Point 118	74.8	75.3	0.5
RF32	67.6	67.4	-0.2	Point 117	74.8	75.0	0.2
RF31	67.3	67.0	-0.3	**Left Bank Bear River**			
RF30	66.3	66.1	-0.2	Point 90	56.8	58.5	1.7
RF29	65.6	65.3	-0.3	Point 89	57.4	57.6	0.2
RF28	64.3	64.5	0.2	Point 88	55.1	57.4	2.3
RF27	64.6	63.8	-0.8	F34	55.8	56.6	0.8
RF26	62.0	62.9	0.9	F33	56.1	56.3	0.2
RF25	63.3	62.8	-0.5	F32	55.1	55.4	0.3
RF24	63.0	62.6	-0.4	F31	54.5	55.1	0.6
RF23	62.3	62.3	0.0	F30	53.5	54.9	1.4
RF22	60.7	60.6	-0.1	F29	52.5	53.4	0.9
RF21	60.4	59.8	-0.5	F28	49.9	52.8	2.9
RF20	59.1	59.4	0.3				
RF19	59.7	58.0	-1.7				
RF18	48.9	56.9	8.0				
RF17	52.8	56.2	3.4				
RF16	54.5	54.8	0.3				
RF15	53.1	53.9	0.8				
RF14	53.1	53.3	0.2				
RF13	52.5	53.2	0.7				
RF12	52.2	52.7	0.5				
RF11	50.9	52.5	1.6				
RF10	49.2	52.4	3.2				
RF9	51.8	51.7	-0.1				
RF8	49.9	50.6	0.7				
FR7	47.9	49.5	1.6				
RF6	47.2	49.1	1.9				
RF5	48.2	49.0	0.8				
RF4	48.6	48.8	0.2				
RF3	47.2	47.6	0.4				
RF2	46.9	47.5	0.6				
RF1	46.6	47.2	0.6				

Table 6

February 1986 Verification Results – (Feet-NGVD)							
HWM	**Observed**	**Computed**	**Difference (ft)**	**HWM**	**Observed**	**Computed**	**Difference (ft)**
Right Bank Feather River				**Left Bank Lower Feather River**			
Yuba City Gage	73.4	73.6	0.2	Point 185	50.4	50.7	0.3
Point 74_1	70.2	70.7	0.5	Point 182	49.6	49.9	0.3
Point 53	70.7	70.4	-0.3	**Left Bank Upper Feather River**			
Point 52	69.4	68.1	-1.3	Point 66	73.1	73.0	-0.1
Point 51	68.8	68.3	-0.5	Point 50	69.7	68.8	-0.9
Point 212	67.9	67.4	-0.5	Point 207	62.6	61.3	-1.3
Point 211	67.4	66.7	-0.7	Point 206	62.5	61.2	-1.3
Point 210	67.1	65.4	-1.7	Point 202	59.6	58.9	-0.7
Point 209	66.1	64.7	-1.4	Point 201	59.2	58.5	-0.7
Point 208	63.8	63.0	-0.8	Point 196	54.7	54.8	0.1
Point 205	61.9	61.1	-0.8	Point 195	53.7	53.8	0.1
Point 204	61.9	61.0	-0.9	Point 192	53.1	53.0	-0.1
Point 203	60.9	59.3	-1.6	Point 191	51.9	52.0	0.1
Point 200	60.9	58.1	-2.8	Point 189	51.4	51.6	0.2
Point 199	59.2	57.6	-1.6	Point 187	50.9	51.3	0.4
Point 198	59.6	56.2	-3.4	**Right Bank Bear River**			
Point 197	55.1	55.1	0.0	Point 215	48.1	52.7	4.6
Point 194	54.6	54.2	-0.4	Point 214	52.3	52.4	0.1
Point 193	53.1	52.8	-0.3	Point 213	50.1	51.6	1.5
Point 190	51.8	51.9	0.1	**Left Bank Bear River**			
Point 188	51.5	51.6	0.1	Point 54	54.6	54.0	-0.6
Point 186	50.6	50.9	0.3	Point 55	53.2	53.0	-0.2
Point 184	50.2	50.8	0.6	Point 56	53.0	52.7	-0.3
Point 183	50.4	50.6	0.2				
Point 181	48.6	49.8	1.2				
Point 71	47.2	48.4	1.2				
Point 72	47.1	47.5	0.4				
Point 73	46.9	47.2	0.3				
Point 74	45.7	46.2	0.5				
Point 75	45.0	45.9	0.9				

Table 7

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
46+00	46+00	53.1	55.8	53.1	55.8
47+00	47+00	53.2	55.8	53.2	55.8
48+00	48+00	53.2	55.9	53.2	55.9
49+00	49+00	53.2	55.9	53.2	55.9
50+00	50+00	53.2	55.9	53.2	55.9
51+00	51+00	53.2	55.9	53.2	55.9
52+00	52+00	53.3	56.0	53.3	56.0
53+00	53+00	53.3	56.0	53.3	56.0
54+00	54+00	53.4	56.0	53.4	56.0
55+00	55+00	53.4	56.1	53.4	56.1
56+00	56+00	53.4	56.1	53.4	56.1
57+00	57+00	53.4	56.1	53.4	56.1
58+00	58+00	53.5	56.2	53.5	56.2
59+00	59+00	53.5	56.2	53.5	56.2
60+00	60+00	53.5	56.3	53.5	56.3
61+00	61+00	53.6	56.3	53.6	56.3
62+00	62+00	53.6	56.3	53.6	56.3
63+00	63+00	53.7	56.4	53.7	56.4
64+00	64+00	53.7	56.4	53.7	56.4
65+00	65+00	53.7	56.5	53.7	56.5
66+00	66+00	53.8	56.5	53.8	56.5
67+00	67+00	53.8	56.5	53.8	56.5
68+00	68+00	53.8	56.6	53.8	56.6
69+00	69+00	53.9	56.6	53.9	56.6
70+00	70+00	53.9	56.7	53.9	56.7
71+00	71+00	53.9	56.7	53.9	56.7
72+00	72+00	54.0	56.7	54.0	56.7
73+00	73+00	54.0	56.8	54.0	56.8
74+00	74+00	54.0	56.8	54.0	56.8
75+00	75+00	54.1	56.9	54.1	56.9
76+00	76+00	54.1	56.9	54.1	56.9
77+00	77+00	54.2	57.0	54.2	57.0
78+00	78+00	54.2	57.0	54.2	57.0
79+00	79+00	54.3	57.1	54.3	57.1
80+00	80+00	54.3	57.1	54.3	57.1
81+00	81+00	54.3	57.1	54.3	57.1
82+00	82+00	54.3	57.2	54.3	57.2
83+00	83+00	54.3	57.2	54.3	57.2
84+00	84+00	54.4	57.2	54.4	57.2
85+00	85+00	54.4	57.2	54.4	57.2
86+00	86+00	54.4	57.3	54.4	57.3
87+00	87+00	54.5	57.3	54.5	57.3
88+00	88+00	54.5	57.4	54.5	57.4
89+00	89+00	54.5	57.4	54.5	57.4

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
90+00	90+00	54.5	57.4	54.5	57.4
91+00	91+00	54.6	57.4	54.6	57.4
92+00	92+00	54.6	57.5	54.6	57.5
93+00	93+00	54.6	57.5	54.6	57.5
94+00	94+00	54.7	57.6	54.7	57.6
95+00	95+00	54.7	57.6	54.7	57.6
96+00	96+00	54.8	57.7	54.8	57.7
97+00	97+00	54.8	57.7	54.8	57.7
98+00	98+00	54.9	57.8	54.9	57.8
99+00	99+00	54.9	57.8	54.9	57.8
100+00	100+00	54.9	57.9	54.9	57.9
101+00	101+00	55.0	57.9	55.0	57.9
102+00	102+00	55.0	58.0	55.0	58.0
103+00	103+00	55.1	58.0	55.1	58.0
104+00	104+00	55.1	58.1	55.1	58.1
105+00	105+00	55.1	58.1	55.1	58.1
106+00	106+00	55.2	58.1	55.2	58.1
107+00	107+00	55.2	58.2	55.2	58.2
108+00	108+00	55.2	58.2	55.2	58.2
109+00	109+00	55.3	58.2	55.3	58.2
110+00	110+00	55.3	58.3	55.3	58.3
111+00	111+00	55.3	58.3	55.3	58.3
112+00	112+00	55.4	58.4	55.4	58.4
113+00	113+00	55.4	58.4	55.4	58.4
114+00	114+00	55.5	58.5	55.5	58.5
115+00	115+00	55.5	58.5	55.5	58.5
116+00	116+00	55.6	58.6	55.6	58.6
117+00	117+00	55.7	58.7	55.7	58.7
118+00	118+00	55.7	58.7	55.7	58.7
119+00	119+00	55.8	58.8	55.8	58.8
120+00	120+00	55.8	58.8	55.8	58.8
121+00	121+00	55.8	58.8	55.8	58.8
122+00	122+00	55.8	58.9	55.8	58.9
123+00	123+00	55.9	58.9	55.9	58.9
124+00	124+00	55.9	58.9	55.9	58.9
125+00	125+00	55.9	58.9	55.9	58.9
126+00	126+00	55.9	59.0	55.9	59.0
127+00	127+00	55.9	59.0	55.9	59.0
128+00	128+00	56.0	59.0	56.0	59.0
129+00	129+00	56.0	59.0	56.0	59.0
130+00	130+00	56.0	59.0	56.0	59.0
131+00	131+00	56.0	59.1	56.0	59.1
132+00	132+00	56.1	59.1	56.1	59.1
133+00	133+00	56.1	59.2	56.1	59.2
134+00	134+00	56.1	59.2	56.1	59.2

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
135+00	135+00	56.1	59.2	56.1	59.2
136+00	136+00	56.2	59.2	56.2	59.2
137+00	137+00	56.2	59.2	56.2	59.2
138+00	138+00	56.2	59.2	56.2	59.2
139+00	139+00	56.3	59.3	56.3	59.3
140+00	140+00	56.3	59.4	56.3	59.4
141+00	141+00	56.4	59.5	56.4	59.5
142+00	142+00	56.5	59.6	56.5	59.6
143+00	143+00	56.6	59.7	56.6	59.7
144+00	144+00	56.7	59.7	56.7	59.7
145+00	145+00	56.7	59.8	56.7	59.8
146+00	146+00	56.8	59.9	56.8	59.9
147+00	147+00	56.8	59.9	56.8	59.9
148+00	148+00	56.9	60.0	56.9	60.0
149+00	149+00	56.9	60.0	56.9	60.0
150+00	150+00	56.9	60.1	56.9	60.1
151+00	151+00	57.0	60.1	57.0	60.1
152+00	152+00	57.0	60.1	57.0	60.1
153+00	153+00	57.0	60.1	57.0	60.1
154+00	154+00	57.0	60.2	57.0	60.2
155+00	155+00	57.1	60.2	57.1	60.2
156+00	156+00	57.1	60.2	57.1	60.2
157+00	157+00	57.1	60.2	57.1	60.2
158+00	158+00	57.1	60.3	57.1	60.3
159+00	159+00	57.2	60.3	57.2	60.3
160+00	160+00	57.2	60.3	57.2	60.3
161+00	161+00	57.2	60.3	57.2	60.3
162+00	162+00	57.2	60.4	57.2	60.4
163+00	163+00	57.3	60.4	57.3	60.4
164+00	164+00	57.3	60.4	57.3	60.4
165+00	165+00	57.3	60.5	57.3	60.5
166+00	166+00	57.3	60.5	57.3	60.5
167+00	167+00	57.4	60.5	57.4	60.5
168+00	168+00	57.4	60.5	57.4	60.5
169+00	169+00	57.4	60.6	57.4	60.6
170+00	170+00	57.5	60.6	57.5	60.6
171+00	171+00	57.5	60.7	57.5	60.7
172+00	172+00	57.6	60.7	57.6	60.7
173+00	173+00	57.6	60.8	57.6	60.8
174+00	174+00	57.6	60.8	57.6	60.8
175+00	175+00	57.7	60.8	57.7	60.8
176+00	176+00	57.7	60.9	57.7	60.9
177+00	177+00	57.8	60.9	57.8	60.9
178+00	178+00	57.8	61.0	57.8	61.0
179+00	179+00	57.9	61.1	57.9	61.1

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
180+00	180+00	57.9	61.1	57.9	61.1
181+00	181+00	58.0	61.2	58.0	61.2
182+00	182+00	58.0	61.2	58.0	61.2
183+00	183+00	58.1	61.3	58.1	61.3
184+00	184+00	58.1	61.3	58.1	61.3
185+00	185+00	58.1	61.4	58.1	61.4
186+00	186+00	58.2	61.4	58.2	61.4
187+00	187+00	58.2	61.5	58.2	61.5
188+00	188+00	58.3	61.5	58.3	61.5
189+00	189+00	58.3	61.6	58.3	61.6
190+00	190+00	58.4	61.6	58.4	61.6
191+00	191+00	58.4	61.6	58.4	61.6
192+00	192+00	58.4	61.6	58.4	61.6
193+00	193+00	58.4	61.6	58.4	61.6
194+00	194+00	58.5	61.7	58.5	61.7
195+00	195+00	58.5	61.7	58.5	61.7
196+00	196+00	58.5	61.7	58.5	61.7
197+00	197+00	58.6	61.8	58.6	61.8
198+00	198+00	58.6	61.8	58.6	61.8
199+00	199+00	58.6	61.8	58.6	61.8
200+00	200+00	58.7	61.9	58.7	61.9
201+00	201+00	58.7	61.9	58.7	61.9
202+00	202+00	58.7	61.9	58.7	61.9
203+00	203+00	58.7	61.9	58.7	61.9
204+00	204+00	58.8	61.9	58.8	61.9
205+00	205+00	58.8	62.0	58.8	62.0
206+00	206+00	58.8	62.0	58.8	62.0
207+00	207+00	58.9	62.1	58.9	62.1
208+00	208+00	59.0	62.2	59.0	62.2
209+00	209+00	59.0	62.2	59.0	62.2
210+00	210+00	59.1	62.3	59.1	62.3
211+00	211+00	59.1	62.3	59.1	62.3
212+00	212+00	59.1	62.4	59.1	62.4
213+00	213+00	59.2	62.4	59.2	62.4
214+00	214+00	59.2	62.5	59.2	62.5
215+00	215+00	59.3	62.5	59.3	62.5
216+00	216+00	59.3	62.5	59.3	62.5
217+00	217+00	59.3	62.5	59.3	62.5
218+00	218+00	59.3	62.5	59.3	62.5
219+00	219+00	59.3	62.5	59.3	62.5
220+00	220+00	59.3	62.5	59.3	62.5
221+00	221+00	59.3	62.5	59.3	62.5
222+00	222+00	59.3	62.5	59.3	62.5
223+00	223+00	59.3	62.5	59.3	62.5
224+00	224+00	59.3	62.5	59.3	62.5

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
228+00	229+00	59.6	62.8	59.6	62.8
229+00	230+00	59.5	62.8	59.5	62.8
230+00	231+00	59.6	62.9	59.6	62.9
231+00	232+00	59.6	62.9	59.6	62.9
232+00	233+00	59.7	62.9	59.7	62.9
233+00	234+00	59.7	62.9	59.7	62.9
234+00	235+00	59.7	63.0	59.7	63.0
235+00	236+00	59.7	63.0	59.7	63.0
236+00	237+00	59.8	63.0	59.8	63.0
237+00	238+00	59.8	63.0	59.8	63.0
238+00	239+00	59.8	63.0	59.8	63.0
239+00	240+00	59.8	63.0	59.8	63.0
240+00	241+00	59.8	63.0	59.8	63.0
241+00	242+00	59.8	63.0	59.8	63.0
242+00	243+00	59.8	63.0	59.8	63.0
243+00	244+00	59.8	63.0	59.8	63.0
244+00	245+00	59.8	63.0	59.8	63.0
245+00	246+00	59.8	63.0	59.8	63.0
246+00	247+00	59.8	63.0	59.8	63.0
247+00	0+00	59.8	63.0	59.8	63.0
247+28	1+00	59.8	63.0	59.8	63.0
250+28	4+00	60.0	63.1	60.0	63.1
253+28	7+00	60.0	63.2	60.0	63.2
254+28	8+00	60.1	63.3	60.1	63.3
255+28	9+00	60.1	63.3	60.1	63.3
256+28	10+00	60.2	63.3	60.1	63.3
257+28	11+00	60.2	63.3	60.2	63.3
258+28	12+00	60.2	63.4	60.2	63.4
259+28	13+00	60.2	63.4	60.2	63.4
260+28	14+00	60.2	63.4	60.2	63.4
261+28	15+00	60.3	63.4	60.3	63.4
262+28	16+00	60.3	63.5	60.3	63.5
263+28	17+00	60.3	63.5	60.3	63.5
264+28	18+00	60.3	63.5	60.3	63.5
265+28	19+00	60.3	63.5	60.3	63.5
266+28	20+00	60.3	63.5	60.3	63.5
267+28	21+00	60.4	63.5	60.4	63.5
268+28	22+00	60.4	63.5	60.4	63.5
269+28	23+00	60.4	63.5	60.4	63.5
270+28	24+00	60.4	63.6	60.4	63.6
271+28	25+00	60.4	63.6	60.4	63.6
272+28	26+00	60.4	63.6	60.4	63.6
273+28	27+00	60.4	63.6	60.4	63.6
274+28	28+00	60.4	63.6	60.4	63.6
275+28	29+00	60.4	63.6	60.4	63.6

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
276+28	30+00	60.4	63.6	60.4	63.6
277+28	31+00	60.4	63.6	60.4	63.6
278+28	32+00	60.5	63.6	60.5	63.6
279+28	33+00	60.5	63.7	60.5	63.7
280+28	34+00	60.5	63.7	60.5	63.7
281+28	35+00	60.5	63.7	60.5	63.7
282+28	36+00	60.5	63.7	60.5	63.7
283+28	37+00	60.5	63.7	60.5	63.7
284+28	38+00	60.5	63.7	60.5	63.7
285+28	39+00	60.5	63.7	60.5	63.7
286+28	40+00	60.6	63.8	60.6	63.8
287+28	41+00	60.6	63.8	60.6	63.8
288+28	42+00	60.6	63.8	60.6	63.8
289+28	43+00	60.6	63.8	60.6	63.8
290+28	44+00	60.6	63.8	60.6	63.8
291+28	45+00	60.6	63.8	60.6	63.8
292+28	46+00	60.7	63.9	60.7	63.9
293+28	47+00	60.7	63.9	60.7	63.9
294+28	48+00	60.7	63.9	60.7	63.9
295+28	49+00	60.7	63.9	60.7	63.9
296+28	50+00	60.7	63.9	60.7	63.9
297+28	51+00	60.8	64.0	60.8	64.0
298+28	52+00	60.8	64.0	60.8	64.0
299+28	53+00	60.8	64.0	60.8	64.0
300+28	54+00	60.8	64.0	60.8	64.0
301+28	55+00	60.9	64.1	60.9	64.1
302+28	56+00	60.9	64.1	60.9	64.1
303+28	57+00	60.9	64.1	60.9	64.1
304+28	58+00	60.9	64.1	60.9	64.1
305+28	59+00	60.9	64.1	60.9	64.1
306+28	60+00	60.9	64.1	60.9	64.1
307+28	61+00	60.9	64.2	60.9	64.2
308+28	62+00	61.0	64.2	61.0	64.2
309+28	63+00	61.0	64.2	61.0	64.2
310+28	64+00	61.0	64.2	61.0	64.2
311+28	65+00	61.0	64.2	61.0	64.2
312+28	66+00	61.0	64.2	61.0	64.2
313+28	67+00	61.0	64.2	61.0	64.2
314+28	68+00	61.1	64.3	61.1	64.3
315+28	69+00	61.1	64.3	61.1	64.3
316+28	70+00	61.1	64.3	61.1	64.3
317+28	71+00	61.1	64.3	61.1	64.3
318+28	72+00	61.2	64.4	61.2	64.4
319+28	73+00	61.2	64.4	61.2	64.4
320+28	74+00	61.2	64.4	61.2	64.4

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
321+28	75+00	61.2	64.4	61.2	64.4
322+28	76+00	61.3	64.4	61.3	64.4
323+28	77+00	61.3	64.5	61.3	64.5
324+28	78+00	61.3	64.5	61.3	64.5
325+28	79+00	61.4	64.5	61.4	64.5
326+28	80+00	61.4	64.6	61.4	64.6
327+28	81+00	61.4	64.6	61.4	64.6
328+28	82+00	61.4	64.6	61.4	64.6
329+28	83+00	61.5	64.6	61.5	64.6
330+28	84+00	61.5	64.7	61.5	64.7
331+28	85+00	61.5	64.7	61.5	64.7
332+28	86+00	61.5	64.7	61.5	64.7
333+28	87+00	61.6	64.7	61.6	64.7
334+28	88+00	61.6	64.8	61.6	64.8
335+28	89+00	61.6	64.8	61.6	64.8
336+28	90+00	61.7	64.8	61.7	64.8
337+28	91+00	61.7	64.9	61.7	64.9
338+28	92+00	61.7	64.9	61.7	64.9
339+28	93+00	61.7	64.9	61.7	64.9
340+28	94+00	61.7	64.9	61.7	64.9
341+28	95+00	61.8	64.9	61.8	64.9
342+28	96+00	61.8	65.0	61.8	64.9
343+28	97+00	61.8	65.0	61.8	65.0
344+28	98+00	61.8	65.0	61.8	65.0
345+28	99+00	61.8	65.0	61.8	65.0
346+28	100+00	61.9	65.0	61.9	65.0
347+28	101+00	61.9	65.1	61.9	65.0
348+28	102+00	61.9	65.1	61.9	65.1
349+28	103+00	61.9	65.1	61.9	65.1
350+28	104+00	61.9	65.1	61.9	65.1
351+28	105+00	61.9	65.1	61.9	65.1
352+28	106+00	61.9	65.1	61.9	65.1
353+28	107+00	62.0	65.1	62.0	65.1
354+28	108+00	62.0	65.2	62.0	65.2
355+28	109+00	62.0	65.2	62.0	65.2
356+28	110+00	62.0	65.2	62.0	65.2
357+28	111+00	62.0	65.2	62.0	65.2
358+28	112+00	62.0	65.2	62.0	65.2
359+28	113+00	62.0	65.2	62.0	65.2
360+28	114+00	62.0	65.2	62.0	65.2
361+28	115+00	62.0	65.2	62.0	65.2
362+28	116+00	62.0	65.2	62.0	65.2
363+28	117+00	62.1	65.3	62.0	65.2
364+28	118+00	62.1	65.3	62.0	65.3
365+28	119+00	62.1	65.3	62.1	65.3

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
366+28	120+00	62.1	65.3	62.1	65.3
367+28	121+00	62.1	65.3	62.1	65.3
368+28	122+00	62.1	65.3	62.1	65.3
369+28	123+00	62.1	65.3	62.1	65.3
370+28	124+00	62.1	65.3	62.1	65.3
371+28	125+00	62.1	65.3	62.1	65.3
372+28	126+00	62.1	65.4	62.1	65.3
373+28	127+00	62.1	65.4	62.1	65.3
374+28	128+00	62.2	65.4	62.1	65.4
375+28	129+00	62.2	65.4	62.1	65.4
376+28	130+00	62.2	65.4	62.2	65.4
377+28	131+00	62.2	65.4	62.2	65.4
378+28	132+00	62.2	65.4	62.2	65.4
379+28	133+00	62.2	65.4	62.2	65.4
380+28	134+00	62.2	65.5	62.2	65.4
381+28	135+00	62.2	65.5	62.2	65.5
382+28	136+00	62.3	65.5	62.2	65.5
383+28	137+00	62.3	65.5	62.3	65.5
384+28	138+00	62.3	65.5	62.3	65.5
385+28	139+00	62.3	65.5	62.3	65.5
386+28	140+00	62.3	65.6	62.3	65.5
387+28	141+00	62.3	65.6	62.3	65.6
388+28	142+00	62.4	65.6	62.3	65.6
389+28	143+00	62.4	65.6	62.3	65.6
390+28	144+00	62.4	65.6	62.4	65.6
391+28	145+00	62.4	65.6	62.4	65.6
392+28	146+00	62.4	65.7	62.4	65.6
393+28	147+00	62.4	65.7	62.4	65.6
394+28	148+00	62.4	65.7	62.4	65.7
395+28	149+00	62.5	65.7	62.4	65.7
396+28	150+00	62.5	65.7	62.5	65.7
397+28	151+00	62.5	65.8	62.5	65.7
398+28	152+00	62.5	65.8	62.5	65.7
399+28	153+00	62.6	65.8	62.5	65.8
400+28	154+00	62.6	65.8	62.5	65.8
401+28	155+00	62.6	65.8	62.6	65.8
402+28	156+00	62.6	65.9	62.6	65.8
403+28	157+00	62.6	65.9	62.6	65.8
404+28	158+00	62.7	65.9	62.6	65.9
405+28	159+00	62.7	65.9	62.6	65.9
406+28	160+00	62.7	65.9	62.7	65.9
407+28	161+00	62.7	66.0	62.7	65.9
408+28	162+00	62.7	66.0	62.7	65.9
409+28	163+00	62.8	66.0	62.7	66.0
410+28	164+00	62.8	66.0	62.8	66.0

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
411+28	165+00	62.8	66.1	62.8	66.0
412+28	166+00	62.8	66.1	62.8	66.1
413+28	167+00	62.9	66.1	62.8	66.1
414+28	168+00	62.9	66.1	62.9	66.1
415+28	169+00	62.9	66.2	62.9	66.1
416+28	170+00	62.9	66.2	62.9	66.2
417+28	171+00	63.0	66.2	62.9	66.2
418+28	172+00	63.0	66.2	63.0	66.2
419+28	173+00	63.0	66.3	63.0	66.3
420+28	174+00	63.1	66.3	63.0	66.3
421+28	175+00	63.1	66.3	63.1	66.3
422+28	176+00	63.1	66.3	63.1	66.3
423+28	177+00	63.1	66.4	63.1	66.4
424+28	178+00	63.2	66.4	63.2	66.4
425+28	179+00	63.2	66.4	63.2	66.4
426+28	180+00	63.2	66.4	63.2	66.5
427+28	181+00	63.2	66.5	63.2	66.5
428+28	182+00	63.3	66.5	63.3	66.5
429+28	183+00	63.3	66.5	63.3	66.5
430+28	184+00	63.3	66.6	63.3	66.6
431+28	185+00	63.3	66.6	63.4	66.6
432+28	186+00	63.4	66.6	63.4	66.6
433+28	187+00	63.4	66.6	63.4	66.7
434+28	188+00	63.4	66.7	63.5	66.7
435+28	189+00	63.5	66.7	63.5	66.7
436+28	190+00	63.5	66.7	63.5	66.8
437+28	191+00	63.5	66.7	63.6	66.8
438+28	192+00	63.5	66.8	63.6	66.8
439+28	193+00	63.6	66.8	63.6	66.8
440+28	194+00	63.6	66.8	63.6	66.9
441+28	195+00	63.6	66.8	63.7	66.9
442+28	196+00	63.7	66.9	63.7	66.9
443+28	197+00	63.7	66.9	63.7	66.9
444+28	198+00	63.7	66.9	63.7	67.0
445+28	199+00	63.7	67.0	63.8	67.0
446+28	200+00	63.8	67.0	63.8	67.0
447+28	201+00	63.8	67.0	63.9	67.1
448+28	202+00	63.9	67.1	63.9	67.1
449+28	203+00	63.9	67.2	64.0	67.2
450+28	204+00	64.0	67.2	64.0	67.3
451+28	205+00	64.0	67.3	64.1	67.3
452+28	206+00	64.1	67.3	64.1	67.4
453+28	207+00	64.1	67.3	64.2	67.4
454+28	208+00	64.2	67.4	64.2	67.4
455+28	209+00	64.2	67.4	64.3	67.5

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
456+28	210+00	64.2	67.5	64.3	67.5
457+28	211+00	64.3	67.5	64.3	67.6
458+28	212+00	64.3	67.5	64.4	67.6
459+28	213+00	64.4	67.6	64.4	67.6
460+28	214+00	64.4	67.6	64.4	67.7
461+28	215+00	64.4	67.7	64.5	67.7
462+28	216+00	64.5	67.7	64.5	67.7
463+28	217+00	64.5	67.7	64.6	67.8
464+28	218+00	64.5	67.8	64.6	67.8
465+28	219+00	64.6	67.8	64.6	67.9
466+28	220+00	64.6	67.8	64.7	67.9
467+28	221+00	64.6	67.9	64.7	67.9
468+28	222+00	64.7	67.9	64.7	68.0
469+28	223+00	64.7	67.9	64.8	68.0
470+28	224+00	64.7	68.0	64.8	68.0
471+28	225+00	64.8	68.0	64.8	68.1
472+28	226+00	64.8	68.0	64.8	68.1
473+28	227+00	64.8	68.1	64.9	68.1
474+28	228+00	64.9	68.1	64.9	68.1
475+28	229+00	64.9	68.1	64.9	68.2
476+28	230+00	64.9	68.2	65.0	68.2
477+28	231+00	64.9	68.2	65.0	68.2
478+28	232+00	65.0	68.2	65.0	68.3
479+28	233+00	65.0	68.2	65.0	68.3
480+28	234+00	65.0	68.3	65.0	68.3
481+28	235+00	65.0	68.3	65.1	68.3
482+28	236+00	65.1	68.3	65.1	68.4
483+28	237+00	65.1	68.3	65.1	68.4
484+28	238+00	65.1	68.4	65.2	68.4
485+28	239+00	65.1	68.4	65.2	68.5
486+28	240+00	65.2	68.4	65.2	68.5
487+28	241+00	65.2	68.5	65.2	68.5
488+28	242+00	65.2	68.5	65.3	68.5
489+28	243+00	65.3	68.5	65.3	68.6
490+28	244+00	65.3	68.5	65.3	68.6
491+28	245+00	65.3	68.6	65.4	68.6
492+28	246+00	65.3	68.6	65.4	68.6
493+28	247+00	65.4	68.6	65.4	68.7
494+28	248+00	65.4	68.7	65.5	68.7
495+28	249+00	65.4	68.7	65.5	68.7
496+28	250+00	65.5	68.7	65.5	68.8
497+28	251+00	65.5	68.7	65.6	68.8
498+28	252+00	65.5	68.8	65.6	68.8
499+28	253+00	65.6	68.8	65.6	68.9
500+28	254+00	65.6	68.8	65.7	68.9

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
501+28	255+00	65.7	68.9	65.7	68.9
502+28	256+00	65.7	68.9	65.7	68.9
503+28	257+00	65.7	68.9	65.8	69.0
504+28	258+00	65.7	68.9	65.8	69.0
505+28	259+00	65.8	69.0	65.8	69.0
506+28	260+00	65.8	69.0	65.9	69.1
507+28	261+00	65.9	69.0	65.9	69.1
508+28	262+00	65.9	69.1	65.9	69.1
509+28	263+00	65.9	69.1	66.0	69.2
510+28	264+00	66.0	69.2	66.0	69.2
511+28	265+00	66.0	69.2	66.0	69.2
512+28	266+00	66.0	69.2	66.1	69.3
513+28	267+00	66.1	69.2	66.1	69.3
514+28	268+00	66.1	69.3	66.1	69.3
515+28	269+00	66.1	69.3	66.2	69.4
516+28	270+00	66.2	69.3	66.2	69.4
517+28	271+00	66.2	69.4	66.2	69.4
518+28	272+00	66.2	69.4	66.3	69.5
519+28	273+00	66.3	69.5	66.3	69.5
520+28	274+00	66.3	69.5	66.4	69.5
521+28	275+00	66.4	69.5	66.4	69.6
522+28	276+00	66.4	69.6	66.4	69.6
523+28	277+00	66.5	69.6	66.5	69.7
524+28	278+00	66.5	69.7	66.5	69.7
525+28	279+00	66.5	69.7	66.6	69.7
526+28	280+00	66.6	69.7	66.6	69.8
527+28	281+00	66.6	69.8	66.7	69.8
528+28	282+00	66.7	69.8	66.7	69.9
529+28	283+00	66.7	69.9	66.7	69.9
530+28	284+00	66.7	69.9	66.8	69.9
531+28	285+00	66.8	69.9	66.8	70.0
532+28	286+00	66.8	70.0	66.8	70.0
533+28	287+00	66.8	70.0	66.9	70.0
534+28	288+00	66.9	70.0	66.9	70.1
535+28	289+00	66.9	70.1	67.0	70.1
536+28	290+00	67.0	70.1	67.0	70.1
537+28	291+00	67.0	70.1	67.0	70.2
538+28	292+00	67.0	70.2	67.1	70.2
539+28	293+00	67.1	70.2	67.1	70.3
540+28	294+00	67.1	70.3	67.2	70.3
541+28	295+00	67.2	70.3	67.2	70.3
542+28	296+00	67.2	70.3	67.2	70.4
543+28	297+00	67.2	70.4	67.2	70.4
544+28	298+00	67.2	70.4	67.3	70.4
545+28	299+00	67.3	70.4	67.3	70.4

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
546+28	300+00	67.3	70.4	67.3	70.4
547+28	301+00	67.3	70.4	67.3	70.5
548+28	302+00	67.3	70.5	67.3	70.5
549+28	575+00	67.3	70.5	67.4	70.5
549+88	576+00	67.3	70.5	67.4	70.5
550+88	577+00	67.4	70.5	67.4	70.5
551+88	578+00	67.4	70.5	67.4	70.5
552+88	579+00	67.4	70.5	67.4	70.6
553+88	580+00	67.4	70.5	67.4	70.6
554+88	581+00	67.4	70.5	67.4	70.6
555+88	582+00	67.4	70.6	67.5	70.6
556+88	583+00	67.4	70.6	67.5	70.6
557+88	584+00	67.4	70.6	67.5	70.6
558+88	585+00	67.5	70.6	67.5	70.6
559+88	586+00	67.5	70.6	67.5	70.6
560+88	587+00	67.5	70.6	67.5	70.7
561+88	588+00	67.5	70.6	67.5	70.7
562+88	589+00	67.5	70.7	67.6	70.7
563+88	590+00	67.5	70.7	67.6	70.7
564+88	591+00	67.5	70.7	67.6	70.7
565+88	592+00	67.6	70.7	67.6	70.7
566+88	593+00	67.6	70.7	67.6	70.7
567+88	594+00	67.6	70.7	67.6	70.7
568+88	595+00	67.6	70.7	67.6	70.8
569+88	596+00	67.6	70.7	67.6	70.8
570+88	597+00	67.6	70.8	67.7	70.8
571+88	598+00	67.6	70.8	67.7	70.8
572+88	599+00	67.7	70.8	67.7	70.8
573+88	600+00	67.7	70.8	67.7	70.8
574+88	601+00	67.7	70.8	67.7	70.8
575+88	602+00	67.7	70.8	67.8	70.9
576+88	603+00	67.8	70.9	67.8	70.9
577+88	604+00	67.8	70.9	67.8	70.9
578+88	605+00	67.8	70.9	67.8	71.0
579+88	606+00	67.8	70.9	67.9	71.0
580+88	607+00	67.9	71.0	67.9	71.0
581+88	608+00	68.0	71.0	68.0	71.1
582+88	609+00	68.0	71.1	68.1	71.2
583+88	610+00	68.1	71.2	68.2	71.2
584+88	611+00	68.2	71.3	68.2	71.3
585+88	612+00	68.3	71.4	68.3	71.4
586+88	613+00	68.4	71.5	68.4	71.5
587+88	614+00	68.5	71.6	68.5	71.6
588+88	615+00	68.6	71.6	68.6	71.7
589+88	616+00	68.6	71.7	68.6	71.7

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
590+88	617+00	68.7	71.7	68.7	71.8
591+88	618+00	68.7	71.8	68.7	71.8
592+88	619+00	68.7	71.8	68.7	71.8
593+88	620+00	68.7	71.8	68.8	71.9
594+88	621+00	68.8	71.9	68.8	71.9
595+88	622+00	68.8	71.9	68.8	71.9
596+88	623+00	68.8	72.0	68.9	72.0
597+88	624+00	68.9	72.0	68.9	72.0
598+88	625+00	68.9	72.0	68.9	72.1
599+88	626+00	68.9	72.0	68.9	72.1
600+88	627+00	68.9	72.1	69.0	72.1
601+88	628+00	69.0	72.1	69.0	72.1
602+88	629+00	69.0	72.1	69.0	72.1
603+88	630+00	69.0	72.1	69.0	72.1
604+88	631+00	69.0	72.1	69.0	72.2
605+88	632+00	69.0	72.2	69.0	72.2
606+88	633+00	69.1	72.2	69.1	72.2
607+88	634+00	69.1	72.2	69.1	72.2
608+88	635+00	69.1	72.2	69.1	72.3
609+88	636+00	69.2	72.3	69.2	72.3
610+88	637+00	69.2	72.3	69.2	72.4
611+88	638+00	69.2	72.4	69.2	72.4
612+88	639+00	69.3	72.4	69.3	72.4
613+88	640+00	69.3	72.4	69.3	72.5
614+88	641+00	69.3	72.5	69.3	72.5
615+88	642+00	69.4	72.5	69.4	72.5
616+88	643+00	69.4	72.5	69.4	72.6
617+88	644+00	69.4	72.6	69.4	72.6
618+88	645+00	69.4	72.6	69.5	72.6
619+88	646+00	69.5	72.6	69.5	72.7
620+88	647+00	69.5	72.7	69.5	72.7
621+88	648+00	69.5	72.7	69.5	72.7
622+88	649+00	69.5	72.7	69.6	72.7
623+88	650+00	69.6	72.7	69.6	72.8
624+88	651+00	69.6	72.8	69.6	72.8
625+88	652+00	69.6	72.8	69.6	72.8
626+88	653+00	69.6	72.8	69.7	72.8
627+88	654+00	69.7	72.8	69.7	72.9
628+88	655+00	69.7	72.8	69.7	72.9
629+88	656+00	69.7	72.9	69.7	72.9
630+88	657+00	69.7	72.9	69.7	72.9
631+88	658+00	69.7	72.9	69.7	72.9
632+88	659+00	69.7	72.9	69.7	72.9
633+88	660+00	69.7	72.9	69.7	72.9
634+88	661+00	69.7	72.9	69.7	72.9

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
635+88	662+00	69.7	72.9	69.7	72.9
636+88	663+00	69.7	72.9	69.8	72.9
637+88	664+00	69.8	72.9	69.8	72.9
638+88	665+00	69.8	72.9	69.8	73.0
639+88	666+00	69.8	73.0	69.8	73.0
640+88	667+00	69.8	73.0	69.8	73.0
641+88	668+00	69.8	73.0	69.8	73.0
642+88	669+00	69.9	73.0	69.9	73.0
643+88	670+00	69.9	73.0	69.9	73.1
644+88	671+00	69.9	73.1	69.9	73.1
645+88	672+00	70.0	73.1	70.0	73.1
646+88	673+00	70.0	73.1	70.0	73.2
647+88	674+00	70.0	73.2	70.0	73.2
648+88	675+00	70.1	73.2	70.1	73.2
649+88	676+00	70.1	73.2	70.1	73.2
650+88	677+00	70.1	73.2	70.1	73.3
651+88	678+00	70.2	73.3	70.2	73.3
652+88	679+00	70.2	73.3	70.2	73.3
653+88	680+00	70.2	73.3	70.2	73.3
654+88	681+00	70.2	73.3	70.2	73.4
655+88	682+00	70.3	73.4	70.3	73.4
656+88	683+00	70.3	73.4	70.3	73.4
657+88	684+00	70.3	73.4	70.3	73.4
658+88	685+00	70.3	73.4	70.3	73.4
659+88	686+00	70.3	73.4	70.3	73.4
660+88	687+00	70.3	73.4	70.3	73.4
661+88	688+00	70.3	73.4	70.3	73.4
662+88	689+00	70.3	73.4	70.3	73.4
663+88	690+00	70.3	73.4	70.3	73.4
664+88	691+00	70.3	73.4	70.3	73.4
666+88	692+00	70.4	73.3	70.3	73.4
667+88	693+00	70.9	74.0	70.8	74.0
668+88	694+00	70.9	74.0	70.9	74.1
670+88	695+00	71.0	74.1	71.0	74.1
671+88	696+00	71.0	74.1	71.0	74.1
672+88	697+00	71.1	74.2	71.1	74.2
673+88	698+00	71.2	74.2	71.1	74.3
674+88	699+00	71.2	74.3	71.2	74.3
675+88	700+00	71.3	74.4	71.3	74.4
676+88	701+00	71.3	74.4	71.3	74.4
677+88	702+00	71.4	74.4	71.3	74.4
678+88	703+00	71.5	74.5	71.4	74.5
679+88	704+00	71.6	74.6	71.5	74.6
680+88	705+00	71.7	74.7	71.6	74.7
681+88	706+00	71.7	74.7	71.6	74.7

