COTTON LANE BRIDGE
FLOODPLAIN REDELINEATION
GILA RIVER
GOODYEAR, ARIZONA

LETTER OF MAP REVISION

Prepared for:

Maricopa Department of Transportation
2901 West Durango Street
Phoenix, AZ 85009-6357

Prepared by:

River Research & Design, Inc.
1345 E. Spur Ave
Gilbert, AZ 85296

March 2010

Flood Control District
of Maricopa County

INTEROFFICE MEMORANDUM

Date: June 17, 2010

To: Timothy S. Phillips, P.E., Chief Engineer and General Manager TSP

From: Stacey A. Lapp, P.E., CFM

Subject: FCC10-012 LOMR Community Acknowledgement Form for MCDOT Cotton Lane Bridge over Gila River Unincorporated Maricopa County and Goodyear, AZ

This is a request to sign a copy of the "Overview and Concurrence Form" for submittal to the Federal Emergency Management Agency (FEMA). The applicant's engineer has addressed all comments that resulted from our review.

Recommendation: Staff recommends **signing** a copy of the attached MT-2 Form 1 for submittal to FEMA.

LMT/KAS LMT / KAS 6/17/2010

2801 West Durango Street Phoenix, Arizona 85009 Phone: 602-506-1501 Fax: 602-506-4601

Stacey Lapp - FCDX

From: Stacey Lapp - FCDX
Sent: Tuesday, June 22, 2010 8:08 AM
To: 'Gary E Freeman'
Subject: Cotton Lane Bridge LOMR

Gary,

Attached is the signed MT-2 form. Please send us a PDF of Goodyear's page. Also be sure to send us pdfs of correspondence to/from FEMA.

Thanks,
Stacey L.

FCC10-012 LOMR
MCDOT Cotton La...

Stacey Lapp - FCDX

From: Gary E Freeman [freeman@r2d-eng.com]
Sent: Friday, June 11, 2010 10:21 AM
To: Stacey Lapp - FCDX; Lisa Ruane - MCDOTX; Keith.Brown@goodyearaz.gov
Subject: Pages for the Cotton Lane Bridge LOMR
Attachments: CLB-Owners-Certs.pdf; TDN_CLB-LOMR-p19r.pdf; freeman.vcf

Here is one revised page (p. 19) and the verification of notification for the adjoining landowners which should go into Appendix B. If I already sent you some of these just ignore this set. The revised page
19 is new however and should replace the existing p. 19 in your LOMR binders.

Gary.

--
Gary E. Freeman, PhD, PE, D.WRE
President

River Research & Design, Inc.
1345 E Spur Ave
Gilbert, AZ 85296

(480) 275-5077
(480) 225-5206 (Cell)
(888) 670-8890 (FAX)

E-mail: freeman@r2d-eng.com
http://www.r2d-eng.com
Alt E-mail: g_freeman@riverspace.com

"We the People of the United States,
in Order to form a more perfect Union,
establish Justice,
insure domestic Tranquility,
provide for the common defence,
promote the general Welfare, and
secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America."

The power belongs to the PEOPLE - We ENTRUST it to Congress.
They seem to have forgotten who they work for - Bring Congress Home in '10!

5.8 Problems Encountered During the Study

No special problems were encountered in this study. All problems were resolved in the previous Gila River/Norte Vista LOMR.

5.9 Modeling Warning and Error Messages

Several warnings and messages were noted. Most of the warnings dealt with divided flow situations. These involved areas of the far overbanks where berms, canals or other features have cut the floodplain off from the channel. These all occurred in areas of ineffective flow.

No errors were noted in the models.

5.10 Calibration

The effective model was run using the Norte Vista LOMR model as accepted by FEMA. The updated topography was inserted into the approved model and changes noted. All other parameters were left as they were in the original FIS model. No other calibration was performed on the model and all data with the exception of the ineffective flow areas and the cross sections immediately adjacent to the Cotton Lane Bridge were as modeled in the Norte Vista LOMR.

5.11 Final Results

5.11.1 Hydraulic Analysis Results

It can be noted that there is a small difference between the Norte Vista LOMR and new floodplain elevations in this reach once the bridge is constructed. The differences are all within the FEMA regulations. Floodplain elevations are slightly higher than those in the Norte Vista LOMR but slightly lower than those proposed in the Cotton Lane Bridge CLOMR. The maximum increase in this LOMR is 0.47 downstream of the bridge (cross section 192.23) compared with a maximum of maximum increase of 0.57 feet higher just upstream of the bridge at cross section 192.52 and still within FEMA guidelines (See Table 3). The maximum increases are highlighted in yellow in Table 3.

Floodway elevations through the reach are reduced over those in the Norte Vista LOMR (effective model) due to the excavation near the bridge and are also slightly lower than those proposed in the Cotton Lane Bridge CLOMR. These data can be seen in Table 4. It is expected that the proposed re-alignment of banks and the channel for future development in this reach may need to encroach into the existing floodway but channel excavations are planned to avoid any rise in the floodway or floodplain. The current economic climate has delayed the plans for additional modifications along the river but it is expected that the developments will go forward in the next several years when the economy recovers.

5.11.2 Verification of Results

The RAS results correspond closely to the existing conditions model from the current effective model (Norte Vista LOMR). The same models were used in the current model and were adjusted only where changes were made for the construction of the bridge. The only difference between the CLOMR model and the LOMR model is the as-built topography associated with the bridge.

Stacey Lapp - FCDX

From: Gary E Freeman [freeman@r2d-eng.com]
Sent: Tuesday, May 25, 2010 8:40 AM
To: Stacey Lapp - FCDX
Subject: Re: Cotton Lane Bridge
Attachments: CLB-LandOwners.doc; Individual Notification-CLB-LOMR.doc; freeman.vcf

Stacey -

Here is the list of owners that are impacted by the floodplain changes from Cotton Lane Bridge as well as the letter I would propose to send out. Let me know if it looks OK. If it does I can send it out this week.

Gary.

--
Gary E. Freeman, PhD, PE, D.WRE
President

River Research & Design, Inc.
1345 E Spur Ave
Gilbert, AZ 85296

(480) 275-5077
(480) 225-5206 (Cell)
(888) 670-8890 (FAX)

E-mail: freeman@r2d-eng.com
http://www.r2d-eng.com
Alt E-mail: g_freeman@riverspace.com

"We the People of the United States,
in Order to form a more perfect Union,
establish Justice,
insure domestic Tranquility,
provide for the common defence,
promote the general Welfare, and
secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America."

The power belongs to the PEOPLE - We ENTRUST it to Congress.
They seem to have forgotten who they work for - Bring Congress Home in '10!

Stacey Lapp - FCDX wrote:
> Sure, that would be fine.
>
> -----Original Message-----
> From: Gary E Freeman [mailto:freeman@r2d-eng.com]
> Sent: Thursday, May 20, 2010 8:04 AM
> To: Stacey Lapp - FCDX
> Subject: Re: Cotton Lane Bridge
>
> Stacey -

May 26, 2010

Name

Address

RE: Notification of increases in 1% (100-year) annual chance water surface elevations
Additional Notification of Floodway Modification

Dear ____:

The Flood Insurance Rate Map (FIRM) for a community depicts land which as been determined to be subject to a 1% (100-year) or greater chance of flooding in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management. The floodway is the portion of the floodplain that includes the channel of a river or other watercourse and the adjacent land area that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation by more than a designated height.

River Research and Design, Inc. is applying for a Letter of Map Revision LOMR) from the Federal Emergency Management Agency (DHS-FEMA) on behalf of The Maricopa County Department of Transportation to revise FIRM 04013C, Panels 2065 H, 2070 H and 2550 G for the City of Goodyear and Maricopa County, Arizona along the Gila River. The Maricopa County Department of Transportation is proposing to modify the floodplain and floodway as a part of the construction of the Cotton Lane Bridge across the Gila River. Similar notification was previously performed during the CLOMR (Conditional Letter of Map Revision) process.

The Flood Control District of Maricopa County and the City of Goodyear, in accordance with the National Flood Insurance Program regulation 65.7(b)(1), hereby give notice of the County's and City's intent to revise the floodway, generally located between where the Citrus Road alignment crosses the Gila River to Estrella Parkway. Specifically the Gila River floodway shall be revised from River Mile 191.38 above its confluence with the Colorado River to River Mile 194 .20. As a result of the floodway revision, the floodway shall primarily narrow with some minor widening with a maximum widening of 160 feet along the north bank approximately 2000 feet west of the Cotton Lane Bridge. The maximum narrowing is approximately 500 feet along the north bank of the Gila River at River Mile 192.38 or immediately west of the Cotton Lane Bridge. Maps and detailed analysis of the floodway revision can be reviewed at The Flood Control District of Maricopa County at 2801 West Durango Street, Phoenix, AZ 85009 or at the City Engineers Office for the City of Goodyear at 195 N. 145th Ave, Building D, Goodyear, AZ 85338. Interested persons may call Lynn Thomas (FCDMC) at (602) 506-1501 or Keith Brown (Goodyear) at (623) 882-3110.

Just need this once - see last paragraph

The proposed bridge project will result in increases in the 1% annual chance water surface elevations for the Gila River with a maximum increase of approximately 0.34 feet (4 inches) over the currently effective floodplain elevations. This maximum increase occurs approximately 0.1 miles (700 feet) upstream of the Cotton Lane Bridge.

add maximum decrease

This letter is to inform you of the proposed increases in the 1% annual chance water surface elevation and floodway modifications on your property located along the Gila River to the west of Estrella Parkway at ______________________________.

If you have any questions or concerns about the proposed project or its affect on your property you may contact The Flood Control District of Maricopa County at 2801 West Durango Street, Phoenix, AZ 85009 or at the City Engineers Office for the City of Goodyear at 195 N. 145th Ave, Building D, Goodyear, AZ 85338. Interested persons may call Lynn Thomas (FCDMC) at (602) 506-1501 or Keith Brown (Goodyear) at (623) 882-3110.

Sincerely;

Gary E. Freeman, PhD, PE
President

List of Property Owners Notified of Cotton Lane CLOMR: May 2010

Buckeye Water Conservation and Drainage District
PO Box 726
Buckeye, AZ 85326
Property between Estrella Parkway and Citrus Road Alignment

Housecat LLC
3040 N 44th St, Ste 4
Phoenix, AZ 85018
Lakin Property between Sarival Alignment and Citrus Road Alignment

Flood Control District of Maricopa County
2801 W Durango St
Phoenix, AZ 85009
Property between Estrella Parkway and Citrus Road Alignment

HE Capital KR, LLC
2850 E Camelback Rd, Ste 110
Phoenix, AZ 85016
King Ranch Property between Estrella Parkway and Citrus Road Alignment

AZ State Land Department
1616 W Adams St.
Phoenix, AZ 85007
Cotton Lane Rd and Southern Ave Alignment

Dos Rios Materials, LLC
5340 W Luke Ave
Glendale, AZ 85301
Sections 26, 34, and 35 T1N, R1W Near intersection of Southern Ave and Citrus Rd

Buckeye Group, LLC
14238 N 66th Dr
Glendale, AZ 85306
Intersection of Southern Ave and Citrus Rd

Dan Mahan
PO Box 301
Buckeye, AZ 85326
Section 26 along Extension Canal immediately north of Southern Ave alignment

Lakin Cattle Company
4456 S Dysart Rd
Avondale, AZ 85323

Stacey Lapp - FCDX

From: Stacey Lapp - FCDX
Sent: Wednesday, April 28, 2010 3:54 PM
To: 'freeman@r2d-eng.com'
Subject: Cotton Lane Bridge

Gary:

I am nearly finished review of this LOMR and it appears that the submittal is complete and I would not expect technical comments. I noticed with the CLOMR that it appeared that you submitted the adjoiner letters. Do you propose that again? We typically prepare these, however, we should coordinate the effort. Have you done an update search of adjoiner names/addresses? With FEMA responses of late they have looked for specific references to width and elevation changes (increases and decreases) for both the floodplain and floodway.

Have you had a response from City of Goodyear yet?

I am away at a training next week, but would like to coordinate with you on this upon my return.

Regards,
Stacey Lapp, P.E., CFM
Sr. Civil Engineer
Floodplain Mgmt. & Services Division
Flood Control District of Maricopa County
Phone: 602-506-4717
Fax: 602-506-7346

Stacey Lapp - FCDX

From: Lynn Thomas - FCDX
Sent: Thursday, March 25, 2010 1:24 PM
To: Stacey Lapp - FCDX
Subject: FW: A Letter/Package Has Arrived for you to pick up

Stacey

FYI.

Lynn

From: Customer Support [mailto:ConnieDelpier@mail.maricopa.gov]
Sent: Wednesday, March 24, 2010 11:56 AM
To: Lynn Thomas - FCDX
Subject: A Letter/Package Has Arrived for you to pick up

A Letter/Package has arrived for you to pick up:

Letter/Package: 2 binders

Sent By: River Research & Design

Date/Time Logged: 3/24/2010 11:55:39 AM

Disposition/Action Taken: at FCD front desk - will be in next day's mail run for pickup

DELPIERC

COTTON LANE BRIDGE
FLOODPLAIN REDELINEATION
GILA RIVER
GOODYEAR, ARIZONA

LETTER OF MAP REVISION

Prepared for:

Maricopa Department of Transportation
2901 West Durango Street
Phoenix, AZ 85009-6357

Prepared by:

River Research & Design, Inc.
1345 E. Spur Ave
Gilbert, AZ 85296

March 2010

Table of Contents

Appendices

List of Figures

List of Tables

1. Introduction

This is the third in a series of submittals involving the Gila River Floodplain in the reach near Cotton Lane Bridge. The first document was a LOMR (Case No.: 08-09-0929P) submitted to FEMA in October of 2007 which was effective August 10, 2009. The second was the CLOMR associated with the construction of the Cotton Lane Bridge. **The CLOMR associated with this project (08-09-1741R) was approved on May 6, 2009. This submittal provides the necessary data for the approval of the Cotton Lane Bridge LOMR including the as-built data, the associated models and analysis.** The bridge was constructed as proposed in the CLOMR with some minor variations from the proposed grading plan in the river that have resulted in lower water surface elevations conditions through the reach than those proposed in the LOMR. Future submittals are expected to further modify the floodplain for planned development projects along this reach of the Gila River.

1.1 Study Area

The study area for this CLOMR is approximately 3 miles long and extends Estrella Parkway (two miles east of Cotton Lane Bridge) to approximately one mile west of the bridge. The study area is located in the jurisdictions of the City of Goodyear and Maricopa County. The area modeled in the hydraulic model extends from the Estrella Parkway Bridge to just downstream of the Tuthill Road Bridge. The sediment transport models extend from approximately the Bullard Road Bridge downstream to the west of Tuthill Road to insure sediment transport model is operating properly before entering the project reach. Figure 1 shows the project vicinity and Figure 2 shows an aerial photograph with Cotton Lane Bridge in place.

The Gila River in this reach currently consists of a braided system with three bridges (in addition to the Cotton Lane Bridge) at Bullard Avenue, Estrella Parkway and Tuthill Road. The Bullard Avenue Bridge and Estrella Parkway Bridge are located approximately 4 miles and 5 miles downstream from the Salt-Gila confluence, respectively. The condition of the vegetation in the channel and floodplain has a high spatial variability, ranging from non-existent to extremely dense over very short distances.

1.2 The Project

The current project consists of the construction of the Cotton Lane Bridge on an alignment nearly perpendicular to the river at River Mile (RM) 192.39. Also included was the construction of guide dikes and bank protection to protect the bridge abutments. Excavation of material from the vicinity of the bridge increases channel capacity and provided fill for the bridge approaches and road construction associated with the bridge and road extension. The removal of material also improved flow characteristics of the river through the Cotton Lane Bridge.

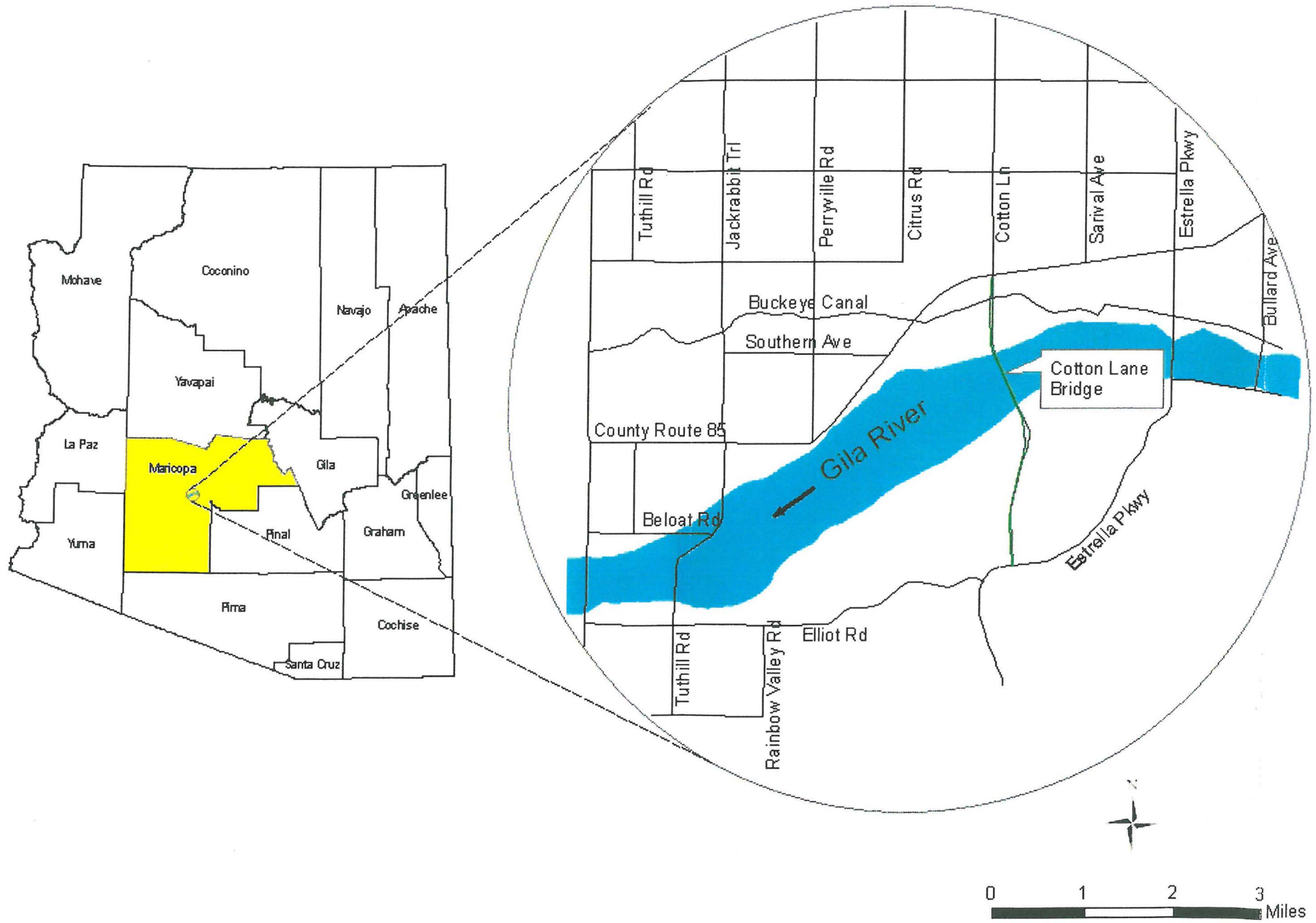

Figure 1. Project Vicinity Map.

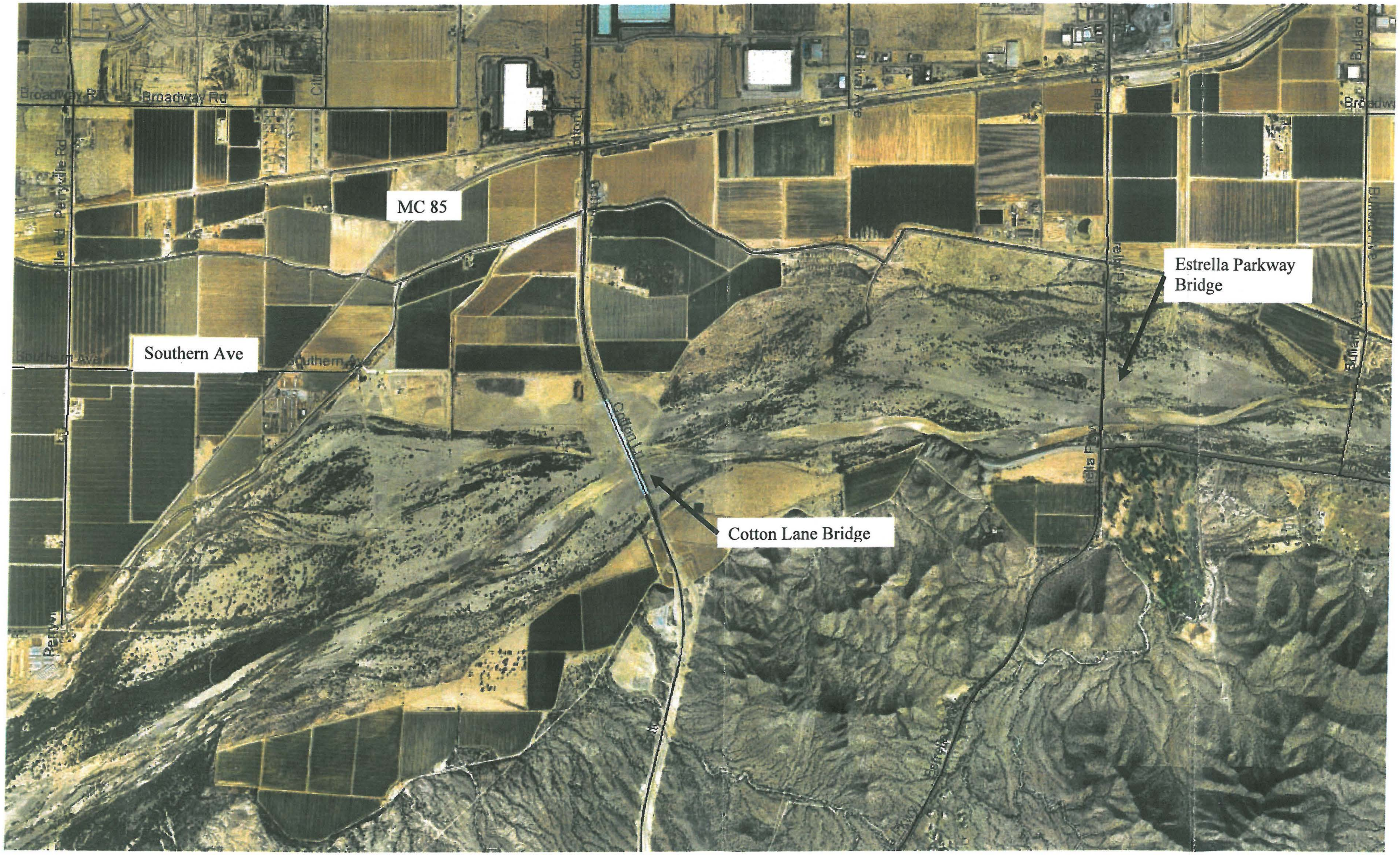

Figure 2. Area Map Showing Cotton Lane Bridge and Surrounding Features.

2. FEMA Forms

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

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour 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, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, 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.**

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
Ex: 480301 480287	City of Katy Harris County	TX TX	480301 48201C	0005D 0220G	02/08/83 09/28/90
040046	City of Goodyear-Map Panels 2070H, 2550G, 2065H	AZ	04013C	2070H	8/10/09
040037	Maricopa County - Map Panels 2070H, 2550G, 2065H	AZ	04013C	2550G	8/10/09

2. a. Flooding Source: Gila River

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier:

4. FEMA zone designations affected: AE (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)

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes	Fee amount: $5,000.00
	☐ 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: John Hauskins	Company: Maricopa County Dept of Transportation	
Mailing Address: 2091 West Durango Phoenix, AZ 85009	Daytime Telephone No.: 602-506-8600	Fax No.: 602-506-4750
	E-Mail Address: JohnHauskins@mail.Maricopa.gov	
Signature of Requester (required):	Date: 3-24-10	

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 requirement that no fill be 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. 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: Tim Phillips, PE, Chief Engineer and General Manager	Community Name: Maricopa County	
Mailing Address: 2801 West Durango Phoenix, AZ 85009	Daytime Telephone No.: 602-506-1501	Fax No.: 602-506-4601
	E-Mail Address: tsp@mail.maricopa.gov	
Community Official's Signature (required):	Date: 6/21/10	

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: Gary E. Freeman, PhD, PE	License No.: 36225	Expiration Date: 6/30/10
Company Name: River Research & Design, Inc.	Telephone No.: 480-275-5077	Fax No.: 888-670-8890
Signature:		Date: 2/26/10

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

Registered Professional Engineer (Civil)
CERTIFICATE NO.
36225
GARY E.
FREEMAN
DATE SIGNED
Arizona, U.S.A.

C. REVIEW FEE

Has the review fee for the appropriate request category been included?	☒ Yes ☐ No, Attach Explanation	Fee amount: $5,000.00

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:	Company:	
Mailing Address: 2091 West Durango Phoenix, AZ 85009	Daytime Telephone No.:	Fax No.:
	E-Mail Address: JohnHauskins@mail.Maricopa.gov	
Signature of Requester (required):	Date:	

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 requirement that no fill be 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. 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: David Ramirez	Community Name: City of Goodyear	
Mailing Address: 190 N. Litchfield Rd Goodyear, AZ 85338	Daytime Telephone No.: 602-882-7979	Fax No.: 602-882-7949
	E-Mail Address: DRamirez@goodyearaz.gov	
Community Official's Signature (required): David J Ramirez	Date: 6/14/2010	

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: Gary E. Freeman, PhD, PE	License No.: 36225	Expiration Date: 6/30/10
Company Name: River Research & Design, Inc.	Telephone No.: 480-275-5077	Fax No.: 888-670-8890
Signature:		Date: 2/26/10

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

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☐ 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

Seal (Optional)

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

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires: 12/31/2010

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3.25 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, U.S. Department of Homeland Security, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, 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.**

Flooding Source: Gila River
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

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

- [x] 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)

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

- [ ] Statistical Analysis of Gage Records
- [ ] Precipitation/Runoff 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

Was sediment transport considered? ☐ Yes ☐ No *If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.*

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Citrus Road	191.38	888.62	888.62
Upstream Limit	Estrella Parkway Bridge	194.20	905.56	905.46

2. Hydraulic Method/Model Used

HEC-RAS 3.1.3

B. HYDRAULICS (CONTINUED)

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. These review programs may help verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. **These tools do not replace engineering judgment.** CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/plan/prevent/fhm/frm_soft.shtm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. Review of your submittal and resolution of valid modeling discrepancies may result in reduced review time.

4. Models Submitted

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	_____
Corrected Effective Model*	File Name:	Plan Name:	File Name:	Plan Name:	_____
Existing or Pre-Project Conditions Model	File Name: ElRioR3	Plan Name: ElRioR3-Exis	File Name: Same	Plan Name: Same	NGVD29
Revised or Post-Project Conditions Model	File Name: GilaRCLBr	Plan Name: AsBuilt	File Name: Same	Plan Name: Same	NGVD29
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 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

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,** 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 of 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.
      - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot.

   b. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☒ Yes ☐ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notification 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 added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR/CLOMR requests, does this request have the potential to impact an endangered species? ☐ Yes ☒ No

   If Yes, please submit documentation to the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA). Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. If an action might harm an endangered species, a permit is required from U.S. Fish and Wildlife Service or National Marine Fisheries Service under Section 10 of the 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.

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

U.S. DEPARTMENT OF HOMELAND SECURITY - FEDERAL EMERGENCY MANAGEMENT AGENCY **RIVERINE STRUCTURES FORM**	*O.M.B No. 1660-0016* *Expires: 12/31/2010*

PAPERWORK REDUCTION ACT

Flooding Source:
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

- Channelization.............. complete Section B
- Bridge/Culvert............... complete Section C
- Dam/Basin...................... complete Section D
- Levee/Floodwall............ complete Section E
- Sediment Transport .... complete Section F (if required)

Description Of Structure

1. **Name of Structure:** **Cotton Lane Bridge Channelization**

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam/Basin

   Location of Structure: 192.38

   Downstream Limit/Cross Section: 192.23

   Upstream Limit/Cross Section: 192.52

2. **Name of Structure:** **Cotton Lane Bridge**

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam/Basin

   Location of Structure: 192.39

   Downstream Limit/Cross Section: 192.38

   Upstream Limit/Cross Section: 192.41

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam/Basin

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: Gila River

Name of Structure: Cotton Lane Bridge Channelization

1. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)]
☐ Superelevated sections
☐ Debris basin/detention basin [Attach Section D (Dam/Basin)]
☐ Other (Describe): Abutment Protection/Guide Dikes
☐ Drop structures
☐ Transitions in cross sectional geometry
☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 227,000 (cfs) and/or the 100-year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Gila River

Name of Structure: Cotton Lane Bridge

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS
☐ Modified bridge/culvert previously modeled in the FIS
☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8):
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☐ Shape (culverts only)
☒ Material
☐ Beveling or Rounding
☐ Wing Wall Angle
☒ Skew Angle
☒ Distances Between Cross Sections
☒ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☐ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☒ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☒ Yes ☐ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

D. DAM/BASIN

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam

2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency ☐ Private organization

   Name of the agency or organization:

3. The Dam was permitted as (check one):

   a. ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number Permitting Agency or Organization

   b. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   - If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm?

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.

6. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

   Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

- ☐ upgrading of an existing levee/floodwall system
- ☐ a newly constructed levee/floodwall system
- ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc.	Station	to
☐ structural floodwall	Station	to
☐ Other (describe):	Station	to

c. Structural Type (check one):

- ☐ monolithic cast-in place reinforced concrete
- ☐ reinforced concrete masonry block
- ☐ sheet piling
- ☐ Other (describe):

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency?

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures.	Sheet Numbers:
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system.	Sheet Numbers:
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure.	Sheet Numbers:
4. A layout detail for the embankment protection measures.	Sheet Numbers:
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations.	Sheet Numbers:

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

c. The range of velocities along the levee during the base flood is: (min.) to (max.)

d. Embankment material is protected by (describe what kind):

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

4. Embankment Protection (continued)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:

☐ Overall height: Sta. ; height ft.

☐ Limiting foundation soil strength:

Sta. , depth to

strength ϕ = degrees, c = psf

slope: SS = (h) to (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):

c. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is hours.

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ , ☐ surface psf

☐ Wind @ P_w = psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = %g

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is ft. to ft.

c. Settlement of the levee crest is determined to be primarily from :

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: acres
Draining to ponding area: acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is cfs

h. The length of levee system used to drive this seepage rate in item g: ft.

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No
If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No

Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL (CONTINUED)

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations? ☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations? ☐ Yes ☐ No

If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No
If No, please attach supporting documentation.

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source: Gila River

Name of Structure: Cotton Lane Bridge & Channelization

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume 158,318 Total (Sand = 6626) acre-feet

Debris load associated with the base flood discharge: Volume Debris Not Estimated acre-feet

Sediment transport rate 52.539 (percent concentration by volume)

Method used to estimate sediment transport: HEC-6T / Toffeleti/Meyer-Peter and Meuller Equations

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: HEC-6T above and USBR for Toe Scour

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

HEC-6T

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

3. Surveying and Mapping Information

Topography for the project area was obtained from a number of previous studies as well as new topography obtained for this study and others. It is identical to that used for the Norte Vista – King Ranch LOMR (Case # 08-09-0030P – now the effective model) and results are directly comparable between the two studies. New surveys were performed for four cross sections impacted by the bridge construction and channel modification.

Topography for the King Ranch and Lakin overbank areas (north and south bank) with a one-foot contour interval was provided by Coe & Van Loo Consultants, Inc. (CVL). Initially this topography covered only the south portion of the river and floodplain. These data were spliced into existing four-foot contour interval data that was used for the original FIS study and used for the preliminary modeling. Subsequent to early studies additional new topography (including both 1 ft and 2 ft contour data) was obtained for the remainder of the river (2 ft) and for Lakin property in the north overbank (1 ft). This confirmed observations made based on the partial river topography obtained earlier that portions of the Gila River Channel had eroded and changed significantly subsequent to the date when the 1993 topography was obtained. This information provided the basis for the Norte Vista LOMR (LOMC # 08-09-0929P-040046).

When the sources were combined, new topography was available for the river channel from just upstream of Estrella Parkway Bridge to approximately the Airport Road Alignment (one mile west of Jackrabbit Trail and 0.75 miles west of the Tuthill Bridge). This topography included the channel for this entire reach as well as for the active floodplains along the reach.

3.1 Field Survey Information

Field surveys were performed for the area excavated as a part of the bridge construction project. This data is included in the Appendix and provided the basis for the updating of the hydraulic and sediment transport models.

3.2 Mapping

Four sources of mapping were used in the preparation of this LOMR. These data were combined to provide a single coverage of topographic information. The details of the methodology adopted to arrive at a combined topographic coverage are presented in the Norte Vista/King Ranch LOMR referenced above (now the effective model). The data which was collected and processed includes:

1) Flood Insurance Study (as ArcView GIS coverages obtained from Flood Control District of Maricopa County (FCD)): This consists of topography flown on 2/6/1993 (main channel and part of the adjacent overbanks), and topography flown on 11/14/1991 (the remainder of the mapping). This topography covers the entire study area. The contour interval is four feet. Spot elevations are also part of this data set.

2) Topography flown in 2003 This topography covers the main channel and the left descending overbank for about a 4 mile river reach, as well as covering King Ranch itself. The contour interval is one foot.

3) Additional aerial photography flown in 2004 covering the balance of the river channel as well as the active river channel west of King Ranch to near the Jackrabbit Road alignment. The majority of this topography has a 2 foot contour interval. Areas covered by the 1 ft and 2 ft contour data flown in 2003 and 2004 are shown in Figure 3.

4) Mapping obtained by the Flood Control District of Maricopa County covering the area of the Buckeye Breakout and the river channel west of the area obtained by Sonterra.

Figure 3 shows the locations of recent topographic and elevation data. All the available topographic data were combined to provide a single coverage of topographic information with the most accurate data available being used.

The area covered in this LOMR is all contained within the 1 and 2 ft contour interval topography obtained by Sonterra. The mapping obtained from the Flood Control District was in areas of the overbank beyond the floodplain for this study and are not relevant to this LOMR other than having been used in the development of the Norte Vista LOMR (effective) model.

The horizontal datum of the study topography for this study is Arizona State Plane Central, NAD83, International Feet. The vertical datum of the topography is stated on the Baker workmaps as being NGVD 1929. This statement was confirmed by comparing the 1 ft contours with the contours from the FEMA study where the aerial (1-ft) contours are within 1 foot of NGVD 1929. The topography flown in 2003 was obtained in a ground coordinate system and thus slightly shifted from Arizona Central State Plane Coordinate system, NAD 83, and has a vertical datum of NGVD 1929. The data was shifted to the Arizona Central State Plane Coordinate System prior to its use.

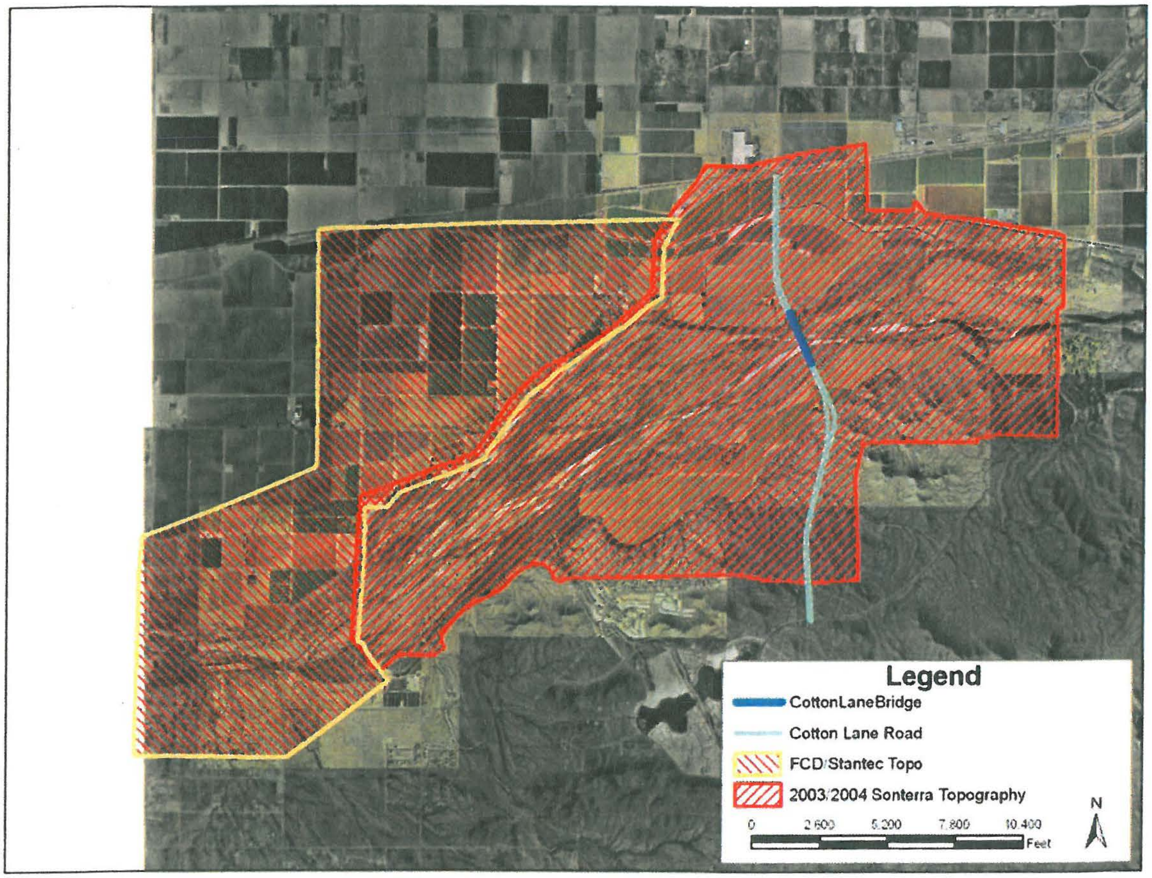

Figure 3. Updated Topography for King Ranch flown in 2003 and 2004 and for the El Rio Study in 2006. Areas outside the hatched area used the existing topography from the Baker FIS study (1999).

4. Hydrology

The peak discharges for the 5, 10, 20, 50, 100 and 500 year flood events were obtained from the report by US Army Corps of Engineers on Gila River Basin (US Army Corps of Engineers, 1996). The values of the peak discharges are presented in Table 2. These peak discharges were used in the steady-state hydraulic models and are the same as used in the Baker study from 1999. The peak discharges used in the hydraulic analysis of the conditions modeled are listed in Table 1.

Table 1. Peak Discharge Values Used in Hydraulic Models

River ID	River Station (miles)	Discharge (cfs)					
		5-Year	10-Year	20-Year	50-Year	100- Year	500-Year
Gila River	195.75	23,500	57,000	92,000	185,000	227,000	285,000

No changes were made or are proposed to the existing hydrology for the project reach.

5. Hydraulics

5.1 Method Description

The hydraulic models from the Norte Vista LOMR (current effective model) were used to define the existing conditions in the current study. The models were modified to represent the proposed Cotton Lane Bridge and associated channel modification and rerun to insure that FEMA regulations were met. The U.S. Army Corps of Engineer's HEC-RAS, v. 3.1.3 model was used for hydraulic analysis using the most current topography described in Section 3.

The HEC-RAS model was shortened from that used in the current effective model so as to facilitate modeling of the local reach. The upstream most cross section in the model is 194.4 while the last downstream cross-section is located at 187.06. The topography used for the generation of the cross-sections was obtained from the Norte Vista LOMR (current effective model) as described earlier in this TDN and as-built plans for bridge and channel construction.

Geometry for the Cotton Lane Bridge and channel was incorporated into the model and the model rerun to view the impacts of the bridge and channel project. The cross sections impacted by the bridge and channel improvements were from 192.23 to 192.52. All other cross sections are identical to those used in the current effective model.

The location of the modified cross sections is shown in Figure 4. The modifications to the cross sections included the removal of the tops of bars in the channel and the removal of materials on the north overbank to allow the bridge to be better aligned with the river channel. This realignment will move the south abutment north out of a depositional area along the south bank. The cross sectional views of the modified sections proposed in the CLOMR are shown in Figure 5. The comparisons between the proposed and as-built cross sections are shown in Figure 6.

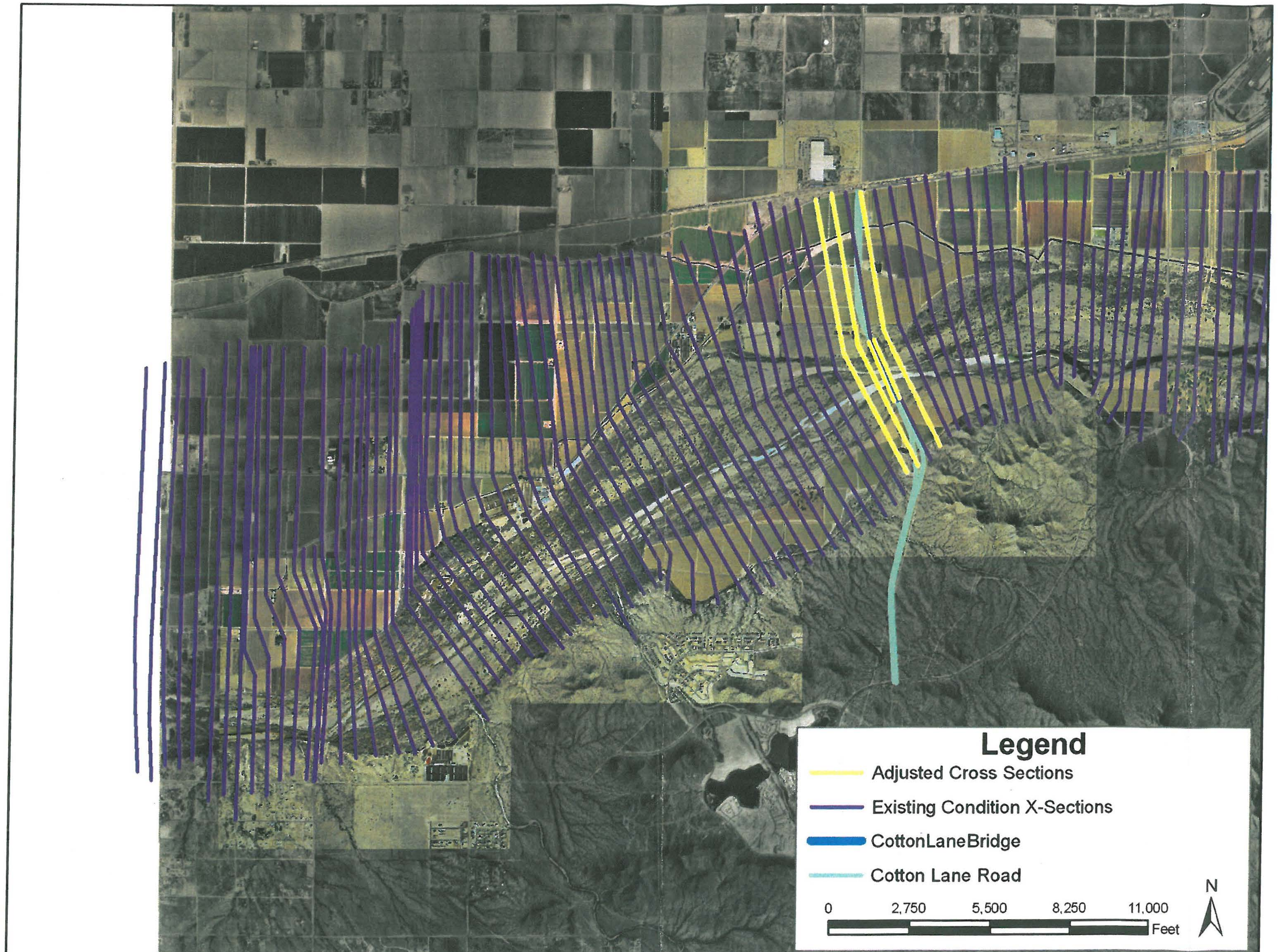

Figure 4. Existing Conditions Cross Sections are shown in Purple and Cross Sections Modified to Represent the Channel Improvements and Bridge are shown in Light Yellow.

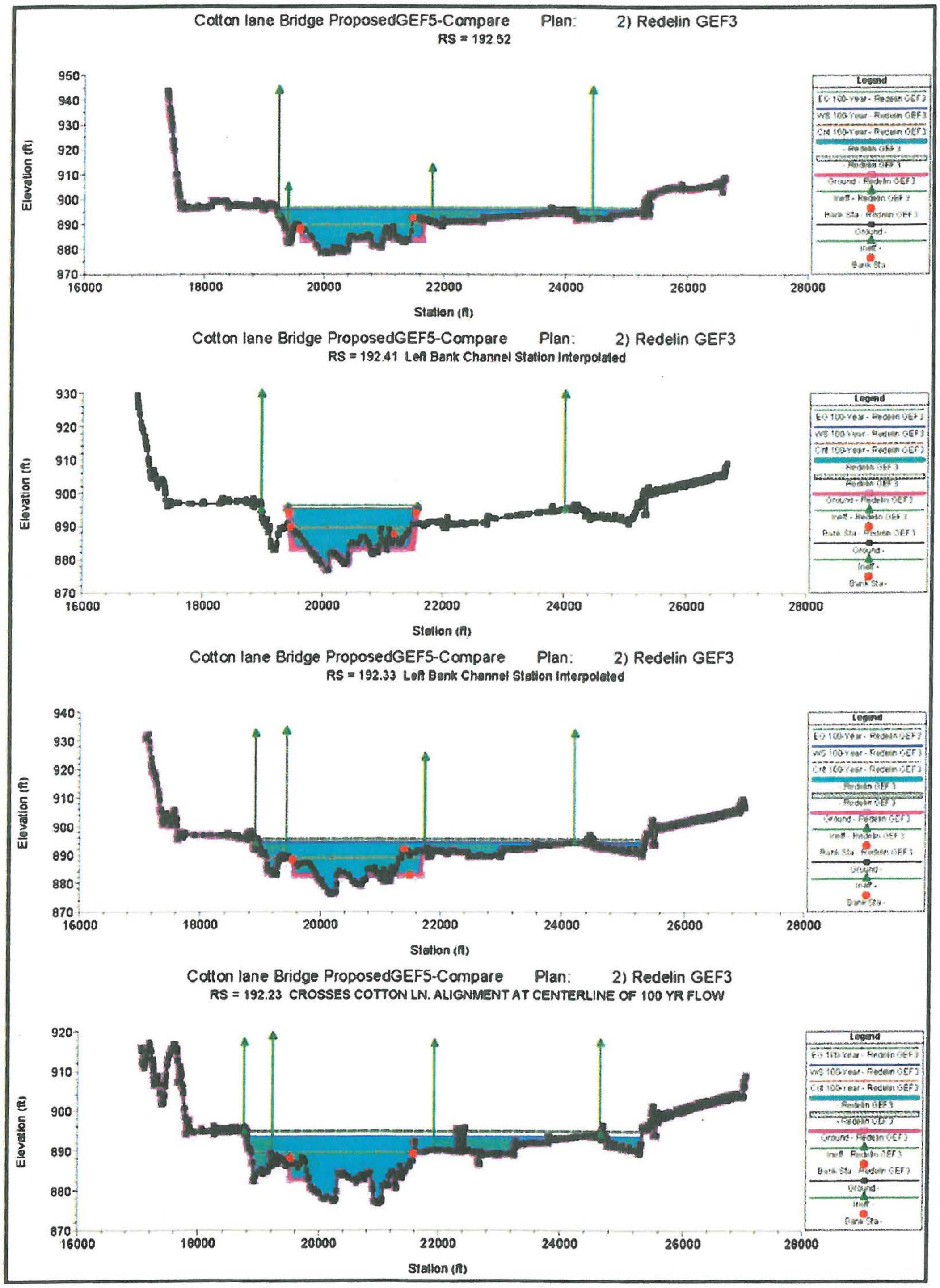

Figure 5. Modified Cross Sections showing Channel Modifications for Bridge Construction. Modified Channel Sections are Shown in Solid Magenta.

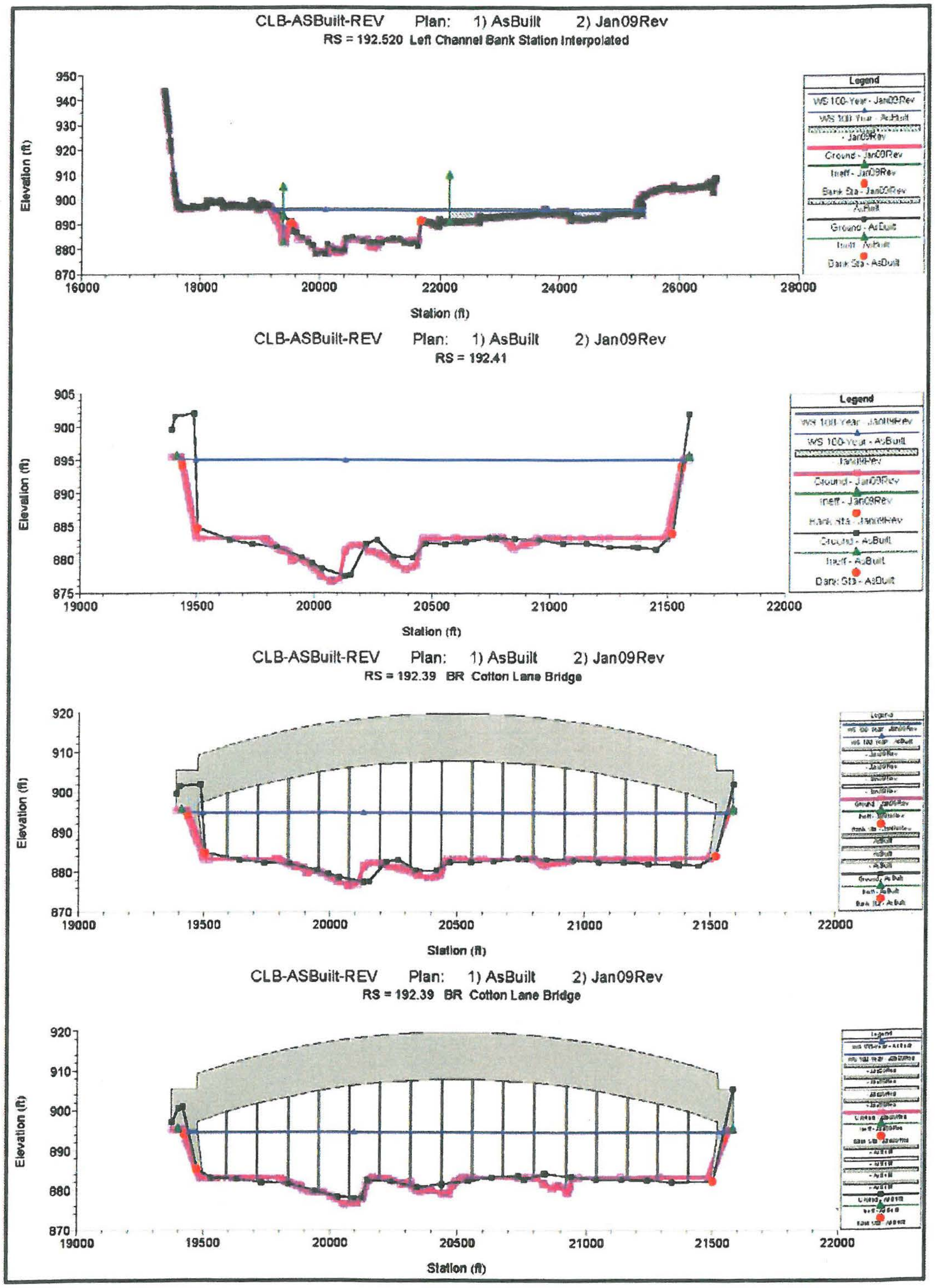

Figure 6. As Built Cross Sections Compared with CLOMR Cross Sections.

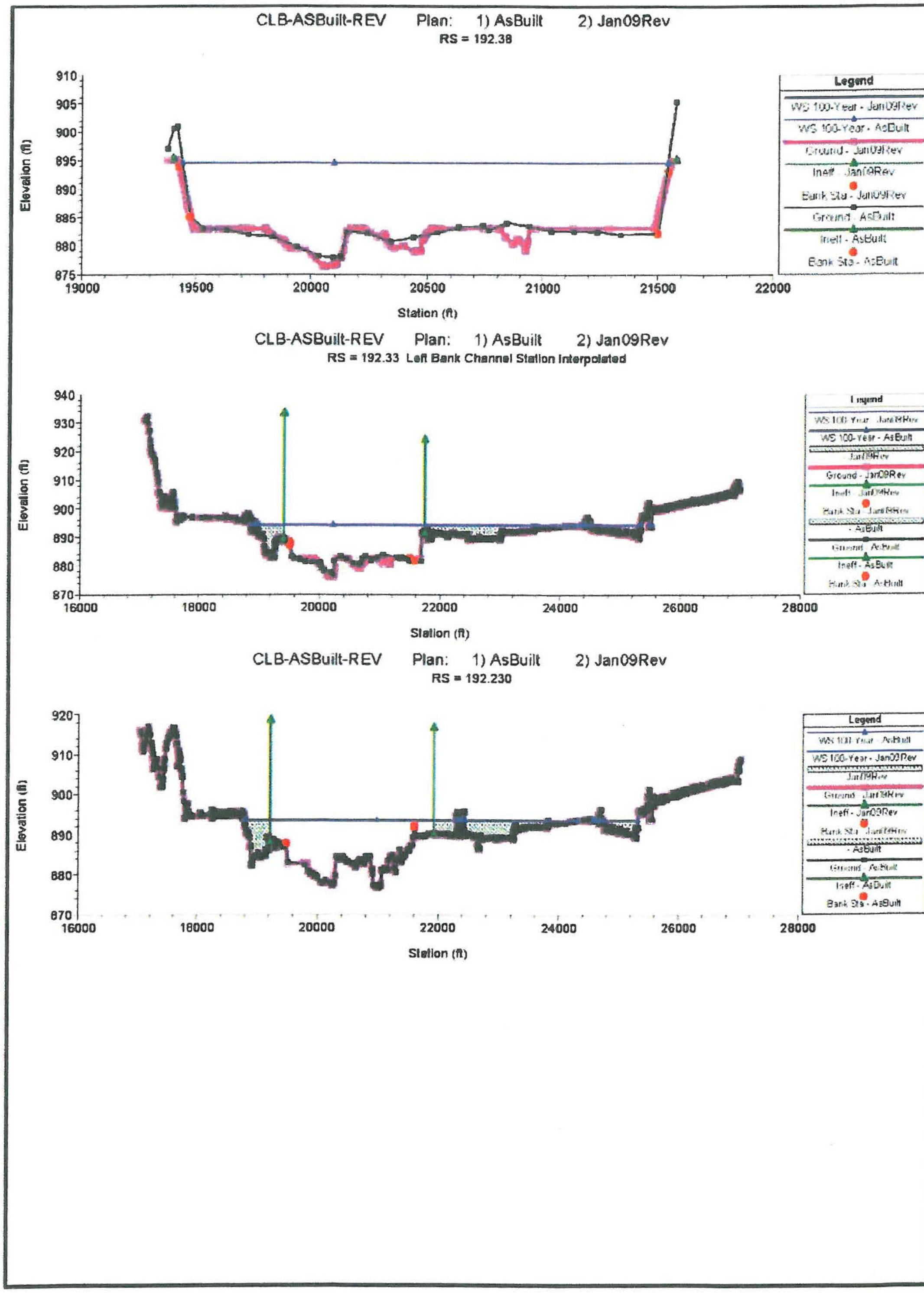

Figure 6 (Continued). As-Built Cross Sections Compared with CLOMR Cross Sections.

5.2 Work Study Maps

The work study maps are included in the 24" x 36" materials at the end of the document. The work maps consist of 5 maps plus the cover and index sheets. The work maps are laid out identically to the Norte Vista LOMR (current effective) work maps for ease in comparison and/or replacement upon approval of the future LOMR for this project. They are produced at a scale of 1" = 400' and include both the existing (Norte Vista LOMR) and proposed floodplain and floodway lines for the project reach.

5.3 Parameter Estimation

5.3.1 Roughness Coefficients

The Manning's n values used for the modeling are the same as used in the current effective model. They were estimated based on standard practice as described in Appendix E. The n values used represent vegetative development after approximately 14 years of undisturbed growth after the 1993 flood and are thought to be a good estimate of long term vegetative roughness. The values used in the Norte Vista LOMR and current modeling are shown in Figure 7. The figure shows areas of 0.028 but these areas were modeled as 0.030 to insure the n values were not being under estimated in these areas. The n values were estimated in conjunction with work by Stantec for the El Rio Watercourse Master Plan.

5.3.2 Future Conditions n Value Analysis

The n values used for existing conditions vegetation were developed for the existing river conditions with approximately 14 years having passed since the 1993 flood event with no maintenance of vegetation. These values were also adjusted upwards and downwards by 10%, 20% and 30% to view the sensitivity of the model to increases in Manning's n values. This modeling indicated that a 10% increase in n values resulted in approximately a 0.6 ft rise in WSE while a 10% decrease in WSE resulted in a 0.65 ft decrease in WSE. The results are shown in Table 2. The table shows the results for the area included in the Cotton Lane Bridge model. The n values used are identical with those used for the existing conditions model in the Norte Vista LOMR and are shown in Figure 7.

Table 2. Change in Water Surface Elevation (in feet) by Percent Change in Manning's n.

	Percent Change in n Value					
	-30%	-20%	-10%	+10%	+20%	+30%
Average Change	-1.99	-1.30	-0.64	0.61	1.20	1.76
Difference (ft)	-0.69	-0.66			0.59	0.56
River Mile						
194.205	Estrella Parkway					
194.2	-2.2	-1.41	-0.69	0.66	1.3	1.9
194.1	-2.18	-1.4	-0.68	0.65	1.28	1.87
194.02	-2.17	-1.39	-0.68	0.65	1.28	1.87
193.94	-2.05	-1.34	-0.66	0.63	1.25	1.83
193.87	-1.98	-1.3	-0.64	0.62	1.23	1.8
193.79	-1.94	-1.27	-0.63	0.62	1.23	1.79
193.73	-2.03	-1.34	-0.66	0.64	1.26	1.83
193.62	-2.23	-1.44	-0.7	0.67	1.32	1.91
193.53	-2.22	-1.44	-0.7	0.67	1.32	1.9
193.43	-2.21	-1.44	-0.7	0.68	1.33	1.91
193.34	-2.2	-1.43	-0.7	0.68	1.32	1.91
193.25	-2.27	-1.48	-0.72	0.68	1.34	1.93
193.16	-2.29	-1.48	-0.72	0.69	1.35	1.94
193.07	-2.24	-1.46	-0.71	0.68	1.34	1.93
192.98	-2.18	-1.42	-0.7	0.67	1.31	1.89
192.89	-2.21	-1.44	-0.71	0.67	1.31	1.9
192.79	-2.23	-1.45	-0.71	0.67	1.32	1.92
192.7	-2.21	-1.44	-0.71	0.67	1.31	1.91
192.61	-2.13	-1.39	-0.68	0.65	1.28	1.87
192.52	-2.03	-1.34	-0.66	0.63	1.25	1.84
192.41	-2	-1.32	-0.65	0.63	1.24	1.81
192.39	Cotton Lane Bridge					
192.38	-2.13	-1.39	-0.68	0.64	1.26	1.83
192.33	-2.09	-1.37	-0.67	0.64	1.25	1.83
192.23	-2.06	-1.35	-0.66	0.64	1.24	1.82
192.14	-2.2	-1.41	-0.68	0.65	1.26	1.84
192.04	-2.08	-1.34	-0.65	0.62	1.21	1.77
191.95	-2	-1.3	-0.64	0.6	1.17	1.72
191.86	-1.92	-1.25	-0.62	0.58	1.15	1.69
191.76	-1.93	-1.26	-0.61	0.59	1.15	1.69
191.67	-1.95	-1.27	-0.62	0.59	1.16	1.7
191.57	-1.96	-1.27	-0.62	0.6	1.17	1.71
191.48	-1.98	-1.28	-0.63	0.6	1.17	1.72
191.38	-2.01	-1.3	-0.63	0.61	1.19	1.74
			End of Project			

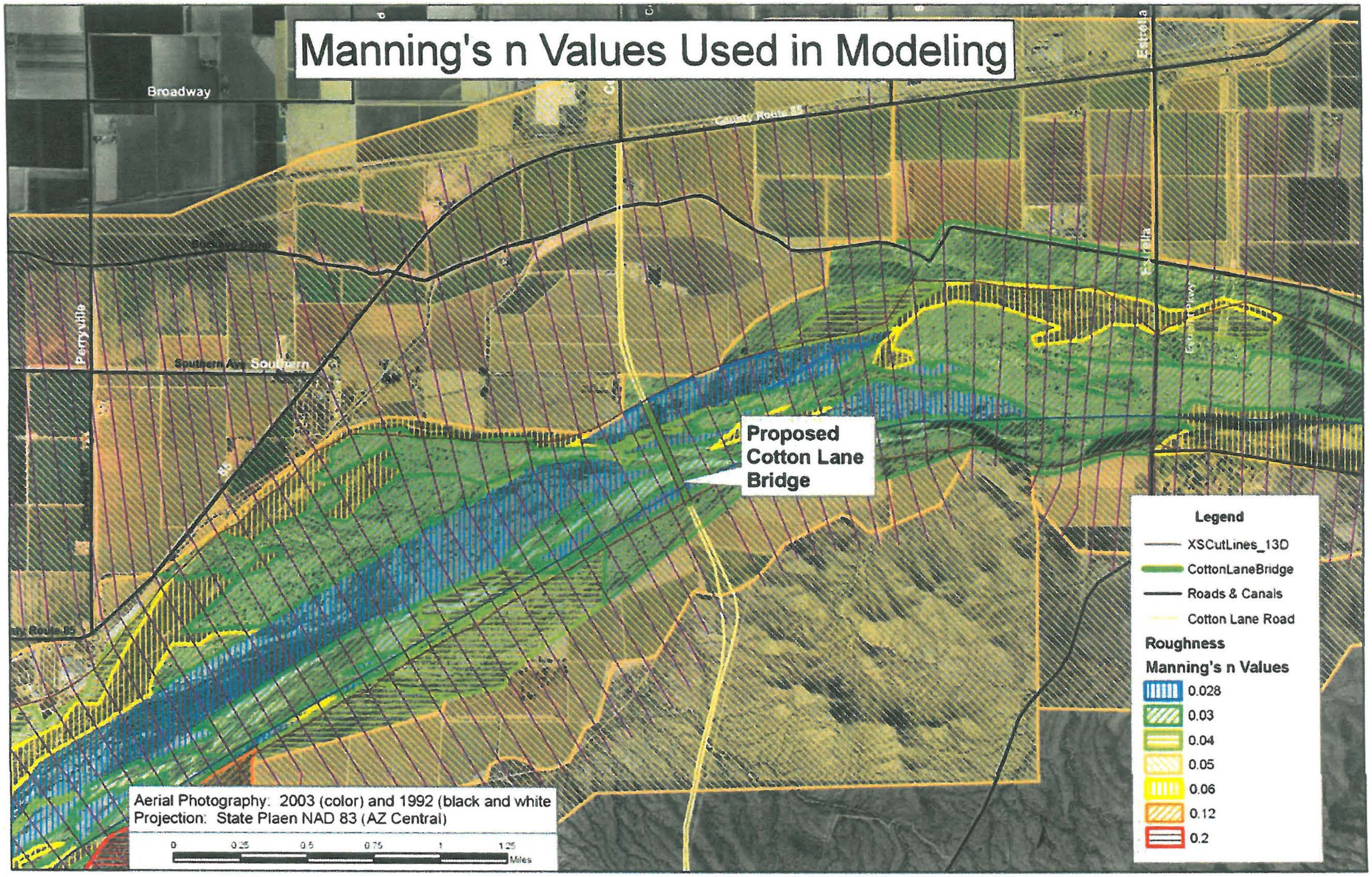

Figure 7. Overview of Selected Manning's n Values for the Cotton Lane Bridge Study Reach. The 0.028 values were converted to 0.030 for both effective and current modeling.

5.4 Expansion and Contraction Coefficients

The contraction and expansion coefficients of 0.1 and 0.3 respectively were used near the bridges to accommodate the hydraulic losses that occur due to the presence of the bridges. These values are identical to those used in the current effective model.

5.5 Cross Section Descriptions

The HEC-RAS model data were taken directly from the Norte Vista / Gila River LOMR (effective model) with the only changes being the addition of the Cotton Lane Bridge at RM 192.39 and modifications to represent channel excavation at cross sections 192.23 through 192.52. The designed excavation is shown in Figure 5. The final cross sections at 192.33 and 192.42 represent only the bridge opening since the approach roadways will completely block the floodplain. The effective model was also shortened to include the area between only cross-section 194.40 and the downstream cross-section of 187.06. The as-built cross sections are compared with the proposed (CLOMR) cross sections in Figure 6.

No other changes were made to the Norte Vista / Gila River LOMR models other than ineffective areas as described below.

5.6 Modeling considerations

5.6.1 Hydraulic Jump and Drop Analysis

No hydraulic jumps or drops are expected within this river reach.

5.6.2 Bridges and Culverts

Two existing bridges exist in the effective FIS model in this reach. One is at Tuthill Road and on at Estrella Parkway. Both of these bridges are shown in Figure 1. This study adds the Cotton Lane Bridge between the two existing bridges. The location of the Cotton Lane Bridge is shown in Figure 1 and Figure 2.

5.6.3 Levees and Dikes

There are no levees in the project area although a road embankment was modeled both as a levee and without the road embankment near Tuthill Road in the effective model. This was not modified for this model.

5.6.4 Islands and Split Flows

There are no islands or split flow areas in the project reach. The models warn of split flows but the areas are located outside of the effective flow areas. These areas are usually canals or other low areas cut off from the active floodplain by natural ground elevations.

5.6.5 Ineffective Flow Areas

The ineffective flow areas were used from the effective model (Norte Vista / King Ranch LOMR). The only modifications were to make the flow transition smoothly into and out of the proposed bridge. All cross-sections were inspected for ineffective flow areas. A maximum of 4:1 expansion was maintained in developing these areas, where necessary. The ineffective flow areas are shown in Figure 8. The contractions were modeled at 2:1. The coefficients for expansion and contraction were 0.1 and 0.3 respectively.

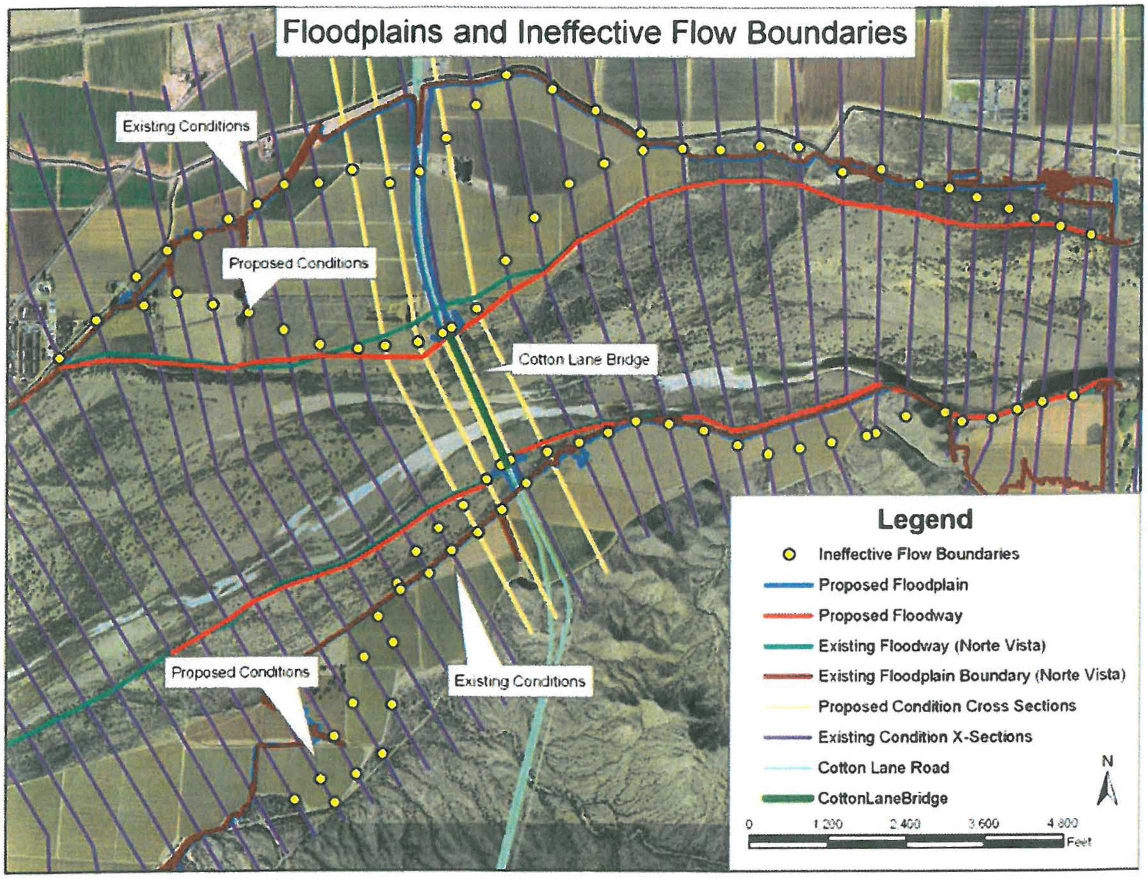

Figure 8. Ineffective Flow Areas for Effective and As-built (labeled Proposed) Models near Cotton Lane Bridge.

5.6.6 Supercritical Flow

No areas of supercritical flow were identified in the project.

5.7 Floodway Modeling

The floodway was modeled by using Method 4 encroachments and then adjusted using Method 1 encroachments to arrive at acceptable solutions. The encroached water surface elevations were less than 1.0 ft above the non-encroached water surface elevations. The encroachments were not allowed to move into the main channel past the bank stations and thus much of the reach has encroached water surface elevations that are significantly less than the allowable 1.0 ft.

5.8 Problems Encountered During the Study

No special problems were encountered in this study. All problems were resolved in the previous Gila River/Norte Vista LOMR.

5.9 Modeling Warning and Error Messages

Several warnings and messages were noted. Most of the warnings dealt with divided flow situations. These involved areas of the far overbanks where berms, canals or other features have cut the floodplain off from the channel. These all occurred in areas of ineffective flow.

No errors were noted in the models.

5.10 Calibration

The effective model was run using the Norte Vista LOMR model as accepted by FEMA. The updated topography was inserted into the approved model and changes noted. All other parameters were left as they were in the original FIS model. No other calibration was performed on the model and all data with the exception of the ineffective flow areas and the cross sections immediately adjacent to the Cotton Lane Bridge were as modeled in the Norte Vista LOMR.

5.11 Final Results

5.11.1 Hydraulic Analysis Results

It can be noted that there is a small difference between the Norte Vista LOMR and new floodplain elevations in this reach once the bridge is constructed. The differences are all within the FEMA regulations. Floodplain elevations are slightly higher than those in the Norte Vista LOMR but slightly lower than those proposed in the Cotton Lane Bridge CLOMR. The maximum increase in this LOMR is 0.47 downstream of the bridge (cross section 192.23) compared with a maximum increase in the CLOMR of 0.57 feet higher just upstream of the bridge at cross section 192.52. Both rises are within FEMA guidelines (See Table 3). The maximum increases are highlighted in yellow in Table 3.

Floodway elevations through the reach are reduced over those in the Norte Vista LOMR (effective model) due to the excavation near the bridge and are also slightly lower than those proposed in the Cotton Lane Bridge CLOMR. These data can be seen in Table 4. It is expected that the proposed re-alignment of banks and the channel for future development in this reach may need to encroach into the existing floodway but channel excavations are planned to avoid any rise in the floodway or floodplain. The current economic climate has delayed the plans for additional modifications along the river but it is expected that the developments will go forward in the next several years when the economy recovers.

5.11.2 Verification of Results

The RAS results correspond closely to the existing conditions model from the current effective model (Norte Vista LOMR). The same models were used in the current model and were adjusted only where changes were made for the construction of the bridge. The only difference between the CLOMR model and the LOMR model is the as-built topography associated with the bridge.

Table 3. HEC-RAS Floodplain Output Comparison for Existing (Effective), CLOMR, and LOMR (Final) Models.

