Balance Hydrologics, Inc.®

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August 28, 2017

LOMC Clearinghouse
847 South Pickett Street
Alexandria, Virginia 22304-4605
Attn: LOMC Manager

RE: Request for a Letter of Map Revision for Areas of Overland Flood Hazard East of California State Route 33, City of Patterson, California, NFIP Community Panel Numbers 06099C0732E and 06099C0755E

To Whom It May Concern:

Attached you will find application materials requesting a Letter of Map Revision (LOMR) for an area of overland flood hazard located east of California State Route 33 (SR33) in the City of Patterson, County of Stanislaus, California. The requested map revision is based on updated hydrologic information compiled by the U.S. Army Corps of Engineers. The sponsor of this LOMR application is the City of Patterson.

Location of the Requested Revision

This map revision request addresses currently mapped flood hazards in an area bounded by the Union Pacific Railroad (UPRR) tracks on the west, Eucalyptus Avenue on the north, Sycamore Avenue on the east, and Walnut Avenue on the south.[1] The flooding characteristics of the area covered by this LOMR application are discussed in the Flood Insurance Study for Stanislaus County, California (FIS, September 26, 2008) and mapped on the currently effective Flood Insurance Rate Maps (FIRMs, Community Panel Numbers 06099C0732E and 06099C0755E, effective September 26, 2008). As it is an area of overland flood hazard, there is no flood profile information in the FIS.

Summary of Currently-effective Mapping

As indicated on the FIRM panels, the requested map revision area includes a Special Flood Hazard Area (SFHA) designated as Zone AO (Depth 1). Zone AO is defined as an area subject to overland flow flood hazard in the 1-percent-chance flood event (100-year flood) where average depths have been determined.

[1] The respective FIRM panels call out the railroad tracks as "Southern Pacific Railroad", reflecting ownership of the corridor at the time the currently-effective mapping was prepared.

The Zone AO area corresponds to the potential release of floodwaters over an approximately 1,000-foot long section of the UPRR tracks located just to the east of SR33. The UPRR tracks trend in a generally northwest to southeast alignment at this point and are cited in the FIS as one of the principal controls on the depth and direction of overbank flows for the west side tributary creeks in the County that eventually drain to the San Joaquin River. In this case, the primary source of overbank flows is Del Puerto Creek at and near Rogers Road approximately 2.5 miles to the west-northwest as shown on the adjacent FIRM Panel Number 06099C0731E.

Requests for information to the FEMA Library and U.S. Army Corps of Engineers related to the previous hazard mapping work for Del Puerto Creek provided the HEC-2 hydraulic model output used for the detailed study of said creek (included as Appendix A), but the only specific information on the overland flood hazard were the respective work maps overlain on USGS topographic map bases. That said, the mapped extent of the SFHA overland flood hazard is consistent with more recent topographic mapping used in this request, which confirms that the UPRR tracks are indeed the local high point with a lower elevation section centered just to the southeast of the Olive Avenue crossing. Flows that overtop the tracks at this location would travel overland in a generally northeasterly direction, with the Zone AO currently mapped as terminating at the Lateral No. 6 North irrigation ditch (locally known as "Lateral C") approximately 1,000 feet west of Sycamore Avenue. Hydrologic calculations (see below), land slope, and lateral width of the Zone AO were consistent with the designation of "Depth 1" on the currently-effective mapping based on the estimate of overbank flow at the time of the mapping (June 1987).

Portions of the study area also include SFHA Zone X (with hatching) designations. Since the currently-effective mapping of Del Puerto Creek does not include the 0.2-percent-chance flood event (500-year flood), these areas are presumed to represent the hazard from shallow overland flooding associated with the 1-percent-chance flood event with depths averaging less than one foot.

Basis for the Request

The requested LOMR is based on updated estimates of the 1-percent event discharge in Del Puerto Creek presented in the document "Orestimba Creek Hydrology, A Reevaluation Based on Updated Peak and Volume Frequency Curves" prepared in March 2008 by the U.S. Army Corps of Engineers as part of the West Stanislaus Feasibility Study Damsite and Floodplain Evaluation.[2]

The City of Patterson has asked Balance Hydrologics to assess the impact of the markedly-reduced discharge values on the extent of the flood hazard in the area east of State Route 33. This letter summarizes the findings of that assessment.[3]

[2] The full report is submitted electronically as part of the LOMR application through the Clearinghouse portal. The cover page and pertinent excepts are attached as Appendix B.

[3] A previous Conditional Letter of Map Revision was issued for the same area in July 2016 under Case Number 16-09-1727R. However, that request was based on the perceived need to collect and convey the larger overbank flows

Hydrology

As discussed above, specific information related to the mapping of the Zone AO SFHA in the study area was not located. However, several concurrent lines of evidence were used to identify the discharge associated with the 1-percent-chance flood event used in the currently-effective mapping. The HEC-2 modeling from June 1987 was based on a 1-percent-chance discharge of 7,960 cfs at Interstate 5 (see FIS, page 18, Table 2) with in-channel flow reduced to 2,200 cfs at the downstream limit of the mapped Zone AO overflow, which includes breakouts to both the north and south.[4]

However, the U.S. Army Corps of Engineers study found the 1-percent discharge value at Interstate 5 to be 5,905 cfs. This represents a very significant reduction in potential overbank flows from the creek. The total breakout discharge (north and south) per the 1987 study would be 5,760 cfs (7,960 - 2,200), whereas the updated base flood information reduces this to 3,705 cfs (5,905 – 2,200). Of equal importance, the same study provides estimates of total flood volume and design hydrographs for the potential dam site west of Interstate 5, and this information is also consistent with much reduced total flood volume releases to the south overbank that are the source of flood hazard in the proposed revision area. Previously estimated to be as high as 700 acre-feet, the information from the 2008 report indicates breakout flows south from Rogers Road are more likely in the range of 400 cfs with a total volume of approximately 200 acre-feet, relatively small given the 2.5-mile flow path to the proposed revision area, with ample opportunity for flow attenuation. Maximum base flood discharge is therefore now estimated to be on the order of 190 cfs across the UPRR tracks at the west boundary of the revision area (see Figure 1.