Project Condition Model Results					
		Scenario 1		Scenario 2	
		1-in-100 AEP	1-in-200 AEP	1-in-100 AEP	1-in-200 AEP
Profile Levee Station	GEI Levee Station	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations	RMA-2 Water Surface Elevations
(ft)	(ft)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)	(ft-NGVD)
682+88	707+00	71.6	74.5	71.5	74.6
683+88	708+00	71.5	74.4	71.5	74.5

FIGURES

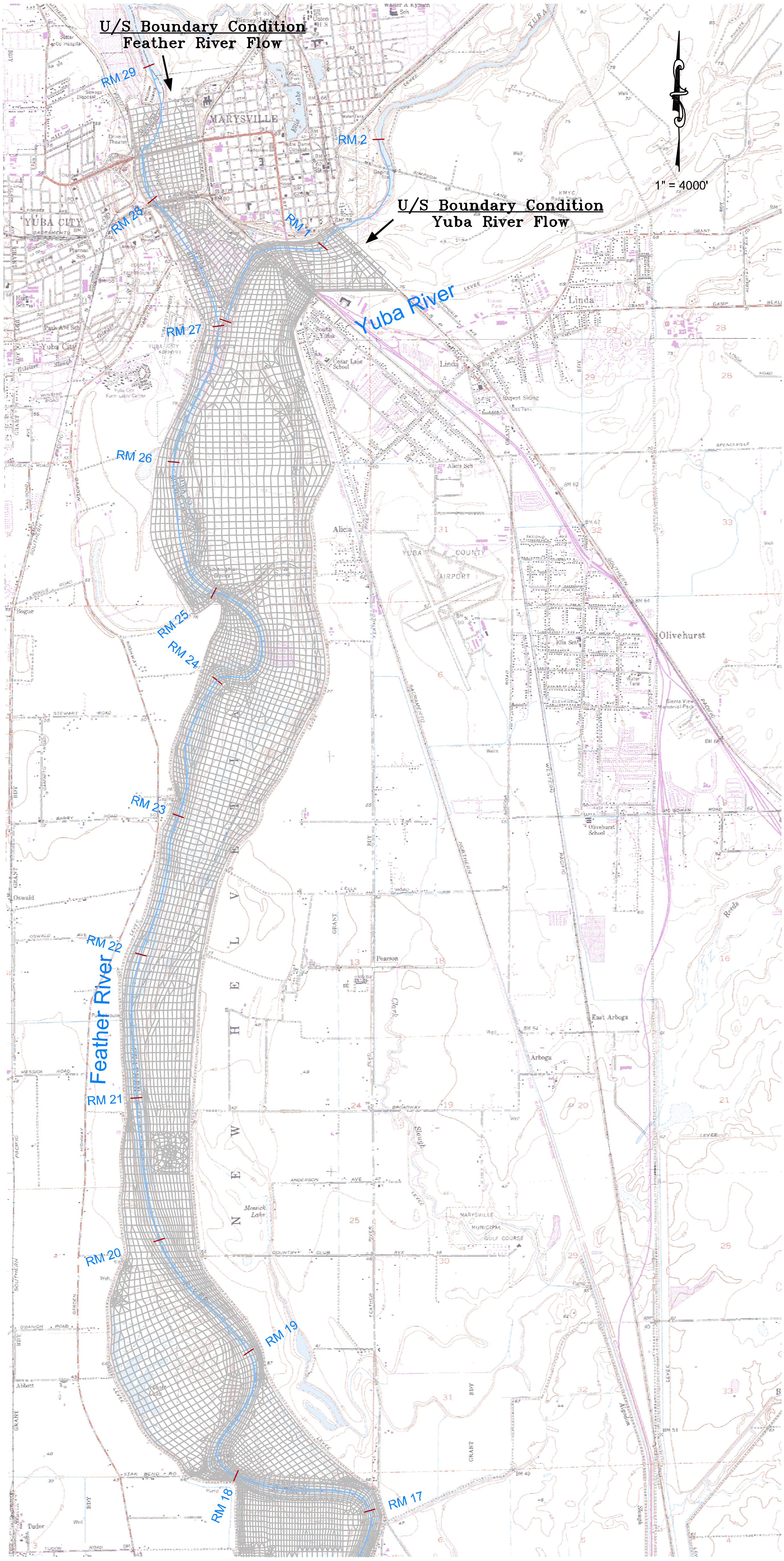


Figure 1

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE: 1"=4000'
JOB NUMBER: 5141.41
REQUESTED BY: GP
DRAWN BY: GP
DATE: June 2007

Three Rivers Levee Improvement Authority

Calibration and Verification
RMA-2 Finite Element Mesh

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

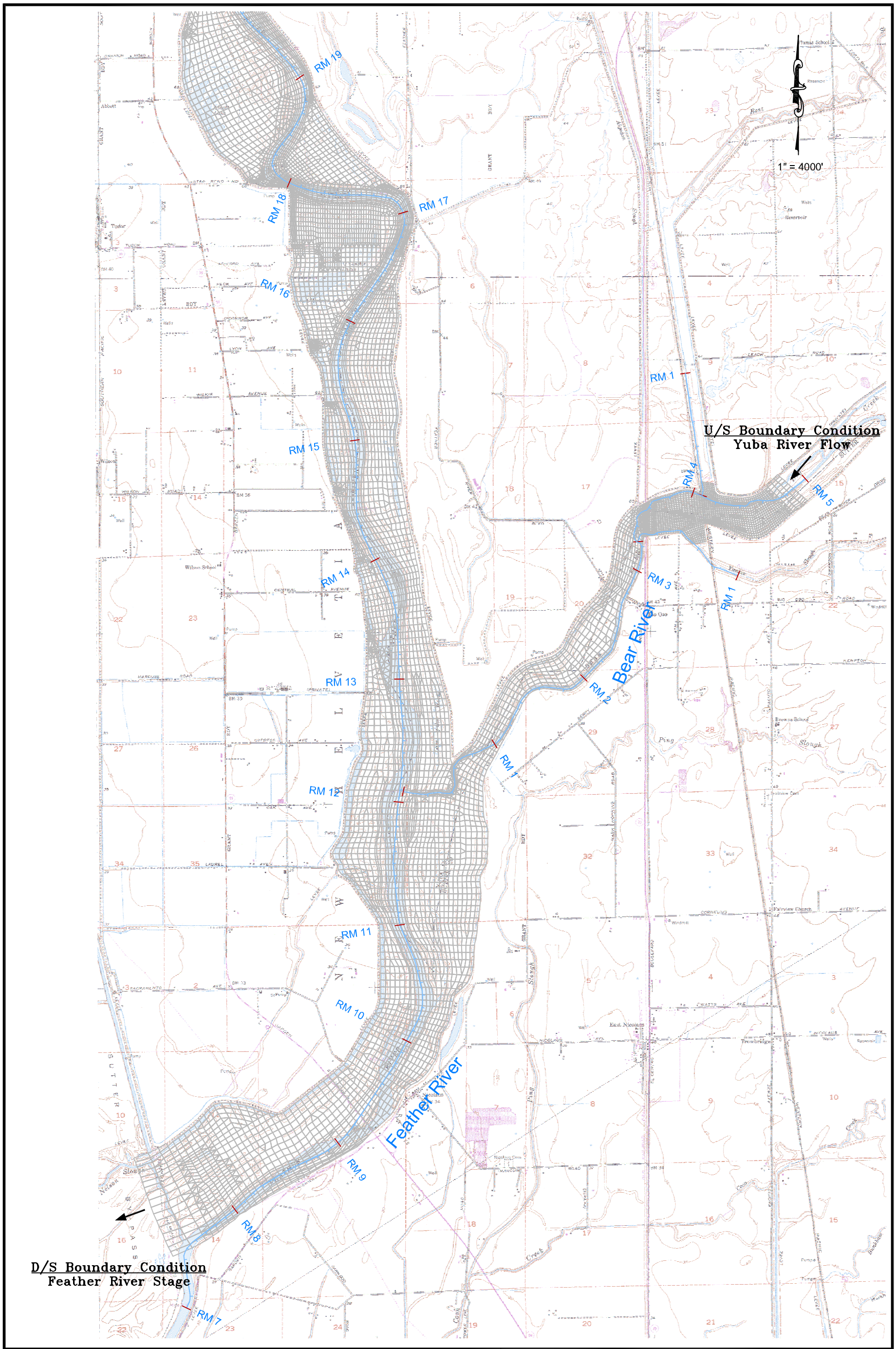


Figure 2

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

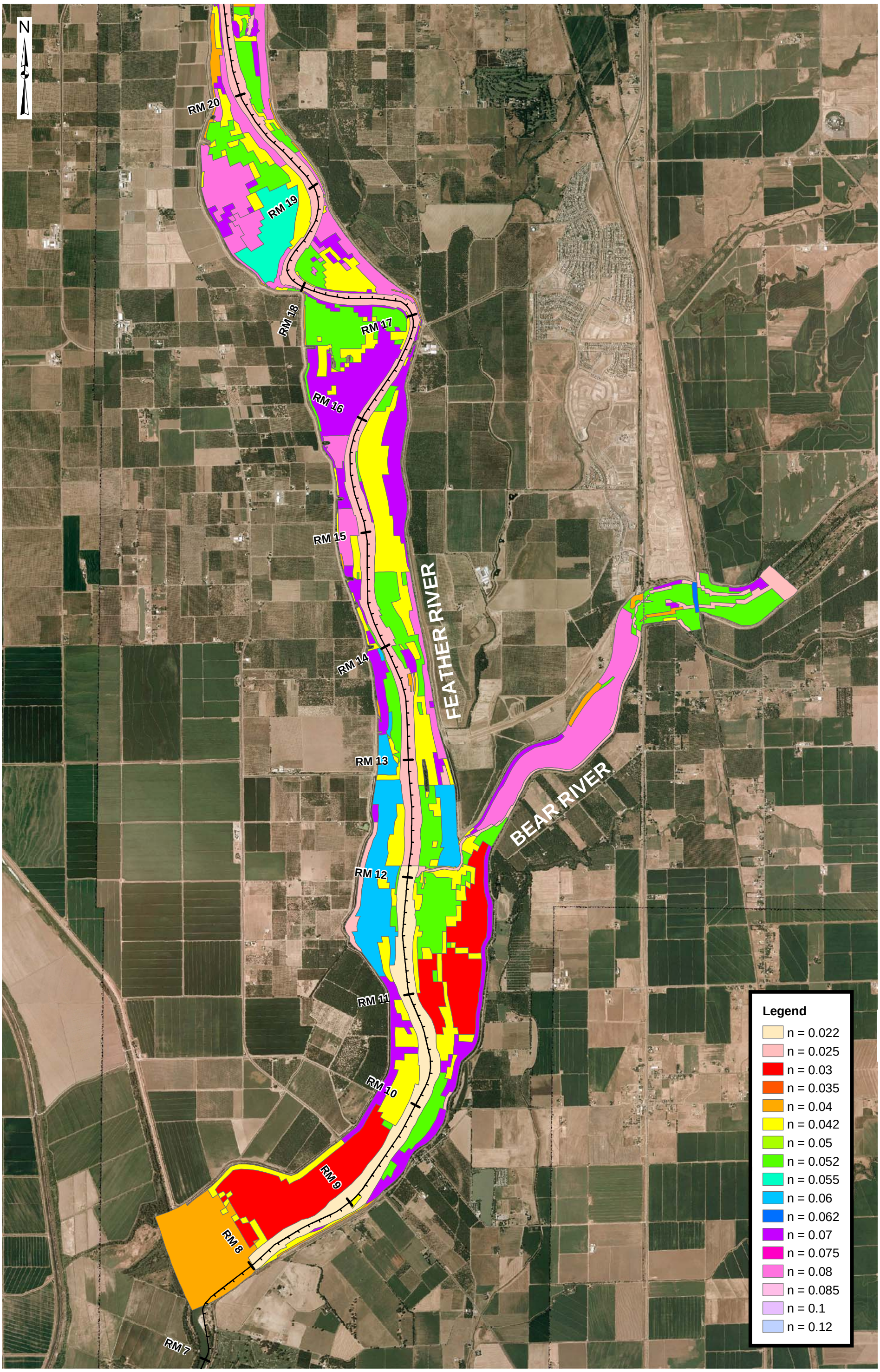
SCALE: 1"=4000'
JOB NUMBER: 5141.41
REQUESTED BY: DT
DRAWN BY: GP
DATE: March 2007

Three Rivers Levee Improvement Authority

Calibration and Verification
RMA-2 Finite Element Mesh

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

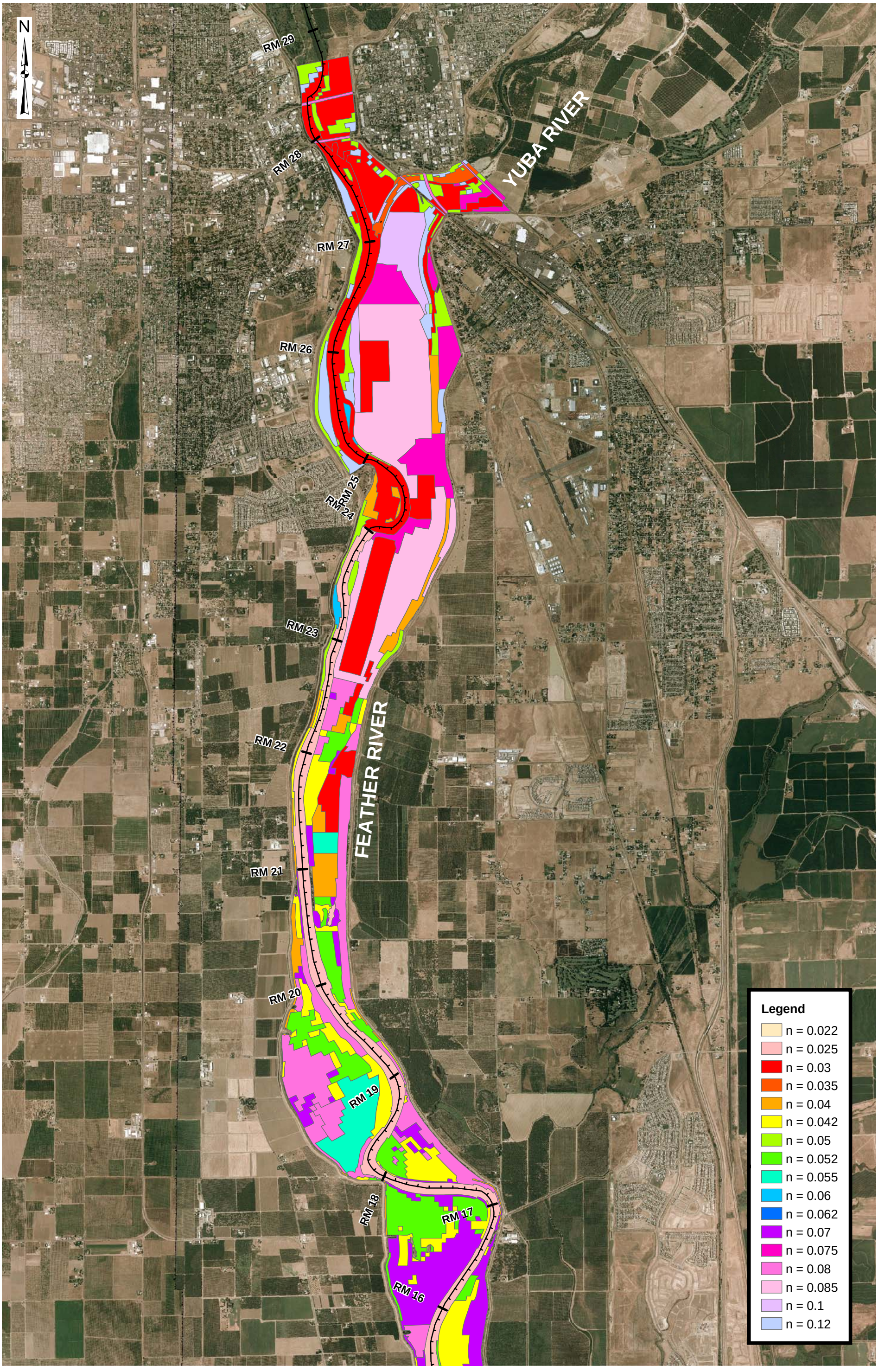


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Calibration Roughness Values

0 2,000 4,000
Scale in Feet

Figure 3



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Calibration Roughness Values

0 2,000 4,000
Scale in Feet

Figure 4

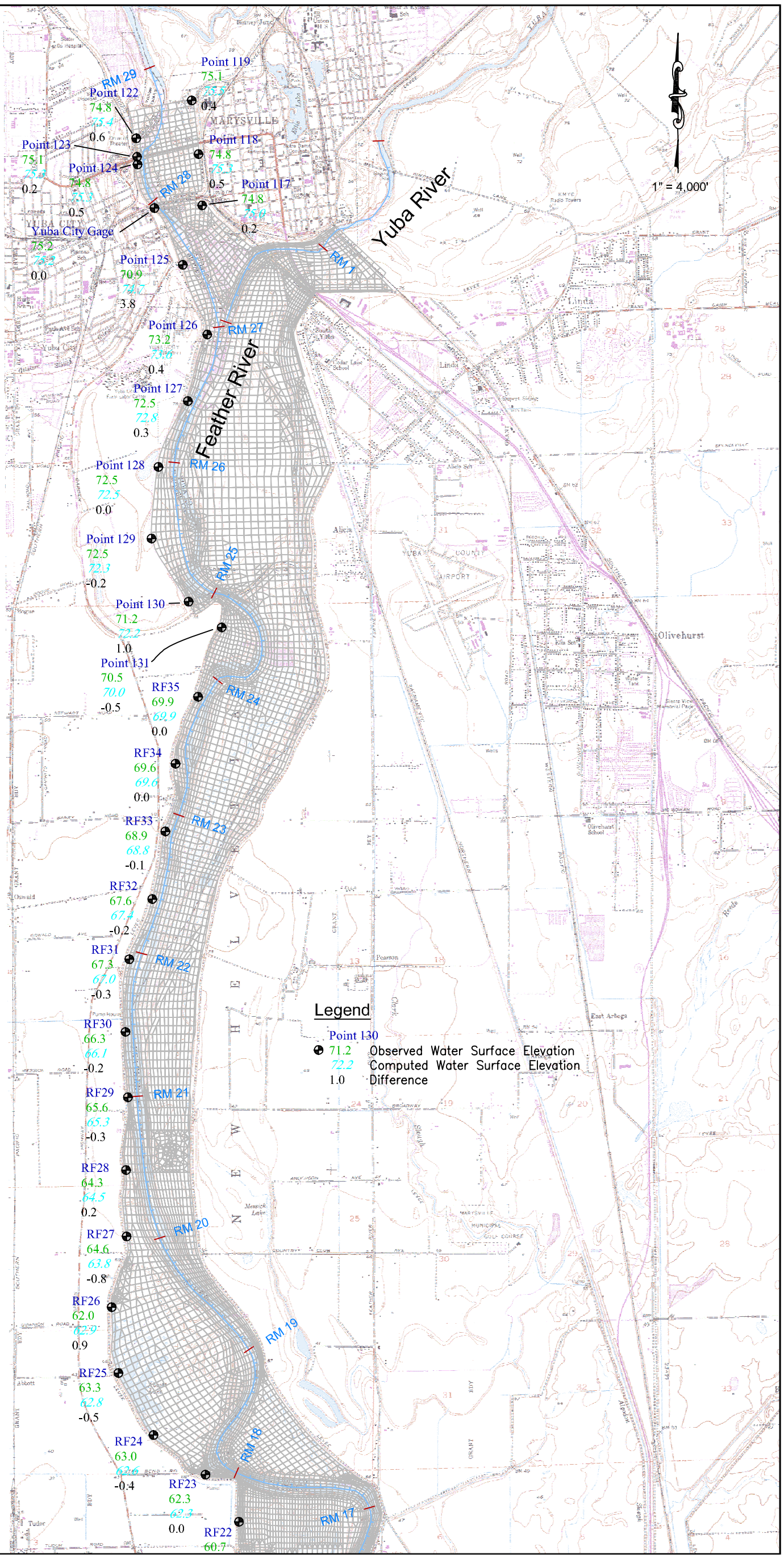


Figure 5

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE: 1"=4,000'
JOB NUMBER: 5141.41
REQUESTED BY: GP
DRAWN BY: GP
DATE: July 2007

Three Rivers Levee Improvement Authority

January 1997 Calibration Results

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

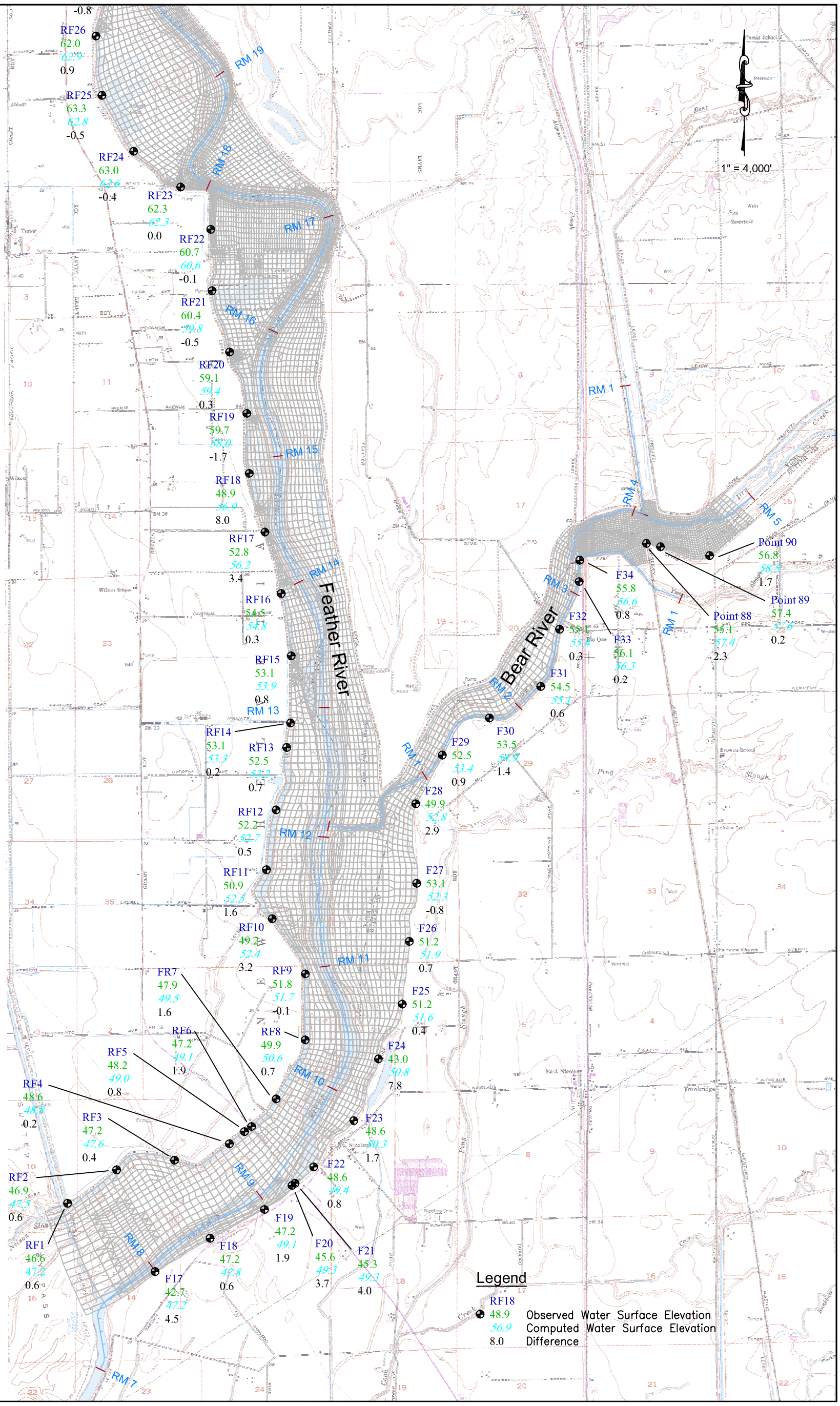


Figure 6

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE:	1"=4,000'
JOB NUMBER:	5141.41
REQUESTED BY:	GP
DRAWN BY:	GP
DATE:	July 2007

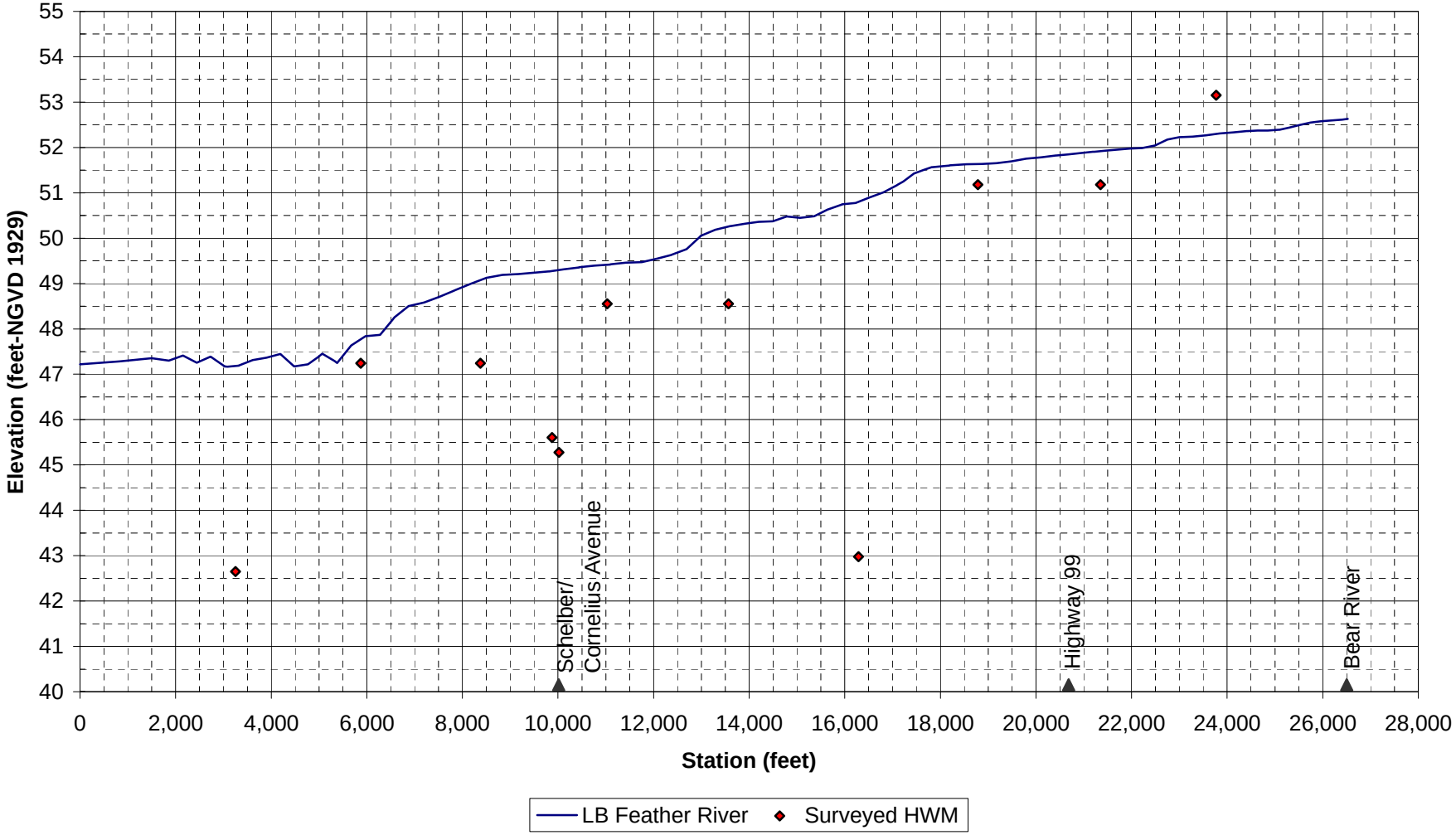
Three Rivers Levee Improvement Authority

January 1997 Calibration Results

No.	DATE	APPROVED	REVISION

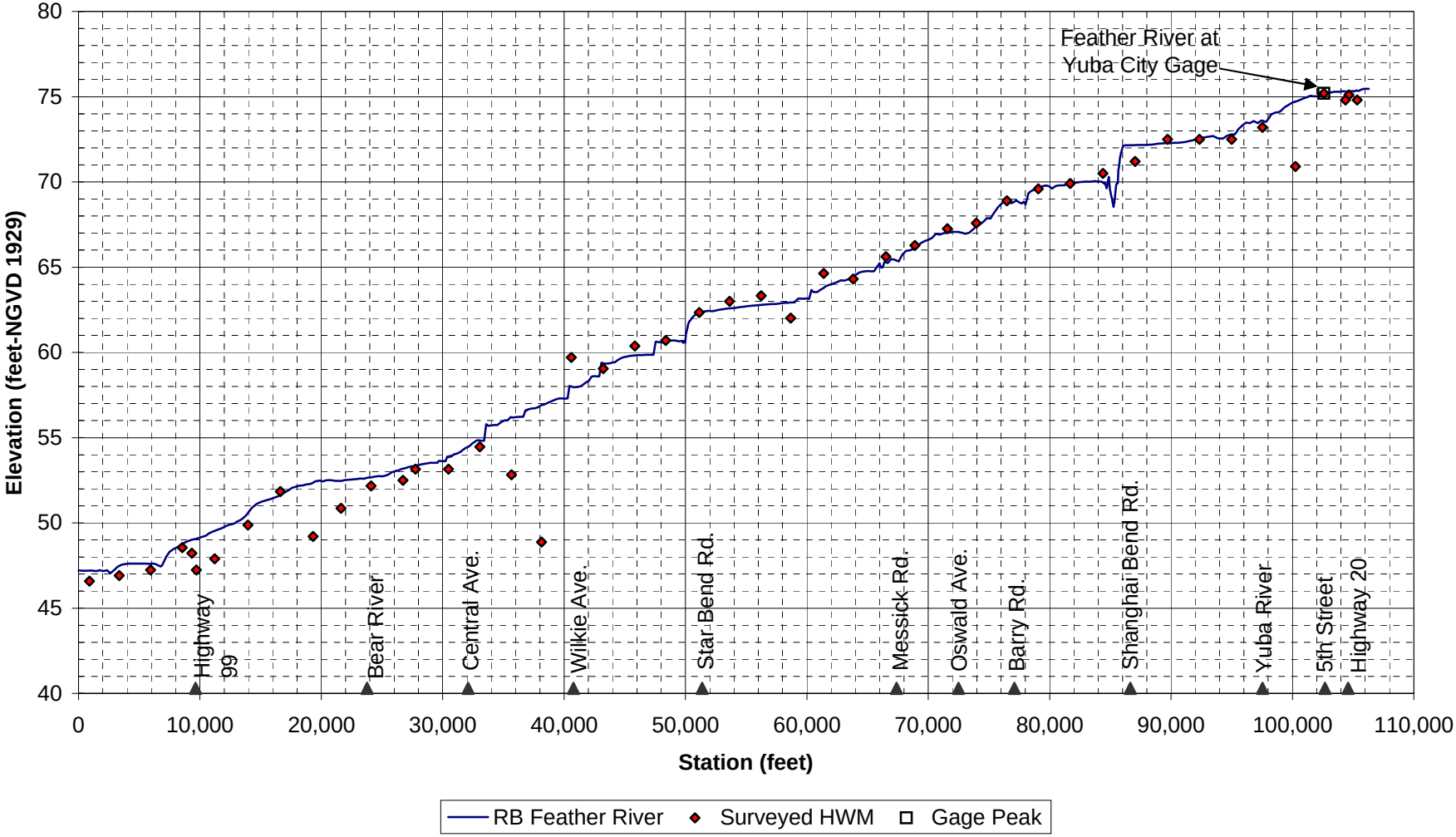
MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

Figure 7
Feather River - Left Bank (RM 7.4 to 12.2)
Maximum Water Surface Profile (2-D Model) - January 1997 Calibration



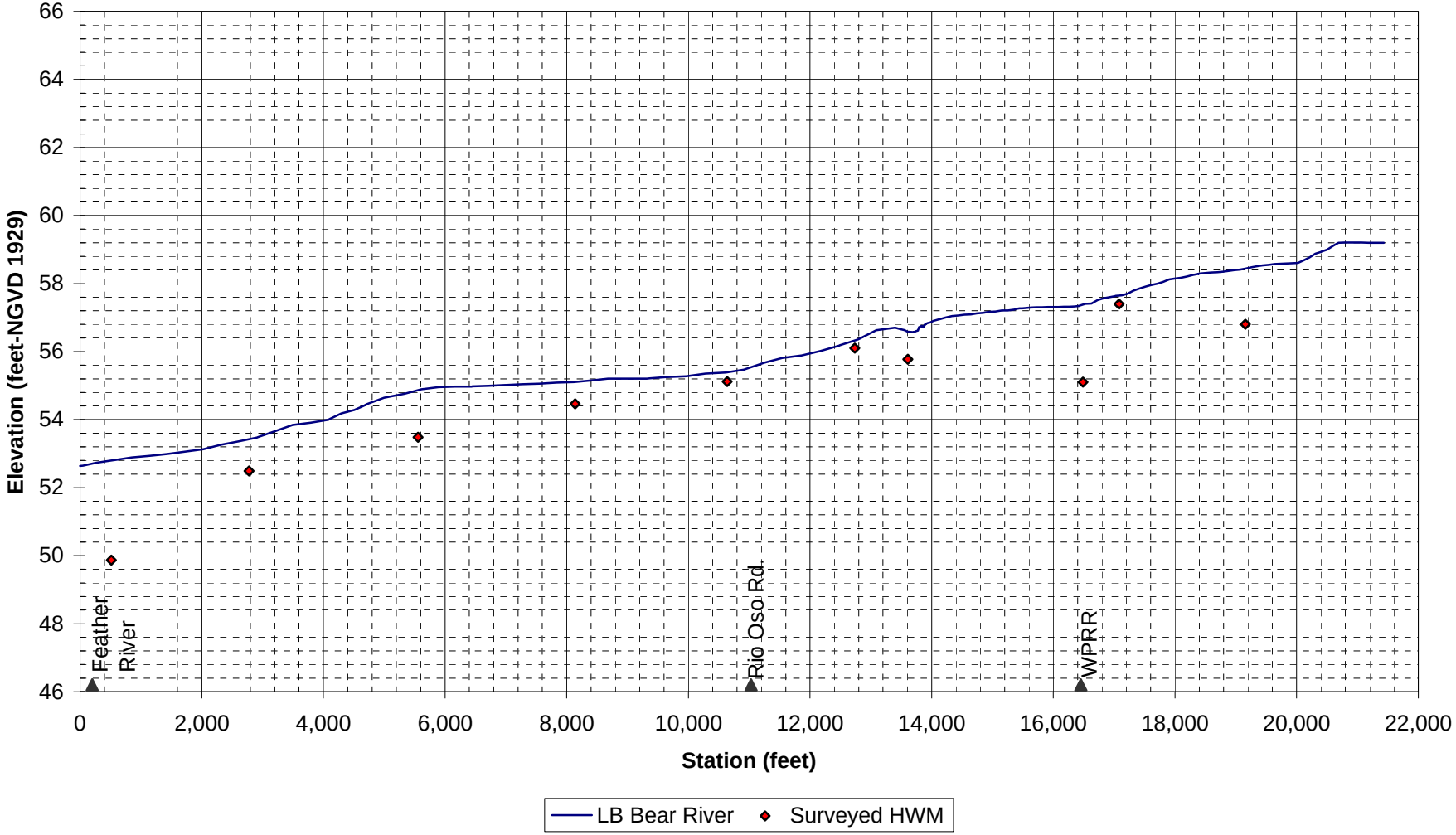
R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Calibration - Jan 97\January 97 Maximum Water Surface Profile.xls

Figure 8
Feather River - Right Bank (RM 7.6 to 28.7)
Maximum Water Surface Profile (2-D Model) - January 1997 Calibration



R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Calibration - Jan 97\January 97 Maximum Water Surface Profile.xls

Figure 9
Bear River - Left Bank (RM 0.6 to 4.9)
Maximum Water Surface Profile (2-D Model) - January 1997 Calibration



R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Calibration - Jan 97\January 97 Maximum Water Surface Profile.xls

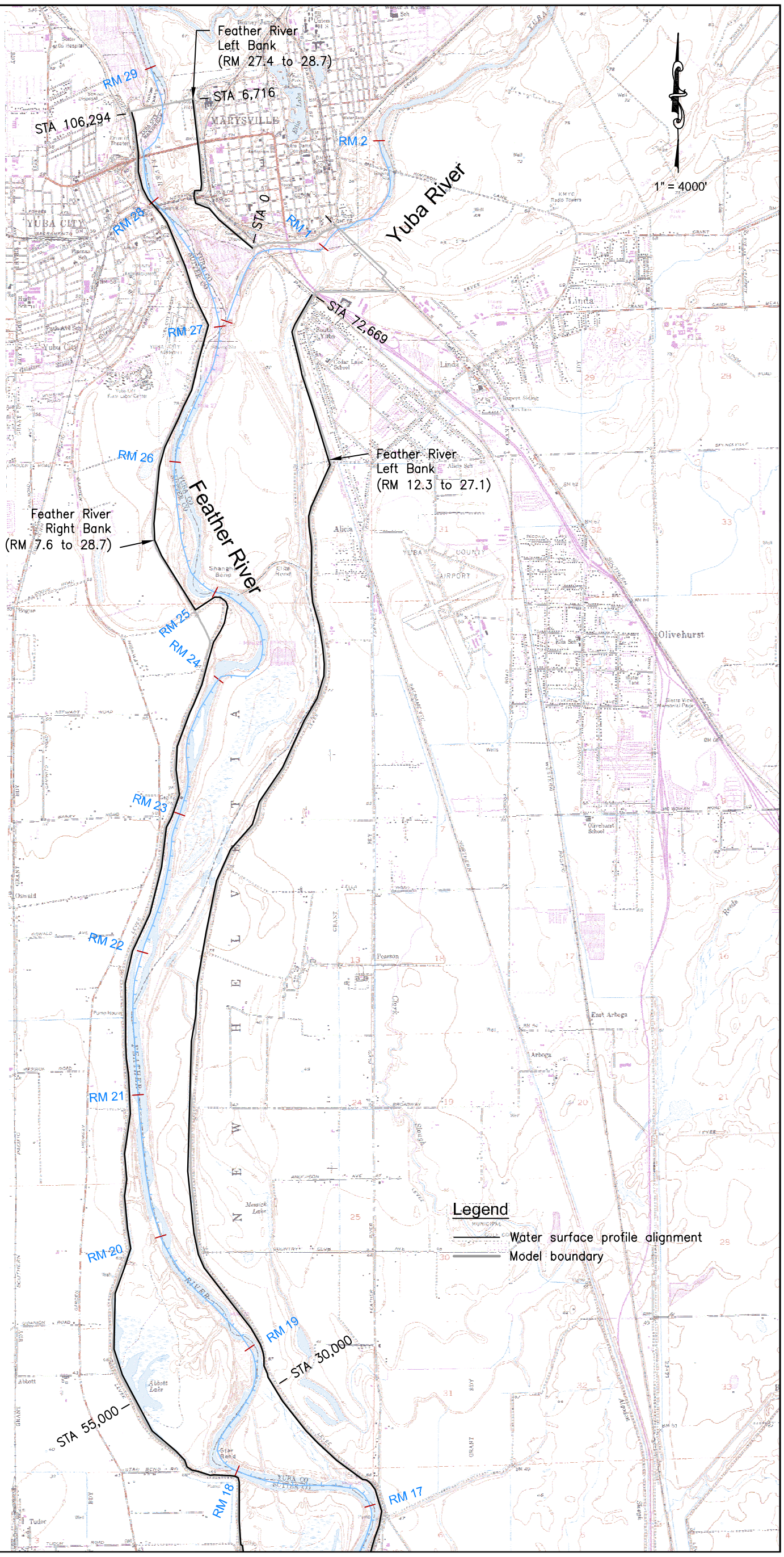


Figure 10

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE: 1"=4000'
JOB NUMBER: 5141.41
REQUESTED BY: DT
DRAWN BY: GP
DATE: June 2007