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Effective	194.205		Estrella Parkway Bridge												
Tie In to Effective Model															
Effective	194.2	100-Year	ElRioWMP	227000	882.97	905.54			901.99	907.12	0.001784	10.1	22474.76	2480.08	0.55
CLOMR	194.2	100-Year	Jan09Rev	227000	882.97	905.46	-0.08		901.99	907.07	0.001827	10.17	22315.06	2470.86	0.55
Final	194.2	100-Year	AsBuilt	227000	882.97	905.46	-0.08	0	901.99	907.07	0.001829	10.18	22307.3	2470.39	0.55
Effective	194.1	100-Year	ElRioWMP	227000	883.87	904.89			901.14	906.2	0.001547	9.2	24795.84	4390.04	0.51
CLOMR	194.1	100-Year	Jan09Rev	227000	883.87	904.87	-0.02		901.14	906.12	0.00151	9.08	25821.7	4386.42	0.5
Final	194.1	100-Year	AsBuilt	227000	883.87	904.86	-0.03	-0.01	901.14	906.12	0.001512	9.08	25808.71	4385.52	0.5
Effective	194.02	100-Year	ElRioWMP	227000	885.49	904.35			900.33	905.46	0.00138	8.45	26871.29	4253.48	0.47
CLOMR	194.02	100-Year	Jan09Rev	227000	885.49	904.41	0.06		900.39	905.41	0.001276	8.15	29411.56	4287.31	0.45
Final	194.02	100-Year	AsBuilt	227000	885.49	904.40	0.05	-0.01	900.39	905.4	0.001279	8.15	29392.77	4283.79	0.45
Effective	193.94	100-Year	ElRioWMP	227000	885.38	904.03			899.39	904.93	0.001122	7.65	29969.87	4683.14	0.42
CLOMR	193.94	100-Year	Jan09Rev	227000	885.38	904.09	0.06		899.41	904.92	0.001052	7.43	32207.06	4751.27	0.4
Final	193.94	100-Year	AsBuilt	227000	885.38	904.08	0.05	-0.01	899.41	904.92	0.001054	7.43	32184.27	4743.77	0.4
Effective	193.87	100-Year	ElRioWMP	227000	882.8	903.69			898.76	904.49	0.001007	7.26	32261.63	4427.12	0.39
CLOMR	193.87	100-Year	Jan09Rev	227000	882.8	903.77	0.08		898.78	904.51	0.000936	7.03	34538.74	4432.08	0.38
Final	193.87	100-Year	AsBuilt	227000	882.8	903.76	0.07	-0.01	898.78	904.51	0.000938	7.04	34511.55	4431.61	0.38
Effective	193.79	100-Year	ElRioWMP	227000	882.55	903.27			898.23	904.02	0.001117	7.03	33924.73	4083.97	0.38
CLOMR	193.7	100-Year	Jan09Rev	227000	882.55	903.36	0.09		898.25	904.07	0.001065	6.9	35077.41	4086.4	0.37

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
	9														
Final	193.79	100-Year	AsBuilt	227000	882.55	903.35	0.08	-0.01	898.25	904.06	0.001069	6.9	35045.66	4086.14	0.37
Effective	193.73	100-Year	ElRioWMP	227000	882.18	902.83			898.08	903.65	0.000975	7.39	32508.52	3422.12	0.4
CLOMR	193.73	100-Year	Jan09Rev	227000	882.18	902.9	0.07		898.07	903.72	0.000951	7.33	32858.19	3422.47	0.4
Final	193.73	100-Year	AsBuilt	227000	882.18	902.89	0.06	-0.01	898.07	903.71	0.000954	7.34	32821.64	3422.42	0.4
Effective	193.62	100-Year	ElRioWMP	227000	878.21	902.05			897.98	903.03	0.001218	8.05	29853.9	3219.12	0.45
CLOMR	193.62	100-Year	Jan09Rev	227000	878.21	902.15	0.1		897.98	903.11	0.001177	7.97	30201.79	3220.05	0.44
Final	193.62	100-Year	AsBuilt	227000	878.21	902.13	0.08	-0.02	897.98	903.1	0.001183	7.98	30156.26	3219.91	0.44
Effective	193.53	100-Year	ElRioWMP	227000	878.96	901.51			897.32	902.43	0.001137	7.82	30700.48	3344.24	0.43
CLOMR	193.53	100-Year	Jan09Rev	227000	878.96	901.64	0.13		897.32	902.54	0.001091	7.72	31111.37	3351.05	0.42
Final	193.53	100-Year	AsBuilt	227000	878.96	901.62	0.11	-0.02	897.32	902.52	0.001097	7.74	31053.29	3349.95	0.43
Effective	193.43	100-Year	ElRioWMP	227000	879.37	901.1			896.46	901.88	0.000967	7.19	32986.82	3715.24	0.4
CLOMR	193.43	100-Year	Jan09Rev	227000	879.37	901.25	0.15		896.46	902.01	0.00092	7.08	33629	3738.13	0.39
Final	193.43	100-Year	AsBuilt	227000	879.37	901.23	0.13	-0.02	896.46	901.99	0.000927	7.09	33554.14	3734.86	0.39
Effective	193.34	100-Year	ElRioWMP	227000	881.18	900.75			895.9	901.42	0.000841	6.64	34855.86	3883.47	0.37
CLOMR	193.34	100-Year	Jan09Rev	227000	881.18	900.92	0.17		895.9	901.57	0.000796	6.52	35506.3	3889.94	0.36
Final	193.34	100-Year	AsBuilt	227000	881.18	900.89	0.14	-0.03	895.9	901.55	0.000802	6.54	35415.56	3889.36	0.36
Effective	193.2	100-Year	ElRioWMP	227000	880.67	900.33			895.48	900.97	0.001037	6.42	35885.75	4130.89	0.37

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
	5														
CLOMR	193.25	100-Year	Jan09Rev	227000	880.67	900.53	0.2		895.48	901.14	0.000969	6.28	36697.93	4132.74	0.36
Final	193.25	100-Year	AsBuilt	227000	880.67	900.50	0.17	-0.03	895.48	901.11	0.000978	6.3	36585.38	4132.49	0.36
Effective	193.16	100-Year	ElRioWMP	227000	880.66	899.82			895.44	900.5	0.000916	6.67	34872.23	4280.54	0.4
CLOMR	193.16	100-Year	Jan09Rev	227000	880.66	900.07	0.25		895.44	900.7	0.00084	6.47	35910.74	4282.5	0.38
Final	193.16	100-Year	AsBuilt	227000	880.66	900.03	0.21	-0.04	895.44	900.68	0.00085	6.5	35768.56	4282.23	0.38
Effective	193.07	100-Year	ElRioWMP	227000	881.99	899.45			894.72	900.07	0.00081	6.41	36858.77	4504.27	0.37
CLOMR	193.07	100-Year	Jan09Rev	227000	881.99	899.73	0.28		894.72	900.31	0.000735	6.21	38166.63	4522.19	0.36
Final	193.07	100-Year	AsBuilt	227000	881.99	899.69	0.24	-0.04	894.72	900.28	0.000745	6.24	37995.68	4521.42	0.36
Effective	192.98	100-Year	ElRioWMP	227000	880.71	899.02			894.32	899.66	0.000871	6.51	36825.77	4501.06	0.37
CLOMR	192.98	100-Year	Jan09Rev	227000	880.71	899.34	0.32		894.32	899.94	0.000785	6.29	38126.16	4530.44	0.35
Final	192.98	100-Year	AsBuilt	227000	880.71	899.29	0.27	-0.05	894.32	899.9	0.000797	6.32	37928.05	4527.29	0.35
Effective	192.89	100-Year	ElRioWMP	227000	880.09	898.37			894.01	899.12	0.001352	7.08	35399.2	5078.24	0.4
CLOMR	192.89	100-Year	Jan09Rev	227000	880.09	898.75	0.38		894.01	899.45	0.001203	6.85	35800.67	5317.66	0.38
Final	192.89	100-Year	AsBuilt	227000	880.09	898.69	0.32	-0.06	894.01	899.41	0.001228	6.89	35557.39	5182.66	0.38
Effective	192.79	100-Year	ElRioWMP	227000	876.81	897.48			893.64	898.35	0.001735	7.78	33969.19	5344.71	0.44
CLOMR	192.79	100-Year	Jan09Rev	227000	876.81	897.80	0.32		893.6	898.73	0.001705	7.88	30831.92	5368.36	0.44
Final	192.7	100-Year	AsBuilt	227000	876.81	897.70	0.22	-0.10	893.6	898.67	0.001757	7.95	30523.02	5364.09	0.44

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
	9														
Effective	192.7	100-Year	ElRioWMP	227000	876.64	896.65			892.33	897.59	0.001352	8.16	34646.51	5675.97	0.43
CLOMR	192.7	100-Year	Jan09Rev	227000	876.64	896.97	0.32		892.33	897.99	0.001344	8.27	30327.02	5690.01	0.43
Final	192.7	100-Year	AsBuilt	227000	876.64	896.84	0.19	-0.13	892.33	897.9	0.001394	8.38	29926.71	5687.63	0.44
Effective	192.61	100-Year	ElRioWMP	227000	878.15	896.06			891.72	896.98	0.001158	8.23	35047.27	5866.16	0.43
CLOMR	192.61	100-Year	Jan09Rev	227000	878.15	896.4	0.34		891.72	897.38	0.001143	8.32	30571.83	5884.3	0.42
Final	192.61	100-Year	AsBuilt	227000	878.15	896.23	0.17	-0.17	891.72	897.27	0.001194	8.44	30111.03	5877.57	0.43
Effective	192.52	100-Year	ElRioWMP	227000	878.23	895.44			890.81	896.39	0.001146	8.27	33793.74	6069.23	0.42
CLOMR	192.52	100-Year	Jan09Rev	227000	878.23	896.01	0.57		889.74	896.83	0.000858	7.42	32044.78	6136.83	0.36
Final	192.52	100-Year	AsBuilt	227000	877.9	895.75	0.31	-0.26	889.78	896.69	0.000982	7.79	30804.49	6066.15	0.38
Effective	192.42	100-Year	ElRioWMP	227000	876.63	894.76			891.45	895.76	0.001348	8.74	31934.25	5803.33	0.46
CLOMR	192.41	100-Year	Jan09Rev	227000	876.67	895.15	0.39		889.51	896.27	0.001138	8.48	26777.9	2136.58	0.42
Final	192.41	100-Year	AsBuilt	227000	877.5	894.93	0.17	-0.22	889.25	896.1	0.001127	8.56	26616.27	2070.25	0.42
	192.39			Bridge											
Effective			ElRioWMP	New Cross Section not in LOMR											
CLOMR	192.38	100-Year	Proposed	227000	876.41	894.55			889.3	895.74	0.001231	8.74	25977.45	2132.96	0.44
Final	192.38	100-Year	AsBuilt	227000	877.9	894.53		-0.02	889.32	895.75	0.001231	8.9	25625.86	2076.11	0.44
Effective	192.33	100-Year	ElRioWMP	227000	876.06	893.82			890.83	895	0.001631	9.27	30110.13	5961.69	0.5
CLOMR	192.3	100-Year	Jan09Rev	227000	876.06	894.3	0.48		888.79	895.34	0.001064	8.27	27904.74	6366.29	0.41

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
	3														
Final	192.33	100-Year	AsBuilt	227000	876.7	894.29	0.47	-0.01	888.88	895.34	0.001073	8.28	27759.86	6364.58	0.41
Effective	192.23	100-Year	ElRioWMP	227000	876.72	893.24			889.65	894.16	0.001424	8.15	33557.55	5881.84	0.44
CLOMR	192.23	100-Year	Jan09Rev	227000	876.72	893.53	0.29		889.27	894.7	0.0015	8.85	26930.89	6072.78	0.46
Final	192.23	100-Year	AsBuilt	227000	876.72	893.53	0.29	0	889.25	894.7	0.00149	8.83	26974.55	6074.78	0.46
Effective	192.14	100-Year	ElRioWMP	227000	875.94	892.61			889.42	893.46	0.001375	7.87	35177.02	6569.96	0.44
CLOMR	192.14	100-Year	Jan09Rev	227000	875.94	892.67	0.06		889.5	893.89	0.00181	9.06	26333.79	6574.67	0.51
Final	192.14	100-Year	AsBuilt	227000	875.94	892.67	0.06	0	889.5	893.89	0.00181	9.06	26333.79	6574.67	0.51
Effective	192.04	100-Year	ElRioWMP	227000	876.36	892.06			888.54	892.78	0.001198	7.24	38126.83	6332.16	0.41
CLOMR	192.04	100-Year	Jan09Rev	227000	876.36	892.03	-0.03		888.58	893	0.001497	8.08	29653.14	6329.48	0.46
Final	192.04	100-Year	AsBuilt	227000	876.36	892.03	-0.03	0	888.58	893	0.001497	8.08	29653.14	6329.48	0.46
Effective	191.95	100-Year	ElRioWMP	227000	874.98	891.56			887.6	892.21	0.001036	6.86	39831.59	6278.96	0.39
CLOMR	191.95	100-Year	Jan09Rev	227000	874.98	891.55	-0.01		887.59	892.29	0.001127	7.15	35099.33	6278.72	0.41
Final	191.95	100-Year	AsBuilt	227000	874.98	891.55	-0.01	0	887.59	892.29	0.001127	7.15	35099.33	6278.72	0.41
Effective	191.86	100-Year	ElRioWMP	227000	874.43	891.08			886.73	891.68	0.001006	6.5	40519.24	6174.46	0.38
CLOMR	191.86	100-Year	Jan09Rev	227000	874.43	891.08	0		886.74	891.71	0.001054	6.65	37908.44	6172.4	0.38
Final	191.86	100-Year	AsBuilt	227000	874.43	891.08	0	0	886.74	891.71	0.001054	6.65	37908.44	6172.4	0.38
Effective	191.7	100-Year	ElRioWMP	227000	874.62	890.61			886.58	891.15	0.001047	6.28	42648.16	6548.31	0.37

Model Description	River Sta	Profile Floodplain Analysis	Model Name	Q Total (cfs)	Min Ch EL (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effective	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
	6														
CLOMR	191.76	100-Year	Jan09Rev	227000	874.62	890.6	-0.01		886.58	891.16	0.001065	6.33	40692.56	6548.04	0.37
Final	191.76	100-Year	AsBuilt	227000	874.62	890.6	-0.01	0	886.58	891.16	0.001065	6.33	40692.56	6548.04	0.37
Effective	191.67	100-Year	ElRioWMP	227000	872.6	890.04			886.43	890.6	0.001163	6.33	41308.19	6270.43	0.39
CLOMR	191.67	100-Year	Jan09Rev	227000	872.6	890.04	0		886.43	890.6	0.001168	6.34	40689.42	6270.43	0.39
Final	191.67	100-Year	AsBuilt	227000	872.6	890.04	0	0	886.43	890.6	0.001168	6.34	40689.42	6270.43	0.39
Effective	191.57	100-Year	ElRioWMP	227000	870.63	889.56			885.66	890.03	0.000997	5.82	44096.36	6247.54	0.36
CLOMR	191.57	100-Year	Jan09Rev	227000	870.63	889.55	-0.01		885.65	890.03	0.001015	5.87	43295.45	6245.83	0.36
Final	191.57	100-Year	AsBuilt	227000	870.63	889.55	-0.01	0	885.65	890.03	0.001015	5.87	43295.45	6245.83	0.36
Effective	191.48	100-Year	ElRioWMP	227000	870.93	889.11			884.98	889.56	0.00086	5.62	45168.46	7088.51	0.34
CLOMR	191.48	100-Year	Jan09Rev	227000	870.93	889.1	-0.01		884.98	889.55	0.000863	5.62	45106.36	7075.78	0.34
Final	191.48	100-Year	AsBuilt	227000	870.93	889.1	-0.01	0	884.98	889.55	0.000863	5.62	45106.36	7075.78	0.34
Effective	191.38	100-Year	ElRioWMP	227000	871.69	888.64			884.78	889.1	0.00096	5.77	44289.06	6622.5	0.35
CLOMR	191.38	100-Year	Jan09Rev	227000	871.69	888.62	-0.02		884.78	889.09	0.000964	5.78	44213.48	6621.8	0.35
Final	191.38	100-Year	AsBuilt	227000	871.69	888.62	-0.02	0	884.78	889.09	0.000964	5.78	44213.48	6621.8	0.35
Tie In to Existing Model															

Table 4. . HEC-RAS Floodway Output Comparison for Existing (Effective), CLOMR, and LOMR (Final) Models.

Reach	River Sta	Profile Floodway Analysis	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effect	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Effective	194.205		Estrella Parkway Bridge												
		Tie In to Effective Model													
Effective	194.2	100-Year Enc	ElRioWMP	227000	882.97	905.72			901.99	907.25	0.001684	9.93	22868.12	2118.38	0.53
CLOMR	194.2	100-Year Enc	Jan09Rev	227000	882.97	905.70	-0.02		901.99	907.24	0.001695	9.95	22824.67	2118.26	0.53
Final	194.2	100-Year Enc	AsBuilt	227000	882.97	905.70	-0.02	0	901.99	907.24	0.001698	9.95	22811.61	2118.22	0.53
Effective	194.1	100-Year Enc	ElRioWMP	227000	883.87	905.13			901.14	906.38	0.001434	9	25340.86	2446.93	0.49
CLOMR	194.1	100-Year Enc	Jan09Rev	227000	883.87	905.10	-0.03		901.12	906.36	0.001446	9.02	25274.85	2446.86	0.49
Final	194.1	100-Year Enc	AsBuilt	227000	883.87	905.09	-0.04	-0.01	901.12	906.36	0.00145	9.03	25254.97	2446.83	0.49
Effective	194.02	100-Year Enc	ElRioWMP	227000	885.49	904.66			900.33	905.7	0.001251	8.2	27683.45	2680.97	0.45
CLOMR	194.02	100-Year Enc	Jan09Rev	227000	885.49	904.63	-0.03		900.33	905.68	0.001263	8.22	27638.07	2680.88	0.45
Final	194.02	100-Year Enc	AsBuilt	227000	885.49	904.62	-0.04	-0.01	900.33	905.67	0.001267	8.23	27611.41	2680.85	0.45
Effective	193.94	100-Year Enc	ElRioWMP	227000	885.38	904.36			899.39	905.22	0.00102	7.44	30542.43	2827.09	0.4
CLOMR	193.94	100-Year Enc	Jan09Rev	227000	885.38	904.33	-0.03		899.39	905.19	0.001032	7.46	30439.25	2826.98	0.4
Final	193.94	100-Year Enc	AsBuilt	227000	885.38	904.31	-0.05	-0.02	899.39	905.18	0.001035	7.47	30407.67	2826.95	0.4
Effective	193.87	100-Year Enc	ElRioWMP	227000	882.8	904.04			898.74	904.83	0.000934	7.13	31849.45	2897.87	0.38
CLOMR	193.87	100-Year Enc	Jan09Rev	227000	882.8	904.00	-0.04		898.74	904.79	0.000945	7.16	31731.65	2897.75	0.38
Final	193.87	100-Year Enc	AsBuilt	227000	882.8	903.98	-0.06	-0.02	898.74	904.78	0.000949	7.17	31695.23	2897.72	0.38
Effective	193.79	100-Year Enc	ElRioWMP	227000	882.55	903.62			898.23	904.39	0.001068	7.02	32351.29	2924.53	0.37
CLOMR	193.79	100-Year Enc	Jan09Rev	227000	882.55	903.58	-0.04		898.23	904.35	0.001083	7.05	32214.74	2924.46	0.37
Final	193.79	100-Year Enc	AsBuilt	227000	882.55	903.56	-0.06	-0.02	898.23	904.34	0.001088	7.06	32172.27	2924.43	0.37
Effective	193.73	100-Year Enc	ElRioWMP	227000	882.18	903.22			898.06	904.05	0.000908	7.3	31082.76	2864.85	0.39
CLOMR	193.73	100-Year Enc	Jan09Rev	227000	882.18	903.16	-0.06		898.05	904	0.000923	7.34	30928.52	2864.79	0.39
Final	193.73	100-Year Enc	AsBuilt	227000	882.18	903.15	-0.07	-0.01	898.05	903.99	0.000928	7.35	30880.46	2864.77	0.39

Reach	River Sta	Profile Floodway Analysis	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effect	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Effective	193.62	100-Year Enc	ElRioWMP	227000	878.21	902.48			897.94	903.46	0.001125	7.96	28524.89	2709.38	0.43
CLOMR	193.62	100-Year Enc	Jan09Rev	227000	878.21	902.41	-0.07		897.94	903.4	0.001151	8.01	28334.06	2709.29	0.44
Final	193.62	100-Year Enc	AsBuilt	227000	878.21	902.39	-0.09	-0.02	897.94	903.39	0.001159	8.03	28274.2	2709.26	0.44
Effective	193.53	100-Year Enc	ElRioWMP	227000	878.96	901.93			897.39	902.91	0.001113	7.95	28628.13	2709	0.43
CLOMR	193.53	100-Year Enc	Jan09Rev	227000	878.96	901.85	-0.08		897.39	902.84	0.001143	8.01	28394.68	2709	0.44
Final	193.53	100-Year Enc	AsBuilt	227000	878.96	901.82	-0.11	-0.03	897.39	902.82	0.001153	8.04	28321.1	2709	0.44
Effective	193.43	100-Year Enc	ElRioWMP	227000	879.37	901.6			896.49	902.38	0.000887	7.1	32091.16	2989	0.38
CLOMR	193.43	100-Year Enc	Jan09Rev	227000	879.37	901.54	-0.06		896.45	902.29	0.000872	7.02	32558	3072.73	0.38
Final	193.43	100-Year Enc	AsBuilt	227000	879.37	901.50	-0.1	-0.04	896.45	902.27	0.00088	7.04	32462.36	3072.66	0.38
Effective	193.34	100-Year Enc	ElRioWMP	227000	881.18	901.32			895.86	901.95	0.000726	6.38	35776.83	3400	0.34
CLOMR	193.34	100-Year Enc	Jan09Rev	227000	881.18	901.24	-0.08		895.86	901.87	0.000745	6.43	35485.68	3400	0.35
Final	193.34	100-Year Enc	AsBuilt	227000	881.18	901.20	-0.12	-0.04	895.86	901.84	0.000753	6.45	35366.98	3400	0.35
Effective	193.25	100-Year Enc	ElRioWMP	227000	880.67	900.95			895.46	901.56	0.000914	6.24	36289.66	3630	0.35
CLOMR	193.25	100-Year Enc	Jan09Rev	227000	880.67	900.85	-0.1		895.46	901.47	0.000942	6.3	35934.06	3630	0.35
Final	193.25	100-Year Enc	AsBuilt	227000	880.67	900.81	-0.14	-0.04	895.46	901.44	0.000954	6.33	35788.5	3630	0.35
Effective	193.16	100-Year Enc	ElRioWMP	227000	880.66	900.53			895.4	901.16	0.00077	6.36	35774.9	3782.19	0.36
CLOMR	193.16	100-Year Enc	Jan09Rev	227000	880.66	900.42	-0.11		895.4	901.06	0.000799	6.43	35336.98	3782.19	0.37
Final	193.16	100-Year Enc	AsBuilt	227000	880.66	900.36	-0.17	-0.06	895.4	901.02	0.000812	6.47	35156.69	3782.19	0.37
Effective	193.07	100-Year Enc	ElRioWMP	227000	881.99	900.23			894.68	900.8	0.00066	6.05	37665.05	3780	0.34
CLOMR	193.07	100-Year Enc	Jan09Rev	227000	881.99	900.11	-0.12		894.68	900.69	0.000687	6.13	37178.71	3780	0.34
Final	193.07	100-Year Enc	AsBuilt	227000	881.99	900.05	-0.18	-0.06	894.68	900.64	0.000699	6.16	36977.52	3780	0.35
Effective	192.98	100-Year Enc	ElRioWMP	227000	880.71	899.83			894.36	900.45	0.000751	6.31	35906.1	3425.34	0.34
CLOMR	192.98	100-Year Enc	Jan09Rev	227000	880.71	899.69	-0.14		894.36	900.33	0.000785	6.4	35404.37	3425	0.35
Final	192.98	100-Year Enc	AsBuilt	227000	880.71	899.62	-0.21	-0.07	894.36	900.27	0.000799	6.44	35195.95	3425	0.35
Effective	192.89	100-Year Enc	ElRioWMP	227000	880.09	899.28			894.01	899.99	0.001111	6.81	33349.13	3123	0.37

Reach	River Sta	Profile Floodway Analysis	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effect	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
CLOMR	192.89	100-Year Enc	Jan09Rev	227000	880.09	899.1	-0.18		894.01	899.84	0.001176	6.92	32796.11	3121.52	0.38
Final	192.89	100-Year Enc	AsBuilt	227000	880.09	899.02	-0.26	-0.08	894.01	899.78	0.001204	6.97	32565.19	3121.52	0.38
Effective	192.79	100-Year Enc	ElRioWMP	227000	876.81	898.46			893.6	899.36	0.001472	7.63	30056.66	2896.12	0.41
CLOMR	192.79	100-Year Enc	Jan09Rev	227000	876.81	898.21	-0.25		893.6	899.16	0.001592	7.81	29325	2875.36	0.42
Final	192.79	100-Year Enc	AsBuilt	227000	876.81	898.10	-0.36	-0.11	893.6	899.08	0.001645	7.89	29032.13	2874.74	0.43
Effective	192.7	100-Year Enc	ElRioWMP	227000	876.64	897.65			892.33	898.69	0.001238	8.22	28225.82	2451	0.42
CLOMR	192.7	100-Year Enc	Jan09Rev	227000	876.64	897.42	-0.23		892.33	898.45	0.001282	8.24	28826.69	2680.25	0.42
Final	192.7	100-Year Enc	AsBuilt	227000	876.64	897.28	-0.37	-0.14	892.33	898.35	0.001331	8.34	28466.14	2680.25	0.43
Effective	192.61	100-Year Enc	ElRioWMP	227000	878.15	897.06			891.86	898.12	0.001113	8.47	28346.62	2494.1	0.42
CLOMR	192.61	100-Year Enc	Jan09Rev	227000	878.15	896.74	-0.32		891.71	897.85	0.001187	8.62	27372.92	2396.48	0.43
Final	192.61	100-Year Enc	AsBuilt	227000	878.15	896.56	-0.50	-0.18	891.71	897.72	0.001242	8.74	26970.82	2396.48	0.44
Effective	192.52	100-Year Enc	ElRioWMP	227000	878.23	896.45			890.93	897.55	0.001117	8.59	27649.01	2400	0.42
CLOMR	192.52	100-Year Enc	Jan09Rev	227000	878.23	896.33	-0.12		889.86	897.28	0.000928	7.84	29090.45	2185.18	0.38
Final	192.52	100-Year Enc	AsBuilt	227000	877.9	896.13	-0.32	-0.20	889.78	897.11	0.000972	7.89	28876.53	2185.18	0.38
Effective	192.42	100-Year Enc	ElRioWMP	227000	876.63	895.76			891.59	896.94	0.001297	9.06	26902.68	2550	0.45
CLOMR	192.41	100-Year Enc	Jan09Rev	227000	876.67	895.73	-0.03		889.51	896.75	0.00098	8.1	28023.04	2145	0.39
Final/LOMR	192.41	100-Year Enc	AsBuilt	227000	877.5	895.52	-0.24	-0.21	889.25	896.58	0.000976	8.19	27805.73	2073.08	0.39
	192.39		Cotton Lane Bridge												
Effective	192.38		ElRioWMP	No Cross Section											
CLOMR	192.38	100-Year Enc	Jan09Rev	227000	876.41	895.19			889.3	896.26	0.001039	8.31	27348.78	2160.18	0.41
Final	192.38	100-Year Enc	AsBuilt	227000	877.9	895.18		-0.01	889.32	896.27	0.001041	8.46	26970.57	2079.27	0.41
Effective	192.33	100-Year Enc	ElRioWMP	227000	876.06	894.82			890.79	896.2	0.00158	9.65	25246.59	2630	0.5
CLOMR	192.33	100-Year Enc	Jan09Rev	227000	876.06	894.80	-0.02		889.01	895.93	0.00109	8.58	26548.34	2027	0.42
Final	192.33	100-Year Enc	AsBuilt	227000	876.7	894.77	-0.05	-0.03	889.14	895.94	0.001127	8.66	26209.75	2027	0.42

Reach	River Sta	Profile Floodway Analysis	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effect	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
Effective	192.23	100-Year Enc	ElRioWMP	227000	876.72	894.16			889.75	895.38	0.00156	9	26748.02	2645	0.46
CLOMR	192.23	100-Year Enc	Jan09Rev	227000	876.72	894.12	-0.04		889.14	895.32	0.001395	8.81	26337.08	2315	0.45
Final	192.23	100-Year Enc	AsBuilt	227000	876.72	894.12	-0.04	0	889.11	895.31	0.001386	8.8	26381.18	2315	0.45
Effective	192.14	100-Year Enc	ElRioWMP	227000	875.94	893.35			889.57	894.58	0.001661	9.02	26363	2750	0.49
CLOMR	192.14	100-Year Enc	Jan09Rev	227000	875.94	893.30	-0.05		889.52	894.56	0.00169	9.07	25861.8	2650	0.49
Final	192.14	100-Year Enc	AsBuilt	227000	875.94	893.30	-0.05	0	889.52	894.56	0.00169	9.07	25861.8	2650	0.49
Effective	192.04	100-Year Enc	ElRioWMP	227000	876.36	892.68			888.71	893.76	0.001484	8.37	27963	2920	0.46
CLOMR	192.04	100-Year Enc	Jan09Rev	227000	876.36	892.67	-0.01		888.73	893.72	0.001461	8.3	28461.53	3025	0.46
Final	192.04	100-Year Enc	AsBuilt	227000	876.36	892.67	-0.01	0	888.73	893.72	0.001461	8.3	28461.53	3025	0.46
Effective	191.95	100-Year Enc	ElRioWMP	227000	874.98	892.15			887.75	893.04	0.001179	7.6	30192.89	3043.38	0.42
CLOMR	191.95	100-Year Enc	Jan09Rev	227000	874.98	892.15	0		887.79	893.01	0.001153	7.51	31035.05	3205	0.42
Final	191.95	100-Year Enc	AsBuilt	227000	874.98	892.15	0	0	887.79	893.01	0.001153	7.51	31035.05	3205	0.42
Effective	191.86	100-Year Enc	ElRioWMP	227000	874.43	891.68			886.97	892.44	0.001071	6.98	32514.66	3290.22	0.39
CLOMR	191.86	100-Year Enc	Jan09Rev	227000	874.43	891.68	0		886.97	892.43	0.001055	6.93	33184.71	3445	0.39
Final	191.86	100-Year Enc	AsBuilt	227000	874.43	891.68	0	0	886.97	892.43	0.001055	6.93	33184.71	3445	0.39
Effective	191.76	100-Year Enc	ElRioWMP	227000	874.62	891.10			886.78	891.87	0.001223	7.03	32580.22	3461.35	0.4
CLOMR	191.76	100-Year Enc	Jan09Rev	227000	874.62	891.10	0		886.78	891.86	0.001216	7.01	32817.71	3515	0.4
Final	191.76	100-Year Enc	AsBuilt	227000	874.62	891.10	0	0	886.78	891.86	0.001216	7.01	32817.71	3515	0.4
Effective	191.67	100-Year Enc	ElRioWMP	227000	872.6	890.42			886.63	891.21	0.001397	7.14	31988.11	3702.85	0.43
CLOMR	191.67	100-Year Enc	Jan09Rev	227000	872.6	890.41	-0.01		886.63	891.2	0.001404	7.15	31936.58	3702.85	0.43
Final	191.67	100-Year Enc	AsBuilt	227000	872.6	890.41	-0.01	0	886.63	891.2	0.001404	7.15	31936.58	3702.85	0.43
Effective	191.57	100-Year Enc	ElRioWMP	227000	870.63	889.84			885.92	890.52	0.00124	6.63	34379.52	4010	0.4
CLOMR	191.57	100-Year Enc	Jan09Rev	227000	870.63	889.83	-0.01		885.92	890.51	0.001249	6.64	34306.84	4010	0.4
Final	191.57	100-Year Enc	AsBuilt	227000	870.63	889.83	-0.01	0	885.92	890.51	0.001249	6.64	34306.84	4010	0.4
Effective	191.48	100-Year Enc	ElRioWMP	227000	870.93	889.4			885	889.95	0.000934	5.98	38729.39	4450	0.36

Reach	River Sta	Profile Floodway Analysis	Plan	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Delta WSE (ft) from Effect	Delta WSE (ft) LOMR-CLOMR	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Channel
CLOMR	191.48	100-Year Enc	Jan09Rev	227000	870.93	889.38	-0.02		885	889.93	0.000942	5.99	38631.07	4450	0.36
Final	191.48	100-Year Enc	AsBuilt	227000	870.93	889.38	-0.02	0	885	889.93	0.000942	5.99	38631.07	4450	0.36
Effective	191.38	100-Year Enc	ElRioWMP	227000	871.69	888.91			884.71	889.46	0.001015	6.04	38864.38	4589.79	0.36
CLOMR	191.38	100-Year Enc	Jan09Rev	227000	871.69	888.88	-0.03		884.71	889.43	0.001025	6.06	38739.71	4589.79	0.37
Final	191.38	100-Year Enc	AsBuilt	227000	871.69	888.88	-0.03	0	884.71	889.43	0.001025	6.06	38739.71	4589.79	0.37
		Tie In to Existing Model													

Table 5. Comparisons of Floodway Encroachments for Proposed and Existing Conditions.

Norte Vista Exising Condition Model (Effective Model)					Proposed (CLOMR) Cotton Lane Bridge Model					LOMR Model (As-Built Conditions)				
Plan	Cross Section	Profile	WSE (ft)	Delta WSE (ft)	Plan	X-Sect	Plan	WSE (ft)	Delta WSE (ft)	Plan	River Sta	Profile	WSE (ft)	Delta WSE (ft)
Models Tie Together														
ElRioWMP	194.2	100-Year	905.54		Proposed	194.2	100-Year	905.56		As Built	194.2	100-Year	905.46	
ElRioWMP	194.2	100-Year Enc	905.72	0.19	Proposed	194.2	100-Year Enc	905.70	0.14	As Built	194.2	100-Year Enc	905.70	0.24
ElRioWMP	194.1	100-Year	904.89		Proposed	194.1	100-Year	904.92		As Built	194.1	100-Year	904.86	
ElRioWMP	194.1	100-Year Enc	905.13	0.24	Proposed	194.1	100-Year Enc	905.1	0.18	As Built	194.1	100-Year Enc	905.09	0.23
ElRioWMP	194.02	100-Year	904.35		Proposed	194.02	100-Year	904.4		As Built	194.02	100-Year	904.40	
ElRioWMP	194.02	100-Year Enc	904.66	0.30	Proposed	194.02	100-Year Enc	904.63	0.23	As Built	194.02	100-Year Enc	904.62	0.22
ElRioWMP	193.94	100-Year	904.03		Proposed	193.94	100-Year	904.08		As Built	193.94	100-Year	904.08	
ElRioWMP	193.94	100-Year Enc	904.36	0.33	Proposed	193.94	100-Year Enc	904.33	0.25	As Built	193.94	100-Year Enc	904.31	0.25
ElRioWMP	193.87	100-Year	903.69		Proposed	193.87	100-Year	903.75		As Built	193.87	100-Year	903.76	
ElRioWMP	193.87	100-Year Enc	904.04	0.35	Proposed	193.87	100-Year Enc	904	0.25	As Built	193.87	100-Year Enc	903.98	0.22
ElRioWMP	193.79	100-Year	903.27		Proposed	193.79	100-Year	903.34		As Built	193.79	100-Year	903.35	
ElRioWMP	193.79	100-Year Enc	903.62	0.35	Proposed	193.79	100-Year Enc	903.58	0.24	As Built	193.79	100-Year Enc	903.56	0.21
ElRioWMP	193.73	100-Year	902.83		Proposed	193.73	100-Year	902.91		As Built	193.73	100-Year	902.89	
ElRioWMP	193.73	100-Year Enc	903.22	0.39	Proposed	193.73	100-Year Enc	903.16	0.26	As Built	193.73	100-Year Enc	903.15	0.26

Norte Vista Exising Condition Model (Effective Model)						Proposed (CLOMR) Cotton Lane Bridge Model						LOMR Model (As-Built Conditions)				
Plan	Cross Section	Profile	WSE (ft)	Delta WSE (ft)		Plan	X-Sect	Plan	WSE (ft)	Delta WSE (ft)		Plan	River Sta	Profile	WSE (ft)	Delta WSE (ft)
ElRioWMP	193.62	100-Year	902.05			Proposed	193.62	100-Year	902.16			As Built	193.62	100-Year	902.13	
ElRioWMP	193.62	100-Year Enc	902.48	0.43		Proposed	193.62	100-Year Enc	902.41	0.25		As Built	193.62	100-Year Enc	902.38	0.25
ElRioWMP	193.53	100-Year	901.51			Proposed	193.53	100-Year	901.65			As Built	193.53	100-Year	901.62	
ElRioWMP	193.53	100-Year Enc	901.93	0.42		Proposed	193.53	100-Year Enc	901.85	0.20		As Built	193.53	100-Year Enc	901.82	0.20
ElRioWMP	193.43	100-Year	901.1			Proposed	193.43	100-Year	901.26			As Built	193.43	100-Year	901.23	
ElRioWMP	193.43	100-Year Enc	901.6	0.49		Proposed	193.43	100-Year Enc	901.54	0.27		As Built	193.43	100-Year Enc	901.50	0.28
ElRioWMP	193.34	100-Year	900.75			Proposed	193.34	100-Year	900.93			As Built	193.34	100-Year	900.90	
ElRioWMP	193.34	100-Year Enc	901.32	0.57		Proposed	193.34	100-Year Enc	901.24	0.30		As Built	193.34	100-Year Enc	901.20	0.30
ElRioWMP	193.25	100-Year	900.33			Proposed	193.25	100-Year	900.55			As Built	193.25	100-Year	900.51	
ElRioWMP	193.25	100-Year Enc	900.95	0.62		Proposed	193.25	100-Year Enc	900.85	0.30		As Built	193.25	100-Year Enc	900.81	0.31
ElRioWMP	193.16	100-Year	899.82			Proposed	193.16	100-Year	900.09			As Built	193.16	100-Year	900.03	
ElRioWMP	193.16	100-Year Enc	900.53	0.71		Proposed	193.16	100-Year Enc	900.42	0.33		As Built	193.16	100-Year Enc	900.36	0.33
ElRioWMP	193.07	100-Year	899.45			Proposed	193.07	100-Year	899.75			As Built	193.07	100-Year	899.69	
ElRioWMP	193.07	100-Year Enc	900.23	0.79		Proposed	193.07	100-Year Enc	900.11	0.35		As Built	193.07	100-Year Enc	900.05	0.36
ElRioWMP	192.98	100-Year	899.02			Proposed	192.98	100-Year	899.37			As Built	192.98	100-Year	899.29	
ElRioWMP	192.98	100-Year Enc	899.83	0.81		Proposed	192.98	100-Year Enc	899.69	0.32		As Built	192.98	100-Year Enc	899.62	0.33
ElRioWMP	192.89	100-Year	898.37			Proposed	192.89	100-Year	898.75			As Built	192.89	100-Year	898.69	
ElRioWMP	192.89	100-Year Enc	899.27	0.90		Proposed	192.89	100-Year Enc	899.1	0.35		As Built	192.89	100-Year Enc	899.02	0.33

Norte Vista Exising Condition Model (Effective Model)					Proposed (CLOMR) Cotton Lane Bridge Model					LOMR Model (As-Built Conditions)				
Plan	Cross Section	Profile	WSE (ft)	Delta WSE (ft)	Plan	X-Sect	Plan	WSE (ft)	Delta WSE (ft)	Plan	River Sta	Profile	WSE (ft)	Delta WSE (ft)
ElRioWMP	192.79	100-Year	897.48		Proposed	192.79	100-Year	897.82		As Built	192.79	100-Year	897.70	
ElRioWMP	192.79	100-Year Enc	898.46	0.98	Proposed	192.79	100-Year Enc	898.21	0.39	As Built	192.79	100-Year Enc	898.10	0.40
ElRioWMP	192.7	100-Year	896.65		Proposed	192.7	100-Year	897		As Built	192.7	100-Year	896.84	
ElRioWMP	192.7	100-Year Enc	897.65	1.00	Proposed	192.7	100-Year Enc	897.42	0.43	As Built	192.7	100-Year Enc	897.28	0.44
ElRioWMP	192.61	100-Year	896.06		Proposed	192.61	100-Year	896.39		As Built	192.61	100-Year	896.23	
ElRioWMP	192.61	100-Year Enc	897.06	1.00	Proposed	192.61	100-Year Enc	896.74	0.35	As Built	192.61	100-Year Enc	896.56	0.33
ElRioWMP	192.52	100-Year	895.44		Proposed	192.52	100-Year	895.95		As Built	192.52	100-Year	895.75	
ElRioWMP	192.52	100-Year Enc	896.45	1.00	Proposed	192.52	100-Year Enc	896.33	0.38	As Built	192.52	100-Year Enc	896.13	0.38
ElRioWMP	192.42	100-Year	894.76		Proposed	192.41	100-Year	895.15		As Built	192.41	100-Year	894.93	
ElRioWMP	192.42	100-Year Enc	895.76	1.00	Proposed	192.41	100-Year Enc	895.73	0.58	As Built	192.41	100-Year Enc	895.52	0.59
					Proposed	192.39 BR U	100-Year	894.88		As Built	192.39 BR U	100-Year	894.72	
					Proposed	192.39 BR U	100-Year Enc	895.5	0.61	As Built	192.39 BR U	100-Year Enc	895.33	0.61
					Proposed	192.39 BR D	100-Year	894.39		As Built	192.39 BR D	100-Year	894.44	
					Proposed	192.39 BR D	100-Year Enc	895.05	0.66	As Built	192.39 BR D	100-Year Enc	895.10	0.66
					Proposed	192.38	100-Year	894.55		As Built	192.38	100-Year	894.53	
					Proposed	192.38	100-Year Enc	895.19	0.64	As Built	192.38	100-Year Enc	895.18	0.65

Norte Vista Exising Condition Model (Effective Model)						Proposed (CLOMR) Cotton Lane Bridge Model						LOMR Model (As-Built Conditions)				
Plan	Cross Section	Profile	WSE (ft)	Delta WSE (ft)		Plan	X-Sect	Plan	WSE (ft)	Delta WSE (ft)		Plan	River Sta	Profile	WSE (ft)	Delta WSE (ft)
ElRioWMP	192.33	100-Year	893.82			Proposed	192.33	100-Year	894.3			As Built	192.33	100-Year	894.29	
ElRioWMP	192.33	100-Year Enc	894.82	1.00		Proposed	192.33	100-Year Enc	894.8	0.49		As Built	192.33	100-Year Enc	894.77	0.48
ElRioWMP	192.23	100-Year	893.24			Proposed	192.23	100-Year	893.53			As Built	192.23	100-Year	893.53	
ElRioWMP	192.23	100-Year Enc	894.16	0.92		Proposed	192.23	100-Year Enc	894.12	0.59		As Built	192.23	100-Year Enc	894.12	0.59
ElRioWMP	192.14	100-Year	892.61			Proposed	192.14	100-Year	892.67			As Built	192.14	100-Year	892.67	
ElRioWMP	192.14	100-Year Enc	893.35	0.74		Proposed	192.14	100-Year Enc	893.3	0.63		As Built	192.14	100-Year Enc	893.30	0.63
ElRioWMP	192.04	100-Year	892.06			Proposed	192.04	100-Year	892.03			As Built	192.04	100-Year	892.03	
ElRioWMP	192.04	100-Year Enc	892.68	0.62		Proposed	192.04	100-Year Enc	892.67	0.64		As Built	192.04	100-Year Enc	892.67	0.64
ElRioWMP	191.95	100-Year	891.56			Proposed	191.95	100-Year	891.55			As Built	191.95	100-Year	891.55	
ElRioWMP	191.95	100-Year Enc	892.15	0.59		Proposed	191.95	100-Year Enc	892.15	0.60		As Built	191.95	100-Year Enc	892.15	0.6
ElRioWMP	191.86	100-Year	891.08			Proposed	191.86	100-Year	891.08			As Built	191.86	100-Year	891.08	
ElRioWMP	191.86	100-Year Enc	891.68	0.60		Proposed	191.86	100-Year Enc	891.68	0.61		As Built	191.86	100-Year Enc	891.68	0.61
ElRioWMP	191.76	100-Year	890.61			Proposed	191.76	100-Year	890.6			As Built	191.76	100-Year	890.60	
ElRioWMP	191.76	100-Year Enc	891.1	0.50		Proposed	191.76	100-Year Enc	891.1	0.50		As Built	191.76	100-Year Enc	891.10	0.5
ElRioWMP	191.67	100-Year	890.04			Proposed	191.67	100-Year	890.04			As Built	191.67	100-Year	890.04	
ElRioWMP	191.67	100-Year Enc	890.42	0.39		Proposed	191.67	100-Year Enc	890.41	0.37		As Built	191.67	100-Year Enc	890.41	0.37
ElRioWMP	191.57	100-Year	889.56			Proposed	191.57	100-Year	889.55			As Built	191.57	100-Year	889.55	

Norte Vista Exising Condition Model (Effective Model)						Proposed (CLOMR) Cotton Lane Bridge Model						LOMR Model (As-Built Conditions)				
Plan	Cross Section	Profile	WSE (ft)	Delta WSE (ft)		Plan	X-Sect	Plan	WSE (ft)	Delta WSE (ft)		Plan	River Sta	Profile	WSE (ft)	Delta WSE (ft)
ElRioWMP	191.57	100-Year Enc	889.84	0.28		Proposed	191.57	100-Year Enc	889.83	0.27		As Built	191.57	100-Year Enc	889.83	0.27
ElRioWMP	191.48	100-Year	889.11			Proposed	191.48	100-Year	889.1			As Built	191.48	100-Year	889.10	
ElRioWMP	191.48	100-Year Enc	889.4	0.29		Proposed	191.48	100-Year Enc	889.38	0.28		As Built	191.48	100-Year Enc	889.38	0.28
ElRioWMP	191.38	100-Year	888.64			Proposed	191.38	100-Year	888.62			As Built	191.38	100-Year	888.62	
ElRioWMP	191.38	100-Year Enc	888.91	0.28		Proposed	191.38	100-Year Enc	888.88	0.26		As Built	191.38	100-Year Enc	888.88	0.26
Models Tie Together																

6. Erosion and Sediment Transport

Sediment transport was modeled using HEC-6T. The models used a hydrographic record developed by the U.S. Army Corps of Engineers for the upstream Tres Rio Study Reach of the Gila and Salt Rivers. The hydrographic record included significant events over 105 years from 1889 through 1993.

6.1 Method Description

HEC-6T was used to model sediment transport in the reach. The model was developed based on HEC-RAS data with the exception of the bank stations. The stations were narrowed in HEC-6T to properly model an area of sediment transport that was approximately 1500 ft wide in the main channel of the river. The HEC-6T model was calibrated to give the same water surface elevation as the HEC-RAS model with the narrowed bank stations. Thus both models were predicting the same flow conditions.

The HEC-6T model was run using a 105 year flow hydrograph that was developed by the U.S. Army Corps of Engineers for the Tres Rios Project which is immediately upstream from this project. The hydrograph was adjusted for existing dams and changes in the watershed and included two large events – one at the beginning of the record and another at the end. The first of these events approached the current 100 year hydrograph.

6.2 Parameter Estimation

6.2.1 Estimation of Bed Sediment Sizes and Sediment Load

Soil and bed material samples were taken 1) by Western Technologies for Cavalier Development (a predecessor to Sonterra Partners) for this study, 2) from prior studies for bridges at the current Cotton Lane Bridge alignment, 3) by WEST as a part of this study and 4) by Stantec as a part of the regional El Rio Watercourse Master Plan. The sediment sample data were obtained from these various sources and are presented in Figure 9. The bold lines in Figure 9 show the samples that have been taken to be most representative of the Gila River in the Cotton Lane Bridge Reach. Further discussion on incorporation of these data in HEC6-T sediment transport model is presented in Section 6.2.3.

6.2.2 Sediment Data

The decisive factor in selecting the proper sediment transport function was based on available bed gradation and maximum grain size. Bed material in the project location is comprised of significant quantities of both sand and gravel, making it necessary to use an appropriate transport function. A combination of the Toffaleti and Meyer-Peter and Muller (TMPM) (US Army 1989) transport functions was used in the study. This combination accounts for sand and gravel, giving a higher, realistic measure of total sediment concentration (and thus total sediment load). Based on field observations, to facilitate modeling and to represent larger diameter cobbles noted in the bed, a maximum grain size of 200mm was used in the final sediment transport runs in HEC-6T. Additional transport equations were also used as a sensitivity analysis and results were not significantly different in terms of final bed configuration for the reach even though transport rates varied through the models. Sediment gradations and model options were unchanged from those used in the effective model.

6.2.3 Bed Sediment Characteristics

The available sediment gradation data are presented in Figure 9 and includes data from Western Technologies, Stantec, AMEC, and WEST. Most of the sediment data that show a predominance of sand (see Figure 9) are taken from the overbank regions but the channel data agrees well with most of the data provided by Stantec as well as that obtained by WEST and other sources. The available samples indicate that this reach of the river is predominately a gravel bed system while the Gila River below Tuthill Road behaves as a sand bed river system (Stantec - El Rio Study – personal communication, Tony Thomas, Mobile Boundary Hydraulics, Personal Comm).

Upon careful investigation and comparing the sediment gradation curves with the sediment data from the Tres Rios PED study (located upstream of this study reach), it was concluded that the samples obtained by WEST and Stantec showing significant gravel adequately represent the conditions in the channel. Therefore, the data from Stantec locations 4, 9, 10, and 11 were used in conjunction with samples, WP161, WP163, WP169 and WP170 obtained by WEST in the development HEC6-T sediment transport model. The samples used in the HEC-6T model are shown in Figure 10 and the locations of the WEST and Stantec samples (those actually used in the mode) are shown in Figure 11. The AMEC samples were obtained near the proposed Cotton Lane Bridge Crossing.

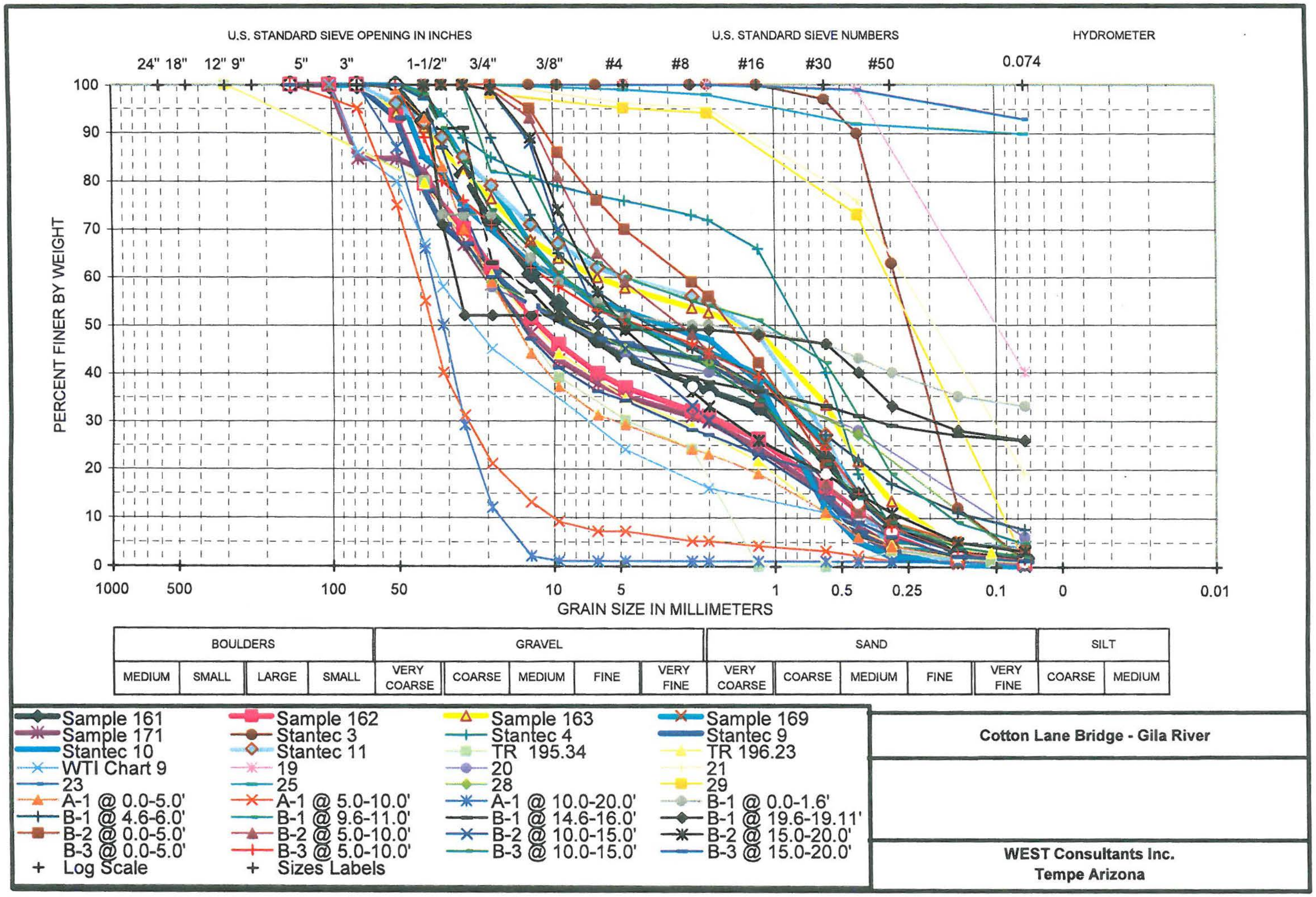

Figure 9. Available Bed Sediment Gradation Data for Gila River Adjacent to King Ranch.

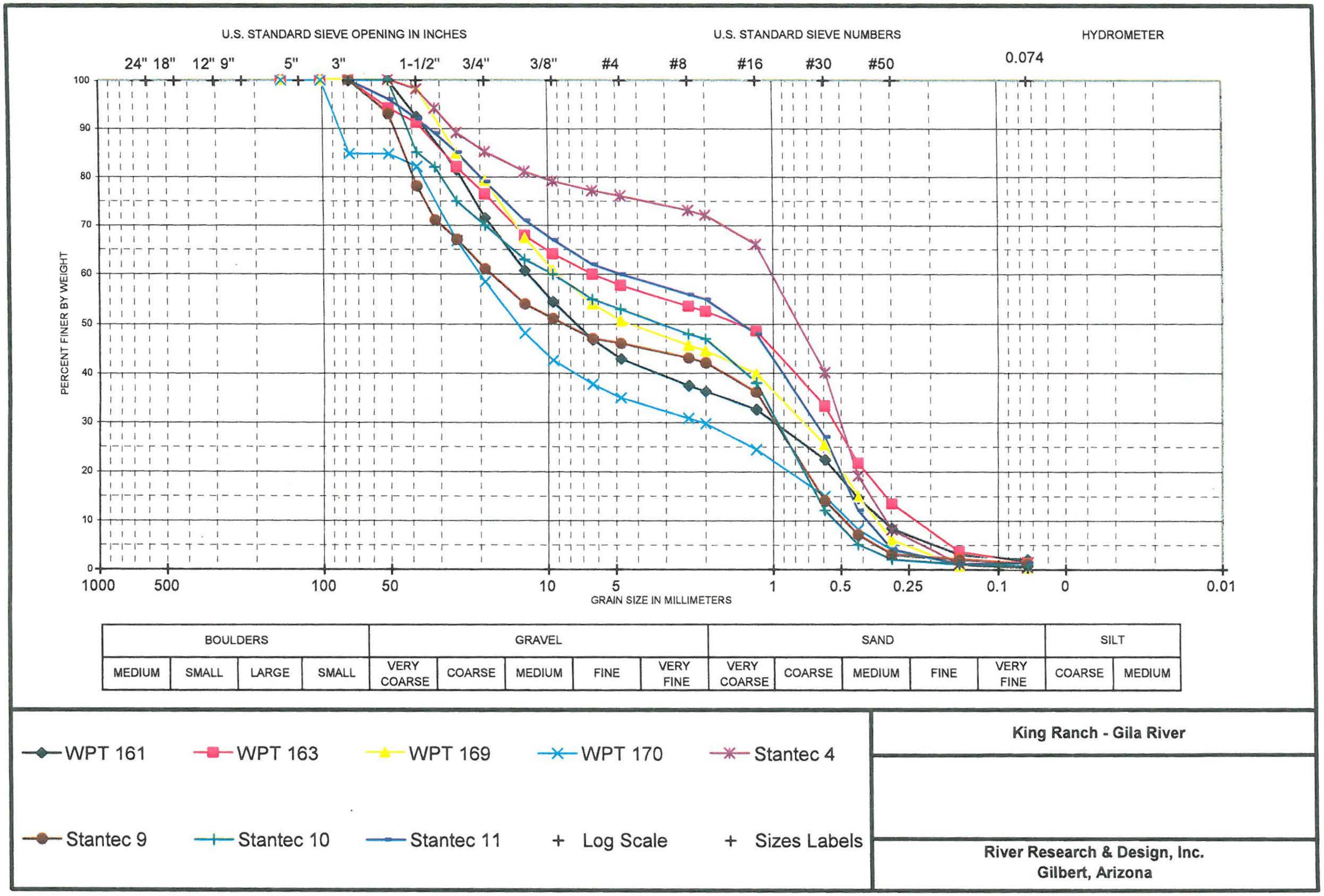

Figure 10. Gradations used in HEC-6T Modeling.

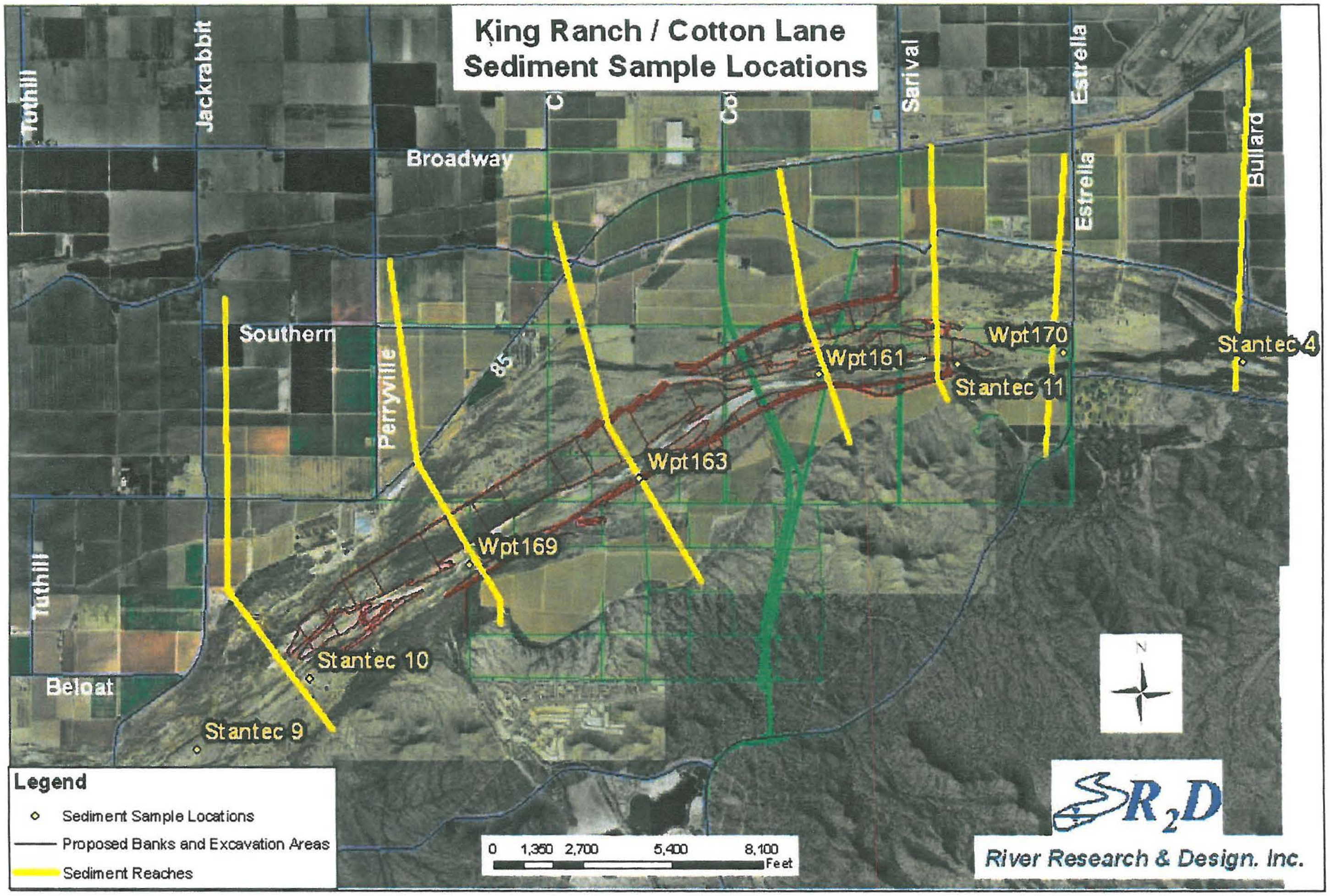

Figure 11. Sediment Sample Locations used for HEC-6T Modeling. Samples identified at Stantec # are from Stantec Study. Samples identified with WPT+ numbers are from WEST work. The reaches where the sediment data was used are immediately upstream from the samples. The boundaries are shown by the yellow cross sections.

6.2.4 Bank Station Locations

Two sets of channel banks stations were developed. One set identified the banks of the main channel as defined for FEMA studies and one set was narrower and used to predict sediment transport. It has been found that active sediment transport does not occur over the entire width of a very wide channel such as the Gila River but in a much narrower width of the channel. The channel banks for the hydraulic and FEMA studies were placed close if not at the same locations as the Norte Vista study / effective model except in areas where the banks or ineffective flow areas were changed due to the construction of the bridge, banks and related channel features.

Channel bank stations for the sediment modeling were identified based on a regime equation proposed by Blench (1970). In general, the channel-forming discharge for a river system such as the Gila River is responsible for the bulk of sediment transport. For this study, the 10-year discharge (57,000) was used as the channel-forming discharge and channel width (distance between bank stations) was based on this value. The application of this modeling approach helps to maintain channel velocities which better ensure that sediment transport is maintained throughout the study reach.

Most regime formulations include three relations that yield values of the channel width, depth, and slope as functions of the water discharge and bed material size. Some of the more refined equations also take into account bank cohesiveness, sediment discharge or concentration, and fluid viscosity. The regime equation used in this study is that of Blench (1970) where the channel width, *w*, is given by

$$w = \sqrt{\frac{F_b Q}{F_s}}$$

where F_b is the so-called bed factor and is defined as the product of *g* (gravitational acceleration) and the Froude number squared, $F_s = 0.10$ for friable banks, and Q is the water discharge (Vanoni, 1975). Based on average Froude number from initial HEC-RAS modeling results, the regime low-flow channel widths were calculated to be approximately 1200 ft for the Gila River.

Stantec in the El Rio Study estimates that sediment transport occurs over a width of approximately 1500 ft in this portion of the Gila River. Based on these findings the value channel banks were placed approximately 1200-1500 feet apart for the sediment modeling through this reach. In braided or very wide sections (such as west of Cotton Lane Bridge) the bank stations were widened slightly to include the main portion of the channel.

6.2.5 Inflowing Sediment Load

The sediment transport model cannot be directly calibrated to historical conditions because detailed historical bed elevation and concentration data are not readily available. The HEC-6T model requires input of the bed material load at the upstream limit of the project reach for the entire range of discharges. For this purpose, data from the HEC6-T model developed for the Tres Rios PED Study was used.

The Tres Rios model considers the reach immediately upstream of the study reach. Therefore, the outflowing sediment load from the Tres Rios model (WEST sediment load) was originally used as the inflowing sediment load for the model developed in this study. A 30 day steady state simulation of the Tres Rios PED model was performed for a range of discharges to generate the inflowing sediment load table. The values obtained in this manner were input into the present HEC-6T model at the upstream-most cross-section located at 195.75. The sediment inflow for the Tres Rios model was also compared with the outflowing sediment load for the Rio Salado Oeste model located immediately upstream on the Salt River from the Tres Rios Study area.

After review by Stantec and the FCD, and in conjunction with Mr. Tony Thomas (the original developer of HEC-6 and HEC-6T) it was suggested that using a higher inflowing concentration with more of the wash load accounted for in the load curve would be more accurate. The wash load was determined to be high enough so as to potentially impact the transport of bed material due to the increased density of the water and sediment mixture. A sensitivity analysis was performed which indicated that this reach of the river is not overly sensitive to changes made to the inputs of sediment transport models. Large changes in inputs resulted in relatively minor changes in bed elevation with changes in final bed elevations on the order of 1-2 ft after a 105 year simulation. This was deemed to be relatively minor for the Cotton Lane Bridge reach of the Gila River. Final modeling used an inflowing sediment load that was acceptable for the El Rio Study, the NorteVista/King Ranch LOMR and the Cotton Lane Bridge studies.

6.3 Modeling considerations

6.3.1 HEC-RAS Model Conversion

6.3.1.1 Model Geometry

The geometry of the HEC-RAS hydraulic model was converted into the format required by the HEC-6T program. Roughness coefficients (Manning's n) in the cross-sections of the river models were varied with depth. After running the 5-, 20- and 100-year flood events in HEC-RAS, the profile output tables were used to extract conveyance weighted Manning's n values for the channel, the left and the right overbanks for the different discharges. The modified data was then entered into the HEC-6T input file using NV records. A default value of 0.065 was used to fill blanks when the conveyance in an overbank area was zero. The result was a configuration of roughness coefficients changing vertically by discharge rather than horizontally by distance as in the HEC-RAS models.

Using normal flow considerations, an elevation-discharge Rating Curve was developed at the downstream boundary of the Gila River (cross-section 186.87) for starting water surface elevations. The rating curve at this point was generated for discharges ranging from 0-292,500 cfs, at 7500 cfs increments for a bed slope of 0.002 ft/ft which is shown in Figure 12.

The Cotton Lane Bridge was first coded into the model with all of the piers as built. This led to anomalies in the average bed calculation for the bridge cross section. The bridge was then recoded to represent all of the piers as a single equivalent (large) pier in the center of the river. This eliminated the problem with the average bed calculation. This method of representing bridges is often used in HEC-6T.

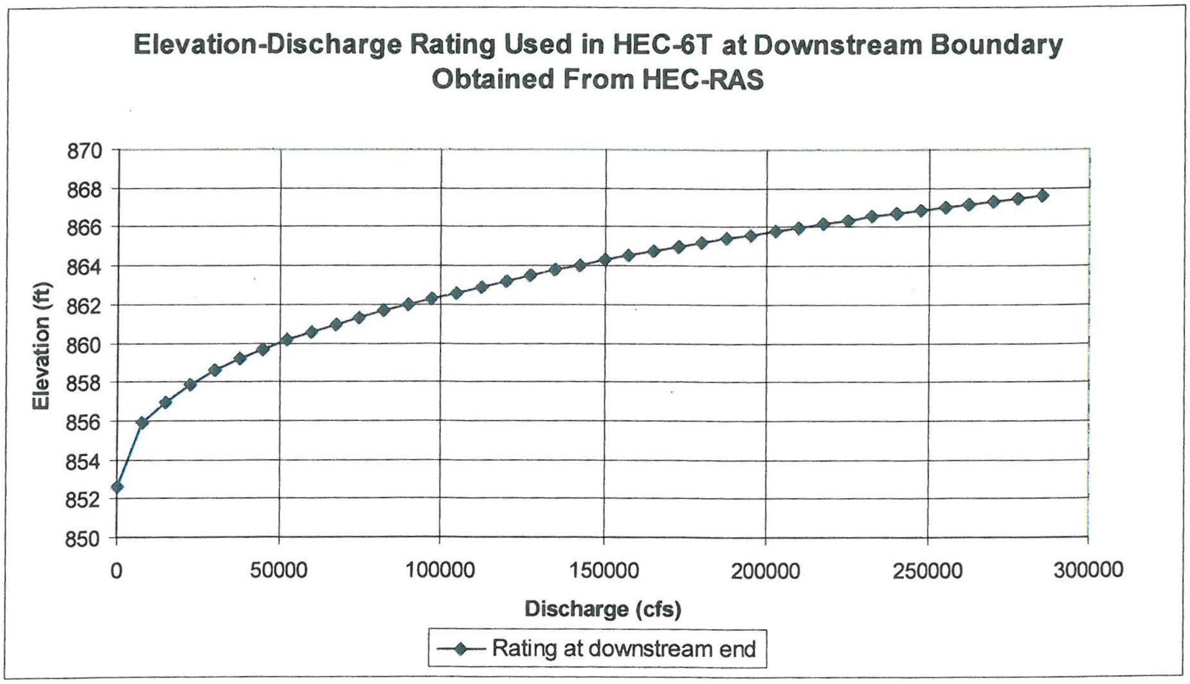

Figure 12. Downstream WSE Boundary Condition for HEC-6T Model.

6.3.1.2 Fixed Bed Model Calibration

Initially, the HEC-6T model was calibrated with a fixed bed using the 5-, 20- and 100-year flows, and the resulting water surface profiles were compared to the HEC-RAS Existing Conditions results. Adjustments of Manning's n were performed for calibration purposes for all cross-sections beginning with the downstream section in the Gila reach. These adjustments were performed to reach agreement between the HEC-RAS and HEC-6T water surface elevations and channel velocities within a difference of 0.1 for both parameters.

6.3.1.3 Movable Bed and Erosion Limits

In general, sediment dynamics tend to be more significant within the active channel, where the bed can either degrade or aggrade in response to erosion or deposition. The overbank areas tend to be more stable and are normally free of erosion, but can experience deposition. HD records were used to specify a bed sediment depth of 25 feet for all cross-sections. Movable bed limits were identified at the boundary of the main channel in HD records (the narrower set of bank stations as described in section 6.2.4 above). The movable bed limits extend beyond the 5-year low flow channel (regime channel) and the defined bank stations. During high flows, significant deposition and scour was expected to occur within the movable bed limits but not expected to extend to the overbank areas.

Average bed elevations were generated using a 50-year flow applied to the model for a few seconds. This allowed wetting of the movable bed cross-sections and provide average elevation across the cross-section while not allowing enough transport to distort the model calculations.

This process allows the comparison of different model results without the plotting of each individual cross-section.

6.3.2 Hydrologic Data

A 105-year (1889-1993) series of hydrographs at the Salt-Gila confluence consisting of historical flows was developed by WEST for the Tres Rios PED study as discussed previously.

6.3.3 Computation Options in HEC-6T

The supercritical option ($SCRT card) was turned off in the HEC-6T model to prevent supercritical velocities, which could produce unrealistic scour depths, from being used in the sediment transport calculations.

The $SMOOTH command was also used to prevent the cross-section geometry from becoming irregular (i.e., having spurious spikes) during the simulation. The command instructs HEC-6T to test the slope across the movable bed versus the angle of repose for sand. An angle of repose is calculated between each set of coordinates using the initial cross-section stations and elevations. The HEC-6T program assumes the bed material to be sand and assigns a value of 0.3 as the angle of repose. When the calculated values are larger than 0.3, the computed angle of repose is used to calculate the slope between cross-section stations. This results in more uniform cross-sections while not impacting the average bed elevations.

6.4 Problems Encountered During the Study

No particularly perplexing problems were encountered during this study other than the coordination of the inflowing sediment load and bed load with other studies. This was more of a coordination issue than a technical issue. Sensitivity analysis was used to show that the various changes made no significant differences in the model results pertaining to bed elevations.

6.4.1 Special Problems and Solutions

No special problems were noted.

6.4.2 Modeling Warning and Error Messages

No critical warnings or errors were found in the model output.

6.5 Calibration

No data existed for calibration or verification of the model but sensitivity analyses were run to insure that the parameters were in the proper range as well as to view model sensitivity to the various input parameters. No problems or particular sensitivity were noted to the range of variables modeled. The HEC-6T model hydraulic data were, however; calibrated to the HEC-RAS results.

6.6 Final Results

6.6.1 Existing Conditions Sediment Results

The HEC-6T model simulation was performed for 105 years with two major events in 1891 and 1993.

Figure 13 shows the impact of the project on the stability of the Gila River. As can be noted the reach appears to be slightly erosional under existing conditions with the proposed conditions only changing by approximately one foot over approximately 0.25 miles of the river (See Figure 15) with almost no differences shown away from the bridge.

In Figure 14, the results of the simulation for existing conditions are presented which show average bed results for a number of intermediate periods in the 105 year simulation. The initial 100 year flood event causes most of the bed change in the model with subsequent events causing little additional change to the average bed elevations. This indicates a general stability of the reach in response to major floods. It can also be noted that after a relatively minor initial adjustment the bed is stable for the entire range of events in the historical record after 1891.