Hydraulic Modeling

Since the study area includes only Zone AO SFHAs, there is no currently-effective hydraulic modeling for the site. In fact, it is likely that the currently-effective SFHA was identified using simple overland routing techniques based on the much higher breakout flowrates assumed at the time. Past submittals associated with Case Number 16-09-1727R noted that the simple application of the Manning's equation with a land slope of 0.3 percent (confirmed by regional topographic mapping) and an 'n' value of 0.05 would give flow depths on the order of one foot for the floodplain width indicated.

The much-reduced overbank discharge for the revised base flood estimate does not merit detailed hydraulic modeling. Simple application of Manning's equation for the conditions noted above and an overland flow path on the order of 1,000 feet wide (roughly half of that on the currently-effective FIRM panels) yields average flow depths of just under 0.3 feet. Clearly, if the flow

associated with the currently-effective 1-percent event discharge. This new request explicitly considers the updated discharge information as compiled by the U.S. Army Corps of Engineers and is not contingent on any physical changes within the mapped floodplain.

[4] The FIS calls out the Q100 as 7,960 cfs at Interstate 5, but the detailed study reach extends upstream only as far as the Delta Mendota Canal, with the overall limit of study at the California Aqueduct. Therefore, the FIS hydrology appears to also not account for the limitations of peak flow through the 16-foot diameter pipe that carries the creek under the Aqueduct.

were even more widely spread out, average depths would be even less. These depths would be indicative of some flood hazard, but would not be deep enough, nor of high enough velocity, for a Zone AO designation.

Proposed Map Revisions

The proposed annotated FIRM panels are illustrated in the attached Figures 2 and 3. For consistency with the currently-effective mapping, the proposed revisions would maintain the boundaries of the currently-mapped Zone AO and shaded Zone X designations. However, all areas east of the UPRR tracks in the revision area are proposed to be mapped with a shaded Zone X designation. This designation would more properly capture the actual flood hazard, while still showing that shallow overland flooding can be expected under extreme flood conditions.

Additional Information

This LOMR request is being made on the basis of updated information only, and does not include any physical changes inside or outside the proposed map revision area. Therefore, there are no potential impacts with respect to compliance with the Federal Endangered Species Act (ESA).

Closing

We appreciate all efforts to review the enclosed application forms and additional materials for compliance with the requirements of the National Flood Insurance Program.

Do not hesitate to contact Balance Hydrologics with any questions related to this LOMR application or the supporting documentation.

Thank you again for your prompt attention to this request.

Sincerely,

BALANCE HYDROLOGICS, Inc.

Edward D. Ballman, P.E.
Principal Engineer

Attachments: LOMR Application MT-2 Forms 1 and 2
Figures 1 through 3
Appendices A and B

cc: Ms. Maria Encinas, CFM, Water Resources Coordinator, City of Patterson

MT-2 FORMS

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.
PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).
ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.
DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☐ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☒ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
060390	City of Patterson	CA	06099C	0732E	09/26/08
060390	City of Patterson	CA	06099C	0755E	09/26/08

2. a. Flooding Source: Overbank flow from Del Puerto Creek

   b. Types of Flooding: ☐ Riverine ☐ Coastal ☒ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: Overland Flooding Areas East of SR33

4. FEMA zone designations affected: AO, X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☐ Physical Change ☒ Improved Methodology/Data ☐ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☐ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☐ Natural Changes
   ☐ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☐ Bridge/Culvert ☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☐ Yes Fee amount: $0

☒ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Edward D. Ballman, P.E.	Company: Balance Hydrologics, Inc.	
Mailing Address: 800 Bancroft Way, Suite 101 Berkeley, California 94710	Daytime Telephone No.: 510-704-1000	Fax No.: 510-704-1001
	E-Mail Address: eballman@balancehydro.com	
Signature of Requester (required):	Date: August 28, 2017	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: Ms. Maria Encinas, CFM, Water Resources Coordinator	Community Name: City of Patterson	
Mailing Address: 1 Plaza Patterson, California 95363	Daytime Telephone No.: 209-895-8061	Fax No.: 209-895-8069
	E-Mail Address: mencinas@ci.patterson.ca.us	
Community Official's Signature (required):	Date: August 28, 2017	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Edward D. Ballman, P.E.	License No.: C64095		Expiration Date: 09/30/2018
Company Name: Balance Hydrologics, Inc.	Telephone No.: 510-704-1000		Fax No.: 510-704-1001
Signature:	Date: 08-28-2017	E-Mail Address: eballman@balancehydro.com	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☐ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

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DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Overbank flooding from Del Puerto Creek

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section B) ☐ No existing analysis ☒ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)
Del Puerto Creek at I-5	72.6	7,960	5,905