Three Rivers Levee Improvement Authority

Calibration and Verification Water Surface Profile Alignments

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

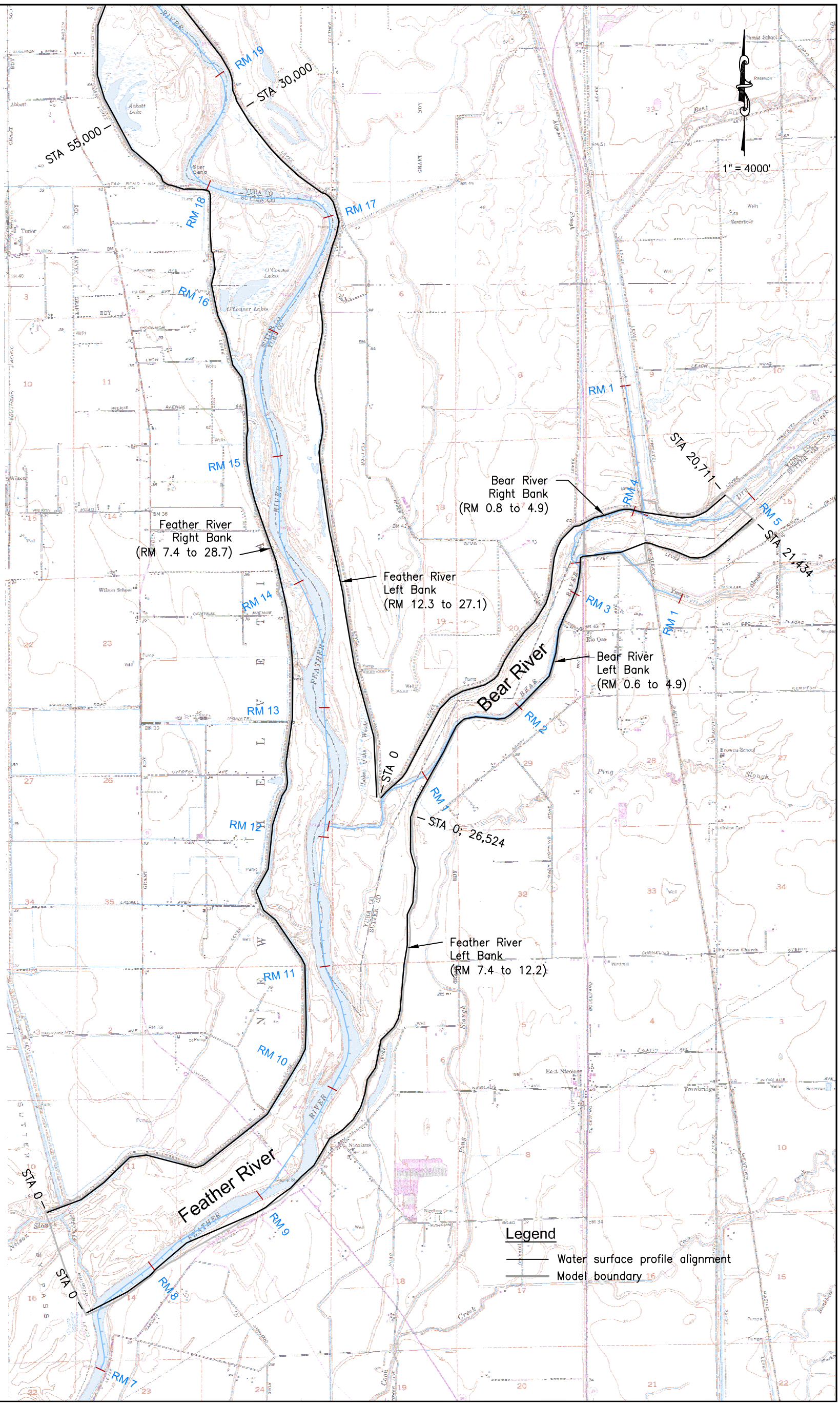


Figure 11

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE:	1"=4000'
JOB NUMBER:	5141.41
REQUESTED BY:	DT
DRAWN BY:	GP
DATE:	June 2007

Three Rivers Levee Improvement Authority

Calibration and Verification Water Surface Profile Alignments

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

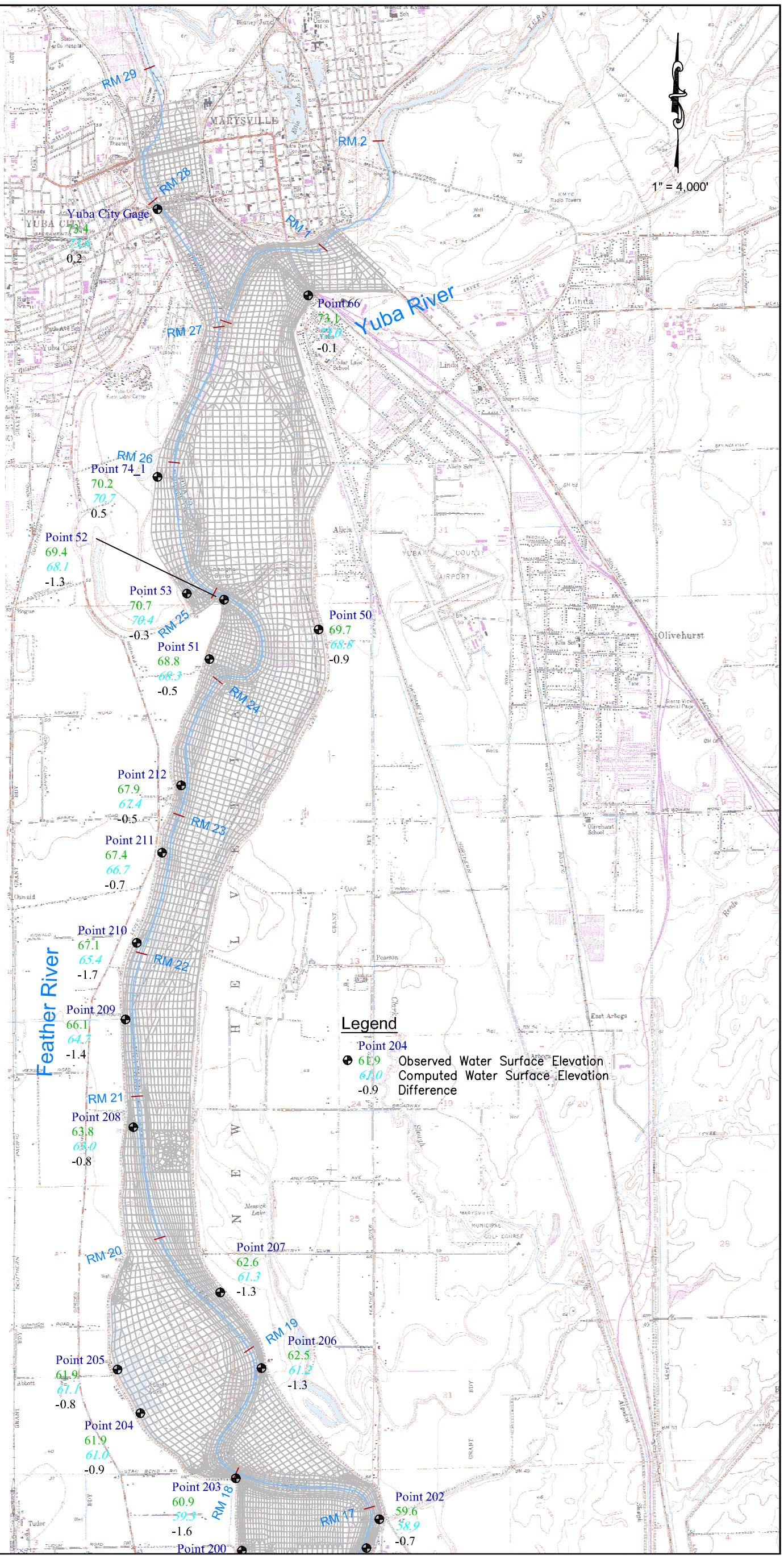


Figure 12

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE:	1"=4,000'
JOB NUMBER:	5141.41
REQUESTED BY:	GP
DRAWN BY:	GP
DATE:	July 2007

Three Rivers Levee Improvement Authority

February 1986 Verification Results

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

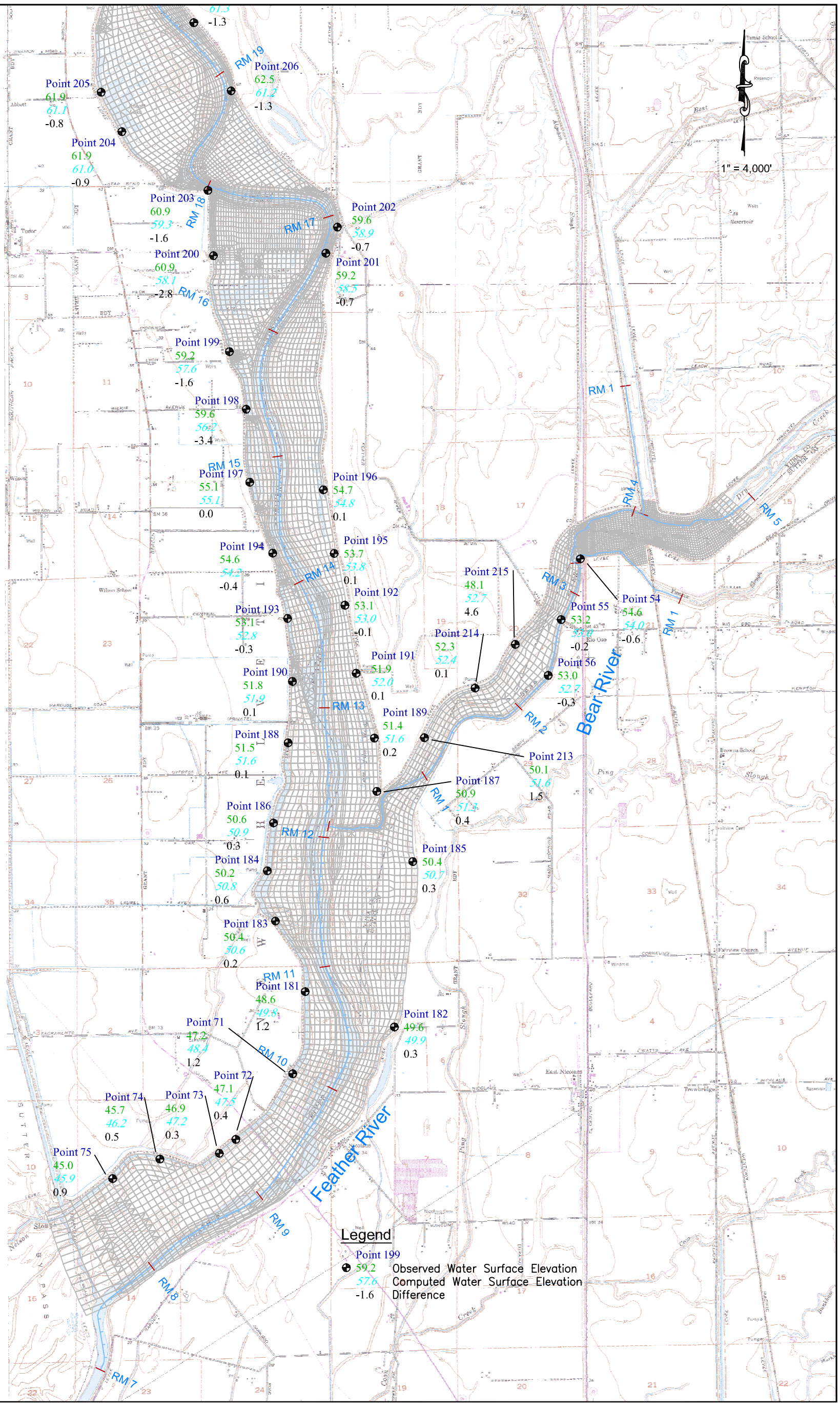


Figure 13

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE: 1"=4,000'
JOB NUMBER: 5141.41
REQUESTED BY: GP
DRAWN BY: GP
DATE: July 2007

Three Rivers Levee Improvement Authority

February 1986 Verification Results

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

Figure 14
Feather River - Left Bank (RM 12.3 to 27.1)
Maximum Water Surface Profile (2-D Model) - February 1986 Verification

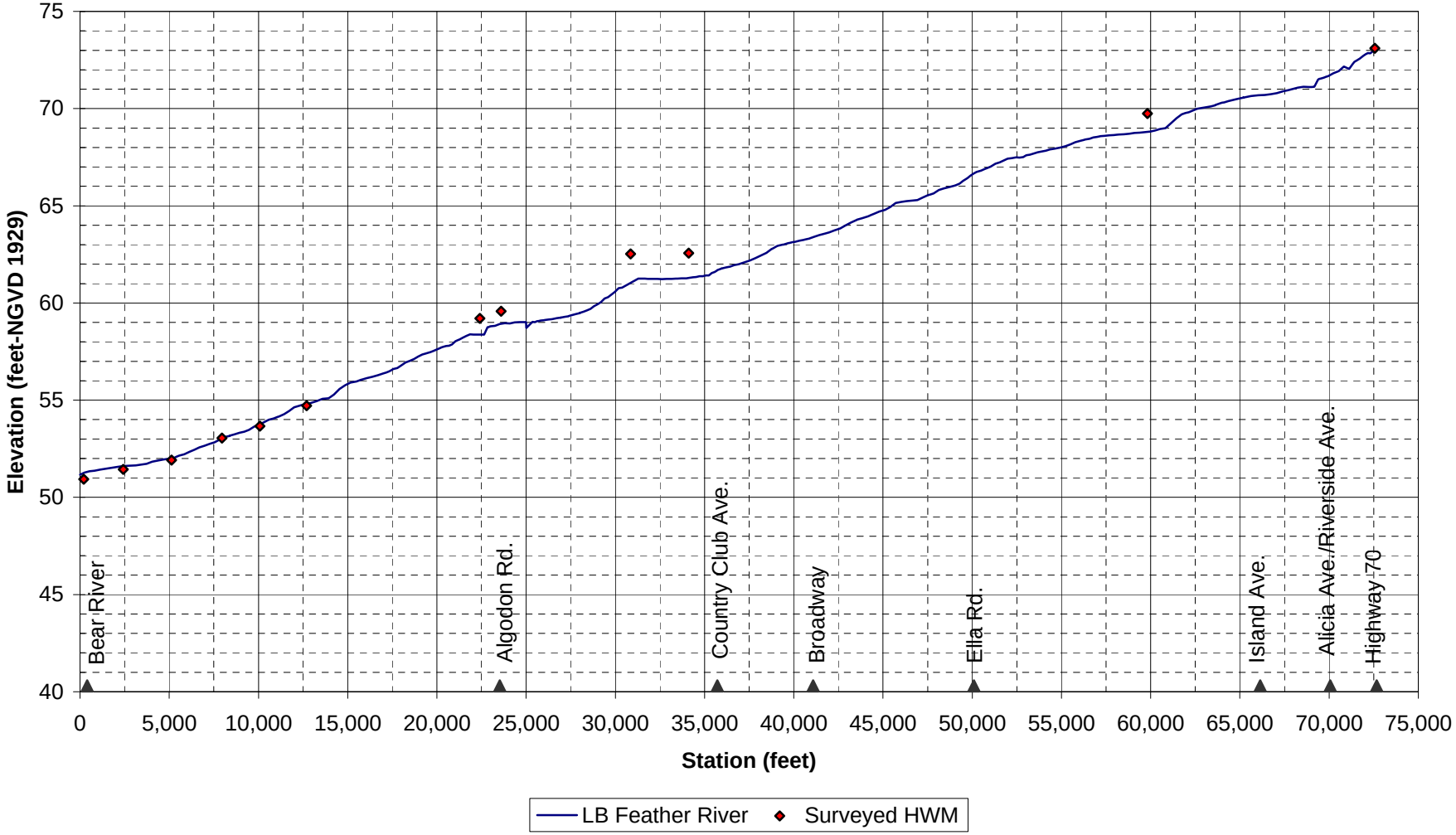


Figure 15
Feather River - Right Bank (RM 7.6 to 28.7)
Maximum Water Surface Profile (2-D Model) - February 1986 Verification

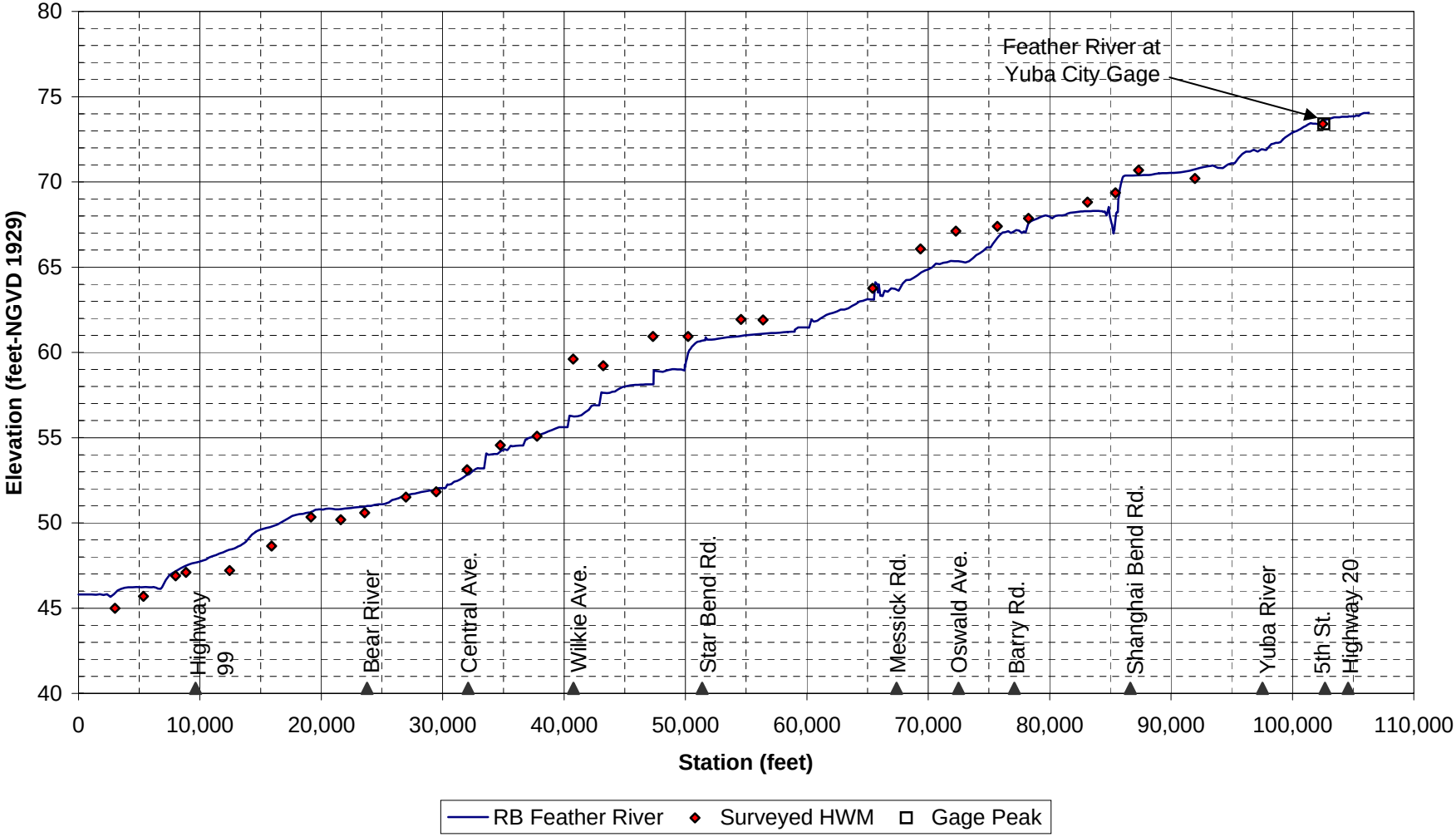


Figure 16
Bear River - Left Bank (RM 0.6 to 4.9)
Maximum Water Surface Profile (2-D Model) - February 1986 Verification

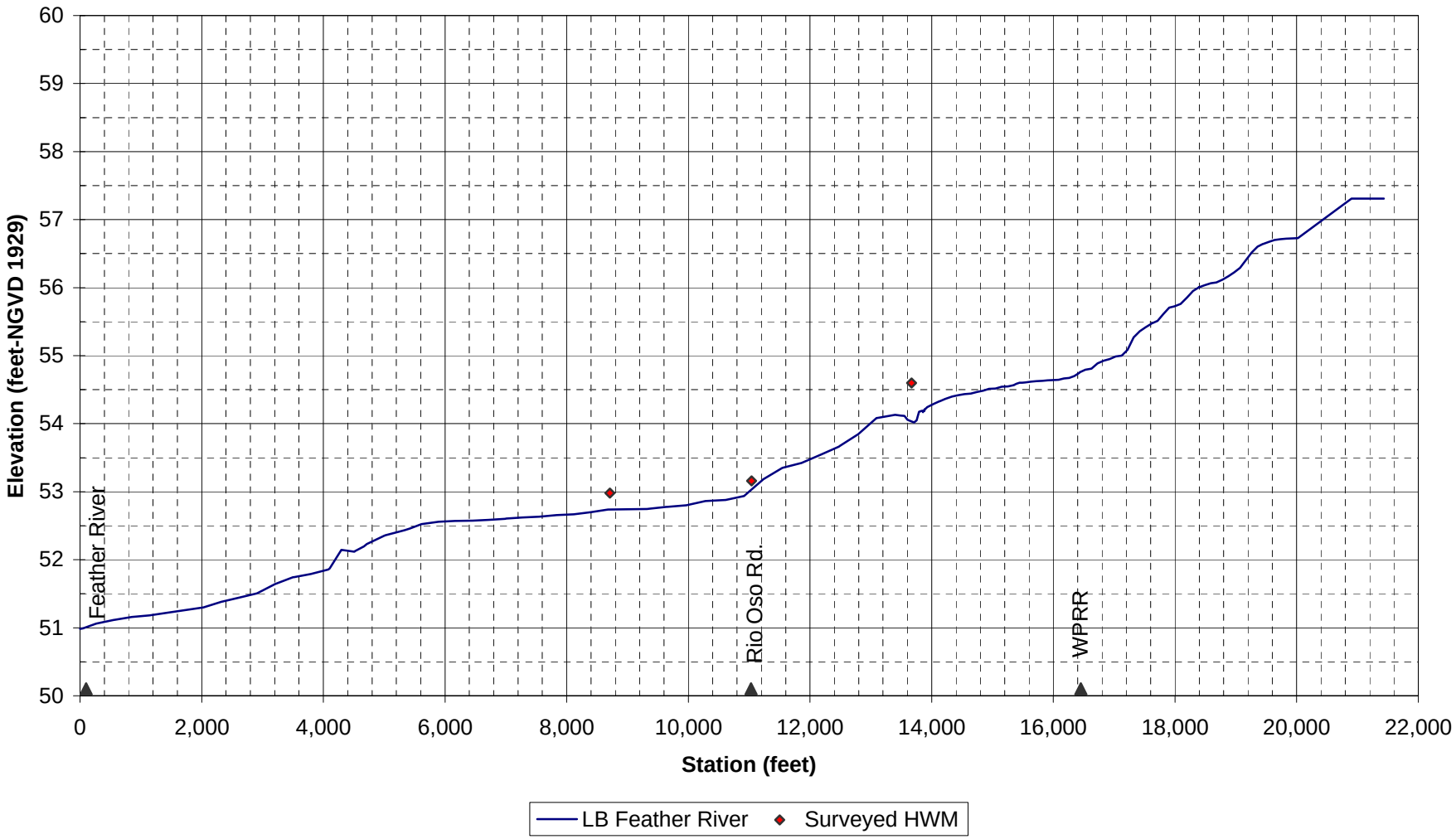
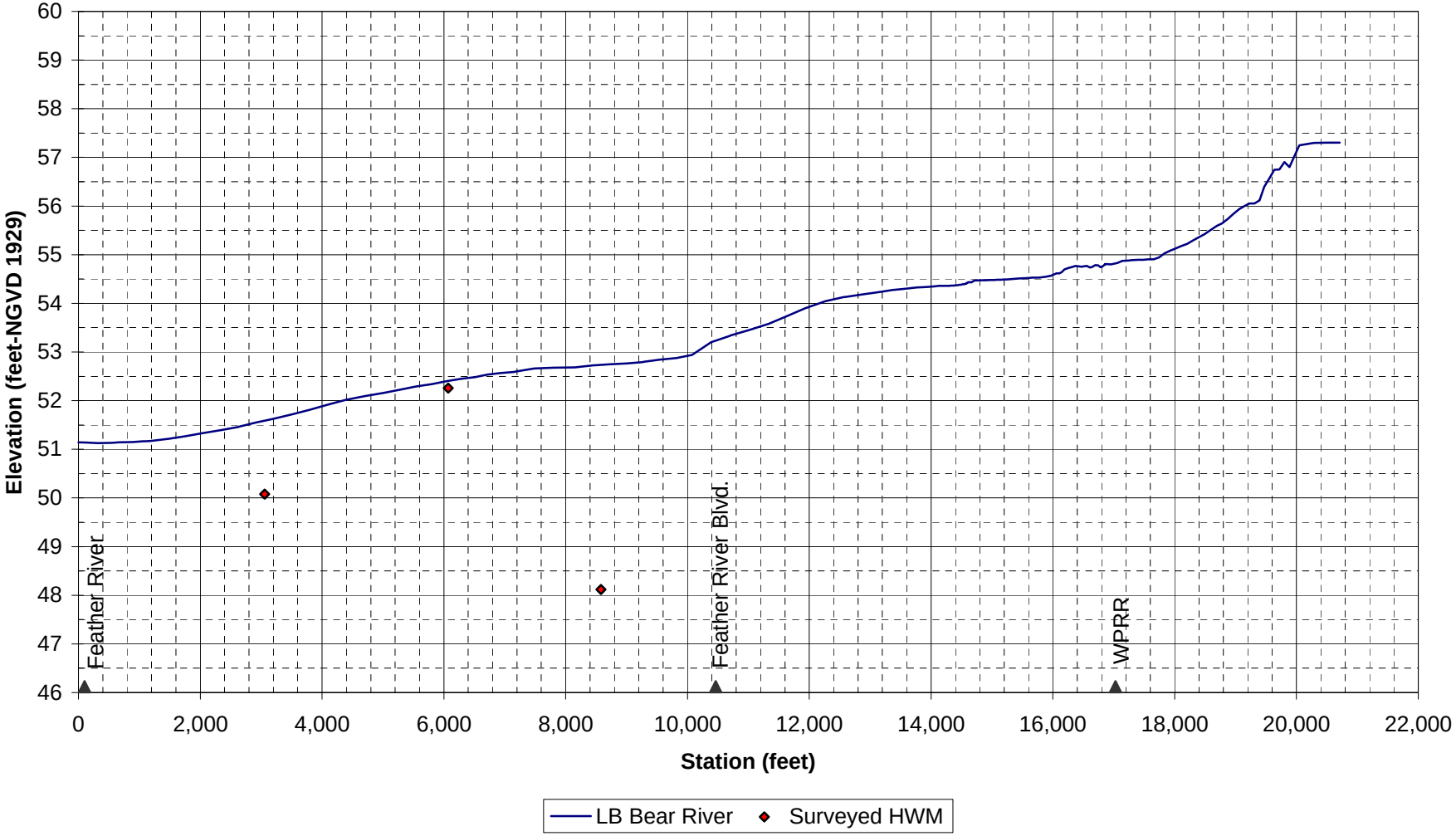


Figure 17
Bear River - Right Bank (RM 0.8 to 4.9)
Maximum Water Surface Profile (2-D Model) - February 1986 Verification



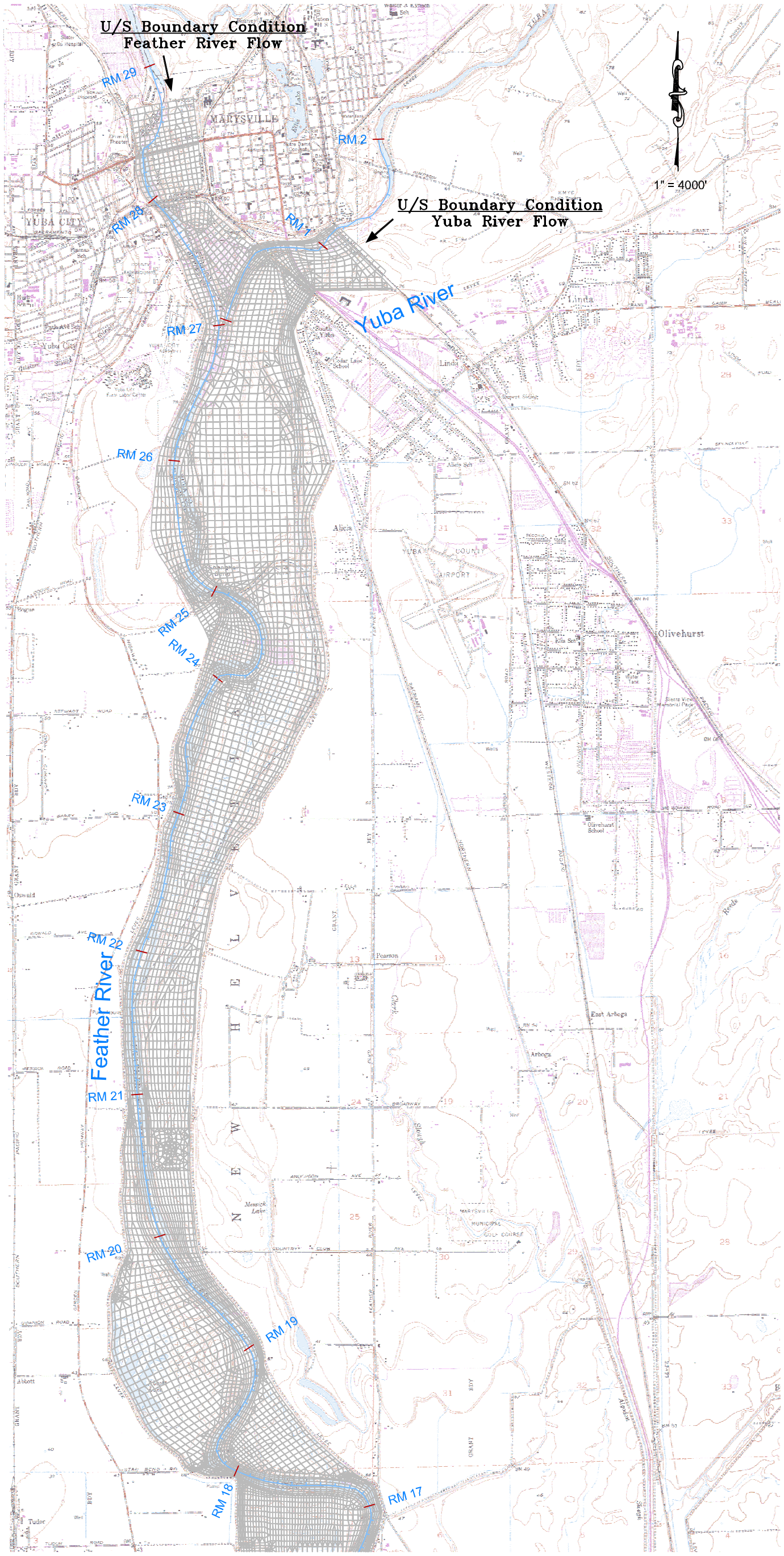


Figure 18

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE:	1"=4000'
JOB NUMBER:	5141.41
REQUESTED BY:	DT
DRAWN BY:	GP
DATE:	July 2007

Three Rivers Levee Improvement Authority

Existing Condition
RMA-2 Finite Element Mesh

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

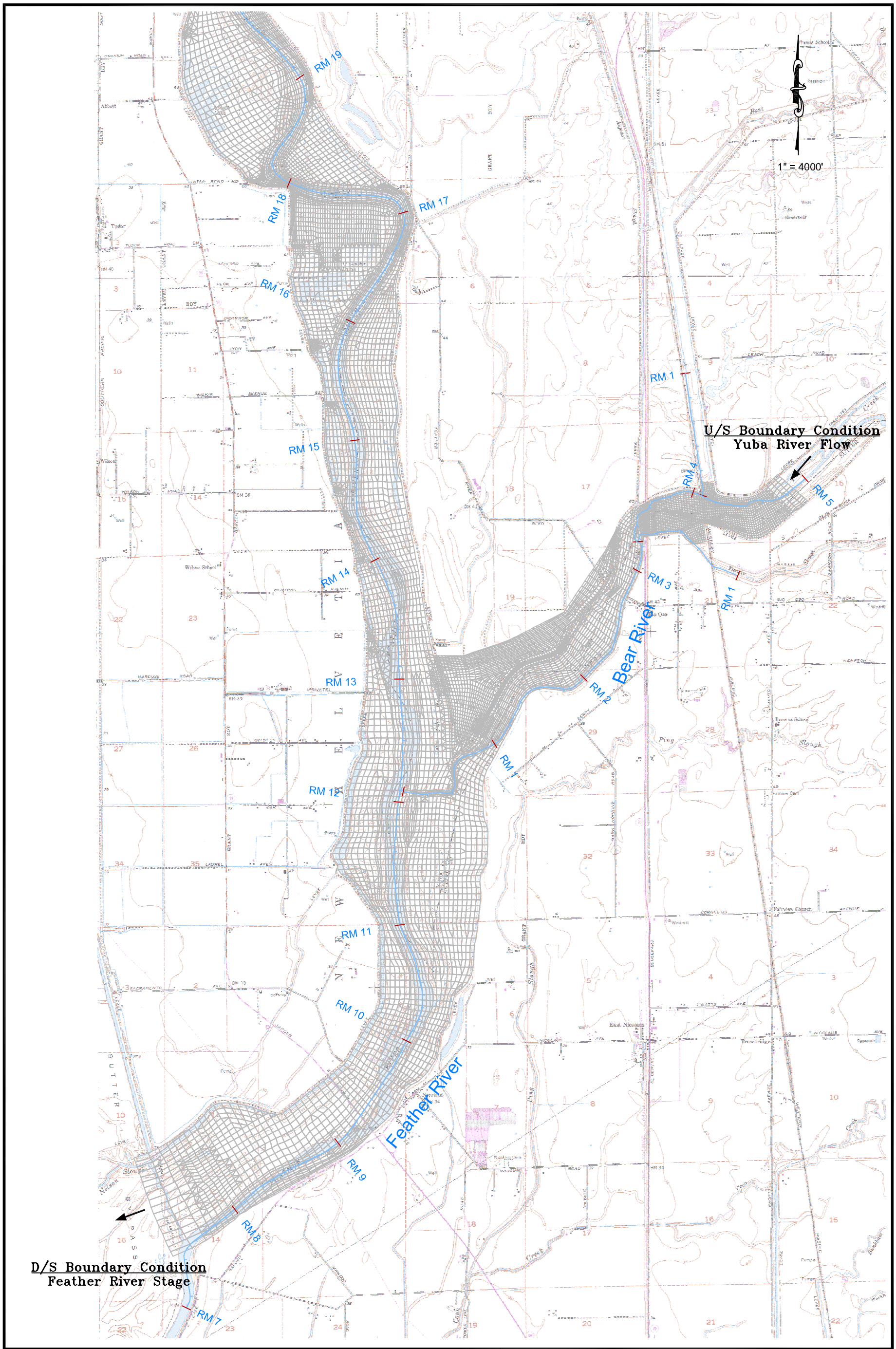


Figure 19

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

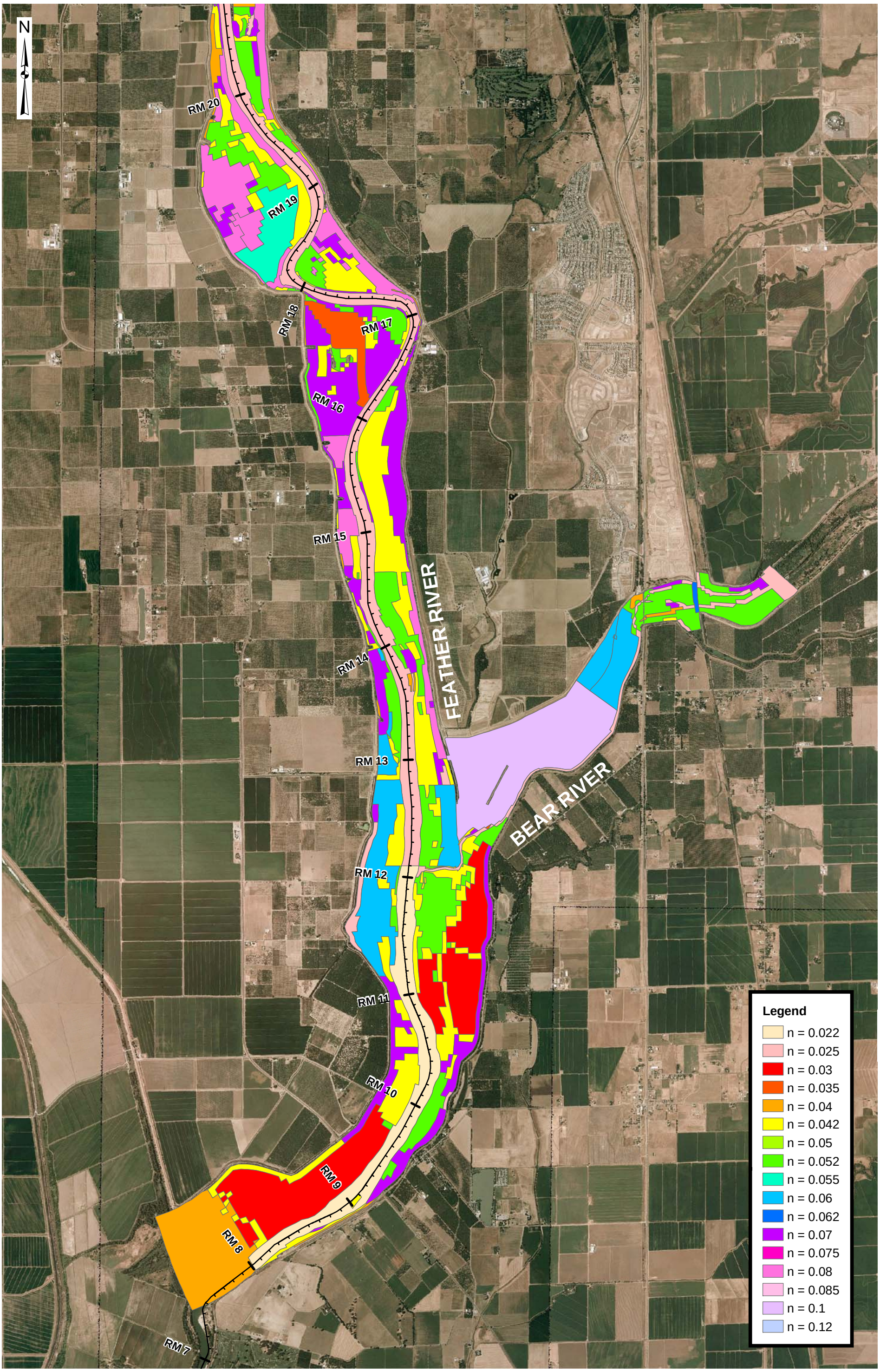
SCALE: 1"=4000'
JOB NUMBER: 5141.41
REQUESTED BY: DT
DRAWN BY: GP
DATE: July 2007