Several feet of erosion can be noted towards the upstream portion of the model (cross-section 194.5) at the Estrella Parkway Bridge but is due to the change in topography sources. It should be remembered that this area is where the topography changes from the channel bed to the top of the 13,000 cfs water surface elevation (described more fully in the Norte Vista LOMR). This change in topography accounts for the erosion noted in the models at the location of the Estrella Parkway Bridge. It is expected that this project will have no impact on erosion at Estrella Parkway since any channel modifications are almost two miles away from the Estrella Parkway bridge.

An apparent accumulation occurs at Station 188.5 in Figure 14. It must be noted that the original topography data ended near this station and the downstream cross-sections use the old data (top of water surface) from the FIS study. In the later data shown in Figure 13 (whose results are based on additional downstream topography) it can be noted that this deposition is eliminated. This indicates that this deposition is indeed the result of the model adjusting itself to the discrepancies between the two sets of topographic data.

6.6.2 Proposed Conditions Sediment Results

The proposed conditions HEC6-T model was developed using the existing conditions model as the base and by incorporating the Cotton Lane Bridge and accounting for the excavation near the bridge. These results are presented in Figure 13 and Figure 15 again show stability for the design channel at the bridge. The models all indicate that deposition can be expected outside the main channel for both existing and plan conditions. The average bed elevations, however, do not change significantly indicating the main channel of the river will remain relatively stable.

Based on the sediment transport results it appears that the river will remain stable in the area impacted by the bridge. Future conditions may change and cause differences due to sand and gravel mining, bank protection or other factors beyond the control of this project. The sediment model indicates that the river is relatively stable in this reach and even relatively significant disruptions in sediment inflow will not cause extreme erosion or deposition through the reach. While the models predict stability in this reach it is possible that deposition or erosion could occur due to debris jams or other obstructions that have not been modeled in this study.

6.6.3 Verification of Results

No verification was possible since no historical bed elevation data was available for verification of model results. However several sensitivity runs were made varying the inflowing load, the bed gradation, the sediment transport equation and other factors. None of these changes made significant differences in the sediment transport model in this reach. It appears that this reach of the river is relatively stable under both the existing and proposed conditions.

6.6.4 Outflowing Sediment Loads

The outflowing sediment loads were compared for the two models using the $VOL card in HEC-6T. The results were very similar at the end of the 105 year simulation. This indicates that the proposed project does not significantly impact sediment transport in the river downstream of the project. The model results indicate that the project has no significant impacts upstream and downstream of the project. The load results for the simulations are shown in Table 6. The sediment output from HEC-6T indicates that 100% of the silts and clays pass through this reach and only the sand and larger size classes tend to deposit in this reach. The trap efficiencies for both silts and clays are 0.00 while the trap efficiency for sand is on the order of 0.40. Changes in sediment transport through the reach are less than ±0.5%.

6.7 Additional Modeling

In addition to the HEC-6T modeling a two-dimensional model (RMA-2/TABS2) was set up in order to model hydraulic flow patterns in the areas away from the bridge. The idea was to view the changes in flow velocities which are the controlling factor for sedimentation. This model compared existing condition velocities with proposed condition velocities and was designed to view any changes in flow patterns and velocities in the reach due to the bridge constriction. The results of the two-dimensional modeling showed no difference in flow pattern existed more than 1300 feet from the bridge with velocity differences at the abutment increasing about 1 to 2 feet per second while velocities in area immediately downstream of the bridge were increased by 0.5 ft/sec or less. The difference plot for the existing and proposed conditions is shown in Appendix F.4.

6.8 Channel Maintenance Plan

A plan for channel maintenance is being developed as a part of the associated, surrounding development project and maintenance will be performed as necessary to keep the channel capacity as currently designed. The maintenance plan is expected to include a maintenance district that will maintain future bank improvements as well as the channel capacity in the area in a larger area of the river.

It is expected that the channel will move and change as floods occur in the river. The channel is not designed to be static but rather dynamic with the low flow channels moving back and forth across the river. Thus changes in the low flow channels or locations of channel bars should not be cause for alarm unless channel capacity is reduced below that required to pass the 100 year flood event. Under current agreements it is expected that maintenance will fall to either the City of Goodyear or the maintenance district.

Occasional topographic surveys may be required after large events to insure that channel changes have not adversely impacted channel capacities. Large events are here classified as those that cause major changes to channel locations or bar formations. These changes should be readily apparent from a visual observation by those familiar with the river channel. Significant channel changes are not expected at events smaller than approximately the 20 year event.

Table 6. Sediment Loads for Existing and Proposed Simulations.

Model	Inflowing Load (Acre Feet)	Outflowing Load (Acre Feet)	Trap Efficiency
Existing	Clay 280,476 Silt 64,725 Sand 15,079	280,472 64,695 9,083	0.00 0.00 0.40
Proposed Conditions	Clay 280,476 Silt 64,725 Sand 15,079	280,476 64,693 9,124	0.00 0.00 0.40
LOMR Model – As-Built Condition	Clay 280,476 Silt 64,725 Sand 15,079	280,451 64,598 9,038	0.00 0.00 0.40
Difference (%) Existing to CLOMR	0.00	0.45% (Sand)	0.00
Difference (%) Existint to LOMR	0.00	-0.49% (Sand	0.00
100 Year Flood* 2nd Hydrograph Values	Clay 87,424 Silt 52,256 Sand 4,700 Total 144,380	87,424 52,256 2,120 141,800	0.00 0.00 0.55 0.018

* Two identical 100 year hydrographs were run using an alternate inflowing loading. The first hydrograph was allowed to adjust the bed to flow conditions since it was run with the topography changes in place. The second run was used for data since the bed had adjusted to flow conditions during the first run. Values were lower for the second run but the trap efficiency was equal except for sand which was slightly higher.

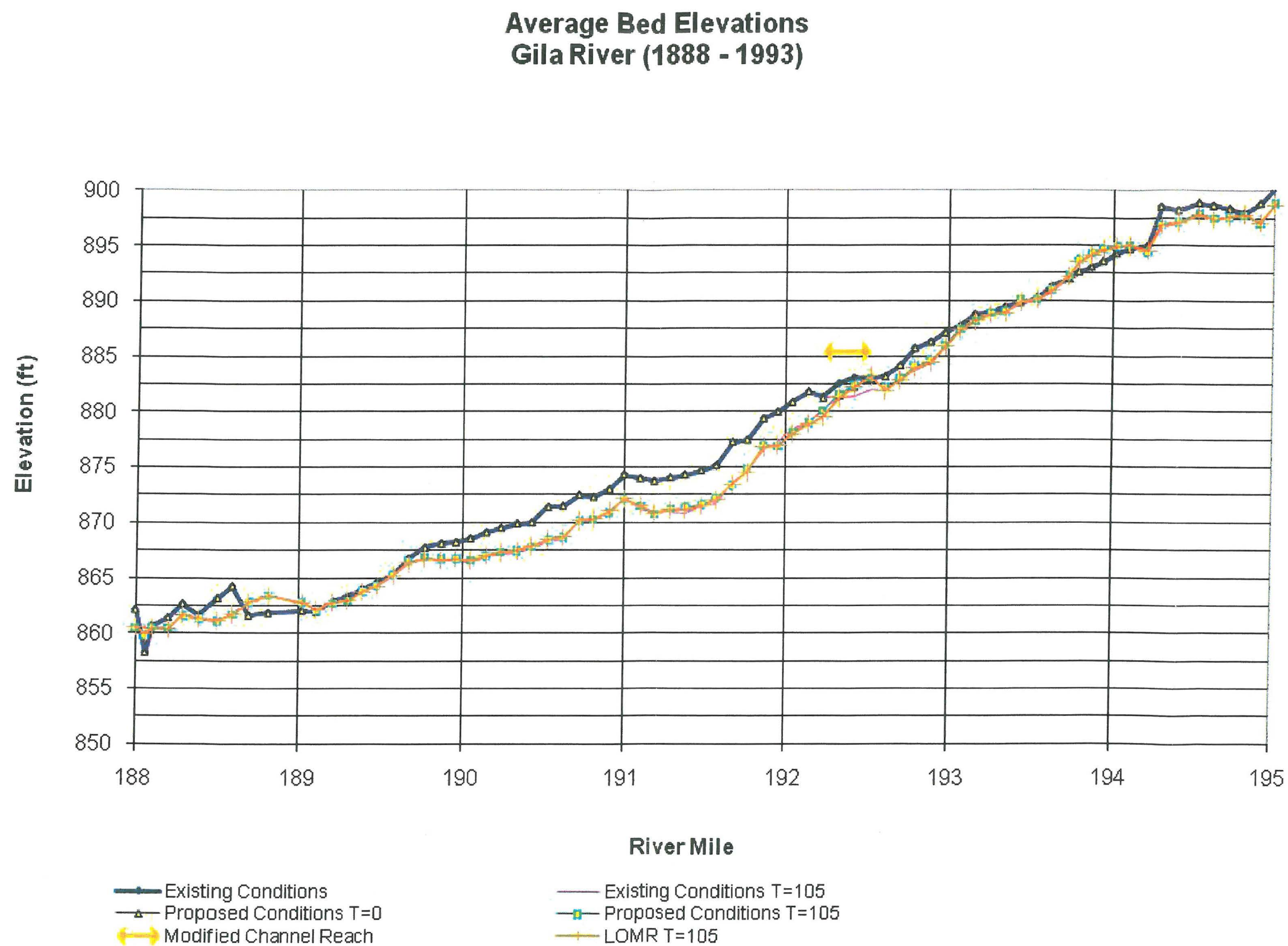

Figure 13. Average Bed Elevations for 105 Simulation of Historical Peak Flows on the Gila River at Cotton Lane Bridge

King Ranch
Average Bed Elevations for the 105-Year Simulation (1898-1993)
Existing Conditions

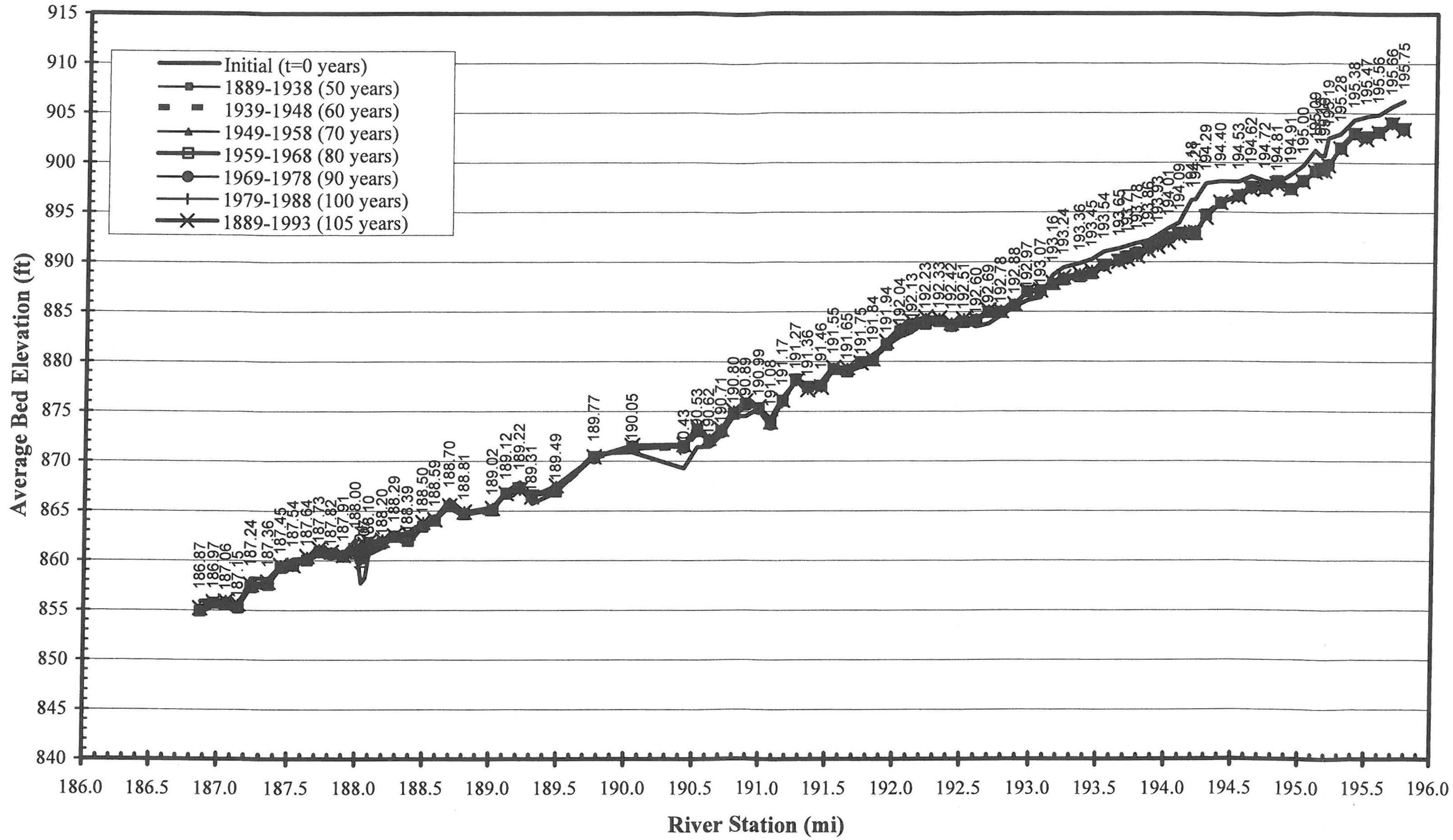

Figure 14. Average Bed Elevation Comparison After 105 Years for Existing conditions

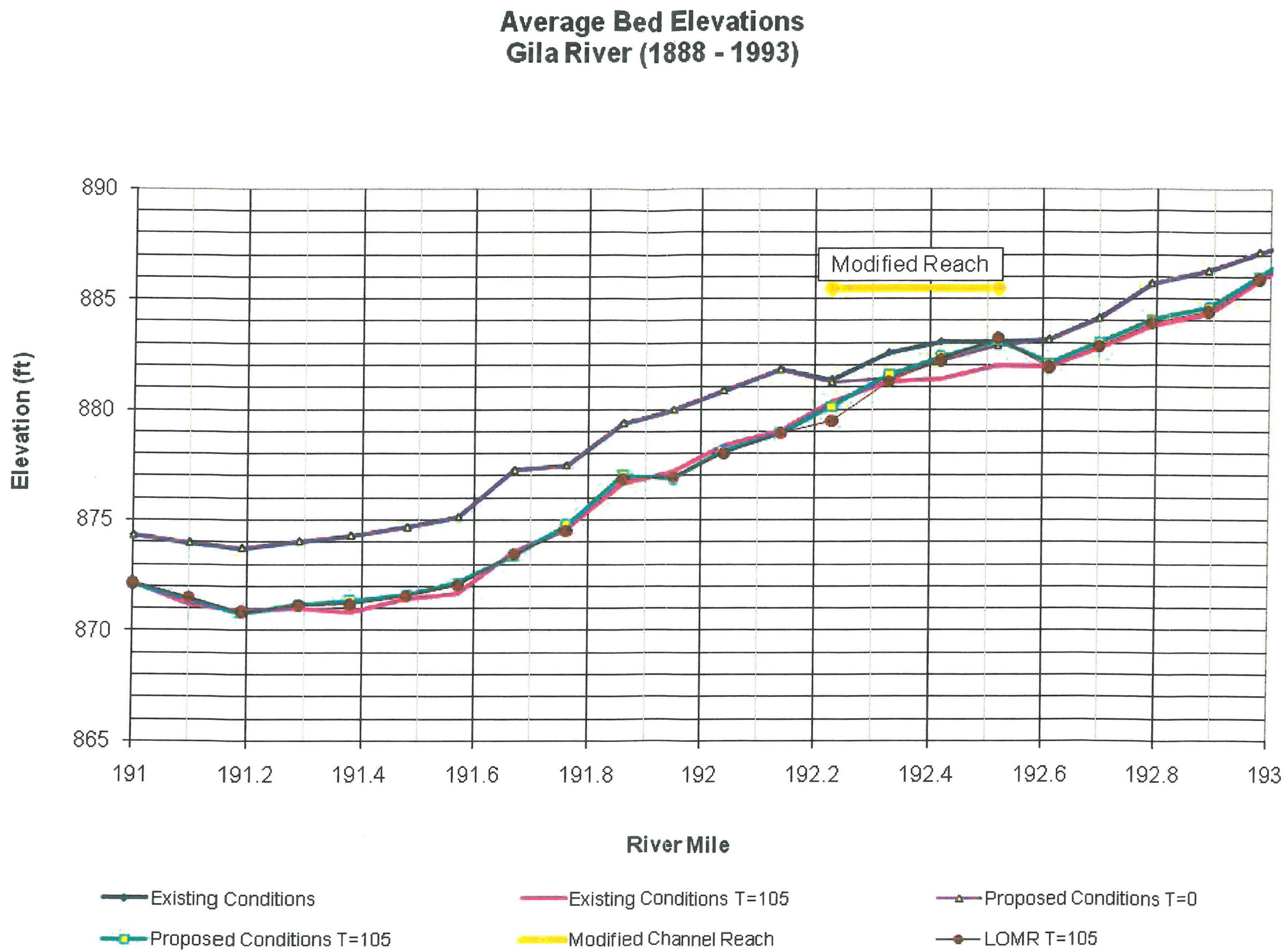

Figure 15. Average Bed Elevation Comparison at Bridge after 105 Years for Existing and Proposed Conditions.

7. Draft FIS Report Data

7.1 Summary of Discharges

The peak discharges used in the hydraulic analysis of all the conditions modeled were developed by the U.S. Army Corps of Engineers (1996) and are shown in Table 7.

Table 7. Peak Discharge Values Used in Hydraulic Models

River ID	River Station (miles)	Discharge (cfs)					
		5-Year	10-Year	20-Year	50-Year	100- Year	500-Year
Gila River	195.75	23,500	57,000	92,000	185,000	227,000	285,000

7.2 Floodway Data

The encroached floodway surcharge data is shown in Table 8 along with the tie in cross sections and water surface elevations for both the floodway and floodplain.

Table 8. Floodway and Floodplain Water Surface Elevations and Encroachment Depths.

HEC-RAS Plan: AsBuilt River: Gila River Reach: El Rio WMP				
Reach	River Sta	Profile	W.S. Elev	Profile Delta WS
			(ft)	(ft)
	Estrella Parkway Bridge			
Models Tie Together with Existing Models				
El Rio WMP	194.2	100-Year	905.54*	
El Rio WMP	194.2	100-Year Enc	905.70	0.24
El Rio WMP	194.1	100-Year	904.86	
El Rio WMP	194.1	100-Year Enc	905.09	0.23
El Rio WMP	194.02	100-Year	904.40	
El Rio WMP	194.02	100-Year Enc	904.62	0.22
El Rio WMP	193.94	100-Year	904.08	
El Rio WMP	193.94	100-Year Enc	904.31	0.24
El Rio WMP	193.87	100-Year	903.76	
El Rio WMP	193.87	100-Year Enc	903.98	0.22
El Rio WMP	193.79	100-Year	903.35	
El Rio WMP	193.79	100-Year Enc	903.56	0.21
El Rio WMP	193.73	100-Year	902.89	
El Rio WMP	193.73	100-Year Enc	903.15	0.26
El Rio WMP	193.62	100-Year	902.13	
El Rio WMP	193.62	100-Year Enc	902.38	0.25
El Rio WMP	193.53	100-Year	901.62	
El Rio WMP	193.53	100-Year Enc	901.82	0.2
El Rio WMP	193.43	100-Year	901.23	
El Rio WMP	193.43	100-Year Enc	901.50	0.28
El Rio WMP	193.34	100-Year	900.89	
El Rio WMP	193.34	100-Year Enc	901.20	0.31
El Rio WMP	193.25	100-Year	900.50	

HEC-RAS Plan: AsBuilt River: Gila River Reach: El Rio WMP				
Reach	River Sta	Profile	W.S. Elev	Profile Delta WS
			(ft)	(ft)
El Rio WMP	193.25	100-Year Enc	900.81	0.31
El Rio WMP	193.16	100-Year	900.03	
El Rio WMP	193.16	100-Year Enc	900.36	0.33
El Rio WMP	193.07	100-Year	899.69	
El Rio WMP	193.07	100-Year Enc	900.05	0.36
El Rio WMP	192.98	100-Year	899.29	
El Rio WMP	192.98	100-Year Enc	899.62	0.33
El Rio WMP	192.89	100-Year	898.69	
El Rio WMP	192.89	100-Year Enc	899.02	0.33
El Rio WMP	192.79	100-Year	897.70	
El Rio WMP	192.79	100-Year Enc	898.10	0.4
El Rio WMP	192.7	100-Year	896.84	
El Rio WMP	192.7	100-Year Enc	897.28	0.44
El Rio WMP	192.61	100-Year	896.23	
El Rio WMP	192.61	100-Year Enc	896.56	0.33
El Rio WMP	192.52	100-Year	895.75	
El Rio WMP	192.52	100-Year Enc	896.13	0.38
El Rio WMP	192.41	100-Year	894.93	
El Rio WMP	192.41	100-Year Enc	895.52	0.59
El Rio WMP	192.39 BR U	100-Year	894.72	
El Rio WMP	192.39 BR U	100-Year Enc	895.33	0.61
Cotton Lane Bridge				
El Rio WMP	192.39 BR D	100-Year	894.44	
El Rio WMP	192.39 BR D	100-Year Enc	895.10	0.66
El Rio WMP	192.38	100-Year	894.53	
El Rio WMP	192.38	100-Year Enc	895.18	0.65

HEC-RAS Plan: AsBuilt River: Gila River Reach: El Rio WMP				
Reach	River Sta	Profile	W.S. Elev	Profile Delta WS
			(ft)	(ft)
El Rio WMP	192.33	100-Year	894.29	
El Rio WMP	192.33	100-Year Enc	894.77	0.48
El Rio WMP	192.23	100-Year	893.53	
El Rio WMP	192.23	100-Year Enc	894.12	0.59
El Rio WMP	192.14	100-Year	892.67	
El Rio WMP	192.14	100-Year Enc	893.30	0.63
El Rio WMP	192.04	100-Year	892.03	
El Rio WMP	192.04	100-Year Enc	892.67	0.64
El Rio WMP	191.95	100-Year	891.55	
El Rio WMP	191.95	100-Year Enc	892.15	0.6
El Rio WMP	191.86	100-Year	891.08	
El Rio WMP	191.86	100-Year Enc	891.68	0.61
El Rio WMP	191.76	100-Year	890.6	
El Rio WMP	191.76	100-Year Enc	891.10	0.5
El Rio WMP	191.67	100-Year	890.04	
El Rio WMP	191.67	100-Year Enc	890.41	0.37
El Rio WMP	191.57	100-Year	889.55	
El Rio WMP	191.57	100-Year Enc	889.83	0.27
El Rio WMP	191.48	100-Year	889.10	
El Rio WMP	191.48	100-Year Enc	889.38	0.28
El Rio WMP	191.38	100-Year	888.62	
El Rio WMP	191.38	100-Year Enc	888.88	0.26
Models Tie Together with Existing Models				

* Effective Model Value

7.3 Annotated Flood Insurance Rate Maps

Draft Flood Insurance Rate Maps are included in the Exhibits section following the Appendices.

7.4 Flood Profiles

Flood Profiles for the reach impacted by the Cotton Lane Bridge are shown in Figure 16.

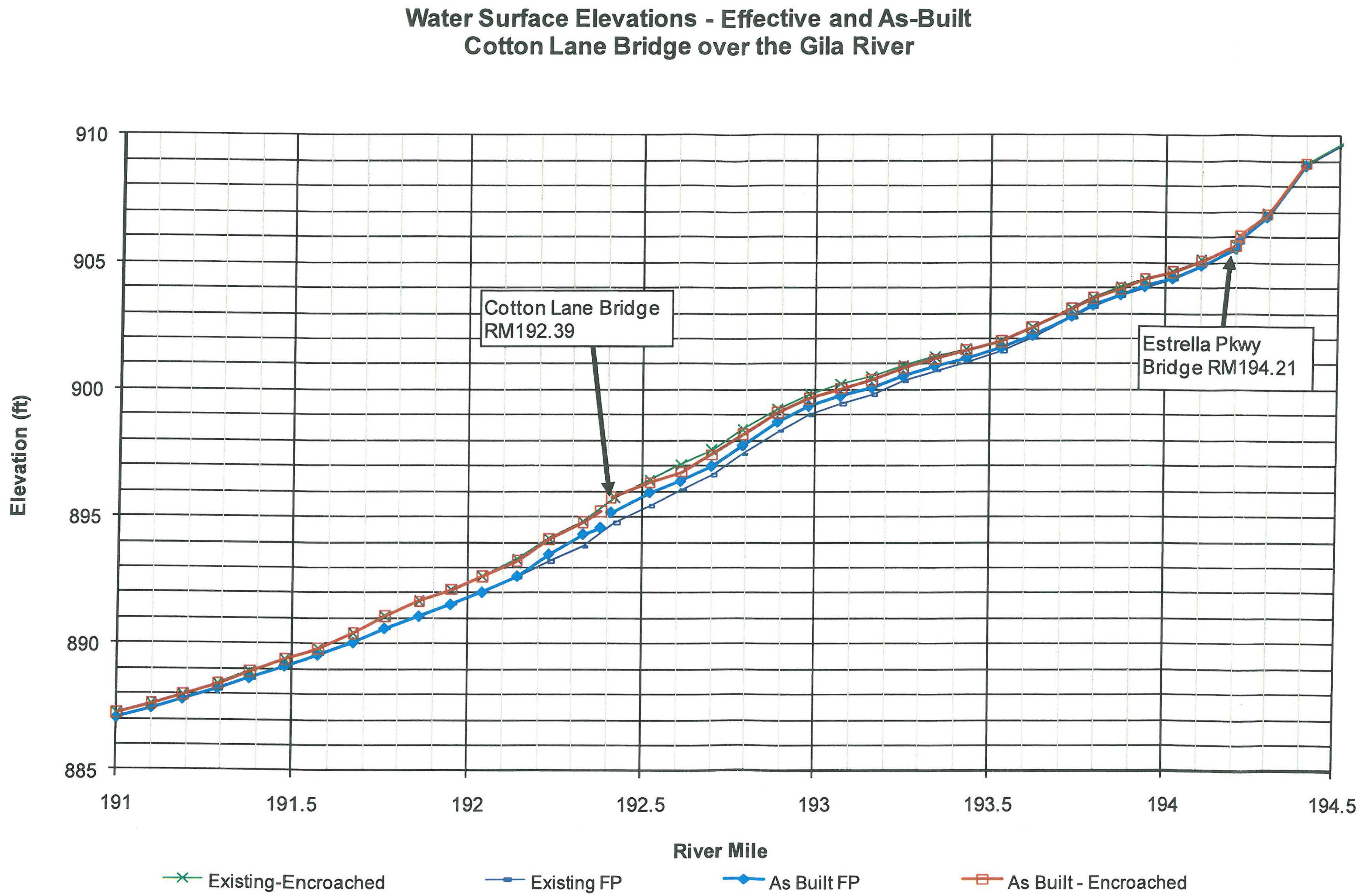

Figure 16. Floodplain and Floodway Profiles for Effective and Conditions with Cotton Lane Bridge in Place.

List of Appendices

G CHECKRAS Output

EXHIBIT MAPS

APPENDIX A

References

A.1 Data Collection Summary

References

1. Gila River Basin, Section 7 Study for Modified Roosevelt Dam, Arizona, U.S. Army Corps of Engineers, Los Angeles District, March 1996.

2. Salt-Gila River Floodplain Delineation Restudy, (FDS), Michael Baker Jr., Inc. for Maricopa County Flood Control District-FCD, 1999

3. HEC-RAS, River Analysis System, v. 3.1.3. U.S. Army Corps of Engineers Hydrologic Engineering Center, Davis, CA, 2004.

4. PED Hydraulic Design of Tres Rios North Levee, Maricopa County, WEST Consultants for U.S. Army Corps of Engineeers, Los Angeles District, 2004.

5. Roughness Coefficients for Channels in Arizona" (Aldridge and Garrett, 1973)

6. Estimated Manning's Roughness Coefficients for Stream Channels and Flood Plains in Maricopa County, Arizona" (Thomsen and Hjalmarson, 1991)

7. Verification of Roughness Coefficients for Selected Natural and Constructed Stream Channels in Arizona" (Phillips and Ingersoll, 1998)

8. Freeman, Rahmeyer, and Copeland, 2000. Determination of resistance due to shrubs and woody vegetation. Technical Report, ERDC/CHL TR-00-25, Engineering Research and Development Center, US Army Corps of Engineers, Vicksburg, Mississippi.

9. Cotton Lane Bridge CLOMR, 2008. (Case # 08-09-1741R – approved May 6, 2009) River Research & Design, Inc.

10. Norte Vista / King Ranch LOMR, 2007. (LOMC # 08-09-0929P-040046) River Research & Design, Inc.

A.2 Data Referenced documents

APPENDIX B

General Documentation & Correspondence

B.1 Special Problem Reports - None

B.2 Contact (telephone) reports - None

B.3 Meeting minutes or reports - None

B.4 General Correspondence - CLOMR and Notification Documentation

B.5 Contract Documents - None

Federal Emergency Management Agency

Washington, D.C. 20472

May 6, 2009

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 08-09-1741R

The Honorable Fulton Brock
Chairman, Maricopa County
Board of Supervisors
301 West Jefferson Street, 10th Floor
Phoenix, AZ 85003

Community: Maricopa County, AZ
Community No.: 040037

104

Dear Mr. Brock:

This responds to a request that the Department of Homeland Security's Federal Emergency Management Agency (FEMA) comment on the effects that a proposed project would have on the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas, in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated August 16, 2008, Gary Freeman, Ph.D., P.E., River Research and Design, Inc., requested that FEMA evaluate the effects along the Gila River that new hydraulic analyses, updated topographic information, the proposed Cotton Lane bridge, and proposed channel modifications in the vicinity of the proposed Cotton Lane bridge would have on the flood hazard information shown on the effective FIRM and FIS report. The proposed area of revision will extend along the Gila River from approximately 5,250 feet downstream of 203rd Avenue to approximately 1,200 feet upstream of Estrella Parkway.

All data required to complete our review of this request for a Conditional Letter of Map Revision (CLOMR) were submitted with letters from Dr. Freeman.

Because this revision request also affects the City of Goodyear, a separate CLOMR for that community was issued on the same date as this CLOMR.

We reviewed the submitted data and the data used to prepare the effective FIRM for your community and determined that the proposed project meets the minimum floodplain management criteria of the NFIP. The submitted existing conditions HEC-RAS hydraulic computer model, dated October 4, 2007, based on updated topographic information, was used as the base conditions model in our review of the proposed conditions model for this CLOMR request. We believe that, if the proposed project is constructed as shown on the plans entitled "Gila River Bridge Location Plan, Sheets 1-5," prepared by Maricopa County Department of Transportation Engineering Division, dated June 2006, and on the topographic work maps entitled "Cotton Lane Bridge Floodplain Redelineation, Sheets 1-7," prepared by River Research and Design, Inc., dated April 3, 2008, and the data listed below are received, a revision to the FIRM would be warranted.

As a result of the updated hydraulic analysis and new topographic information, the existing conditions Base (1-percent-annual-chance) Flood Elevations (BFEs) decreased compared to the effective BFEs along the Gila River. The maximum decrease in BFE, approximately 4.3 feet, occurred approximately 11,100 feet upstream of 203rd Avenue.

As a result of the proposed project, the BFEs will increase compared to the existing conditions BFEs along the revised reach of the Gila River. The maximum increase in BFE, 0.5 foot, will occur approximately 700 feet upstream of the proposed Cotton Lane bridge.

As a result of the updated hydraulic analysis, new topographic information, and proposed project, the BFEs will increase and decrease compared to the effective BFEs along the revised reach of the Gila River. The maximum increase in BFE, approximately 0.3 foot, will occur approximately 3,150 feet upstream of the proposed Cotton Lane bridge. The maximum decrease in BFE, approximately 4.3 feet, will occur approximately 12,300 feet downstream of the proposed Cotton Lane bridge.

As a result of the updated hydraulic analysis, new topographic information, and proposed project, the width of the Special Flood Hazard Area (SFHA), the area subject to inundation by the base flood, will increase in some areas and decrease in other areas compared to the effective SFHA width along the Gila River. The maximum increase in SFHA width, approximately 600 feet, will occur approximately 28,140 feet downstream of the proposed Cotton Lane bridge. The maximum decrease in SFHA width, approximately 3,250 feet, will occur approximately 3,380 feet downstream of the proposed Cotton Lane bridge.

As a result of the updated hydraulic analysis, new topographic information, and proposed project, the width of the regulatory floodway will increase in some areas and decrease in other areas compared to the effective floodway width along the Gila River. The maximum increase in floodway width, approximately 580 feet, will occur approximately 22,970 feet downstream of the proposed Cotton Lane bridge. The maximum decrease in floodway width, approximately 1,600 feet, will occur approximately 10,350 feet downstream of the proposed Cotton Lane bridge.

Upon completion of the project, your community may submit the data listed below and request that we make a final determination on revising the effective FIRM and FIS report.

- With this request, your community has complied with all requirements of Paragraph 65.12(a) of the NFIP regulations. Compliance with Paragraph 65.12(b) also is necessary before FEMA can issue a Letter of Map Revision (LOMR) when a community proposes to permit encroachments into the effective regulatory floodway that will cause increases in BFE in excess of those permitted under Paragraph 60.3(d)(3). Please provide evidence that your community has, prior to approval of the proposed encroachment, adopted floodplain management ordinances that incorporate the increased BFEs and revised floodway boundary delineations to reflect post-project conditions, as stated in Paragraph 65.12(b).

- Detailed application and certification forms must be used for requesting final revisions to the maps. Therefore, when the map revision request for the area covered by this letter is submitted, Form 1, entitled "Overview & Concurrence Form," must be included. (A copy of this form is enclosed.)

- The detailed application and certification forms listed below may be required if as-built conditions differ from the preliminary plans. If required, please submit new forms (copies of which are enclosed) or annotated copies of the previously submitted forms showing the revised information.

  Form 2, entitled "Riverine Hydrology & Hydraulics Form"

  Form 3, entitled "Riverine Structures Form"

  Hydraulic analyses, for as-built conditions, of the base flood and the regulatory floodway, together with a topographic work map showing the revised floodplain and floodway boundaries, must be submitted with Form 2.

- Effective October 1, 2007, FEMA revised the fee schedule for reviewing and processing requests for conditional and final modifications to published flood information and maps. In accordance with this schedule, the current fee for this map revision request is $4,800 and must be received before we can begin processing the request. Please note, however, that the fee schedule is subject to change, and requesters are required to submit the fee in effect at the time of the submittal. Payment of this fee shall be made in the form of a check or money order, made payable in U.S. funds to the National Flood Insurance Program, or by credit card (Visa or MasterCard only). The payment, along with the revision application, must be forwarded to the following address:

  FEMA National Service Provider
  3601 Eisenhower Avenue
  Alexandria, VA 22304-6425

- As-built plans, certified by a registered professional engineer, of all proposed project elements

- A copy of the public notice distributed by your community stating its intent to revise the regulatory floodway, or a statement by your community that it has notified all affected property owners and affected adjacent jurisdictions

- An annotated FIRM, at the scale of the effective FIRM, that shows the revised conditions base floodplain and floodway boundary delineations shown on the submitted work map and how they tie into the base floodplain and floodway boundary delineations shown on the effective FIRM at the downstream and upstream ends of the revised reach

- The submitted proposed conditions hydraulic analysis, at the upstream and downstream ends, ties into the existing conditions hydraulic model that was submitted in support of a LOMR request currently under review (Case No. 08-09-0929P). Upon completion of the project for which this CLOMR is issued, please comply with one of the following alternatives:

  - If the LOMR for Case No. 08-09-0929P is issued before completion of the project for which this CLOMR is issued, the hydraulic model submitted with the LOMR request for this project must tie into the hydraulic model for the LOMR for Case No. 08-09-0929P.

- If the LOMR request for the project for which this CLOMR is issued is submitted before the LOMR for Case No. 08-09-0929P is issued, then the revised BFEs and SFHA boundary delineations must tie into the currently effective information. Therefore, please submit a hydraulic model and topographic map, certified by a registered professional engineer, in which the revised BFEs and SFHA boundary delineations tie into the currently effective information at the upstream end of the revision.

- Documentation of the individual legal notices sent to property owners who will be affected by the increases in BFE and/or increases in width and/or shifting of the base floodplain within the limits of revision. This documentation may take the form of certified mailing receipts or certification that all property owners have been notified, with an accompanying mailing list and a copy of the letter sent.

  - If you submit notification of and acceptance by the adversely affected property owners, FEMA can issue a LOMR that is effective on the date of issuance.

  - If you submit notification of, but not acceptance by, the adversely affected property owners, FEMA may issue a LOMR that will become effective 3 to 6 months after the date of issuance.

After receiving appropriate documentation to show that the project has been completed, FEMA will initiate a revision to the FIRM and FIS report. Because the BFEs would change as a result of the project, a 90-day appeal period would be initiated, during which community officials and interested persons may appeal the revised BFEs based on scientific or technical data.

The basis of this CLOMR is, in whole or in part, a channel-modification/bridge project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities assure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel and bridge rests with your community.

This CLOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Director, Mitigation Division of FEMA in

Oakland, California, at (510) 627-7175. If you have any questions regarding this CLOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Dahlia Kasperski, P.E., CFM, Program Specialist
Engineering Management Branch
Mitigation Directorate

For: William R. Blanton Jr., CFM, Chief
Engineering Management Branch
Mitigation Directorate

Enclosures

cc: The Honorable Jim Cavanaugh
Mayor, City of Goodyear

Mr. John Hauskins, P.E.
Department of Transportation
Maricopa County

Mr. Timothy S. Phillips, P.E.
Chief Engineer and General Manager
Flood Control District of Maricopa County

Mr. David Ramirez, P.E.
City Engineer
City of Goodyear

Mr. Brian Cosson, CFM
State NFIP Coordinator
Flood Mitigation Section
Arizona Department of Water Resources

Gary Freeman, Ph.D., P.E.
River Research and Design, Inc.

R2D River Research and Design, Inc.

FAX: (480) 275-5870 **Phone: (480) 275-5077** E-mail: freeman@r2d-eng.com
Website: www.r2d-eng.com

February 4, 2009

Syed Qayum, CFM
National LOMR Technical Manger
Michael Baker Jr., Inc
3601 Eisenhower Ave
Alexandria, VA 22304-6425

RE: Cotton Lane Bridge CLOMR, Case # 08-09-1741R

Mr. Qayum:

We have notified the owners of property that adjoins the proposed floodplain modification for Cotton Lane Bridge, Case No. 08-09-1741R. We have checked the area and have found no insurable structures that will be impacted by the changes. All of the landowners were notified by registered mail and we have attached copies of the letters and the receipts for the certified mailings along with a list of the owners notified.

I hereby certify that the mailings took place and that no insurable structures were found that will be impacted by the changes. If you have any questions or need further information please feel free to call me at (480) 275-5077 or contact me via e-mail at freeman@r2d-eng.com.

Sincerely;

Gary E. Freeman, PhD, PE
President

ENC: Copies of Notifications (7)
List of Addressees

List of Property Owners Notified of Cotton Lane CLOMR:

Buckeye Water Conservation and Drainage District
PO Box 726
Buckeye, AZ 85326
Property between Estrella Parkway and Citrus Road Alignment

Housecat LLC
3040 N 44th St, Ste 4
Phoenix, AZ 85018
Lakin Property between Sarival Alignment and Citrus Road Alignment

Flood Control District of Maricopa County
2801 W Durango St
Phoenix, AZ 85009
Property between Estrella Parkway and Citrus Road Alignment

HE Capital KR, LLC
2850 E Camelback Rd, Ste 110
Phoenix, AZ 85016
King Ranch Property between Estrella Parkway and Citrus Road Alignment

AZ State Land Department
1616 W Adams St.
Phoenix, AZ 85007
Cotton Lane Rd and Southern Ave Alignment

Dos Rios Materials, LLC
5340 W Luke Ave
Glendale, AZ 85301
Sections 26, 34, and 35 T1N, R1W Near intersection of Southern Ave and Citrus Rd

Buckeye Group, LLC
14238 N 66th Dr
Glendale, AZ 85206
Intersection of Southern Ave and Citrus Rd

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PO BOX 726

City, State, ZIP+4
BUCKEYE AZ 85326

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R2D River Research and Design, Inc.

FAX: (888) 670-8890 Phone: (480) 275-5077 E-mail: freeman@r2d-eng.com
Website: www.r2d-eng.com

Idaho Office:
4347 N. Pine-Featherville Rd
Featherville, ID 83647

Arizona Office/Mailing Address:
1345 E Spur Avenue
Gilbert, AZ 85296

June 10, 2010

Name

Address

RE: Notification of increases in 1% (100-year) annual chance water surface elevations
Additional Notification of Floodway Modification

Dear Sir/Madam:

The Flood Insurance Rate Map (FIRM) for a community depicts land which as been determined to be subject to a 1% (100-year) or greater chance of flooding in any given year. The FIRM is used to determine flood insurance rates and to help the community with floodplain management. The floodway is the portion of the floodplain that includes the channel of a river or other watercourse and the adjacent land area that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation by more than a designated height.

River Research and Design, Inc. is applying for a Letter of Map Revision LOMR) from the Federal Emergency Management Agency (DHS-FEMA) on behalf of The Maricopa County Department of Transportation to revise FIRM 04013C, Panels 2065 H, 2070 H and 2550 G for the City of Goodyear and Maricopa County, Arizona along the Gila River. The Maricopa County Department of Transportation is proposing to modify the floodplain and floodway as a part of the construction of the Cotton Lane Bridge across the Gila River. Similar notification was previously performed during the CLOMR (Conditional Letter of Map Revision) process.

The Flood Control District of Maricopa County and the City of Goodyear, in accordance with the National Flood Insurance Program regulation 65.7(b)(1), hereby give notice of the County's and City's intent to revise the floodway, generally located between where the Citrus Road alignment crosses the Gila River to Estrella Parkway. Specifically the Gila River floodway shall be revised from River Mile 191.38 above its confluence with the Colorado River to River Mile 194.20. As a result of the floodway revision, the floodway shall primarily narrow with some minor widening with a maximum widening of 160 feet along the north bank approximately 2000 feet west of the Cotton Lane Bridge. The maximum narrowing is approximately 500 feet along the north bank of the Gila River at River Mile 192.38 or immediately west of the Cotton Lane Bridge.

The proposed bridge project will result in increases in the 1% annual chance water surface elevations for the Gila River with a maximum increase of approximately 0.47 feet (5.6 inches) over the currently effective floodplain elevations. This maximum increase occurs approximately 0.06 miles (300 feet) downstream of the Cotton Lane Bridge.

Maps and detailed analysis of the floodway revision can be reviewed at The Flood Control District of Maricopa County at 2801 West Durango Street, Phoenix, AZ 85009 or at the City Engineers Office for the City of Goodyear at 195 N. 145th Ave, Building D, Goodyear, AZ 85338. If you have any questions or concerns about the proposed project or its affect on your property you may contact Lynn Thomas (FCDMC) at (602) 506-1501 or Keith Brown (Goodyear) at (623) 882-3110.

This letter is to inform you of the proposed increases in the 1% annual chance water surface elevation and floodway modifications on your property located along the Gila River to the west of Estrella Parkway at ___________________________.

Sincerely;

Gary E. Freeman, PhD, PE, CFM
President

List of Property Owners Notified of Cotton Lane CLOMR: June 10, 2010

Buckeye Water Conservation and Drainage District
PO Box 726
Buckeye, AZ 85326
Property between Estrella Parkway and Citrus Road Alignment

Housecat LLC
3040 N 44^{th} St, Ste 4
Phoenix, AZ 85018
Lakin Property between Sarival Alignment and Citrus Road Alignment

Flood Control District of Maricopa County
2801 W Durango St
Phoenix, AZ 85009
Property between Estrella Parkway and Citrus Road Alignment

HE Capital KR, LLC
2850 E Camelback Rd, Ste 110
Phoenix, AZ 85016
King Ranch Property between Estrella Parkway and Citrus Road Alignment

AZ State Land Department
1616 W Adams St.
Phoenix, AZ 85007
Cotton Lane Rd and Southern Ave Alignment

Dos Rios Materials, LLC
5340 W Luke Ave
Glendale, AZ 85301
Sections 26, 34, and 35 T1N, R1W Near intersection of Southern Ave and Citrus Rd

Buckeye Group, LLC
14238 N 66^{th} Dr
Glendale, AZ 85306
Intersection of Southern Ave and Citrus Rd

Dan Mahan
PO Box 301
Buckeye, AZ 85326
Section 26 along Extension Canal immediately north of Southern Ave alignment

Lakin Cattle Company
4456 S Dysart Rd
Avondale, AZ 85323

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City, State, ZIP+4 GLENDALE, AZ 85301-6020

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Street, Apt. No.; or PO Box No. 4456 S. DYSART RD
City, State, ZIP+4: AVONDALE AZ 85323-9746

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City, State, ZIP+4: Phoenix Az 85009-

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Street, Apt. No.; or PO Box No. PO Box 301
City, State, ZIP+4: BUCKEYE AZ 85326-0025

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APPENDIX C

Survey Field Notes

C.1 Survey field notes for aerial mapping control

C.2 Survey field notes for hydrologic modeling

C.3 Survey field notes for hydraulic modeling

As-Built Data for HEC-RAS Cross Sections

Key
#'s 2 thru 10 look like keyed-in grid alignment points, and the remainder are as follows:

cbc - control brass cap
cbcf - control brass cap flush
cbchh - control brass cap in handhole
gg - ground shot
gtp - ground top of slope
gto - ground toe of slope
ggb - ground grade break
drr - drainage rip rap toes/tops

1000,870814.402,544456.204,897.976,base 112309
1001,870663.640,544362.320,890.040,cbc 62288
1002,875947.699,544398.965,912.903,cbcf 62264???
1003,878592.106,544407.586,924.186,cbcf 62260???
1004,875964.334,541750.845,907.172,cbchh 62265
62288,870663.640,544362.320,890.040,cbc
62264,875947.612,544398.953,912.488,cbc
62260,878592.089,544407.641,924.178,cbc
62265,875964.340,541750.842,907.345,cbc
115,870202.488,544386.010,889.565,bm
1005,870202.516,544385.951,889.624,bm 115
1006,870050.693,544813.384,905.283,abut c/l
1007,868159.912,545641.094,905.343,abut c/l
10,868220.064,545778.504,905.343,1-w
2,868460.676,546328.145,905.343,2e
3,868079.708,545457.880,905.343,1w
4,868019.555,545320.469,905.343,2-w
5,869860.209,544378.251,905.283,2-w
6,869990.540,544675.974,905.283,1-w
7,870120.872,544973.696,905.283,1-e
8,870301.330,545385.927,905.283,2-e
5000,870029.028,544346.427,891.347,gg
5001,869943.482,544346.390,892.211,gg
5002,869849.597,544363.687,891.643,gtp
5003,869753.740,544360.891,891.250,gtp
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APPENDIX D

Hydrologic Analysis Supporting Documentation

D.1 Precipitation data - None

D.2 Physical parameter calculations - None

D.3 Hydrograph routing data - None

D.4 Reservoir routing data - None

D.5 Flow splits and diversions data - None

D.6 Hydrologic calculations - None

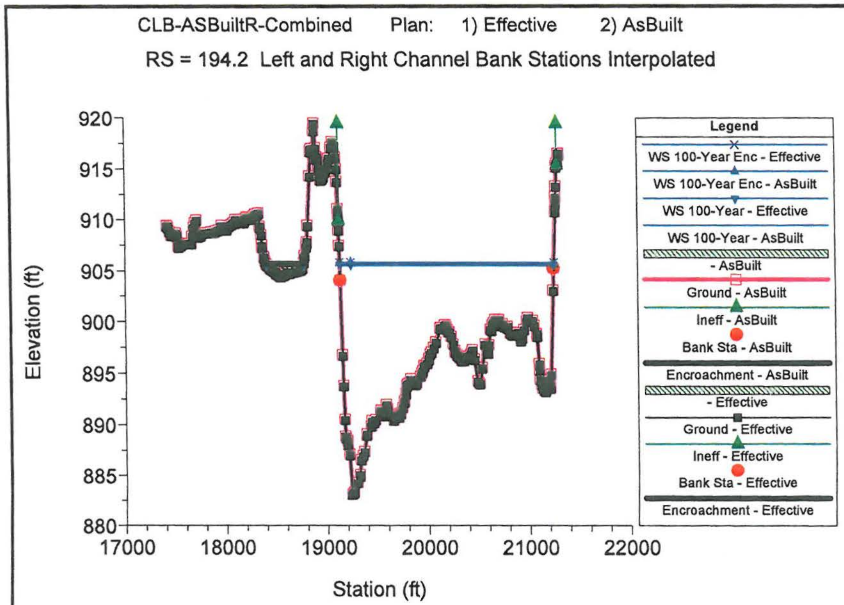
APPENDIX E

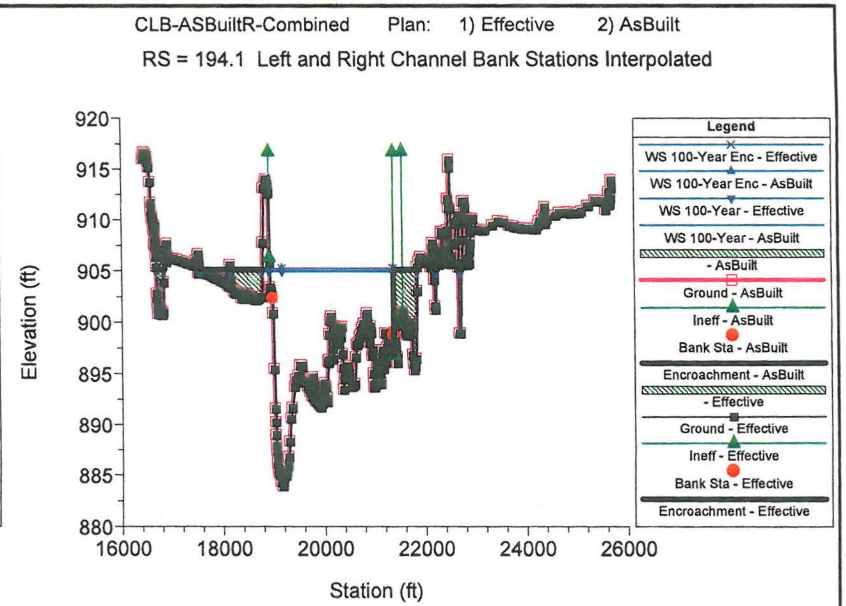
HYDRAULIC ANALYSIS SUPPORTING DOCUMENTATION

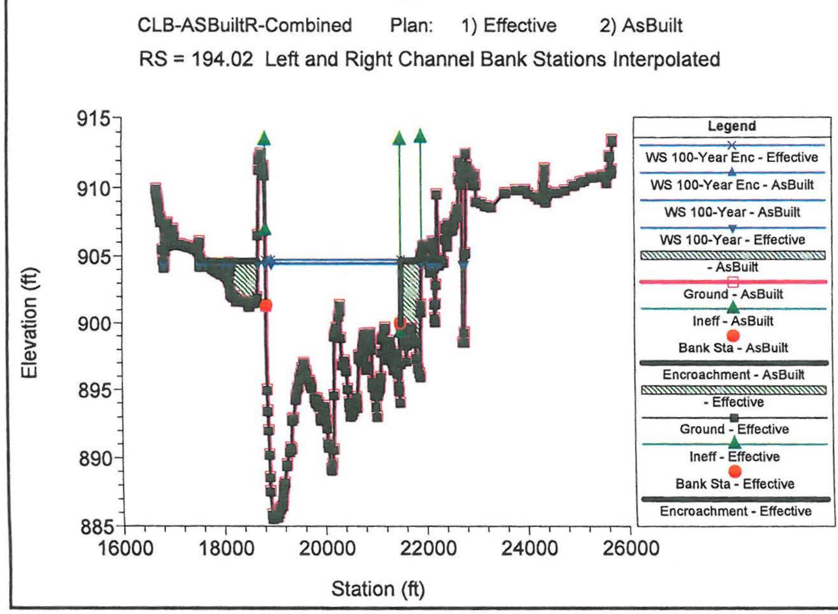
E.1 Roughness Coefficient Estimation

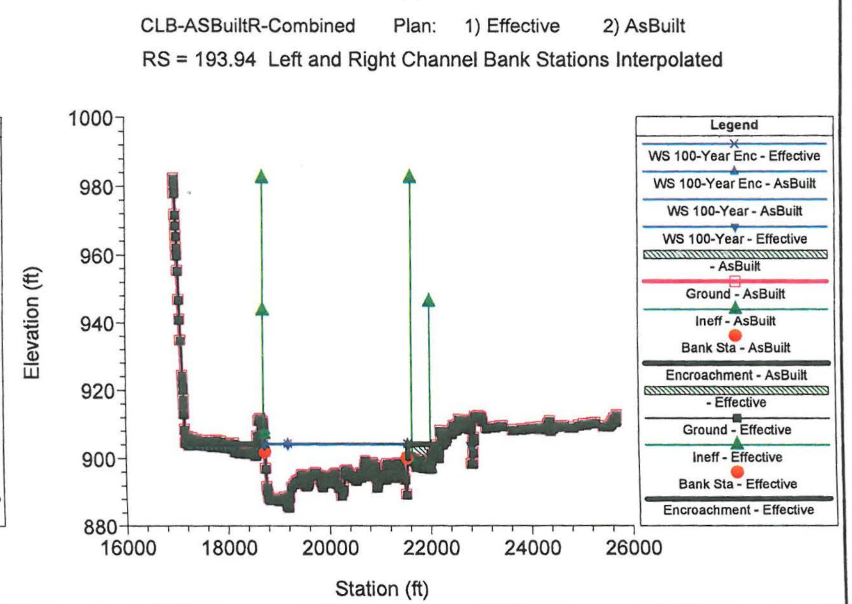
Included in Text

E.2 Cross Section Plots
As-Built Conditions Model
Compared with Effective Model


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 194.2 Left and Right Channel Bank Stations Interpolated
Elevation (ft)
920
915
910
905
900
895
890
885
880
17000
18000
19000
20000
21000
22000
Station (ft)
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective

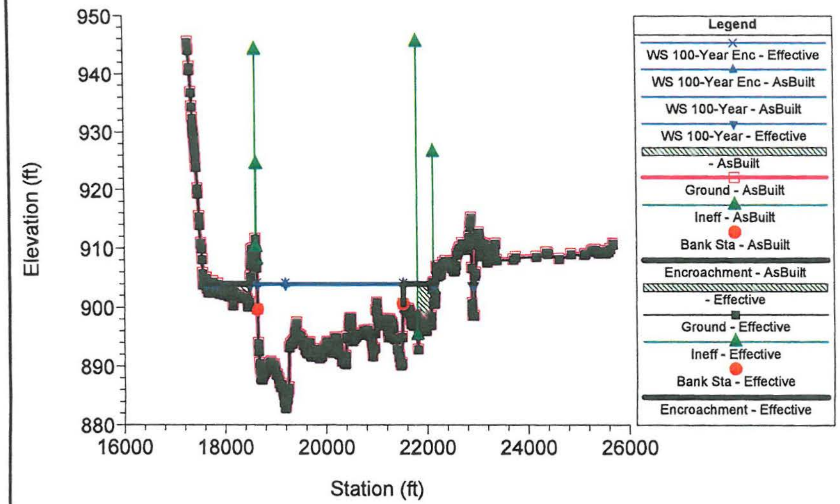

CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 194.1 Left and Right Channel Bank Stations Interpolated
Elevation (ft)
920
915
910
905
900
895
890
885
880
16000
18000
20000
22000
24000
26000
Station (ft)
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 194.02 Left and Right Channel Bank Stations Interpolated
Elevation (ft)
915
910
905
900
895
890
885
16000
18000
20000
22000
24000
26000
Station (ft)
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - AsBuilt
WS 100-Year - Effective
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 193.94 Left and Right Channel Bank Stations Interpolated
Elevation (ft)
1000
980
960
940
920
900
880
16000
18000
20000
22000
24000
26000
Station (ft)
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - AsBuilt
WS 100-Year - Effective
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective

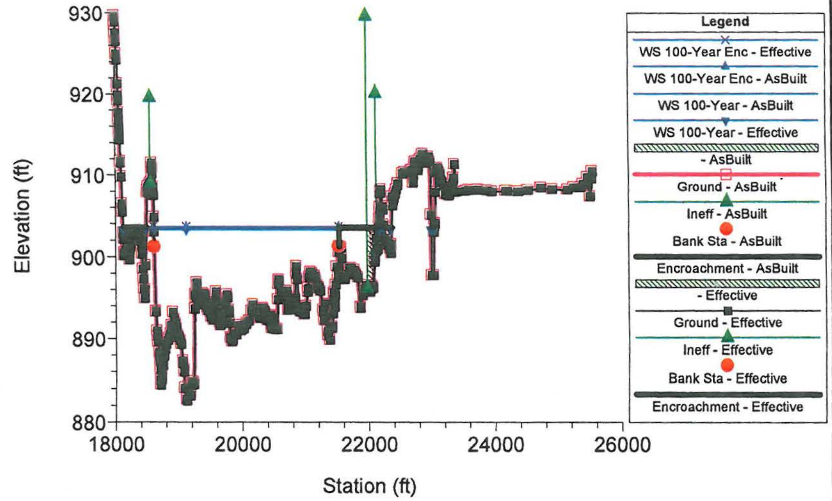
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.87 Left and Right Channel Bank Stations Interpolated



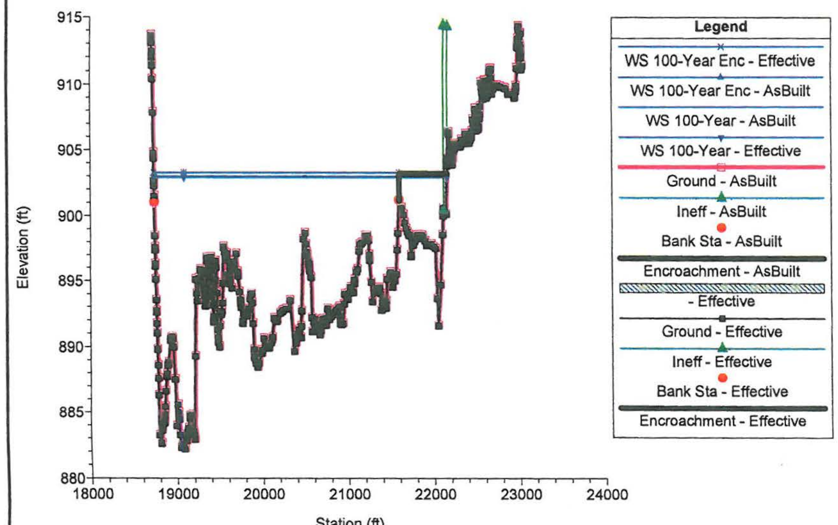
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.79 Left and Right Channel Bank Stations Interpolated



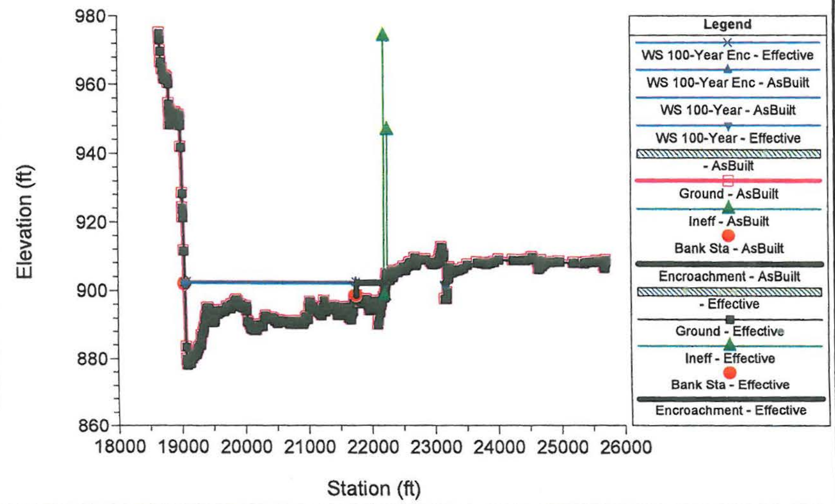
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.73 Left and Right Channel Bank Stations Interpolated



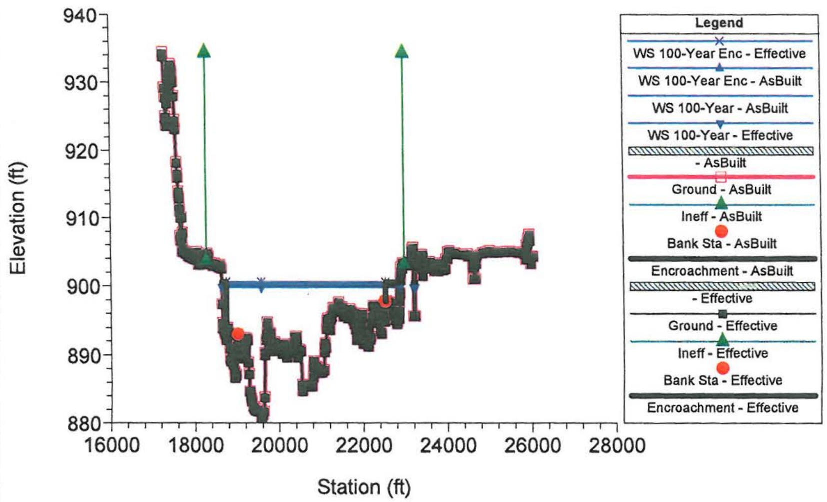
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.62 Left and Right Channel Bank Stations Interpolated



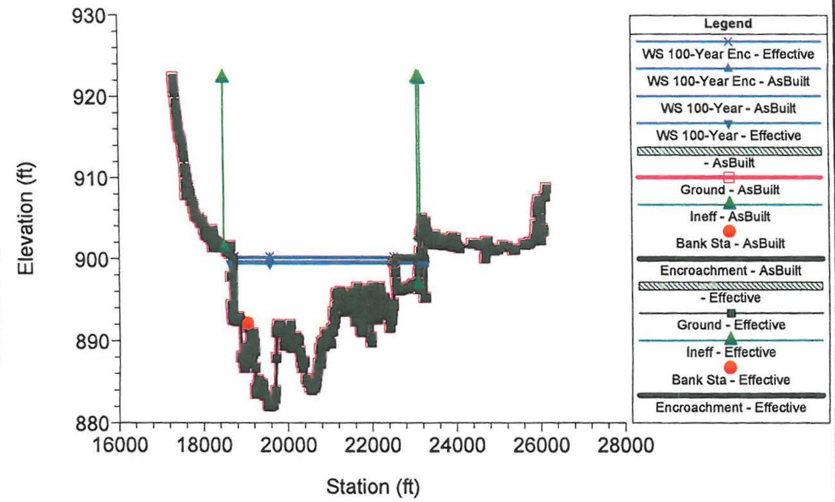
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.16 Left Channel Bank Station Interpolated



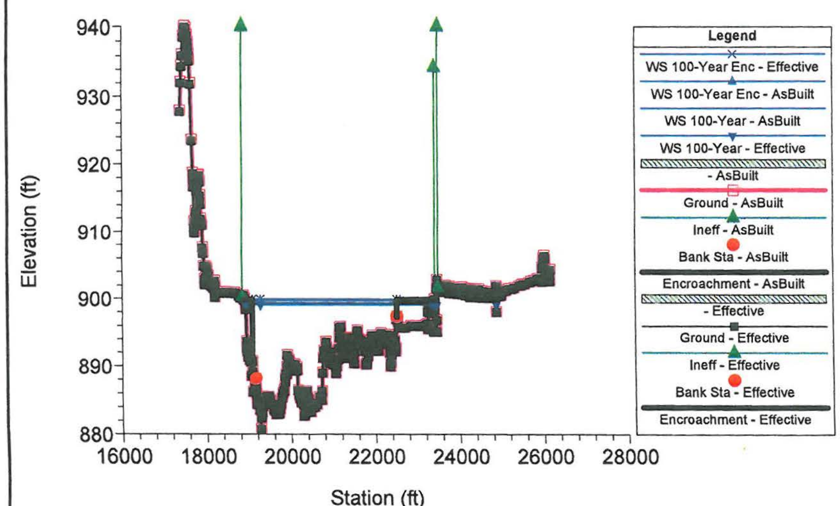
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.07



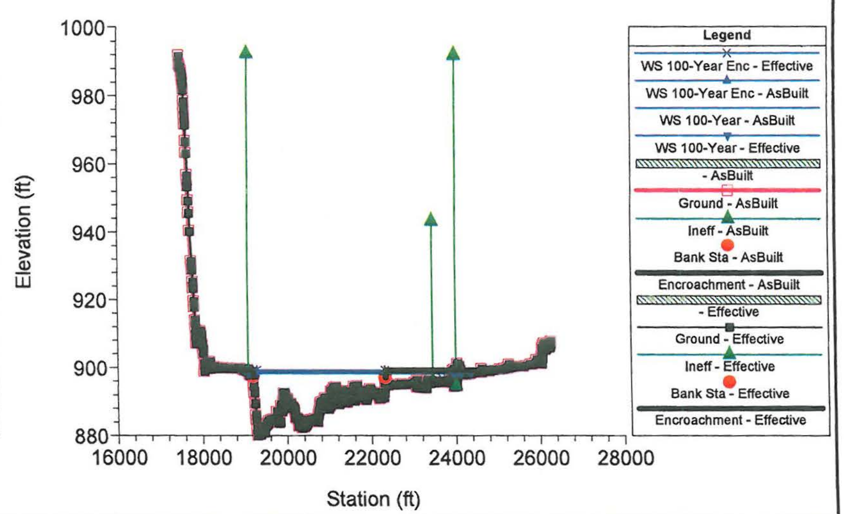
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 192.98



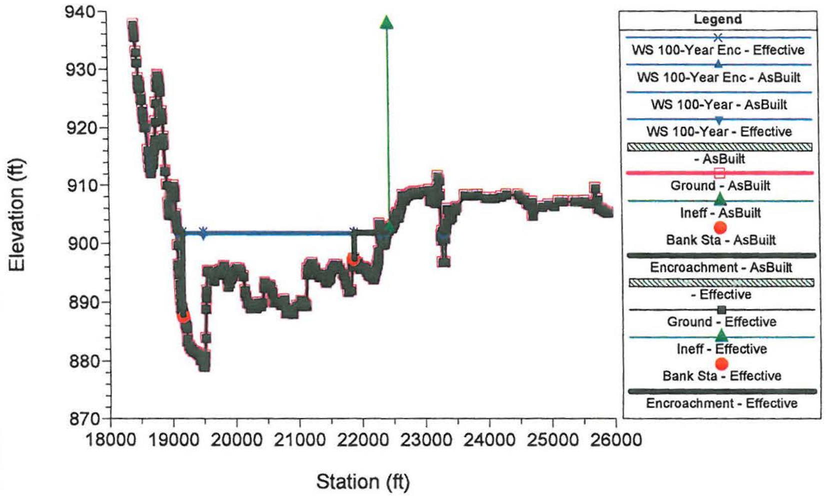
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 192.89



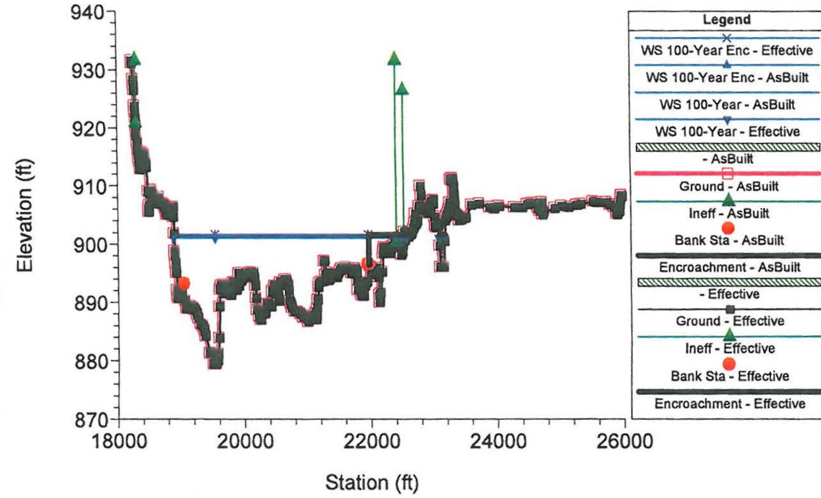
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.53



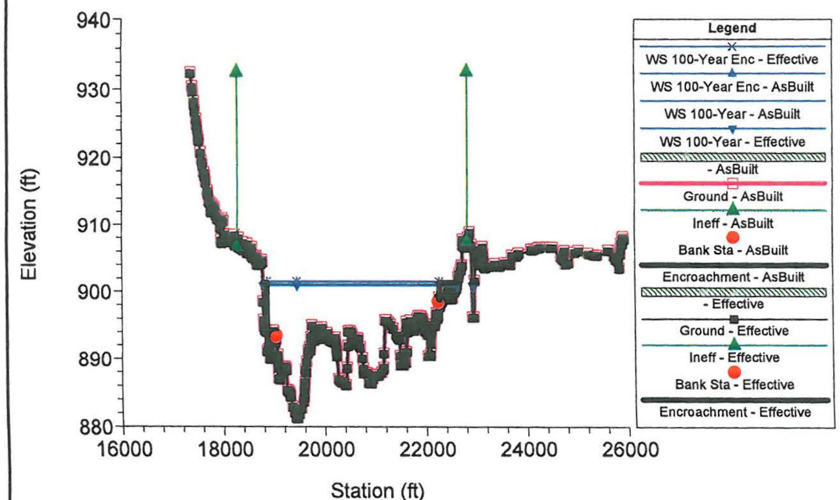
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.43 Left and Right Channel Bank Stations Interpolated



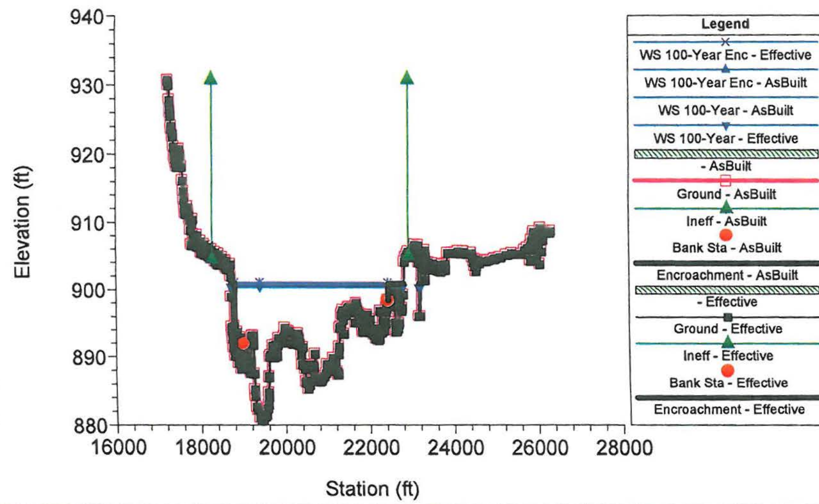
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 193.34 Left Channel Bank Station Interpolated

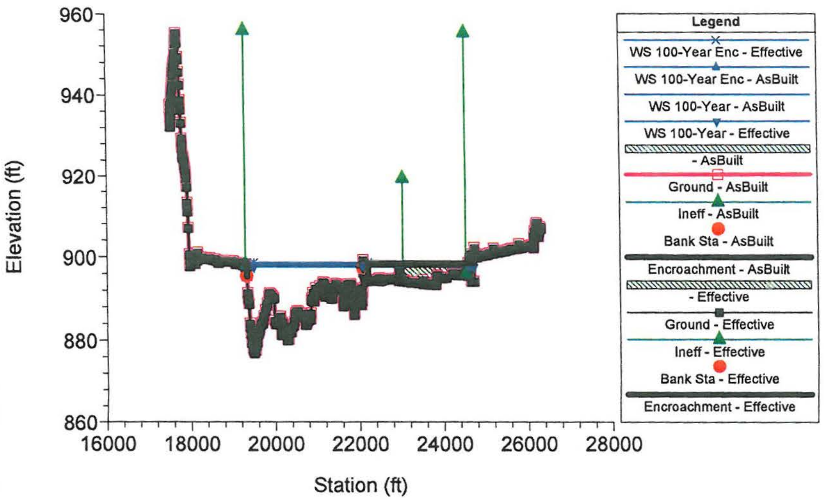


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

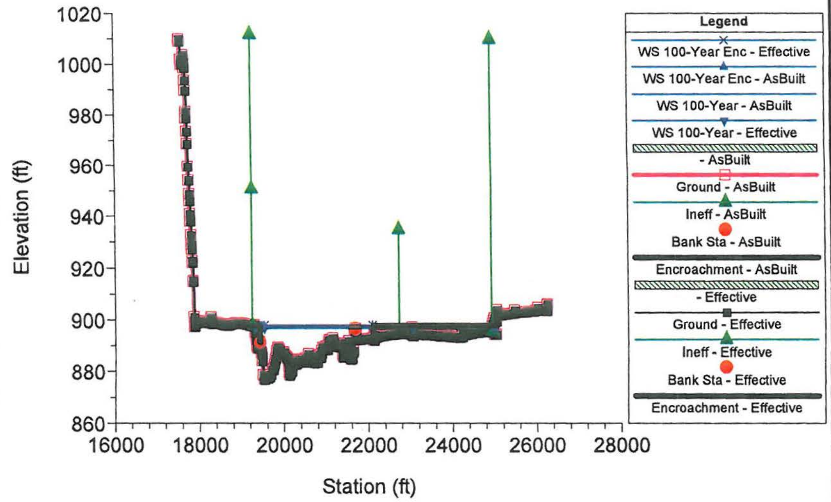
RS = 193.25 Left Channel Bank Station Interpolated