3. Methodology for New Hydrologic Analysis (check all that apply)

☒ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☒ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit*	Sycamore Avenue	N/A (overland)		
Upstream Limit*	UPRR tracks (SR 33)	N/A (overland)		

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: Shallow overland flooding only, see cover letter

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: N/A	Plan Name:	File Name:	Plan Name:	
Corrected Effective Model*	File Name: N/A	Plan Name:	File Name:	Plan Name:	
Existing or Pre-Project Conditions Model	File Name: N/A	Plan Name:	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: N/A	Plan Name:	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☐ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☐ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: _____

Source: _____ Date: _____

Accuracy: _____

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☒ No

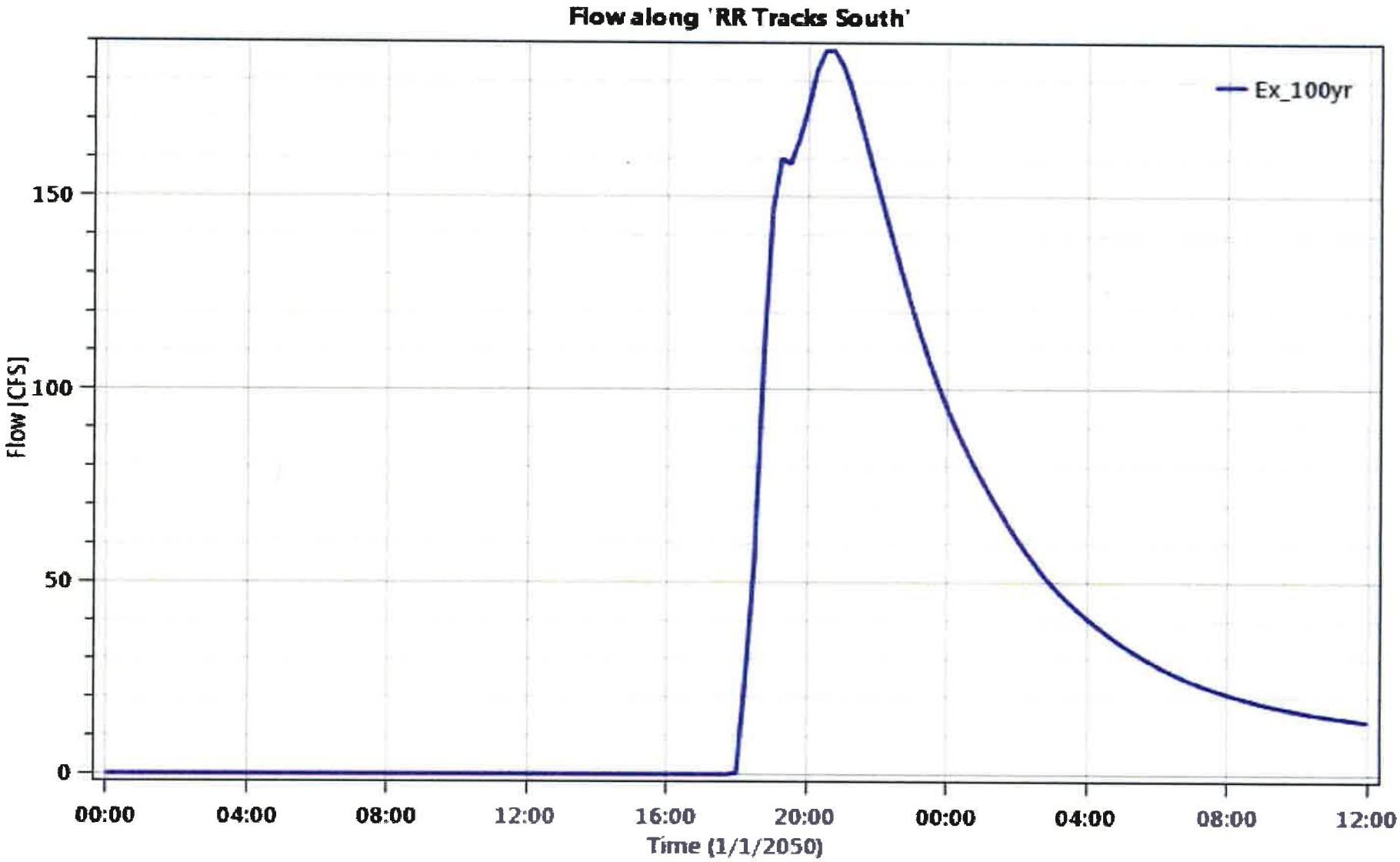
   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

FIGURES



Balance Hydrologics, Inc.

Figure 1. Predicted flood hydrograph at UPRR tracks for overbank flows from Del Puerto Creek based on revised U.S. Army Corps of Engineers estimate of the 1-percent chance flood event. Note that peak discharge at the tracks (upslope boundary of the study area) is predicted to be on the order of 200 cfs.