Three Rivers Levee Improvement Authority

Existing Condition
RMA-2 Finite Element Mesh

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

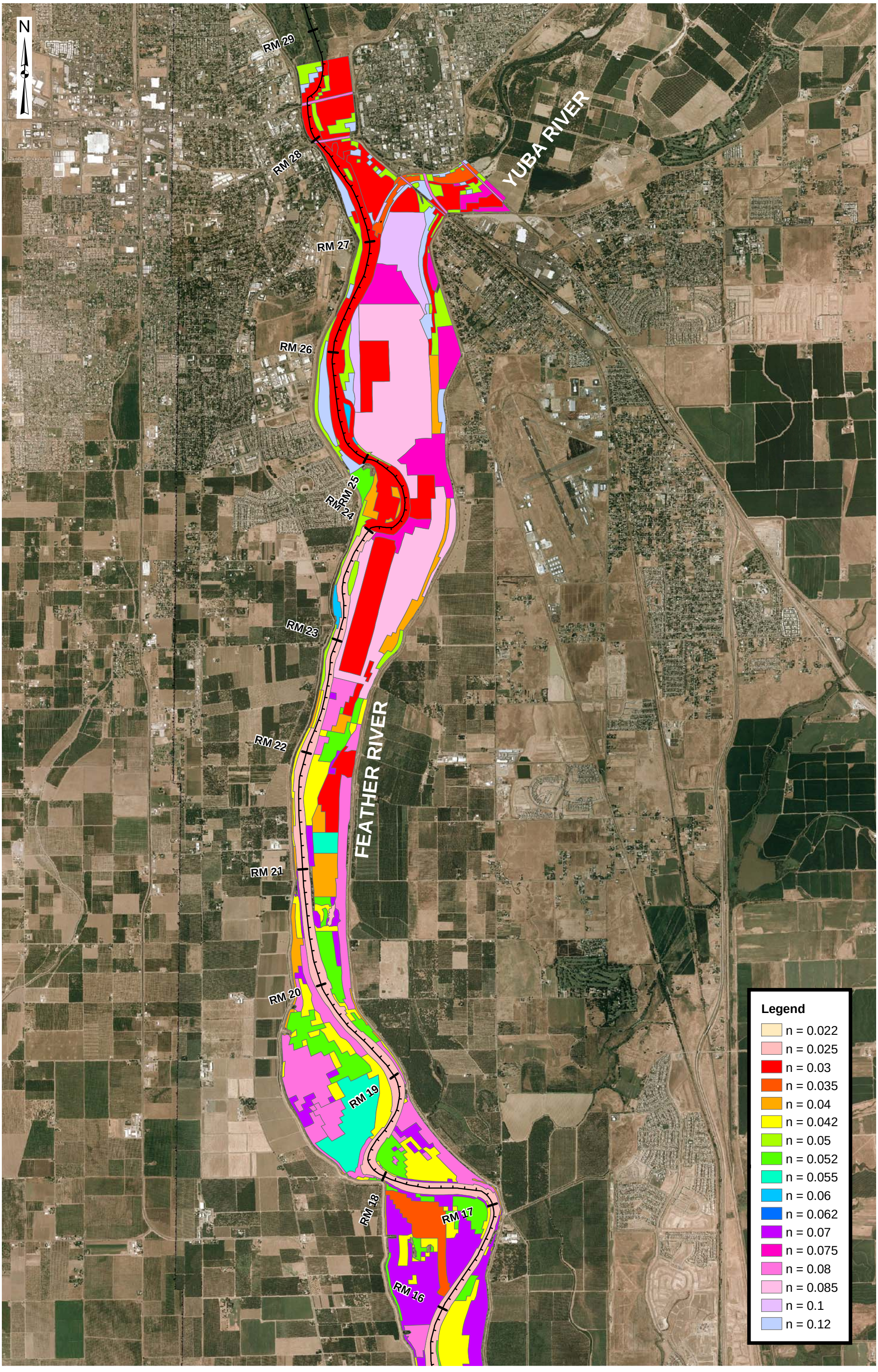


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Existing Condition Roughness Values

0 2,000 4,000
Scale in Feet

Figure 20



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Existing Condition Roughness Values

0 2,000 4,000
Scale in Feet

Figure 21

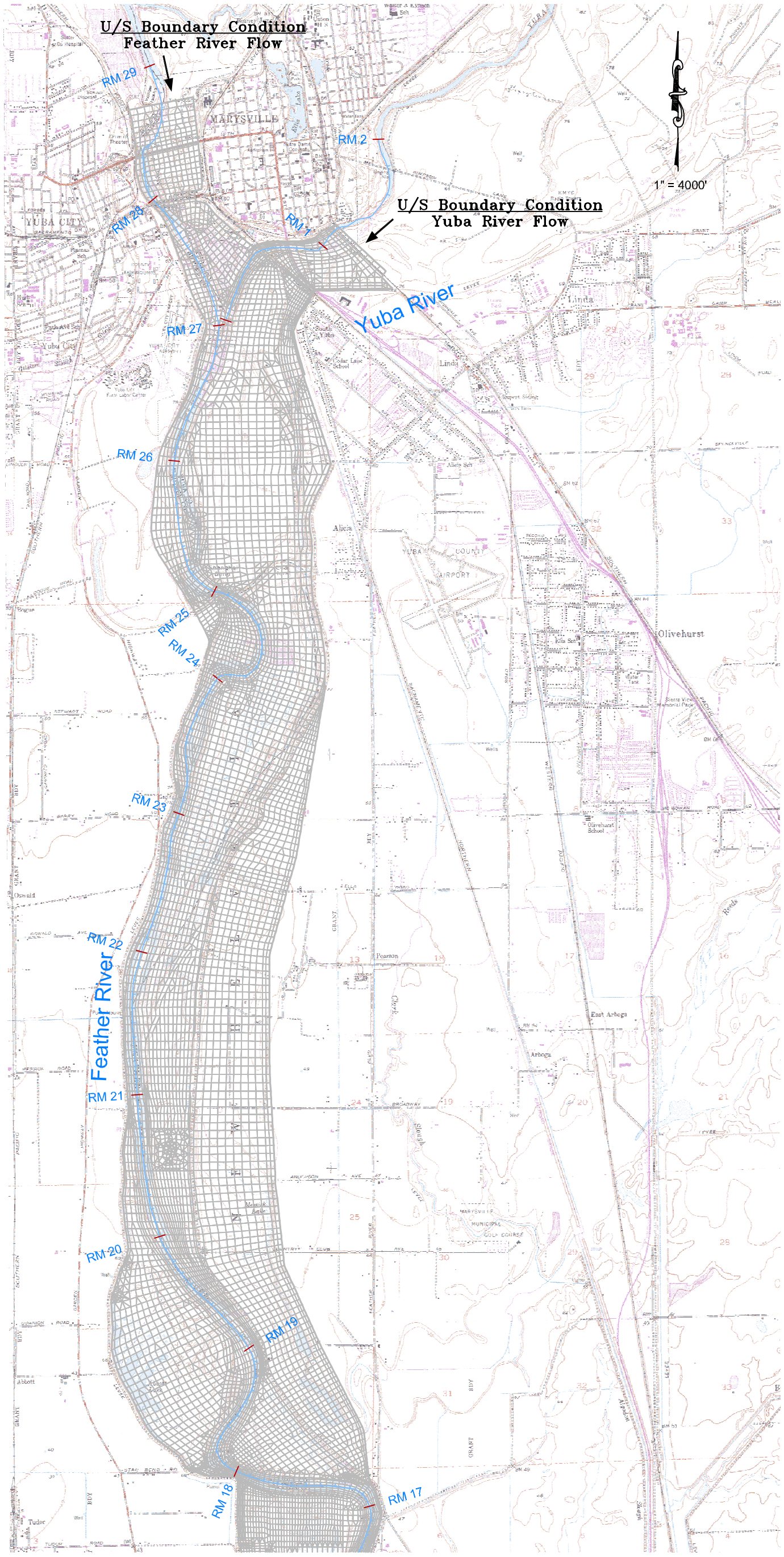


Figure 22

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

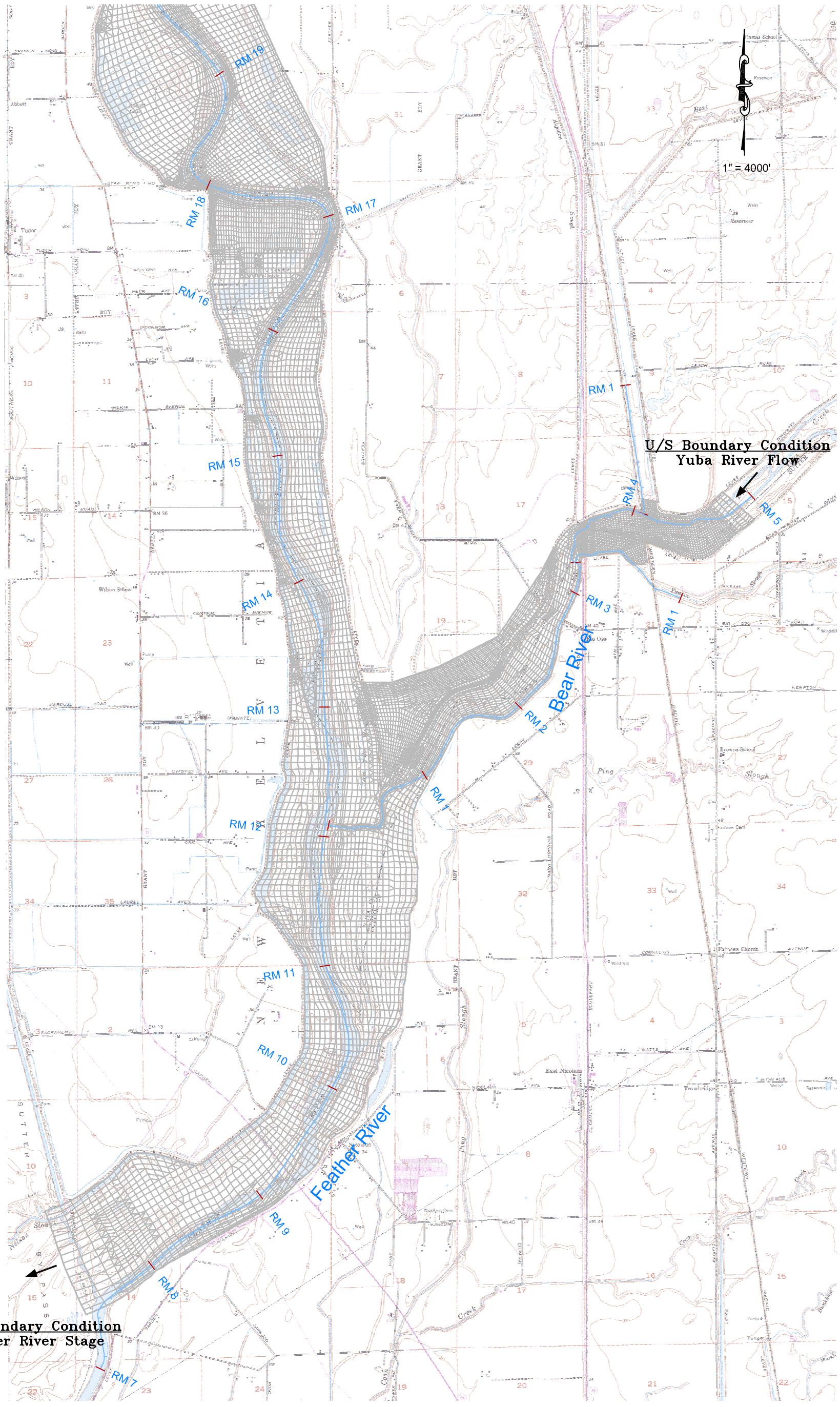
SCALE:	1"=4000'
JOB NUMBER:	5141.41
REQUESTED BY:	GP
DRAWN BY:	GP
DATE:	July 2007

Three Rivers Levee Improvement Authority

Project Condition
RMA-2 Finite Element Mesh

No.	DATE	APPROVED	REVISION

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253



Three Rivers Levee Improvement Authority

Project Condition
RMA-2 Finite Element Mesh

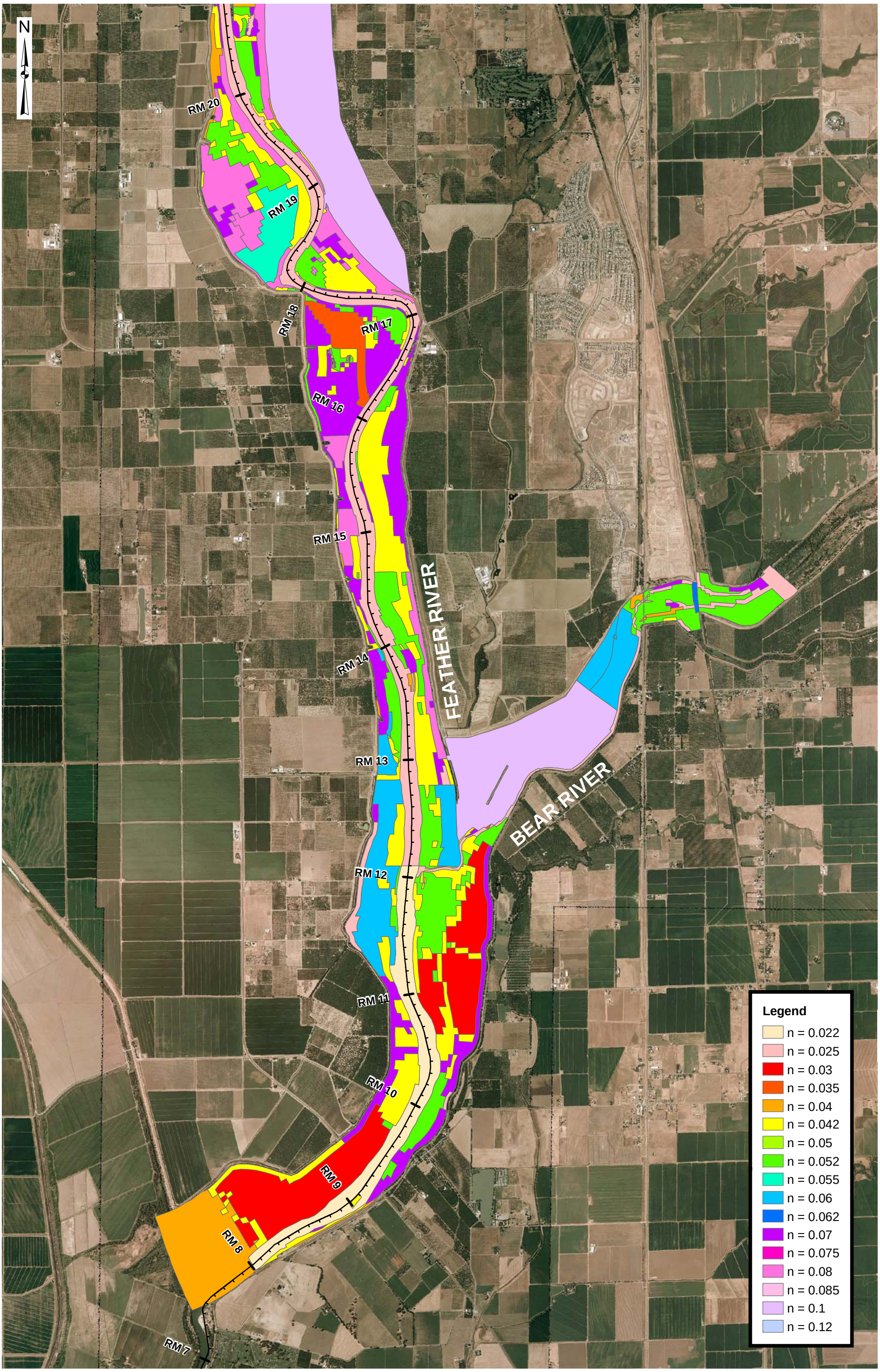
No.	DATE	APPROVED	REVISION

Figure 23

Bar Length On Original Drawing Equals One Inch. Adjust Scale Accordingly

SCALE: 1"=4000'
JOB NUMBER: 5141.41
REQUESTED BY: DT
DRAWN BY: GP
DATE: July 2007

MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

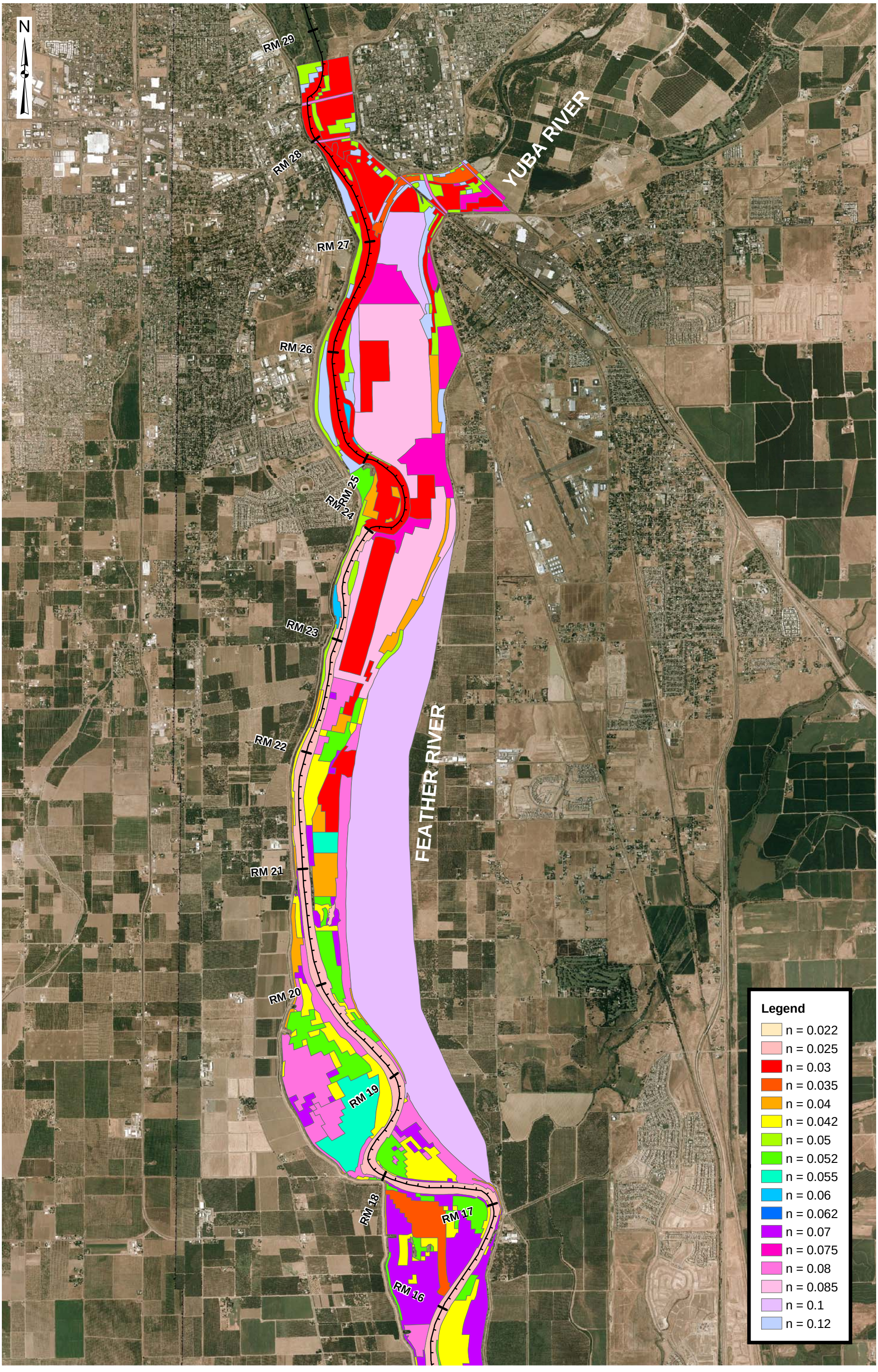


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Project Condition Roughness Values

0 2,000 4,000
Scale in Feet

Figure 24



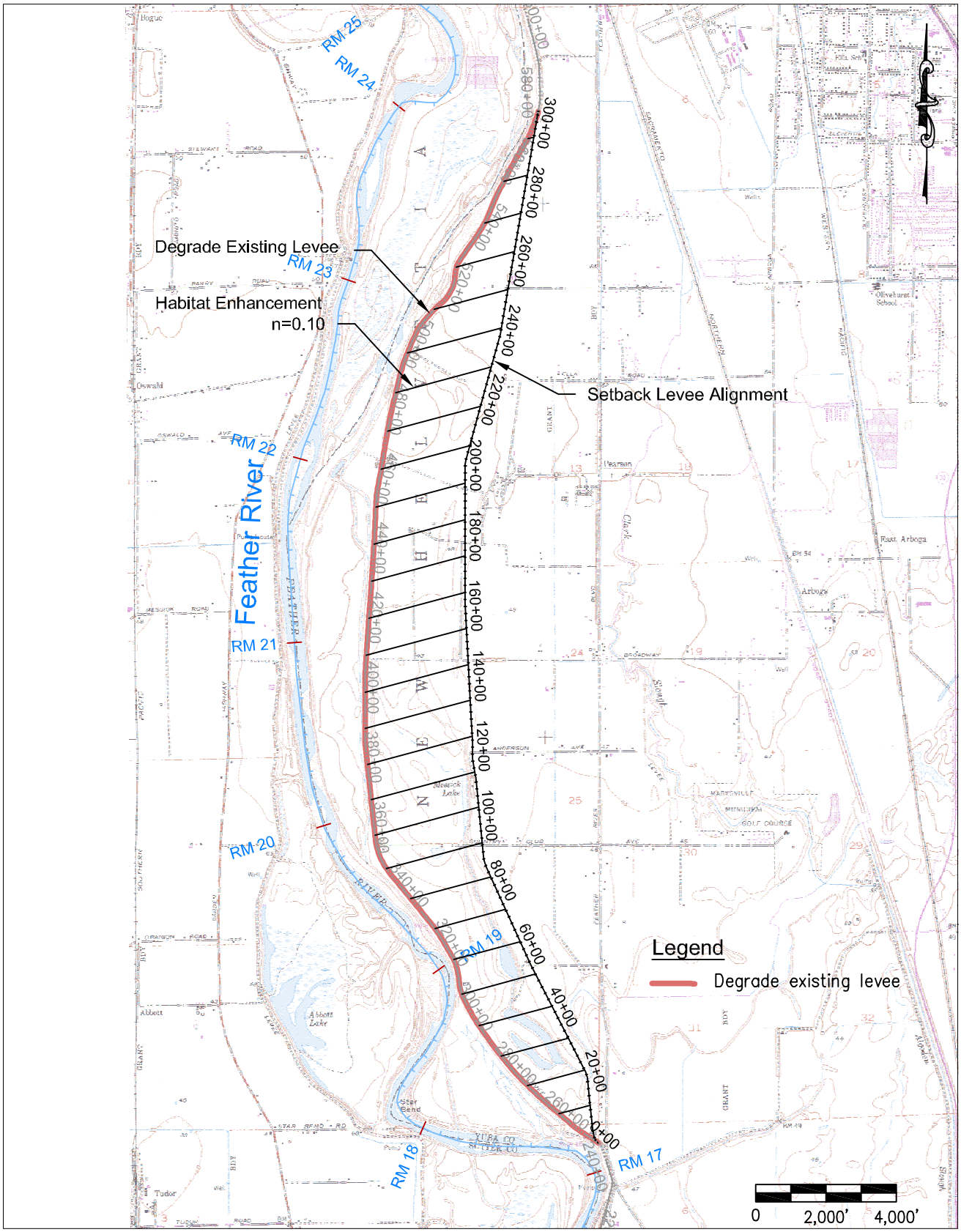
MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

RMA-2 Finite Element Model
Project Condition Roughness Values

0 2,000 4,000
Scale in Feet

Figure 25

R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\ACAD\Fig 26-27 Levee Degradation.dwg, 7/13/2007 3:34:06 PM



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

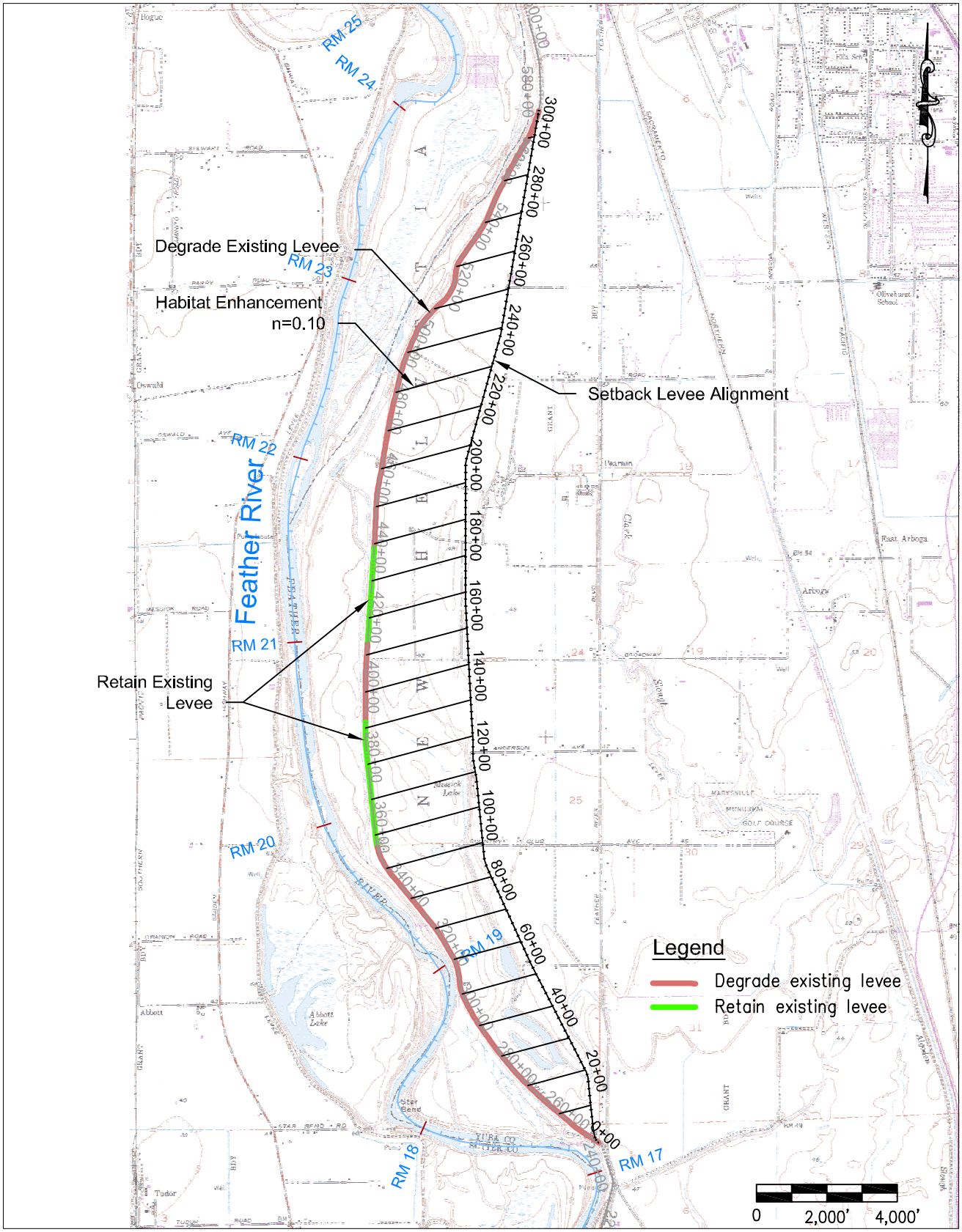
Three Rivers Levee Improvement Authority

Project Condition Scenario 1
All Levees Degraded

SCALE:	1" = 4,000'
JOB NUMBER:	5141.41
DRAWN BY:	GP
DATE:	July 2007

Figure
26

R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\ACAD\Fig 26-27 Levee Degradation.dwg, 7/13/2007 3:36:33 PM



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
Phone: (916) 456-4400 • Fax: (916) 456-0253

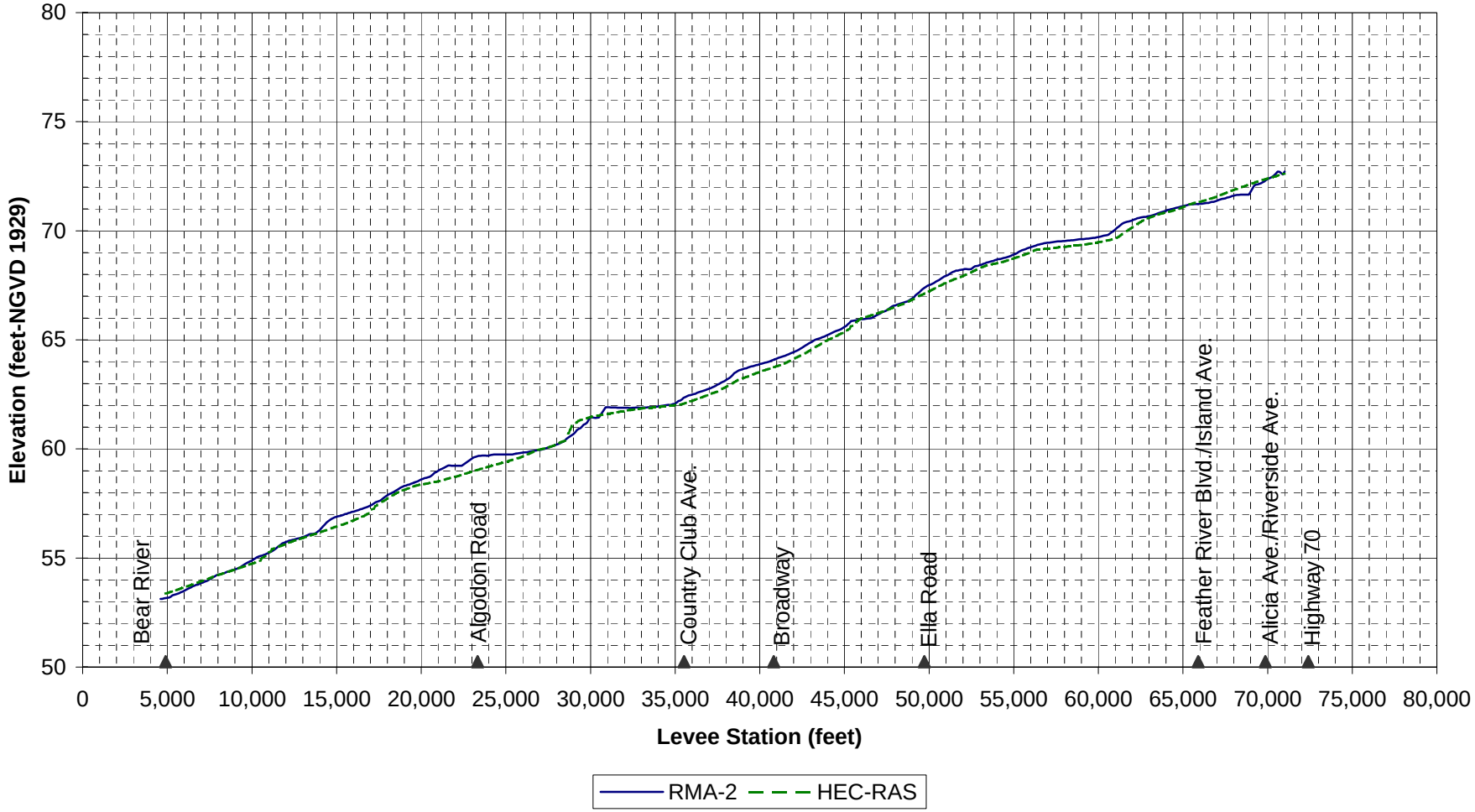
Three Rivers Levee Improvement Authority

Project Condition Scenario 2
Partial Levee Degrade

SCALE:	1" = 4,000'
JOB NUMBER:	5141.41
DRAWN BY:	GP
DATE:	July 2007

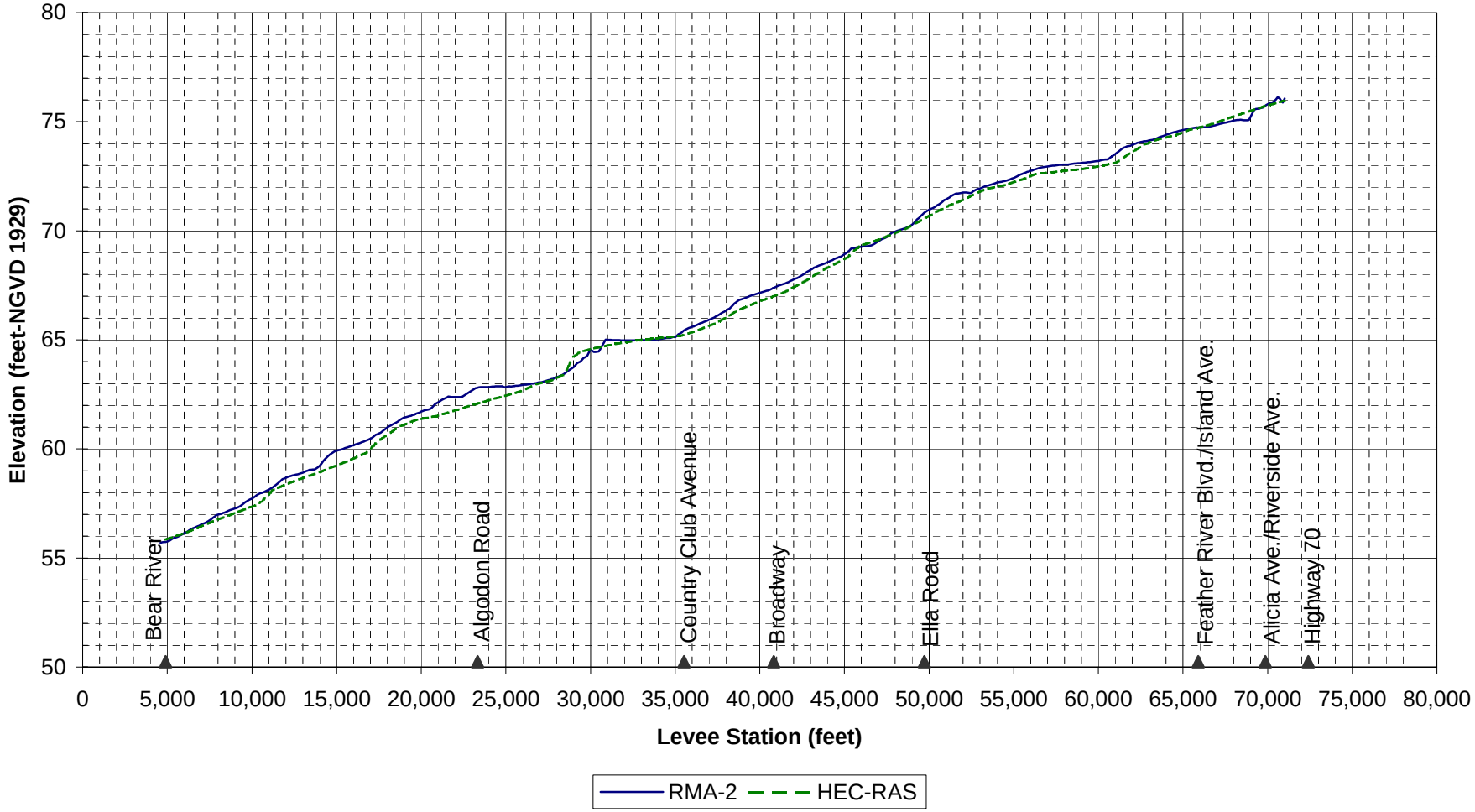
Figure
27

Figure 28
1-in-100 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Existing Condition



R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Existing Condition\Model Results Existing Conditions.xls

Figure 29
1-in-200 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Existing Condition



R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Existing Condition\Model Results Existing Conditions.xls

Figure 30
1-in-100 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Project Condition Scenario 1