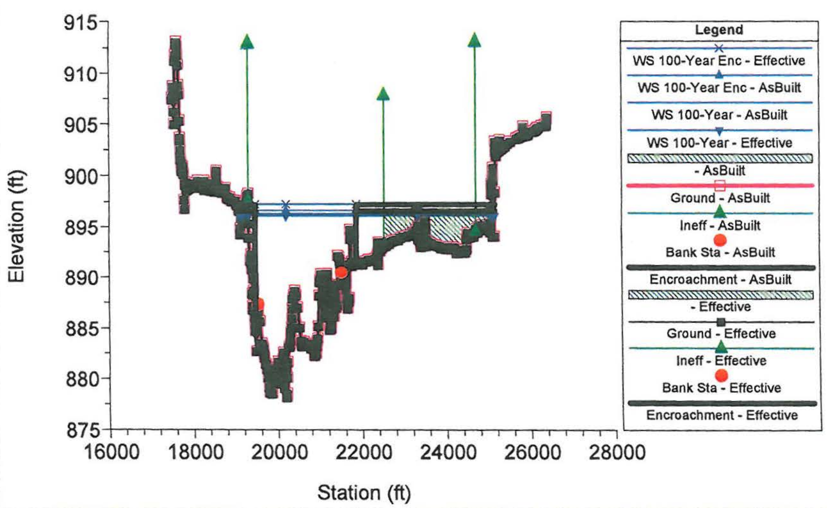
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 192.79



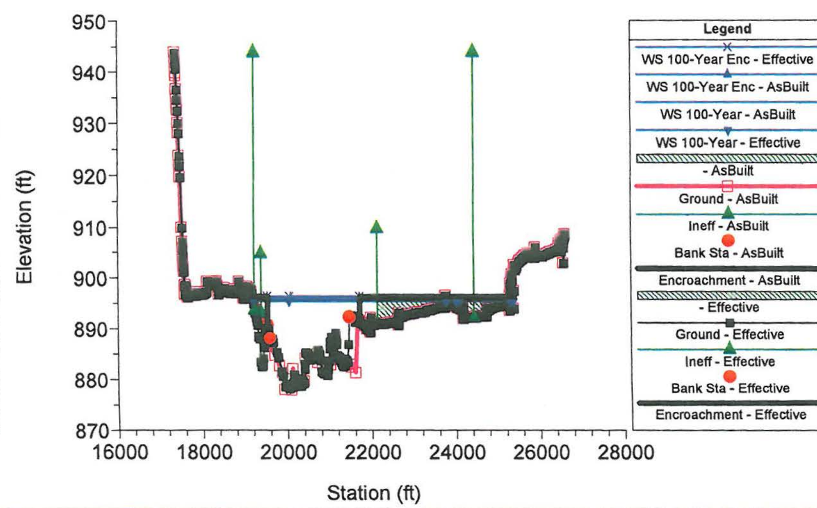
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 192.7



CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 192.61

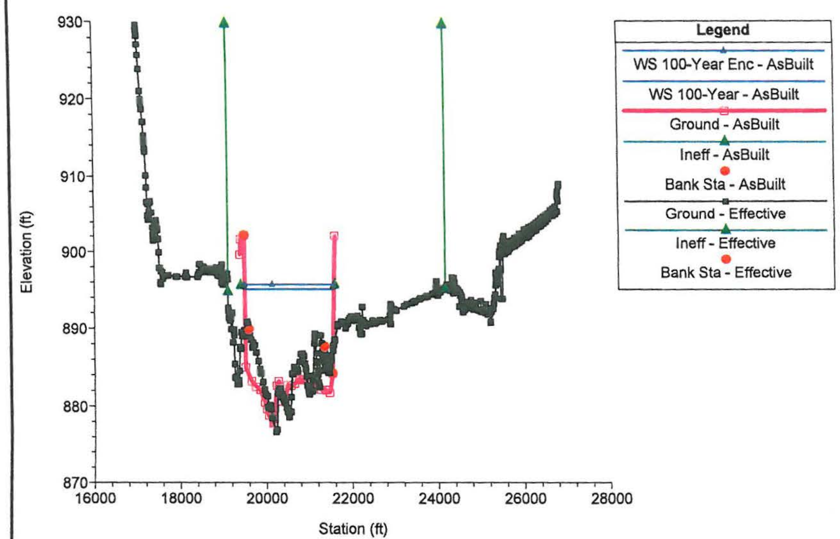


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 192.52



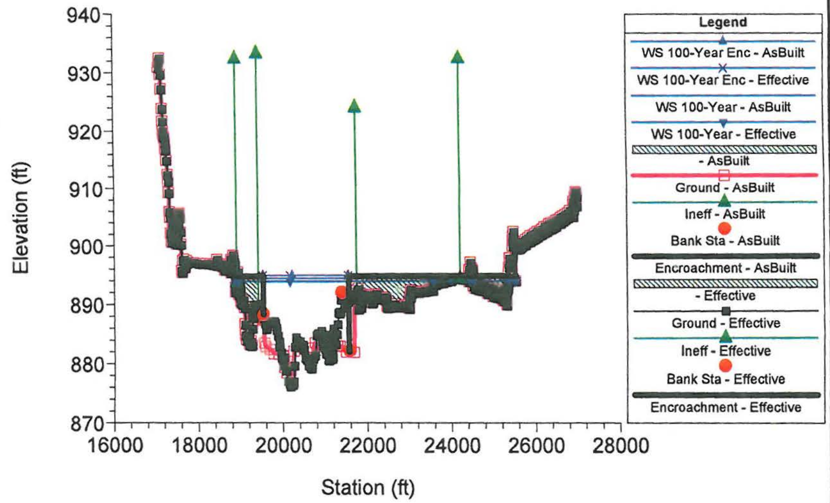
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 192.41 Left Bank Channel Station Interpolated



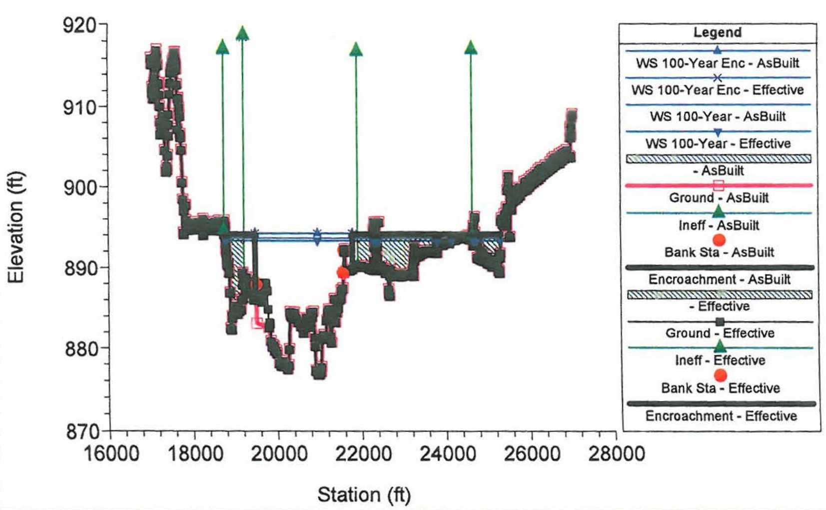
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

RS = 192.33 Left Bank Channel Station Interpolated



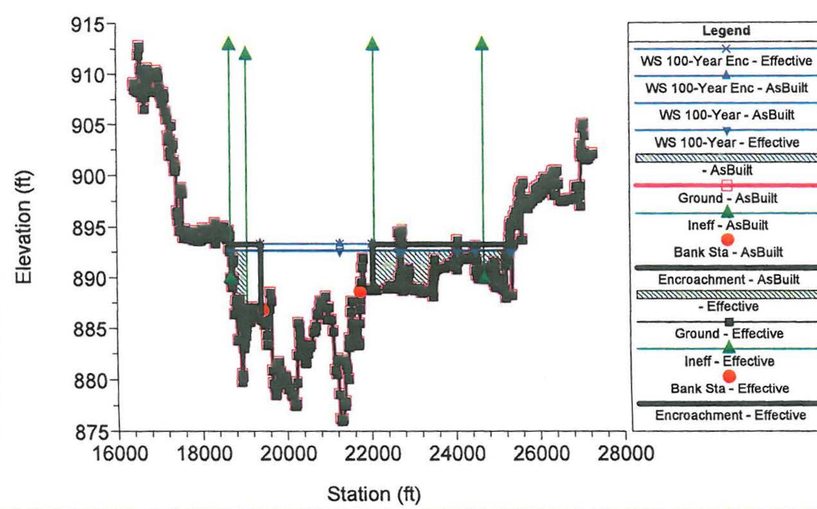
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

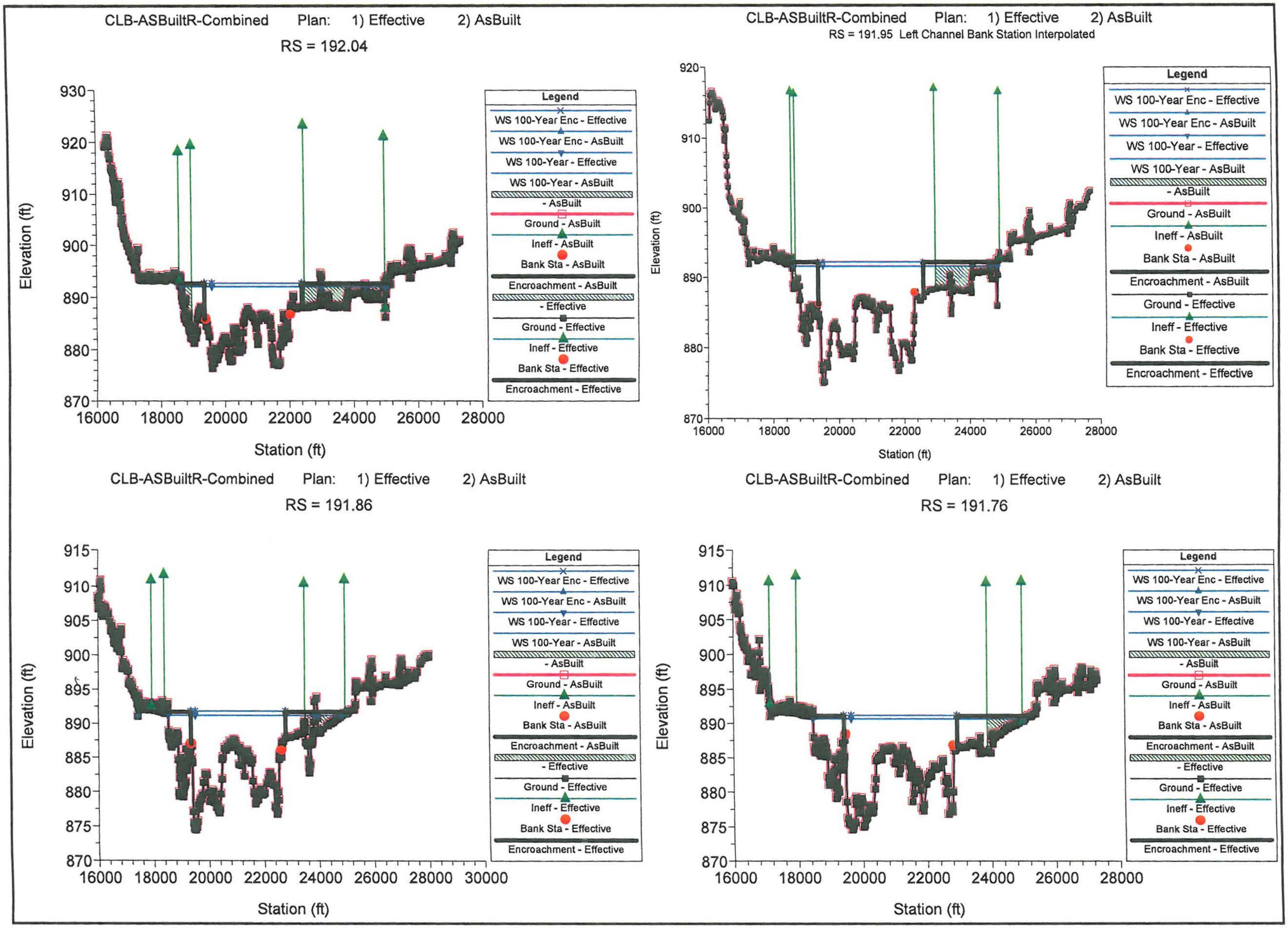
RS = 192.23 CROSSES COTTON LN. ALIGNMENT AT CENTERLINE OF 100 YR FLOW

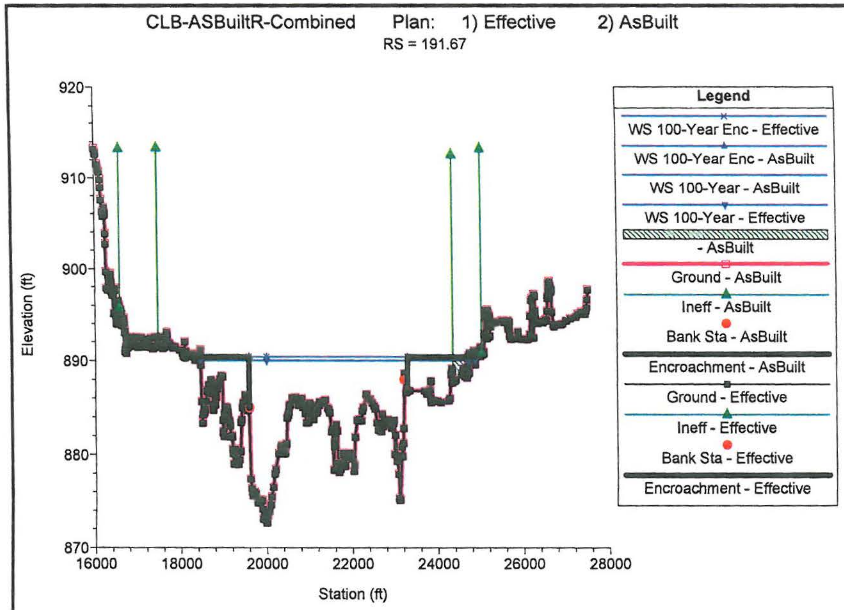


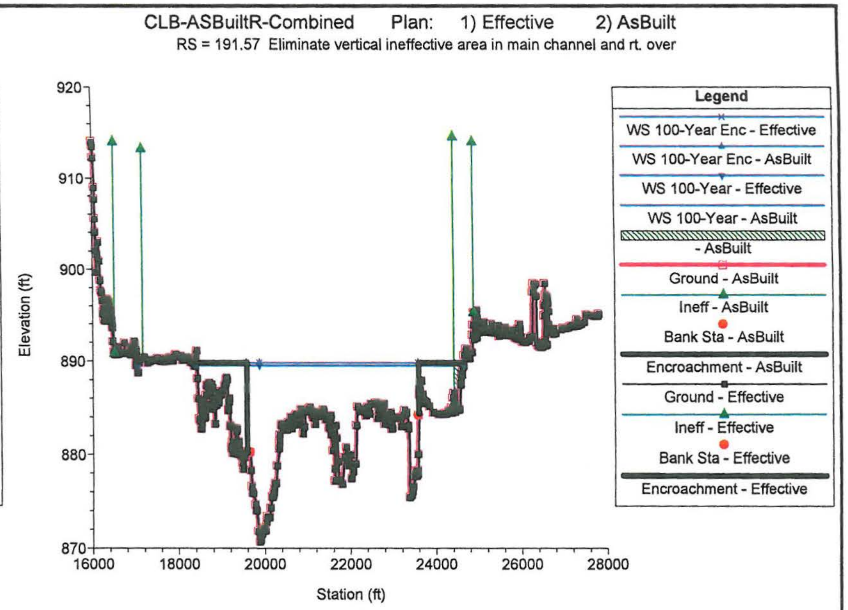
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt

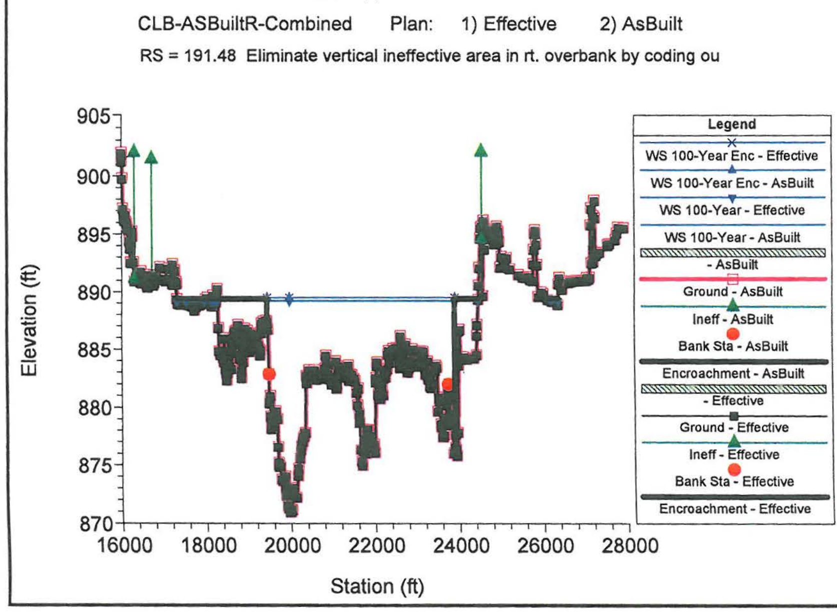
RS = 192.14 Left Channel Bank Station Interpolated

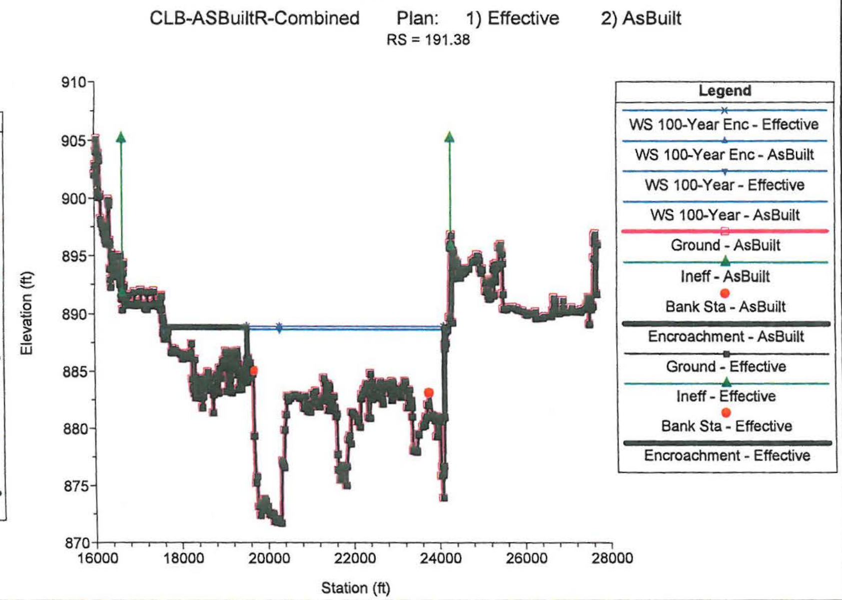



CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 192.04
Elevation (ft)
Station (ft)
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.95 Left Channel Bank Station Interpolated
Elevation (ft)
Station (ft)
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.86
Elevation (ft)
Station (ft)
CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.76
Elevation (ft)
Station (ft)


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.67
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - AsBuilt
WS 100-Year - Effective
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective
Elevation (ft)
Station (ft)


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.57 Eliminate vertical ineffective area in main channel and rt. over
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective
Elevation (ft)
Station (ft)


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.48 Eliminate vertical ineffective area in rt. overbank by coding ou
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
- AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
- Effective
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective
Elevation (ft)
Station (ft)


CLB-ASBuiltR-Combined Plan: 1) Effective 2) AsBuilt
RS = 191.38
Legend
WS 100-Year Enc - Effective
WS 100-Year Enc - AsBuilt
WS 100-Year - Effective
WS 100-Year - AsBuilt
Ground - AsBuilt
Ineff - AsBuilt
Bank Sta - AsBuilt
Encroachment - AsBuilt
Ground - Effective
Ineff - Effective
Bank Sta - Effective
Encroachment - Effective
Elevation (ft)
Station (ft)

E.3 Expansion and Contraction Coefficients

Cotton Lane Bridge LOMR			
HEC-RAS Contraction/Expansion Coefficients			
	River Station	Contraction	Expansion
1	194.4	0.1	0.3
2	194.29	0.1	0.3
3	194.21	0.1	0.3
4	194.205	Bridge	
5	194.2	0.1	0.3
6	194.1	0.1	0.3
7	194.02	0.1	0.3
8	193.94	0.1	0.3
9	193.87	0.1	0.3
10	193.79	0.1	0.3
11	193.73	0.1	0.3
12	193.62	0.1	0.3
13	193.53	0.1	0.3
14	193.43	0.1	0.3
15	193.34	0.1	0.3
16	193.25	0.1	0.3
17	193.16	0.1	0.3
18	193.07	0.1	0.3
19	192.98	0.1	0.3
20	192.89	0.1	0.3
21	192.79	0.1	0.3
22	192.7	0.1	0.3
23	192.61	0.1	0.3
24	192.52	0.1	0.3
25	192.41	0.1	0.3
26	192.39	Bridge	
27	192.38	0.1	0.3
28	192.33	0.1	0.3
29	192.23	0.1	0.3
30	192.14	0.1	0.3
31	192.04	0.1	0.3
32	191.95	0.1	0.3
33	191.86	0.1	0.3
34	191.76	0.1	0.3
35	191.67	0.1	0.3
36	191.57	0.1	0.3
37	191.48	0.1	0.3
38	191.38	0.1	0.3
39	191.29	0.1	0.3

40	191.19	0.1	0.3
41	191.1	0.1	0.3
42	191	0.1	0.3
43	190.91	0.1	0.3
44	190.81	0.1	0.3
45	190.72	0.1	0.3
46	190.62	0.1	0.3
47	190.53	0.1	0.3
48	190.43	0.1	0.3
49	190.34	0.1	0.3
50	190.24	0.1	0.3
51	190.15	0.1	0.3
52	190.05	0.1	0.3
53	189.96	0.1	0.3
54	189.87	0.1	0.3
55	189.77	0.1	0.3
56	189.67	0.1	0.3
57	189.58	0.1	0.3
58	189.48	0.1	0.3
59	189.39	0.1	0.3
60	189.3	0.1	0.3
61	189.21	0.1	0.3
62	189.11	0.1	0.3
63	189.02	0.1	0.3
64	188.81	0.1	0.3
65	188.69	0.1	0.3
66	188.59	0.1	0.3
67	188.5	0.1	0.3
68	188.39	0.1	0.3
69	188.29	0.1	0.3
70	188.2	0.1	0.3
71	188.1	0.1	0.3
72	188.07	0.1	0.3
73	188.055	Bridge	
74	188.04	0.1	0.3
75	188	0.1	0.3
76	187.91	0.1	0.3
77	187.82	0.1	0.3
78	187.73	0.1	0.3
79	187.64	0.1	0.3
80	187.54	0.1	0.3
81	187.45	0.1	0.3
82	187.36	0.1	0.3
83	187.24	0.1	0.3
84	187.15	0.1	0.3
85	187.06	0.1	0.3

E.4 Analysis of Structures

Structures were Analyzed Using Standard HEC-RAS Bridge Routines

E.5 Hydraulic Calculations

APPENDIX F

Sediment Transport

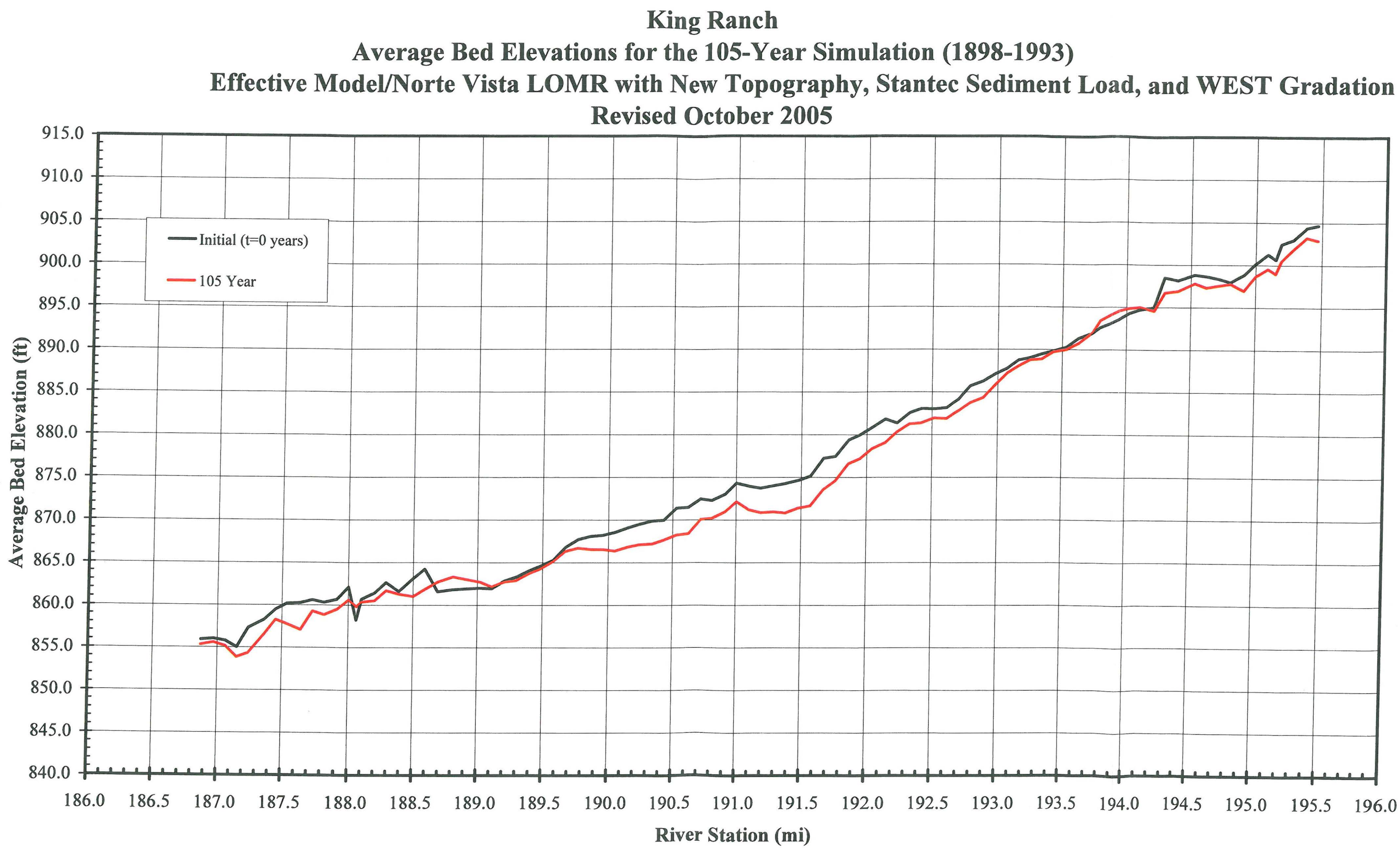
HEC-6T Model Results

APPENDIX F

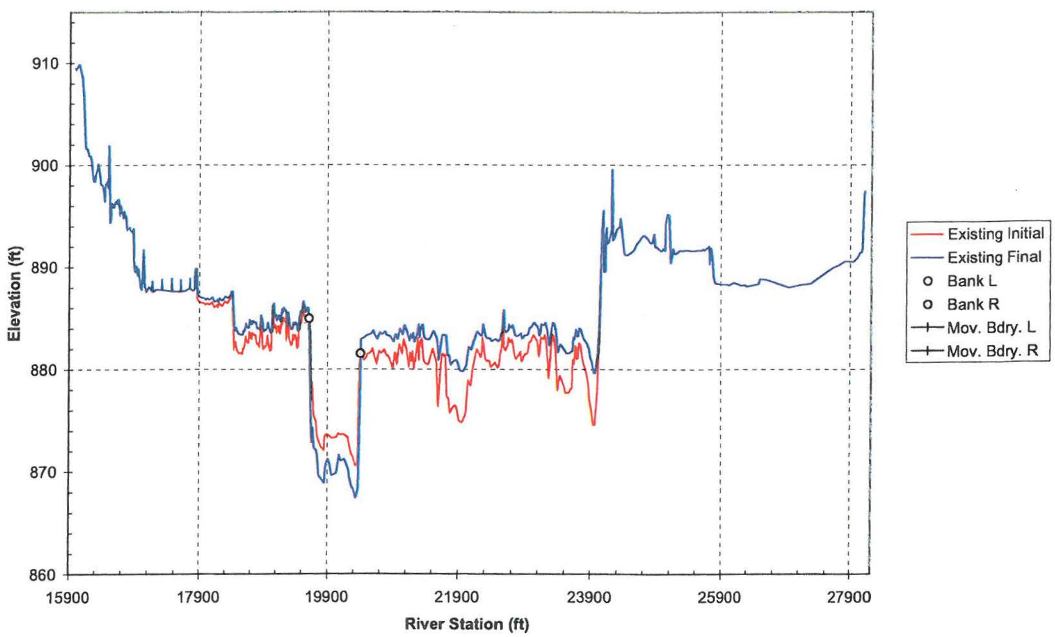
SECTION 1

Sediment Transport HEC-6T Model Results

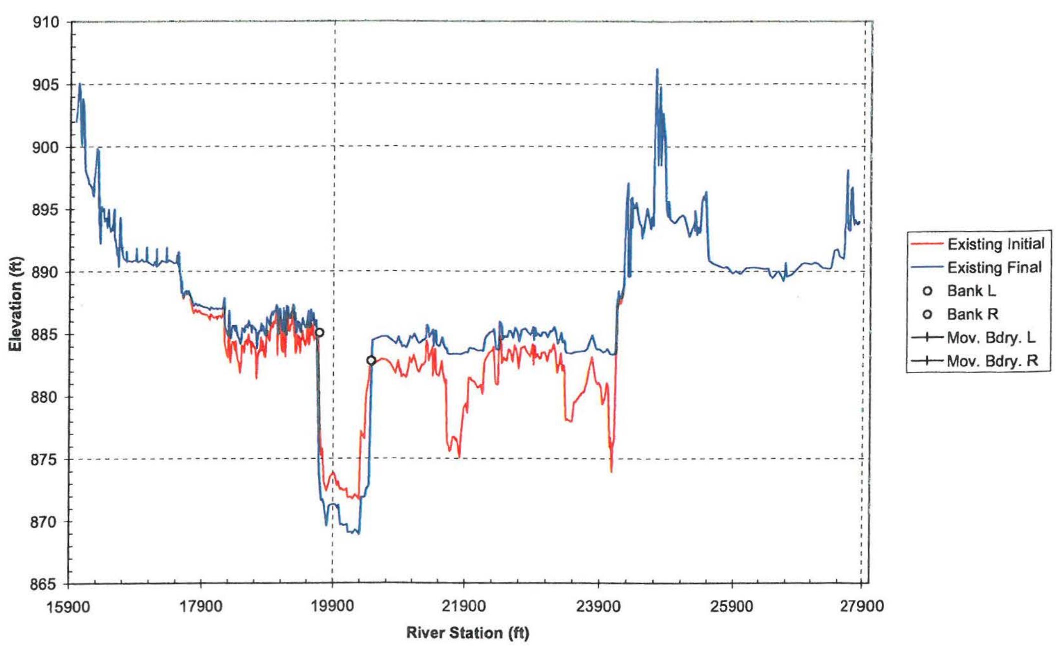
EXISTING CONDITIONS


King Ranch
Average Bed Elevations for the 105-Year Simulation (1898-1993)
Effective Model/Norte Vista LOMR with New Topography, Stantec Sediment Load, and WEST Gradation
Revised October 2005
Initial (t=0 years)
105 Year
Average Bed Elevation (ft)
915.0
910.0
905.0
900.0
895.0
890.0
885.0
880.0
875.0
870.0
865.0
860.0
855.0
850.0
845.0
840.0
186.0
186.5
187.0
187.5
188.0
188.5
189.0
189.5
190.0
190.5
191.0
191.5
192.0
192.5
193.0
193.5
194.0
194.5
195.0
195.5
196.0
River Station (mi)

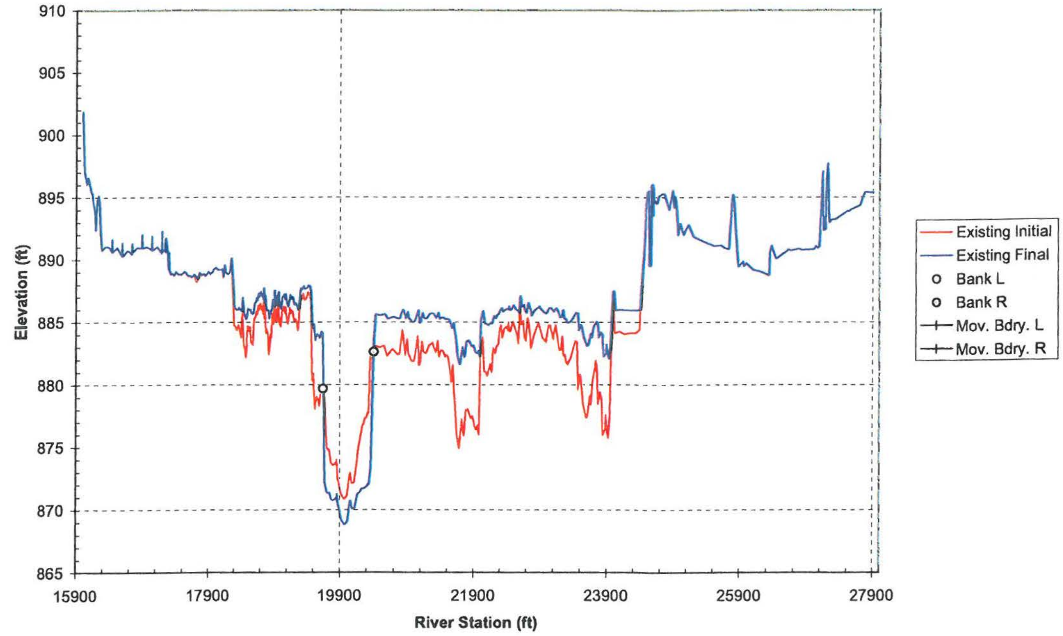
Cross Section 191.29



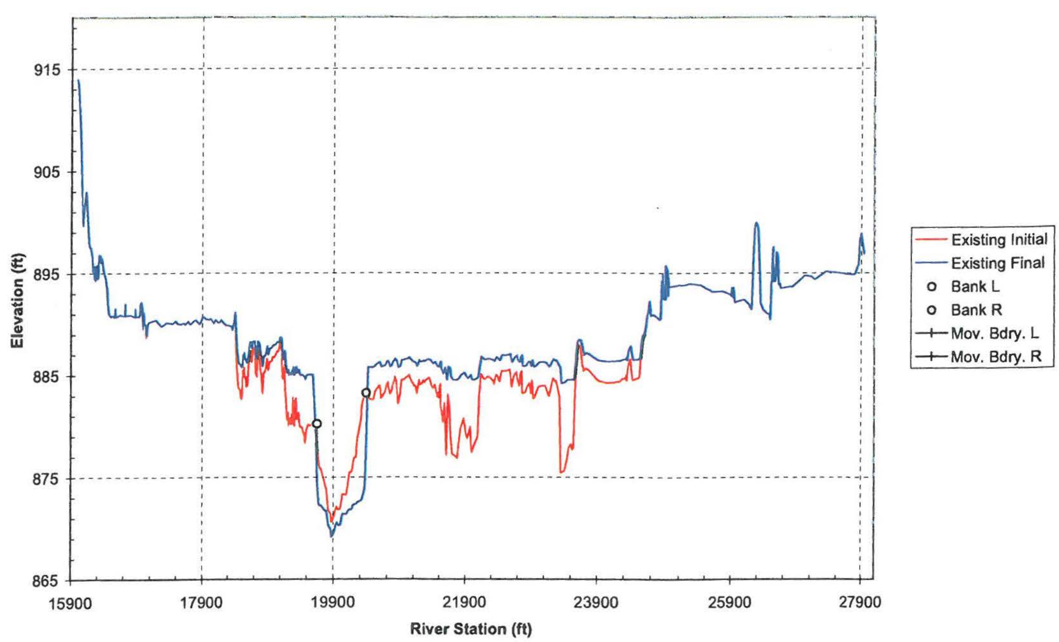
Cross Section 191.38



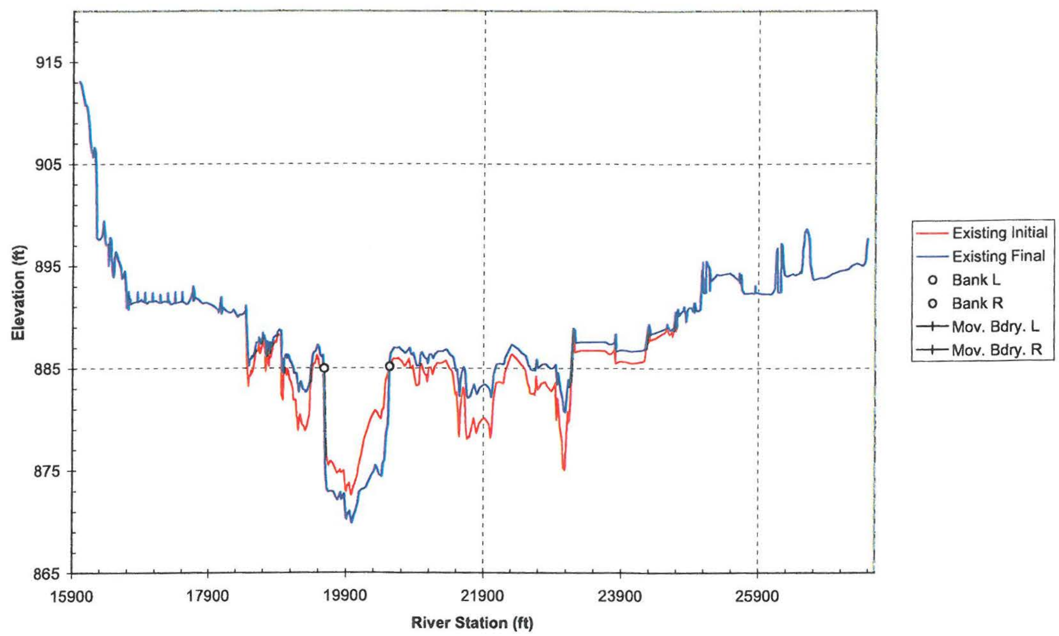
Cross Section 191.48



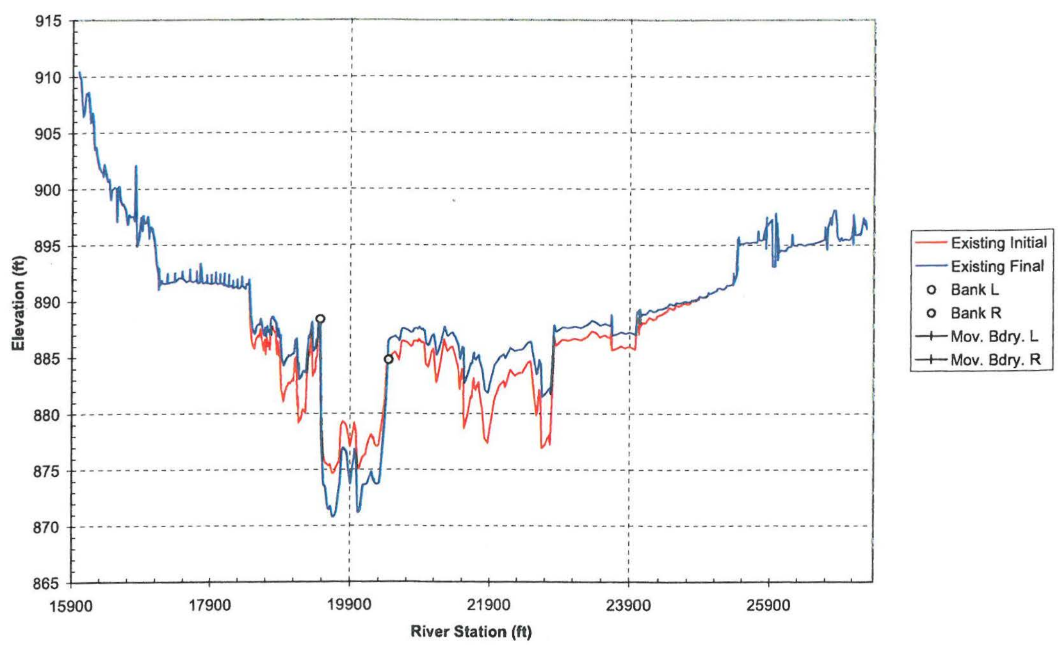
Cross Section 191.57



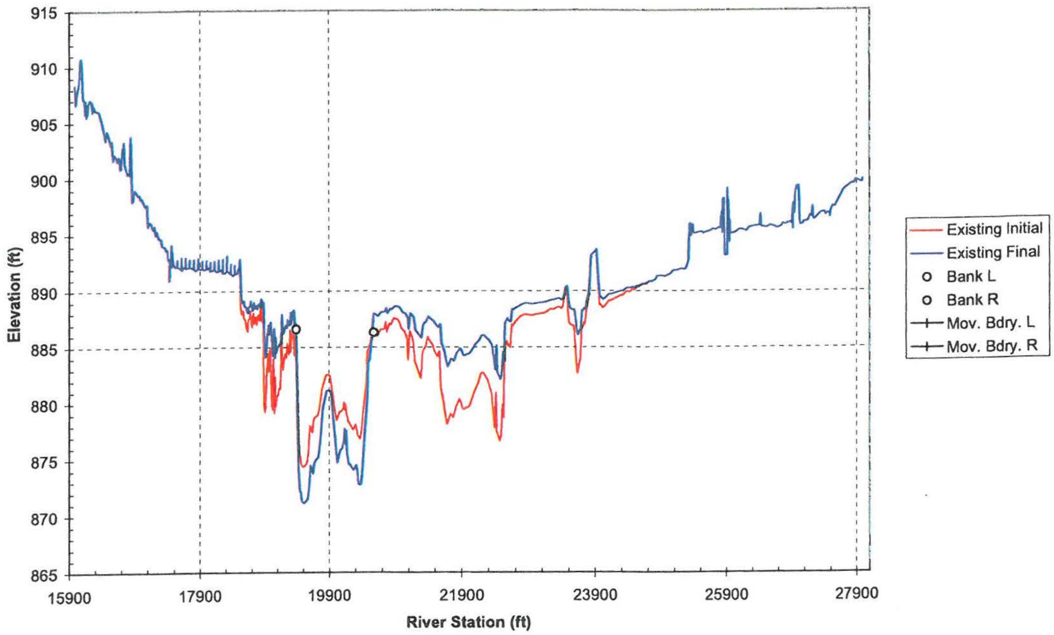
Cross Section 191.67



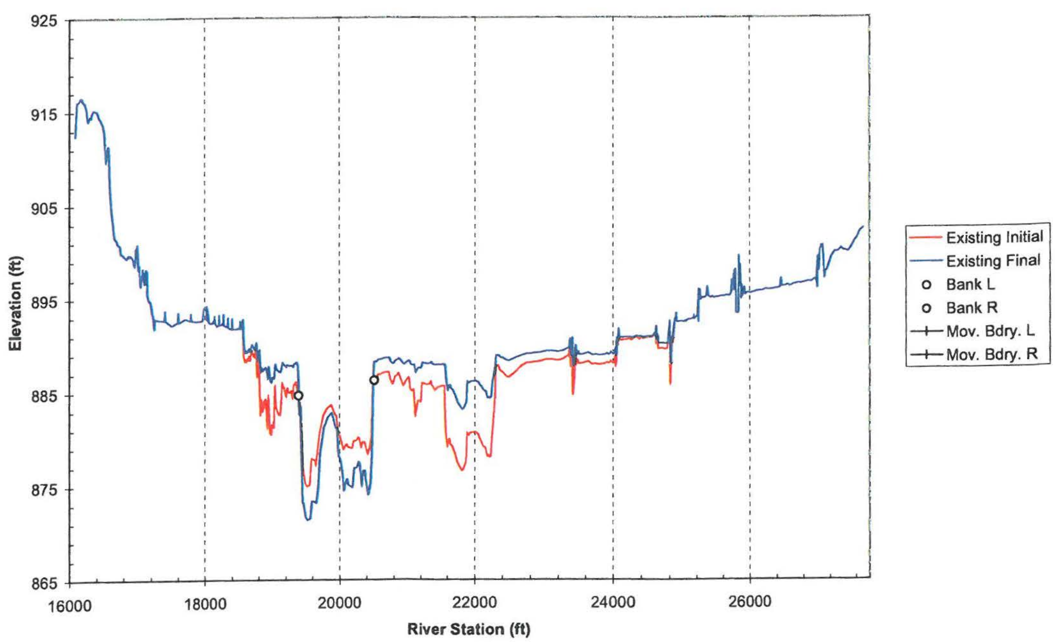
Cross Section 191.76



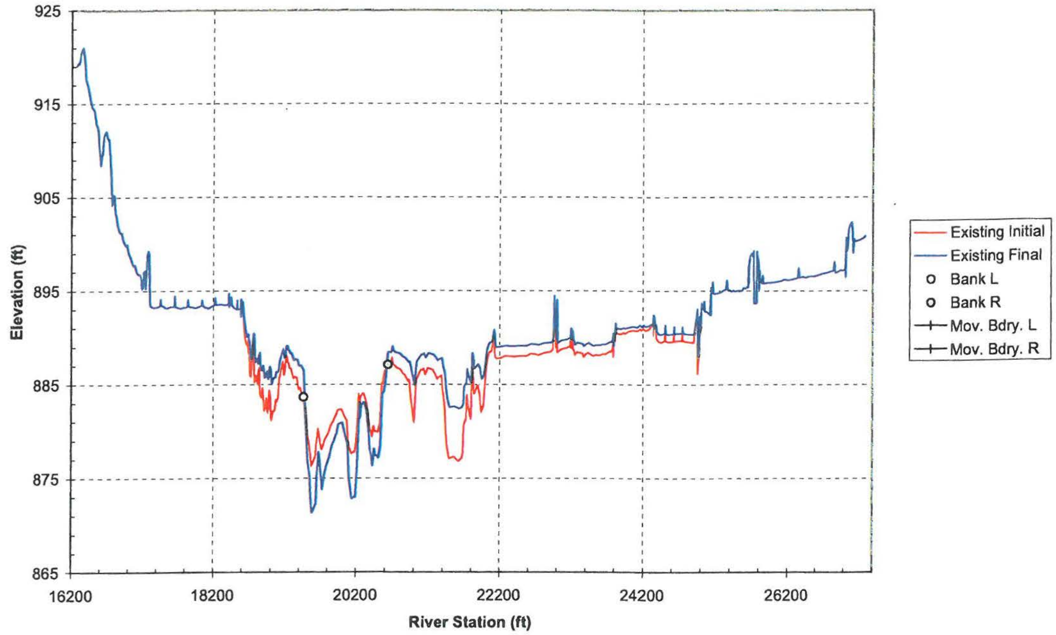
Cross Section 191.86



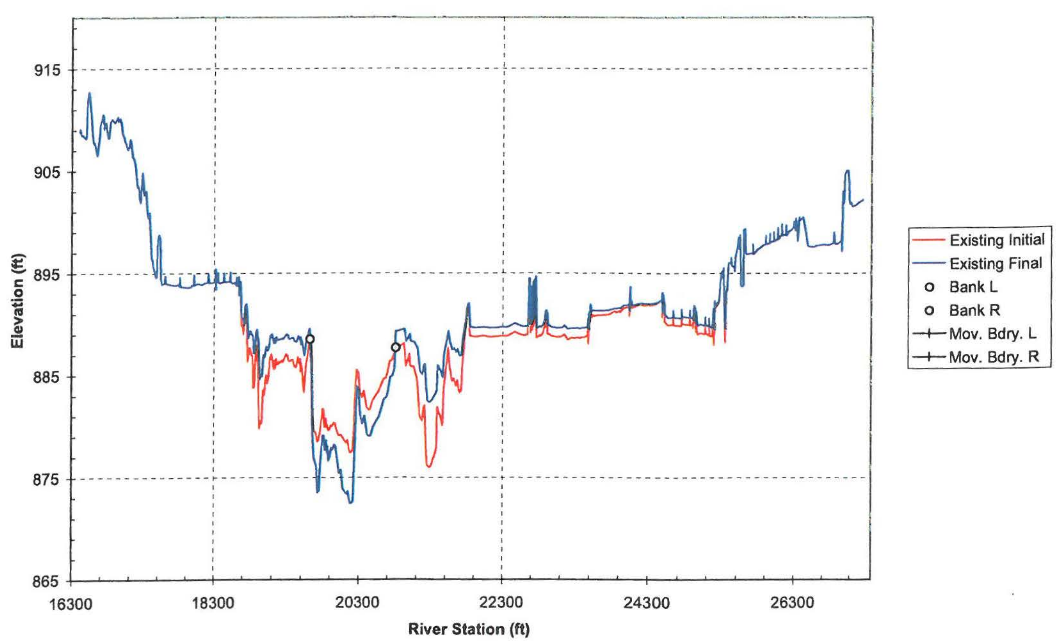
Cross Section 191.95



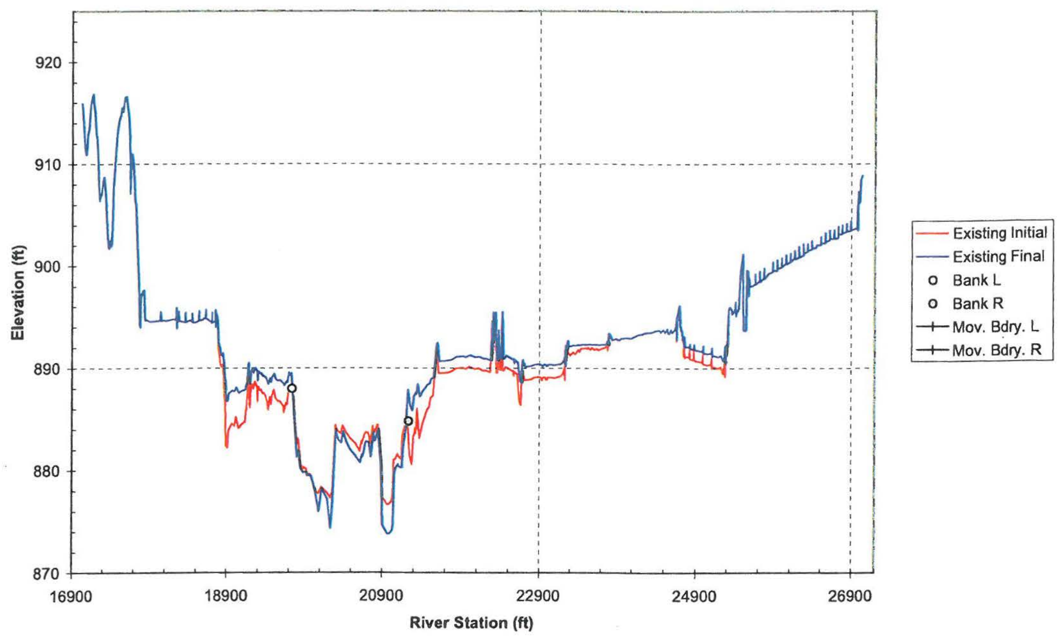
Cross Section 192.04



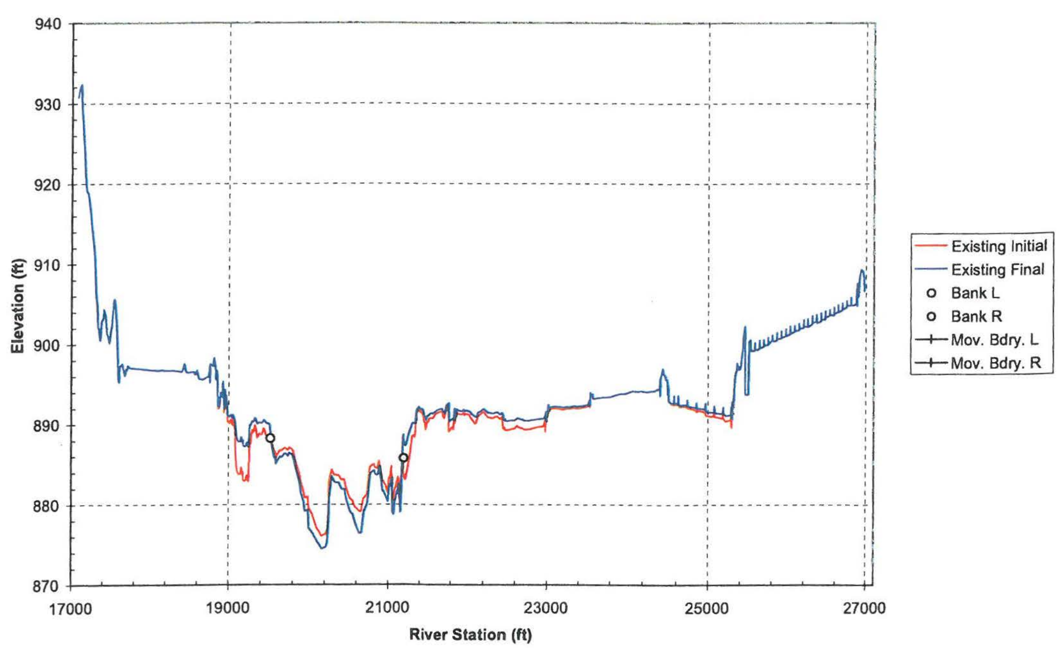
Cross Section 192.14



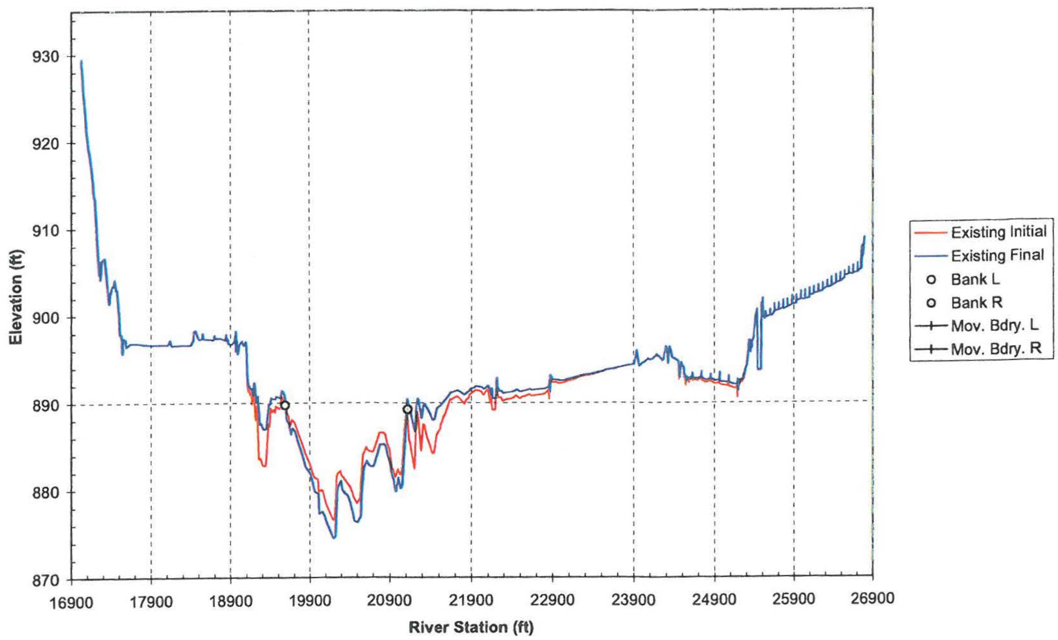
Cross Section 192.23



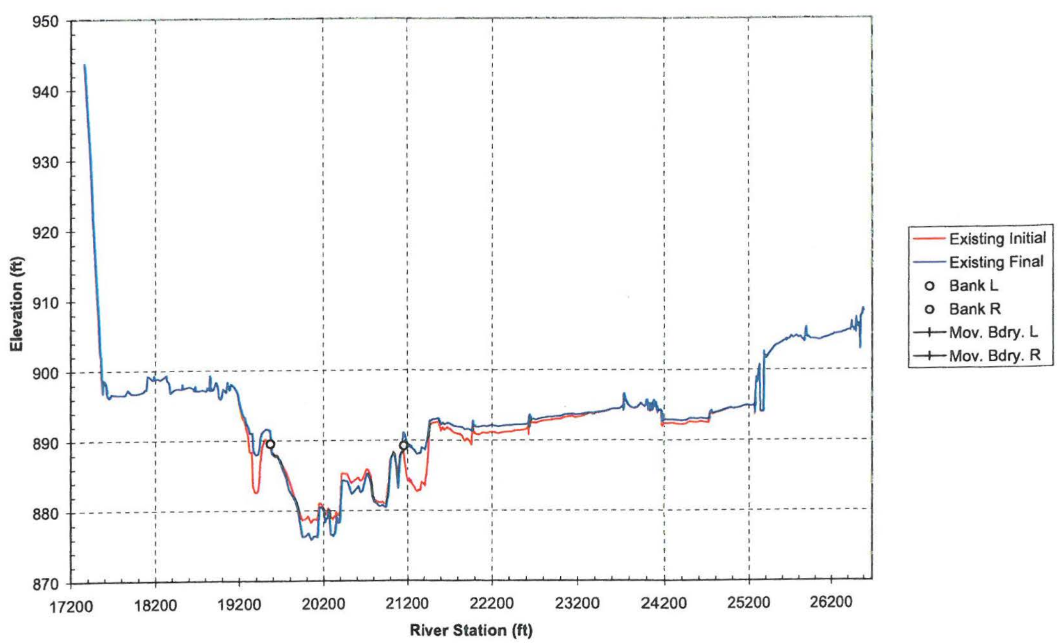
Cross Section 192.33



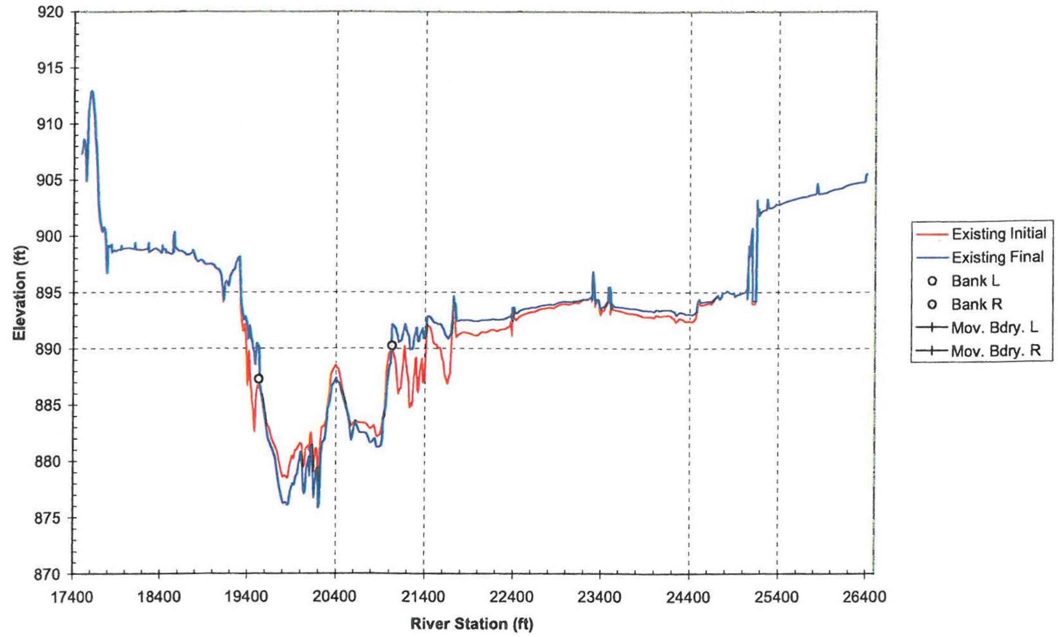
Cross Section 192.42



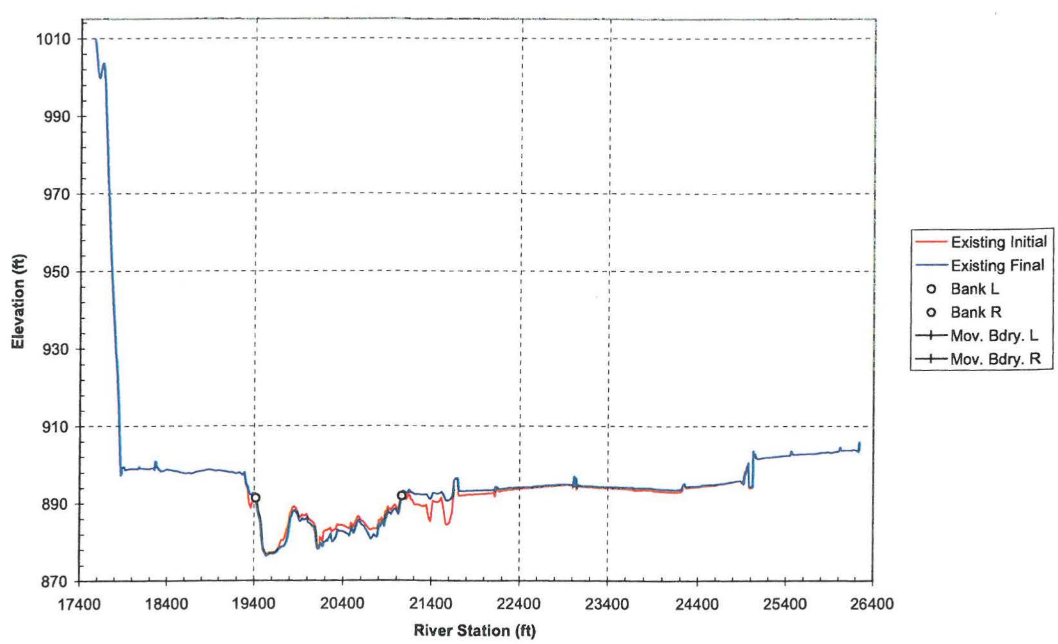
Cross Section 192.52



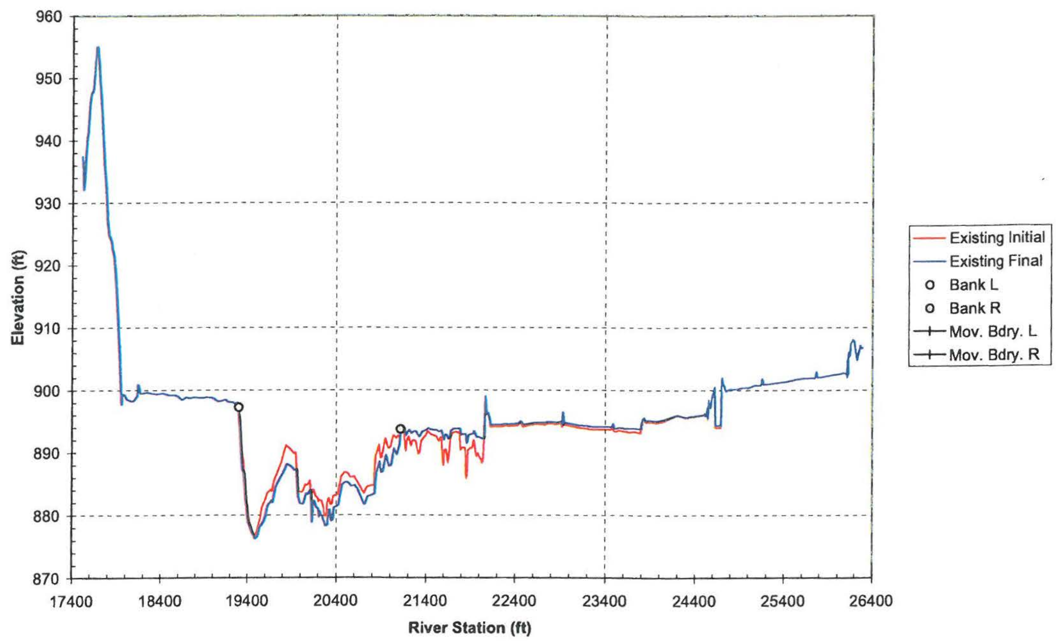
Cross Section 192.61



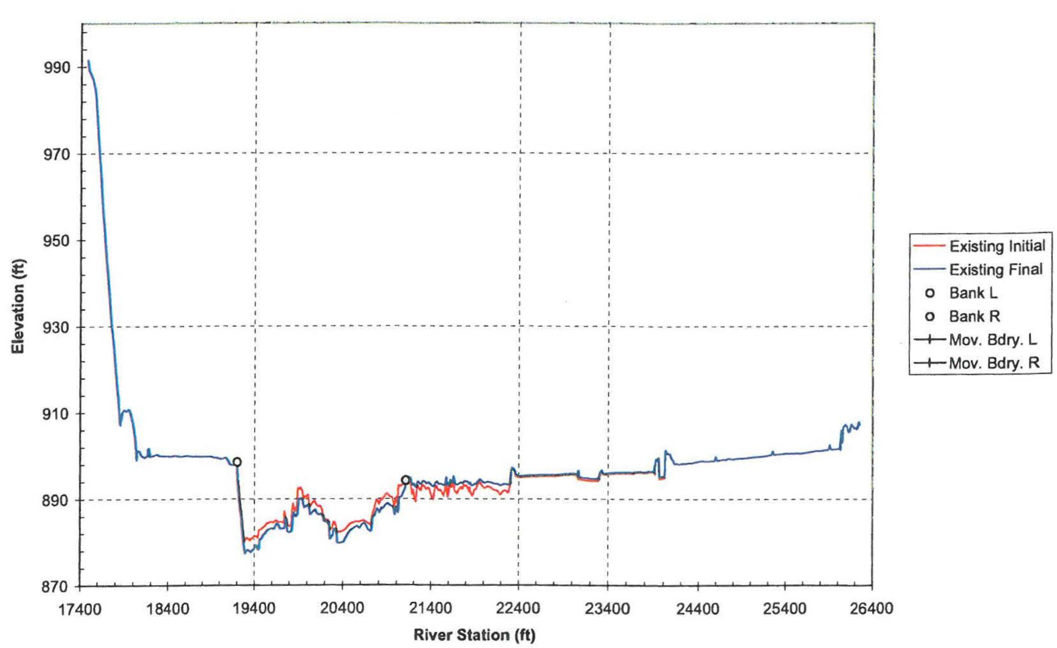
Cross Section 192.7



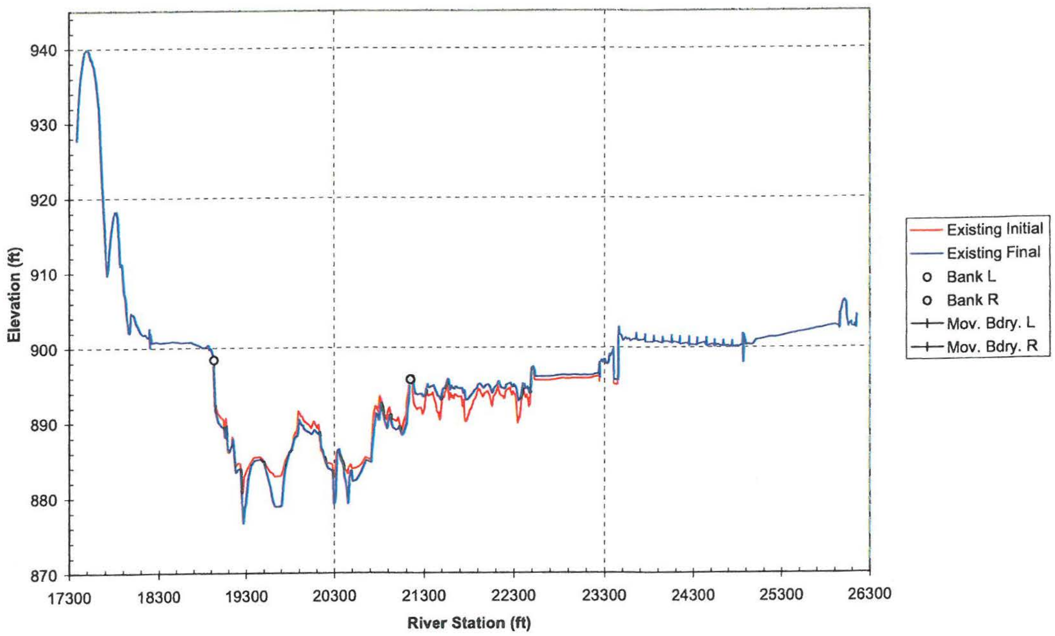
Cross Section 192.79



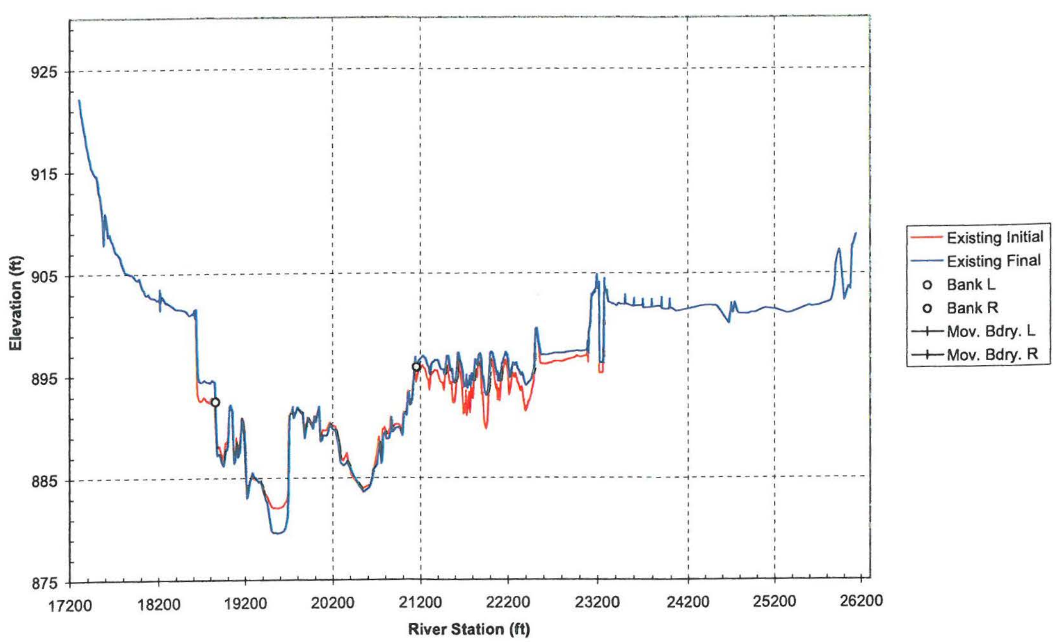
Cross Section 192.89



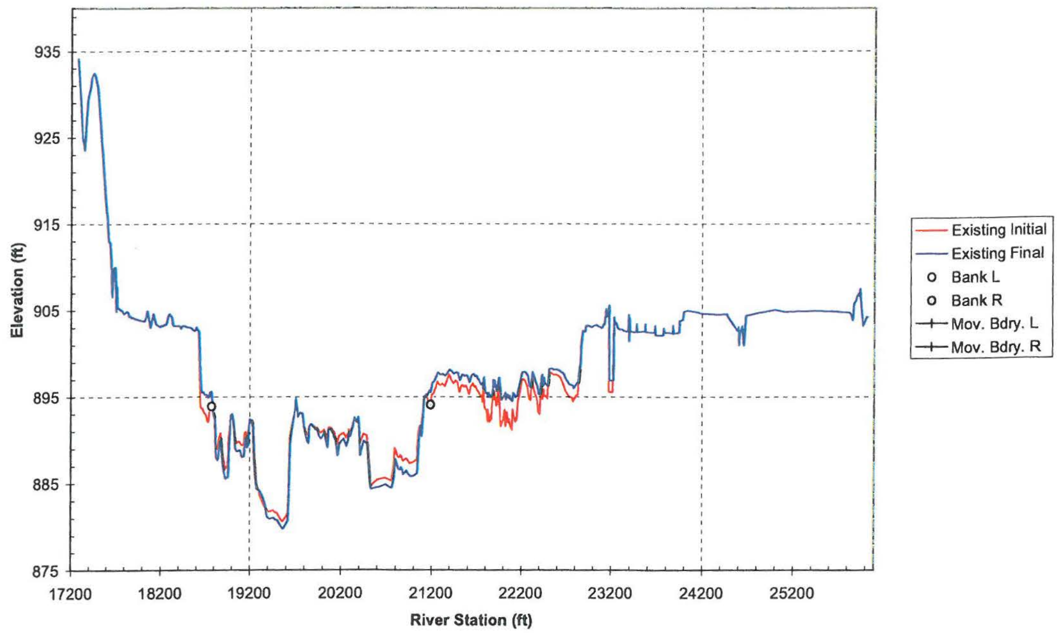
Cross Section 192.98



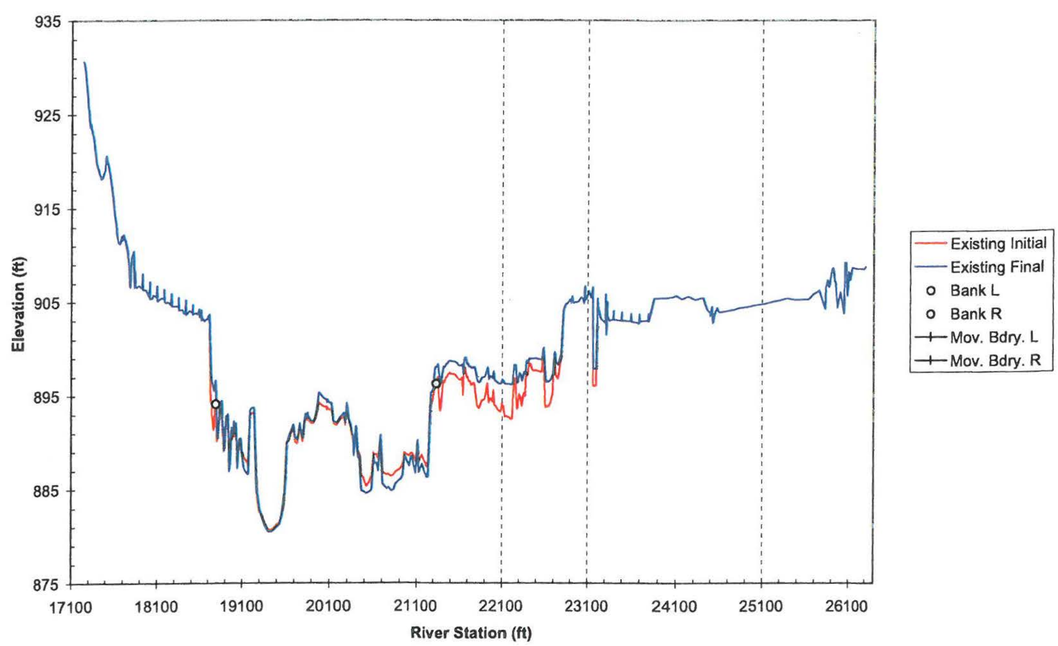
Cross Section 193.07



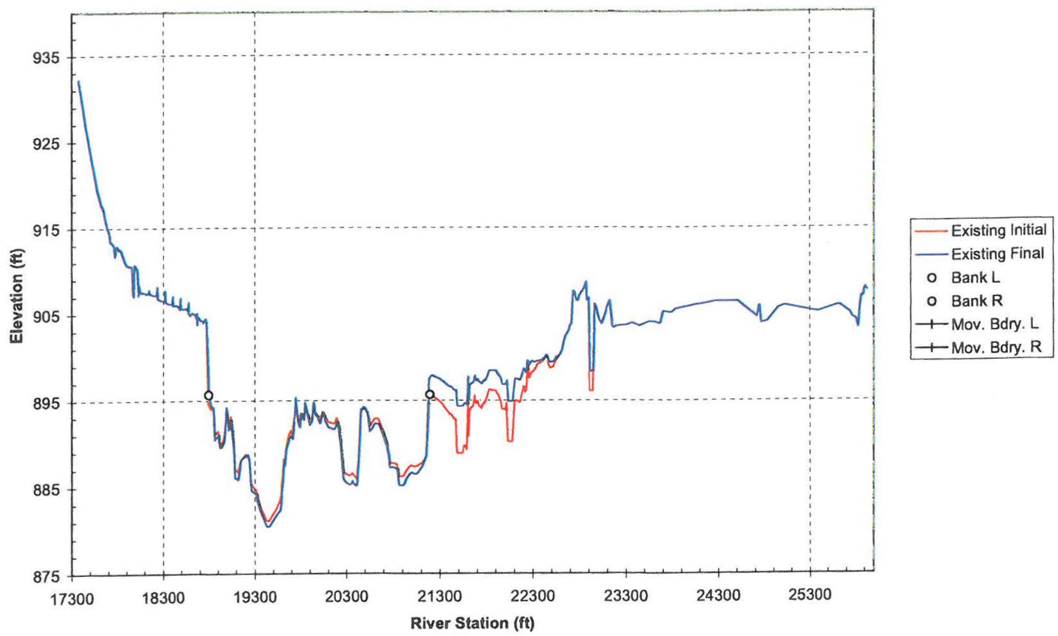
Cross Section 193.16



Cross Section 193.25



Cross Section 193.34



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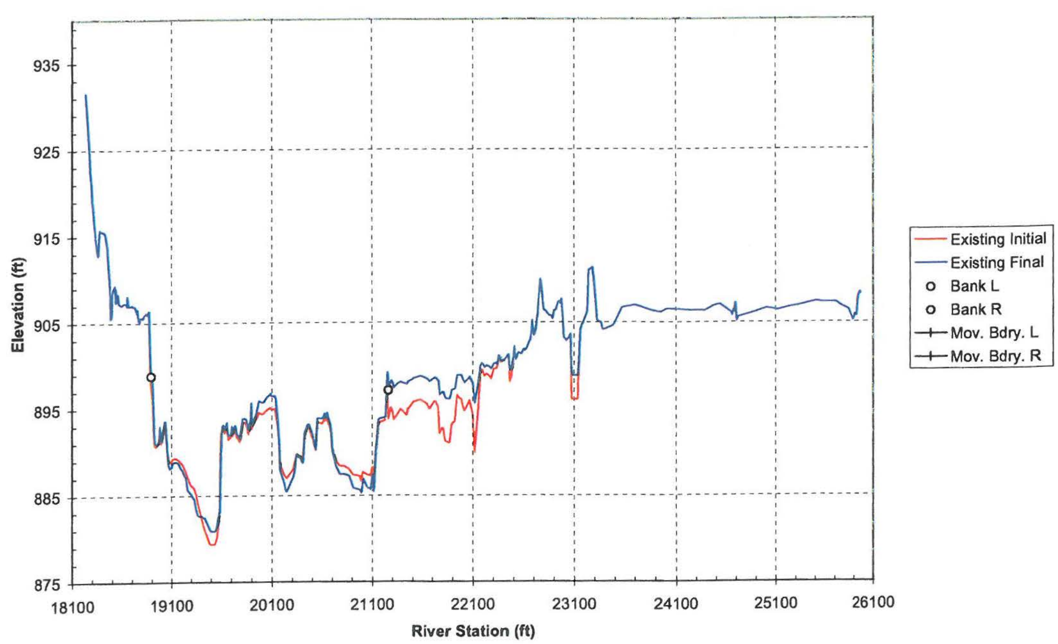
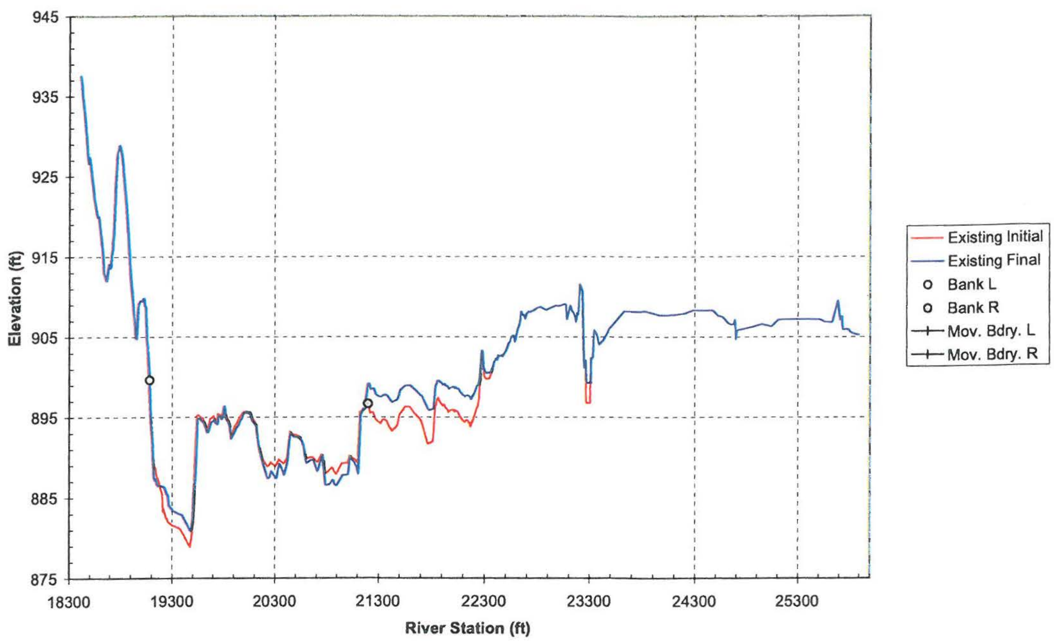