APPENDICES

APPENDIX A

Selected Pages from Del Puerto Creek HEC-2 Model Output

DEL PUERTO CREEK

THIS RUN EXECUTED 2 JUN 87 7:17:14

Series

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**************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAY  1984
  ERROR CORR -  01,02,03,04,05,06
  MODIFICATION -  50,51,52,53,54,55,56
**************************************************

C
T1      STANISLAUS CO FIS
T2      DELPUE01  FASRUN07 DELPU01D
T3      DEL PULPUERTO CREEK

J1  ICHECK    INQ      NINV     IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.      2.       0.       0.  0.005000      0.00      0.0       0.      36.000    0.000

J2  NPROF     IPLOT    PRFVS    XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
    1.000     0.000   -1.000    0.000     0.000     0.000    -1.000     0.000     0.000     0.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000    43.000    1.000    2.000     3.000     5.000    26.000    42.000     4.000     8.000

    58.000    25.000   39.000    0.000     0.000     0.000     0.000     0.000     0.000     0.000

    38.000    43.000   23.000    1.000    24.000    40.000    41.000    42.000    10.000    11.000

     6.000     7.000    0.000    0.000     0.000     0.000     0.000     0.000     0.000     0.000

J5  LPRNT    NUMSEC                    ********REQUESTED SECTION NUMBERS********

    -10.000  -10.000    0.000    0.000     0.000     0.000     0.000     0.000     0.000     0.000

QT   9.000  1800.000  1600.000  1400.000  1200.000  1000.000   800.000   600.000   400.000   200.000
NC   0.035     0.035     0.055     0.300     0.600     0.000     0.000     0.000     0.000     0.000
X1   1.000    11.000   181.000   219.000     0.000     0.000     0.000     0.000     0.000     0.000
X3  10.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
GR  41.700     0.000    44.200    74.000    40.100   107.000    36.900   149.000    38.400   181.000
GR  30.200   192.000    29.200   200.000    30.500   208.000    39.100   219.000    40.700   231.000
GR  40.600   400.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