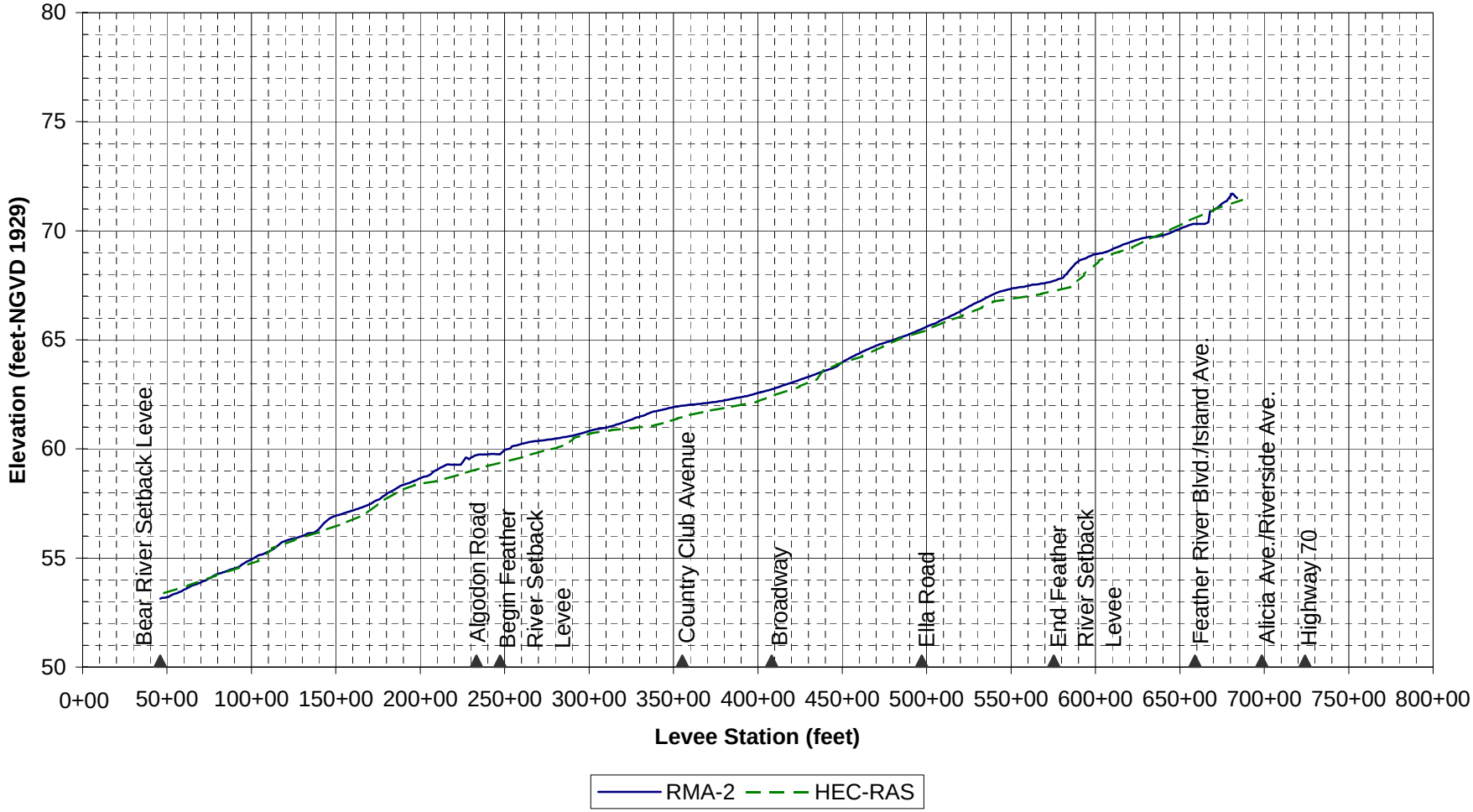
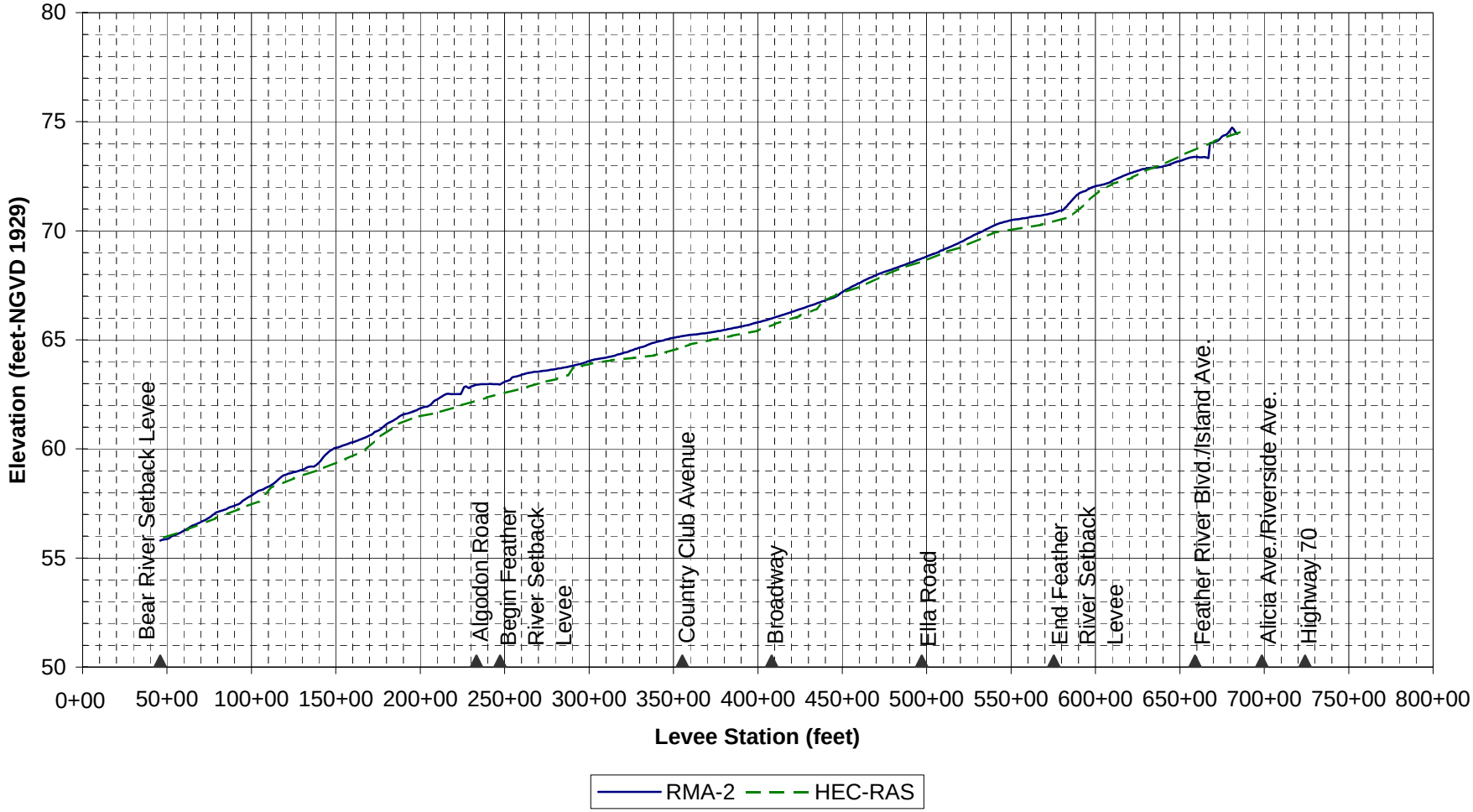
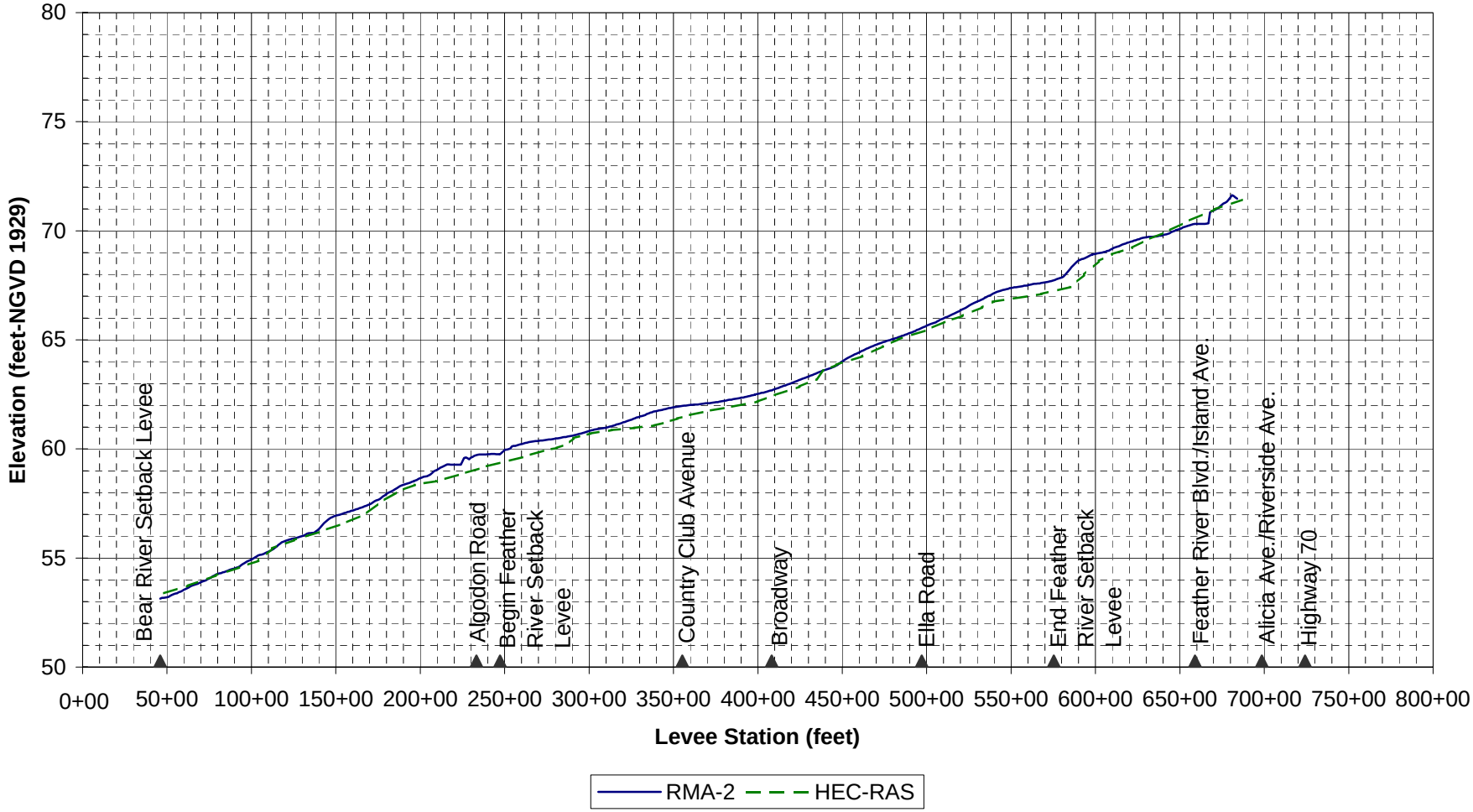


Figure 31
1-in-200 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Project Condition Scenario 1



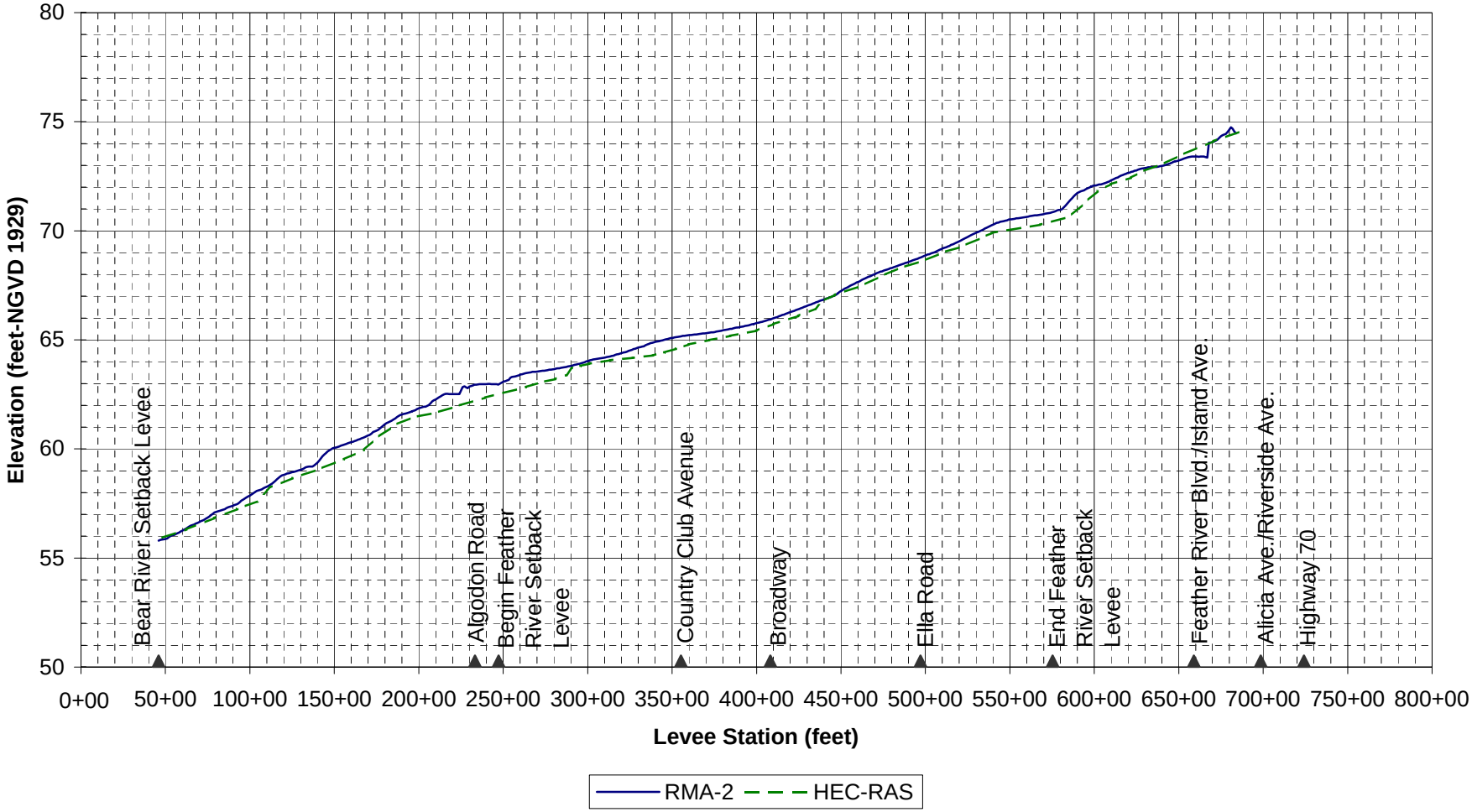
R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Project Condition\Model Results Project Conditions.xls

Figure 32
1-in-100 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Project Condition Scenario 2

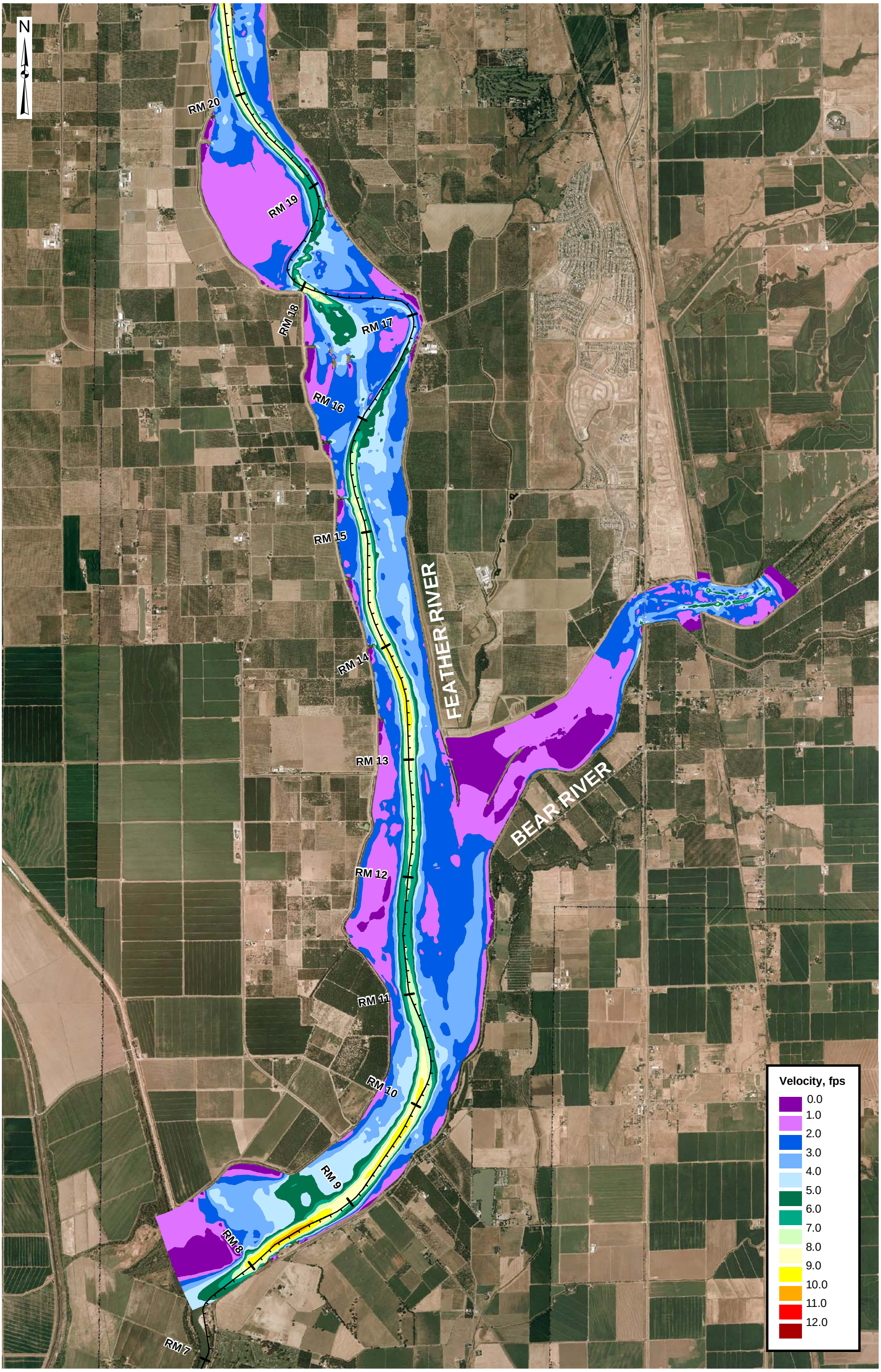


R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Project Condition\Model Results Project Conditions.xls

Figure 33
1-in-200 AEP Shanghai Centering
Feather River - Left Bank (RM 13.2 to 27.1)
Maximum Water Surface Profiles (2-D & 1-D Models) - Project Condition Scenario 2



R:\5141.41 TRLIA Hydraulic Model\2-D Model - Feather\Project Condition\Model Results Project Conditions.xls

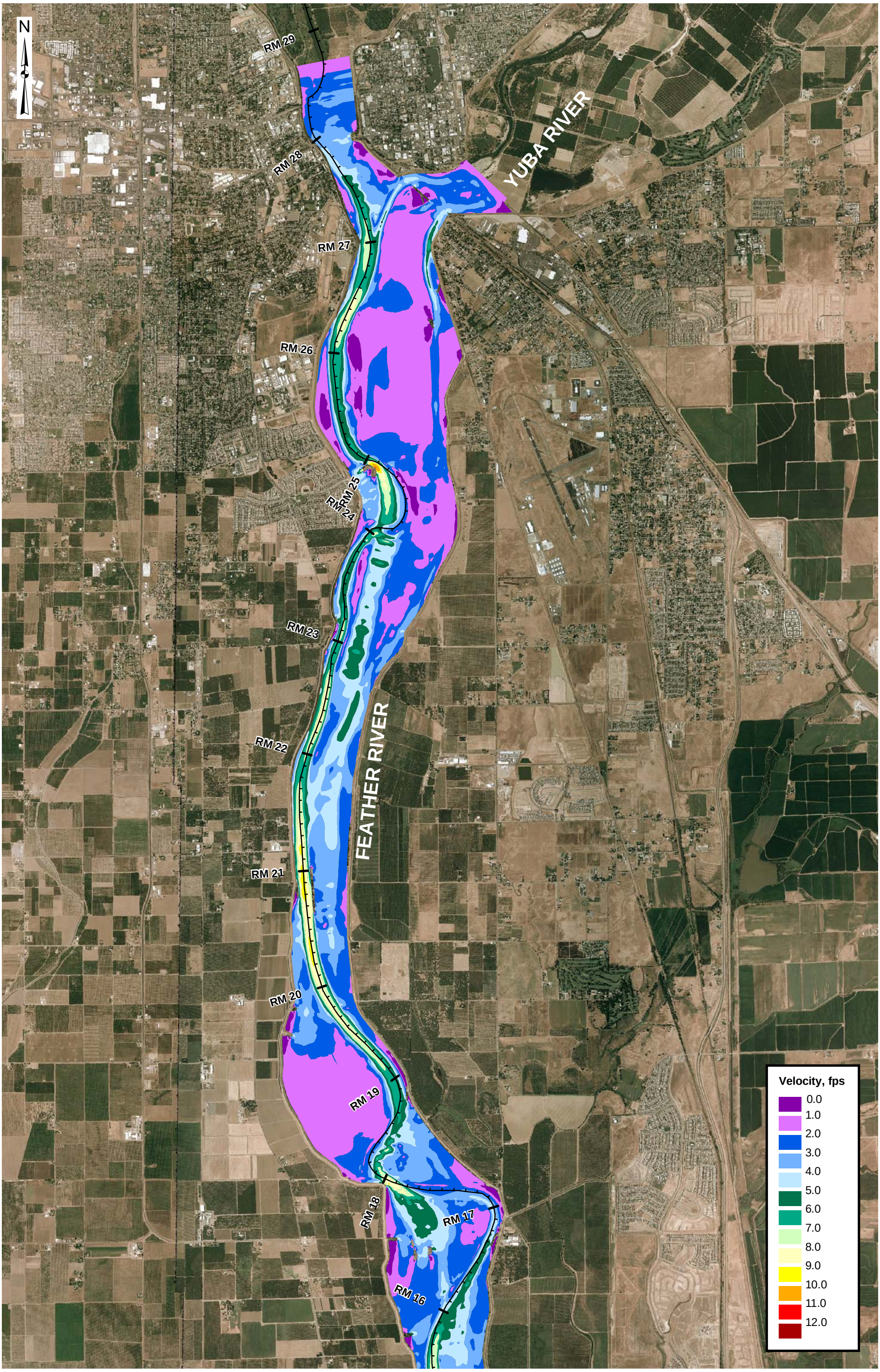


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Existing Condition
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 34

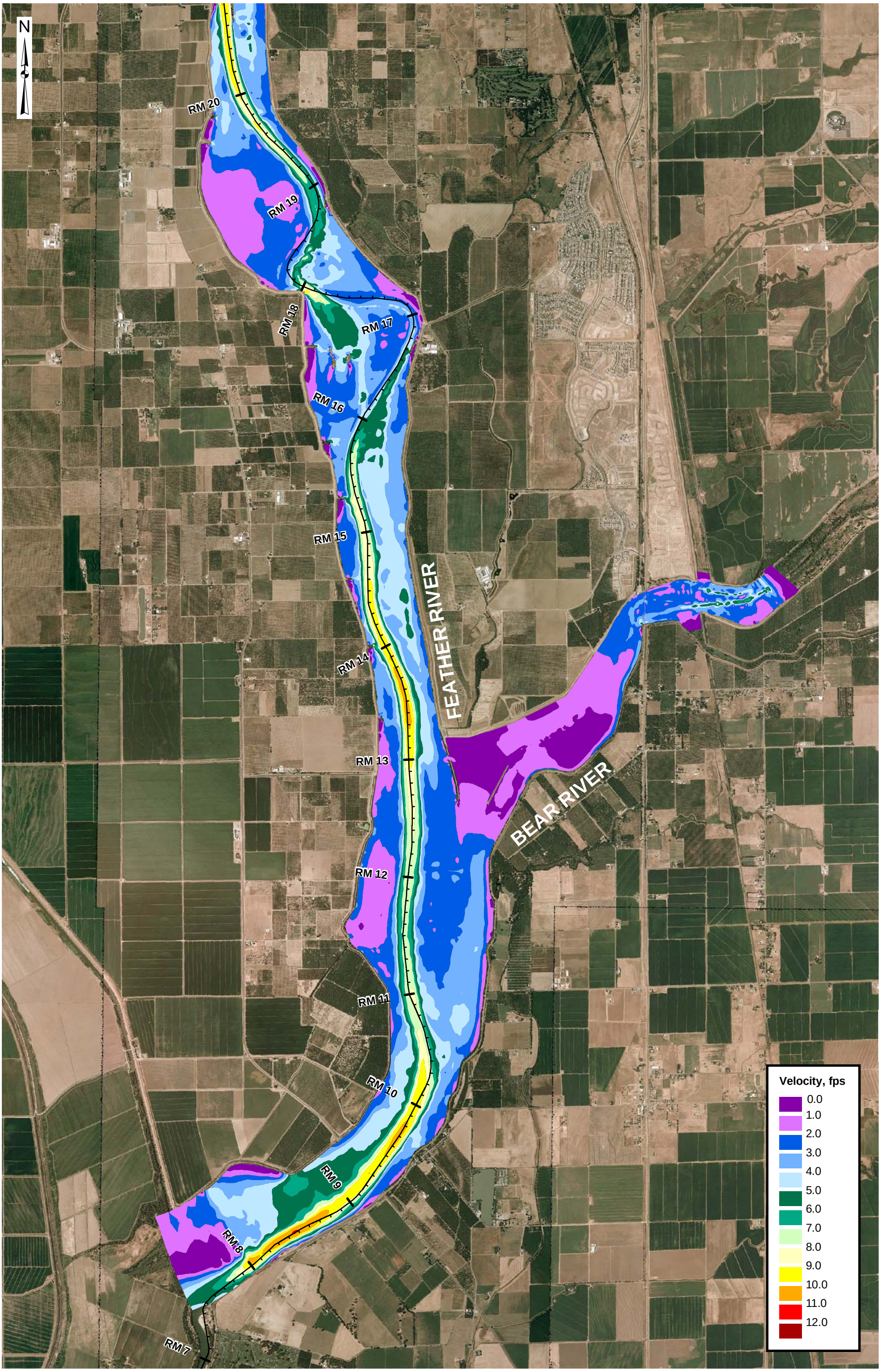


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Existing Condition
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 35

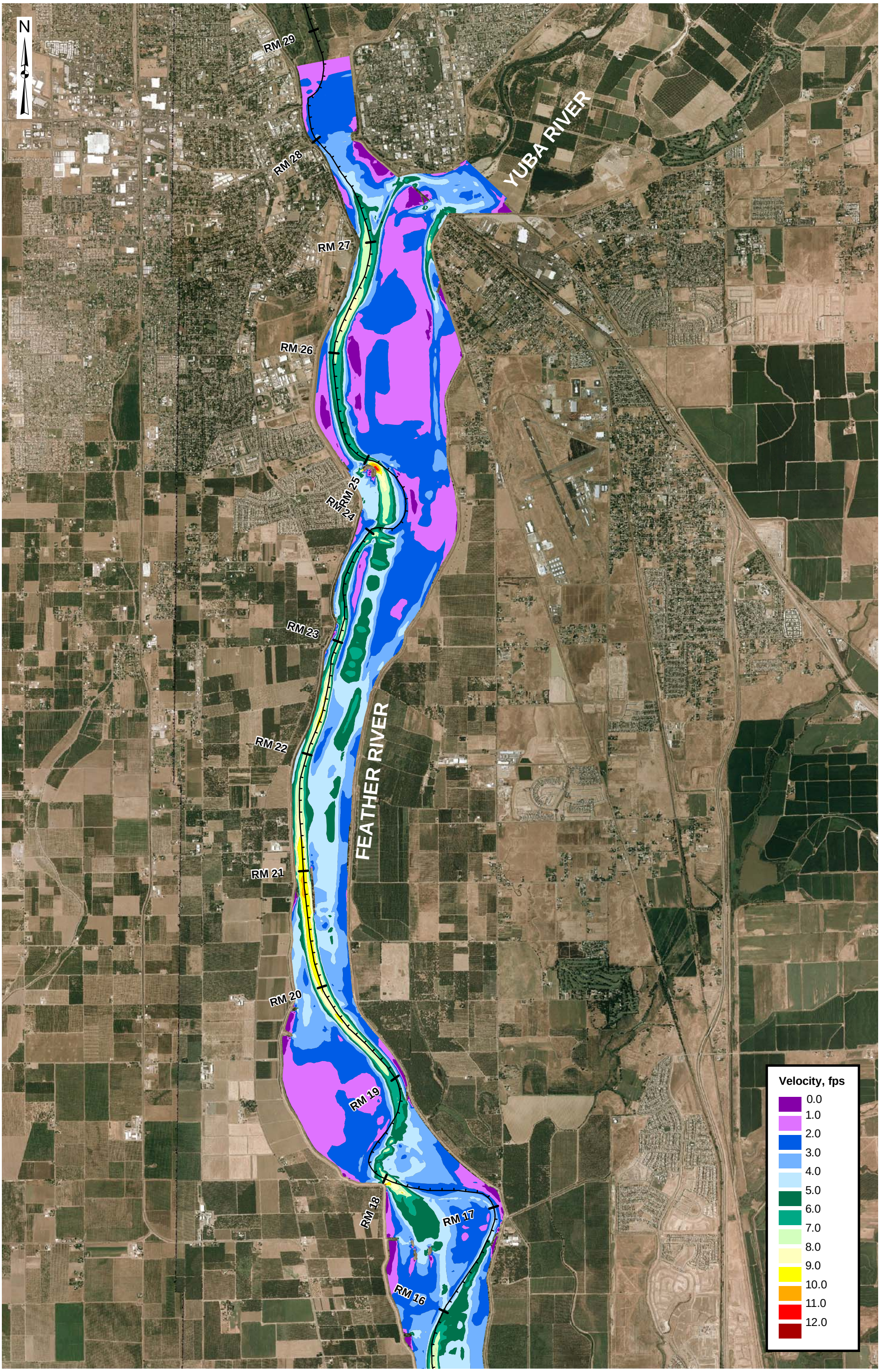


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Existing Condition
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 36

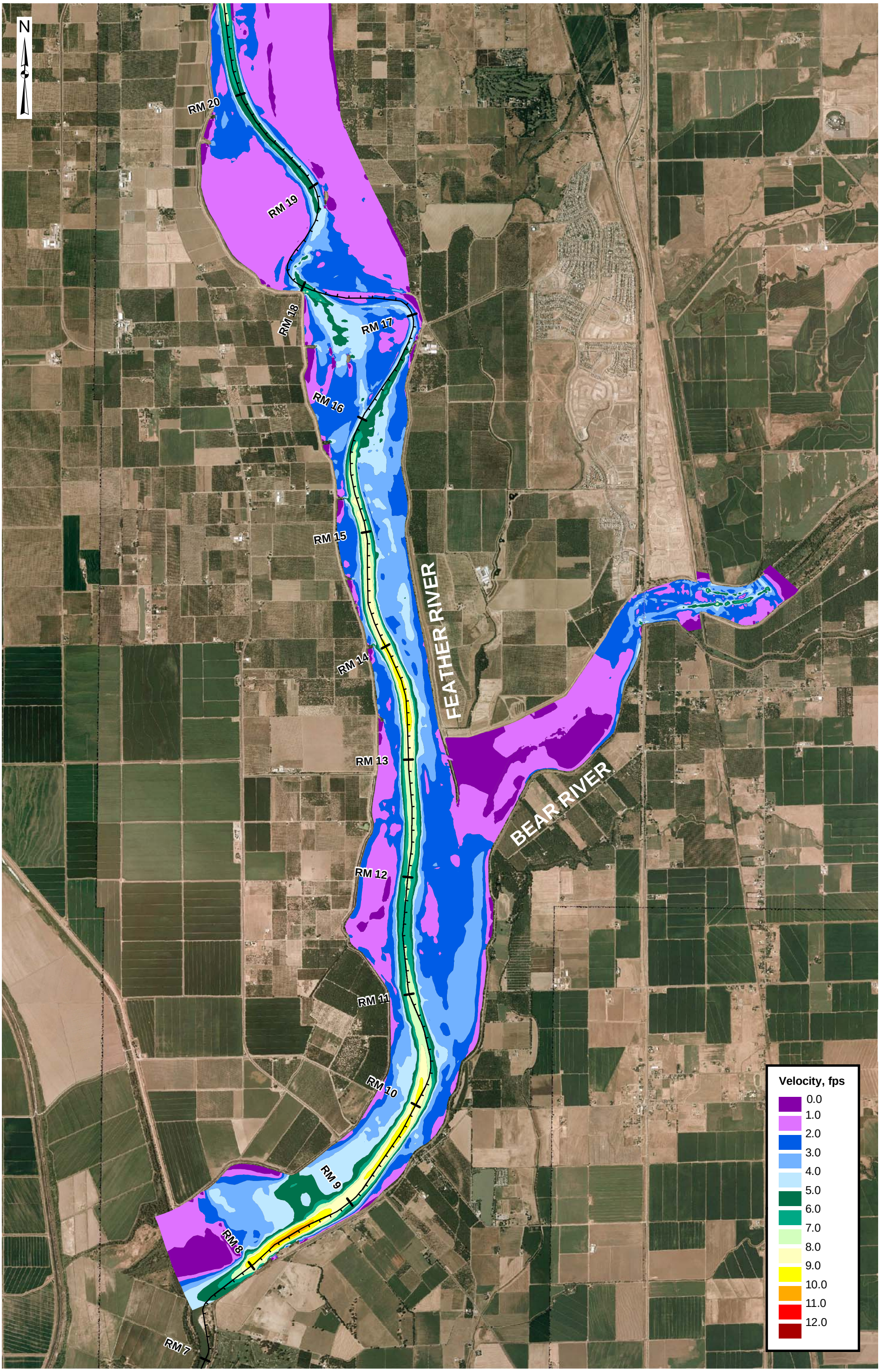


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Existing Condition
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 37

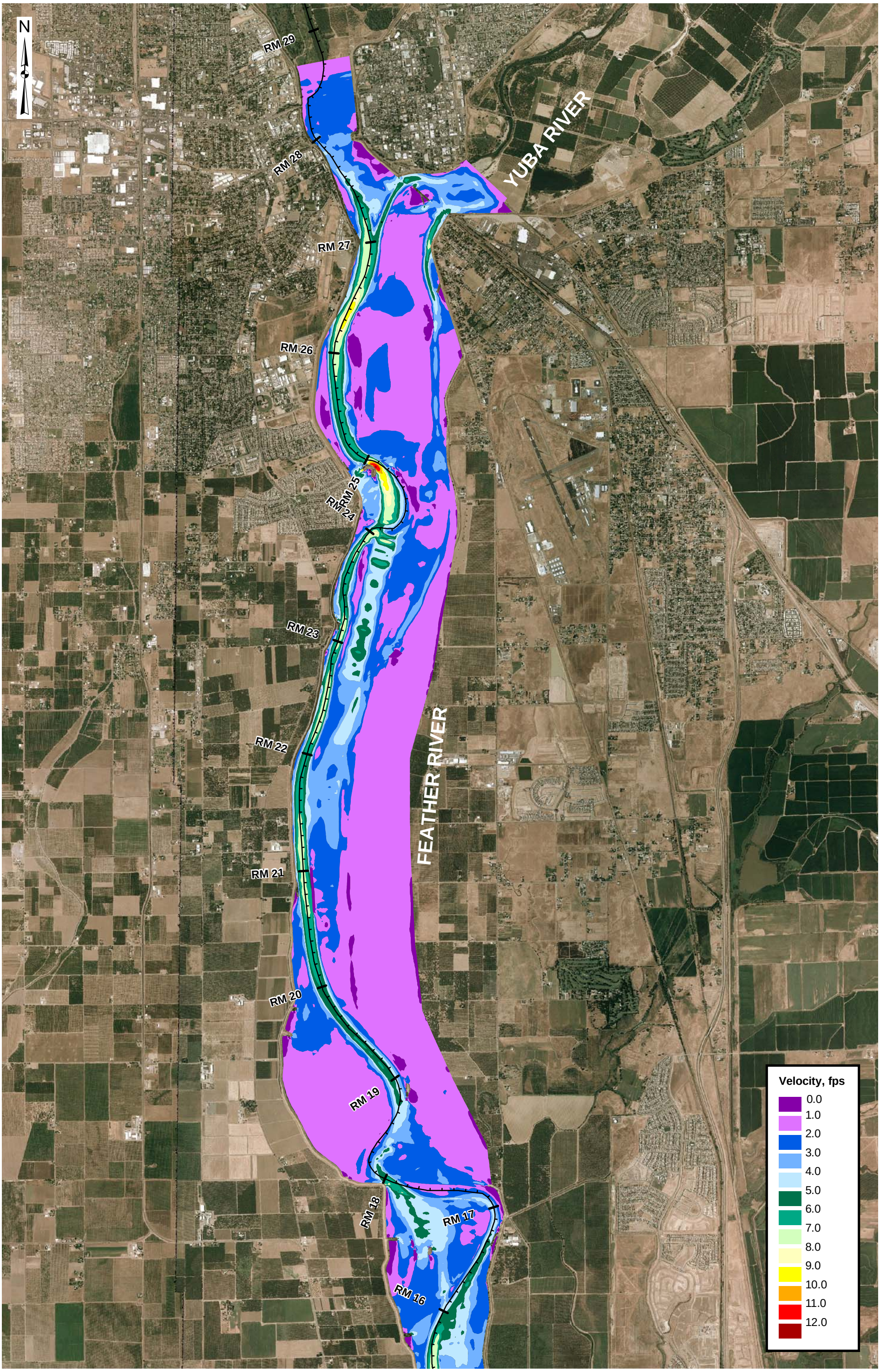


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 1
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 38

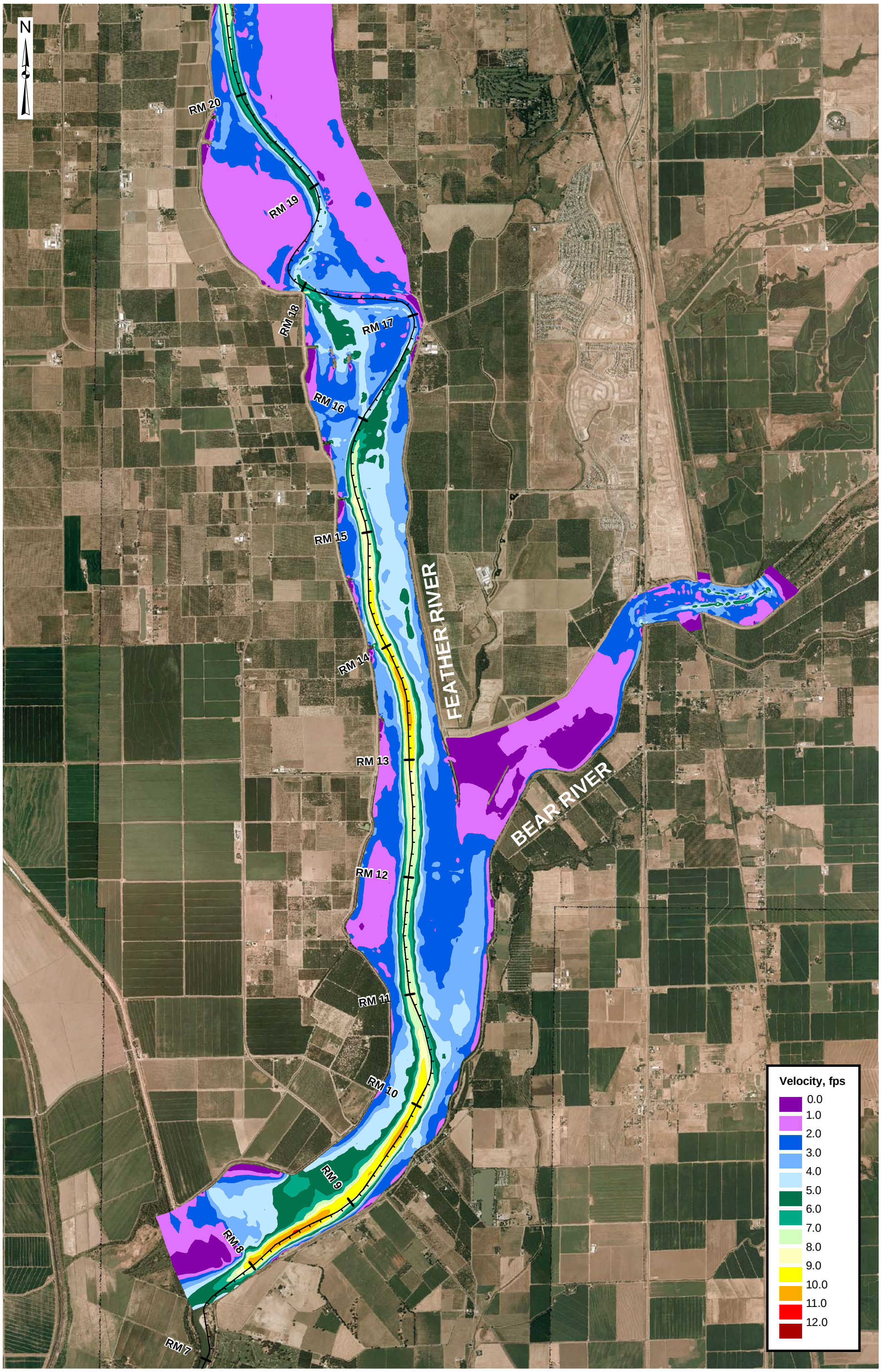


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 1
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 39