Cross Section 193.53



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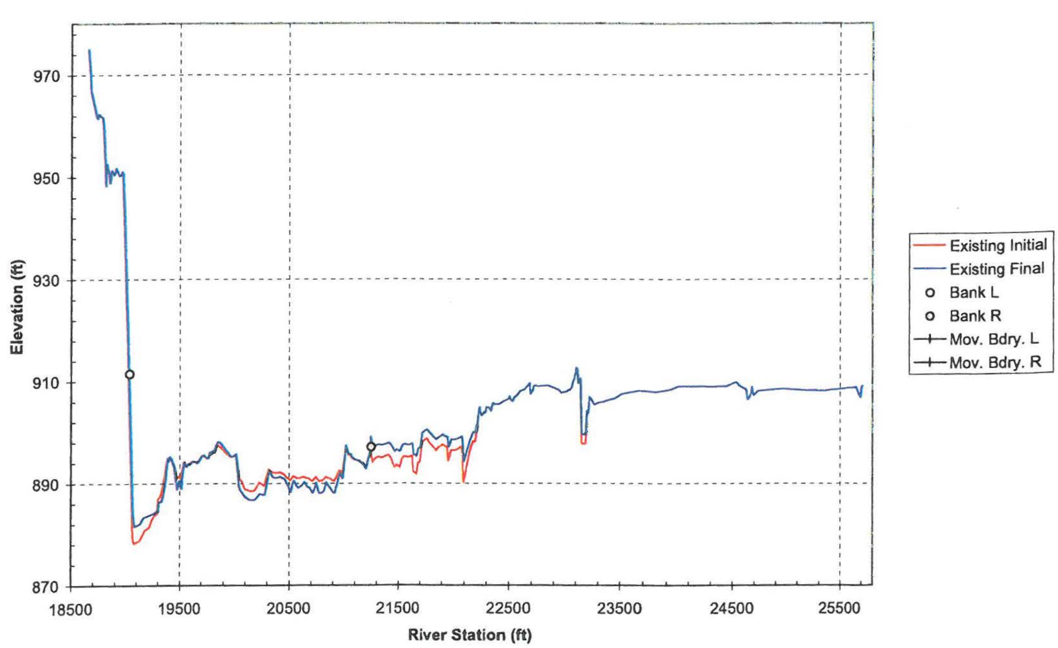

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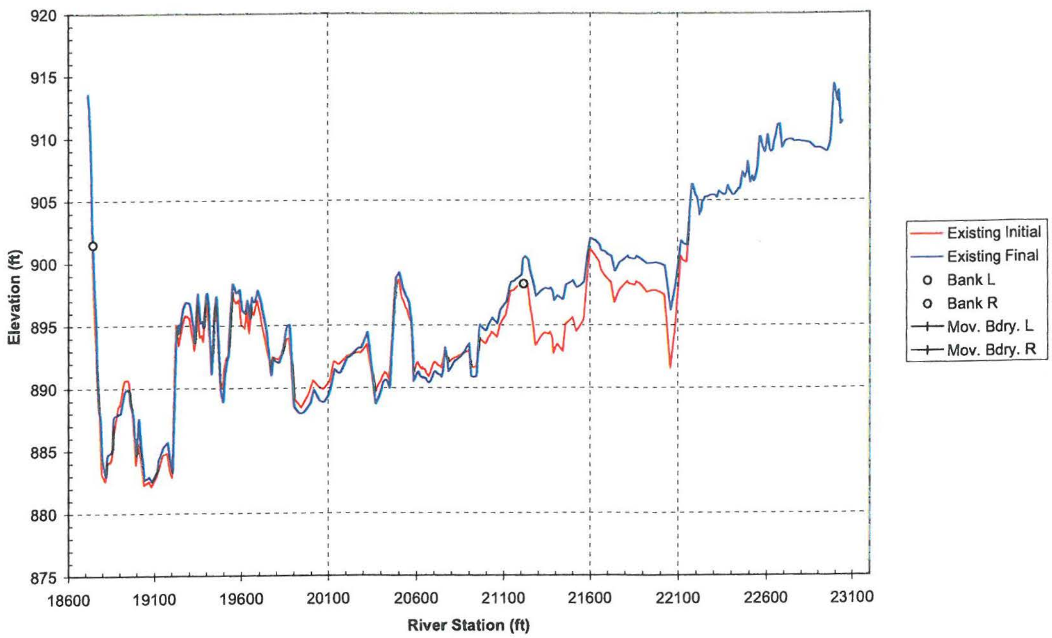
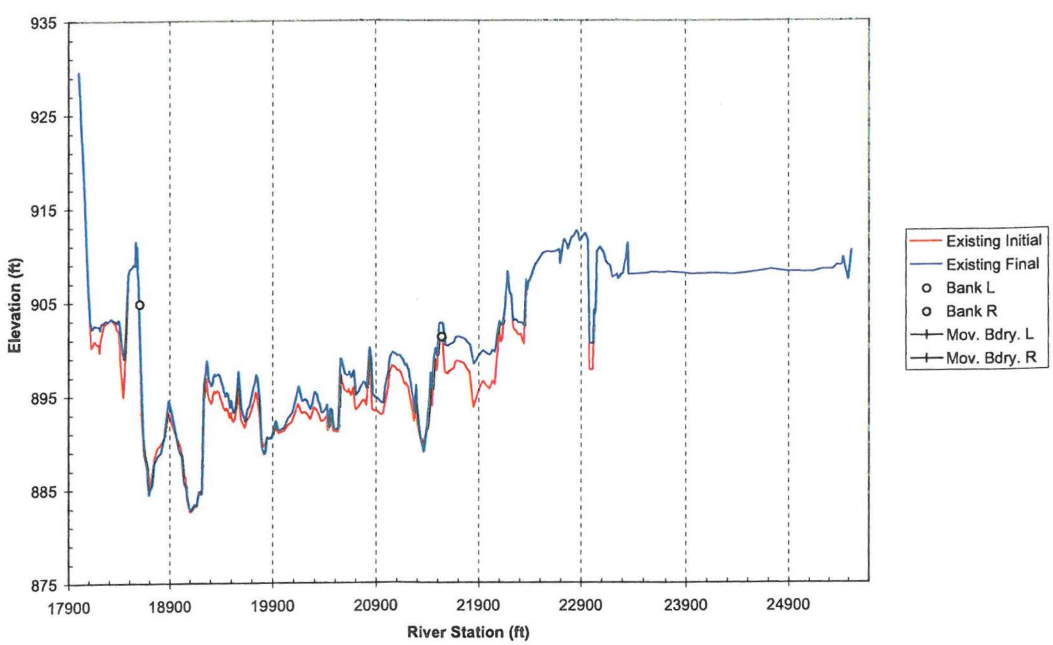
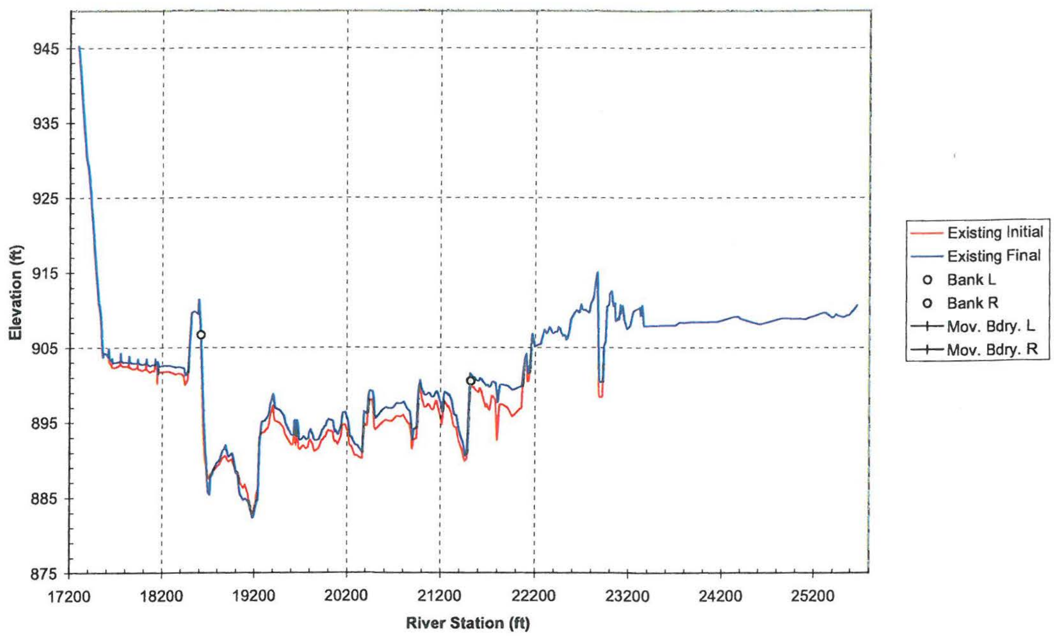


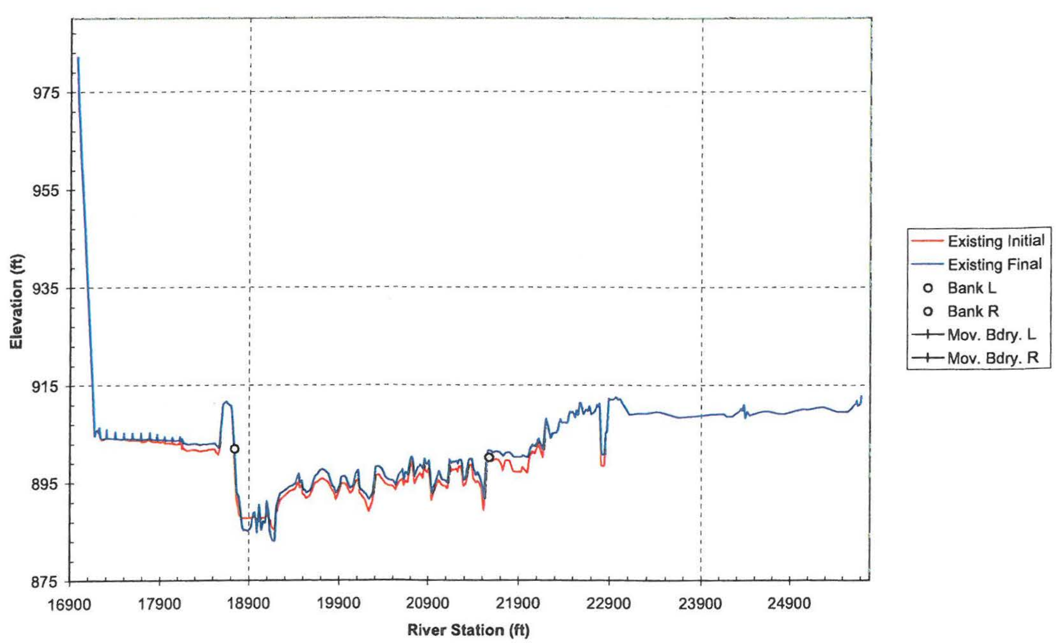
Cross Section 193.79



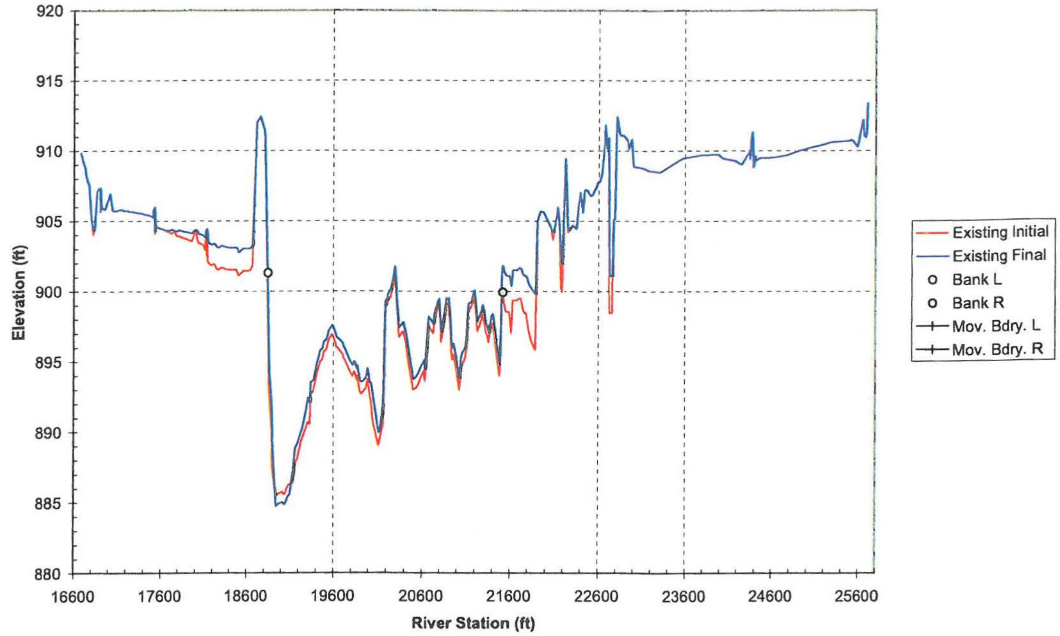
Cross Section 193.87



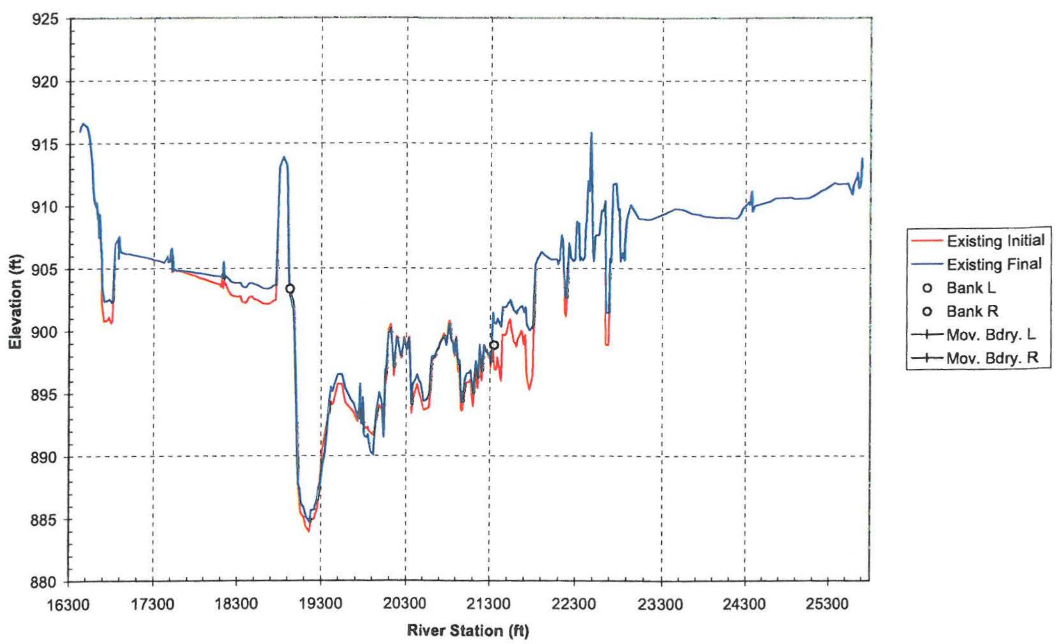
Cross Section 193.94



Cross Section 194.02



Cross Section 194.1

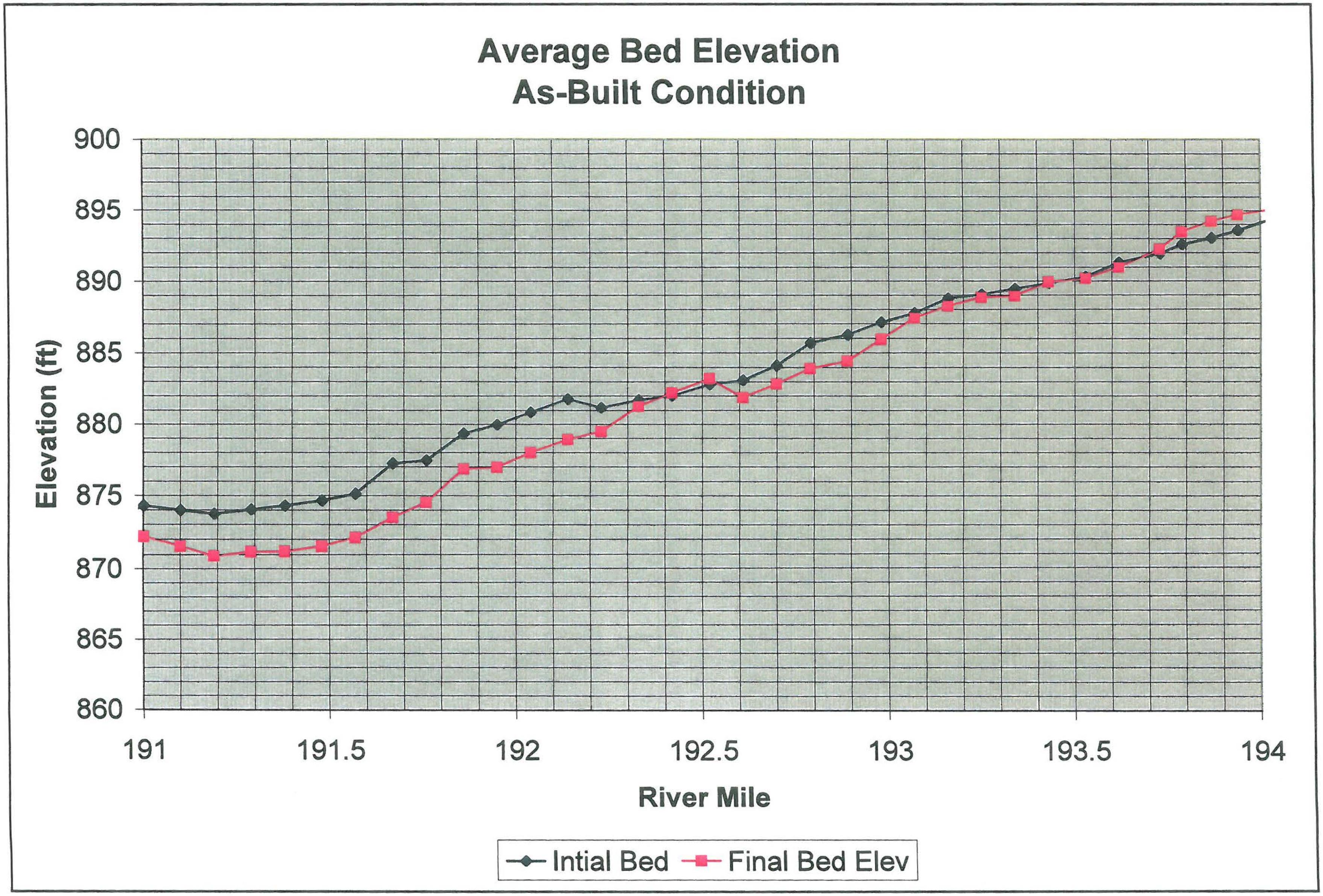


APPENDIX F

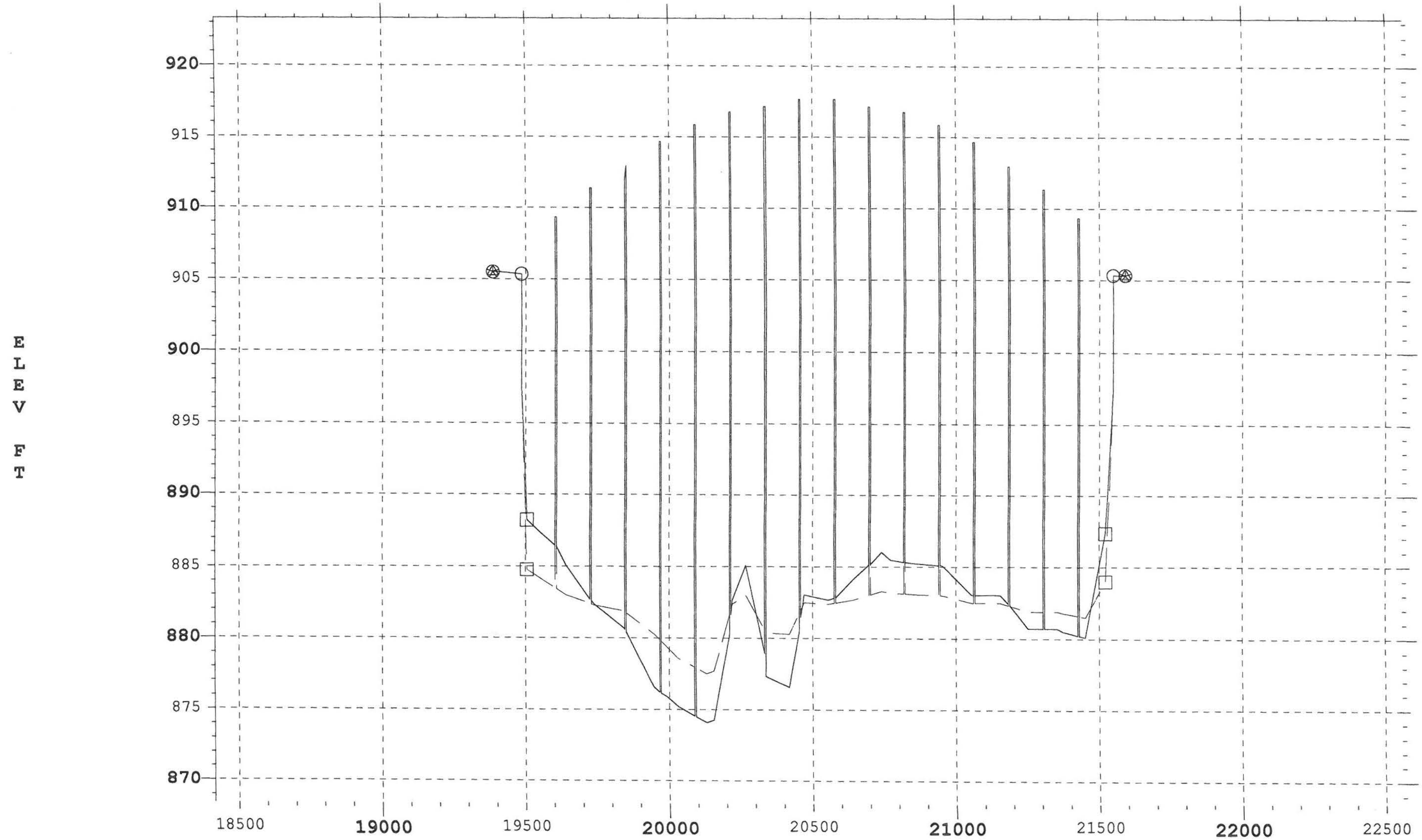
SECTION 2

Sediment Transport HEC-6T Model Results

AS-BUILT CONDITIONS


Average Bed Elevation
As-Built Condition
Elevation (ft)
900
895
890
885
880
875
870
865
860
191
191.5
192
192.5
193
193.5
194
River Mile
Intial Bed
Final Bed Elev

1 END XSECS



⋆ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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— —XSEC 1-192.42 DAYS= 0.001

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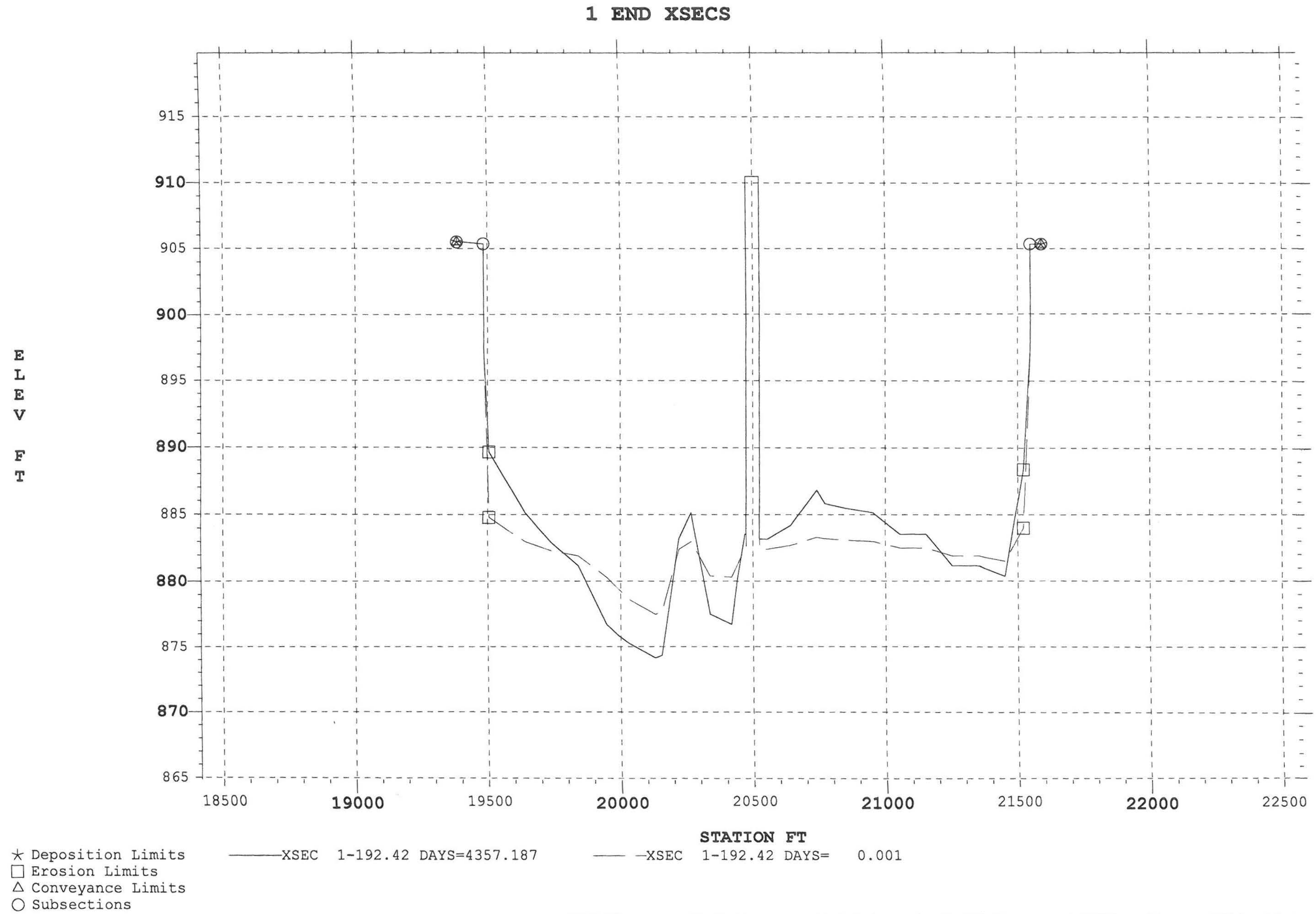

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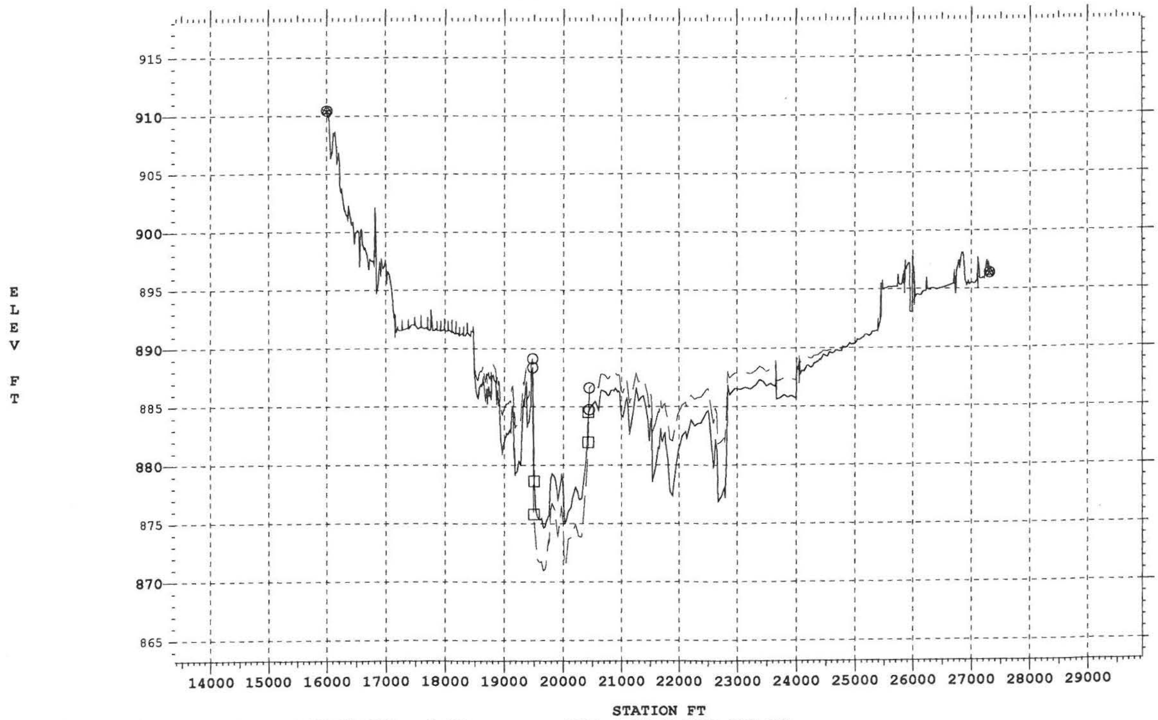

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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"P:\1018-07-MCDOT-01-CottonLane\Models\LOMR\HEC-6T\CLB-LMRC3.T98" - 4 Mar 2010 4:46pm

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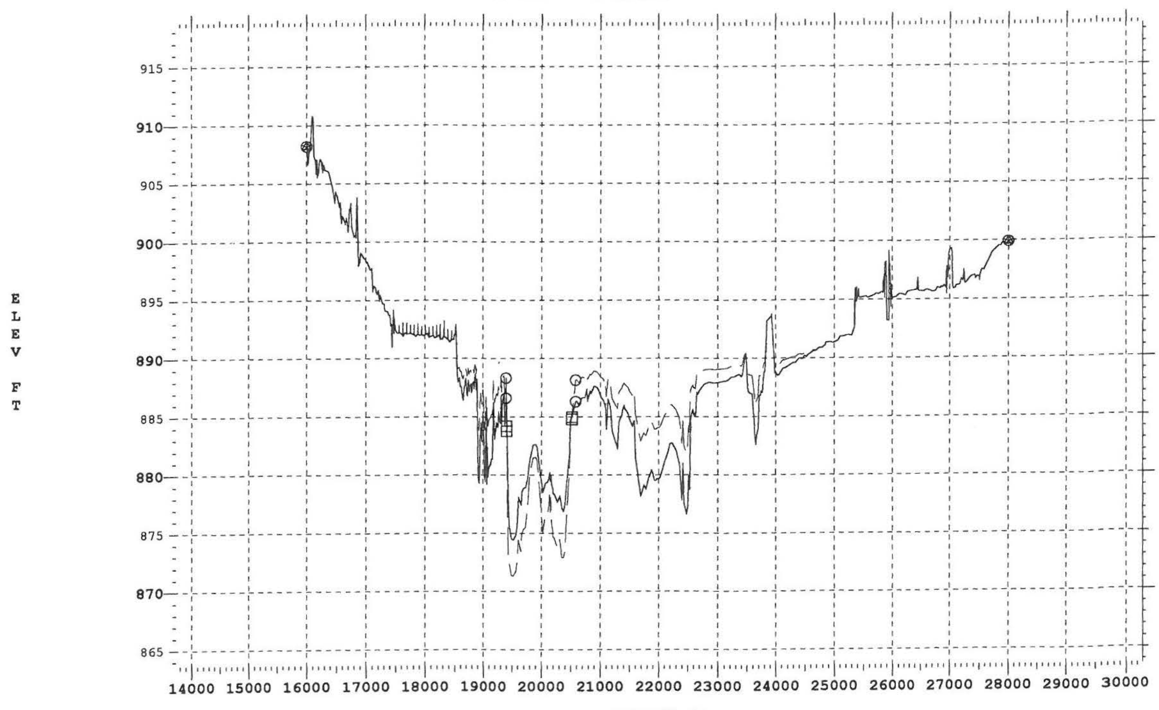

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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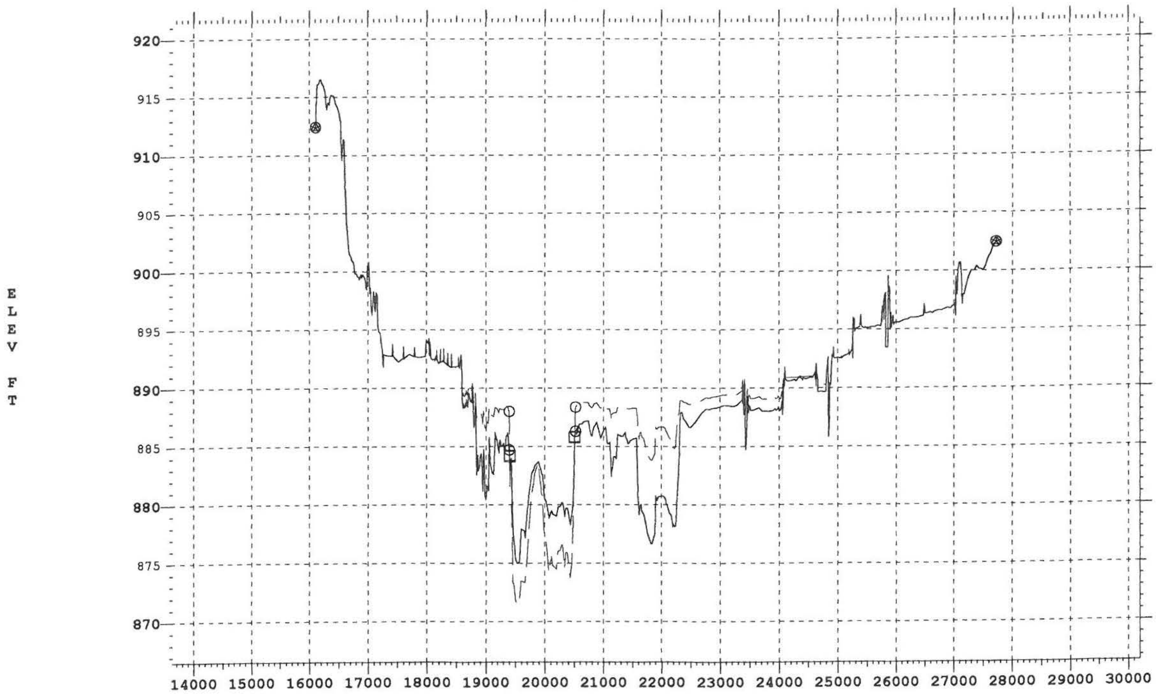
1 INITIAL XSECS



⋆ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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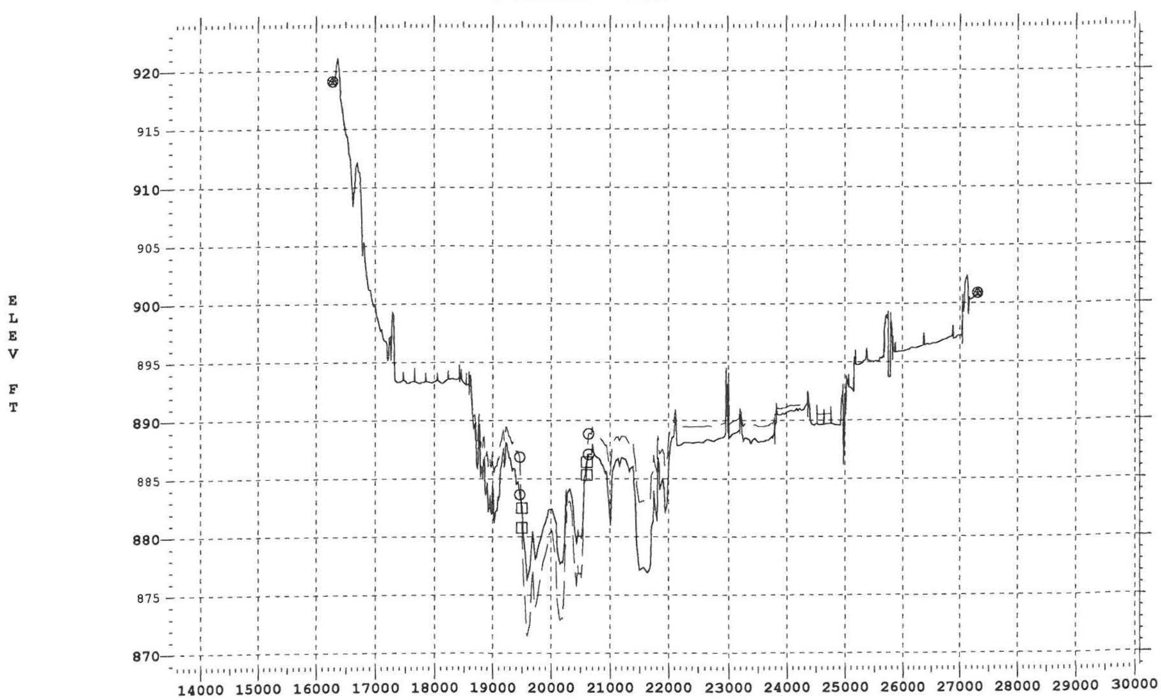
1 INITIAL XSECS



⋆ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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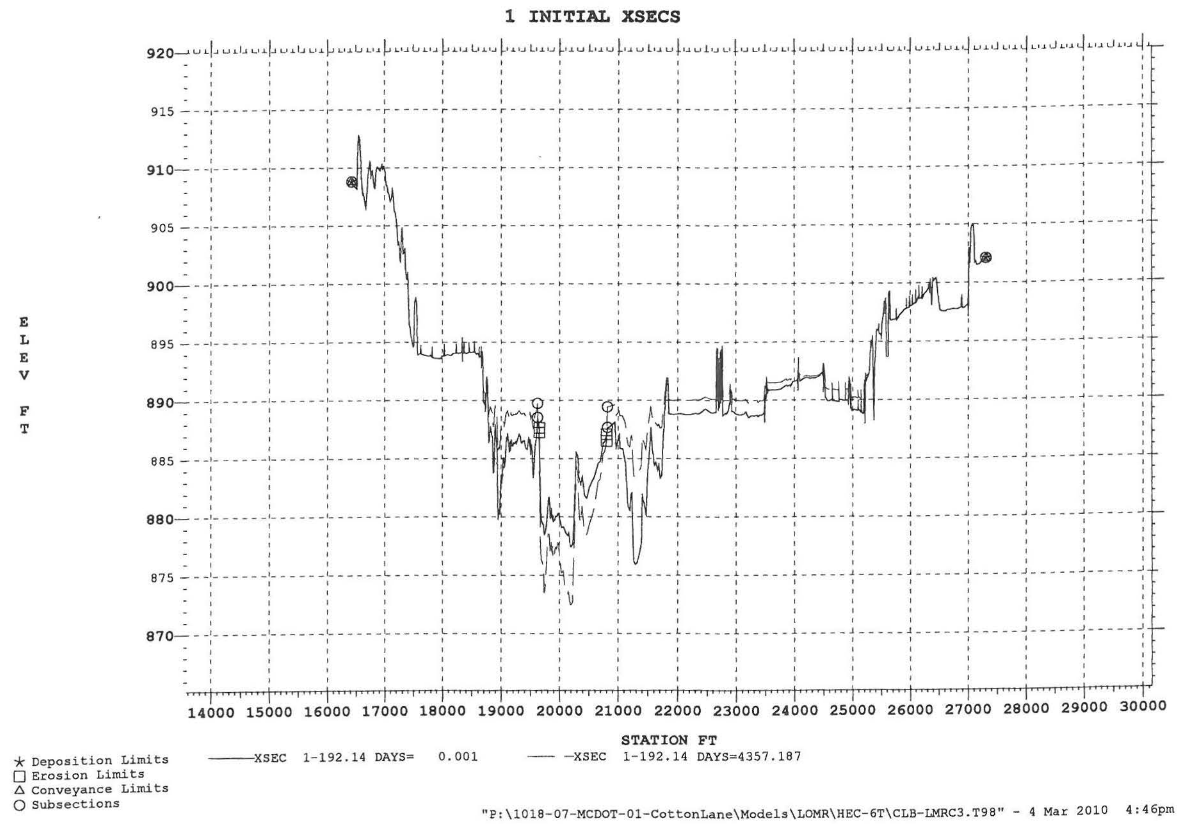
1 INITIAL XSECS
920
915
910
905
900
895
890
885
880
875
870
E L E V F T
14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000
STATION FT
* Deposition Limits
□ Erosion Limits
Δ Conveyance Limits
○ Subsections
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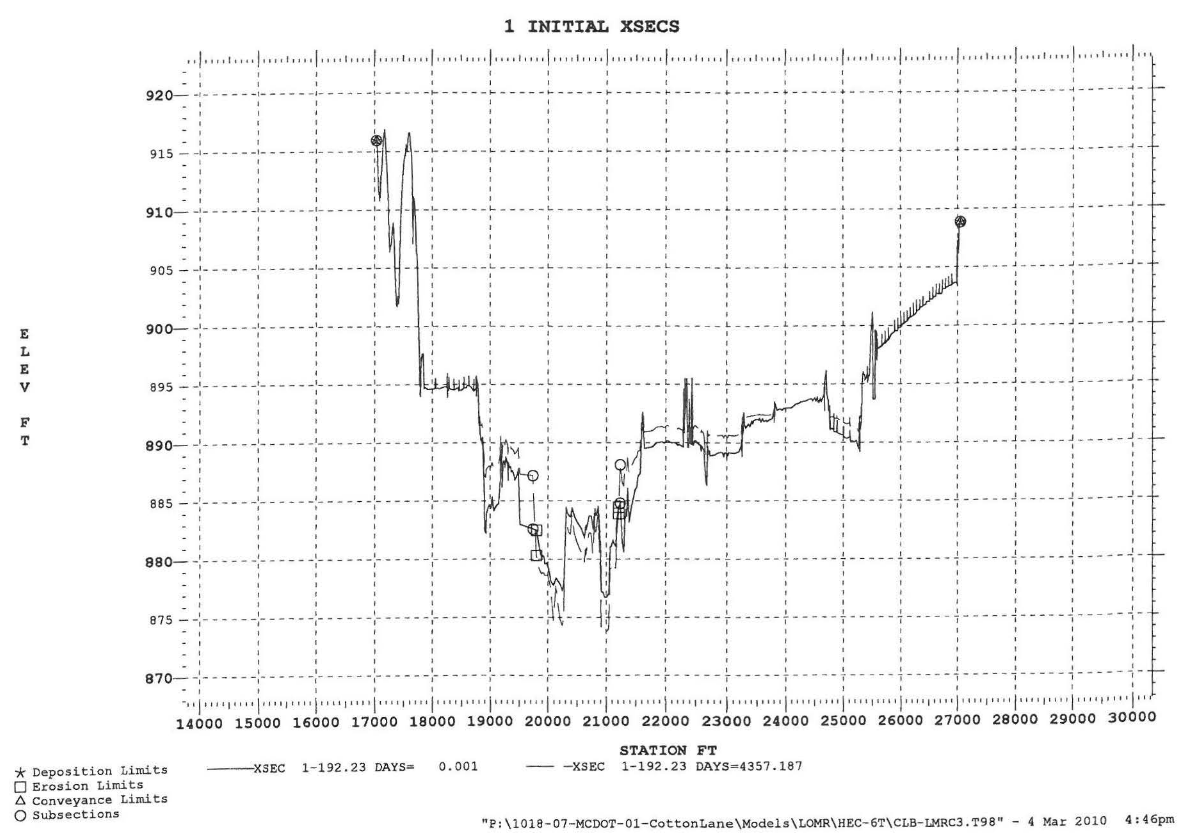
1 INITIAL XSECS
920
915
910
905
900
895
890
885
880
875
870
E L E V F T
14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000 30000
STATION FT
* Deposition Limits
□ Erosion Limits
Δ Conveyance Limits
○ Subsections
XSEC 1-192.23 DAYS= 0.001
-XSEC 1-192.23 DAYS=4357.187
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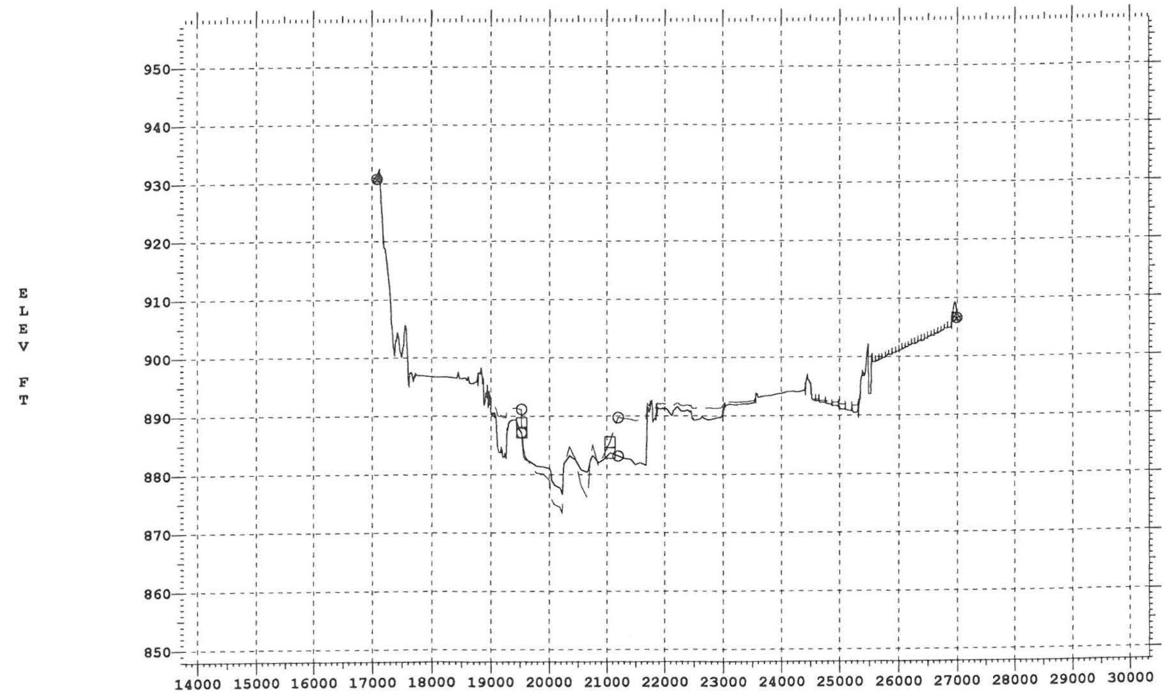

★ Deposition Limits ——XSEC 1-192.33 DAYS= 0.001 — —XSEC 1-192.33 DAYS=4357.187
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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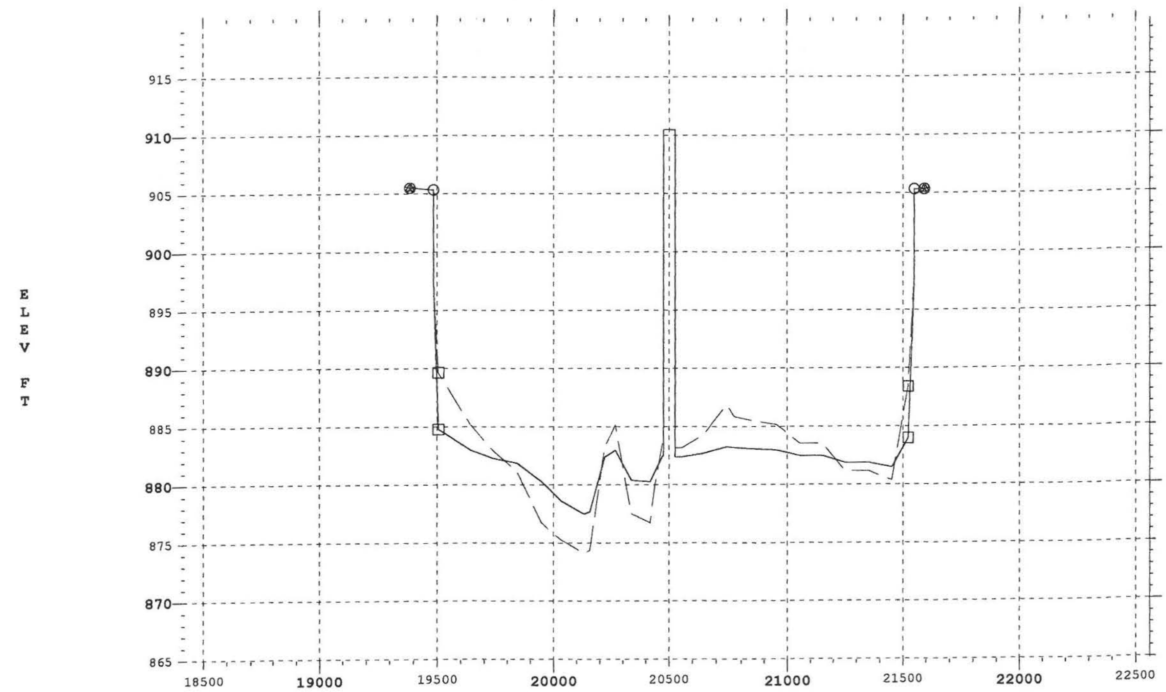

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□ Erosion Limits
△ Conveyance Limits
○ Subsections

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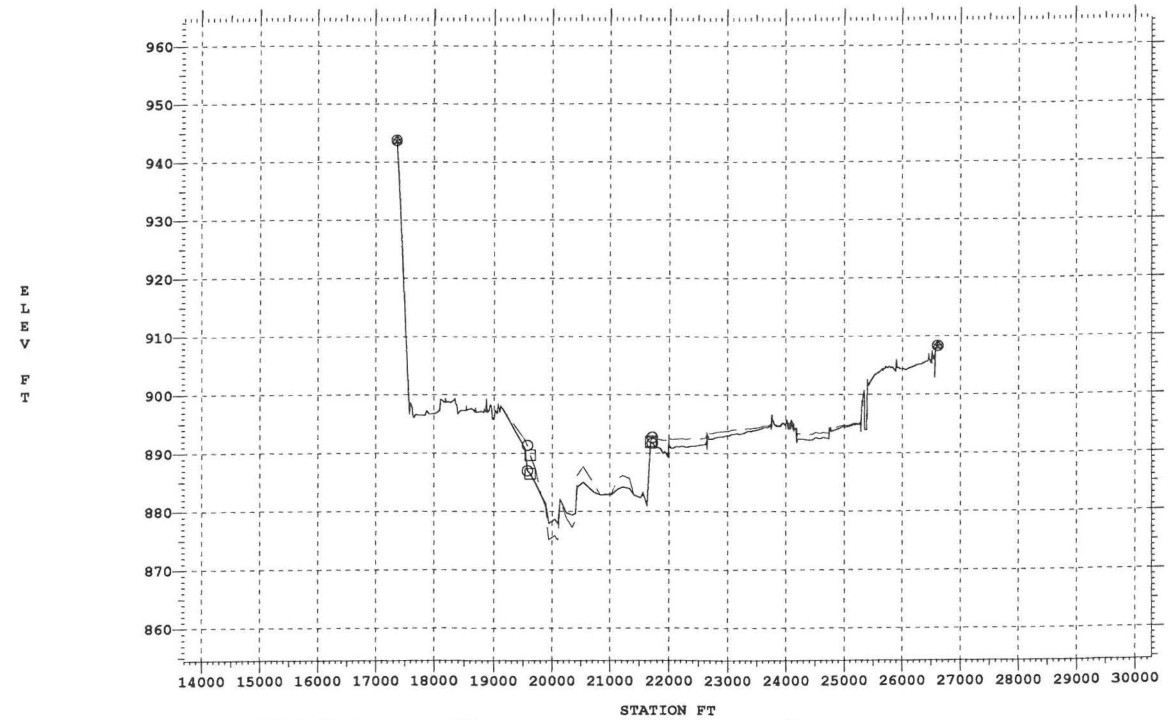

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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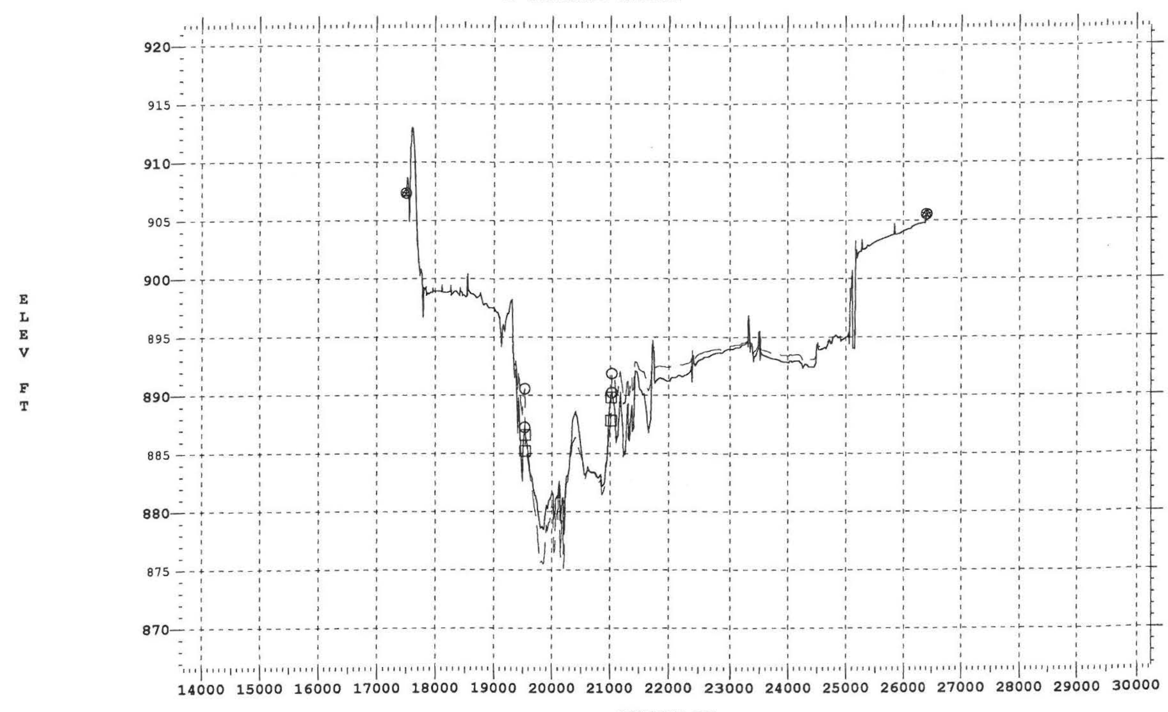

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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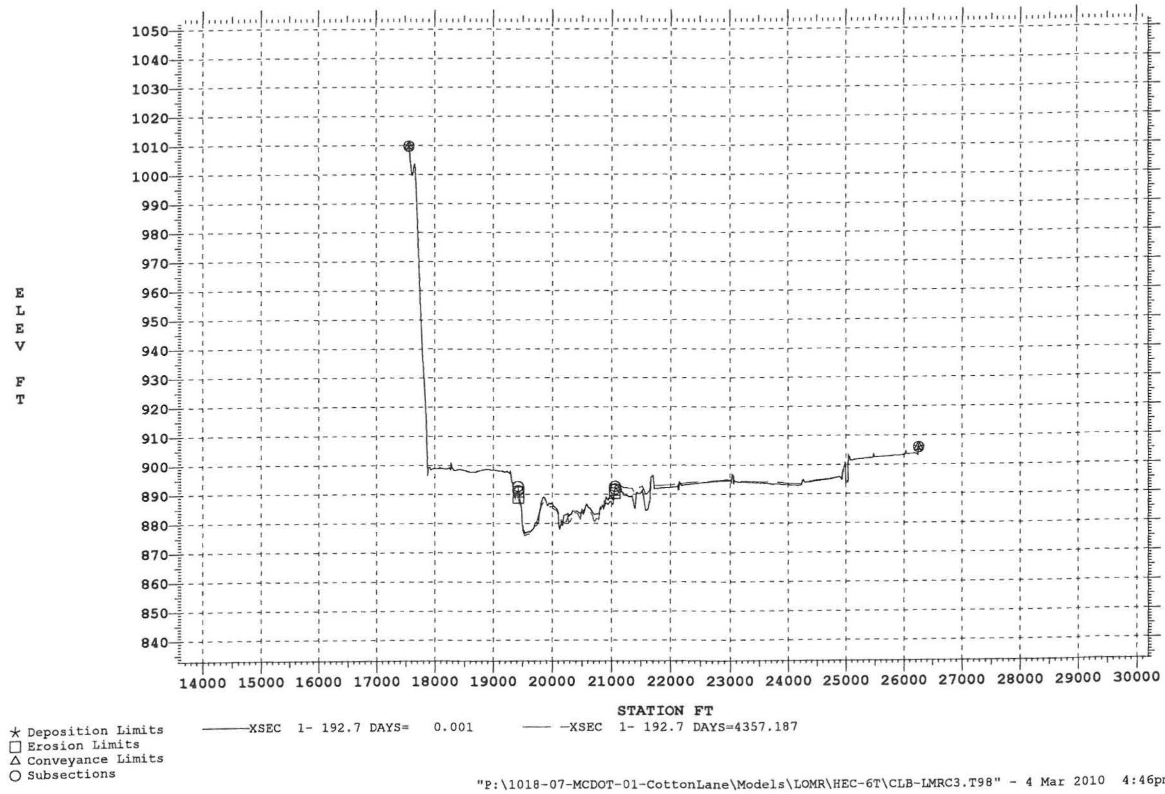

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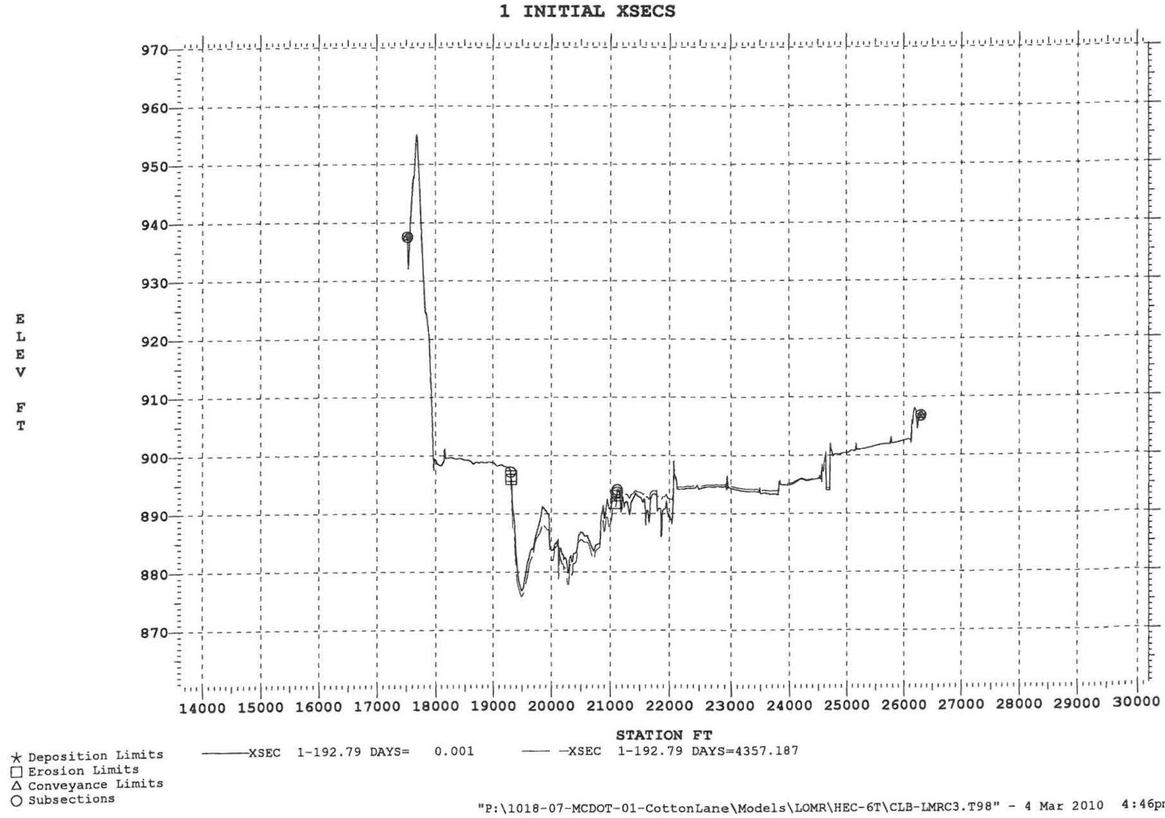

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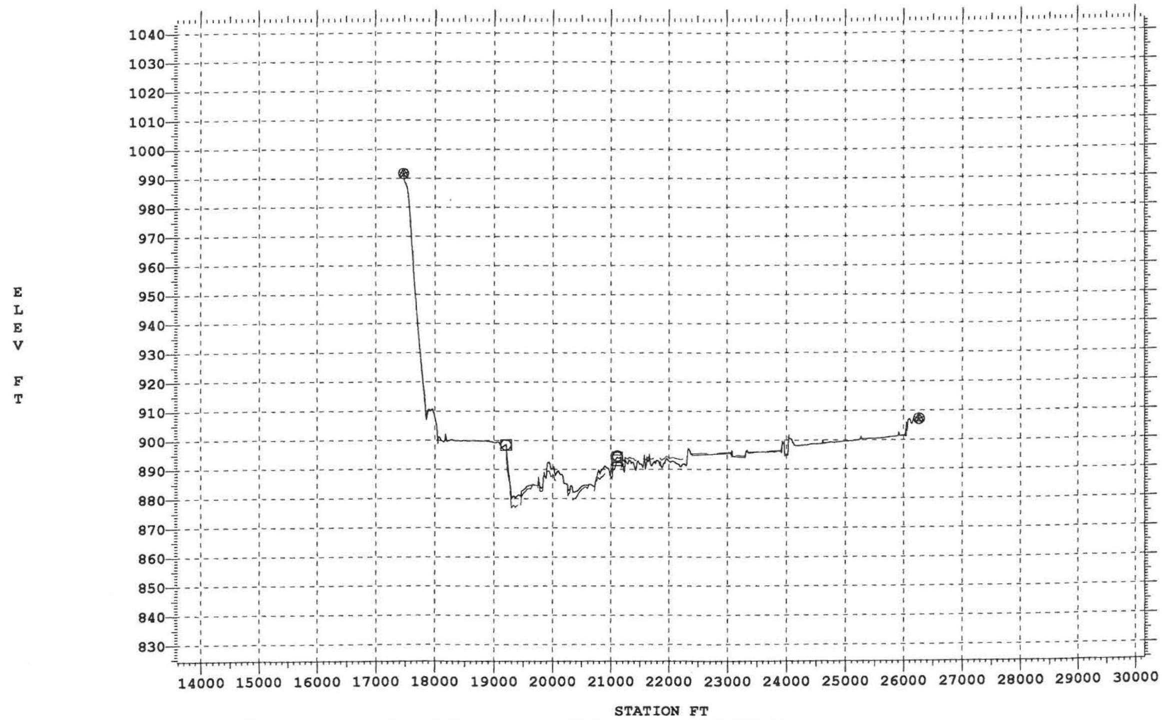