X1 850.000    14.000   181.000   219.000  1200.000   500.000   850.000     0.000     0.000     0.000
X3  10.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
GR  44.200     0.000    44.500    54.000    46.300    66.000    46.700    74.000    42.600   107.000
GR  39.400   149.000    40.900   181.000    32.700   192.000    31.700   200.000    33.000   208.000
GR  41.600   219.000    43.200   231.000    43.200   300.000    43.100   400.000     0.000     0.000
```

X1	3120.000	15.000	162.000	218.000	2270.000	2270.000	2270.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	50.200	0.000	50.100	54.000	51.500	72.000	52.500	162.000	42.300	195.000
GR	38.800	196.000	38.500	200.000	38.300	204.000	51.100	218.000	52.400	244.000
GR	53.500	260.000	51.500	264.000	53.900	268.000	51.900	282.000	50.900	400.000
X1	7580.000	13.000	172.000	212.000	4460.000	4460.000	4460.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	65.000	0.000	65.200	127.000	67.400	140.000	67.600	147.000	68.700	172.000
GR	55.700	197.000	55.600	200.000	55.900	203.000	66.300	212.000	66.600	216.000
GR	67.500	236.000	64.900	238.000	64.600	400.000	0.000	0.000	0.000	0.000
X1	8270.000	10.000	173.000	215.000	780.000	600.000	690.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	67.800	0.000	67.900	127.000	70.700	173.000	58.200	195.000	58.000	200.000
GR	58.300	203.000	68.800	215.000	69.700	237.000	67.800	240.000	67.300	400.000
X1	8970.000	10.000	175.000	217.000	780.000	600.000	700.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	70.600	0.000	70.600	130.000	72.700	175.000	60.400	196.000	60.200	200.000
GR	60.500	203.000	71.200	217.000	72.000	238.000	70.700	243.000	70.200	400.000
X1	9670.000	10.000	177.000	218.000	780.000	600.000	700.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	73.300	0.000	74.800	159.000	74.600	177.000	62.900	196.000	62.700	200.000
GR	63.000	203.000	73.600	218.000	74.100	240.000	73.300	246.000	73.100	400.000
X1	10370.000	10.000	178.000	220.000	780.000	600.000	700.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	76.000	0.000	77.000	160.000	76.500	178.000	65.200	197.000	65.000	200.000
GR	65.300	203.000	75.900	220.000	76.300	242.000	75.900	249.000	75.900	400.000
X1	11070.000	10.000	180.000	221.000	780.000	600.000	700.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	78.800	0.000	78.900	134.000	79.600	181.000	78.500	180.000	67.600	197.000
GR	67.500	200.000	67.800	203.000	78.500	221.000	78.600	276.000	78.700	400.000
NC	0.035	0.035	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	13850.000	10.000	154.000	220.000	3500.000	2000.000	2780.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	86.900	0.000	87.700	154.000	85.600	170.000	77.900	197.000	77.500	200.000
GR	77.600	203.000	85.000	220.000	85.800	250.000	86.400	300.000	85.700	400.000
NC	0.035	0.035	0.055	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	14770.000	18.000	173.250	226.250	1740.000	240.000	990.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
DT	2.000	173.250	91.800	90.600	226.250	91.800	90.600	0.000	0.000	0.000
GR	91.800	0.000	91.800	173.250	82.000	173.250	61.600	185.750	90.600	185.750
GR	90.600	187.250	80.600	197.600	80.600	199.250	90.600	199.600	90.600	200.750
GR	82.000	200.750	82.300	212.750	73.600	212.750	91.600	214.250	82.100	214.250
GR	83.400	226.250	91.600	226.250	91.800	400.000	0.000	0.000	0.000	0.000

	VINEYARD									