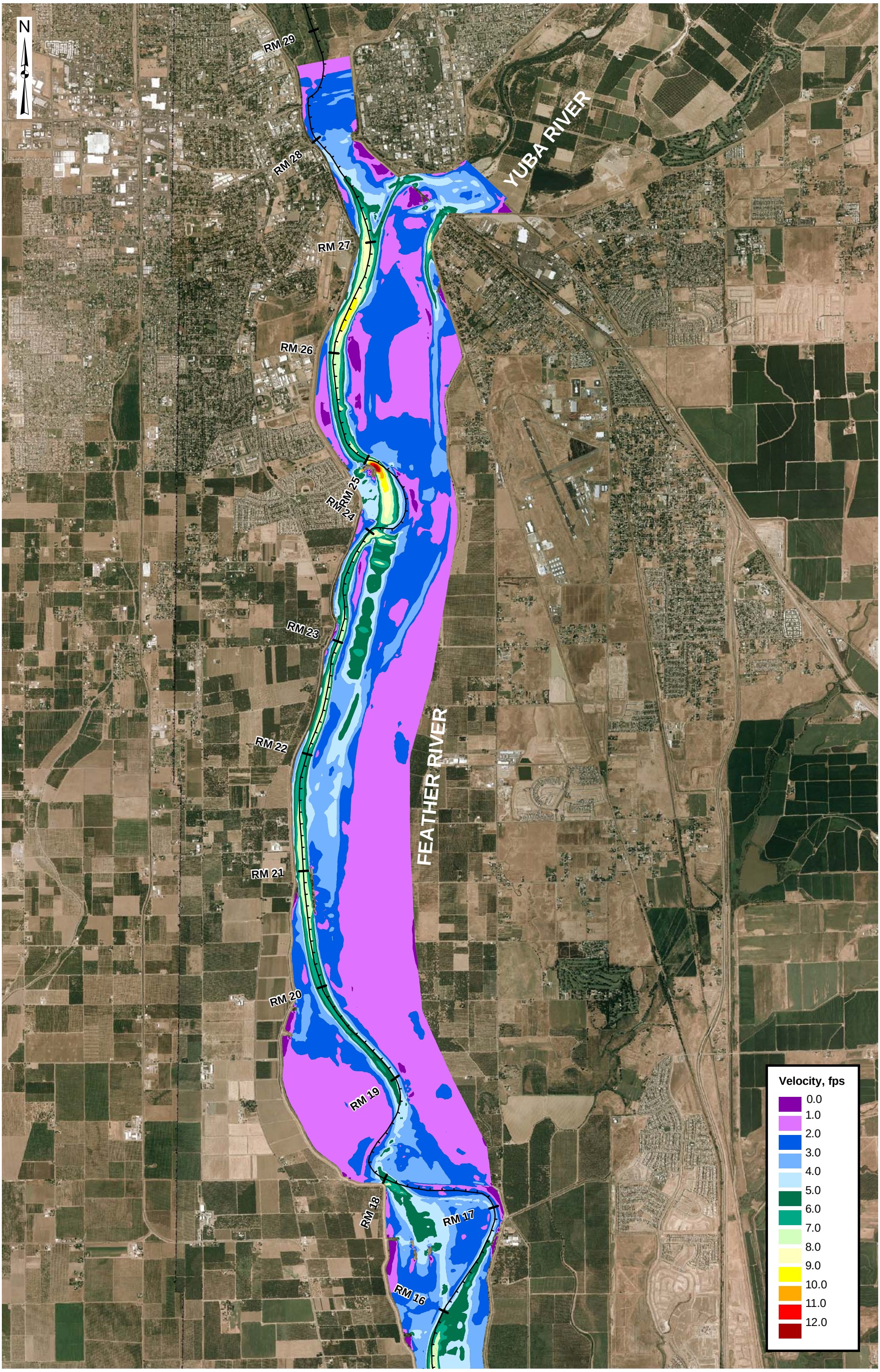


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 1
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 40

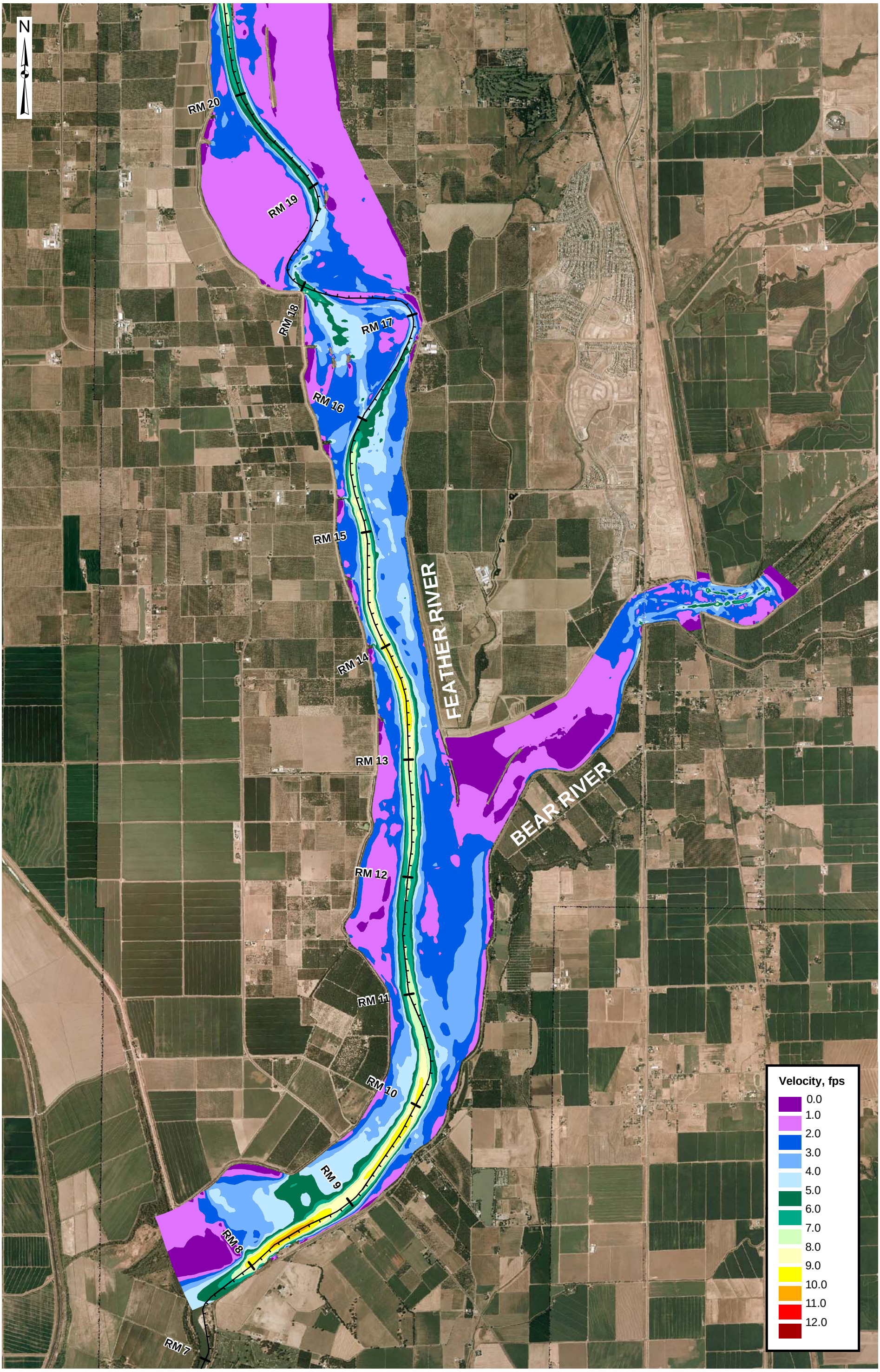


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 1
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 41

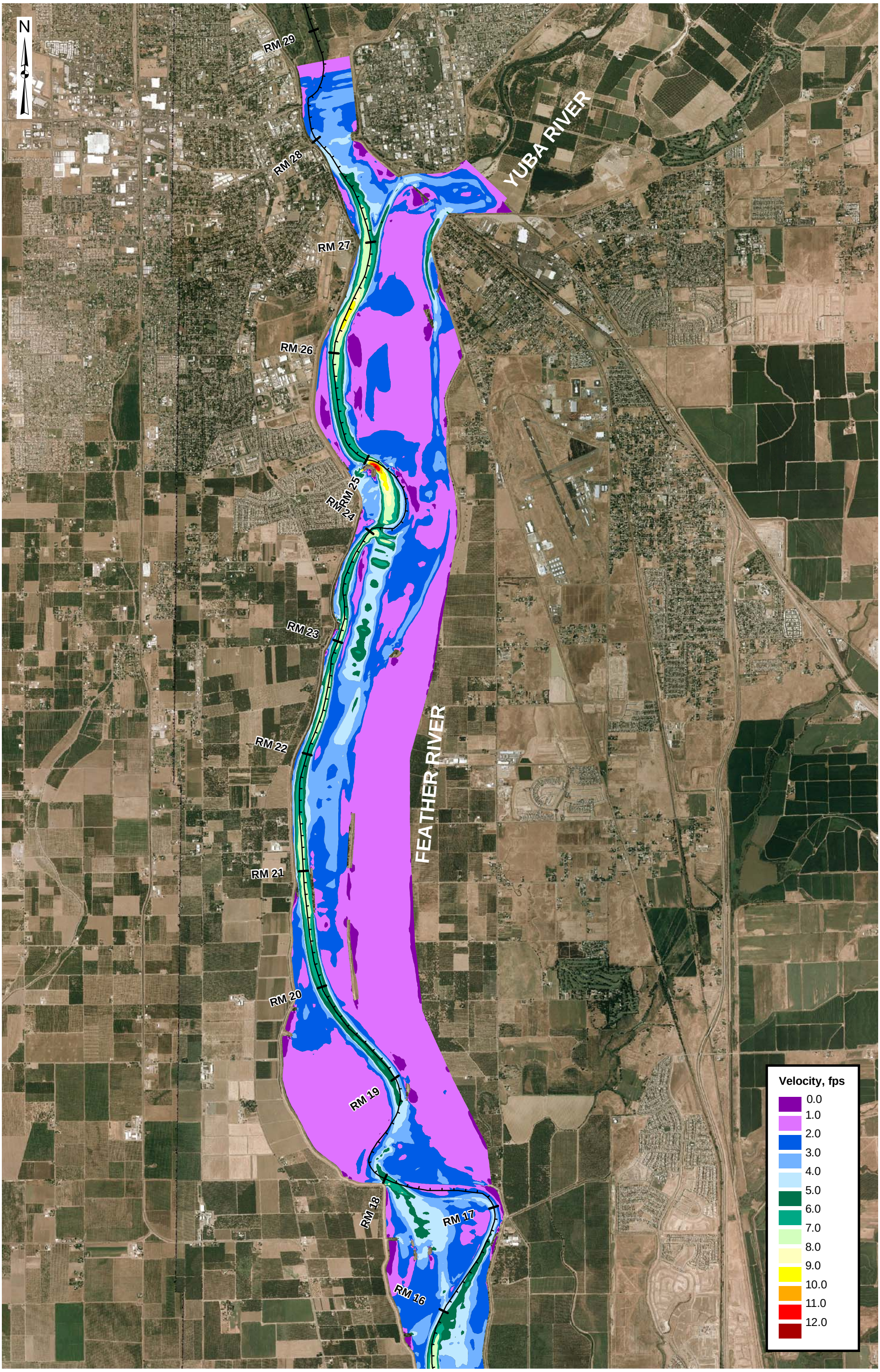


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 2
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 42

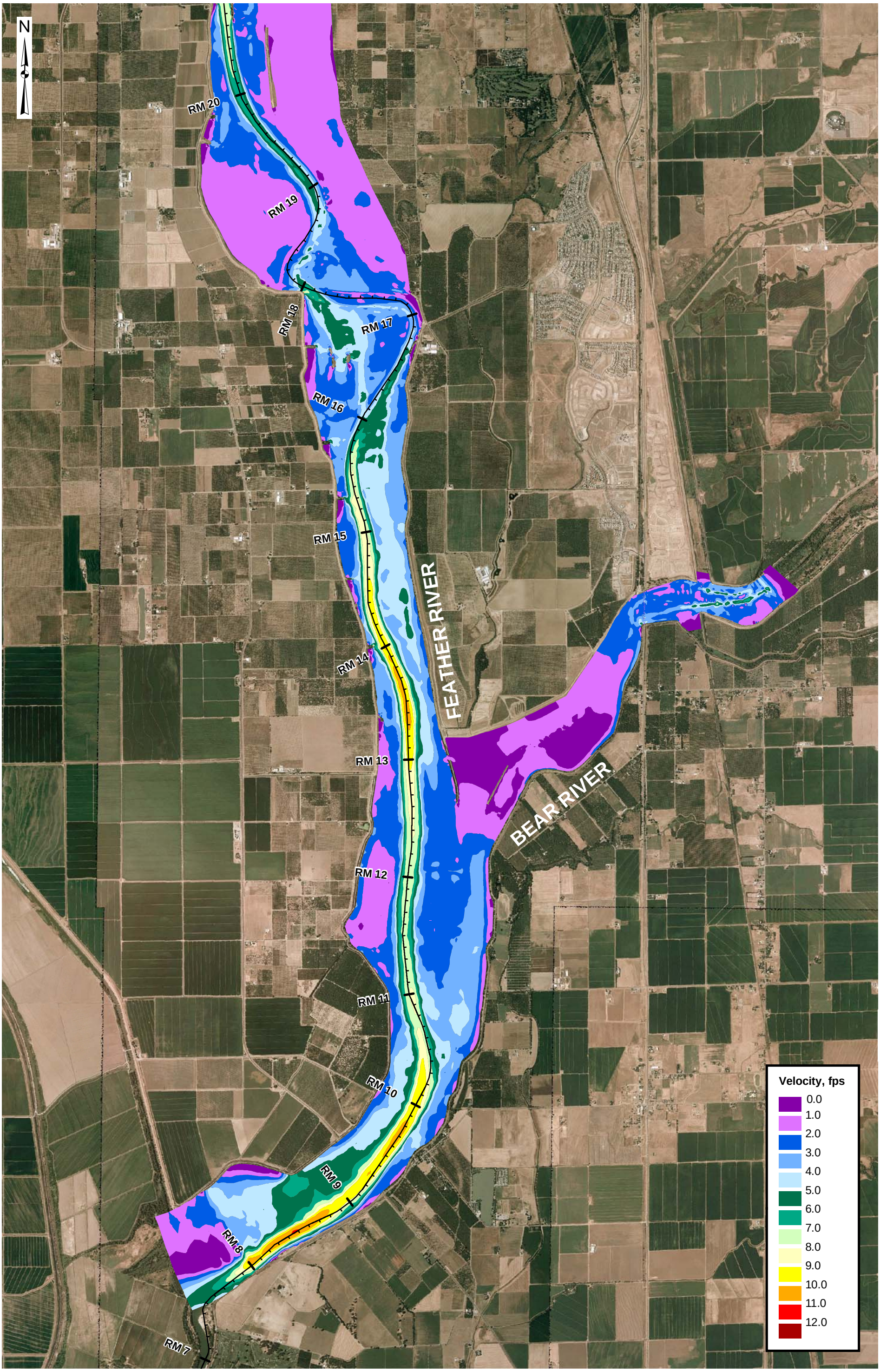


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 2
1-in-100 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 43

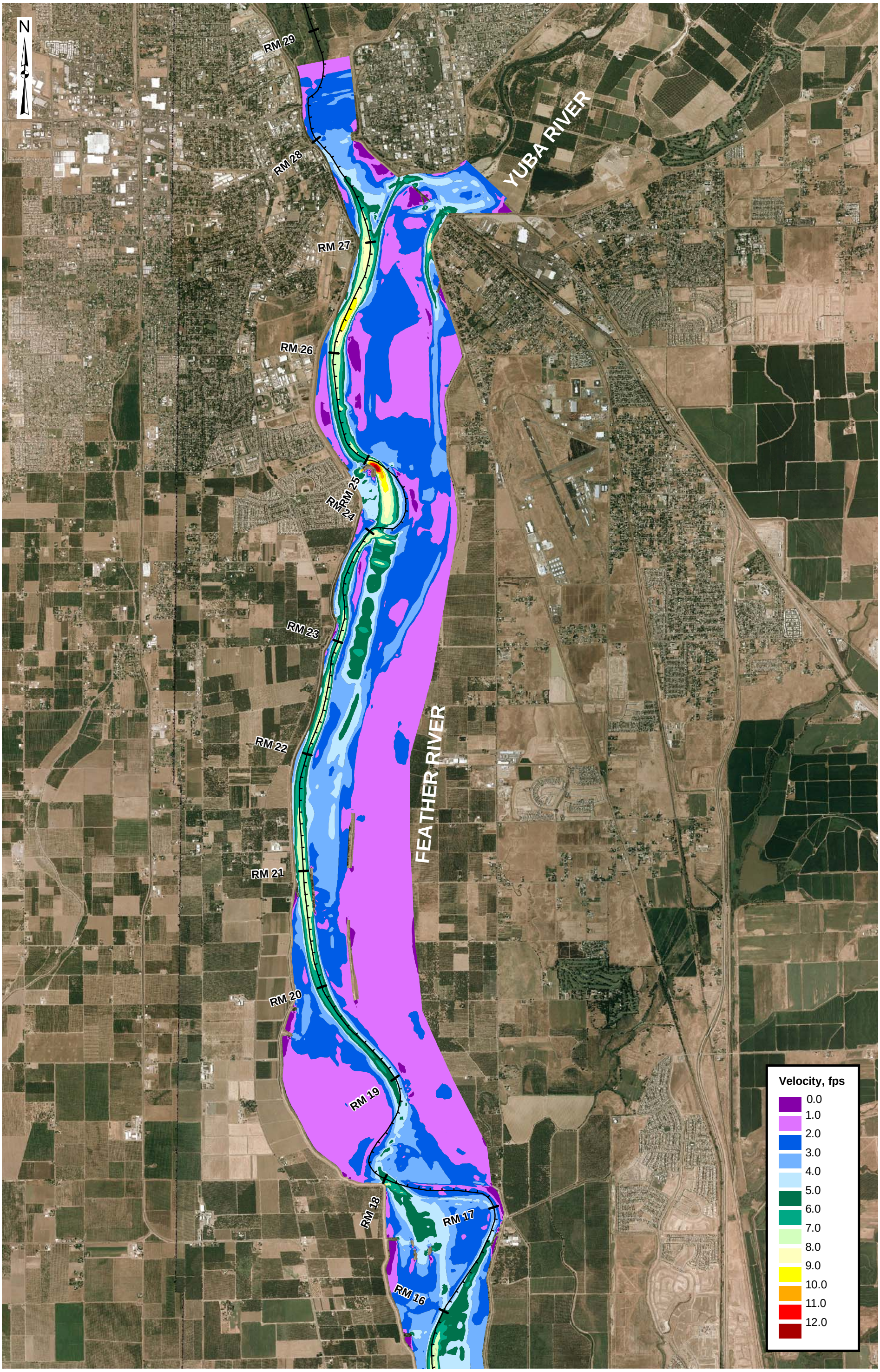


MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 2
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 44



MBK ENGINEERS
2450 Alhambra Boulevard, 2nd Floor
Sacramento, California 95817
(916) 456-4400

Project Condition - Scenario 2
1-in-200 AEP Velocity

0 2,000 4,000
Scale in Feet

Figure 45

Signed Section 1602 Agreement

AGREEMENT REGARDING PROPOSED STREAM ALTERATION

THIS AGREEMENT, entered into between the State of California, Department of Fish and Game, hereinafter called the Department, and Three Rivers Levee Improvement Authority of Marysville, State of California, hereafter called TRLIA, is as follows:

WHEREAS, pursuant to California Fish and Game Code, Section 1602, TRLIA, on August 31, 2007, notified the Department that it intends to substantially divert or obstruct the natural flow of, or substantially change the bed, channel, or bank of, or use material from the streambed of, the following water: Feather River, Plumas Lake Canal and associated drainages, in the County of Yuba, State of California, Township 13 & 14N, Range 3 & 4E, USGS Map Olivehurst MDB&M.

WHEREAS, the Department, represented by Gary Hobgood, has determined that such operations may substantially adversely affect existing fish and wildlife resources including: giant garter snake (*Thamnophis couchi gigas*); valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*); Swainson's hawk (*Buteo swainsoni*); Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*); Central Valley spring-run Chinook salmon (*O. tshawytscha*); fall-/late fall-run Chinook salmon (*O. tshawytscha*); Central Valley steelhead (*O. mykiss*); green sturgeon (*Acipenser medirostris*), warm water fish species, amphibians, and other aquatic and terrestrial plant and wildlife species.

THEREFORE, the Department hereby proposes measures to protect fish and wildlife during TRLIA's work. TRLIA hereby agrees to accept the following recommendations as part of this work:

Project Description: The proposed project involves constructing a setback levee, relocating a pump station adjacent to the existing levee, and degrading portions of the existing Feather River left bank levee. Approximately 5.7 miles of new setback levee would be constructed within Segment 2 to replace 6.2 miles of existing levee, and the new setback levee would tie into the existing levee at the north end of Segment 1 and the south end of Segment 3.

The proposed activities in Segment 2 will be completed in two stages: Stage 1 includes the construction of the setback levee and associated stability berms, construction of Pump Station No. 3 and associated facilities, excavation of material within borrow sites, and removal and relocation of existing utilities and structures within the setback area. Stage 2 includes the degradation of all or portions of the existing Feather River east levee within Segment 2, filling of the Plumas Lake Canal on the water side from the setback levee to where the canal opens into the ponded area, and on the land side from the setback levee to the new Pump Station No. 3, decommissioning of the existing Pump Station No. 3, and re-contouring of portions of the levee setback area and an existing drainage to facilitate the drainage of water from the levee setback area after flood events. TRLIA is considering active and passive habitat restoration areas in the setback area in addition to long term continuance of agricultural practices. With appropriate notice to the Department, this work may be included in the Stage 2 work.

Specific activities associated with Stages 1 and 2:

Stage 1 Construction

<u>Setback Levee Construction</u>

The setback levee will be approximately 5.7 miles long. The new levee segment will generally be set

back approximately 0.5 mile to the east of the existing Feather River levee, except near the northern and southern ends, where it will join the existing levee. The area between the east toe of the existing levee and the west toe of the setback levee (the levee setback area) will include approximately 1,300 acres. It is anticipated that the design crown elevation of the setback levee will be the same as the crown elevation of the existing levee at each given latitude along the alignment. The height of the setback levee will generally range from about 20 to 30 feet above the existing ground surface. The most common levee height above the adjacent land will be approximately 25 feet. The existing levee has been reconstructed by the U.S. Army Corps of Engineers (USACE) to provide a minimum of 3 feet of freeboard above the 1957 design profile. Because the levee setback will lower most flow profiles by widening the flow channel, it follows that the setback levee, if constructed to the crown elevations described above, will have freeboard of at least 3 feet above the 1957 design profile. Other anticipated dimensions of the setback levee are: a crown width of 20 feet; a footprint width (levee toe to levee toe) of approximately 170 feet (depending on levee height); levee slopes at a 3:1 ratio (H:V); and a 12-foot-wide patrol road on the levee crown.

Construction of the setback levee will include three main design elements: preparation of the levee foundation, construction of a slurry cut-off wall for seepage control in some reaches, and construction of the levee embankment. Preparation of the foundation of the setback levee will involve clearing and grubbing of all trees, brush, loose stone, abandoned structures, existing utilities, buried pipelines, and other deleterious materials that may exist within 10 feet of the proposed levee toes. After clearing and grubbing, the setback levee foundation will be stripped to remove low-growing vegetation and topsoil to a depth of at least 6 inches, although local areas with extensive tree roots or deep organic soils may require excavation to a depth of 3 feet or greater. The topsoil will be placed in a designated "unsuitable material" spoil area and/or used for borrow area reclamation. Overall, the depth of stripping is expected to average about 1 foot. Construction of a slurry cutoff wall is proposed along those portions of the setback levee where widespread strata of permeable sands and gravels exist in the foundation. The purpose of the slurry cutoff wall is to dissipate the hydraulic gradient in the levee foundation and reduce seepage quantities. To achieve maximum effectiveness, the slurry cutoff wall must extend completely through the permeable strata and terminate some distance into an underlying, reasonably continuous layer with lower permeability. The slurry cutoff wall will be composed of a mixture of soil and bentonite clay, and, in some applications, cement. Finally, construction of the setback levee embankment will begin as soon as sufficient lengths of levee foundation are complete and weather conditions allow. The embankment will be constructed as an engineered fill, with the fill placed in horizontal lifts. Each lift will be moisture conditioned and compacted to the specified density using a suitable compactor, such as a sheepsfoot, tamping-foot, or rubber-tired roller. Stability berms integral to the levee embankment will be provided in portions of the southern alignment where the foundation of the levee contains soft clay and silt deposits.

New Pump Station No. 3

An existing pump station (Pump Station No. 3) will need to be relocated to the land side of the setback levee. The current location of Pump Station No. 3 experiences excessive seepage and boils during high-water events, making it desirable to relocate the pump station out of this area. In addition, after the setback levee is complete, the existing Pump Station No. 3 will be in the setback area and exposed to flooding after the existing levee is degraded. Therefore, as part of Stage 1 of the setback levee project, a new/replacement Pump Station No. 3 will be constructed on the land side of the setback levee, followed in Stage 2 by removal of the existing pump station. The location of the new pump station will be adjacent to the Plumas Lake Canal, south of Rich Road. The new Pump Station

No. 3 will be a reinforced-concrete structure similar to the recently constructed Pump Station No. 2 in RD 784. The specific capacity of the new Pump Station No. 3 will be determined during detailed project design; however, preliminary design shows that the capacity of the current pump station will be able to accommodate high-water events without the threat of upstream flooding. Once the new Pump Station No. 3 is built, an "approach channel" will be excavated to connect the pump station to the Plumas Lake Canal.

Utility Relocation and Structure Removal

Implementation of the setback levee project will necessitate the removal of all structures (houses, trailers, sheds, barns, other agricultural outbuildings) from the levee setback area, which would be subject to periodic flooding following removal of the existing levee. Approximately 20 structures in the levee setback area will be displaced by the project. Displaced structures include six residential dwelling units, and remaining structures include associated agricultural use buildings and barns. Some utilities and other facilities located in the levee setback area will need to be relocated or reinforced with implementation of the levee setback. As discussed previously, RD 784 Pump Station No. 3 will be relocated to the land side of the proposed setback levee. A PG&E 115-kilovolt (kV) transmission line called the Bogue Loop crosses the levee setback area on four towers. These towers will be replaced with new towers along the same alignment. The new towers will include reinforced foundations so that their integrity will be maintained during times of flood water inundation.

Other existing facilities that may need to be abandoned, reinforced, or relocated include roads, power distribution lines, irrigation pipelines, drainage ditches, wells, fill stations, and communications lines. Several private irrigation lines will be cut off by the construction of the setback levee, separating some lands on both sides of the setback levee that require irrigation from current water sources. The wells within the setback area may be retained to support continuing agricultural activities, may be retained to support potential environmental enhancement activities for several years after setback levee construction, or will be destroyed in accordance with California's water well regulations. Wells and fill stations in the levee setback area that will be abandoned will be removed and filled, and new wells will be dug and fill stations built outside the levee setback area to replace the abandoned facilities, as appropriate. Wells and fill stations that will be retained in the levee setback area will be retrofitted to accommodate periodic flooding. New power lines and power poles may be required for any new wells and fill stations.

Borrow Areas

Borrow material will be obtained locally from borrow areas developed inside and outside the levee setback area. It is currently estimated that a total of approximately 3.4 million cubic yards (cy) of compacted borrow material will be required to construct the setback levee in project Segment 2 and that borrow areas will be excavated to depths in the order of about of 5–10 feet.

Two general objectives are important in the selection of borrow areas: to minimize haul distances to the setback levee alignment and provide a continuous or nearly continuous borrow source, and to reduce the potential for seepage impacts at the foundation of the setback levee. Minimizing haul distances is important to minimize project construction costs, air emissions, and traffic impacts. To reduce the potential for seepage impacts at the foundation of the setback levee, a distance of 400 feet or greater from the edge of the borrow area to the toe of the proposed levee must be maintained unless there is an incised drainage channel between the setback levee alignment and the borrow

area. If such an incised drainage exists, borrow excavation closer to the levee may be allowed, based on an evaluation of local site conditions. Borrow areas may also be developed closer than 400 feet from the toe of the setback levee if the borrow pit is to be subsequently backfilled.

Wide, shallow excavations (rather than deep trenches) are anticipated. At the conclusion of the work, the borrow areas will be graded to blend with the topography, leaving slopes flat enough to reduce erosion and promote conditions conducive to vegetative growth (slopes 3:1 [H:V] or flatter), or filled with material from removal of existing levees (during stage 2). If not filled, the bottom of the borrow areas will be re-graded to drain away from the levee and toward the river or toward existing drainage ways. The drainage of the borrow areas will also need to ensure fish movement out of the levee setback area into the main channel of the Feather River when flood flows recede following inundating flood events. The borrow areas will be revegetated to conform to the surrounding landscape. The borrow sites will be reclaimed as appropriate. Some stockpiled topsoil, and other excess earth materials (organic soils, roots, and grass) from borrow areas and the setback levee foundation could be spread over borrow sites after excavation has been completed.

A detailed investigation of borrow areas suitable for levee embankment materials is currently underway. The location and limits of borrow areas will be determined and refined as a result of this effort. Borrow sites will be selected based on several criteria including right-of-way access, distance to the setback levee alignment, and environmental resources locations. Borrow sites will not be located where the sites could adversely affect sensitive species or habitats (i.e., wetlands or DFG jurisdictional habitats).

Stage 2 Construction

Fill of Portions of the Plumas Lake Canal

During Stage 1 the new setback levee will divide the Plumas Lake Canal with portions of the canal remaining intact on either side of the setback levee. To minimize potential for underseepage that could result from having an excavated feature too close to the levee, approximately 700 feet of the canal on the west (water) side of the setback levee will be completely filled (from the west side of the setback levee alignment to where the canal becomes ponded). Approximately 2,000 feet of canal on the east (land) side of the setback levee will be filled between the new Pump Station No. 3 and the setback levee alignment. An approximately 2-foot-deep ditch will remain along the canal alignment to drain surface runoff from landside areas at the southern end of the setback levee to the new Pump Station No. 3.

Decommission of Existing Pump Station No. 3

After the setback levee and Pump Station No. 3 construction is complete, the existing Pump Station No. 3 will continue to operate until the existing levee is degraded. At that time, the existing Pump Station No. 3 will be decommissioned and dismantled.

Setback Area Drainage Swale

A floodplain swale will be constructed along the alignment of the existing Pump Station No. 3 discharge channel from the existing Pump Station No. 3 location to the Feather River. This swale will connect the setback area lowlands to the Feather River and thus facilitate drainage and allow flood

waters to recede from the setback area in a manner that minimizes fish stranding. The existing channel will have to be enlarged and deepened to accommodate flood flows leaving the setback area and to minimize the potential for fish stranding as flood waters recede. The channel will be constructed in a manner that minimizes vegetation disturbance, fish stranding, and other environmental impacts. A site-specific drainage plan for the entire setback area will be developed in final design.

The swale will also act to allow backwater to flow into the setback area from the Feather River, increasing the inundation frequency of the setback area and resulting in higher quality habitat. It is estimated that the 40-foot stage will be inundated in two out of every three years for a period of at least one week between March 15 and May 15. Floodplain land at or below this elevation will provide a broad suite of valuable ecosystem functions, including provision of nutrients and seasonal habitat for aquatic species.

Degradation of Existing Levee

All or portions of the existing levee in Segment 2 will be removed to achieve the maximum hydraulic benefits of the levee setback by allowing water to flow into and out of the levee setback area during high river stages. Where the existing levee will be excavated to allow flood waters to pass into and out of the levee setback area, the existing embankment will be excavated to the level of the adjoining ground surface in the levee access corridor. Specific sections to be retained, if any, will be determined in final project design and will be based on factors that include possible mitigation value for project impacts on sensitive species. Those sections of the existing levee that may be left in place will not be maintained. There are no plans to use material in the existing Feather River left bank levee as borrow material for the new setback levee. It is expected that for some period of time, the existing levee and the new setback levee will be in place concurrently. During this period, the setback levee will function as a "backup" levee, providing a second line of levee protection if the existing levee in Segment 2 were to breach during a flood event.

Stream Zone Defined: The stream zone is that portion of the stream channel that restricts lateral movement of water. Where the lateral flow is restricted by levee slope, the stream zone extends to the hinge point on the water side toe of the levee. On the Plumas Lake Canal and associated drainages, the stream zone is delineated at the top of the bank or the outer edge of any riparian vegetation, whichever is more landward.

1. The notification, together with all supporting documents submitted with the notification, including the Drawing for: Phase 4 Feather River Levee Repair Project - Feather River Setback Levee – Reclamation District No. 784 dated August 15, 2007; and the Mitigation Monitoring and Reporting Program for the Feather River Levee Repair Project, are hereby incorporated into this agreement to describe the location and features of the proposed project. TRLIA agrees that all work shall be done as described in the notification and supporting documents, incorporating all project modifications, wildlife resource protection features, mitigation measures, and provisions as described in this agreement. Where apparent conflicts exist between the notification and the provisions listed in this agreement, TRLIA shall comply with the provisions listed in this agreement. TRLIA further agrees to notify the Department of any modifications made to the project plans submitted to the Department. At the discretion of the Department, this agreement will be amended to accommodate modifications to the project plans submitted to the Department and/or new project activities. Please see the current fee schedule to determine the appropriate amendment fee.

2. Documents, plans, surveys, notifications, and requests pertaining to this project or required by this agreement may be sent via email to Gary Hobgood at ghobgood@dfg.ca.gov or delivered to the Department of Fish and Game at 1701 Nimbus Road, Suite A, Rancho Cordova, CA 95670. Refer to Notification Number 1600-2007-0294-R2 when submitting documents to the Department.

3. The time period for completing the work within the stream zone of Feather River, Plumas Lake Canal and associated drainages shall be restricted to periods of low stream flow and dry weather and shall be confined to the period of May 1 to October 1. Construction activities shall be timed with awareness of precipitation forecasts and likely increases in stream flow. Revegetation, restoration and erosion control work is not confined to this time period.

4. If TRLIA finds more time is needed to complete the authorized activity, TRLIA shall submit a written request for a work period time extension to the Department. The work period extension request shall provide the following information: 1) Describe the extent of work already completed; 2) Provide specific detail of the activities that remain to be completed within the stream zone; and 3) Detail the actual time required to complete each of the remaining activities within the stream zone. The work period extension request should consider the effects of increased stream conditions, rain delays, increased erosion control measures, limited access due to saturated soil conditions, and limited growth of erosion control grasses due to cool weather. Time extensions are issued at the discretion of the Department. The Department will review the written request to work beyond the established work period. The Department will have ten calendar days to approve the proposed work period extension. The Department reserves the right to require additional measures designed to protect natural resources.

5. TRLIA is responsible for obtaining all required permits and authorizations from local, state and federal agencies. TRLIA shall notify the Department where conflicts exist between the provisions of this agreement and those imposed by other regulatory agencies. Unless otherwise notified, TRLIA shall comply with the provision that offers the greatest protection to water quality, species of special concern and/or critical habitat.

6. A copy of this agreement shall be provided to the Contractor(s) who works within the stream zone of this project. A copy of this agreement and a copy of the original notification, including the project description, as submitted to the Department, must be available upon request at the work site. The Contractor(s) shall sign this agreement prior to working within the stream zone. The Contractor(s) or a designated crew supervisor(s) shall be on site the entire time a work crew is working near the stream zone. The supervisor(s) shall be completely familiar with the terms and conditions of this agreement and shall ensure compliance with all terms and conditions. The Department reserves the right to enter the project site at any time to ensure that there is compliance with the terms/conditions of this Agreement.

7. TRLIA shall notify the Department within two working days of beginning work within the stream zones of the Feather River, Plumas Lake Canal and associated drainages. In addition, TRLIA/Contractor shall notify the Department within two working days of the completion of work within the stream zone on this project. Notification shall be submitted to the Department as instructed in item number 2 above.

8. Work in the flowing portion of the Feather River is not allowed without written authorization from the Department. All work, including dewatering, within the Plumas Lake Canal and associated drainage shall be done in accordance with the giant garter snake avoidance and mitigation measures listed in the Mitigation Monitoring and Reporting Program for the Feather River Levee Repair Project Alternative 2 – The ASB Setback Levee Alternative.

9. It is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird except as otherwise provided by the Fish and Game Code. No trees known to contain active nests of birds protected under the Fish and Game Code shall be disturbed until all eggs have hatched and young birds have fledged without prior consultation and approval of a Department representative. It is recommended that non-orchard trees that are identified for removal, be removed during the non-nesting period of August 15 to February 15. Orchard trees are defined as fruit or nut trees under active cultivation. If removal of non-orchard trees must occur during the period of February 16 and August 14, a qualified biologist shall conduct a pre-construction survey for bird nests or nesting activity in the project area. Surveys will be constructed no more that 14 days prior to the start work. If any active nests or nesting behaviors are found during the surveys, or incidentally during other project activities, the Department must be notified prior to further action. TRLIA may be required to create exclusion zones of 75 to 1,000 feet depending on the species observed. The exclusion zone must be maintained until birds have fledged or the nest is abandoned. The survey results shall be provided to the Department prior to removing any trees. The survey shall be submitted to the Department as instructed in item number 2 above. Given the extent of orchard trees in the project area, and the typically low quality of nesting habitat provided by these trees due to spraying of herbicides and pesticides and human disturbance associated with maintenance and harvest, preconstruction surveys and seasonal restrictions on tree removal are considered to provide little benefit relative to required effort. Therefore, seasonal removal restrictions and preconstruction survey requirements are not applied to orchard trees as defined above. However, if nesting birds are found in orchard trees during other project activities, the birds and trees will be provided the same level of protection as other trees containing nesting birds, as described above.

10. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. No native trees with a trunk diameter at breast height (DBH) in excess of four (4) inches shall be removed or damaged without being properly identified and enumerated. Compensation for riparian community losses will encompass the goal of "no net loss" of riparian habitat acres or values. Impacts on riparian communities will be compensated for at a minimum ratio of 1:1 (acreage value). A revegetation plan will be prepared by a qualified restoration ecologist and submitted to the Department for review and approval. The revegetation plan will specify the planting stock appropriate for the region and employ the most successful techniques available at the time of planting. Success criteria will be established as part of the plan. Plantings will be monitored for 5 years to ensure they have established successfully. The riparian community mitigation will be considered successful when sapling trees are established, no longer require active management, and are arranged in groups that, when mature, replicate the area, natural structure, and species composition of similar riparian habitat in the region. The planting plan shall be submitted to the Department for review and approval within 180 days of the removal of the existing Feather River Levee within Segment 2. The Department will have 30 calendar days to approve the planting plan. If the Department does not reply within 30 days, the planting plan shall be implemented as submitted. To the extent that replacement of the riparian community cannot be accomplished on site, TRLIA may

combine on-site mitigation with the acquisition of mitigation credits at an approved mitigation bank or may participate in some other Department approved compensation plan. The riparian community compensation plan and monitoring reports shall be submitted to the Department as instructed in item number 2 above.

11. Precautions to minimize turbidity/siltation shall be taken into account during project planning and implementation. This may require the placement of silt fencing, coir logs, coir rolls, straw bale dikes, or other siltation barriers so that silt and/or other deleterious materials are not allowed to pass to downstream reaches. Passage of sediment beyond the sediment barrier(s) is prohibited. If any sediment barrier fails to retain sediment, corrective measures shall be taken. The sediment barrier(s) shall be maintained in good operating condition throughout the construction period and the following rainy season. Maintenance includes, but is not limited to, removal of accumulated silt and/or replacement of damaged silt fencing, coir logs, coir rolls, and/or straw bale dikes. TRLIA is responsible for the removal of non-biodegradable silt barriers (such as plastic silt fencing) after the disturbed areas have been stabilized with erosion control vegetation (usually after the first growing season). Upon Department determination that turbidity/siltation levels resulting from project related activities constitute a threat to aquatic life, activities associated with the turbidity/siltation shall be halted until effective Department approved control devices are installed or abatement procedures are initiated.

12. Raw cement/concrete or washings thereof, asphalt, paint or other coating material, oil or other petroleum products, or any other substances which could be hazardous to aquatic life, resulting from project related activities, shall be prevented from contaminating the soil and/or entering the waters of the state. Any of these materials, placed within or where they may enter a stream or lake by TRLIA or any party working under contract or with the permission of TRLIA, shall be removed immediately. The Department shall be notified immediately by TRLIA of any spills and shall be consulted regarding clean-up procedures.

13. During construction, the contractor shall not dump any litter or construction debris within the stream zone. All construction debris and associated materials shall be removed from the work site upon completion of this project.

14. All exposed/disturbed areas and access points within the stream zone left barren of vegetation as a result of the construction activities shall be restored using locally native grass seeds, locally native grass plugs and/or a mix of quick growing sterile non-native grass with locally native grass seeds. Seeded areas shall be covered with broadcast straw and/or jute netted (monofilament erosion blankets are not authorized).

15. This agreement is not valid and work may not begin until the agreement is signed by a representative of the Department of Fish & Game. Stream alteration work authorized by this agreement expires on December 31, 2012. This agreement shall remain in effect for that time necessary to satisfy all required mitigation and monitoring measures.

16. Requests for Extensions (agreement renewal), Minor Amendments, and Major Amendments must be submitted in writing prior to expiration of the agreement or commencement of work on modified project plans. Extensions and Amendments are issued at the discretion of the Department. Please see the current fee schedule to determine the appropriate fee.