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△ Conveyance Limits
○ Subsections

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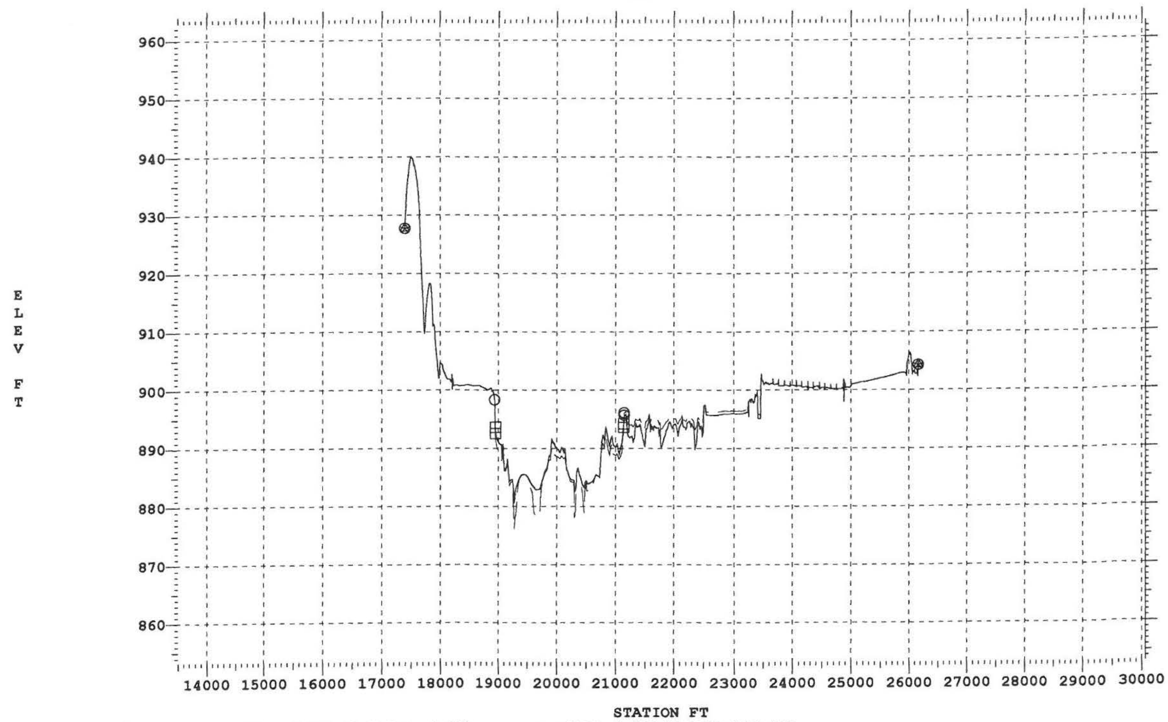

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△ Conveyance Limits
○ Subsections

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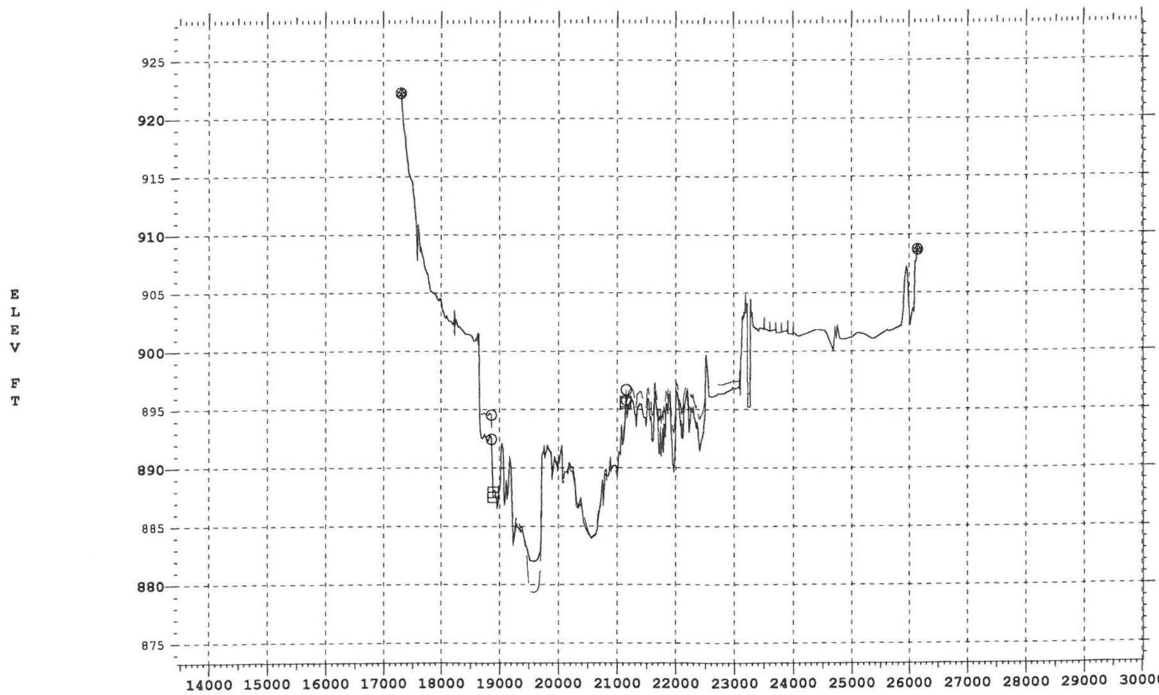

★ Deposition Limits
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△ Conveyance Limits
○ Subsections

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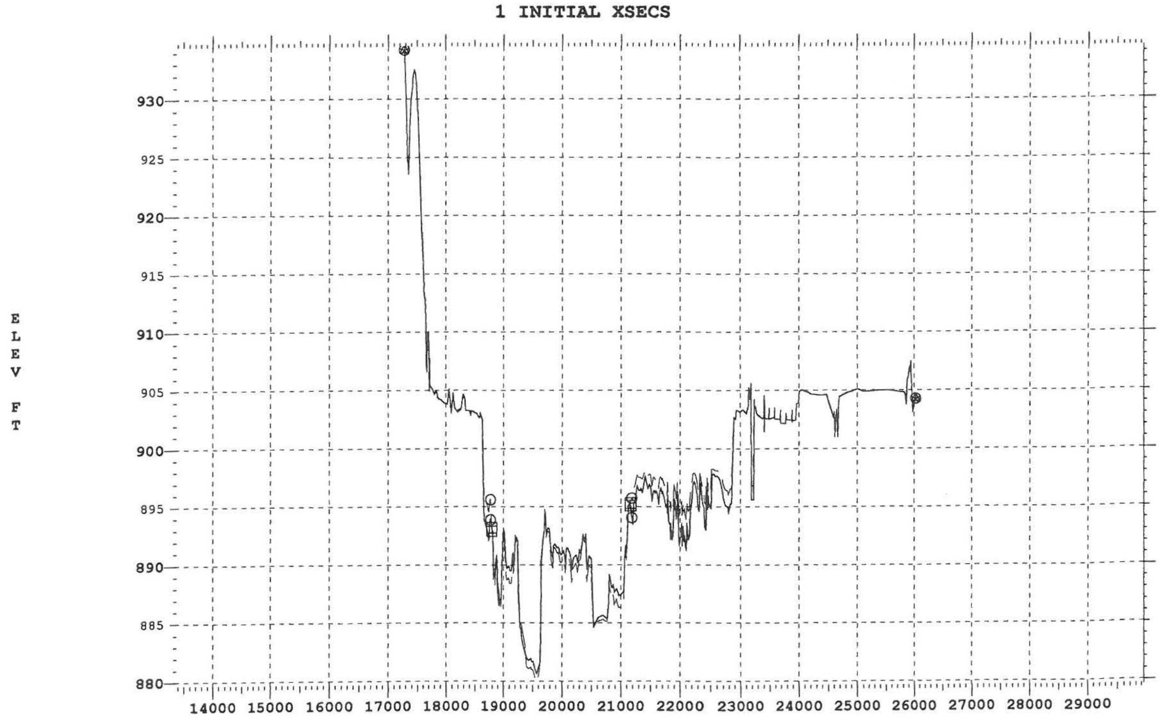

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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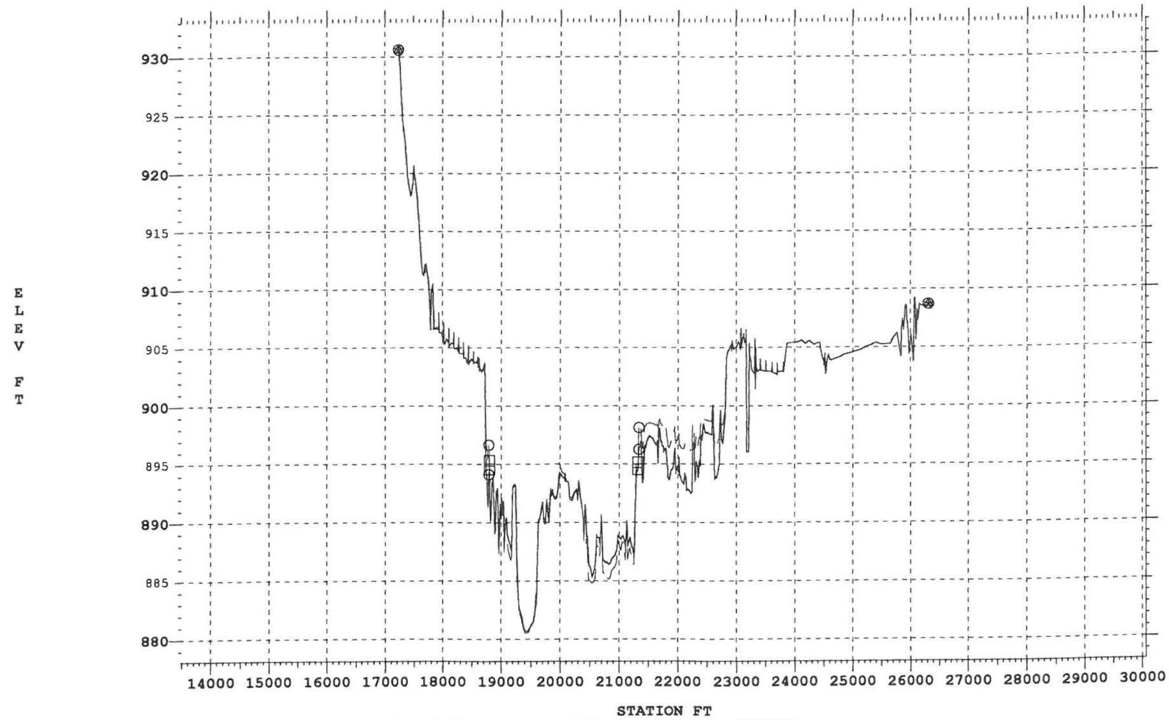

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△ Conveyance Limits
○ Subsections

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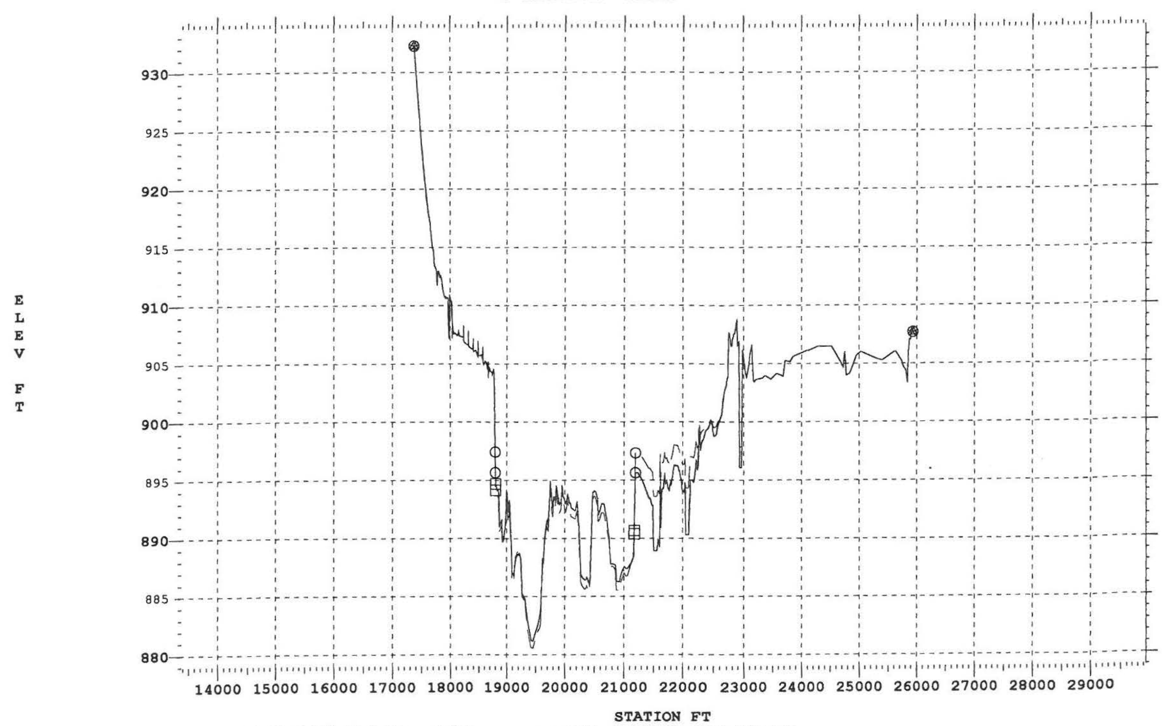

★ Deposition Limits
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△ Conveyance Limits
○ Subsections

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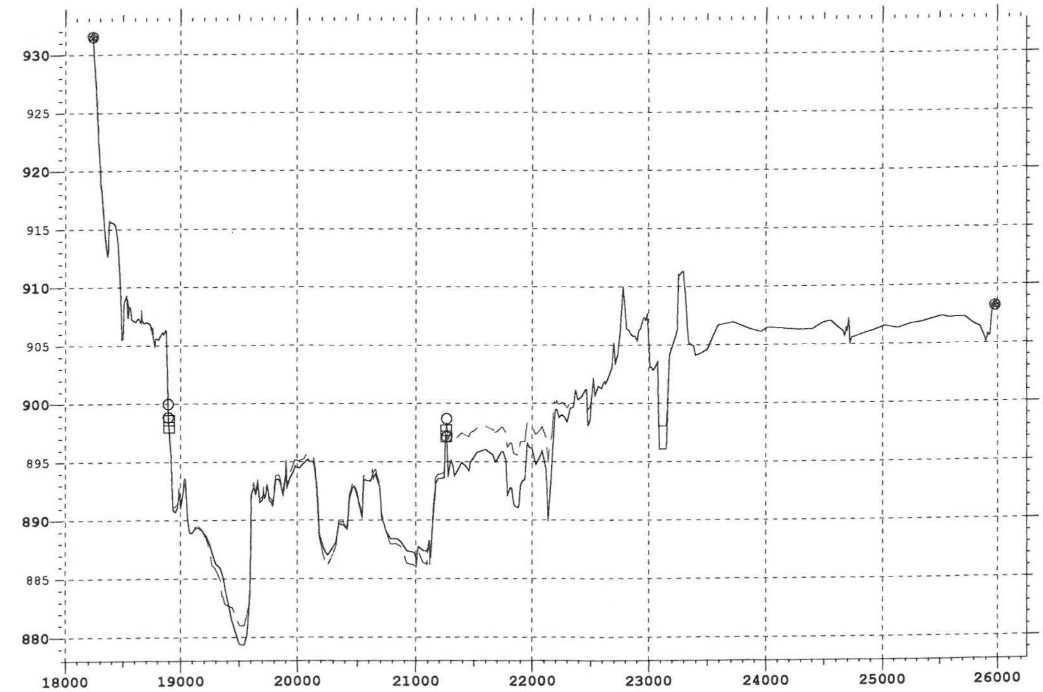

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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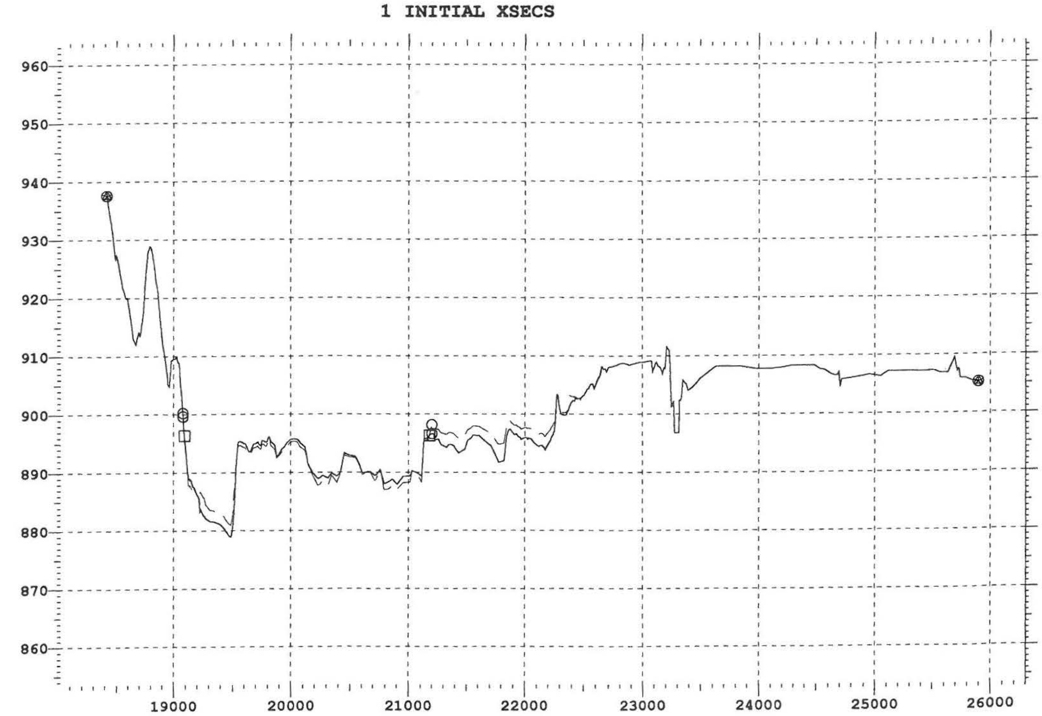

★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections

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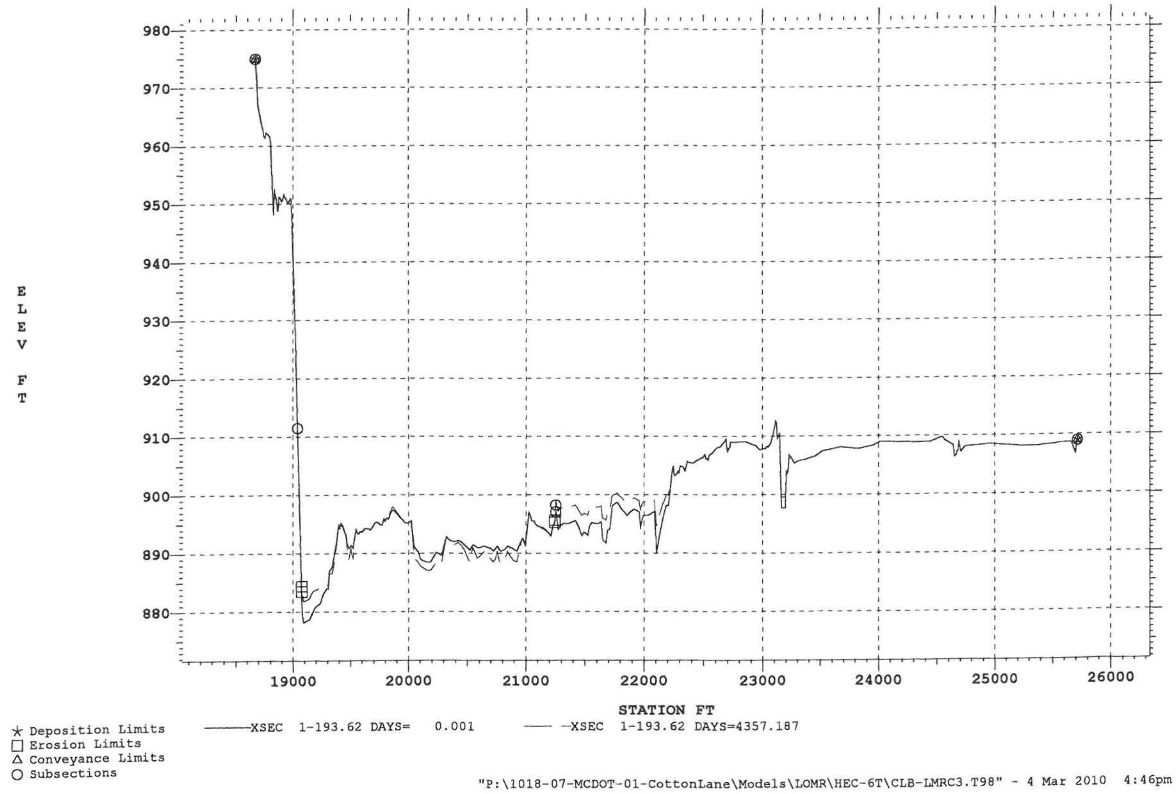

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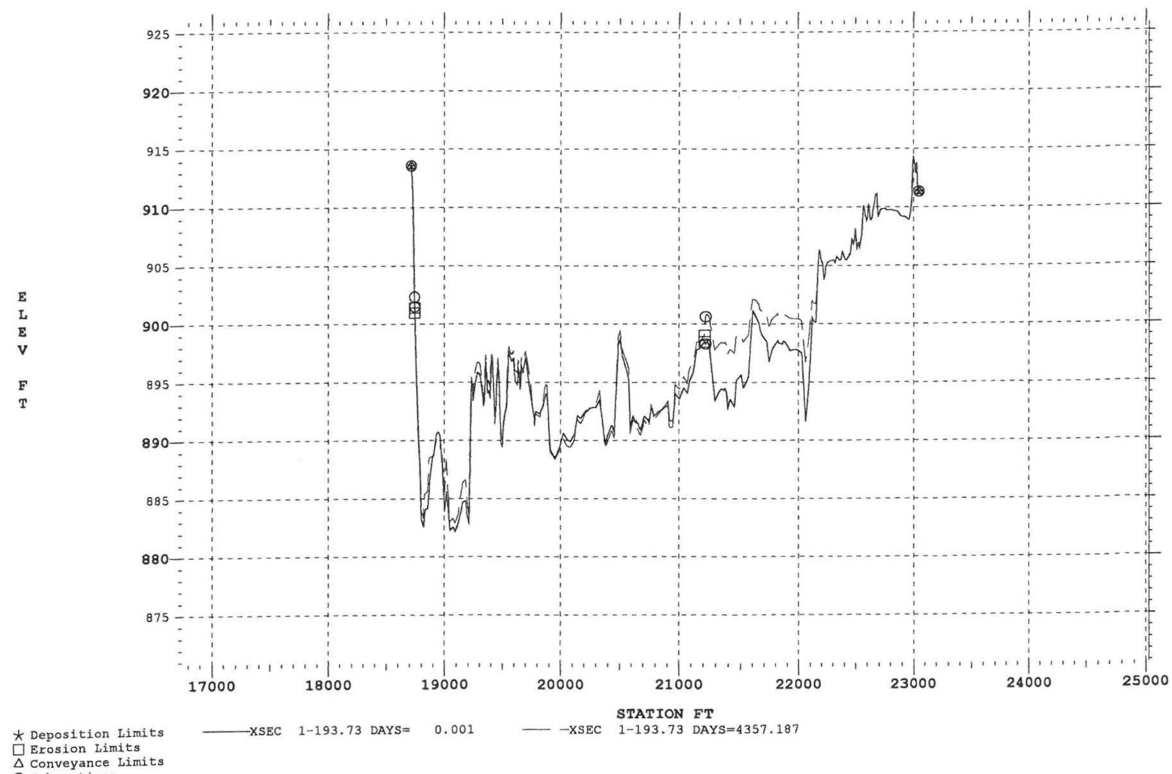

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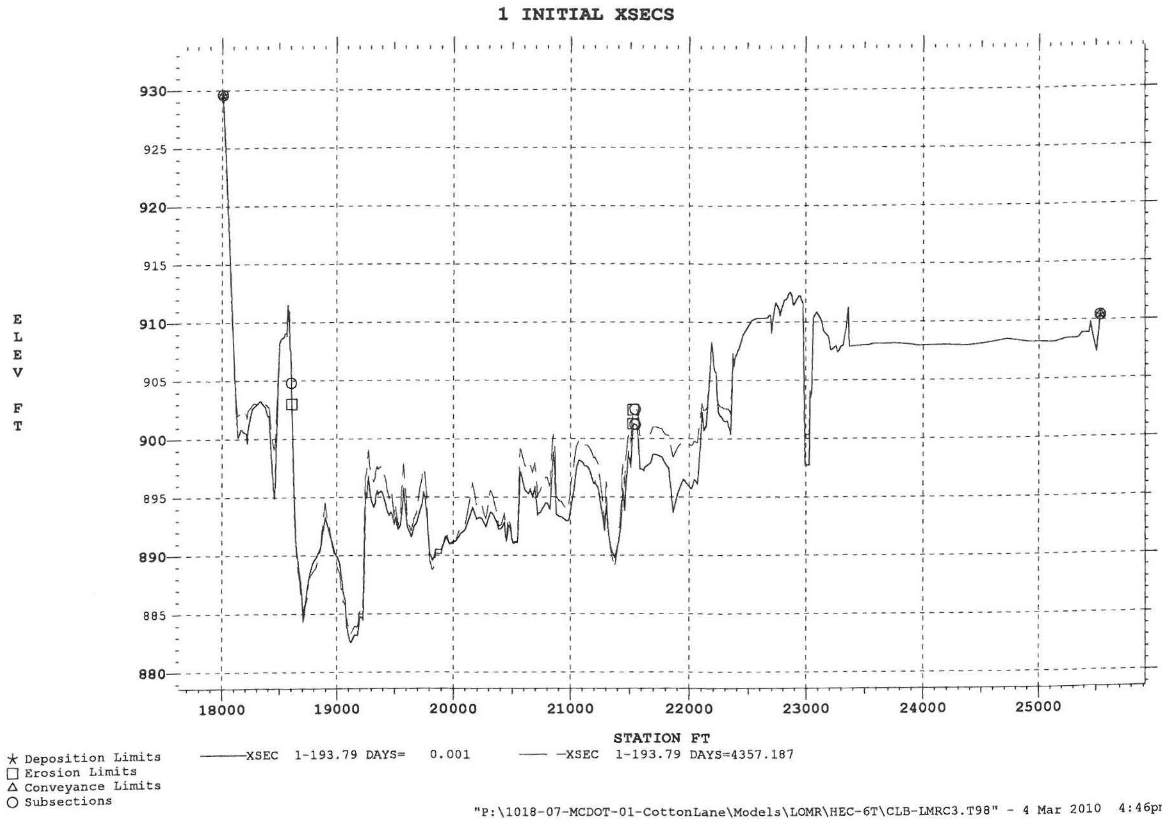

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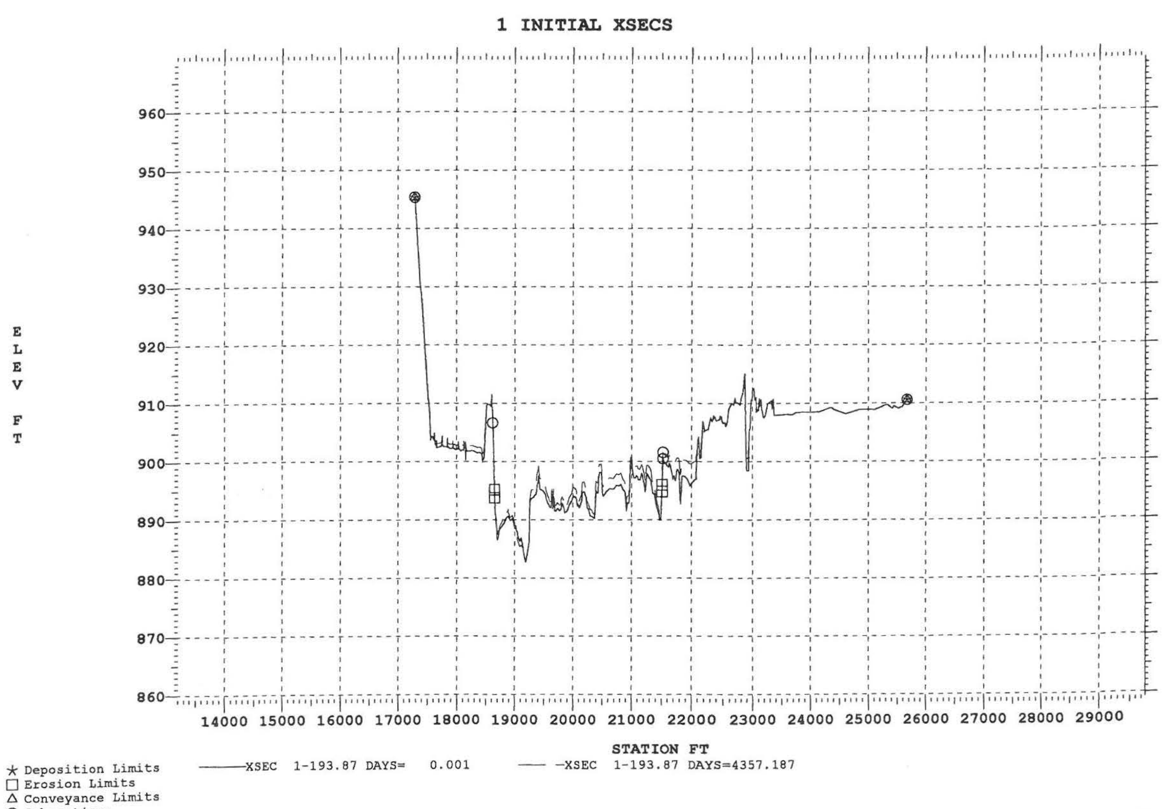

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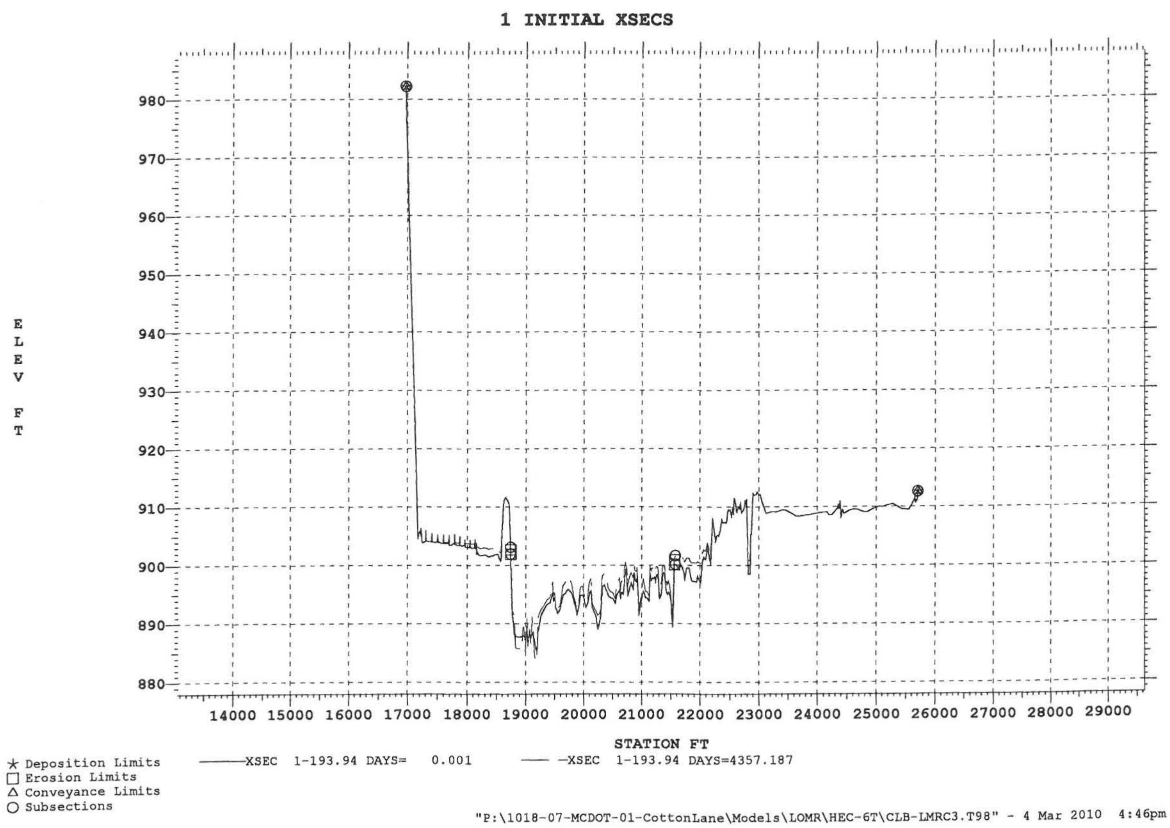
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960
950
940
930
920
910
900
890
880
ELEV FT
14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000
STATION FT
★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections
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— —XSEC 1-193.94 DAYS=4357.187
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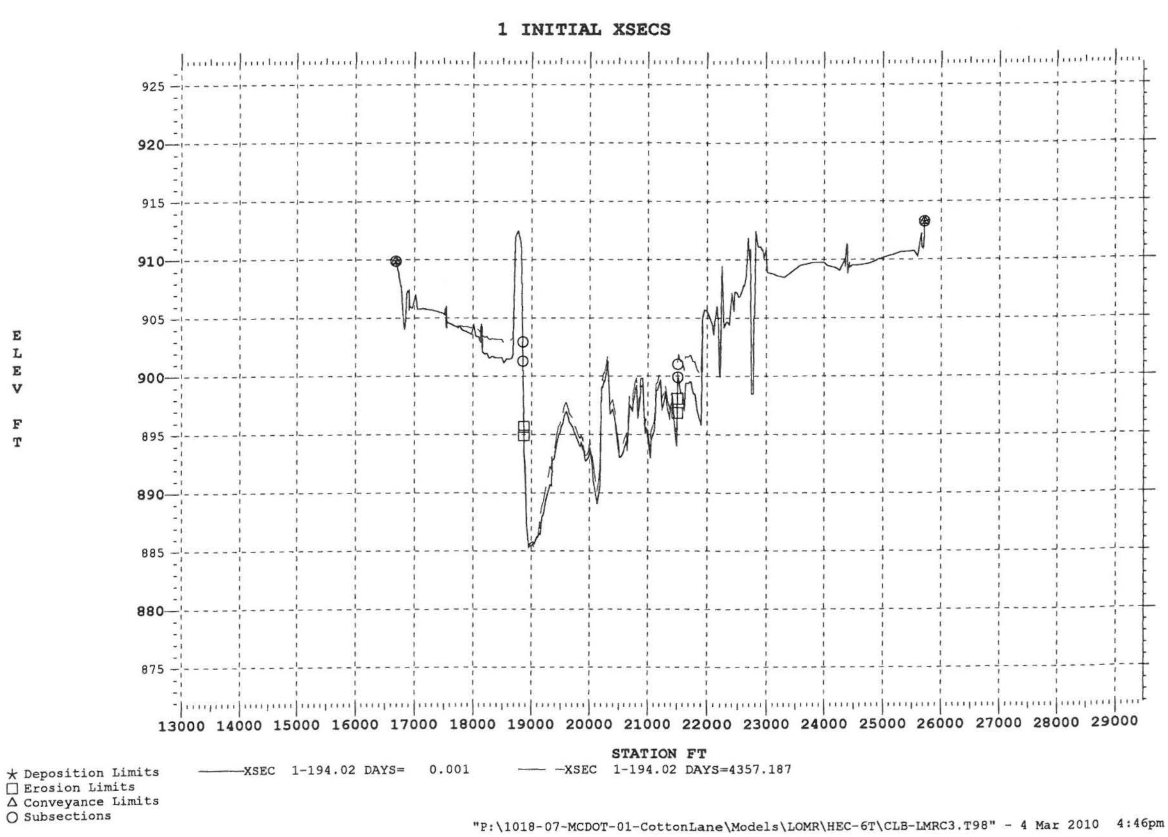
1 INITIAL XSECS
925
920
915
910
905
900
895
890
885
880
875
ELEV FT
13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000
STATION FT
★ Deposition Limits
□ Erosion Limits
△ Conveyance Limits
○ Subsections
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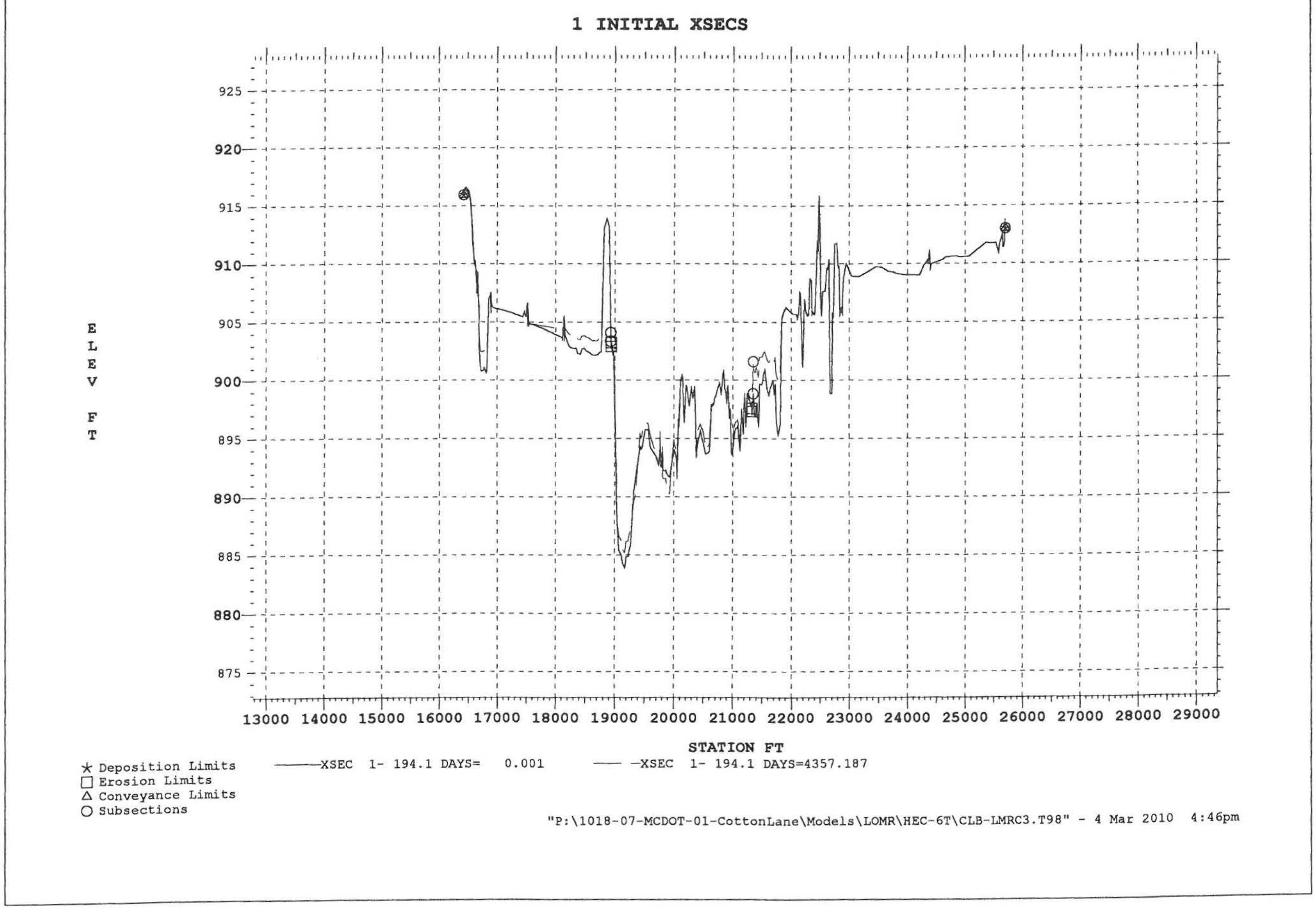
1 INITIAL XSECS
925
920
915
910
905
900
895
890
885
880
875
ELEV FT
13000 14000 15000 16000 17000 18000 19000 20000 21000 22000 23000 24000 25000 26000 27000 28000 29000
STATION FT
* Deposition Limits
□ Erosion Limits
Δ Conveyance Limits
○ Subsections
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APPENDIX F

SECTION 3

SCOUR CALCULATIONS

SCOUR CALCULATIONS

The scour along the banks and at the Cotton Lane Bridge were calculated using standard formulas from engineering practice. These values have been calculated using formulas that have been applied in the Phoenix metropolitan area and have been reviewed by the Flood Control District of Maricopa County. The methods recommended by the U.S. Bureau of Reclamation have been applied and equations that give similar results in the mid- to upper mid-range of scour values have been used. The following pages give the equations, values used and results for the scour calculations.

Maximum Scour Depths for Gila River at Cotton Lane Bridge

6/5/2006

River Mile	Beginning Bed Elev	Min Bed Elevation	Max Scour (ft)	End Bed Elevation	End Scour (ft)
194.21	883.1	883.1	0	884.48	1.38
Estrella Parkway Bridge					
194.1	883.87	883.9	0.03	884.36	0.49
194.02	885.49	884.4	-1.09	884.42	-1.07
193.94	885.38	882.88	-2.5	882.9	-2.48
193.87	882.8	882	-0.8	882.08	-0.72
193.79	882.55	882.17	-0.38	882.41	-0.14
193.73	882.18	882.18	0	882.24	0.06
193.62	878.21	878.21	0	881.61	3.4
193.53	878.96	878.96	0	881.02	2.06
193.43	879.37	879.23	-0.14	881.02	1.65
193.34	881.18	880.71	-0.47	880.72	-0.46
193.25	880.67	880.58	-0.09	880.85	0.18
193.16	880.66	879.91	-0.75	879.94	-0.72
193.07	881.99	879.95	-2.04	879.97	-2.02
192.98	880.71	877.32	-3.39	877.38	-3.33
192.89	880.29	878.49	-1.8	878.51	-1.78
192.79	876.74	876.73	-0.01	877.4	0.66
192.7	877.01	877.01	0	877.87	0.86
192.61	878.15	877.28	-0.87	877.34	-0.81
192.52	878.23	877.52	-0.71	877.53	-0.7
Cotton lane Bridge					
192.39	876.67	873.92	-2.75	876.31	-0.36
192.33	876.06	875.41	-0.65	876.38	0.32
192.23	876.72	875.85	-0.87	876.09	-0.63
192.14	875.94	875.02	-0.92	875.12	-0.82
192.04	876.36	874.93	-1.43	874.94	-1.42
191.95	876.88	873.58	-3.3	873.61	-3.27
191.86	876.27	873.18	-3.09	873.2	-3.07
191.76	874.62	873.45	-1.17	873.5	-1.12
191.67	872.6	872.37	-0.23	872.73	0.13
191.57	870.63	870.63	0	872.23	1.6
191.48	870.93	870.89	-0.04	872.13	1.2
191.38	871.69	871.66	-0.03	872.11	0.42
191.29	870.63	870.53	-0.1	870.93	0.3
191.19	869.78	869.63	-0.15	870.28	0.5
191.1	870.88	870.01	-0.87	870.13	-0.75
191	869.64	869	-0.64	869.26	-0.38
190.91	867.98	867.65	-0.33	868.8	0.82
190.81	867.86	867.83	-0.03	869.11	1.25
190.72	866.3	866.3	0	868.51	2.21
190.62	867.37	867.28	-0.09	868.61	1.24
190.53	866.16	866.16	0	867.43	1.27
190.43	867.42	866.93	-0.49	868	0.58

Reach 1

Max Scour (ft)	End Scour (ft)
-3.39	-3.33

Reach 2

Max Scour (ft)	End Scour (ft)
-3.3	-3.27

Reach 3

Max Scour (ft)	End Scour (ft)
-0.87	-0.75

Calculation of General Scour Depths - English Units (ft)

June 5, 2006

Gila River / Cotton Lane Bridge - w/Protected South Bank - 500 Year Flood Flow = 285,000 cfs

Gila River - King Ranch/Cotton Lane Bridge
Cotton Lane Bridge Section
Method not Applicable

Stream Values

Incised / Bankfull Q cfs	Qi	285000
Incised / Bankfull Width	Wi	2140
Incised / Bankfull q cfs/ft	qi	133.18
Depth of Incision	di	10
Competent Veloc.(Fig 12 p.41 cohensionle	Vc	7
(Table 8 for cohesive soils)		
Design Q (Channel)		285000
Design Channel Width		2140
Design Flow / Width	qf	133.18
Average Depth / Hydraulic Depth	dm	14.2
Maximum Depth	Ymax	24
Average Velocity	Vm	10.6
Bend Radius of Curvature (ft)	Rc	4210
Neill's m - *0.67 Sand to 0.85 Coarse Gravel*	m	0.85
D50 - mm		6
D85 - mm		35
D90 - mm		50
Slope		0.0012
Froude Number for Channel		0.51
USBR - Lacey Z - Straight Reach	Zl	0.25
Neill Z (p. 36 USBR) Straight Reach	Zn	0.5
Blench Z (p. 36 USBR) Straight Rch	Zb	0.6
Blench "zero bed factor" (p35)	Fbo	2.8

Using All Equations

Average Scour Depth	6.3
Bend Scour - Moderate Bend	8.5
Bend Scour - Severe Bend	9.2

Total Scour Depth Calculations

		Meth. Used
Average of Similar Values	4.2	3,4
Bend Scour Average	9.5	4 (Moderate)
Long Term Scour (HEC-6T 105 Yrs) (Max	3.4	
Bed Form Scour (See Tab) (BF)	1.6	
Low Flow Incisement (LFI)	2	
Safety Factor x (LT+BF+BS+LFI)	1.3	
Recommended Toe Down / with Bend	21.5	

Recommended Toe Down -No Bend	14.5 Feet

This Spreadsheet is provided without implied or express warranty as to the applicability, accuracy or correctness of any formulas or calculations. The use of this spreadsheet indicates the willingness of the user to accept all risks and liabilities arising from its use. The user is encouraged to verify the accuracy and applicability of all equations prior to their use in determining toe down depths.

1 Neill - Incised — ds = Z *df

df = di*(qf/qi)^m

	di		qf		m		df	Zn
df =	10	x (	133.18	)^	0.85	=	10.0	0.5
			133.18				Moderate Bend	0.6
Includes Bend Scour			qi				Severe Bend	0.70

2 Neill - Competent Velocity - Sand or Coarser Material

ds = dm((Vm/Vc)-1)

	dm		Vm				ds
ds =	14.2	x ((	10.6	) -	1	) =	7.3
			7				
			Vc				

3 USBR - D50 Method — 50% of Average Flow Depth (dm)

ds = Z*dm

	Z		dm	ds
ds =	0.25	x	14.2	3.6

4 Lacey - Zero Bed Sediment Transport Assumed — ds = Z*dm

dm=0.47*(Q/f)^1/3

			Q				dm	Z
dm =	0.47	x (	285000	)^	0.3333	=	19.0	0.25
			4.3				Mod Bend	0.5
Includes Bend Scour			f				Sharp Bend	0.6
							Right Angle Bend	1
							Vertical Rock Bank or Wall	1.25
			Dm = D50				f	
f =	1.76	*	6	^	0.5	=	4.3	

5 Blench - Zero Bed Factor — ds = Z*dfo

dfo = qf ^(2/3) / Fbo^(1/3)

	qf				dfo	Z
dfo =	133.18	^	0.67	=	18.5	0.6
	2.8	^	0.3333			
Includes Bend Scour	Fbo				Right Angle Bend	1.25

6 Abbot - SW Streams — 0.5 < d50 < 0.7 — Design Assumption

ds = K * (qi)^0.24
K = 2.45

			qi				ds
ds =	2.45	*	133.18	^	0.24	=	7.9

7 Zeller Equation - General Scour - Minor Watercourses

IGNORE IF NEGATIVE!

Z = Ymax * [0.0685 * v^0.8 / (yh^0.4 * Se^0.3) - 1]

		Ymax		V				
Zgeneral	=	24	[(0.0685	10.6	^	0.8	) -1] =	
			(14.2	^0.4	0.0012	^0.3	)	
			Yh		Se			

Scour results

Method	Scour Depth	Scour in Bends: Moderate Bend	Severe Bend	Right Angle Bend	Vertical Wall	
1 Neill - Incised	5.0	Don't Use; 6.0	7			No / No / OK
2 Neill - Competent Velocity	7.3	7.3	7.3			
3 USBR - D50 Method	3.6					
4 Lacey	4.8	9.5	11.4	19.0	23.8	
5 Blench	11.1	11.1	11.1	12.0		
6 Abbot	Don't Use; 7.9					
7 Zeller	OK; 4.3					
Average Bend Scour Values		8.5	9.2	15.5	23.8	

Use Proper Bend Scour Value in B29 for Calculations at Left - Not Necessarily This Average!!!

Applicability of Neill Incised Eqn

No	dm < df	19.0 dm
No	dm < df < dfo	10.0 df
OK	df < dfo	18.5 dfo

dfo calculated below (under eqn 5)

Middle Section

			Recommend Toe Down
USBR Calcs			
Straight Bank	14.5	ft	14.5
With Bend	21.5	ft	21.5
Corps Calcs			
Outer Bend	19.4	ft	19.4

Table LR

Method	Neill	Lacey	Blench
Straight	0.5	0.25	0.6
Moderate Bend	0.6	0.5	0.6
Severe Bend	0.7	0.75	0.6
Right Angle Bend		1	1.25
Vertical Rock Bank		1.25	

Methodology Adapted from "Computing Degradation and Local Scour", US Bureau of Reclamation, Ernest L. Pemberton and Joseph M. Lara, January 1984
Zeller Equation from the Flood Control District of Maricopa County Drainage Design Manual - Hydraulics, September 2003 (Draft)
Thanks to those who have reviewed this spreadsheet and pointed out inconsistencies and suggested improvements!

Final Design Calculations - Section 1 (Bridge Section)

King Ranch - Cotton Lane Bridge - Near Bridge Reach
Bedform Scour Depths

Zbedform = 0.5 Dh

Hydraulic Depth 14.2
Froude Number 0.51

Simons and Senturk (1992)						
Dune Height (Dh)			**Applicable when Fr <1.0**			
Dh = 0.066 * Yh^1.21						
		Yh				
Dh =	0.066		14.2 ^ 1.21	=		**1.6**
Antidune Height	**Applicable when Fr > 0.7**					
Dh = 0.28 * pi * Yh * Fr^2						
Dh =	0.28	3.14	14.2 *	0.51 ^2	=	**3.2**
Bedform Height	**1.6**		**Fr =**	**0.51**		

Based on Methodology Presented in Flood Control District of Maricopa County Drainage Design Manual, September 2003 (Draft)

Final Design Calculations - June 2006
Section 1

Calculation of General Scour Depths - English Units (ft)

June 5, 2006

Gila River / Cotton Lane Bridge - w/Protected South Bank - 500 Year Flood Flow = 285,000 cfs

Gila River - King Ranch/Cotton Lane Bridge
Cotton Lane Bridge Section
Method not Applicable

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Stream Values

Incised / Bankfull Q cfs	Qi	285000
Incised / Bankfull Width	Wi	3150
Incised / Bankfull q cfs/ft	qi	90.48
Depth of Incision	di	10
Competent Veloc.(Fig 12 p 41 cohensionle	Vc	7
(Table 8 for cohesive soils)		
Design Q (Channel)		285000
Design Channel Width		3150
Design Flow / Width	qf	90.48
Average Depth / Hydraulic Depth	dm	11
Maximum Depth	Ymax	19.26
Average Velocity	Vm	8.8
Bend Radius of Curvature (ft)	Rc	4210
Neill's m - 0.67 Sand to 0.85 Coarse Gravel	m	0.85
D50 - mm		6
D85 - mm		35
D90 - mm		50
Slope		0.0012
Froude Number for Channel		0.44
USBR - Lacey Z - Straight Reach	Zl	0.25
Neill Z (p. 36 USBR) Straight Reach	Zn	0.5
Blench Z (p. 36 USBR) Straight Rch	Zb	0.6
Blench "zero bed factor" (p35)	Fbo	2.8

Using All Equations

Average Scour Depth	4.8
Average Scour Depth - Moderate Bend	6 7
Average Scour Depth - Severe Bend	7.5

Total Scour Depth Calculations — Meth. Used

Average of Similar Values	3.8	3,4
Bend Scour Average	9 0	Moderate Bend
Long Term Scour (HEC-6T 105 Yrs) (Max	3.3	
Bed Form Scour (See Tab) (BF)	1.2	
Low Flow Incisement (LFI)	2	
Safety Factor x (LT+BF+BS+LFI)	1.3	
Recommended Toe Down / with Bend	20 2	

Recommended Toe Down -No Bend	13.3 Feet

This Spreadsheet is provided without implied or express warranty as to the applicability, accuracy or correctness of any formulas or calculations The use of this spreadsheet indicates the willingness of the user to accept all risks and liabilities arising from its use. The user is encouraged to veryify the accuracy and applicability of all equations prior to their use in determining toe down depths

Methodology Adapted from "Computing Degradation and Local Scour", US Bureau of Reclamation, Ernest L. Pemberton and Joseph M. Lara January 1984
Zeller Equation from the Flood Control District of Maricopa County Drainage Design Manual - Hydraulics, September 2003 (Draft)
Thanks to those who have reviewed this spreadsheet and pointed out inconsistencies and suggested improvements!

1 Neill - Incised

$df = di*(qf/qi)^m$ — ds = Z *df

	di		qf		m		df	Zn
df =	10	x (	90.48	)^	0 85	=	10 0	0.5
			90 48			Moderate Bend		0.6
Includes Bend Scour			qi			Severe Bend		0.70

2 Neill - Competent Velocity - Sand or Coarser Material

$ds = dm((Vm/Vc)-1)$

	dm		Vm				ds
ds =	11	x ((	8.8	) -	1	) =	2 8
			7				
			Vc				

3 USBR - D90 Method

50% of Average Flow Depth (dm)

$ds = Z*dm$

	Z		dm	ds
ds =	0.25	x	11	2 8

4 Lacey - Zero Bed Sediment Transport Assumed

$dm=0\ 47*(Q/f)^{1/3}$ — ds = Z*dm

			Q				dm	Z
dm =	0.47	x (	285000	)^	0.3333	=	19.0	0.25
			4.3				Mod Bend	0.5
Includes Bend Scour			f				Sharp Bend	0 6
							Right Angle Bend	1
							Vertical Rock Bank or Wall	1.25
			Dm = D50				f	
f =	1.76	*	6	^	0.5	=	4.3	

5 Blench - Zero Bed Factor

$dfo = qf^{(2/3)} / Fbo^{(1/3)}$ — ds = Z*dfo

	qf				dfo	Z
dfo =	90.48	^	0.67	=	14.3	0 6
	2.8	^	0 3333			
Includes Bend Scour	Fbo				Right Angle Bend	1.25

6 Abbot - SW Streams

0.5 < d50 < 0.7 — Design Assumption

$ds = K * (qi)^{0\ 24}$
K = 2.45

			qi				ds
ds =	2.45	*	90.48	^	0 24	=	7.2

7 Zeller Equation - General Scour - Minor Watercourses

IGNORE IF NEGATIVE!

$Z = Ymax * [0.0685 * v^{0\ 8} / (yh^{0.4} * Se^{0.3}) - 1]$

		Ymax			V				
Zgeneral	=	19.26	((	0.0685	8 8	^	0.8	)	-1] =
			(	11	^0.4	0 0012	^0.3	)	
				Yh		Se			

Results

Method	Scour Depth	Scour in Bends: Moderate Bend	Severe Bend	Right Angle Bend	Vertical Wall
1 Neill - Incised	5.0	Don't Use; 6 0	7		
2 Neill - Competent Velocity	2.8	2.8	2 8		
3 USBR - D90 Method	2.8				
4 Lacey	4.8	9 5	11.4	19.0	23.8
5 Blench	8.6	8.6	8.6	9.3	
6 Abbot	Don't Use; 7 2				
7 Zeller	OK; 2.4				
Average Bend Scour Values		6 7	7.5	14.1	23.8

Use Proper Bend Scour Value in B29 for Calculations at Left - Not Necessarily This Average!!!

Applicability of Neill Incised Eqn

No	dm < df	19.0 dm
No	dm < df < dfo	10.0 df
OK	df < dfo	14.3 dfo
	dfo calculated below (under eqn 5)	

Middle Section

			Recommended Toe Down
USBR Calcs			
Straight Bank	13.3	ft	13.5
With Bend	20.2	ft	20.5
Corps Calcs			
Outer Bend	26 9	ft	26.9

Table LR

Method	Neill	Lacey	Blench
Straight	0.5	0.25	0.6
Moderate Bend	0 6	0.5	0 6
Severe Bend	0.7	0 75	0.6
Right Angle Bend		1	1 25
Vertical Rock Bank		1.25	

Final Design Calculations - Section 2 (West of Cotton Lane Bridge)

King Ranch - Cotton Lane Bridge - Middle Reach - Expansion Reach
Bedform Scour Depths

Zbedform = 0.5 Dh

Hydraulic Depth 11
Froude Number 0.44

Simons and Senturk (1992)						
Dune Height (Dh)			**Applicable when Fr <1.0**			
Dh = 0.066 * Yh^1.21						
		Yh				
Dh =	0.066		11 ^ 1.21 =	1.2		
Antidune Height	**Applicable when Fr > 0.7**					
Dh = 0.28 * pi * Yh * Fr^2						
Dh =	0.28	3.14	11 *	0.44 ^2	=	1.9
Bedform Height	1.2	Fr =	0.44			

Based on Methodology Presented in Flood Control District of Maricopa County Drainage Design Manual, September 2003 (Draft)

Calculation of General Scour Depths - English Units (ft)

June 5, 2008

Gila River / Cotton Lane Bridge - w/Protected South Bank - 500 Year Flood Flow = 285,000 cfs

Gila River - King Ranch/Cotton Lane Bridge
Cotton Lane Bridge Section
Method not Applicable

Stream Values

Incised / Bankfull Q cfs	Qi	285000
Incised / Bankfull Width	Wi	4150
Incised / Bankfull q cfs/ft	qi	68.67
Depth of Incision	di	10
Competent Veloc (Fig 12 p.41 cohensionle	Vc	7
(Table 8 for cohesive soils)		
Design Q (Channel)		285000
Design Channel Width		4150
Design Flow / Width	qf	68.67
Average Depth / Hydraulic Depth	dm	12.6
Maximum Depth	Ymax	20.1
Average Velocity	Vm	6.3
Bend Radius of Curvature (ft)	Rc	4210
Neill's m - 0.67 Sand to 0 85 Coarse Gravel	m	0.85
D50 - mm		6
D85 - mm		35
D90 - mm		50
Slope		0.0012
Froude Number for Channel		0.35
USBR - Lacey Z - Straight Reach	Zl	0.25
Neill Z (p. 36 USBR) Straight Reach	Zn	0.5
Blench Z (p. 36 USBR) Straight Rch	Zb	0.6
Blench "zero bed factor" (p35)	Fbo	2.8

Using All Equations

Average Scour Depth	3 1
Average Scour Depth - Moderate Bend	5.3
Average Scour Depth - Severe Bend	6 1

Total Scour Depth Calculations		Meth. Used
Average of Similar Values	4 0	3, 4
Bend Scour Average (Moderate Bend)	6 3	4, 5
Long Term Scour (HEC-6T 105 Yrs)	0.9	
Bed Form Scour (See Tab) (BF)	1.4	
Low Flow Incisement (LFI)	2	
Safety Factor x (LT+BF+BS+LFI)	1.3	
Recommended Toe Down / with Bend	16 4	

Recommended Toe Down -No Bend	10.7 Feet

Methodology Adapted from "Computing Degradation and Local Scour", US Bureau of Reclamation, Ernest L. Pemberton and Joseph M. Lara, January 1984
Zeller Equation from the Flood Control District of Maricopa County Drainage Design Manual - Hydraulics, September 2003 (Draft)
Thanks to those who have reviewed this spreadsheet and pointed out inconsistencies and suggested improvements!

Methods

1 Neill - Incised (ds = Z *df)

df = di*(qf/qi)^m

	di		qf		m		df	Zn
df =	10	x (	68.67	)^	0.85	=	10.0	0.5
			68.67		Moderate Bend			0.6
Includes Bend Scour			qi		Severe Bend			0.70

2 Neill - Competent Velocity - Sand or Coarser Material

	dm		Vm				ds
ds = dm((Vm/Vc)-1) ds =	12.6	x ((	6.3	) -	1	) =	-1.3
			7				
			Vc				

3 USBR - D90 Method — 50% of Average Flow Depth (dm)

	Z		dm	ds
ds = Z*dm ds =	0.25	x	12.6	3 2

4 Lacey - Zero Bed Sediment Transport Assumed (ds = Z*dm)

			Q				dm	Z
dm=0.47*(Q/f)^1/3 dm =	0.47	x (	285000	)^	0.3333	=	19 0	0.25
			4.3		Mod Bend			0 5
Includes Bend Scour			f		Sharp Bend			0.6
					Right Angle Bend			1
					Vertical Rock Bank or Wall			1 25
			Dm = D50				f	
f =	1 76	*	6	^	0.5	=	4.3	

5 Blench - Zero Bed Factor (ds = Z*dfo)

		qf				dfo	Z
dfo = qf ^(2/3) / Fbo^(1/3) dfo =		68.67	^	0.67	=	11 9	0 6
		2.8	^	0 3333			
Includes Bend Scour		Fbo		Right Angle Bend			1 25

6 Abbot - SW Streams — 0.5 < d50 < 0.7 — Design Assumption

			qi				ds
ds = K * (qi)^0.24 ds =	2.45	*	68.67	^	0.24	=	6 8

K = 2 45

7 Zeller Equation - General Scour - Minor Watercourses

IGNORE IF NEGATIVE!

Z = Ymax * [0.0685 * v^0.8 / (yh^0 4 * Se^0.3) - 1]

		Ymax			V				
Zgeneral	=	20.1	[(	0.0685	6.3	^	0.8	) -1	] =
			(	12 6	^0.4	0.0012	^0 3	)	
				Yh		Se			

Scour Results

Method	Scour Depth	Scour in Bends: Moderate Bend	Severe Bend	Right Angle Bend	Vertical Wall
1 Neill - Incised	5.0	Don't Use 6.0	7		
2 Neill - Competent Velocity	-1.3	-1.3	-1 3		
3 USBR - D90 Method	3.2				
4 Lacey	4.8	9.5	11.4	19 0	23.8
5 Blench	7 1	7.1	7 1	7.7	
6 Abbot	Don't Use 6.8				
7 Zeller	Don't Use -3.7				
Average Bend Scour Values		5 3	6.1	13.4	23.8

Use Proper Bend Scour Value in B29 for Calculations at Left - Not Necessarily This Average!!!

Applicability of Neill Incised Eqn

No	dm < df	19.0	dm
No	dm < df < dfo	10.0	df
OK	df < dfo	11.9	dfo

dfo calculated below (under eqn 5)

Middle Section

			Recommended Toe Down
USBR Calcs			
Straight Bank	10.7	ft	11
With Bend	16.4	ft	16.5
Corps Calcs			
Outer Bend	37.4	ft	

Table LR

Method	Neill	Lacey	Blench
Straight	0 5	0 25	0.6
Moderate Bend	0.6	0.5	0.6
Severe Bend	0 7	0.75	0.6
Right Angle Bend		1	1.25
Vertical Rock Bank		1.25	

Final Design Calculations - Section 3 (West End of King Ranch)

King Ranch - Cotton Lane Bridge - Middle Reach - Expansion Reach
Bedform Scour Depths

Zbedform = 0.5 Dh

Hydraulic Depth	12.6
Froude Number	0.35

Simons and Senturk (1992)						
Dune Height (Dh)			**Applicable when Fr <1.0**			
Dh = 0.066 * Yh^1.21						
		Yh				
Dh =	0.066		12.6 ^ 1.21	=		1.4
Antidune Height		**Applicable when Fr > 0.7**				
Dh = 0.28 * pi * Yh * Fr^2						
Dh =	0.28	3.14	12.6 *	0.35 ^2	=	1.4
Bedform Height	1.4		**Fr =**	**0.35**		

Based on Methodology Presented in Flood Control District of Maricopa County Drainage Design Manual, September 2003 (Draft)

Final Design Calculations - June 2006

Section 3 - West of Cotton Lane Bridge - West End of King Ranch

Cotton Lane Bridge - Pier Scour Calculations

Scour Summary of Calculations

Leo Kreymborg, P.E.

16-Feb-06

Pier Scour (5 foot columns)	100-year	500-year	Notes
General Scour	1.1	1.1	Both are Zeller General Scour at 192.41 from n=0.025 in channel model
Long Term Scour	1.5	1.5	
30% factor of safety on subtotal	0.8	0.8	
Subtotal	3.4	3.4	
Local Pier Scour	19.7	20.7	
Total Scour	23.1	24.1	

Left and Right Abutment Scour	100-year	500-year	Notes
General Scour	1.1	see note below	Zeller General Scour at 192.41 from n=0.025 in channel model
Long Term Scour	1.5	see note below	
Dune Scour	3	see note below	1/6 of Maximum Depth at 192.41
Factor of Safety, 30%	1.7	see note below	
Total Scour	7.3	27.3	for 500-year flood, use pier scour calculation for 5-foot piers

500-year pier scour

y_1	19.6	Flow depth directly upstream of pier	from cross-section 192.41 Channel Maximum Depth (n=0.025 in channel model)
K_1	1.1	Correction Factor for pier nose shape	Square Nose Including Debris, Table 6.1 HEC-18
K_2	1.0	Correction Factor for angle of attack	0 angle of attack, Table 6.2
K_3	1.1	Correction Factor for bed condition	Table 6.3 Plane bed and antidune flow
K_4	1.0	Correction Factor for armoring	Several samples do not have D95 > 20mm, so no armoring is assumed
a	9.0	Pier width (5 feet + 4 feet debris)	8 feet
Fr_1	0.47	Froude number directly upstream of pier	from cross-section 192.42, Channel Froude number
V_1	9.77	Mean channel velocity (not used)	Channel velocity from 192.42
g	32.2	(not used)	

$y_s = a * 2.0 * K_1 * K_2 * K_3 * K_4 * (y_1/a)^{0.35} * Fr_1^{0.43}$

$y_s =$ 20.67115

Summary of Scour Values for Vane Dikes June 29, 2006

Using Pier Scour Equations from WEST

500-year pier scour

y_1	13.9	Flow depth directly upstream of pier	from cross-section 192.41 Channel Maximum Depth (n=0.025 in char
K_1	1.0	Correction Factor for pier nose shape	Round Nose Not Including Debris, Table 6.1 HEC-18
K_2	1.0	Correction Factor for angle of attack	15 degree angle of attack, Table 6.2 - L/a = 500/20 = 25
K_3	1.1	Correction Factor for bed condition	Table 6.3 Plane bed and antidune flow
K_4	1.0	Correction Factor for armoring	Several samples do not have D95 > 20mm, so no armoring is assum
a	30.0	Pier width - No Direct Correlation	Varies from 9 ft at crest to 93 ft at bed
Fr_1	0.43	Froude number directly upstream of pier	from cross-section 191.95, Channel Froude number
V_1	7.8	Mean channel velocity (not used)	Channel velocity from 191.95
g	32.2	(not used)	

$y_s = a * 2.0 * K_1 * K_2 * K_3 * K_4 * (y_1/a)^{0.35} * Fr_1^{0.43}$

$y_s =$ 35.07503

Method	Scour Depth
Pier Scour - 20 ft width	27
Pier Scour - 30 ft width	35
Guide Dike Calculations (USBR - See Section 2)	
Lacey - Using Worst Value	33.33
Blench - Using Worst Value	25
Average Value	30.08

	River Mile	Water Surface Elevation	Top of Vane Dike	ank Elevati FW+1.0 ft	Thalweg Elevation	Vane Dikes Toe Elevation	Vane Dikes Total Height	Vane Dikes Distance to Toe*
						30		
Reach 2	191.95	890.70	887.50	891.70	876.88	846.88	40.62	121.86
	191.86	890.19	887.00	891.19	876.27	846.27	40.73	122.19
	191.76	889.66	886.50	890.66	874.62	844.62	41.88	125.64
	191.67	889.10	886.00	890.10	872.6	842.60	43.40	130.2
	191.57	888.58	885.50	889.58	870.63	840.63	44.87	134.61
Reach 3	191.48	888.13	885.00	889.13	870.93	840.93	44.07	132.21

King Ranch Riprap Sizing - North/Outer Bank

PROGRAM OUTPUT FOR A CHANNEL WITH A KNOWN LOCAL
DEPTH AVERAGED VELOCITY, BENDWAY
INPUT PARAMETERS

SPECIFIC WEIGHT OF STONE,PCF	155.0
MINIMUM CENTER LINE BEND RADIUS,FT	5000.0
WATER SURFACE WIDTH,FT	2100.0
LOCAL FLOW DEPTH,FT	20.0
CHANNEL SIDE SLOPE,1 VER: 4.00 HORZ	
LOCAL DEPTH AVG VELOCITY,FPS	10.00
SIDE SLOPE CORRECTION FACTOR K1	1.00
CORRECTION FOR VELOCITY PROFILE IN BEND	1.21
RIPRAP DESIGN SAFETY FACTOR	1.10

SELECTED STABLE GRADATIONS
ETL GRADATION

NAME	COMPUTED D30 FT	D30(MIN) FT	D100(MAX) IN	D85/D15	N=THICKNESS/ D100(MAX)	CT	THICKNESS IN
1		.37	9.00	1.70	NOT STABLE		
2	.48	.48	12.00	1.70	1.00	1.00	12.0

D100(MAX) IN	LIMITS OF STONE WEIGHT,LB FOR PERCENT LIGHTER BY WEIGHT 100		50		15		D30(MIN) FT	D90(MIN) FT
12.00	81	32	24	16	12	5	.48	.70

EQUIVALENT SPHERICAL DIAMETERS IN INCHES

D100(MAX)	D100(MIN)	D50(MAX)	D50(MIN)	D15(MAX)	D15(MIN)
12.0	8.8	8.0	7.0	6.3	4.8

King Ranch Riprap Sizes South Bank

PROGRAM OUTPUT FOR A CHANNEL WITH A KNOWN LOCAL
DEPTH AVERAGED VELOCITY, STRAIGHT REACH
INPUT PARAMETERS

SPECIFIC WEIGHT OF STONE,PCF	155.0
LOCAL FLOW DEPTH,FT	10.0
CHANNEL SIDE SLOPE,1 VER: 4.00 HORZ	
LOCAL DEPTH AVG VELOCITY,FPS	10.00
SIDE SLOPE CORRECTION FACTOR K1	1.00
CORRECTION FOR VELOCITY PROFILE IN BEND	1.00
RIPRAP DESIGN SAFETY FACTOR	1.10

SELECTED STABLE GRADATIONS
ETL GRADATION

NAME	COMPUTED D30 FT	D30(MIN) FT	D100(MAX) IN	D85/D15	N=THICKNESS/ D100(MAX)	CT	THICKNESS IN
1		.37	9.00	1.70	NOT STABLE		
2	.47	.48	12.00	1.70	1.00	1.00	12.0

D100(MAX) LIMITS OF STONE WEIGHT,LB D30(MIN) D90(MIN)

ChannelPro-RiprapSize-12-Outer

IN	FOR PERCENT LIGHTER BY WEIGHT						FT	FT
	100		50		15			
12.00	81	32	24	16	12	5	.48	.70

EQUIVALENT SPHERICAL DIAMETERS IN INCHES

D100(MAX)	D100(MIN)	D50(MAX)	D50(MIN)	D15(MAX)	D15(MIN)
12.0	8.8	8.0	7.0	6.3	4.8

APPENDIX F

SECTION 4

2D VELOCITY DIFFERENCES

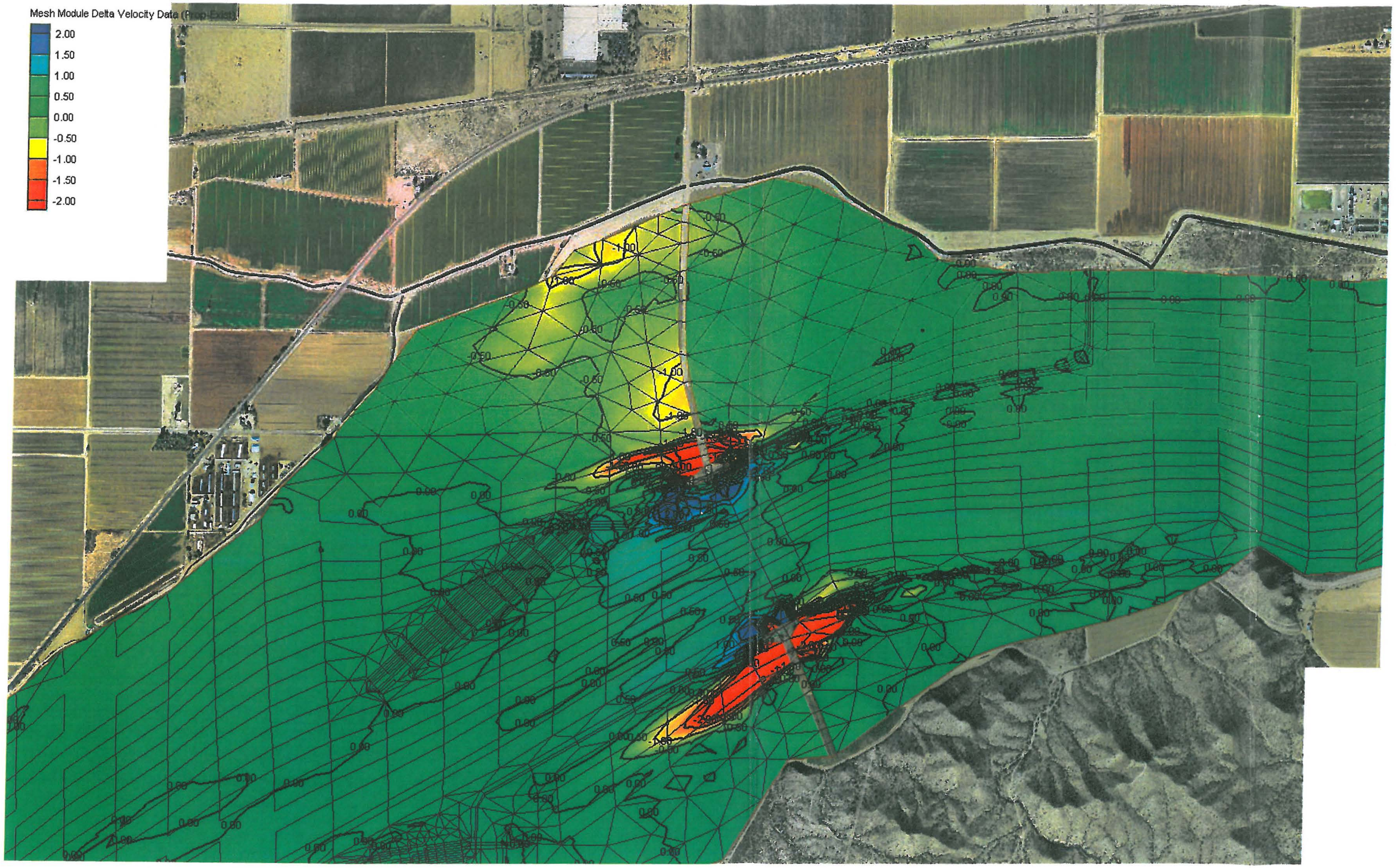


Figure 5. Velocity Differences between Existing Conditions and with Bridge Conditions.