X1	14790.000	0.000	0.000	0.000	20.000	20.000	20.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QT	9.000	2100.000	1900.000	1700.000	1500.000	1300.000	1100.000	900.000	700.000	500.000
X1	17470.000	13.000	165.000	217.000	2260.000	3100.000	2680.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	99.900	0.000	100.000	130.000	100.700	165.000	92.900	185.000	92.700	195.000
GR	90.700	177.000	90.700	200.000	90.500	203.000	96.700	207.000	99.000	217.000
GR	99.400	224.000	99.400	245.000	99.400	400.000	0.000	0.000	0.000	0.000
QT	9.000	2400.000	2200.000	2000.000	1800.000	1600.000	1400.000	1200.000	1000.000	800.000
X1	19300.000	18.000	144.500	255.500	0.000	0.000	1830.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	2.000	144.500	110.400	109.000	255.500	110.400	109.000	0.000	0.000	0.000
GR	110.400	0.000	110.400	144.500	107.000	144.500	106.000	171.500	109.000	171.500
GR	109.000	172.500	97.400	172.500	97.400	199.500	109.000	199.500	109.000	200.500
GR	101.000	200.500	101.000	227.500	109.000	227.500	109.000	228.500	102.000	228.500
GR	106.000	255.500	110.400	255.500	110.400	400.000	0.000	0.000	0.000	0.000
	HWY 33									
X1	19340.000	0.000	0.000	0.000	40.000	40.000	40.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	19390.000	51.000	110.500	289.500	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	2.000	110.500	111.500	107.800	289.500	111.500	107.800	0.000	0.000	0.000
GR	111.500	0.000	111.500	110.500	105.500	110.500	105.200	124.500	107.800	124.500
GR	107.800	125.500	105.200	125.500	104.900	139.500	107.800	139.500	107.800	140.500
GR	104.900	140.500	104.600	154.500	107.800	154.500	107.800	155.500	104.600	155.500
GR	104.300	169.500	107.800	169.500	107.800	170.500	104.300	170.500	104.000	184.500
GR	107.600	184.500	107.800	185.500	104.000	185.500	103.700	199.500	107.800	199.500
GR	107.800	200.500	103.700	200.500	103.400	214.500	107.800	214.500	107.800	215.500
GR	103.400	215.500	103.100	229.500	107.800	229.500	107.800	230.500	103.100	230.500
GR	102.800	244.500	107.800	244.500	107.800	245.500	102.800	245.500	97.800	252.500
GR	102.800	259.500	107.800	259.500	107.800	260.500	102.800	260.500	103.800	274.500
GR	107.800	274.500	107.800	275.500	103.800	275.500	107.800	289.500	111.500	289.500
GR	111.500	400.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	SPRR									
X1	19406.000	0.000	0.000	0.000	16.000	16.000	16.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	20600.000	2.000	185.500	214.500	1194.000	1194.000	1194.000	0.000	0.000	0.000
BT	2.000	185.500	113.500	112.000	214.500	113.500	112.000	0.000	0.000	0.000
GR	109.000	0.000	113.500	185.500	105.000	185.500	102.500	198.000	102.500	202.000
GR	105.000	214.500	113.500	214.500	109.000	400.000	0.000	0.000	0.000	0.000

PVT RD

X1	20910.000	0.000	0.000	0.000	10.000	10.000	10.000	0.000	0.000	0.000
X1	21100.000	15.000	136.000	217.000	490.000	490.000	490.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	111.200	0.000	111.300	11.000	112.800	26.000	111.100	136.000	109.000	149.000
GR	108.900	165.000	108.100	179.000	105.000	193.000	104.400	200.000	105.100	207.000
GR	111.100	217.000	110.300	230.000	110.200	250.000	110.800	400.000	113.000	500.000
X1	22090.000	12.000	180.000	220.000	1075.000	900.000	990.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	117.600	0.000	116.600	100.000	115.200	140.000	112.600	180.000	109.300	193.000