17. The Department may take enforcement action and reserves the right to suspend and/or revoke this agreement if the Department determines that the circumstances warrant. The circumstances that could require these Department actions include, but are not limited to, the following: A) Failure to comply with the terms/conditions of this agreement. B) The information provided by TRLIA in support of the agreement/notification is determined by the Department to be incomplete, or inaccurate. C) When new information related to adverse effects on the stream zone and fish and wildlife resources becomes available to the Department representative(s) that was not known when preparing the original terms/conditions of this agreement. D) The project as described in the notification, agreement, or amendment has changed, or conditions affecting fish and wildlife resources change, resulting in increased adverse effects on these resources.

18. If, in the opinion of the Department, conditions arise or change in such a manner as to be considered deleterious to aquatic life, operations in the stream zone or affecting the stream zone shall cease until corrective measures are taken.

19. It is understood that the Department enters into this agreement for purposes of establishing protective features for fish and wildlife, in the event that a project is implemented. The decision to proceed with the project is the sole responsibility of TRLIA, and is not required by this agreement. It is agreed that all liability and/or incurred costs related to or arising out of TRLIA's project and the fish and wildlife protective conditions of this agreement, remain the sole responsibility of TRLIA. TRLIA agrees to hold harmless and defend the State of California and the Department of Fish and Game against any related claim made by any party or parties for personal injury or other damage.

SIGNATURE PAGE

TRLIA, as designated by the signature on this agreement, shall be responsible for the execution of all elements of this agreement. A copy of this agreement must be provided to contractor(s) and subcontractor(s) and must be in their possession at the work site.

Failure to comply with the provisions of this agreement and with other pertinent Code Sections, including but not limited to Fish and Game Code Sections 5650, 5652 and 5948, may result in prosecution.

Nothing in this agreement authorizes TRLIA to trespass on any land or property, nor does it relieve TRLIA of responsibility for compliance with applicable federal, state, or local laws or ordinances.

This agreement is not valid and work may not begin until the agreement is signed by a representative of the Department of Fish & Game.

TRLIA Representative: Paul G. Brunner
Please print and sign name

Date December 20, 2007

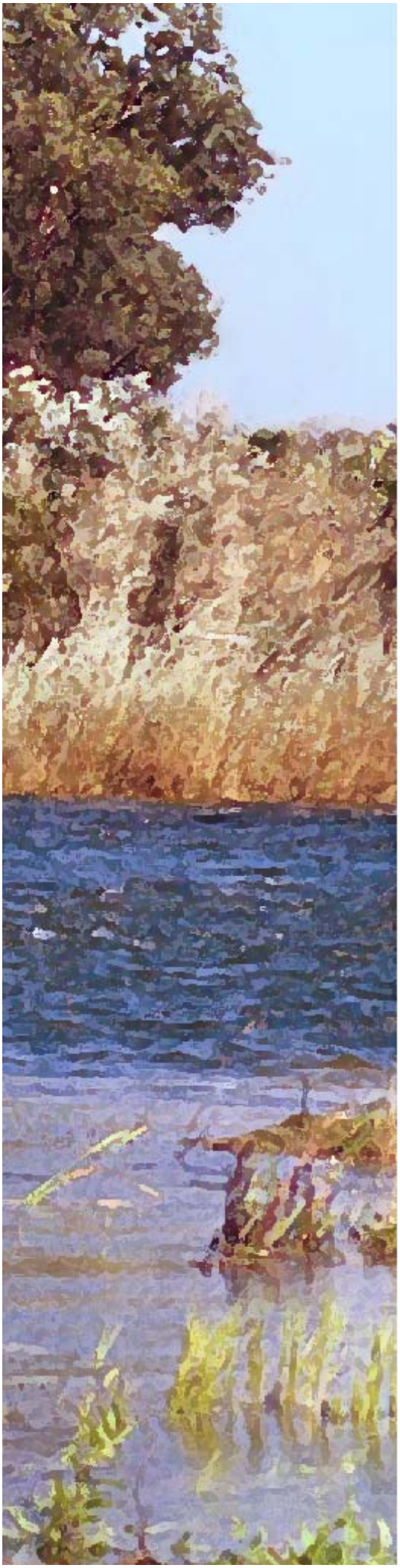
Contractor: _____ Date _____

Title: _____

Company: _____

Department Representative: Sandra Morey, Regional Manager Date 1/2/08

Application for Section 2081(b) Incidental Take Permit, Segment 2



Application for
CALIFORNIA ENDANGERED SPECIES ACT
SECTION 2081(b) INCIDENTAL TAKE PERMIT

FOR THE
FEATHER RIVER LEVEE REPAIR PROJECT
SEGMENT 2

AN ELEMENT OF THE
YUBA-FEATHER SUPPLEMENTAL
FLOOD CONTROL PROJECT

APPLICANT

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

PREPARED BY

EDAW

August 2007

Application for
CALIFORNIA ENDANGERED SPECIES ACT SECTION 2081(b) INCIDENTAL TAKE PERMIT

FOR THE
FEATHER RIVER LEVEE REPAIR PROJECT SEGMENT 2

AN ELEMENT OF THE
YUBA-FEATHER SUPPLEMENTAL FLOOD CONTROL PROJECT

PREPARED FOR

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Contact: Paul Brunner

PREPARED BY

EDAW
2022 J Street
Sacramento, CA 95814

Contact: Anne King
Senior Wildlife Biologist
916/414-5800

August 2007

06110019.01
8.1.07

TABLE OF CONTENTS

Section Page

APPLICANT INFORMATION 1

Applicant 1

Applicant's Representatives 1

PROJECT LOCATION 1

PROJECT DESCRIPTION 1

Background and Purpose, Need, and Objectives 1

Setback Levee Alignment 5

Setback Levee and Maintenance Corridor Dimensions 5

Project Construction Elements 6

Staging Areas, Access Routes, and Material Disposal 12

Project Schedule 12

COVERED SPECIES 13

Giant Garter Snake 14

Swainson's Hawk 14

Central Valley Spring-run Chinook Salmon 23

POTENTIAL FOR TAKE 23

Giant Garter Snake 23

Swainson's Hawk 24

Central Valley Spring-run Chinook Salmon 24

IMPACTS OF PROPOSED TAKE 27

POTENTIAL TO JEOPARDIZE CONTINUED EXISTENCE 28

MITIGATION 28

Giant Garter Snake 28

Swainson's Hawk 29

Central Valley Spring-run Chinook Salmon ESU 29

MONITORING 31

FUNDING 32

CERTIFICATION 32

REFERENCES 33

TABLE OF CONTENTS

Section Page

Exhibits

1 Regional Setting 2
2 Project Area 3
3 Setback Levee Construction Elements 7
4 Aquatic Habitat and Adjacent Uplands within the Action Area 15
5a Suitable Giant Garter Snake Habitat within the Action Area 17
5b Suitable Giant Garter Snake Habitat within the Action Area 19
6 Swainson's Hawk Nest Locations 21
7 Direct Impacts to Giant Garter Snake Habitat 25

APPLICANT INFORMATION

APPLICANT

Three Rivers Levee Improvement Authority
1114 Yuba Street, Suite 218
Marysville, California 95901

The Three Rivers Levee Improvement Authority (TRLIA) is a joint powers authority with the mission of advancing the flood safety of southwestern Yuba County, California. TRLIA's member agencies include Reclamation District (RD) 784 and the County of Yuba (County).

APPLICANT'S REPRESENTATIVES

PRINCIPAL OFFICER

Paul Brunner
Executive Director, TRLIA
(530) 749-5679

CONSULTANT

Anne King
Senior Wildlife Biologist, EDAW
(916) 414-5800

Sean Bechta
Project Manager, EDAW
(916) 414-5800

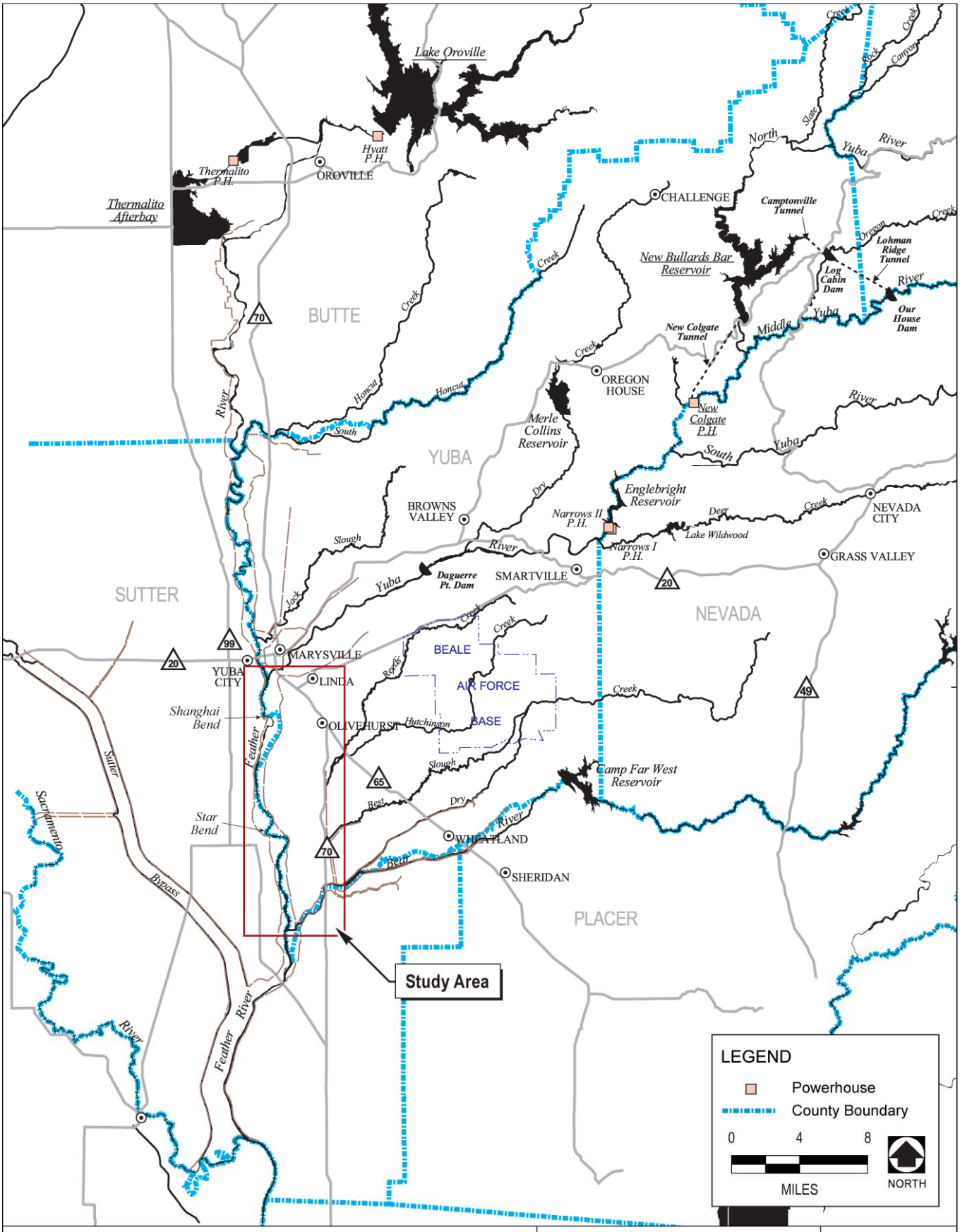
PROJECT LOCATION

The Feather River Levee Repair Project (FRLRP) area is located in the southern portion of Yuba County, generally bounded by Feather River Boulevard to the east, the Bear River to the south, the Feather River to the west, and the Yuba River to the north (Exhibit 1). For study, design, and construction purposes, the project area is divided into the three project segments depicted in Exhibit 2. Segment 2 (the subject of this application) is located in Township 14 North, Range 3 East, on the Nicolaus 7.5-minute U.S. Geological Survey topographic map.

PROJECT DESCRIPTION

BACKGROUND AND PURPOSE, NEED, AND OBJECTIVES

Studies by the California Department of Water Resources (DWR), the U.S. Army Corps of Engineers (USACE), RD 784, and TRLIA have found that several reaches of the levee system protecting the RD 784 area do not satisfy geotechnical criteria for seepage at the water surface elevation for the 100-year flood event. To correct the deficiencies identified along levee segments on the east bank of the Feather River and a small segment of the south bank of the Yuba River, TRLIA is undertaking the FRLRP. The FRLRP represents a portion of the Phase IV TRLIA program to repair and improve the Feather River and Yuba River levees within RD 784. Improvements to be conducted in each of the project segments are summarized briefly below. The improvements to Segments 1



Feather River Levee Repair Project

Regional Setting

Sources: Data Provided by EDAW and GEI 2007

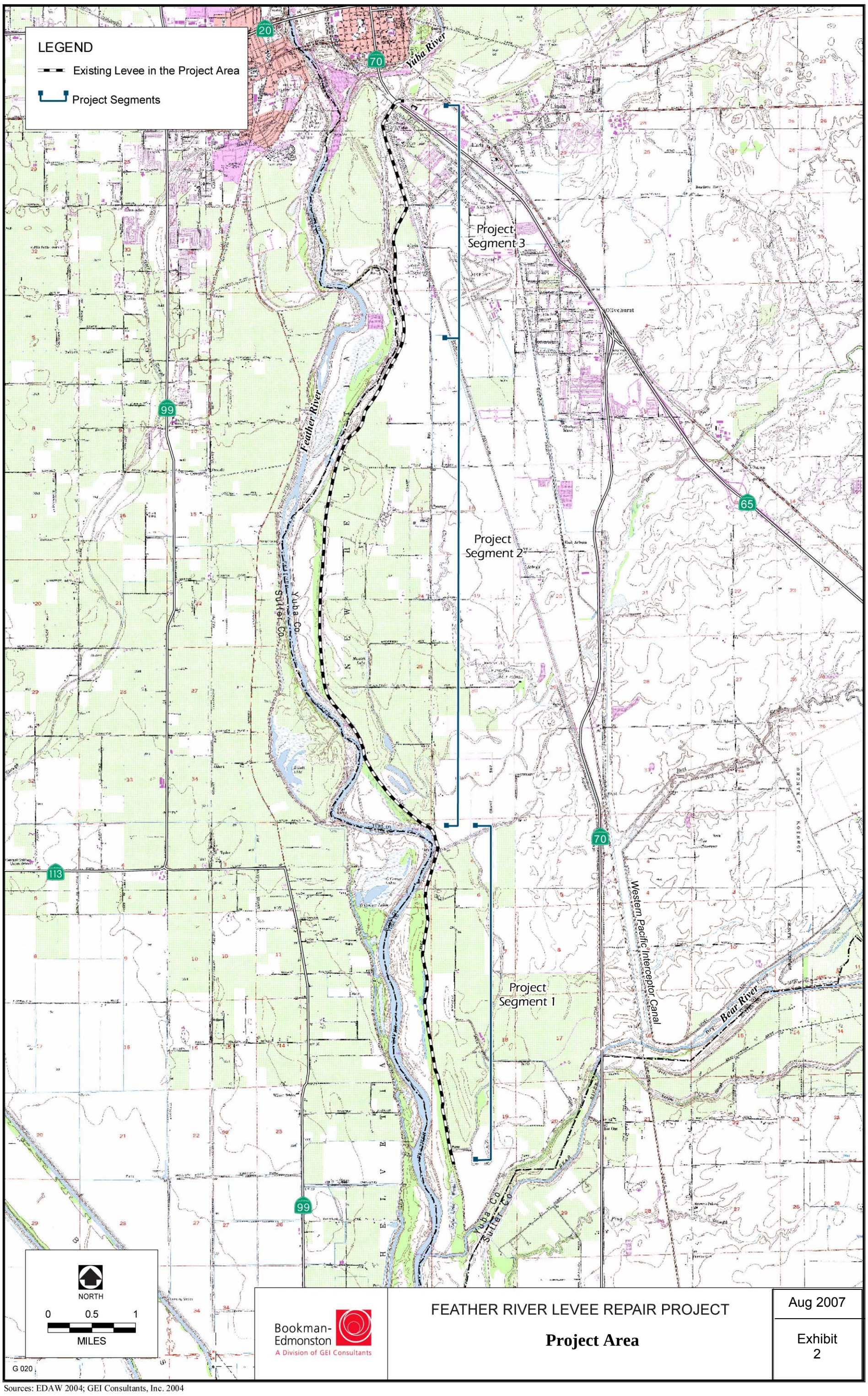
G024

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY

114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 1



Sources: EDAW 2004; GEI Consultants, Inc. 2004

and 3 have been undertaken in a separate design and construction effort from the setback levee design and construction in Segment 2.

- Segment 1—The existing Feather River left bank levee from Project Levee Mile (PLM) 13.3 to PLM 17.2 (from approximately Pump Station No. 2 to Star Bend). Improvements to this levee segment consist of repairing and strengthening the existing levee in place to correct seepage and/or stability deficiencies.

- Segment 2—The existing Feather River left bank levee from approximately PLM 17.2 to PLM 23.4 (from Star Bend to immediately south of Shanghai Bend [west of the Yuba County Airport]). TRLIA's planned improvement in this project segment is a setback levee. After the setback levee is constructed, the existing levee will be removed in various locations to allow floodwaters to enter the setback area. The existing Pump Station No. 3 will be relocated to the land side of the setback levee.

- Segment 3—The existing Feather River left bank levee from PLM 23.4 to PLM 26.1, and the Yuba River left bank levee from PLM 0.0 to PLM 0.3 (west of the Yuba County Airport to the Western Pacific Railroad crossing just west of the State Route [SR] 70 bridge). Improvements to this levee segment consist of repairing and strengthening the existing levee in place to correct seepage and/or stability deficiencies, as in Segment 1.

The proposed action would be limited to project activities in FRLRP Segment 2, including construction of the setback levee, establishment of soil borrow areas, relocation of Pump Station No. 3, removal and relocation of additional facilities and structures within the levee setback area, grading to facilitate drainage of the levee setback area after flood events, and degradation of the existing Feather River east levee within Segment 2. A more detailed description of these specific components is provided below.

SETBACK LEVEE ALIGNMENT

The proposed alignment for the setback levee in FRLRP Segment 2 is shown in Exhibit 3. This alignment was selected to achieve substantial reductions in river flood stage elevations while maintaining a Feather River floodway width that is consistent with upstream and downstream reaches of the river. A second consideration was to take advantage of the existing configuration of the levee system to identify constructible locations where the setback levee could be connected to the existing levee. This alignment has been refined based on topographic, geologic, and socioeconomic considerations. The location of the setback levee was aligned as much as possible along a topographically elevated area formed by older, more consolidated soils that are less susceptible to underseepage and therefore more suitable for a levee foundation. Consideration was also given to reducing impacts on occupied residential units.

The setback levee will be 5.7 miles long and replaces 6.2 miles of existing levee. The new levee segment will generally be set back approximately 0.5 mile to the east of the existing Feather River levee, except near the northern and southern ends, where it will join the existing levee. The area between the existing levee and the setback levee alignment (the levee setback area) and the footprint of the setback levee will include approximately 1,600 acres.

SETBACK LEVEE AND MAINTENANCE CORRIDOR DIMENSIONS

It is anticipated that the design crown elevation of the setback levee will be the same as the crown elevation of the existing levee at each given latitude along the alignment. A review of the available topographic data for the project vicinity developed as part of the Sacramento and San Joaquin River Basins Comprehensive Study indicates that the height of the setback levee will generally range from about 20 to 30 feet above the existing ground surface. The most common levee height above the adjacent land will be about 25 feet.

The existing levee has been reconstructed by the USACE to provide a minimum of 3 feet of freeboard above the 1957 design profile. Because the levee setback will lower most flow profiles by widening the flow channel,

it follows that the setback levee, if constructed to the crown elevations described above, will have freeboard of at least 3 feet above the 1957 design profile.

Other anticipated dimensions of the setback levee are:

- crown width of 20 feet,
- footprint width of approximately 170 feet depending on levee height,
- waterside and landside slope of 3:1 (H:V), and
- 12-foot-wide patrol road on levee crown.

On each side of the setback levee, stability berms integral to the levee embankment will be provided in portions of the southern alignment where the foundation of the levee contains soft clay and silt deposits. In all other sections of the alignment, a 50-foot access corridor will be provided to support levee maintenance and inspection and flood fighting activities. Adjacent to the landside access corridor, a drainage ditch will be constructed to intercept and transport stormwater flows moving toward the levee. The drainage ditch will be sized to meet flow demands. An approximately 65-foot-wide utility corridor will be provided east of the landside access corridor to accommodate the drainage ditch, a 15-foot-wide maintenance road, and other required utilities. Based on these parameters, the levee right-of-way in these portions of the alignment will be up to approximately 335 feet wide.

PROJECT CONSTRUCTION ELEMENTS

Flood control improvements in Segment 2 of the FRLRP area will be completed in two stages to accommodate schedule challenges related to beginning construction of the setback levee to replace the extremely deficient segment of existing levee, while undergoing the process for USACE and the State of California Reclamation Board (The Reclamation Board) approval to degrade the existing levee. If these processes were to take place at the same time (i.e., if TRLIA were to wait to construct the setback levee until approval to degrade the existing levee is obtained), it would delay the construction of the setback levee, which is recommended to be started as soon as possible because of the deficiencies in the existing levee. Stage 1 of the FRLRP Segment 2 activities includes construction of the setback levee and associated stability berms, construction of the new Pump Station No. 3 and associated facilities, removal and relocation of existing utilities and structures within the setback area, and excavation of borrow material. Stage 2 of the project includes degradation of all or portions of the existing Feather River east levee within Segment 2; removal of the old Pump Station No. 3; filling of Plumas Lake Canal on the water side from the setback levee to where the canal opens into the pond-like feature, and on the land side from the setback levee to the new Pump Station No. 3; and recontouring of portions of the levee setback area and an existing drainage to facilitate drainage of water from the levee setback area after flood events. Specific Stage 1 and Stage 2 activities are described in greater detail below.

STAGE 1

BORROW MATERIAL ACQUISITION

Borrow material will be obtained locally from borrow areas developed inside and outside the levee setback area. It is currently estimated that a total of approximately 3.4 million cubic yards (cy) of compacted borrow material will be required to construct the setback levee. A detailed investigation of borrow areas suitable for levee embankment materials is currently underway. The location and limits of borrow areas will be determined and refined as a result of this effort.

Objectives for use of local borrow areas include: 1) reducing the impact on land resources; 2) shortening borrow haul distances to reduce impacts on air quality and traffic; and 3) promoting the use of large off-road earthmoving equipment such as scrapers rather than trucks to reduce construction costs.

Feather River Levee Repair Project Segment 2 **Setback Levee Construction Elements**	THREE RIVERS LEVEE IMPROVEMENT AUTHORITY 1114 Yuba Street, Suite 218 Marysville, CA 95901	Aug 2007 Exhibit 3
Source: Data Provided by EDAW and GEI 2007 X118		

Two general objectives are important in the selection of borrow areas:

- Haul distances to the setback levee alignment should be minimized and a continuous or nearly continuous borrow source provided. Minimizing haul distances is important to minimize project construction costs, air emissions, and traffic impacts.

- Potential for seepage impacts at the foundation of the setback levee should be reduced by maintaining a distance of 400 feet or greater from the edge of the borrow area to the toe of the proposed levee unless there is an incised drainage channel between the setback levee alignment and the borrow area. If such an incised drainage exists, borrow excavation closer to the levee may be allowed, based on an evaluation of local site conditions. Borrow areas may also be developed closer than 400 feet from the toe of the setback levee if the borrow pit is to be subsequently backfilled.

It is anticipated that borrow will be extracted from wide, shallow (5–10 feet deep) excavations, rather than deep trenches. At the conclusion of the work, the borrow areas will be graded to blend with the topography, leaving slopes flat enough to reduce erosion and promote conditions conducive to vegetative growth (slopes 3:1 [H:V] or flatter), or filled with material from removal of existing levees (during stage 2). If not filled, the bottom of the borrow areas will be regraded to drain away from the levee and toward the river or toward existing drainageways to ensure fish movement out of the levee setback area into the main channel of the Feather River when flood flows recede following inundating flood events. The borrow areas will be revegetated to conform to the surrounding landscape. Some stockpiled topsoil, and other excess earth materials (organic soils, roots, and grass) from borrow areas and the setback levee foundation could be spread over borrow sites after excavation has been completed.

Aggregate base needed to surface the patrol road on the levee crown and similar materials will be obtained from commercial sand and gravel operations in the Marysville-Yuba City area and will be hauled to the setback levee alignment by truck.

SETBACK LEVEE FOUNDATION PREPARATION

Preparation of the foundation of the setback levee will involve a sequence of several activities. The setback levee footprint will be cleared and grubbed of all trees, brush, loose stone, abandoned structures, existing utilities, buried pipelines, and other deleterious materials that may exist within 10 feet of the levee toes. After clearing and grubbing, the setback levee foundation will be stripped to remove low-growing vegetation and topsoil to a depth of at least 6 inches, although local areas with extensive tree roots or deep organic soils could require excavation to a depth of 3 feet or greater. Overall, the depth of stripping is expected to average 1–3 feet. The topsoil will be placed in a designated “unsuitable material” spoil area or used for borrow area reclamation. After stripping, an inspection trench will be excavated. The trench then will be backfilled and compacted.

Before placement of the embankment fill, the foundation surface will be proof-rolled, and any remaining soft materials will be removed and replaced with compacted fill, treated with lime stabilization, or strengthened with geogrid mesh. Before the first lift of fill is placed, the foundation surface will be scarified to a depth of about 4 inches and moisture conditioned to help create a good bond between the foundation and the embankment fill.

SEEPAGE CONTROL/SLURRY CUTOFF WALL CONSTRUCTION

Based on the performance history of the existing levees and the results of investigations along the proposed setback levee alignment, it is anticipated that seepage control measures will be required along significant portions of the setback levee. Susceptibility of the setback levee embankment and foundation soils to seepage and internal erosion is the primary concern related to levee integrity and stability.

Construction of a slurry cutoff wall is proposed along those portions of the setback levee where widespread strata of permeable sands and gravels exist in the foundation. The purpose of the slurry cutoff wall is to dissipate the hydraulic gradient in the levee foundation and reduce seepage quantities. To achieve maximum effectiveness, the slurry cutoff wall must extend completely through the permeable strata and terminate some distance into an underlying, reasonably continuous layer with lower permeability.

Construction of the slurry cutoff wall to the depths required along the proposed setback levee alignment will be accomplished with large modified backhoes. This equipment and the associated sequence of excavation, backfill preparation, and placement of backfill back into the slurry cutoff wall trench will require an approximately 80-foot-wide work platform. The slurry cutoff wall is expected to be as much as 80 feet deep. Therefore, for each section of the setback levee where a slurry cutoff wall is needed, the wall will be installed before the levee embankment is constructed. In addition, the work platform will need to be at least 4–5 feet above the highest groundwater level to provide a stable base for the excavation equipment.

SETBACK LEVEE EMBANKMENT CONSTRUCTION

Construction of the setback levee embankment will begin as soon as sufficient lengths of levee foundation are complete and weather conditions allow. The embankment will be constructed as an engineered fill, with the fill placed in horizontal lifts. Each lift will be moisture conditioned and compacted to the specified density using a suitable compactor, such as a sheepsfoot, tamping-foot, or rubber-tired roller. Landside stability berms integral to the levee embankment will be constructed in portions of the southern alignment where the foundation of the levee contains soft clay and silt deposits. This will require fill of a small portion Plumas Lake Canal.

PUMP STATION NO. 3 RELOCATION

The current location of Pump Station No. 3 experiences excessive seepage and boils during high-water events. In addition, after the setback levee is complete, the existing Pump Station No. 3 will be in the setback area and exposed to flooding after the existing levee is degraded. Therefore, as part of the setback levee project, a new/replacement Pump Station No. 3 will be constructed on the land side of the setback levee in Stage 1 and the existing pump station will be removed in Stage 2. The new pump station will be located where the setback levee is adjacent to Plumas Lake Canal. The new Pump Station No. 3 will be a reinforced-concrete structure similar to the recently constructed Pump Station No. 2 and Pump Station No. 6 in RD 784. The specific capacity of the new Pump Station No. 3 will be determined during detailed project design.

UTILITY RELOCATION AND STRUCTURE REMOVAL

Implementation of the setback levee project would necessitate the removal of all structures (houses, trailers, sheds, barns, other agricultural outbuildings) from the levee setback area, which would be subject to periodic flooding following removal of the existing levee. Approximately 20 structures in the levee setback area will be displaced by the project. Displaced structures include six residential dwelling units, and remaining structures include associated agricultural use buildings and dilapidated barns. Some utilities and other facilities located in the levee setback area will need to be relocated or reinforced with implementation of the levee setback.
As discussed previously, RD 784 Pump Station No. 3 will be relocated to the land side of the proposed setback levee. A PG&E 115-kilovolt (kV) transmission line called the Bogue Loop crosses the levee setback area on four towers. The foundations for these steel structures will likely require reinforcement or replacement to maintain their integrity during periods of flood water inundation. Other steel towers along the same transmission line are located on the water side of the existing Feather River levee and are supported by elevated steel pile foundations.

Other existing facilities that may need to be abandoned, reinforced, or relocated include roads, power distribution lines, irrigation pipelines, drainage ditches, wells, fill stations, and communications lines. Several private irrigation lines will be cut off by the construction of the setback levee, separating some lands on both sides of the setback levee that require irrigation from current water sources. During detailed design, and in coordination with

landowners, appropriate water sources and irrigation infrastructure will be determined for lands where irrigation lines were cut off and that will continue to require irrigation water after project construction. The wells within the setback area will be retained for use in environmental enhancement activities over the next several years, to support continuing agricultural activities, or will be destroyed in accordance with California's water well regulations. Wells and fill stations in the levee setback area to be abandoned will be removed and filled, and new wells will be dug and fill stations built outside the levee setback area to replace the abandoned facilities, as appropriate. Wells and fill stations to be retained in the levee setback area will be retrofitted to accommodate periodic flooding. New power lines and power poles may be required for any new wells and fill stations.

STAGE 2

FILL OF CANAL SEGMENTS ADJACENT TO SETBACK LEVEE

Construction of the new setback in Stage 1 will divide the Plumas Lake Canal, with portions of the canal remaining intact on either side of the setback levee. To minimize potential for underseepage that could result from having an excavated feature too close to the levee, approximately 800 feet of the canal on the west (water) side of the setback levee will be completely filled (from the west side of the setback levee alignment to where the canal opens into Plumas Lake). Approximately 2,200 feet of canal on the east (land) side of the setback levee will be filled between the new Pump Station No. 3 and the setback levee alignment. An approximately 2-foot-deep ditch will remain along the canal alignment to drain surface runoff from landside areas at the southern end of the setback levee to the new Pump Station No. 3.

REMOVAL OF THE EXISTING LEVEE

There are no plans to use material in the existing Feather River left bank levee in Segment 2 as borrow material for the new setback levee. It is expected that for some period of time, the existing levee and the new setback levee will be in place concurrently (see "Project Schedule" below). During this period, the setback levee will function as a "backup" levee, providing a second line of levee protection if the existing levee in Segment 2 were to breach during a flood event.

All or portions of the existing levee in Segment 2 will be removed to achieve the maximum hydraulic benefits of the levee setback by allowing water to flow into and out of the levee setback area during high river stages. Where the existing levee will be excavated to allow flood waters to pass into and out of the levee setback area, the existing embankment will be excavated to the level of the adjoining ground surface. Specific sections to be retained will be determined in final project design and will be based on factors that include possible mitigation value for project impacts on sensitive species. Sections of the existing levee that are left in place will not be maintained.

REMOVAL OF PUMP STATION NO. 3 AND FACILITATION OF SETBACK AREA DRAINAGE

The existing Pump Station No. 3 will be removed and the adjacent area currently occupied by the existing Feather River levee and maintenance zone will be excavated to facilitate drainage and allow flood waters to recede from the setback area in a manner that minimizes fish stranding. The existing channel that currently conveys discharges from Pump Station No. 3 will likely need to be enlarged and deepened to accommodate flood flows leaving the setback area and to minimize the potential for fish stranding as flood waters recede. Whether this drainage location or another is used, the channel will be located and constructed in a manner that minimizes vegetation disturbance, fish stranding, and other environmental impacts. A site-specific drainage plan for the entire setback area will be developed in final design.

The swale will also act to allow backwater to flow into the setback area from the Feather River, increasing the inundation frequency of the setback area and improving habitat quality. It is estimated that the 40-foot stage will be inundated in two out of every three years for a period of at least one week between March 15 and May 15.

Floodplain land at or below this elevation will provide a broad suite of valuable ecosystem functions, including provision of nutrients and seasonal habitat for aquatic species.

HABITAT RESTORATION AND MANAGEMENT OF THE LEVEE SETBACK AREA

At this time, it is unclear whether existing agricultural land uses will be maintained in the levee setback area. TRLIA is discussing the feasibility of continuing agricultural practices throughout the setback area with various landowners and stakeholders. TRLIA is also discussing the potential for active restoration with landowners, stakeholders, and various regulatory agencies. It is possible that a portion of the setback levee area will be restored to riparian habitat via active or passive restoration in the event that agricultural uses are discontinued.

STAGING AREAS, ACCESS ROUTES, AND MATERIAL DISPOSAL

It is anticipated that several staging areas will be developed along the setback levee alignment to allow for efficient use and distribution of materials and equipment. Staging areas will be located within the construction corridor and near active construction areas, so they can be relocated as construction progresses. Because the work area is essentially flat, suitable sites for construction staging are abundant. Final selection of staging areas will be based on contractor preference and environmental and land use constraints.

Personnel, equipment, and imported materials will reach the project site via SR 70 and Feather River Boulevard. At the project site, the primary construction corridor will include the setback levee alignment, soil borrow areas, and roads used for access to the work areas, including Feather River Boulevard. Access roads will consist mainly of the existing east-west lateral roads between SR 70, Feather River Boulevard, and the levee setback area.

Excess earth materials (organic soils, roots, and grass from borrow areas and the setback levee foundation; excavated material that does not meet levee embankment criteria) will be used in the reclamation of borrow areas or will be placed in a surplus material berm at the waterside toe of the setback levee. In addition, excess material could be used in the contouring of the setback area to facilitate drainage to the Feather River and prevent fish stranding. Cleared vegetation (i.e., trees, brush) will be hauled off-site. Debris from structure demolition, power poles, piping, and other materials requiring disposal will be hauled off-site to a suitable landfill.

PROJECT SCHEDULE

A period of up to approximately 22 months is planned for construction of the setback levee project, with contractor mobilization beginning in late September 2007, the setback levee embankment (Stage 1) completed in December 2008, the existing levee breached (Stage 2) in spring/summer 2009, and final clean-up and contractor demobilization in fall 2009. Schedule highlights are as follows:

- **Mobilization:** Mobilization will include setting up construction offices and transporting heavy earthmoving equipment to the site. These activities will take approximately one month.

- **Levee Foundation Preparation:** This activity will begin soon after mobilization. Construction will take approximately eight to nine months depending on the amount of equipment working simultaneously, weather conditions, and permit requirements.

- **Slurry Cutoff Wall Construction:** Installation of slurry cutoff walls along the setback levee alignment will occur simultaneously with levee foundation preparation.

- **Levee Embankment Construction (including stability berms):** Because the setback levee alignment is nearly 6 miles long, levee embankment construction could begin in some areas while foundation preparation is underway along other portions of the alignment. Levee embankment construction is anticipated to take approximately eight months.

- **Borrow Material Excavation:** Excavation of borrow materials for use in the construction of the setback levee embankment could begin simultaneously with levee foundation preparation or slurry wall construction and would occur for the duration of levee embankment construction.

- **Tie-ins to Existing Levees:** Elements of tying in the setback levee to the existing levees will take place during levee foundation preparation, levee embankment construction, and potentially during slurry cutoff wall construction.

- **Pump Station No. 3 Construction:** Pump Station No. 3 will be constructed concurrent with levee embankment construction. Procurement of long-lead items (e.g., pumps, motors, valves, and generator) could begin as early as 2007.

- **Fill of Portions of the Plumas Lake Canal:** The portion of Plumas Lake Canal within the levee embankment footprint will be filled during levee foundation preparation. The portion of canal downstream of the setback levee and between the setback levee and Pump Station No. 3 will be filled concurrent with removal of the existing levee.

- **Removal of the Existing Levee:** The existing Feather River levee in the setback area will not be removed until the setback levee is complete, and removal activities will occur outside of the identified Feather River flood season. Levee removal is anticipated to occur in spring/summer 2009.

- **Decommission of the Existing Pump Station No. 3:** Removal of the existing pump station would be done concurrent with removal of the existing levee.

- **Facilitation of Setback Area Drainage:** Grading of the setback area to facilitate drainage of floodwaters back to the Feather River and enhancement of the setback area drainage channel would be conducted concurrent with removal of the existing levee.

- **Demobilization:** Demobilization will include removal of equipment and materials from the project site, disposal of excess materials at appropriate facilities, and restoration of staging areas and temporary access roads to pre-project conditions. Demobilization activities will likely occur in various locations as construction proceeds along the project alignment, but will be completed in fall 2009 after removal of the existing Feather River levee is complete.

COVERED SPECIES

Coverage for incidental take of the following species is requested:

Common Name	Scientific Name	Status
Giant garter snake	*Thamnophis gigas*	Threatened
Swainson's hawk	*Buteo swainsoni*	Threatened
Central Valley spring-run chinook salmon (evolutionarily significant unit)	*Oncorhynchus tshawytscha*	Threatened

The following sections provide a brief discussion of the status of each species in the region, current habitat conditions within the project site for each of these species, and potential for each species to occur on the project site.

GIANT GARTER SNAKE

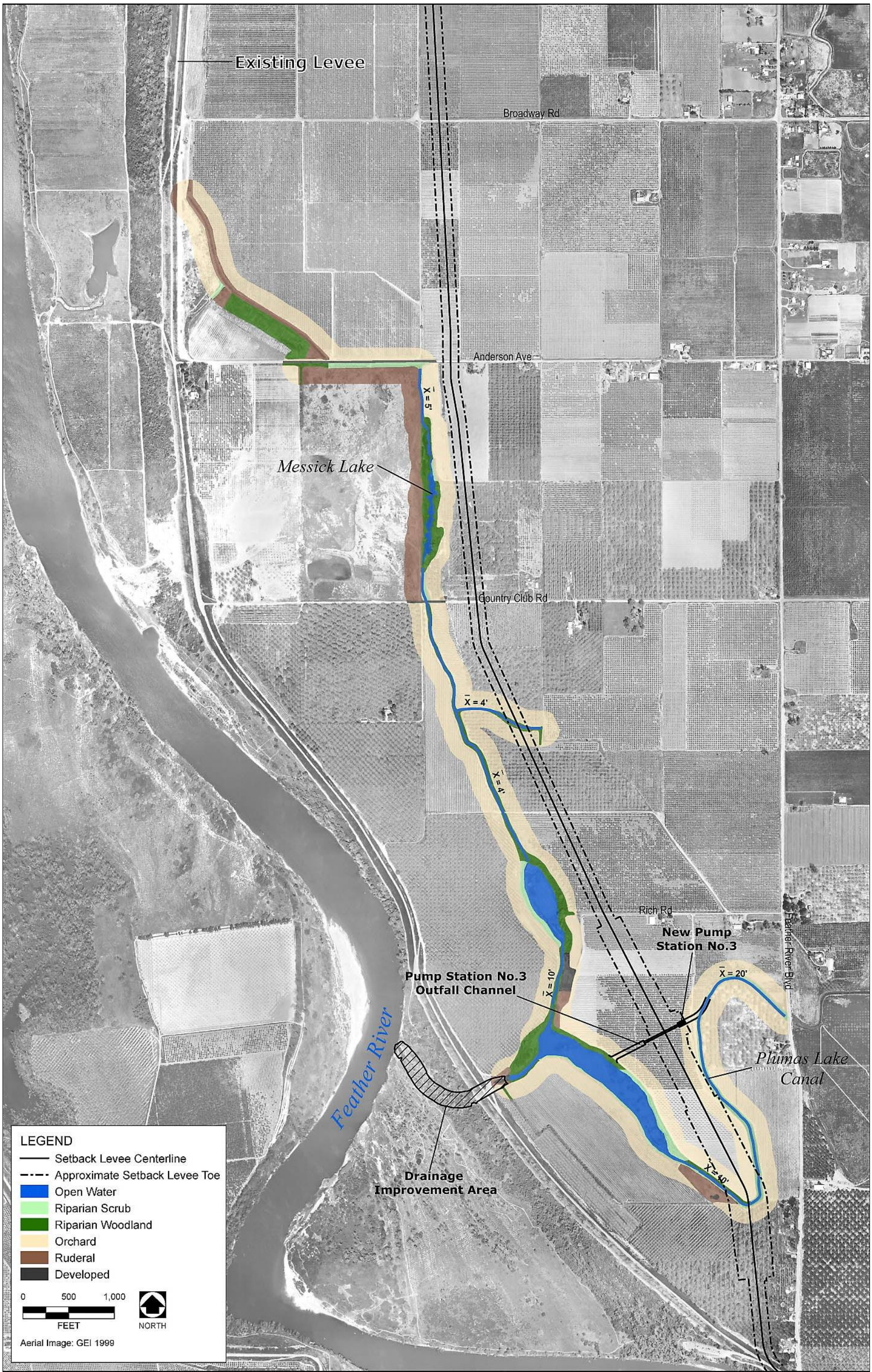
The California Natural Diversity Database (CNDDB) documents seven giant garter snake locality records within 10 miles of the project site; only one of these is within 5 miles. The nearest record (CNDDB Occurrence Record 108) represents an undisclosed number of individuals northeast of Rio Oso, east of Highway 70, and south of the Bear River, that were sighted prior to, but not during, a 1986–1987 study by George Hansen. No giant garter snakes have been officially documented in the project vicinity north of the Bear River, although there was a reported sighting at the Olivehurst detention basin site (less than 5 miles east of the project site) in 1998 (Sycamore Environmental 1998).