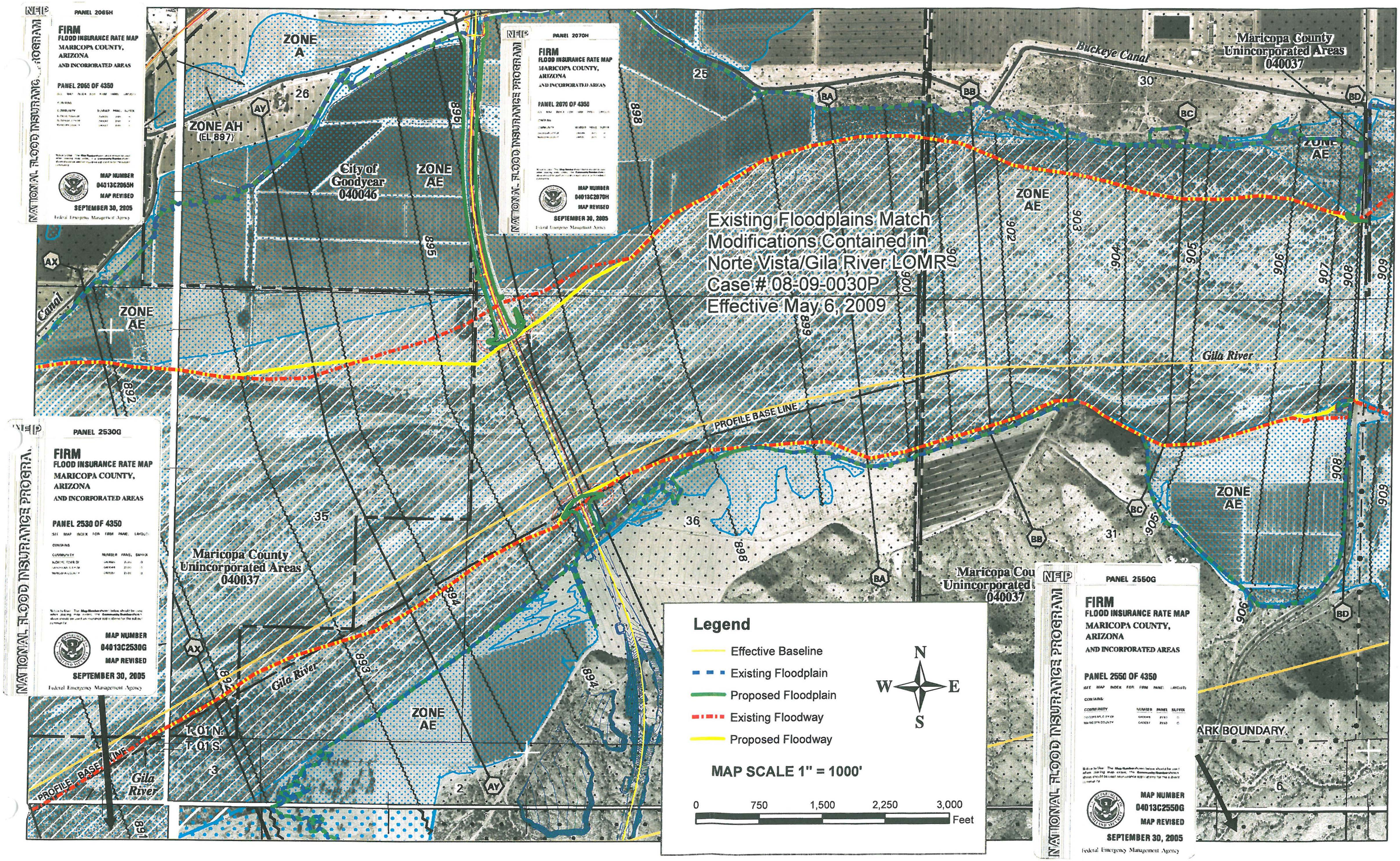
Mailing Address: 1345 E. Spur Ave, Gilbert, AZ 85296
Physical Location: 3048 E Baseline Rd, Suite 118, Mesa, AZ 85204

APPENDIX G

CHECK-RAS OUTPUT

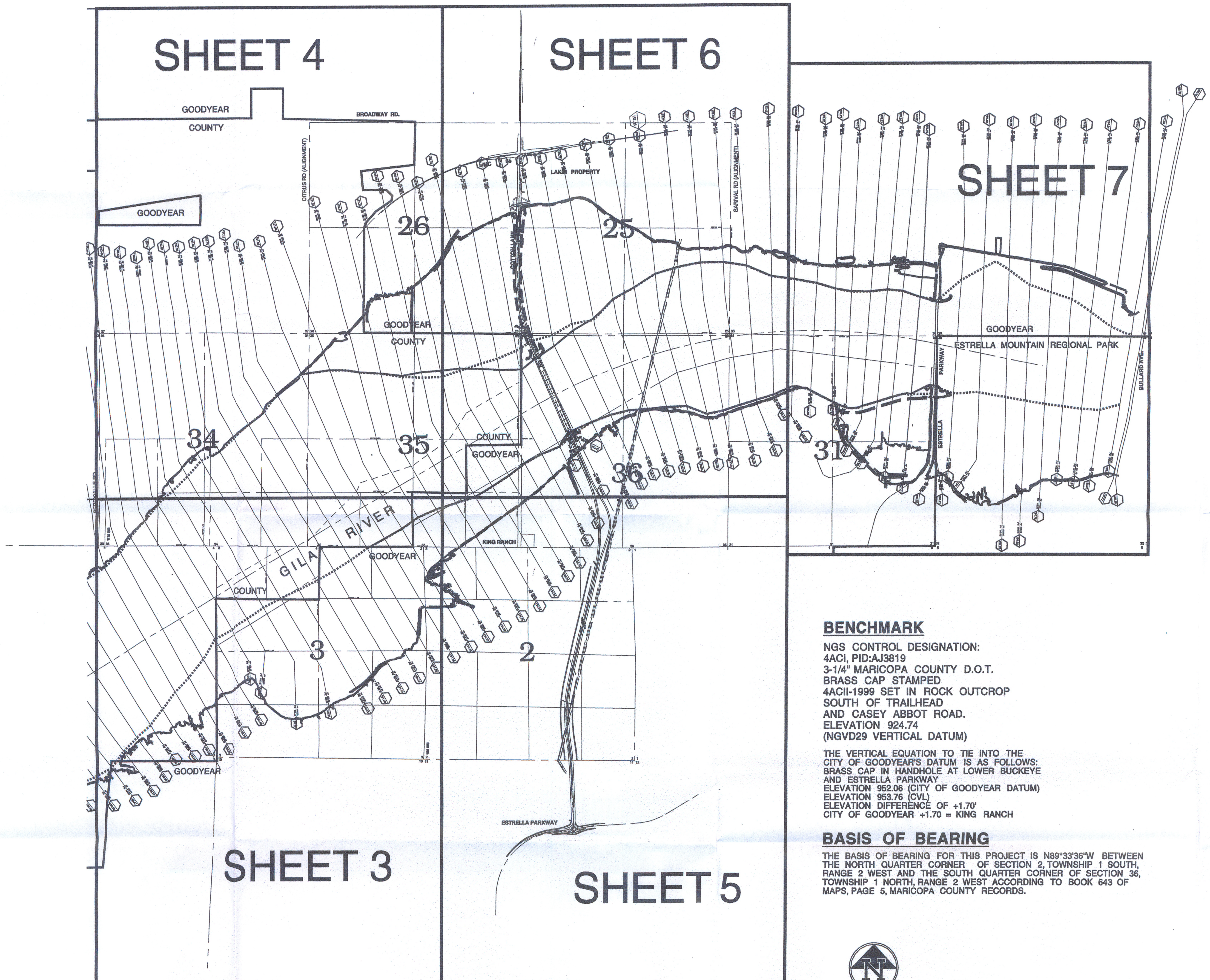
The CHECK-RAS report was reviewed and no critical errors were found. The report files can be generated from the data on the enclosed CD if desired. This was done to conserve both paper and storage space.

EXHIBIT MAPS



Existing Floodplains Match
Modifications Contained in
Norte Vista/Gila River LOMR
Case # 08-09-0030P
Effective May 6, 2009
Legend
Effective Baseline
Existing Floodplain
Proposed Floodplain
Existing Floodway
Proposed Floodway
MAP SCALE 1" = 1000'
0 750 1,500 2,250 3,000 Feet
N
S
E
W
ZONE A
ZONE AH
(EL 897)
ZONE AE
City of Goodyear 040046
Maricopa County Unincorporated Areas 040037
Buckeye Canal
Gila River
PROFILE BASE LINE
Canal
ARK BOUNDARY
T.01 N.
T.01 S.
NFIP
PANEL 2065H
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 2065 OF 4350
MAP NUMBER 04013C2065H
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency
PANEL 2070H
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 2070 OF 4350
MAP NUMBER 04013C2070H
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency
NATIONAL FLOOD INSURANCE PROGRAM
PANEL 2530G
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 2530 OF 4350
MAP NUMBER 04013C2530G
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency
PANEL 2550G
FIRM
FLOOD INSURANCE RATE MAP
MARICOPA COUNTY, ARIZONA
AND INCORPORATED AREAS
PANEL 2550 OF 4350
MAP NUMBER 04013C2550G
MAP REVISED SEPTEMBER 30, 2005
Federal Emergency Management Agency

COTTON LANE BRIDGE/KING RANCH FLOODPLAIN REDELINEATION



BENCHMARK

NGS CONTROL DESIGNATION:
4ACI, PID:AJ3819
3-1/4" MARICOPA COUNTY D.O.T.
BRASS CAP STAMPED
4ACII-1999 SET IN ROCK OUTCROP
SOUTH OF TRAILHEAD
AND CASEY ABBOT ROAD.
ELEVATION 924.74
(NGVD29 VERTICAL DATUM)

THE VERTICAL EQUATION TO TIE INTO THE CITY OF GOODYEAR'S DATUM IS AS FOLLOWS:
BRASS CAP IN HANDHOLE AT LOWER BUCKEYE AND ESTRELLA PARKWAY
ELEVATION 952.06 (CITY OF GOODYEAR DATUM)
ELEVATION 953.76 (CVL)
ELEVATION DIFFERENCE OF +1.70'
CITY OF GOODYEAR +1.70 = KING RANCH

BASIS OF BEARING

THE BASIS OF BEARING FOR THIS PROJECT IS N89°33'36"W BETWEEN THE NORTH QUARTER CORNER OF SECTION 2, TOWNSHIP 1 SOUTH, RANGE 2 WEST AND THE SOUTH QUARTER CORNER OF SECTION 36, TOWNSHIP 1 NORTH, RANGE 2 WEST ACCORDING TO BOOK 643 OF MAPS, PAGE 5, MARICOPA COUNTY RECORDS.

N
NOT TO SCALE

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River Research & Design, Inc.
1345 E Spur Avenue
Gilbert, AZ 85296
Telephone 480-275-5077

NO.	REVISION	DATE

River Research & Design, Inc.

GILA RIVER FLOODPLAIN

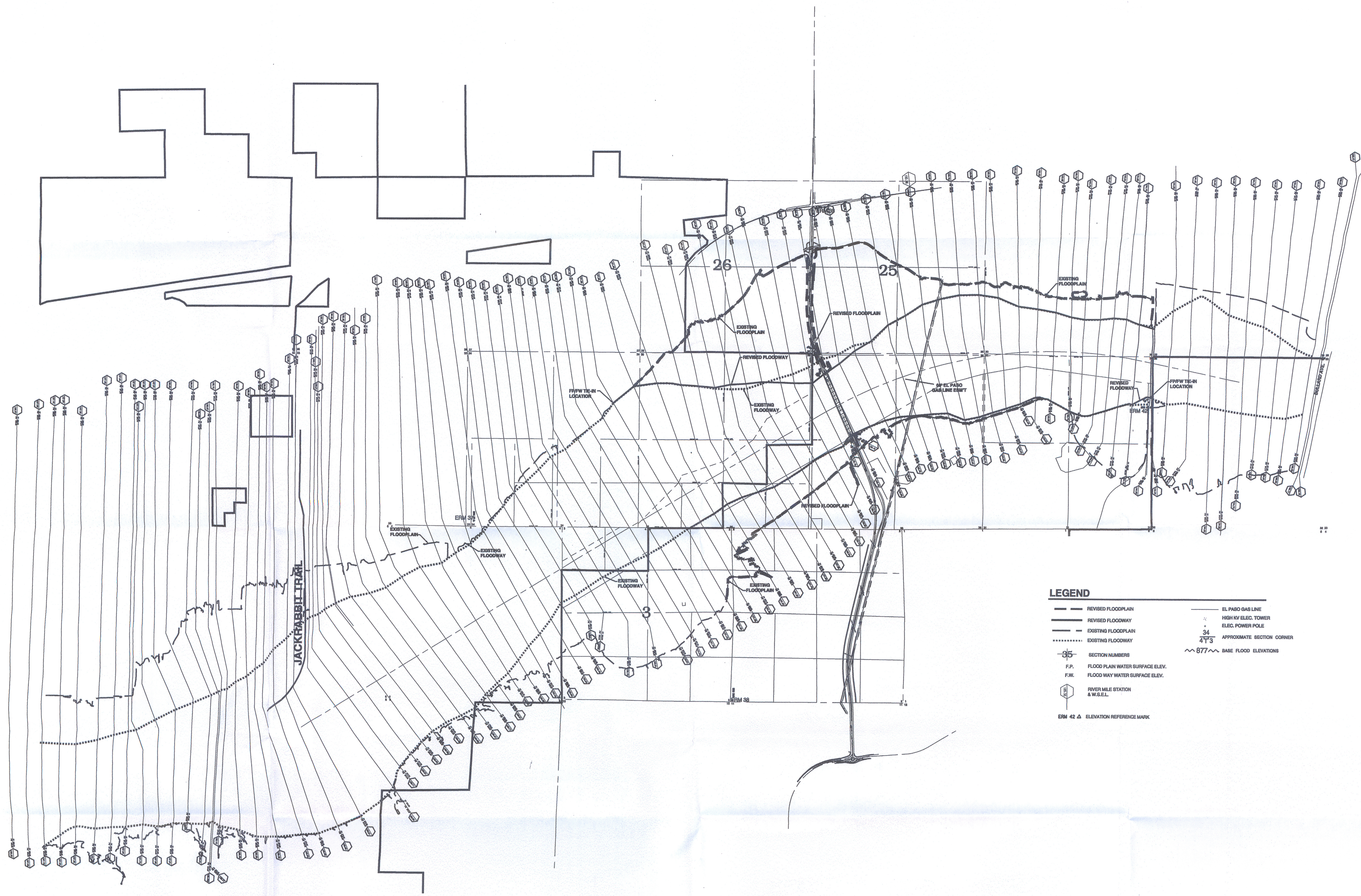
COTTON LANE BRIDGE FLOODPLAIN REDELINEATION

Registered Professional Engineer
CERTIFICATE NO. 36225
GARY E. FREEMAN
ARIZONA, U.S.A.
EXPIRES 6/30/10

Two working days before you dig CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

SHEET 1 OF 7
R2D Contact: GARY FREEMAN
Project #: 1021-07-MCDOT
LOMR - March 3, 2010
DESIGN DATE: FEB. 22, 2008

3/16/2010
10:23:01 AM



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OVERVIEW MAP & LEGEND

COTTON LANE BRIDGE FLOODPLAIN REDELINEATION

Registered Professional Engineer (Civil)
CERTIFICATE NO.
36225
GARY E.
FREEMAN
Date Signed 3/16/10
ARIZONA, U.S.A.
EXPIRES 6/30/10

SHEET
2 OF 7

R2D Contact: GARY FREEMAN

Project #: 1021-07-MCDOT

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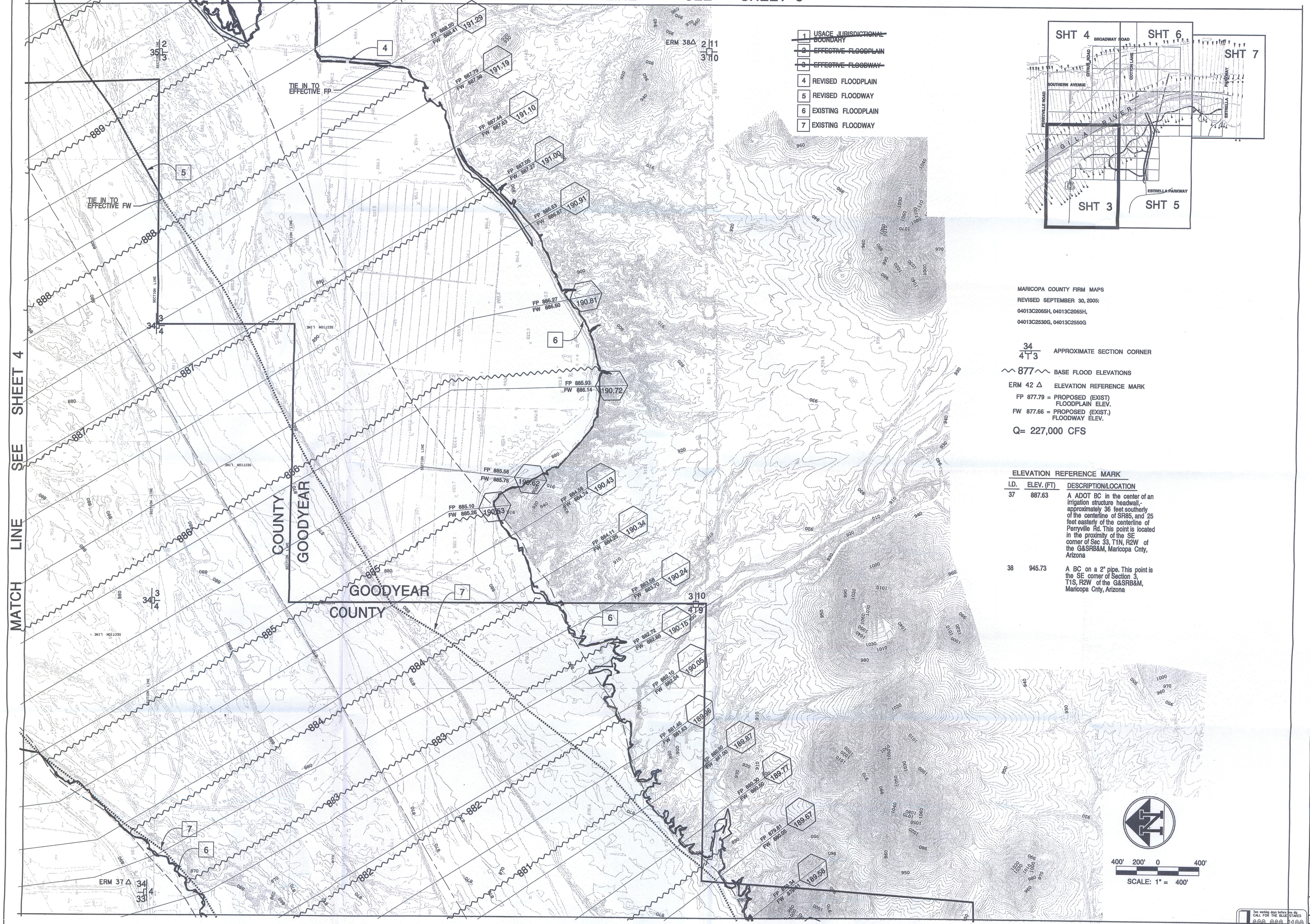
MATCH LINE SEE SHEET 5

MATCH LINE SEE SHEET 4



1	~~USACE JURISDICTIONAL BOUNDARY~~
2	~~EFFECTIVE FLOODPLAIN~~
3	~~EFFECTIVE FLOODWAY~~
4	REVISED FLOODPLAIN
5	REVISED FLOODWAY
6	EXISTING FLOODPLAIN
7	EXISTING FLOODWAY

MARICOPA COUNTY FIRM MAPS
REVISED SEPTEMBER 30, 2005:
04013C2065H, 04013C2065H,
04013C2530G, 04013C2550G

34 / 4 3 — APPROXIMATE SECTION CORNER

877 — BASE FLOOD ELEVATIONS

ERM 42 △ — ELEVATION REFERENCE MARK

FP 877.79 = PROPOSED (EXIST) FLOODPLAIN ELEV.

FW 877.66 = PROPOSED (EXIST.) FLOODWAY ELEV.

Q= 227,000 CFS

ELEVATION REFERENCE MARK

I.D.	ELEV. (FT)	DESCRIPTION/LOCATION
37	887.63	A ADOT BC in the center of an irrigation structure headwall,- approximately 36 feet southerly of the centerline of SR85, and 25 feet easterly of the centerline of Perryville Rd. This point is located in the proximity of the SE corner of Sec 33, T1N, R2W of the G&SRB&M, Maricopa Cnty, Arizona
38	945.73	A BC on a 2" pipe. This point is the SE corner of Section 3, T1S, R2W of the G&SRB&M, Maricopa Cnty, Arizona

400' 200' 0 400'
SCALE: 1" = 400'

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NO. | REVISION | DATE

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GILA RIVER FLOODPLAIN

COTTON LANE BRIDGE FLOODPLAIN REDELINEATION

Registered Professional Engineer (Civil)
36225
GARY E. FREEMAN
Date Signed 3/16/10
ARIZONA, U.S.A.
EXPIRES 6/30/10

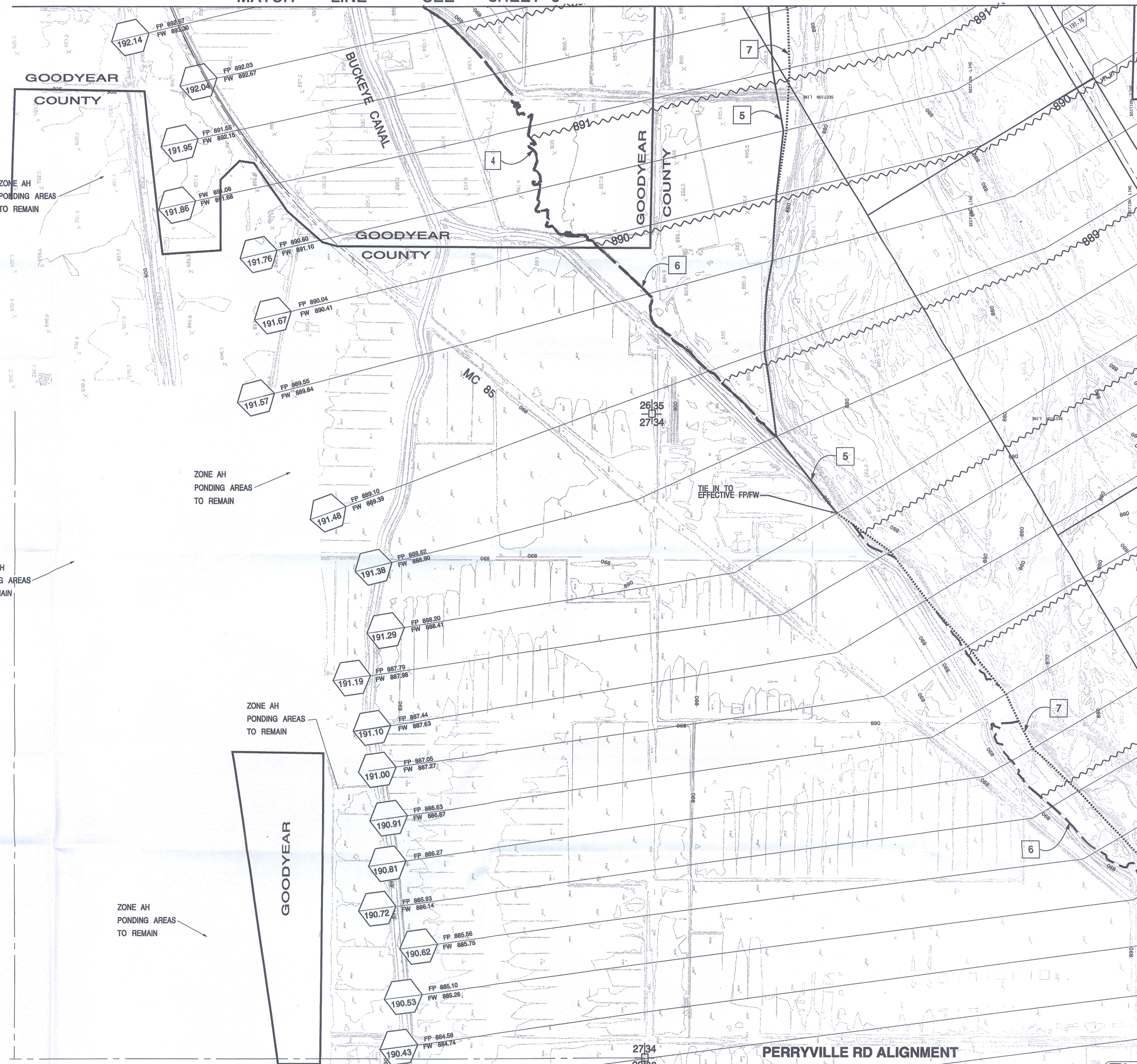
SHEET
3 OF 7

R2D Contact: GARY FREEMAN

Project #: 1021-07-MCDOT

LOMR - March 3, 2010
DESIGN DATE: FEB. 22, 2008

MATCH LINE SEE SHEET 6



~~1 USACE JURISDICTIONAL BOUNDARY~~

~~2 EFFECTIVE FLOODPLAIN~~

~~3 EFFECTIVE FLOODWAY~~

4 REVISED FLOODPLAIN

5 REVISED FLOODWAY

6 EXISTING FLOODPLAIN

7 EXISTING FLOODWAY

34 4 3 APPROXIMATE SECTION CORNER

877 BASE FLOOD ELEVATIONS

FP 877.79 = PROPOSED (EXIST) FLOODPLAIN ELEV.

FW 877.66 = PROPOSED (EXIST.) FLOODWAY ELEV.

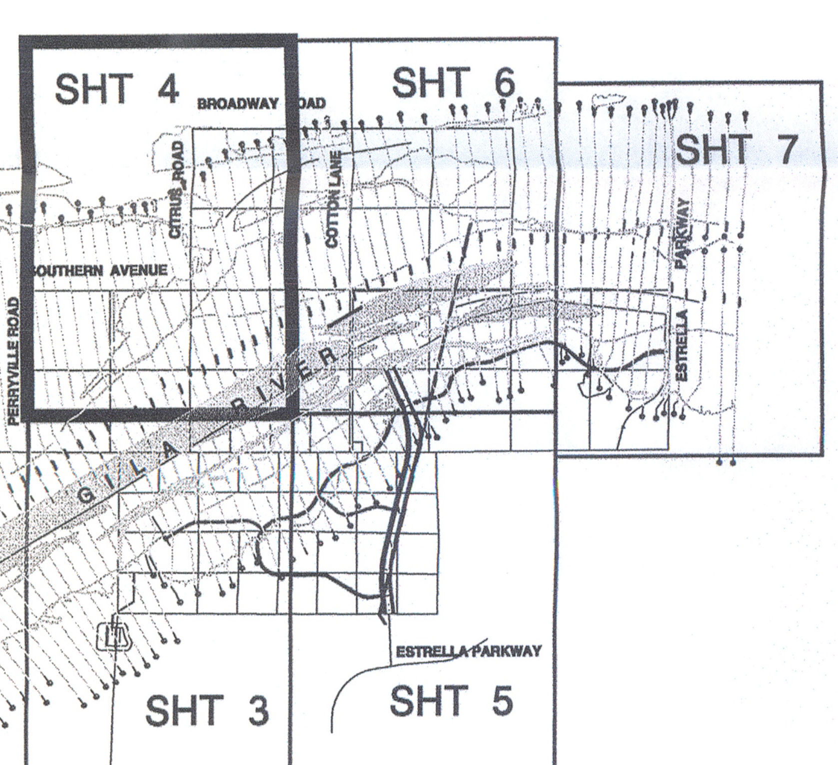
Q= 227,000 CFS

ZONE AH PONDING AREAS TO REMAIN

400' 200' 0 400'

SCALE: 1" = 400'

MARICOPA COUNTY FIRM MAPS REVISED SEPTEMBER 30, 2005: 04013C2065H, 04013C2065H, 04013C2530G, 04013C2550G



3/16/2010
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SHEET 4 OF 7

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Project #: 1021-07-MCDOT
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DESIGN DATE: FEB. 22, 2008

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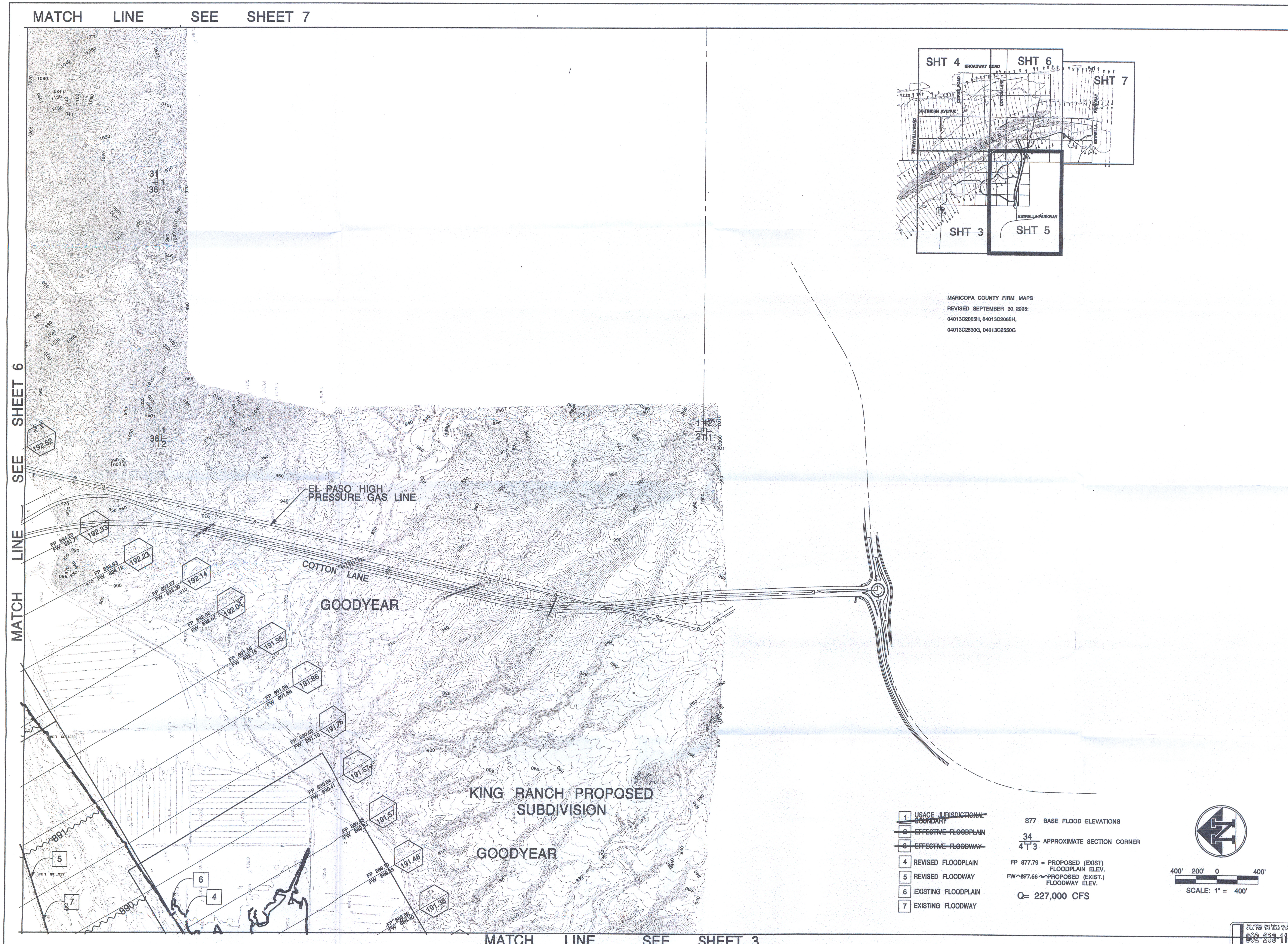

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COTTON LANE BRIDGE FLOODPLAIN REDELINEATION

Registered Professional Engineer (Civil)
CERTIFICATE NO.
36225
GARY E.
FREEMAN
Date Signed 2/1/10
ARIZONA, U.S.A.
EXPIRES 6/30/10

SHEET
5 OF 7

R2D Contact: GARY FREEMAN
Project #: 1021-07-MCDOT
LOMR - March 3, 2010
DESIGN DATE: FEB. 22, 2008

MATCH LINE SEE SHEET 7
400' 200' 0 400'
SCALE: 1" = 400'
34 4 3 APPROXIMATE SECTION CORNER
877 BASE FLOOD ELEVATIONS
ERM 42 △ ELEVATION REFERENCE MARK
FP 877.79 = PROPOSED (EXIST) FLOODPLAIN ELEV.
FW 877.66 = PROPOSED (EXIST.) FLOODWAY ELEV.
Q= 227,000 CFS
ELEVATION REFERENCE MARK
I.D. ELEV. (FT) DESCRIPTION/LOCATION
39 909.14 An ADOT BC in the center of an irrigation structure headwall, approximately 25 feet southerly of the centerline of Cotton Lane. This point is approximately 700 feet S and 100 feet E of the NW corner of Sec 25, T1N, R2W of the G&SRB&M, Maricopa Cnty, Arizona
1 ~~USACE JURISDICTIONAL BOUNDARY~~
2 ~~EFFECTIVE FLOODPLAIN~~
3 ~~EFFECTIVE FLOODWAY~~
4 REVISED FLOODPLAIN
5 REVISED FLOODWAY
6 EXISTING FLOODPLAIN
7 EXISTING FLOODWAY
MARICOPA COUNTY FIRM MAPS
REVISED SEPTEMBER 30, 2005:
04013C2065H, 04013C2065H,
04013C2530G, 04013C2550G
AH ZONE PONDING AREAS TO REMAIN
AH ZONE PONDING AREAS TO REMAIN
COTTON LANE
BUCKEYE CANAL
SHT 4
SHT 6
SHT 7
SHT 3
SHT 5
GILA RIVER
MATCH LINE SEE SHEET 5
MATCH LINE SEE SHEET 4
GILA RIVER FLOODPLAIN
COTTON LANE BRIDGE
FLOODPLAIN REDELINEATION
River Research & Design, Inc.
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1345 E Spur Avenue
Gilbert, AZ 85296
Telephone 480-275-5077
NO. REVISION DATE
36225
GARY E. FREEMAN
EXPIRES 6/30/10
SHEET 6 OF 7
R2D Contact: GARY FREEMAN
Project #: 1021-07-MCDOT
LOMR - March 3, 2010
DESIGN DATE: FEB. 22, 2008
1-800-STAKE-IT

R2D River Research & Design, Inc.
1345 E Spur Avenue
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Telephone 480-275-5077

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COTTON LANE BRIDGE
FLOODPLAIN REDELINEATION

Registered Professional Engineer 36225 GARY E. FREEMAN ARIZONA, U.S.A. EXPIRES 6/30/10

SHEET 7 OF 7

R2D Contact: GARY FREEMAN
Project #: 1021-07-MCDOT
LOMR - March 3, 2010
DESIGN DATE: FEB. 22, 2008

602-263-1100

3/16/2010
2:34:04 PM

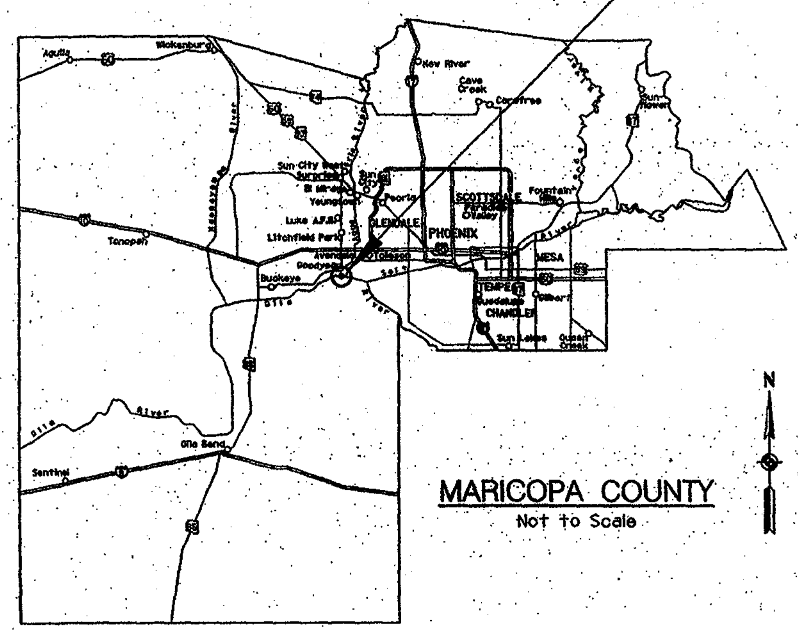
MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION

PLANS FOR THE CONSTRUCTION OF
COTTON LANE - MC 85 TO ESTRELLA PARKWAY

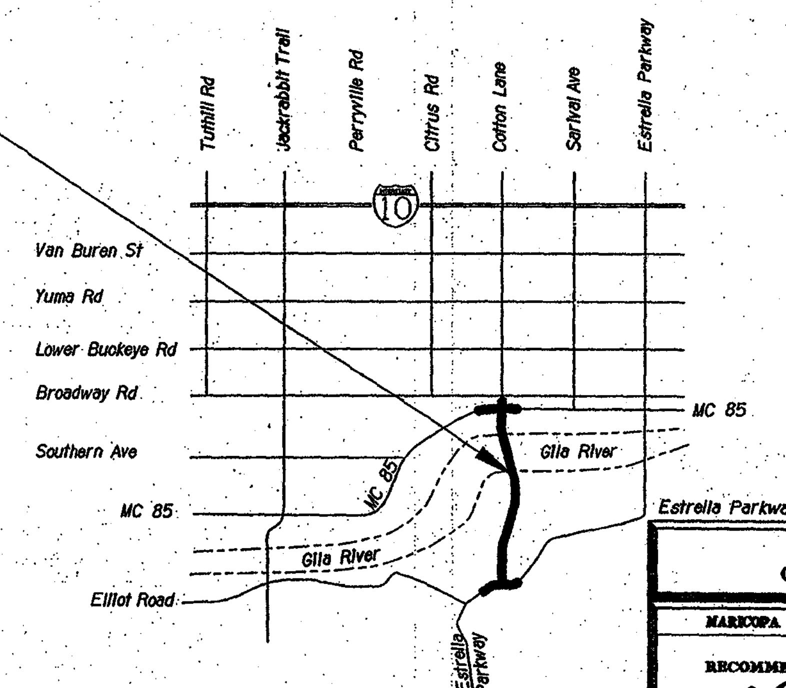
PROJECT NO. TT-180

PART 2

PROJECT NO. TT-180



MARICOPA COUNTY
Not to Scale



VICINITY MAP
Not to Scale

RECORD DRAWINGS - AS BUILT

I HEREBY CERTIFY THAT THE AS-BUILT INFORMATION AS SHOWN OR NOTED HEREIN WERE MADE BY ME OR UNDER MY SUPERVISION AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

EXPIRES 9/30/2011

IN COOPERATION WITH:
CITY OF GOODYEAR

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

RECOMMENDED FOR CONSTRUCTION:

WILLIAM R.W. HAHN
PROJECT MANAGER — 9/14/06 DATE

ISSUED FOR CONSTRUCTION and:

MICHAEL S. ELLEGOOD, P.E.
TRANSPORTATION DIRECTOR — 9-14-06 DATE

COUNTY BOARD OF SUPERVISORS

DON STAPLEY - CHAIRMAN

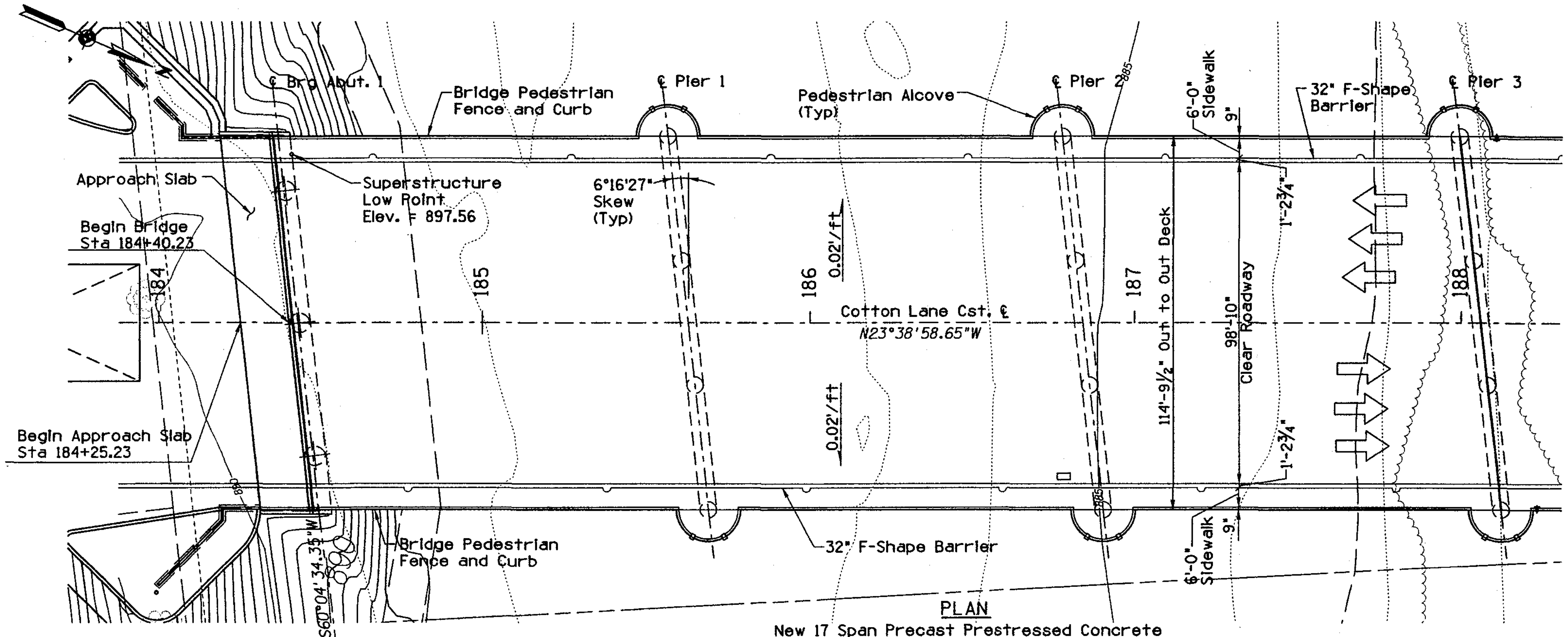
DISTRICT 1	R. FULTON BROCK
DISTRICT 2	DON STAPLEY
DISTRICT 3	ANDREW W. KUNASEK
DISTRICT 4	MAX WILSON
DISTRICT 5	MARY ROSE WILCOX

Baker

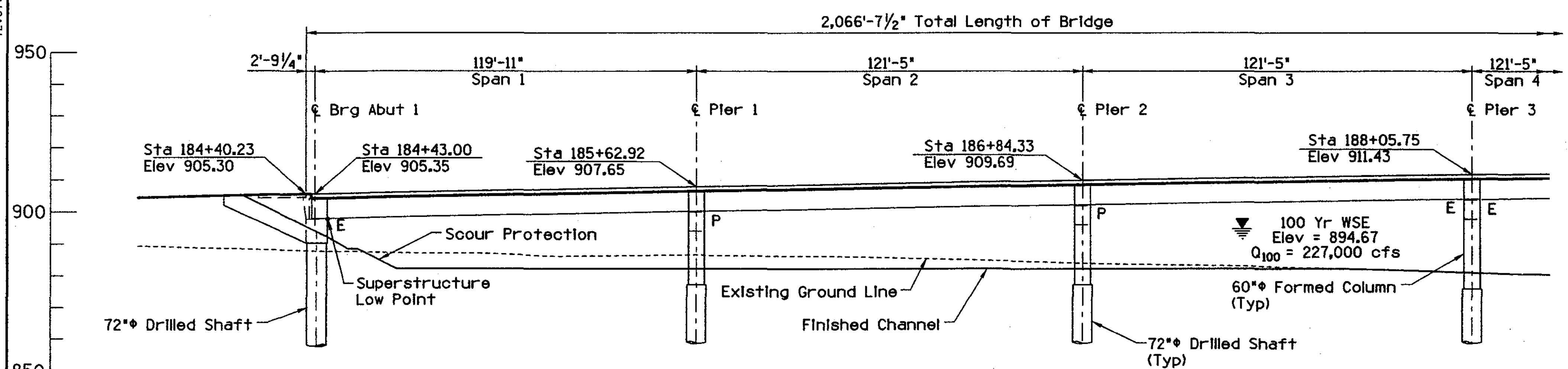
09/14/2006 09:11:31 AM

T:\Cotton Lane\Cadd\sh_CLcover.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	325	547	JK 8/28/08



PLAN
New 17 Span Precast Prestressed Concrete
AASHTO Type VI Modified Girder Bridge
Scale: 1" = 20'-0"



SECTION ALONG CST. ℄
Elevations indicated are given at the
Cotton Lane Cst ℄
Scale: 1" = 20'-0"

SHEET INDEX

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D.J. LAWSON	08/06
DRAWN	C.R. SMITH	08/06
CHECKED	T. E. QUILLMAN	08/06

38412 DAVID J. LAWSON ARIZONA, U.S.A.

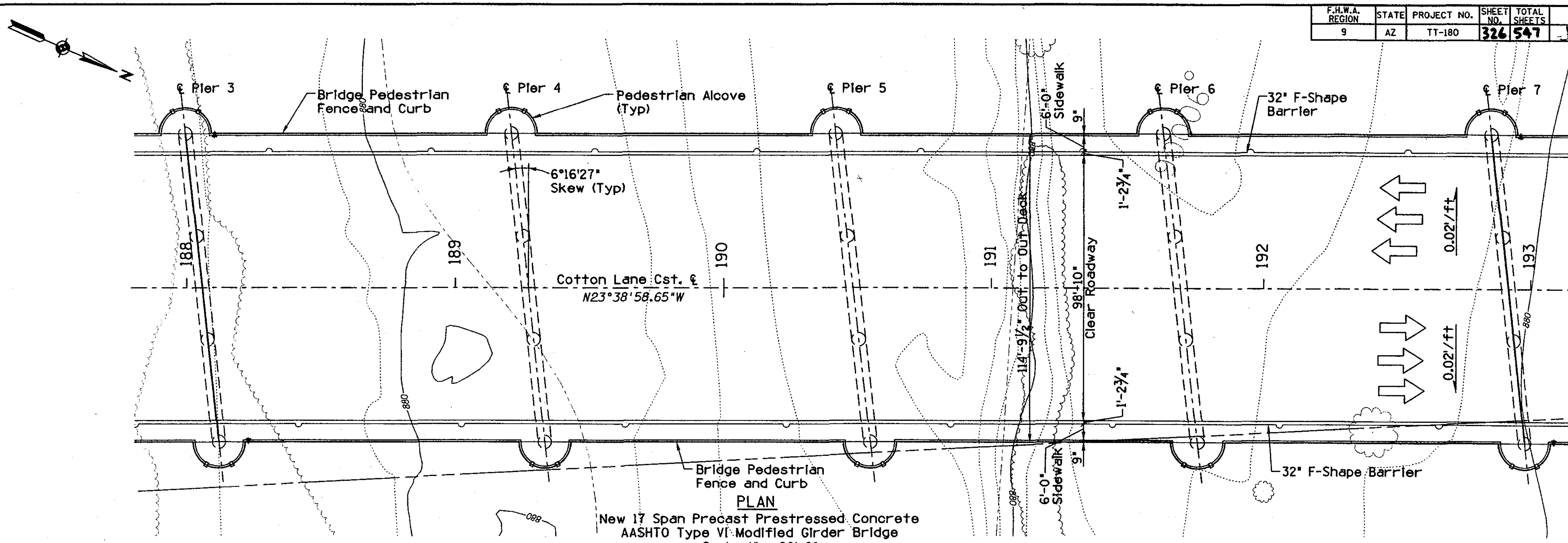
GILA RIVER BRIDGE
LOCATION PLAN - 1

SHEET S-1.01 OF 56

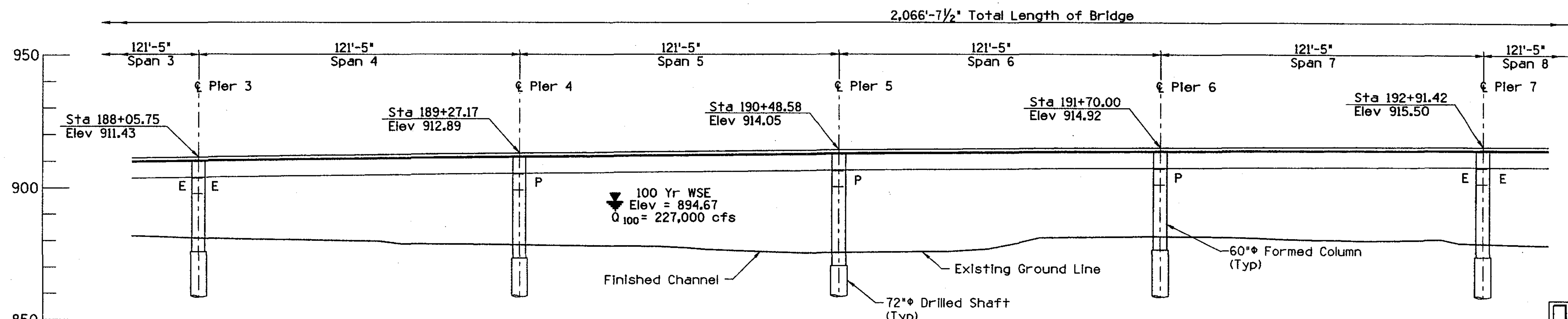
Baker

09/05/2006 12:01:51 PM t:\cotton lane\cadd\s_cl_genpl_01.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	326	547	8/28/08



PLAN
New 17 Span Precast Prestressed Concrete AASHTO Type VI Modified Girder Bridge
Scale: 1" = 20'-0"



SECTION ALONG CST. ℄
Elevations indicated are given at the Cotton Lane Cst ℄
Scale: 1" = 20'-0"

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D.J. LAWSON	08/06
DRAWN	C.R. SMITH	08/06
CHECKED	C. MATTY	08/06

Baker

GILA RIVER BRIDGE
LOCATION PLAN - 2

SHEET S-1.02 OF 56

09/05/2006 12:02:23 PM
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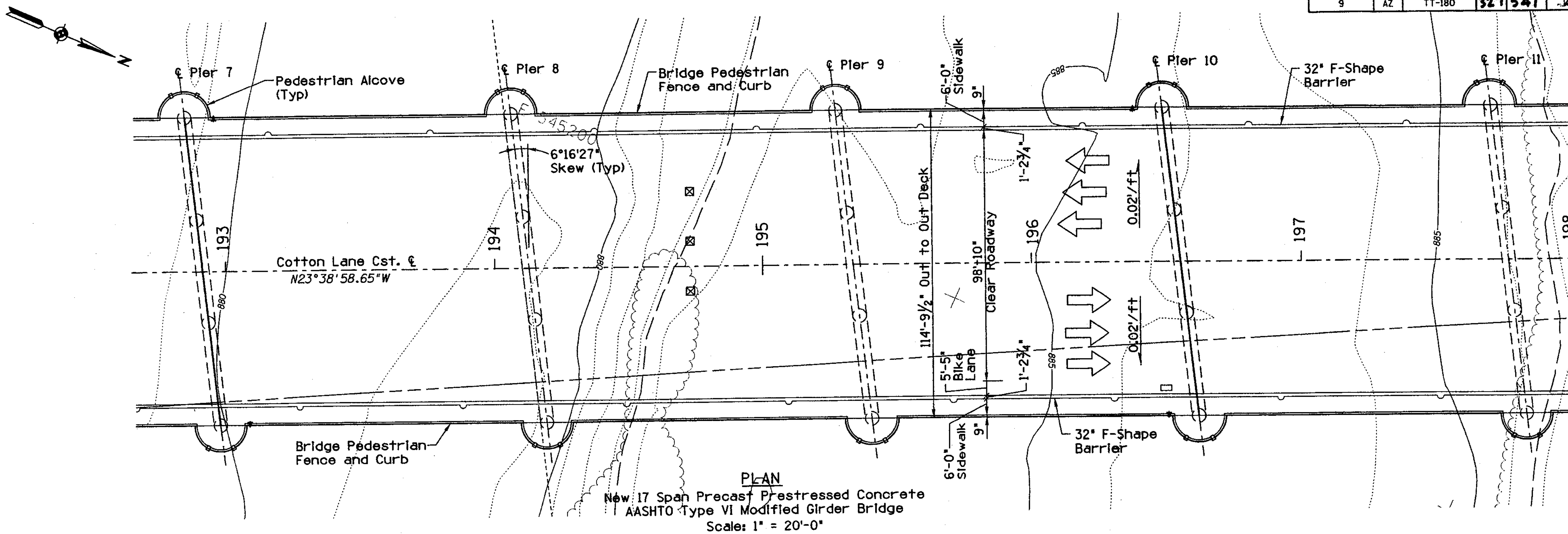
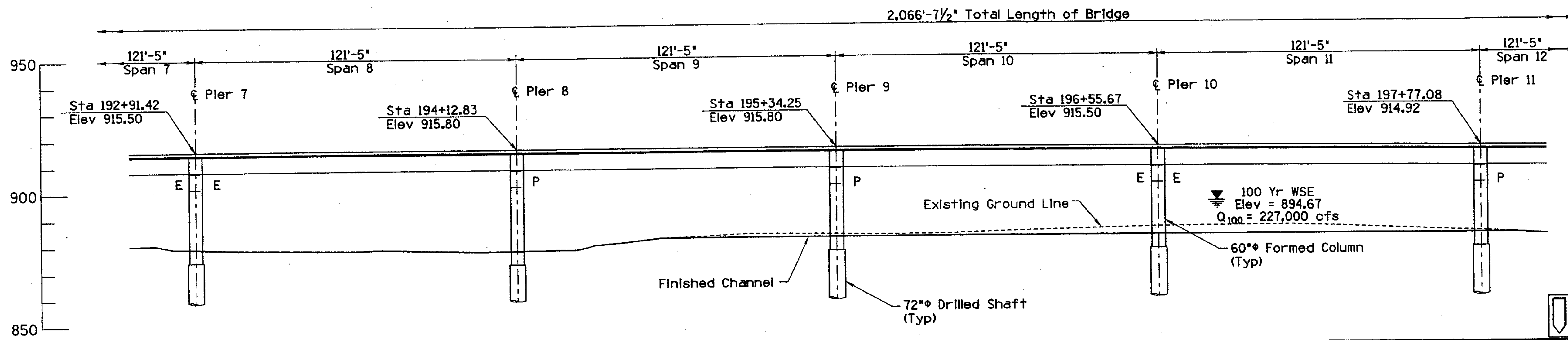
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	327	547	8/28/08



PLAN

New 17 Span Precast Prestressed Concrete AASHTO Type VI Modified Girder Bridge

Scale: 1" = 20'-0"



SECTION ALONG CST. ℄

Elevations indicated are given at the Cotton Lane Cst ℄

Scale: 1" = 20'-0"

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D. J. LAWSON	08/06
DRAWN	C. R. SMITH	08/06
CHECKED	T. E. QUILLMAN	08/06

Baker

GILA RIVER BRIDGE
LOCATION PLAN - 3

SHEET S-1.03 OF 56

09/05/2006 12:02:57 PM

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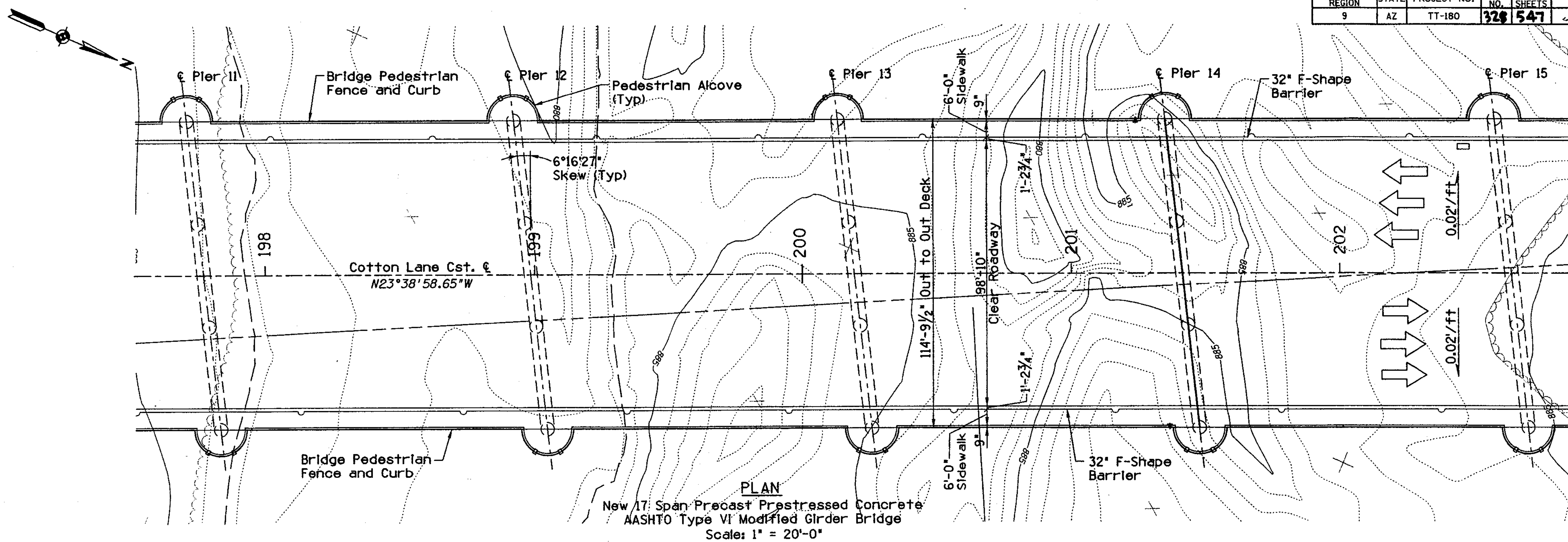
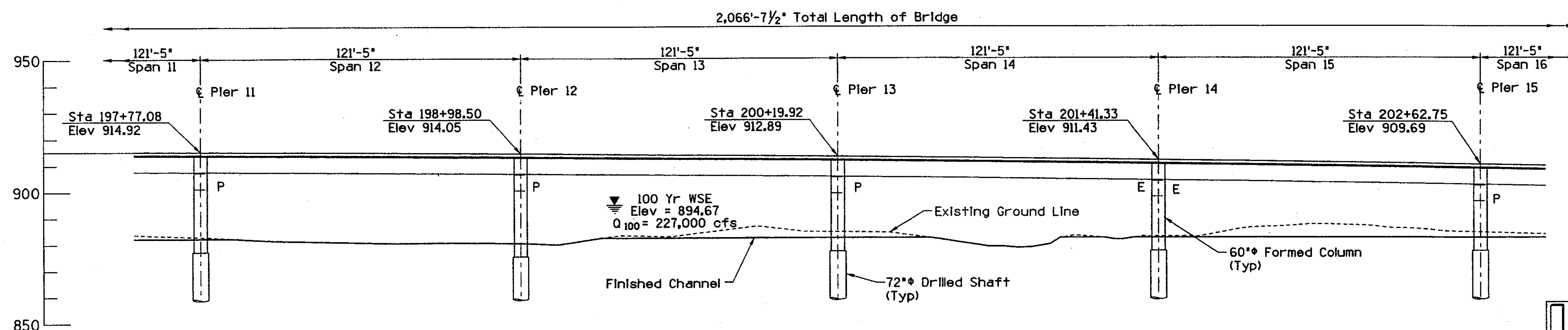
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	328	547	JL 8/28/08



PLAN
New 17 Span Precast Prestressed Concrete AASHTO Type VI Modified Girder Bridge
Scale: 1" = 20'-0"



SECTION ALONG CST. ℄
Elevations indicated are given at the Cotton Lane Cst ℄
Scale: 1" = 20'-0"

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D. J. LAWSON	08/06
DRAWN	C. R. SMITH	08/06
CHECKED	C. MATTY	08/06

GILA RIVER BRIDGE
LOCATION PLAN - 4

SHEET S-1.04 OF 56

Baker

09/05/2006 12:03:28 PM
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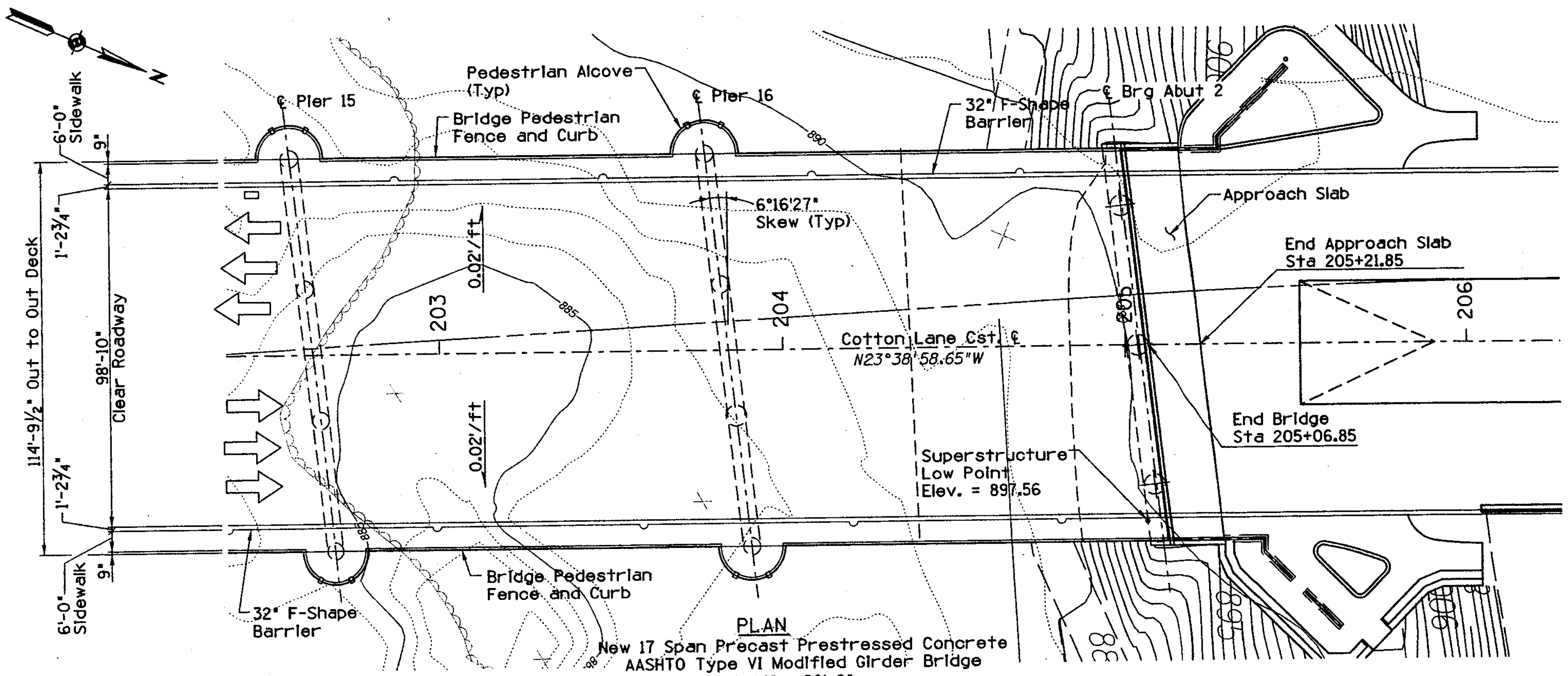
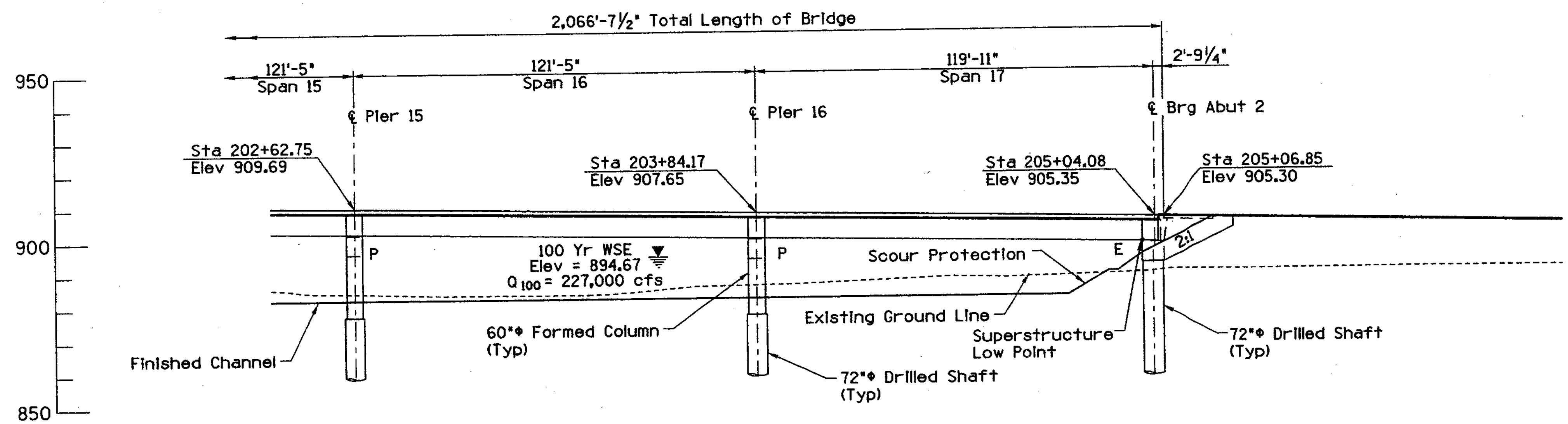
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	329	547	JK 8/28/08

09/05/2006 12:00:20 PM



PLAN
New 17 Span Precast Prestressed Concrete AASHTO Type VI Modified Girder Bridge
Scale: 1" = 20'-0"



SECTION ALONG CST. ℄
Elevations indicated are given at the Cotton Lane Cst ℄
Scale: 1" = 20'-0"

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D. J. LAWSON	08/06
DRAWN	C. R. SMITH	08/06
CHECKED	C. MATTY	08/06