GR	108.800	200.000	109.500	207.000	111.300	210.000	115.500	220.000	115.600	230.000
GR	115.400	250.000	115.800	400.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	23080.000	12.000	180.000	220.000	1075.000	900.000	990.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	122.300	0.000	121.600	100.000	120.500	140.000	117.100	180.000	113.700	193.000
GR	113.000	200.000	113.800	207.000	115.300	210.000	120.100	220.000	120.800	230.000
GR	120.600	250.000	120.800	400.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	24070.000	12.000	180.000	220.000	1075.000	900.000	990.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	127.200	0.000	126.500	100.000	125.800	140.000	121.600	180.000	118.000	193.000
GR	117.200	200.000	118.000	207.000	119.400	210.000	124.800	220.000	126.200	230.000
GR	125.800	250.000	125.800	400.000	0.000	0.000	0.000	0.000	0.000	0.000
QT	9.000	2600.000	2400.000	2200.000	2000.000	1800.000	1600.000	1400.000	1200.000	1000.000
X1	25060.000	13.000	175.000	223.000	1075.000	900.000	990.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	132.000	0.000	131.400	141.000	131.200	151.000	130.100	159.000	128.700	175.000
GR	124.700	183.000	122.400	195.000	121.300	200.000	122.200	208.000	131.200	223.000
GR	131.400	231.000	130.900	255.000	130.900	400.000	0.000	0.000	0.000	0.000
X1	26880.000	13.000	168.000	236.000	1620.000	2020.000	1820.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	139.300	0.000	139.600	117.000	141.000	135.000	141.800	150.000	140.700	169.000
GR	128.300	195.000	127.600	200.000	129.900	205.000	132.500	207.000	140.500	236.000
GR	140.500	247.000	140.500	262.000	140.600	400.000	0.000	0.000	0.000	0.000
X1	28080.000	7.000	168.000	237.000	1200.000	1200.000	1200.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	146.000	0.000	148.300	150.000	148.100	168.000	134.700	200.000	139.700	215.000
GR	148.200	237.000	147.000	400.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	28670.000	0.000	0.000	0.000	590.000	590.000	590.000	0.000	3.800	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

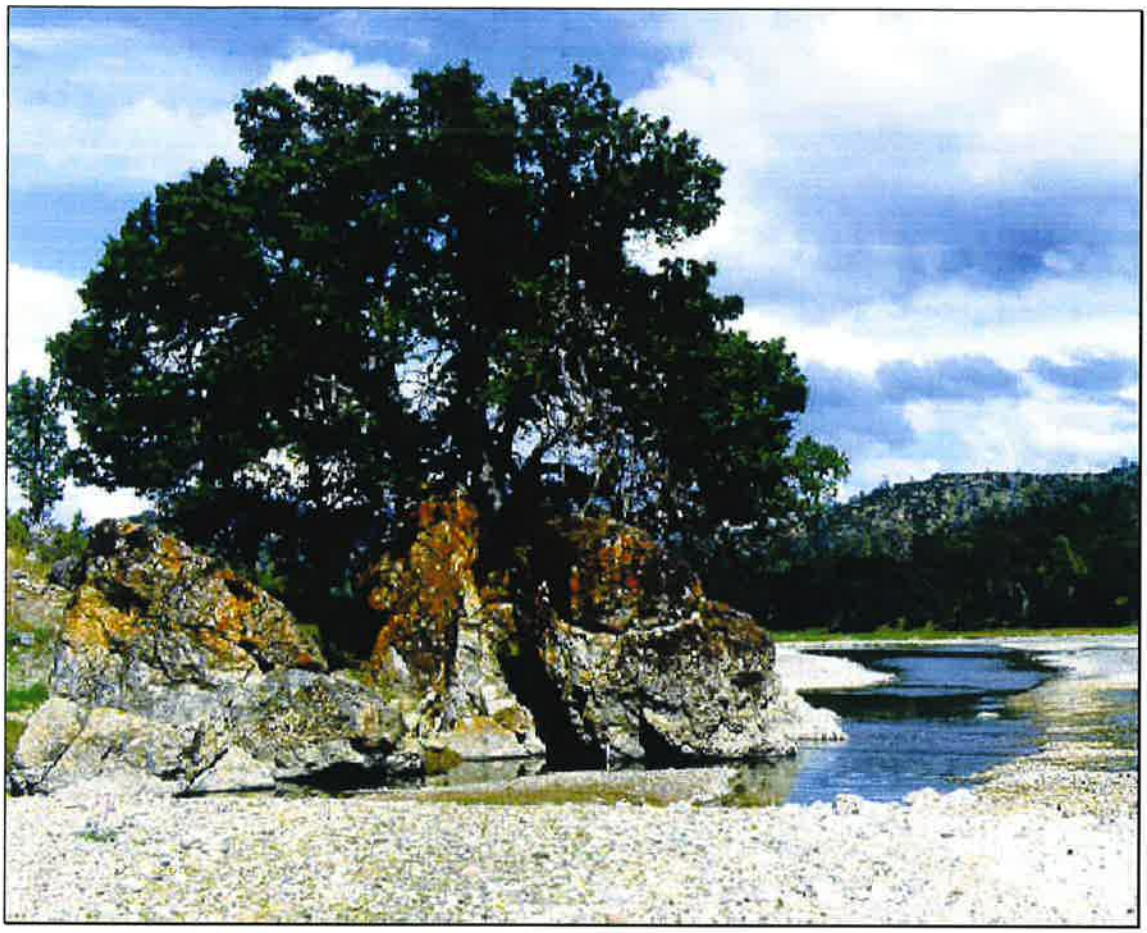
X1	28680.000	11.000	184.000	216.000	10.000	10.000	10.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	2.000	186.000	1[illegible].000	149.500	216.000	153.200	149.500	0.000	0.000	0.000
GR	149.000	0.000	1[illegible].200	184.000	143.000	186.000	139.000	199.000	149.500	199.000
GR	149.500	201.000	139.000	201.000	138.500	208.500	143.000	216.000	153.200	216.000
GR	150.000	400.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	ROGERS RD									
X1	28720.000	0.000	0.000	0.000	40.000	40.000	40.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	9.000	3200.000	3000.000	2800.000	2600.000	2400.000	2200.000	2000.000	1800.000	1600.000
X1	30820.000	11.000	169.000	237.000	2260.000	1220.000	2100.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	158.100	0.000	157.900	1[illegible].000	158.000	169.000	157.800	176.000	152.200	183.000
GR	152.200	200.000	151.900	2[illegible].00	161.400	237.000	161.400	247.000	161.200	257.000
GR	160.900	400.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	9.000	8300.000	8150.000	7900.000	7700.000	7500.000	7300.000	7100.000	6900.000	6700.000
X1	33640.000	13.000	499.000	562.000	2950.000	2700.000	2820.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GR	180.000	0.000	171.500	340.000	171.200	474.000	171.000	488.000	171.000	499.000