Despite the near lack of giant garter snake records in the project vicinity, portions of Plumas Lake Canal and associated drainage ditches on the project site are potentially suitable for giant garter snake and are hydrologically connected to other areas capable of supporting the species. Exhibit 4 depicts Plumas Lake Canal and associated drainage ditches within the project area, and upland habitats within 200 feet. All of these areas were examined during an assessment of habitat suitability conducted by EDAW biologist Anne King on May 18, 2007. Based on this evaluation, many of the upland areas were determined to be unsuitable for the species because they are actively farmed orchards or riparian woodland dominated by tall woody shrubs and trees that completely shade the understory. In addition, some of the aquatic habitats were determined to be unsuitable because they are located in the upper reaches of the drainage system and do not retain water during the garter snake active season (they were dry at the time of the EDAW survey). Exhibits 5a and 5b depict the approximately 17 acres of aquatic habitat and 11 acres of upland habitat the habitats that were determined to be suitable for giant garter snake, based on the field evaluation. In general, all open water habitat is considered potentially suitable for giant garter snake, even if it is completely shaded by overhead riparian woodland vegetation, because snakes could utilize these ditches to travel between areas of more suitable habitat. However, ditches in the northern portion of Exhibit 4, including the ditch south of and parallel to Anderson Avenue and ditches north of Anderson Avenue, are unsuitable due to lack of water during the snake's active season. Suitable upland vegetation includes all areas mapped as ruderal or riparian scrub that are adjacent to suitable aquatic habitat. One exception to this is the ruderal habitat mapped west of Messick Lake. This is an active borrow/disposal site that is regularly disked and maintained for borrow extraction purposes. Therefore, uplands on this property are not suitable for giant garter snake. Representative photographs of aquatic and adjacent upland habitats on the project site are provided as an appendix, and photo locations are shown on Exhibits 4, 5a, and 5b.

SWAINSON'S HAWK

Riparian habitat along the Feather River, Plumas Lake Canal, and associated drainages supports many suitable Swainson's hawk nest trees. Isolated trees associated with scattered residences in the project vicinity also provide suitable nest sites. A number of active nests within and adjacent to Segment 2 are documented in the CNDDB (2006) and have been observed by EDAW biologists during surveys conducted in 2006 and 2007. These nest locations are depicted in Exhibit 6.

Suitable foraging habitat within and in the vicinity of Segment 2 is limited by the predominance of development and agricultural crops of low foraging quality, primarily orchards. Swainson's hawks feed primarily on small rodents, usually in large fields that support low vegetative cover (to provide access to the ground) and provide the highest densities of prey. These habitats include fields of hay and grain crops, certain row crops, and lightly grazed pasturelands. Fields lacking adequate prey populations (e.g., flooded rice fields) or those that are inaccessible to foraging birds (e.g., vineyards, orchards, and tall dense row crops) are rarely used (Estep 2003). The project site is dominated by orchards and rural residential and agricultural development. Suitable Swainson's hawk foraging habitat on the project site is limited to ruderal vegetation on levee slopes and in adjacent maintenance zones and two areas of fallow agricultural fields that total just over 25 acres.



Feather River Levee Repair Project
Segment 2

Aquatic Habitat and Adjacent Uplands within the Action Area

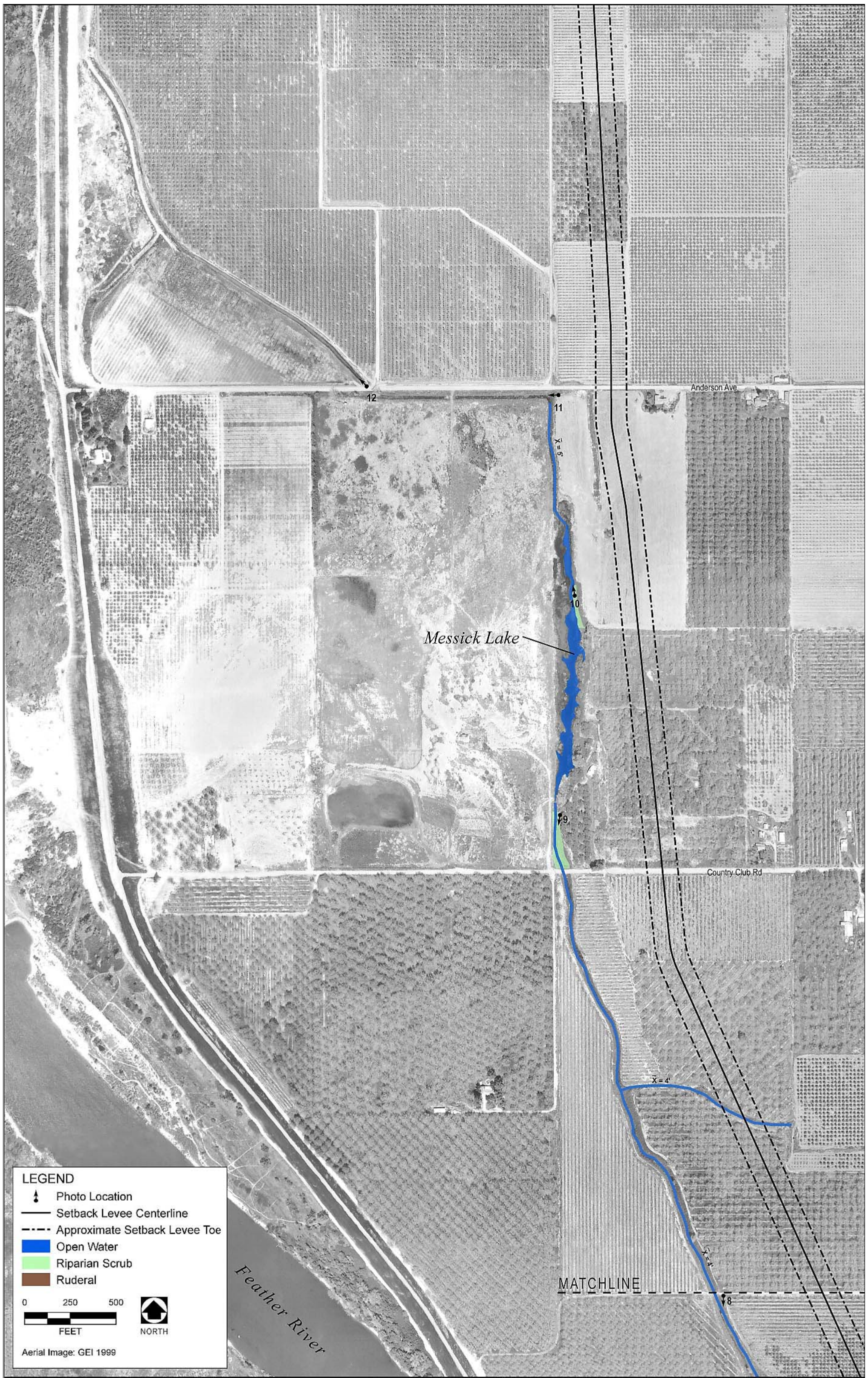
Source: Data Provided by EDAW and GEI 2007

X124

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 4



Feather River Levee Repair Project
Segment 2

Suitable Giant Garter Snake Habitat within the Action Area

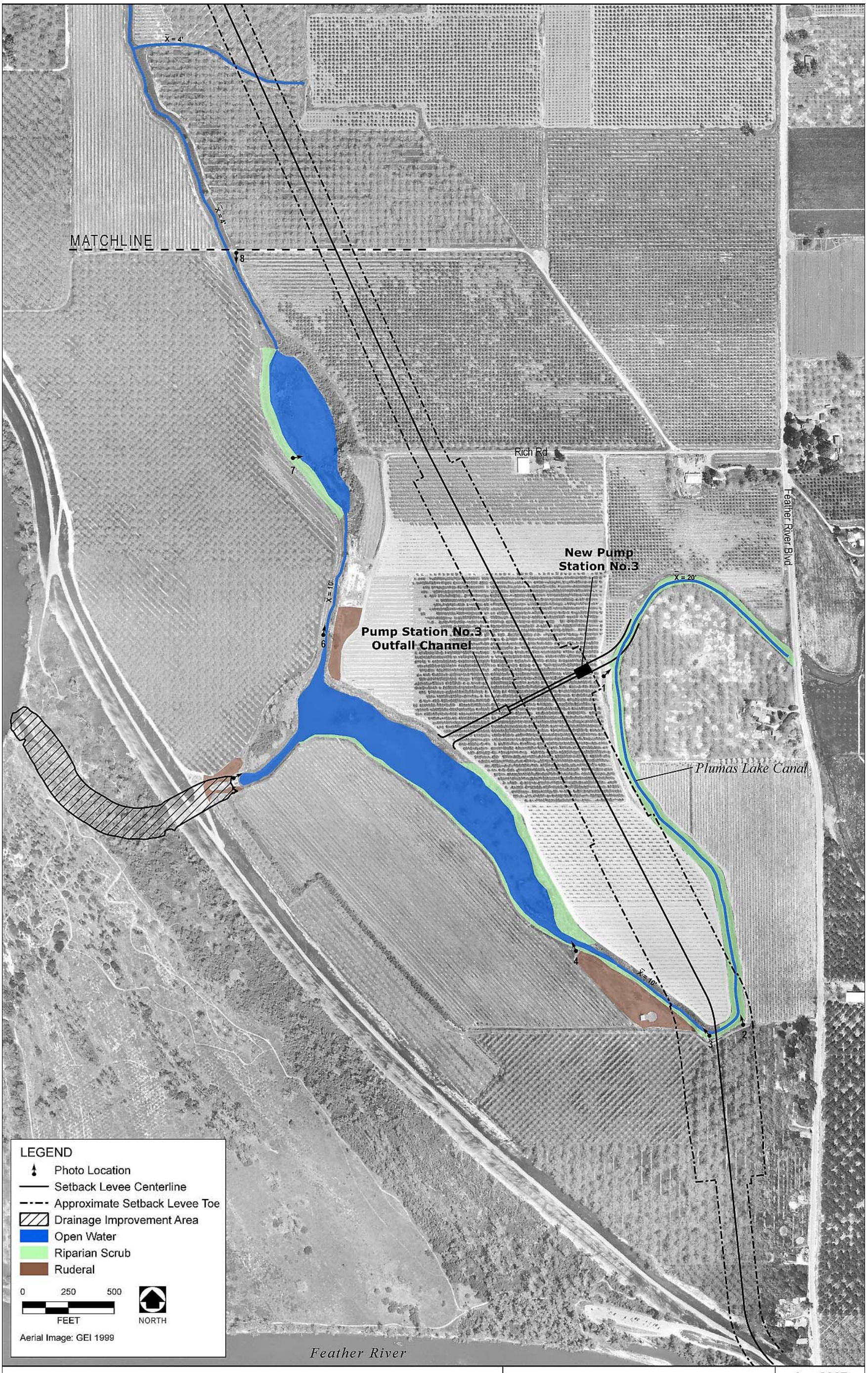
Source: Data Provided by EDAW and GEI 2007

X116

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 5a



Feather River Levee Repair Project
Segment 2

Suitable Giant Garter Snake Habitat within the Action Area

Source: Data Provided by EDAW and GEI 2007

X117

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 5b

Feather River Levee Repair Project
Segment 2
Swainson's Hawk Nest Locations

Source: Data Provided by EDAW and GEI 2007; CNDDB 2007

X115

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 6

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON

The portion of the Feather River within Segment 2 provides migration (adult upstream and juvenile downstream) and juvenile rearing habitat for salmon considered part of the Central Valley spring-run chinook salmon Evolutionarily Significant Unit (ESU). The Feather River Fish Hatchery sustains the spring-run population on the Feather River, but the genetic integrity of that run is questionable (DWR 1997). Adult spring-run chinook salmon that return to the Feather River Fish Hatchery have been counted each year since 1963, and their numbers have ranged from 146 in 1967 to 8,662 in 2003 (DFG 2004). The majority of spawning by in-river spring-run chinook salmon is concentrated in the uppermost 3 miles of accessible habitat in the Feather River below the Feather River Fish Hatchery (DWR 2001). The Yuba River is just upstream of the project site and supports one of the last large remaining runs of wild stock chinook salmon, including spring-run. These Yuba River fish must pass through the project action area on their spawning and downstream migrations.

POTENTIAL FOR TAKE

GIANT GARTER SNAKE

Adverse effects to suitable giant garter snake habitat that will occur during Stage 1 construction are limited to direct impacts resulting from construction of the setback levee where it crosses Plumas Lake Canal and construction of the new Pump Station No. 3. These areas are depicted in Exhibit 7. Construction of the setback levee and stability berms and establishment of the adjacent maintenance corridor will result in permanent loss of 0.38 acre of suitable aquatic habitat for giant garter snake provided by Plumas Lake Canal and 1.70 acres of suitable adjacent upland. Relocation of Pump Station No. 3 will result in temporary effects to 0.11 acre of aquatic habitat and permanent loss of 0.09 acre of upland habitat. The temporary effects to aquatic habitat would result from dewatering a segment of the existing canal during pump station construction; this habitat would be restored to pre-project conditions when construction is complete. During Stage 1, a total of 2.17 acres of giant garter snake habitat (0.38 aquatic and 1.79 upland) will be permanently lost, and an additional 0.11 acre of aquatic habitat will be temporarily affected.

The majority of adverse effects to giant garter snake habitat resulting from implementation of the proposed project are associated with Stage 2. These effects include direct loss of 0.35 acre of aquatic habitat resulting from fill of portions of Plumas Lake Canal adjacent to the setback levee. However, the primary potential impact to garter snake habitat will occur when the existing Feather River levee is degraded and the remaining areas of suitable habitat within the setback area are exposed to flooding. A total of 15.87 acres of potentially suitable aquatic habitat and 10.45 acres of suitable upland habitat will be indirectly lost as a result of this action. Therefore, a total of 26.67 acres of potentially suitable giant garter snake habitat (16.22 aquatic and 10.45 upland) will be considered permanently affected during Stage 2.

Although nearly 16 acres of aquatic habitat are present within the levee setback area and will be lost as a result of project implementation, the amount of suitable upland to support snakes during their inactive season is very limited, as indicated above. In addition, the aquatic habitat is located at a downstream dead-end beyond which there is no additional habitat. Therefore, if the project site is utilized by giant garter snakes, such use is likely to be limited to individuals that wander from upstream areas with suitable aquatic habitat and adjacent uplands more capable of supporting a permanent population. As a result, loss of this habitat on the project site is unlikely to result in take of the species or have a substantial adverse effect on local giant garter snake populations.

The greatest potential for take of giant garter snake is direct mortality or injury of individuals during construction activities. Snakes could be harmed by in-water activities and fill of aquatic habitat, as well as construction in adjacent uplands into which they could wander during daily movements and occur for longer periods if suitable burrows are present.

SWAINSON'S HAWK

Construction activities in Segment 2 could result in disturbance of nesting Swainson's hawks if an active nest is located close enough to the activities. Depending on the timing and severity of disturbance, abandonment of a nest with eggs or young could occur, resulting in take of the species. Based on known nest locations in previous years (Exhibit 5), Stage 1 construction activities are unlikely to result in nest disturbance or loss, because no nests have been documented or are anticipated to be present in the immediate vicinity of the setback levee footprint. One nest has been documented within 1,000 feet of the land side of the setback levee. However, it is in an area of relatively high disturbance levels from ongoing agricultural activities, including a nearby packing facility, and is likely to be far enough from the project site to avoid take. The greatest potential for take would occur during Stage 2, when levee degradation and drainage enhancements will be conducted within and adjacent to riparian habitat along the Feather River. Several of the nest sites along the Feather River are located in close proximity to the existing levee and could be disturbed by levee degradation, pump station removal, and/or drainage enhancement. No known Swainson's hawk nest trees will be removed during project implementation and very few, if any, suitable nest trees would be removed (along the setback levee footprint and within the drainage enhancement area).

No permanent loss of Swainson's hawk foraging habitat will result from project implementation. The existing Feather River levee and adjacent maintenance zones occupy approximately 150 acres over the 6.2-mile length, much of which could be utilized by foraging Swainson's hawks. Two areas of currently fallow agricultural field are present within the setback area, but these total only approximately 25 acres of the nearly 1,500-acre setback area. Degradation of the existing levee could result in loss of this habitat if the former levee footprint and fallow fields in the setback area transition to riparian habitat, either through active restoration or natural recruitment. However, the setback levee and adjacent maintenance zones would occupy approximately 185 acres. Therefore, potential for loss of foraging habitat would be offset by the creation of habitat similar to what would be lost.

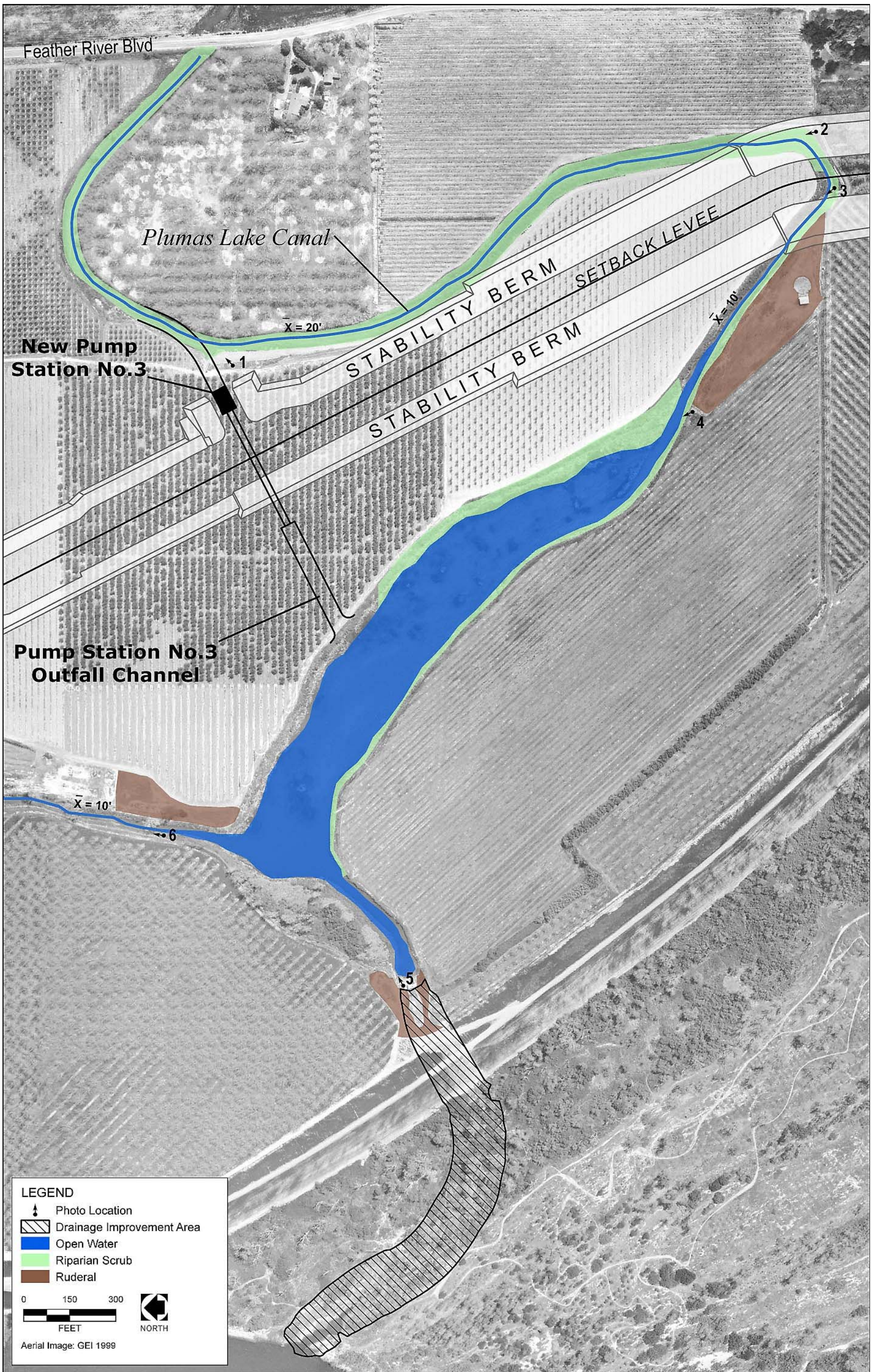
CENTRAL VALLEY SPRING-RUN CHINOOK SALMON

Implementation of Stage 1 and Stage 2 project components associated with the Segment 2 setback levee could result in take of Central Valley spring-run chinook salmon ESU through several different mechanisms, including water quality and other habitat degradation and fish stranding. Analysis of whether and to what extent these mechanisms could result in take is provided below.

WATER QUALITY DEGRADATION

If construction occurs when spring-run chinook salmon are present, construction activities could temporarily reduce the amount and quality of fish habitat to an extent that results in take. Degrading the existing Feather River levee and ground disturbance in the setback area will disturb soils in the newly expanded floodplain. Any resulting erosion or runoff could temporarily increase turbidity and sedimentation downstream of the construction sites if soils are transported in stormwater runoff. Fish population levels and survival have been linked to levels of turbidity and siltation in a watershed (Waters 1995). Prolonged exposure to high levels of suspended sediment can create a loss of visual capability, leading to a reduction in feeding and growth rates; a thickening of the gill epithelium, potentially causing the loss of respiratory function; clogging and abrasion of gill filaments; and increases in stress levels, reducing the tolerance of fish to disease and toxicants (Waters 1995).

In addition, high levels of suspended sediments cause movement and redistribution of chinook salmon and can affect physical habitat. Once suspended sediment is deposited, it can alter habitat, decreasing the water's physical carrying capacity for juvenile and adult fish (Waters 1995). Increased sediment loading can also degrade food-producing habitat immediately downstream of the project site. Sediment loading can interfere with photosynthesis of aquatic flora and displaces aquatic fauna. Chinook salmon are sight feeders, and turbid waters reduce the efficiency of these fish in locating and feeding on prey. Some fish, particularly juveniles, can become disoriented, and leave areas where their main food sources are located, ultimately reducing their growth rates. Increases in



Feather River Levee Repair Project
Segment 2
Direct Impacts to Giant Garter Snake Habitat

Source: Data Provided by EDAW and GEI 2007 X123

THREE RIVERS LEVEE IMPROVEMENT AUTHORITY
1114 Yuba Street, Suite 218
Marysville, CA 95901

Aug 2007

Exhibit 7

turbidity and sedimentation commonly result in fish avoiding an area. Fish will not occupy areas that are not suitable for survival unless they have no other option. Therefore, habitat can become limited in systems where high turbidity precludes a species from occupying habitat required for specific life stages.

The potential also exists for contaminants such as concrete, fuels, oils, and other petroleum products used in construction activities to be introduced into the water system directly or through surface runoff. Contaminants may be toxic to fish or cause altered oxygen diffusion rates and acute and chronic toxicity to aquatic organisms, thereby reducing growth and survival.

TEMPORARY HABITAT LOSS

Up to 5.5 acres of mixed riparian vegetation, intermittent drainage, and perennial drainage (i.e., Feather River backwater) will be temporarily affected during enhancement of the drainage channel outlet in Stage 2. Portions of this vegetation and other habitat elements could provide overhead cover for fish or contribute instream woody material to the Feather River channel. However, any potential temporary loss of these benefits will be limited by the relatively small size of the affected area, and the overall result would be an enhancement in the habitat quality. Therefore, these habitat effects are unlikely to result in take of spring-run chinook salmon.

STRANDING

The greatest potential for take of spring-run chinook salmon would result from inadequate drainage of the levee setback area. The floodplain to be created by removal of portions of the existing Feather River levee in Stage 2 is a relatively flat land area that drains to the south and west and currently includes agricultural lands, riparian vegetation, drainage ditches, ponds, roads, and structures. The presence of these multiple uses indicates that the area has some variation in topography. After the area is flooded during high-water events, water will drain to the areas of lowest elevation and pool or flow to the river. This creates a potential situation where fish that enter the floodplain with the high water could become stranded in remnant pools that do not fully drain back to the river. Stranded fish, including spring run chinook salmon, could experience high mortality as a result of lethal water temperatures, poor water quality, predation, or desiccation of these areas; with no means to return to the river, trapped fish will inevitably die. However, planned earth moving and grading in the setback area to remove areas that would pond water and enhancement of the channel that connects the current Pump Station No. 3 outfall to the Feather River to improve drainage of floodwaters from the setback area would greatly minimize and possibly avoid any potential fish stranding.

IMPACTS OF PROPOSED TAKE

With implementation of the measures described below under “Mitigation,” potential for take of Swainson’s hawk would be minimal. If take were to inadvertently occur, the level of take would be too small (e.g., no more than several individuals) to have an overall impact on the local population or on the species as a whole.

Implementation of the project would result in loss or disturbance of nearly 30 acres of aquatic and upland habitat that is suitable for giant garter snake. Habitat effects alone are unlikely to result in take because the project site is unlikely to provide important habitat or support a permanent population of the species. Take that could result from direct mortality or injury during construction would be greatly minimized and likely avoided by implementation of the measures described below under “Mitigation.” As with Swainson’s hawk, any inadvertent take would likely be very limited and would not have an overall impact on the local population or on the species as a whole. In addition, compensatory mitigation that would be implemented would offset the habitat loss and potential direct take of individuals. Therefore, there would be no overall impact to the species as a result of project implementation.

Although implementation of the project could result in take (stranding) of spring-run chinook salmon, it would likely improve the overall success of this and other native fish species that use the area. Habitat availability would be increased by expansion of the floodplain and potential resulting take would be minimized by drainage enhancements. Therefore, potential for take of large enough numbers of fish to have an adverse impact on the overall status of the species would be avoided. If portions of the new floodplain are passively or actively restored to natural habitats, there would be a long-term beneficial impact to the status of spring-run Chinook salmon.

POTENTIAL TO JEOPARDIZE CONTINUED EXISTENCE

As discussed above, avoidance and minimization measures would reduce potential for take of giant garter snake, Swainson's hawk, and spring-run chinook salmon to minimal levels. Therefore, very few individuals, if any, are likely to be taken, and take of these individuals would not have an overall effect on the species. Although there is evidence that these species continue to decline, primarily resulting from expanding threat of habitat conversion, they also continue to thrive in some areas, and population levels are not low enough that their extinction is threatened. Therefore, the very small level of potential take associated with issuance of an incidental take permit for the Segment 2 project would not jeopardize the continued existence of any of the species addressed in this permit application.

MITIGATION

The measures described below for each species would be implemented to avoid, minimize, and/or fully mitigate take that could result from implementation of the setback levee project in Segment 2.

GIANT GARTER SNAKE

- A worker awareness training program for construction personnel will be conducted by a qualified biologist prior to beginning construction activities. The program will provide workers with information on their responsibilities with regard to the snake, an overview of the life-history of this species, a description of measures to minimize potential for take of the snake, and an explanation of the possible penalties for not properly implementing these measures. Written documentation of the training will be submitted to the U.S. Fish and Wildlife Service (USFWS) and California Department of Fish and Game (DFG) within 30 days of its completion.

- Construction and other ground-disturbing activities in areas within 200 feet of suitable aquatic habitat will not occur between October 1 and April 30. Dewatering of suitable aquatic habitat will not occur before April 15, and dewatered habitat will remain dry for at least 15 days prior to fill or excavation.

- Prior to beginning construction activities, high-visibility fencing will be erected to protect areas of giant garter snake habitat from encroachment. These areas will be avoided by all construction personnel. The fencing will be inspected before the start of each work day and maintained by the project proponents until all construction activities are completed.

- Within 24 hours before beginning construction activities, areas within 200 feet of suitable aquatic habitat for giant garter snake will be surveyed by a qualified biologist. The biologist will provide USFWS and DFG written documentation of the monitoring efforts within 48 hours after the survey is completed. Habitat will be re-inspected by the monitoring biologist whenever a lapse in construction activity of 2 weeks or greater occurs. The biologist will be present on-site during initial ground disturbance activities, including clearing and grubbing/stripping. The biologist will be available throughout the construction period and will conduct regular monitoring visits to ensure avoidance and minimization measures are being properly implemented.

- The number of access routes, number and size of staging areas, and the total area of the proposed project activity will be limited to the minimum necessary. Routes and boundaries will be clearly demarcated. Movement of heavy equipment to and from the project site will be restricted to established roadways to minimize habitat disturbance. Project-related vehicles will observe a 20-mile-per-hour speed limit within construction areas, except on county roads and on state and federal highways.

- During construction operations, stockpiling of construction materials, portable equipment, vehicles, and supplies will be restricted to the designated construction staging areas. To eliminate an attraction to predators of the snake, all food-related trash items, such as wrappers, cans, bottles, and food scraps, will be disposed of in closed containers.

- Unavoidable adverse effects to giant garter snake will be mitigated through creation, enhancement, and/or preservation of suitable aquatic and adjacent upland habitat for the species. Mitigation will be provided through purchase of mitigation credits at a USFWS- and DFG-approved giant garter snake mitigation bank whose service area includes the project site. Currently, the most likely mitigation bank is Gilsizer Slough, which is owned and managed by Wildlands, Inc. A letter of credit for purchase of giant garter snake habitat mitigation acres at Gilzier Slough has been drafted and is expected to be signed in Fall 2007. This letter of credit outlines a payment schedule for purchase of the mitigation acreage.

SWAINSON'S HAWK

- Swainson's hawk nest surveys shall be conducted by a qualified biologist. Surveys shall be conducted prior to and during construction to identify active nests in the vicinity of the project site and monitor their progress throughout the season.

- Impacts to active nests shall be avoided by establishment and maintenance of buffers around the nests. The appropriate size and shape of the buffers shall be determined by a qualified biologist and may vary, depending on the nest location, nest stage, and construction activity. No project activity shall commence within the buffer area until the biologist confirms that the nest is no longer active. Monitoring shall be conducted to confirm project activity is not resulting in detectable adverse effects to active nests.

Because take of active nests is unlikely to occur with implementation of the above measures, there would be no loss of known nest tress, and temporary adverse effects to the relatively small amount of marginal-quality foraging habitat on the project site would not result in take, no compensatory mitigation is considered necessary.

CENTRAL VALLEY SPRING-RUN CHINOOK SALMON ESU

The following design elements and avoidance and minimization measures will be implemented to minimize and fully mitigate impacts from take of Central Valley spring-run chinook salmon.

FISHERIES CONSERVATION

- All in-channel construction activities (i.e., improvements to the existing Pump Station No. 3 drainage channel where it connects to the river) shall be conducted during months when sensitive fish species are less likely to be present or less susceptible to disturbance (i.e., June 15 to September 15).

- Levee degradation shall not take place during the designated flood season (i.e., November 1 to April 15) and shall not begin until evaluation of upstream conditions (e.g., reservoir storage and snowpack) indicate that inundation of the levee setback area is unlikely to occur.

- The project shall incorporate features designed to avoid the potential for stranding of fish within the setback levee area. These include restoring a hydrologic connection from the small pond-like features in the southern

portion of the setback area to the Feather River (see Exhibit 3). Connectivity to waters that drain to the Feather River will be ensured for any areas where water could potentially pond and become isolated.

WATER QUALITY CONSERVATION

- To the extent practicable, all work immediately adjacent to the rivers shall be conducted during low flows.
- Earth moving in the setback area shall be conducted only when floodwaters from the Feather River are not present in the excavation area and there is no immediate threat of floodwaters inundating the area.
- A Phase I Environmental Site Assessment shall be completed for the levee setback area and appropriate remediation actions shall be implemented in areas where contamination is found. Levee borrow material shall be evaluated for potential contaminants in coordination with the Regional Water Quality Control Board (RWQCB) and any soils contaminated beyond agency standards shall not be used for levee construction.
- All local, state, and federal regulations and environmental requirements regarding turbidity-reduction measures shall be complied with, including the following: obtain and comply with relevant agency permits (e.g., DFG Streambed Alteration Agreement, RWQCB Clean Water Act Section 401 Certification, Section 404 permit), and developing and implementing a storm water pollution prevention plan that identifies specific best management practices (BMPs) to avoid and minimize impacts on water quality during construction activities. These standard erosion control measures shall be designed to reduce the potential for soil erosion and sedimentation of drainage channels.

  At a minimum, the following specific BMPs will be implemented:

  - Conduct all work according to site-specific construction plans that identify areas for clearing, grading, and revegetation so that ground disturbance is minimized.
  - Avoid riparian and wetland vegetation wherever practicable and identify vegetation to be retained for habitat maintenance (i.e., as identified through preconstruction biological surveys), cover cleared areas with mulches, install silt fences near riparian areas or waterways to control erosion and trap sediment, and reseed cleared areas with native vegetation.
  - Stabilize disturbed soils of the new levees, existing levee removal areas, and borrow sites before the onset of the winter rainfall season.
  - Stabilize and protect stockpiles from exposure to erosion and flooding.

  The stormwater pollution prevention plan for each stage of construction shall specify appropriate hazardous materials handling, storage, and spill response practices to reduce the possibility of adverse impacts from use or accidental spills or releases of contaminants. Specific measures applicable to the project include, but are not limited to, the following:

  - Develop and implement strict on-site handling rules to keep construction and maintenance materials out of drainages and waterways.
  - Conduct all refueling and servicing of equipment with absorbent material or drip pans underneath to contain spilled fuel. Collect any fluid drained from machinery during servicing in leak-proof containers and deliver to an appropriate disposal or recycling facility.
  - Maintain controlled construction staging, site entrance, concrete washout, and fueling areas at least 100 feet away from waterways or wetlands to minimize accidental spills and runoff of contaminants in stormwater.

- Prevent raw cement; concrete or concrete washings; asphalt, paint, or other coating material; oil or other petroleum products; or any other substances that could be hazardous to aquatic life from contaminating the soil or entering watercourses.

- Maintain spill cleanup equipment in proper working condition. Clean up all spills immediately according to the spill prevention and response plan, and immediately notify DFG, the National Marine Fisheries Service (NMFS), and the RWQCB of any spills and cleanup procedures.

- A worker awareness training program shall be conducted for construction crews before the start of construction activities. The program shall include a brief overview of sensitive fish resources in the project area, measures to minimize impacts on those resources, and conditions of relevant regulatory permits.

- If any in-water work is to be conducted, a qualified biologist or resource specialist shall be present during such work to monitor construction activities and ensure compliance with mitigation requirements and terms and conditions of permits issued by regulatory agencies.

MONITORING

A biological monitor will be provided to conduct relevant giant garter snake and Swainson's hawk pre-construction surveys and be present during initiation of construction activities in areas of suitable and/or occupied habitat. The monitor will also conduct periodic site visits during construction to assess compliance with additional avoidance and minimization measures, such as water quality BMPs, exclusion fencing, and buffer areas.

An Operations and Maintenance Plan that identifies specific monitoring tasks for the setback area, including waterways within the floodplain, will be developed as part of the Stage 2 design and will be submitted to NMFS and DFG as soon as it is available. Monitoring of the setback area drainage channel and adjacent floodplain will be conducted for 5 years after the drainage channel is enhanced. The length, frequency, and scope of any additional monitoring will be determined in coordination with DFG and will depend on results from the 5-year monitoring period, including the extent of floodplain habitat development and its effect on monitoring feasibility. The following specific monitoring actions will be conducted:

- A baseline visual assessment of the levee setback area shall be conducted by a qualified biologist after the drainage channel is enhanced, any potential restoration is complete, and levee degradation has occurred, and before the high-flow season begins November 1. The survey will document features of the setback area, including physical and biological components of the site, such as vegetation and expected fish passage routes. Specific stations will be established to conduct photodocumentation of the levee setback area during subsequent surveys.

- For the first 5 years following completion of construction, visual surveys shall be conducted by a qualified biologist after up to one event per year that inundates the drainage channel and adjacent floodplain. A survey shall also be conducted after each of the first three events that inundate the setback area from the upstream eastern end by overtopping the bank of the Feather River. The purpose of these surveys will be to identify the extent of any ponded areas that cannot drain to the drainage channel. Photodocumentation will be conducted from the stations established during the baseline visual survey and from other points, as necessary, to document the condition of the drainage channel and adjacent floodplain.

- Following each year when monitoring is conducted, a letter report summarizing the overall condition of the floodplain habitat and any changes that have occurred since the previous report shall be submitted to DFG and NMFS by August 1. The focus of the report will be an assessment of fish passage and potential for stranding. The report will recommend remediation measures, if needed, along with a schedule specifying when the remediation activities will occur. Based on project design and hydraulic and sediment deposition analyses, potential remediation is anticipated to be restricted to minor activities to remove debris and fish passage

barriers, such as beaver dams, from the enhanced drainage channel. The ultimate goal is that the setback area and drainage channel function naturally and as planned with minimal human intervention and maintenance.

FUNDING

Funding for implementation of giant garter snake, Swainson's hawk, and spring-run chinook salmon avoidance and minimization measures, giant garter snake compensatory mitigation, and construction and long-term management of drainage enhancement features to minimize fish stranding potential is anticipated to be provided via reimbursement from the $7.4 million of 2007 Proposition 13 grant funding that has been assigned to TRLIA.

CERTIFICATION

I certify that the information submitted in this application is complete and accurate to the best of my knowledge and belief. I understand that any false statement herein may subject me to suspension or revocation of this permit and to civil and criminal penalties under the laws of the State of California.

Paul Brunner, P.E.
Executive Director, TRLIA

REFERENCES

California Department of Fish and Game. 2004. Preliminary unpublished data: Adult Chinook salmon populations in the Sacramento/San Joaquin River systems. Native Anadromous Fish and Watershed Branch. Sacramento, CA.

California Department of Water Resources. 1997. Implications of the Delay at the Suisun Marsh Salinity Control Gates on Chinook Salmon Upstream Migrants. Environmental Services Office.

California Department of Water Resources. 2001. Initial Information Package for the Relicensing of the Oroville Facilities, FERC No. 2100.

California Natural Diversity Database. 2007. RareFind 3.1.0; Updated version as of March 3, 2007. California Department of Fish and Game, Natural Heritage Division, Sacramento, CA.

Estep, J. A. 2003. *Nesting Swainson's Hawks (*Buteo swainsoni*) in the Natomas Basin Habitat Conservation Plan Area, 2003 Annual Survey Results*. Prepared for The Natomas Basin Conservancy, Sacramento, CA.

Sycamore Environmental Consultants. 1998. *Biological Resources and Jurisdictional Report for South Olivehurst Detention Basin Project.* Yuba County. Prepared for the County of Yuba, Department of Public Works, Marysville, CA.

Waters, T. F. 1995. Sediment in Streams: Sources, *Biological Effects, and Control*. American Fisheries Society Monograph 7. Bethesda, MD.