GR	161.700	526.000	162.200	540.000	162.300	554.000	166.400	562.000	166.800	579.000
GR	167.400	590.000	169.100	740.000	178.000	1000.000	0.000	0.000	0.000	0.000
X1	34500.000	15.000	142.000	258.000	860.000	860.000	860.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	2.000	142.000	184.600	182.900	158.000	184.600	182.900	0.000	0.000	0.000
GR	184.600	0.000	184.600	142.000	180.000	142.000	170.700	180.000	182.900	180.000
GR	182.900	181.000	170.400	181.000	165.800	200.000	170.400	219.000	182.900	219.000
GR	182.900	220.000	170.700	220.000	180.000	258.000	184.600	258.000	184.600	460.000
	DMC									
X1	34516.000	0.000	0.000	0.000	16.000	16.000	16.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	36000.000	8.000	1240.000	1380.000	1484.000	1484.000	1484.000	0.000	0.000	0.000
GR	195.000	0.000	195.000	800.000	185.000	1100.000	180.000	1240.000	171.000	1260.000
GR	171.000	1320.000	180.000	1380.000	200.000	1460.000	0.000	0.000	0.000	0.000
X1	37000.000	6.000	1080.000	1180.000	1000.000	1000.000	1000.000	0.000	0.000	0.000
GR	200.000	0.000	180.000	1080.000	174.000	1100.000	174.000	1150.000	180.000	1180.000
GR	200.000	1240.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

= Delta Mendota Canal upstream of breakout

Corresponds to the FIS Q100 = 7,960 cfs

APPENDIX B

Selected Pages from U.S. Army Corps of Engineers Report
March 2008



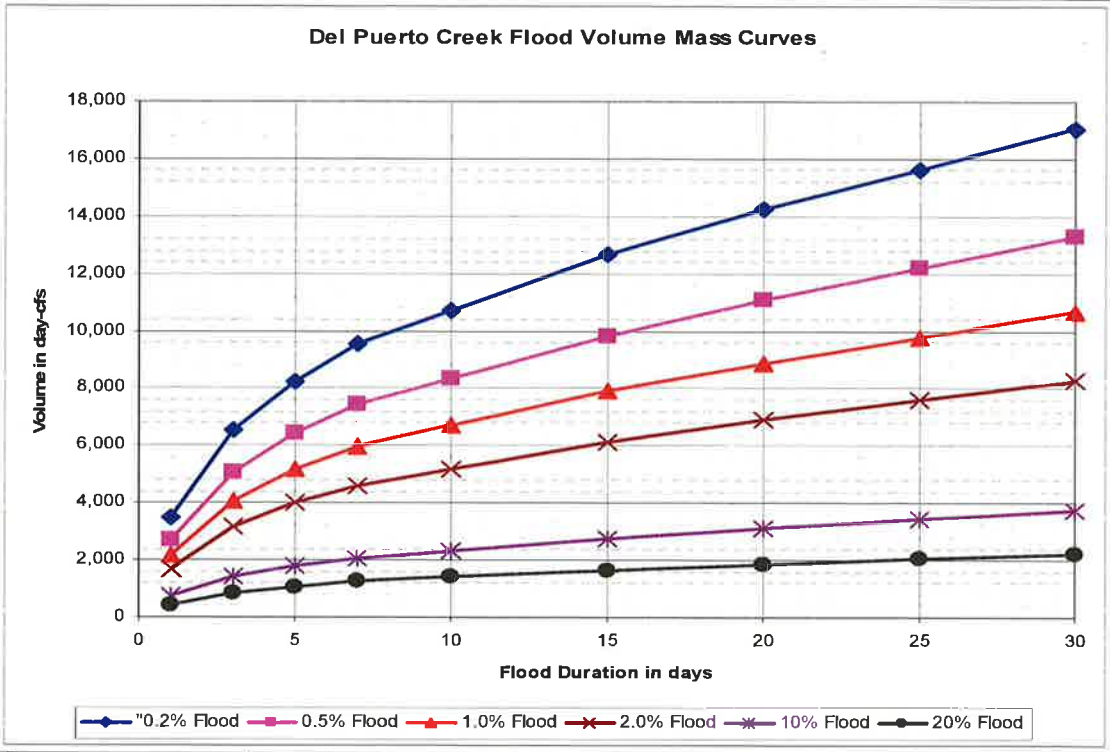
Orestimba Creek Hydrology

A Reevaluation Based on Updated Peak and Volume Frequency Curves

For the West Stanislaus Feasibility Study
Orestimba Creek, California
Damsite and Floodplain Evaluation

March 2008

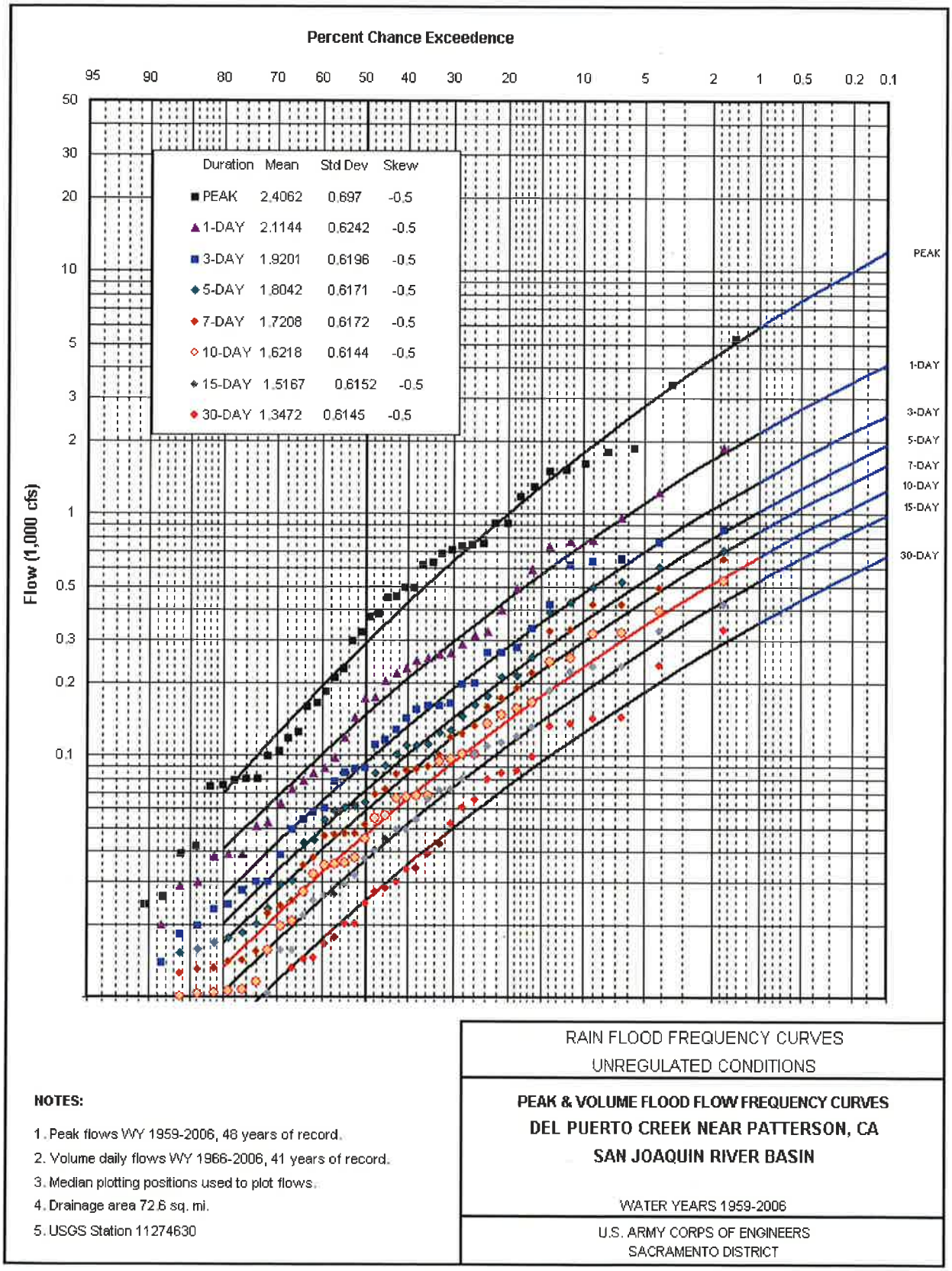
U.S. Army Corps of Engineers
Water Management Section
Sacramento, California



Duration	Flood Probability in Average Flow for each Duration in Day-cfs					
	0.2%	0.5%	1.0%	2.0%	10.0%	20.0%
Peak (cfs)	10,069	7,576	5,905	4,430	1,793	1,005
1-Day-cfs	3,503	2,715	2,172	1,679	747	445
3-Day-cfs	2,186	1,697	1,360	1,053	471	282
5-Day-cfs	1,652	1,284	1,030	798	358	215
7-Day-cfs	1,364	1,060	850	659	296	177
10-Day-cfs	1,070	833	668	519	234	140
15-Day-cfs	844	656	527	409	184	110
20-Day-cfs	712	553	444	345	155	93
30-Day-cfs	569	443	355	276	124	75
Flood Flow Frequency Volumes in Day-cfs for Mass Curves						
Duration	Flood Probability in Total Flood Volume for Each Duration in Day-cfs					
	0.2%	0.5%	1.0%	2.0%	10.0%	20.0%
1-Day	3,503	2,715	2,172	1,679	747	445
3-Days	6,557	5,092	4,080	3,160	1,414	846
5-Days	8,259	6,420	5,149	3,992	1,792	1,074
7-Days	9,547	7,421	5,952	4,615	2,071	1,241
10-Days	10,699	8,326	6,685	5,189	2,337	1,404
15-Days	12,653	9,843	7,900	6,130	2,758	1,656
20-Days	14,233	11,070	8,883	6,891	3,098	1,859
25-Days	15,649	12,174	9,772	7,583	3,413	2,049
30-Days	17,065	13,279	10,661	8,275	3,727	2,238

Figure 8. Del Puerto Creek Flood Volume Mass Curves and Tabulation

Note: 1-percent event discharge highlighted by applicant.



RAIN FLOOD FREQUENCY CURVES
UNREGULATED CONDITIONS

PEAK & VOLUME FLOOD FLOW FREQUENCY CURVES
DEL PUERTO CREEK NEAR PATTERSON, CA
SAN JOAQUIN RIVER BASIN

WATER YEARS 1959-2006

U.S. ARMY CORPS OF ENGINEERS
SACRAMENTO DISTRICT

NOTES:

1. Peak flows WY 1959-2006, 48 years of record.
2. Volume daily flows WY 1966-2006, 41 years of record.
3. Median plotting positions used to plot flows.
4. Drainage area 72.6 sq. mi.
5. USGS Station 11274630

Chart 1