38412 DAVID J. LAWSON ARIZONA, U.S.A.

Baker

GILA RIVER BRIDGE
LOCATION PLAN - 5

SHEET S-1.05 OF 56

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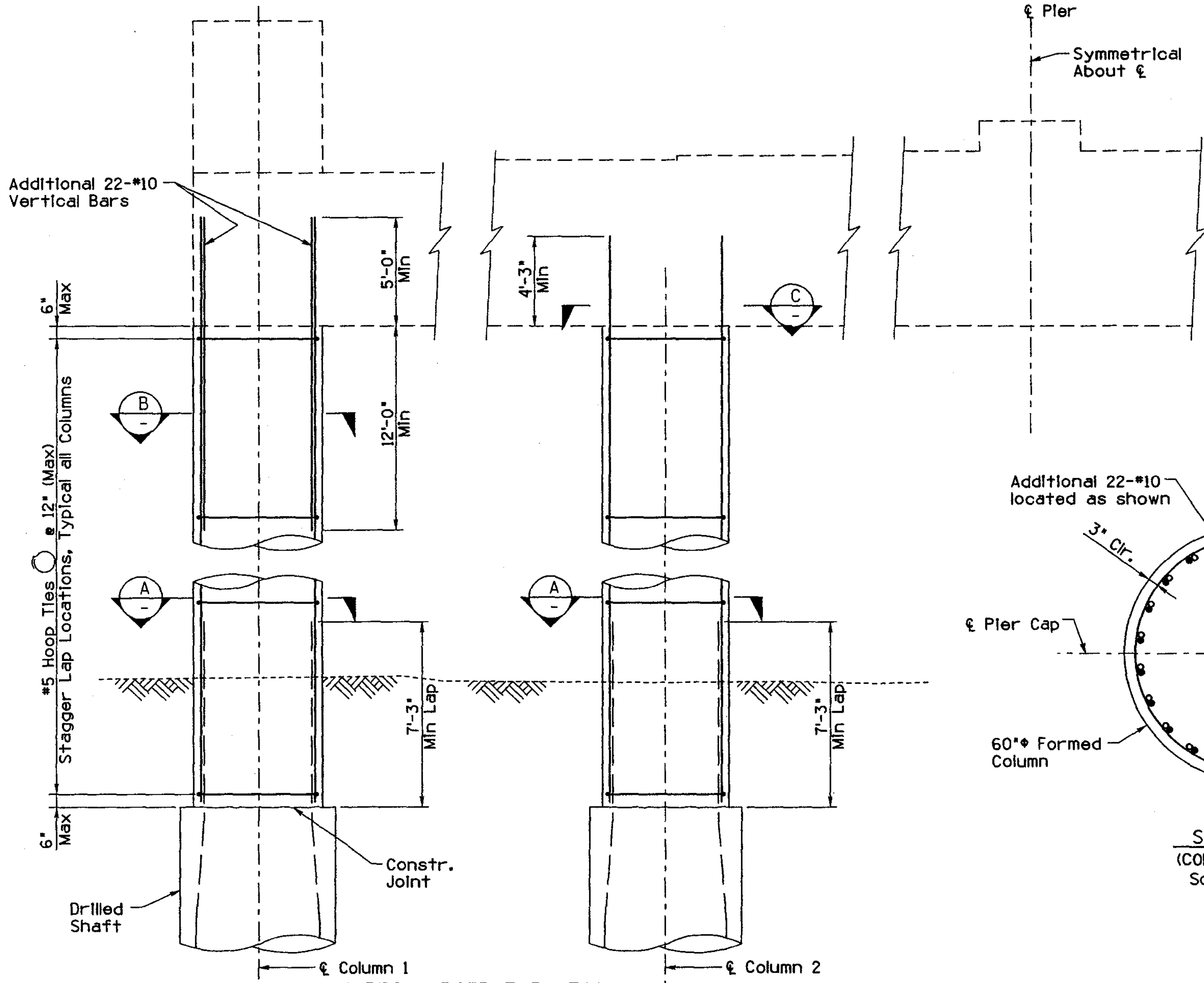
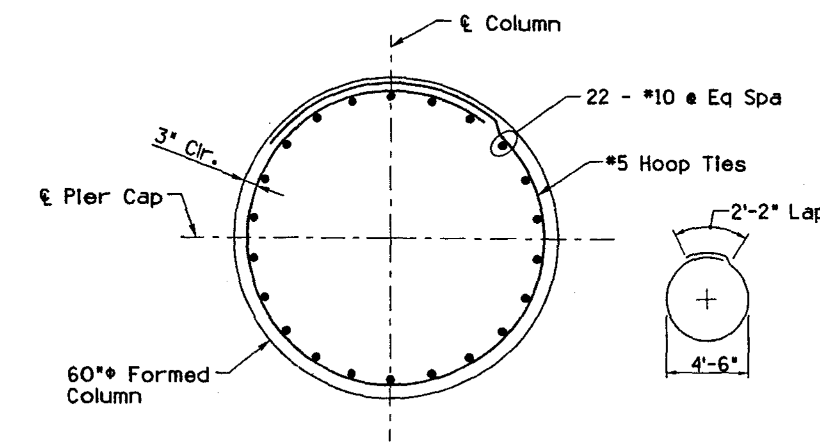
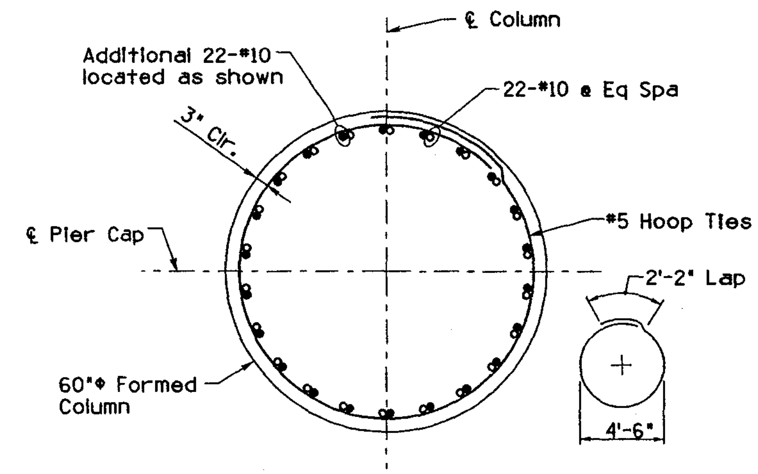
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	345	547	9/28/08



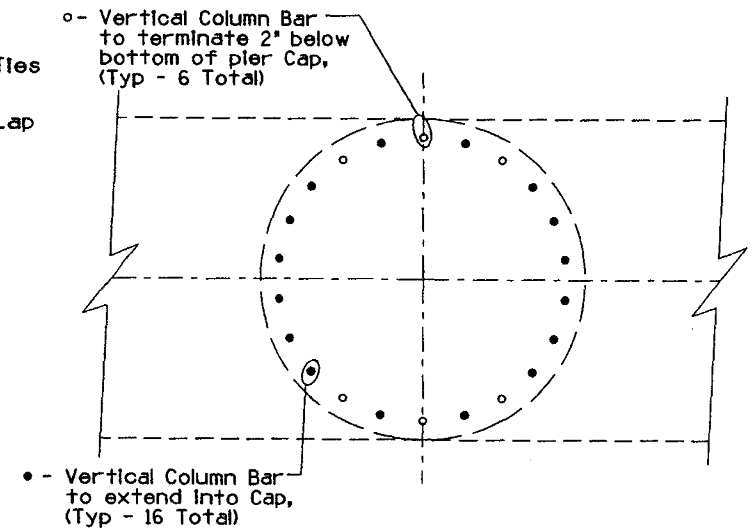
PARTIAL PIER ELEVATION
Scale: 3/8"=1'-0"



SECTION A
Scale: 3/4"=1'-0"



SECTION B
(COLUMNS #1 & #4)
Scale: 3/4"=1'-0"



SECTION C
(COLUMNS #2 & #3)
Scale: 3/4"=1'-0"

PIER DATA

LOCATION	COLUMN ELEVS.					TOP OF CAP ELEVS.											
	TOP Col 1	TOP Col 2	TOP Col 3	TOP Col 4	BOTTOM	A	B	C	D	E	F	G	H	I	J	K	L
Pier 1	893.33	893.39	893.46	893.53	878.07	899.33	899.55	899.75	899.96	900.17	900.37	900.39	900.22	900.05	899.88	899.71	899.53
Pier 2	895.38	895.44	895.50	895.56	878.12	901.38	901.60	901.80	902.01	902.21	902.41	902.43	902.26	902.09	901.91	901.74	901.56
Pier 3	896.98	897.03	897.08	897.13	876.22	902.98	903.19	903.39	903.59	903.80	904.00	904.01	903.84	903.66	903.49	903.31	903.13
Pier 4	898.66	898.70	898.74	898.78	874.40	904.66	904.87	905.07	905.27	905.47	905.67	905.68	905.50	905.32	905.15	904.97	904.78
Pier 5	899.85	899.88	899.91	899.94	871.34	905.85	906.06	906.26	906.45	906.65	906.85	906.86	906.68	906.50	906.32	906.14	905.94
Pier 6	900.74	900.76	900.78	900.80	877.23	906.74	906.94	907.14	907.33	907.53	907.72	907.73	907.55	907.36	907.18	907.00	906.80
Pier 7	901.12	901.14	901.15	901.16	875.11	907.12	907.33	907.52	907.71	907.90	908.10	908.10	907.92	907.73	907.55	907.36	907.16
Pier 8	901.64	901.64	901.64	901.65	873.13	907.64	907.84	908.03	908.22	908.41	908.60	908.60	908.41	908.22	908.04	907.85	907.65
Pier 9	901.65	901.64	901.64	901.64	878.13	907.65	907.85	908.04	908.22	908.41	908.60	908.60	908.41	908.22	908.03	907.84	907.64
Pier 10	901.16	901.15	901.14	901.12	877.61	907.16	907.36	907.55	907.73	907.91	908.10	908.10	907.90	907.71	907.52	907.33	907.12
Pier 11	900.80	900.78	900.76	900.74	877.98	906.80	907.00	907.18	907.36	907.55	907.73	907.72	907.53	907.33	907.14	906.94	906.74
Pier 12	899.94	899.91	899.88	899.85	876.34	905.94	906.14	906.32	906.50	906.68	906.86	906.85	906.65	906.45	906.26	906.06	905.85
Pier 13	898.78	898.74	898.70	898.66	877.90	904.78	904.97	905.15	905.32	905.50	905.68	905.67	905.47	905.27	905.07	904.87	904.66
Pier 14	897.13	897.08	897.03	896.98	878.22	903.13	903.31	903.49	903.66	903.84	904.01	904.00	903.80	903.59	903.39	903.19	902.98
Pier 15	895.56	895.50	895.44	895.38	878.12	901.56	901.74	901.91	902.09	902.26	902.43	902.41	902.21	902.01	901.80	901.60	901.38
Pier 16	893.53	893.46	893.39	893.33	878.07	899.53	899.71	899.88	900.05	900.22	900.39	900.37	900.17	899.96	899.75	899.55	899.33

TWO WORKING DAYS BEFORE YOU DIG, CALL 602-263-1100 BLUE STAKE

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	D. J. LAWSON	08/06
DRAWN	C. R. SMITH	08/06
CHECKED	C. MATTY	08/06

Baker

GILA RIVER BRIDGE
PIER DETAILS - 1

SHEET S-1.21 OF 56

09/05/2006
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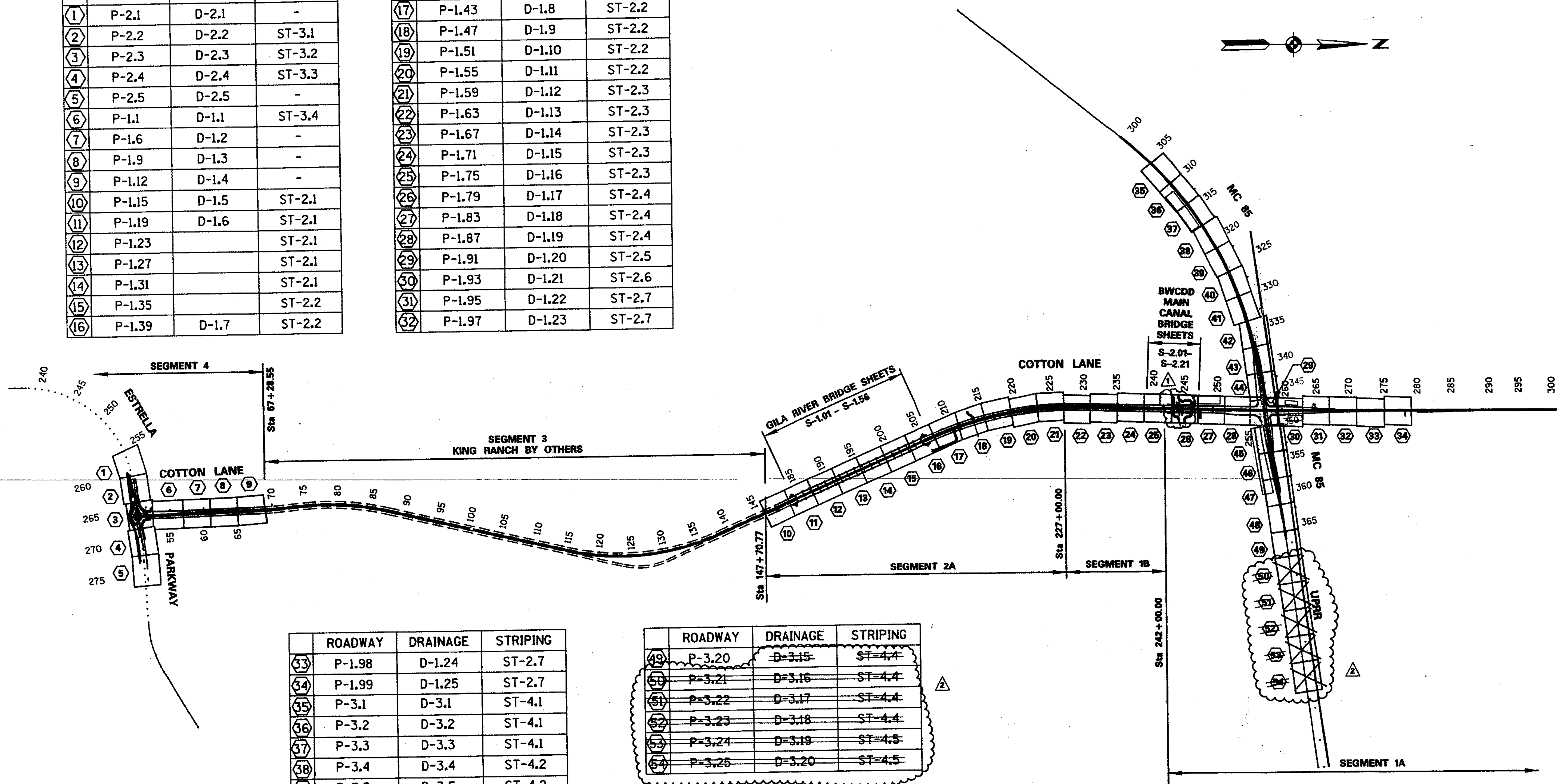
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	2	547	

	ROADWAY	DRAINAGE	STRIPING
1	P-2.1	D-2.1	-
2	P-2.2	D-2.2	ST-3.1
3	P-2.3	D-2.3	ST-3.2
4	P-2.4	D-2.4	ST-3.3
5	P-2.5	D-2.5	-
6	P-1.1	D-1.1	ST-3.4
7	P-1.6	D-1.2	-
8	P-1.9	D-1.3	-
9	P-1.12	D-1.4	-
10	P-1.15	D-1.5	ST-2.1
11	P-1.19	D-1.6	ST-2.1
12	P-1.23		ST-2.1
13	P-1.27		ST-2.1
14	P-1.31		ST-2.1
15	P-1.35		ST-2.2
16	P-1.39	D-1.7	ST-2.2

	ROADWAY	DRAINAGE	STRIPING
17	P-1.43	D-1.8	ST-2.2
18	P-1.47	D-1.9	ST-2.2
19	P-1.51	D-1.10	ST-2.2
20	P-1.55	D-1.11	ST-2.2
21	P-1.59	D-1.12	ST-2.3
22	P-1.63	D-1.13	ST-2.3
23	P-1.67	D-1.14	ST-2.3
24	P-1.71	D-1.15	ST-2.3
25	P-1.75	D-1.16	ST-2.3
26	P-1.79	D-1.17	ST-2.4
27	P-1.83	D-1.18	ST-2.4
28	P-1.87	D-1.19	ST-2.4
29	P-1.91	D-1.20	ST-2.5
30	P-1.93	D-1.21	ST-2.6
31	P-1.95	D-1.22	ST-2.7
32	P-1.97	D-1.23	ST-2.7



	ROADWAY	DRAINAGE	STRIPING
33	P-1.98	D-1.24	ST-2.7
34	P-1.99	D-1.25	ST-2.7
35	P-3.1	D-3.1	ST-4.1
36	P-3.2	D-3.2	ST-4.1
37	P-3.3	D-3.3	ST-4.1
38	P-3.4	D-3.4	ST-4.2
39	P-3.5	D-3.5	ST-4.2
40	P-3.6	D-3.6	ST-4.2
41	P-3.7	D-3.7	ST-4.2
42	P-3.8	D-3.8	ST-4.2
43	P-3.9	D-3.9	ST-4.3
44	P-3.11	D-3.10	ST-4.3
45	P-3.14	D-3.11	ST-4.3
46	P-3.16	D-3.12	ST-4.3
47	P-3.18	D-3.13	ST-4.4
48	P-3.19	D-3.14	ST-4.4

	ROADWAY	DRAINAGE	STRIPING
49	P-3.20	~~D-3.15~~	~~ST-4.4~~
~~50~~	~~P-3.21~~	~~D-3.16~~	~~ST-4.4~~
~~51~~	~~P-3.22~~	~~D-3.17~~	~~ST-4.4~~
~~52~~	~~P-3.23~~	~~D-3.18~~	~~ST-4.4~~
~~53~~	~~P-3.24~~	~~D-3.19~~	~~ST-4.5~~
~~54~~	~~P-3.25~~	~~D-3.20~~	~~ST-4.5~~

NO.	REVISION	BY	DATE
2	Deleted Sheets	CHA	1-19-07
1	Revised Access Roads	CHA	11-13-06

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA ROAD
PROJECT NO. TT-180

	BY	DATE
DESIGNED	A.HOFFMAN	08/06
DRAWN	A.HOFFMAN	08/06
CHECKED	A.PISANO	08/06

KEY MAP SHEET

SHEET G-0.1 OF 1

Baker

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F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	69	347	8/28/08

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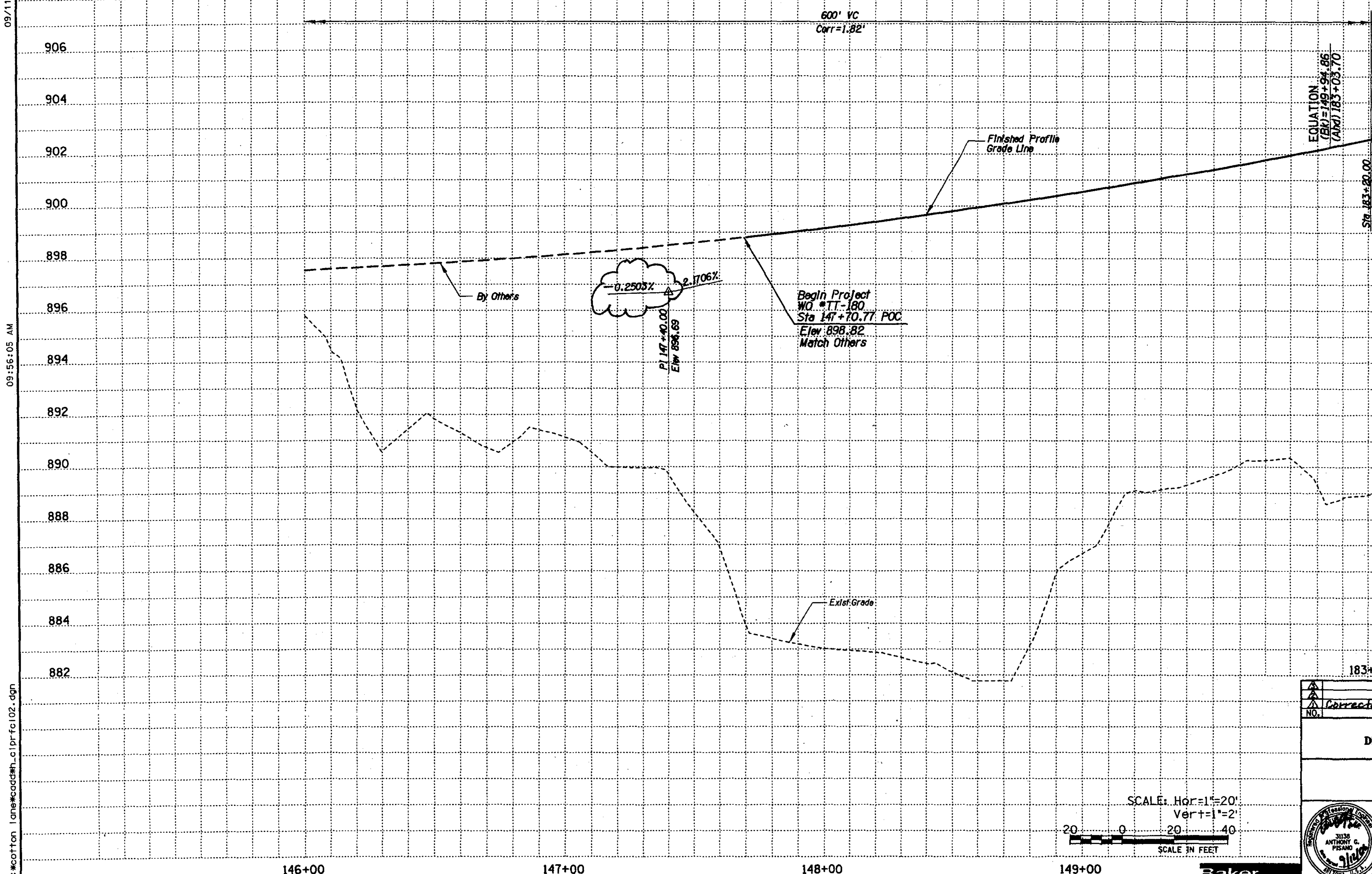

NO.	REVISION	BY	DATE
1	Corrected Slope.	XS	11-5-07

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

Baker

COTTON LANE PROFILE
STA 147+70.77 TO 183+20.00

SHEET P-1.16 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	69	547	JD 8/28/08

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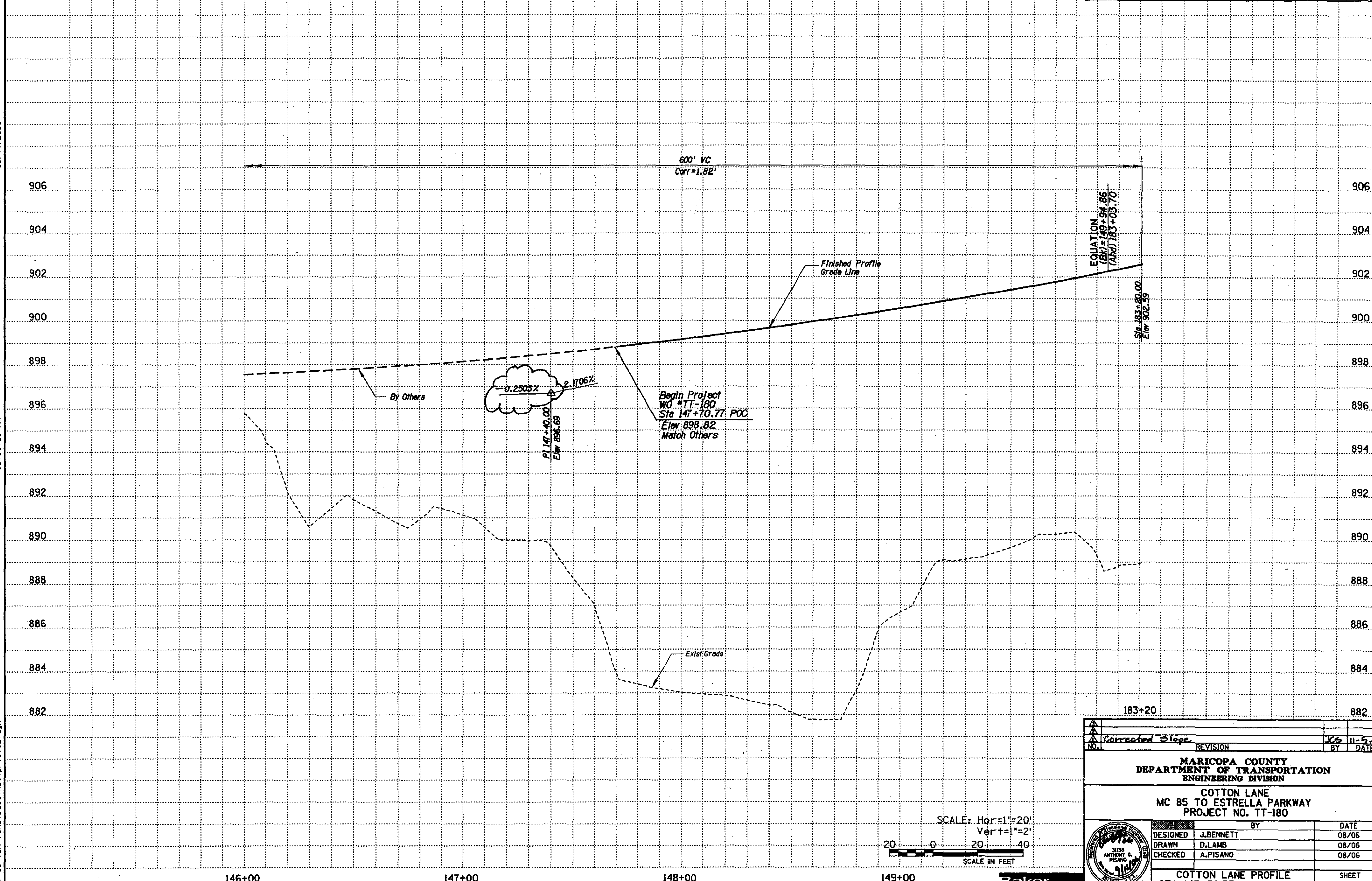


NO.	REVISION	BY	DATE
3			
2			
1	Corrected Slope	XS	11-5-07

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

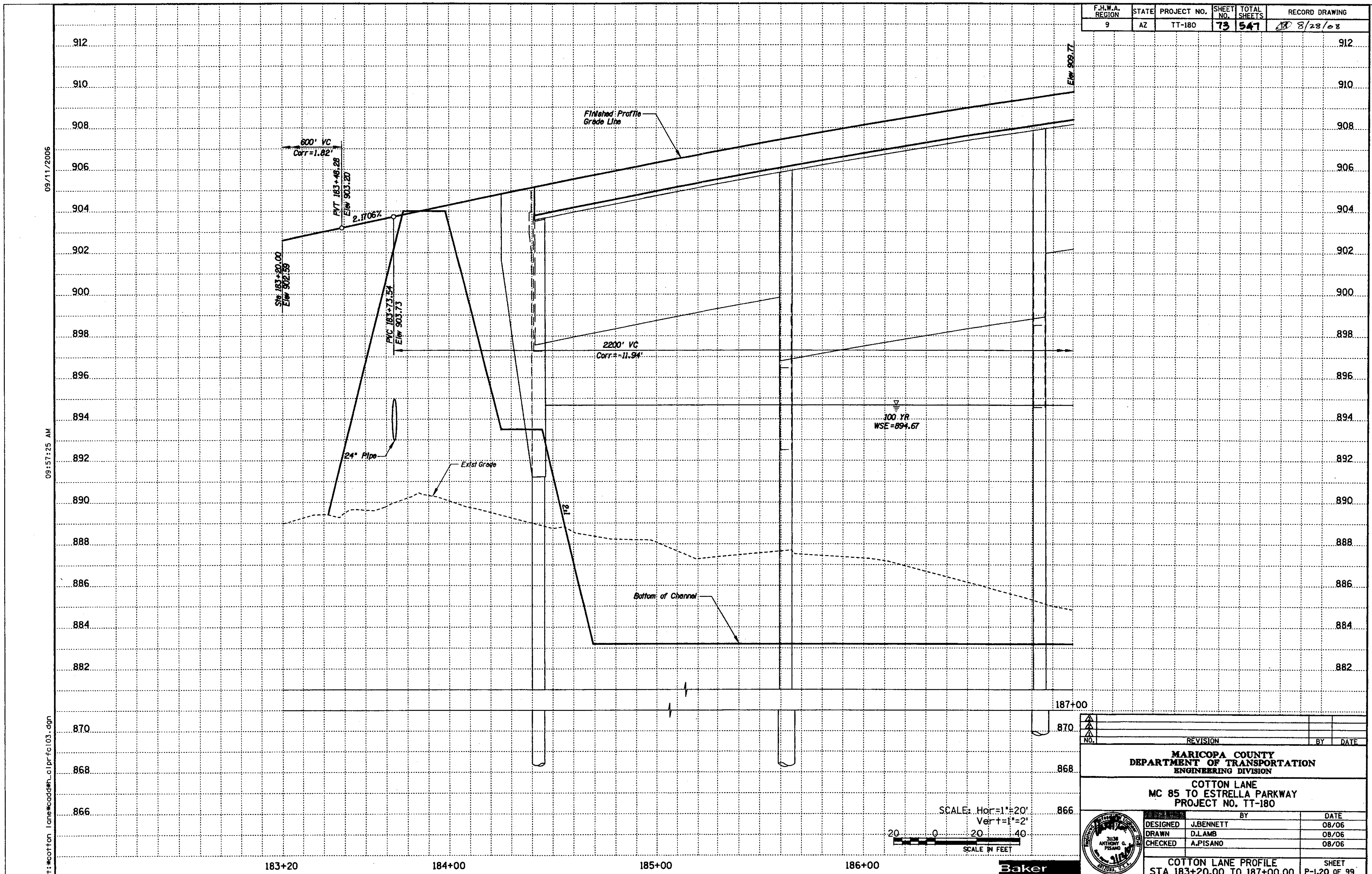
COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A. 9/11/06

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 147+70.77 TO 183+20.00

SHEET P-1.16 OF 99



F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	73	547	8/28/08

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

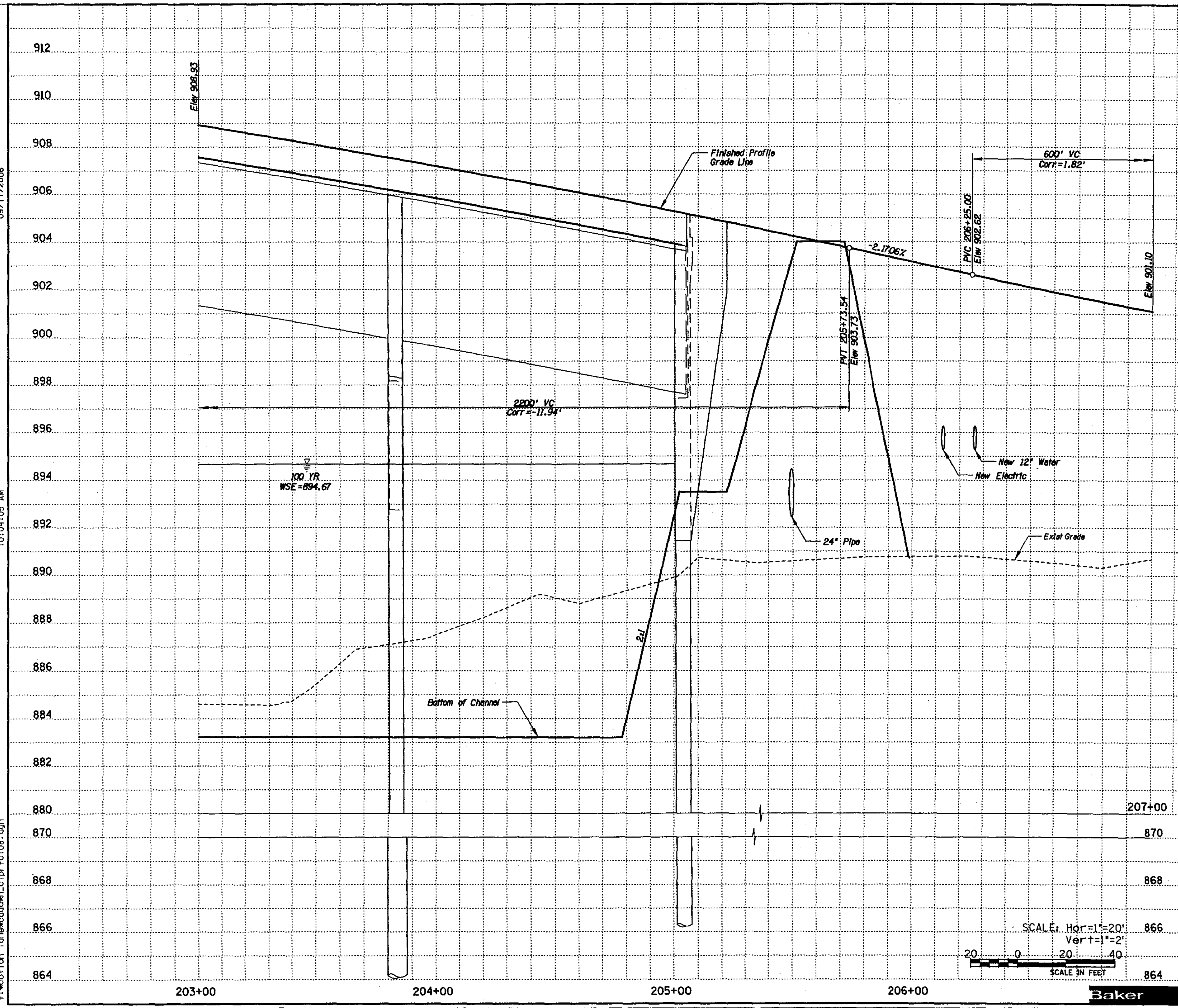
	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

Baker

COTTON LANE PROFILE
STA 183+20.00 TO 187+00.00

SHEET P-1.20 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	93	547	8/28/08



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NO.	REVISION	BY	DATE
3			
2			
1			

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

Baker

COTTON LANE PROFILE
STA 203+00.00 TO 207+00.00

SHEET P-1.40 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	97	541	8/28/06

09/11/2006

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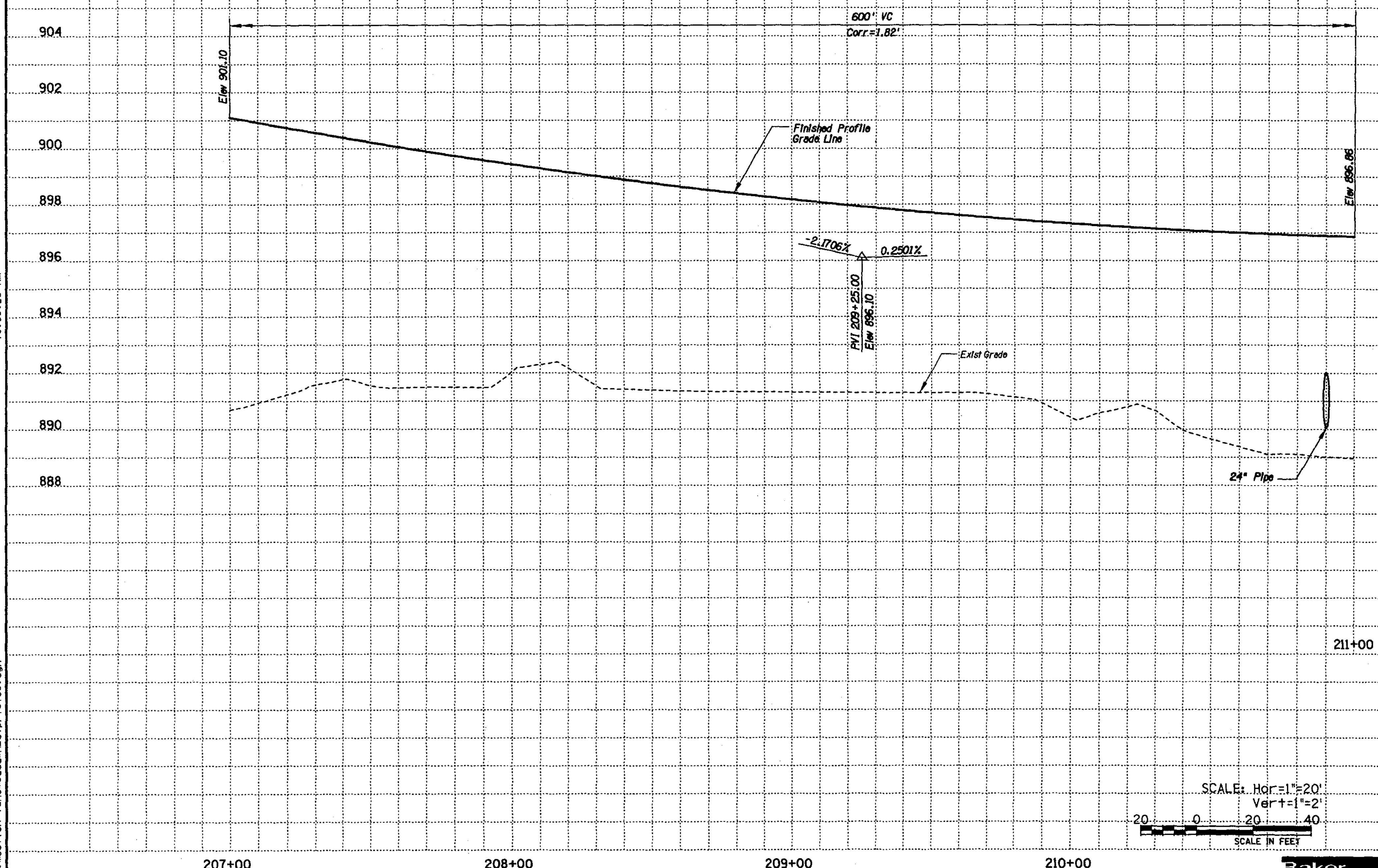

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 207+00.00 TO 211+00.00

SHEET P-1.44 OF 99

Baker

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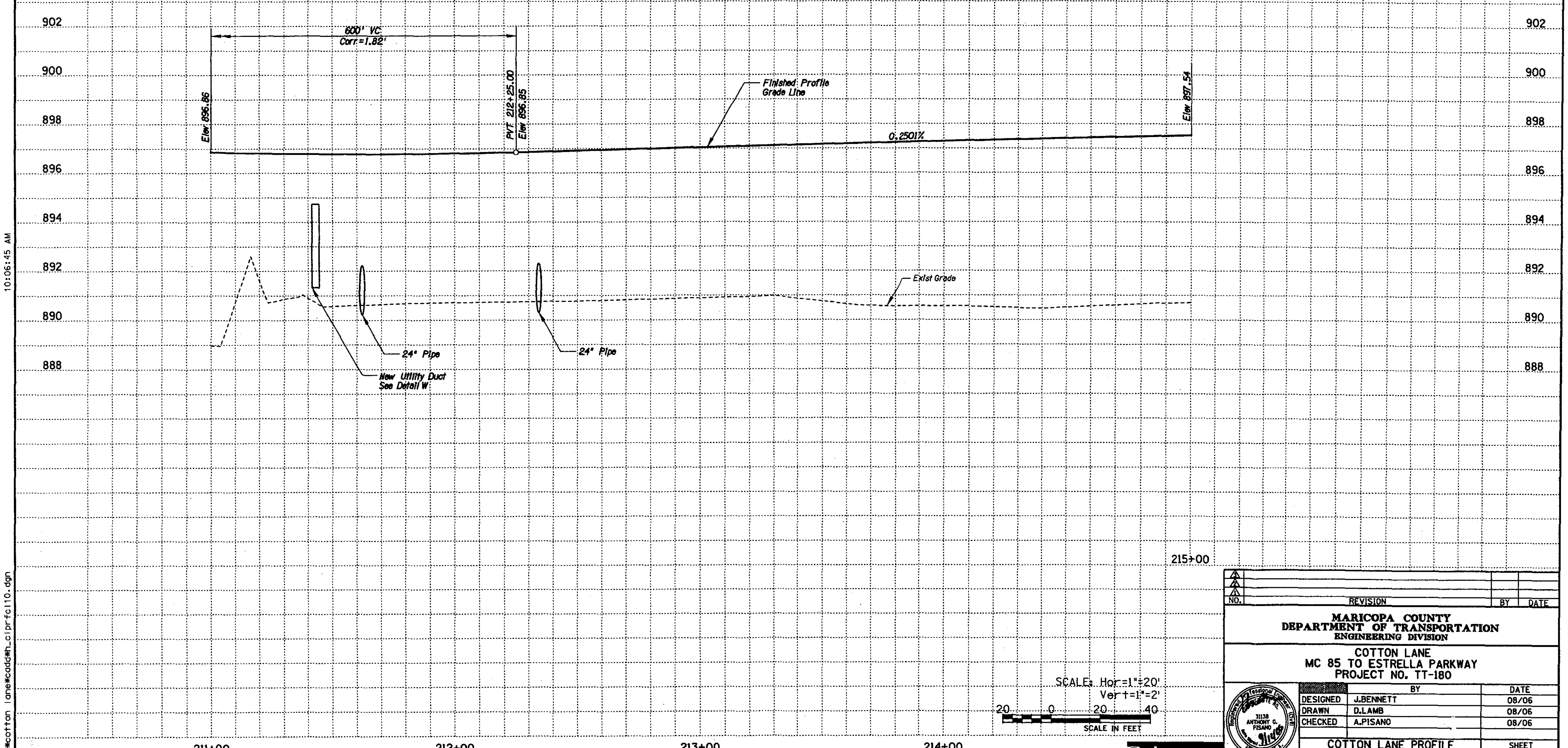
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	101	547	8/28/08



09/11/2006

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SCALE: Hor=1"=20'
Vert=1"=2'
20 0 20 40
SCALE IN FEET

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

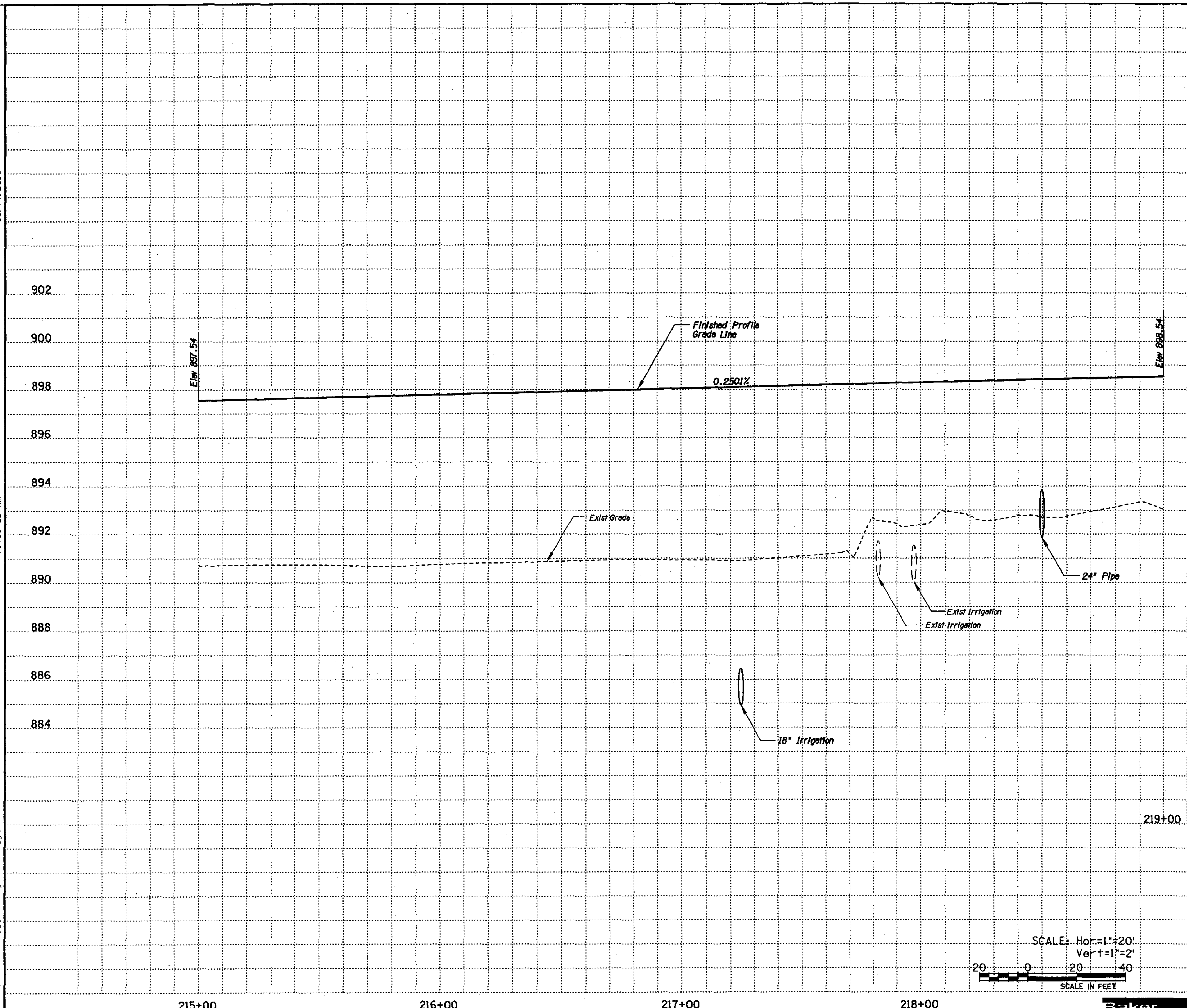
	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 211+00.00 TO 215+00.00

SHEET P-L48 OF 99

Baker

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	105	547	8/28/08



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Baker

NO.	REVISION	BY	DATE
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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

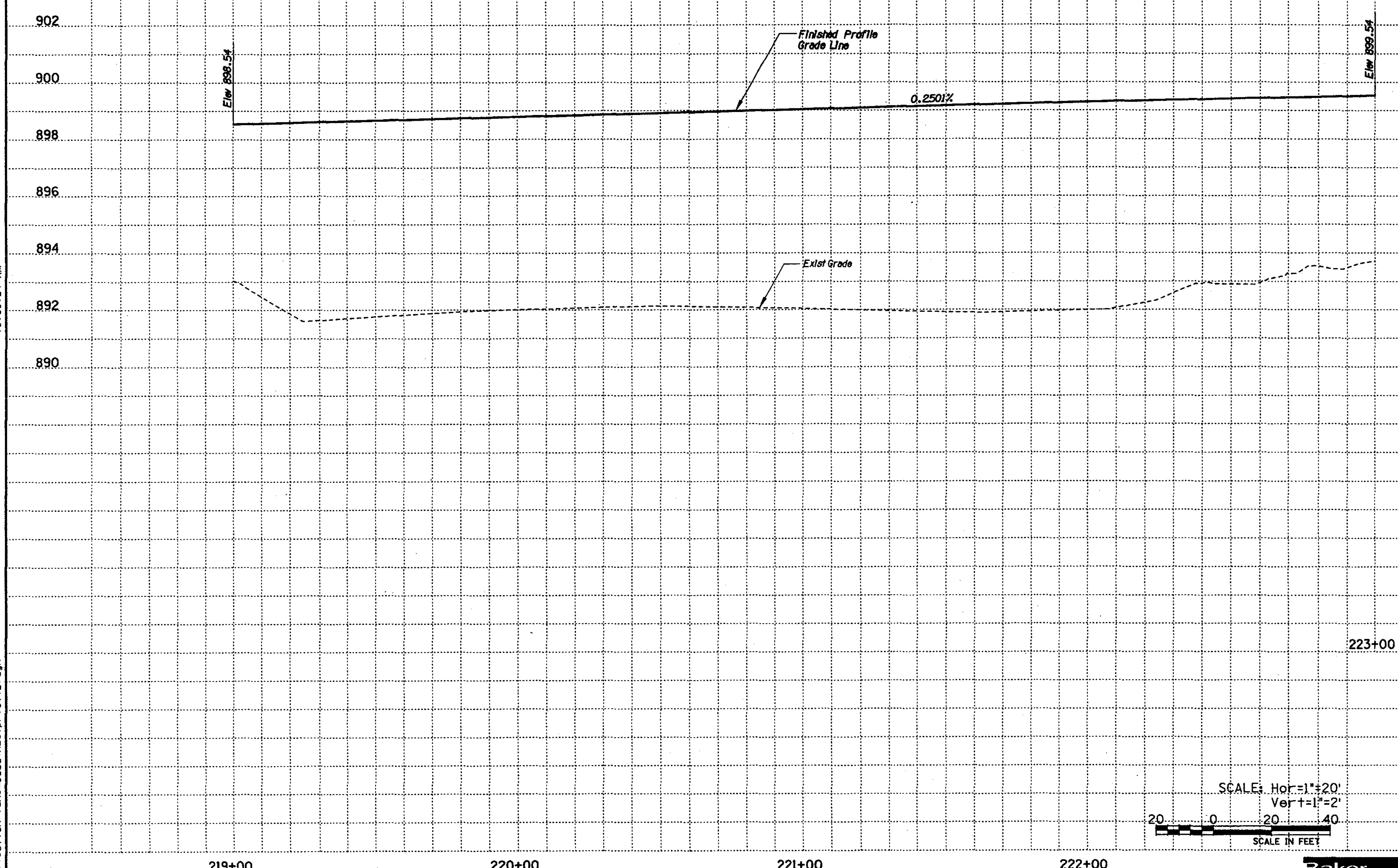
Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 215+00.00 TO 219+00.00

SHEET P-1.52 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	109	547	8/28/08



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Baker

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

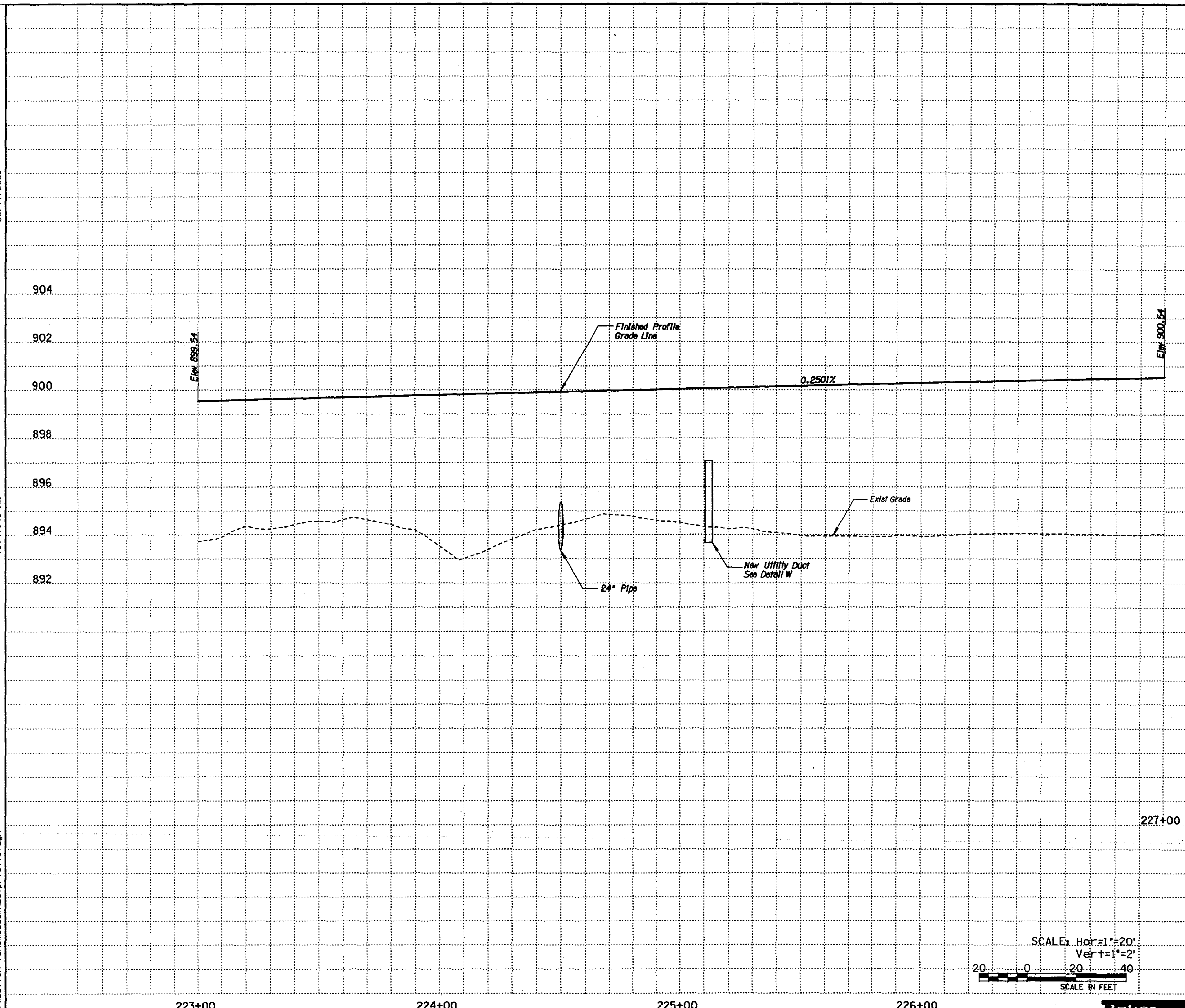
Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 219+00.00 TO 223+00.00

SHEET P-1.56 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	113	547	8/28/08



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Baker

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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

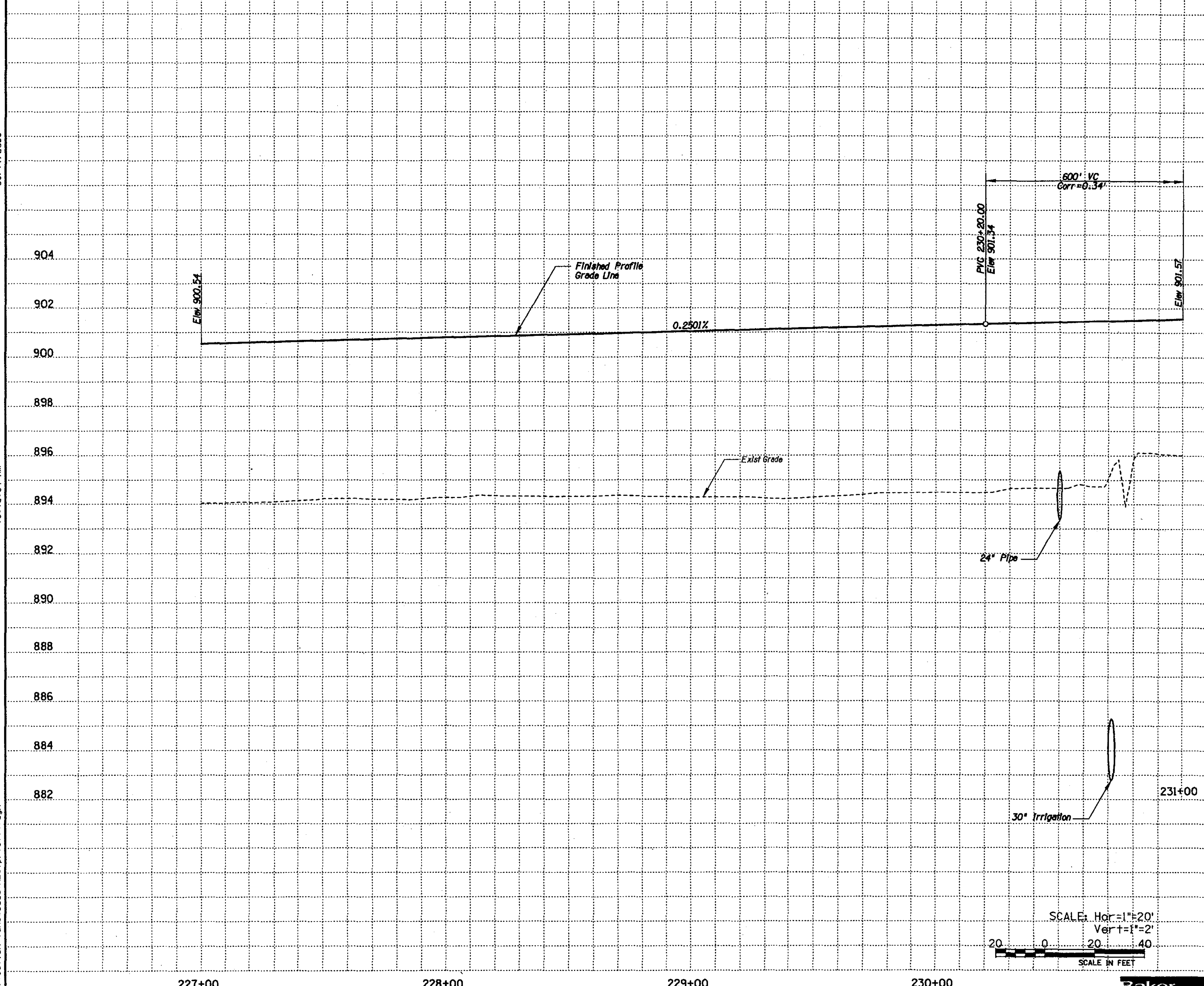
COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

COTTON LANE PROFILE STA 223+00.00 TO 227+00.00	SHEET P-1.60 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	117	547	8/28/08



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NO.	REVISION	BY	DATE
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MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

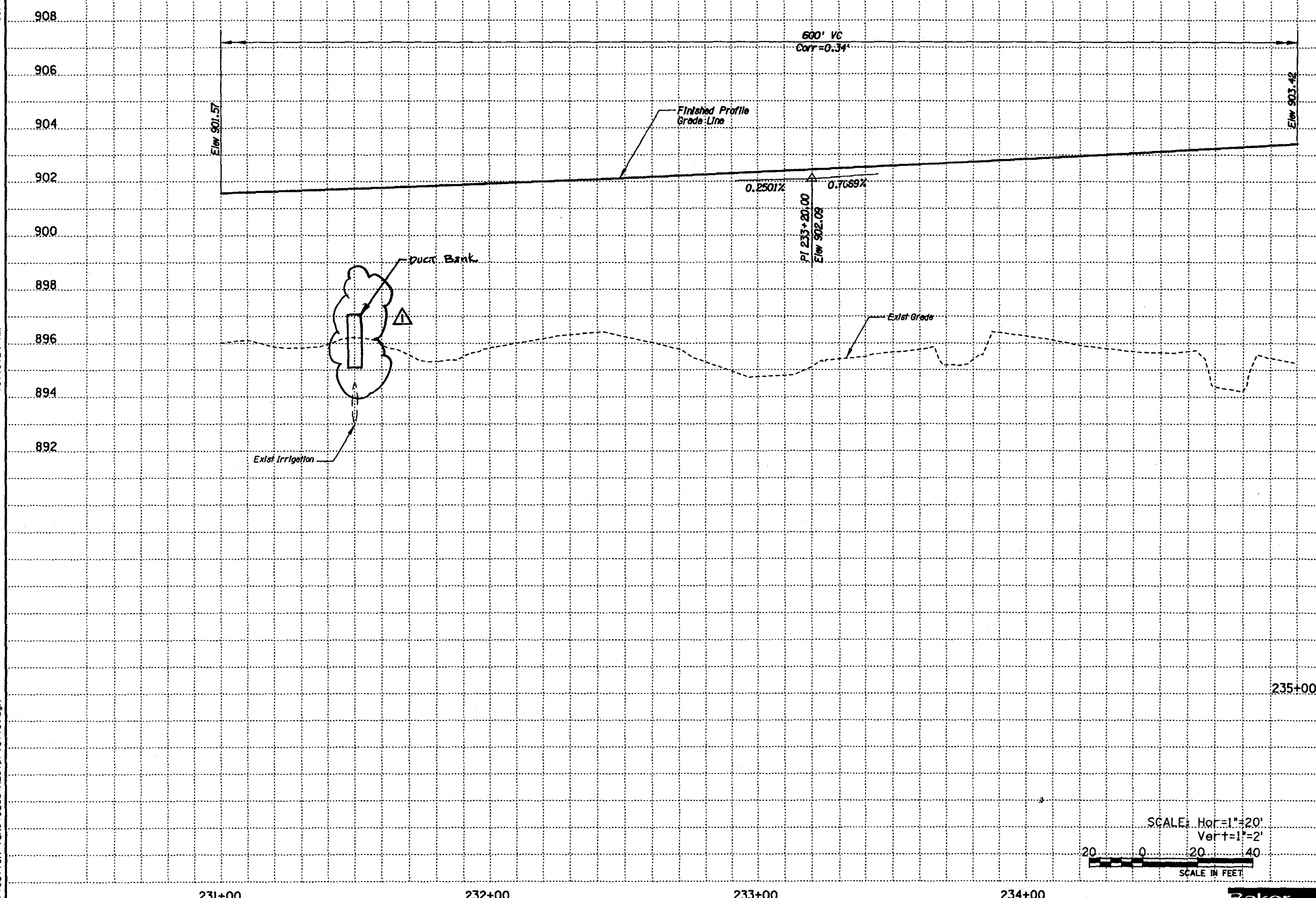
Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 227+00.00 TO 231+00.00

SHEET P-1.64 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	121	547	8/28/08



NO.	REVISION	BY	DATE
1	Added Duct Bank	V.G.	11-06-07

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

Registered Professional Engineer 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

Baker

COTTON LANE PROFILE
STA 231+00.00 TO 235+00.00

SHEET P-1.68 OF 99

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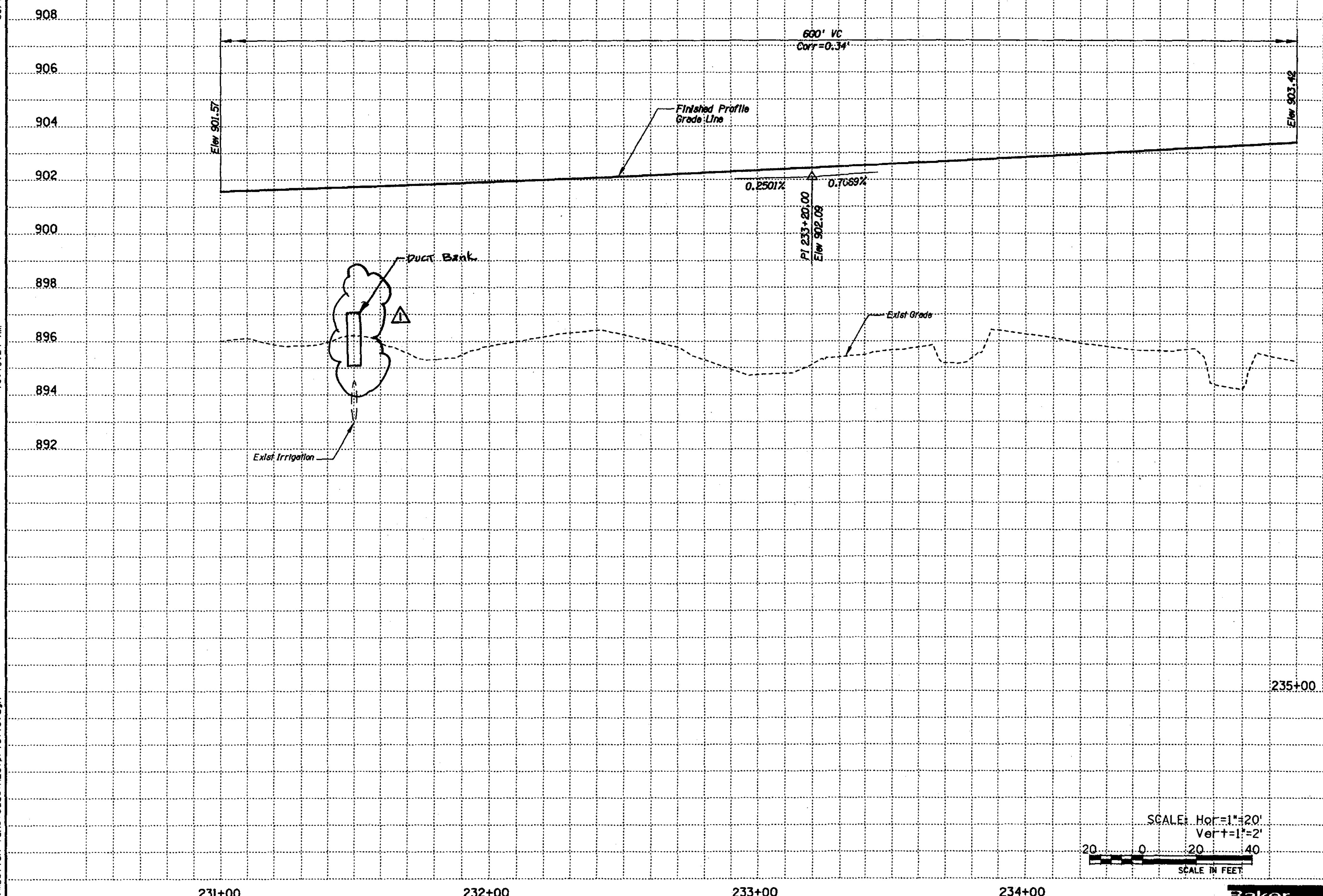
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	121	547	8/28/08



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NO.	REVISION	BY	DATE
3			
2			
1	Added Duct Bank		11-06-07

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

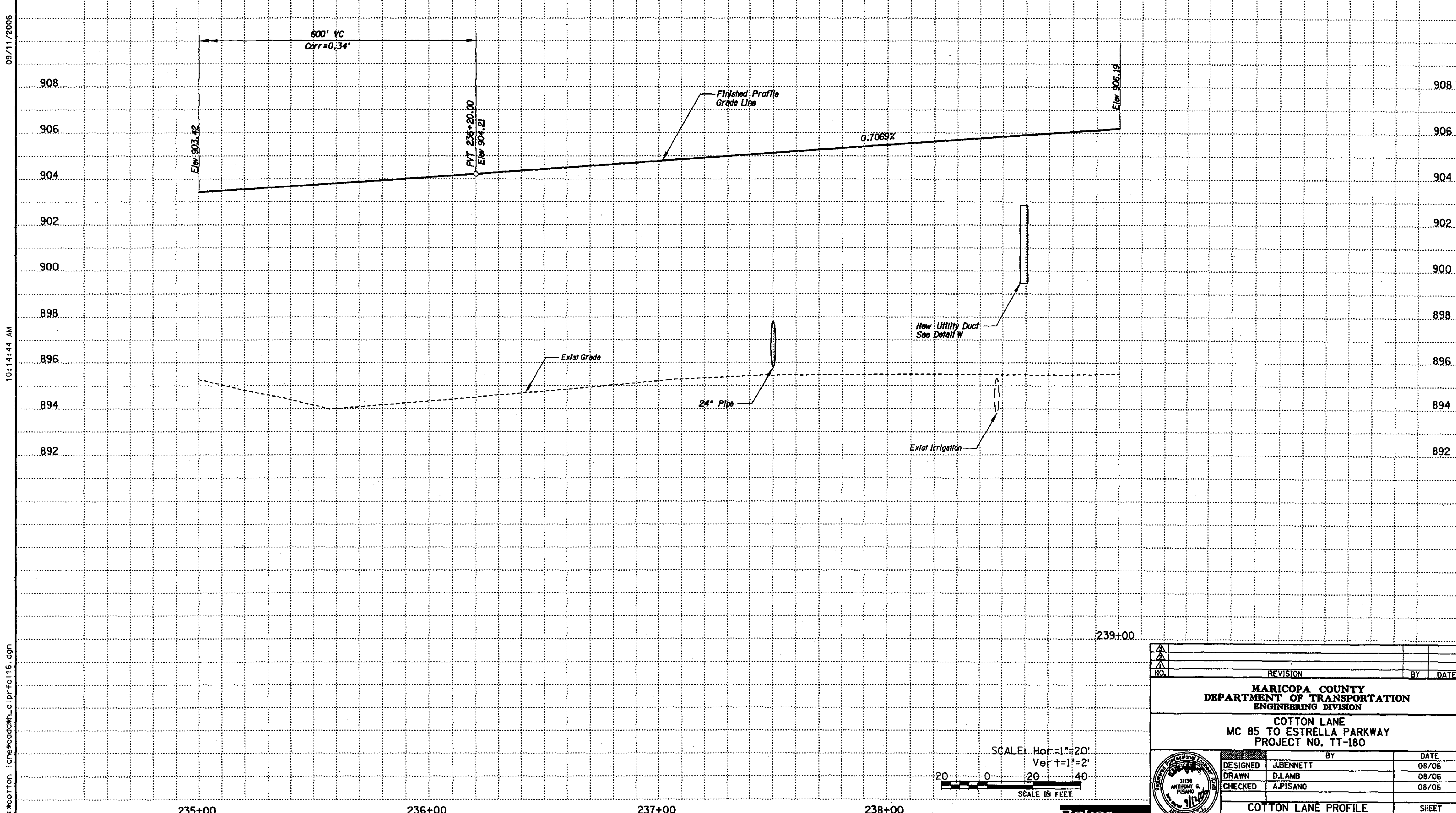
Registered Professional Engineer 31138 ANTHONY G. PISANO ARIZONA, U.S.A.

Baker

COTTON LANE PROFILE
STA 231+00.00 TO 235+00.00

SHEET P-1.68 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	125	547	9/28/08



NO.	REVISION	BY	DATE
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Baker

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

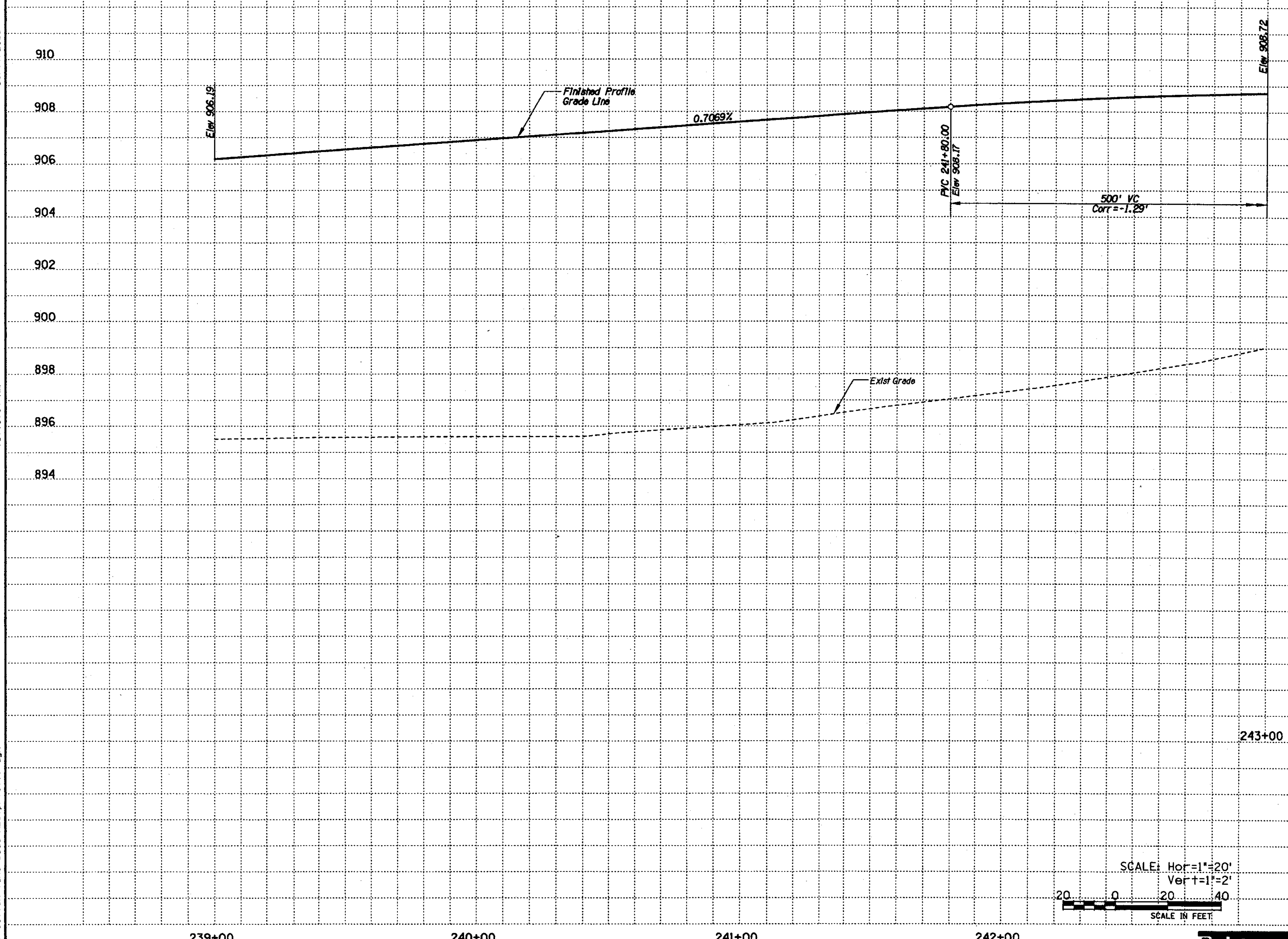
Registered Professional Engineer (Civil) 31138 ANTHONY G. PISANO ARIZONA, U.S.A. 9/12/06

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

COTTON LANE PROFILE
STA 235+00.00 TO 239+00.00

SHEET
P-1.72 OF 99

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	RECORD DRAWING
9	AZ	TT-180	129	541	8/28/08



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SCALE: Hor=1"=20'
Vert=1"=2'

20 0 20 40
SCALE IN FEET

Baker

NO.	REVISION	BY	DATE

MARICOPA COUNTY
DEPARTMENT OF TRANSPORTATION
ENGINEERING DIVISION

COTTON LANE
MC 85 TO ESTRELLA PARKWAY
PROJECT NO. TT-180

	BY	DATE
DESIGNED	J.BENNETT	08/06
DRAWN	D.LAMB	08/06
CHECKED	A.PISANO	08/06

31138
ANTHONY C. PISANO

COTTON LANE PROFILE STA 239+00.00 TO 243+00.00	SHEET P-1.76 OF 99

548 / 582

CITY OF GOODYEAR GENERAL NOTES FOR GRADING AND DRAINAGE CONSTRUCTION

A. AN ON-SITE GRADING PERMIT IS REQUIRED.

B. A SEPARATE PERMIT IS NECESSARY FOR ANY OFF-SITE CONSTRUCTION.

C. THE CITY SHALL BE NOTIFIED 24 HOURS BEFORE ANY ON-SITE CONSTRUCTION BEGINS (623-932-1637).

D. THE GRADING CONTRACTOR SHALL DESIGNATE THE LOCATION FOR WASTING SPOIL MATERIALS AND A LETTER FROM THE OWNER GIVING PERMISSION FOR SAID DISPOSAL PRIOR TO STARTING ON-SITE CONSTRUCTION.

E. GRADING AND DRAINAGE PLAN APPROVAL INCLUDES: CONSTRUCTION OF DRAINAGE PLAN INCLUDING, BUT NOT LIMITED TO, RETENTION AREAS AND/OR OTHER DRAINAGE FACILITIES, SURFACE GRADING, WALLS, CURBS, ASPHALT PAVEMENT, AND BUILDING FLOOR ELEVATIONS.

F. THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS AND SHALL BE KEPT AT THE CONSTRUCTION SITE. SUCH REVIEW SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN PLANS WHICH ARE FOUND TO BE IN VIOLATION OF ANY LAW OR ORDINANCE.

G. YOU ARE HEREBY ADVISED THAT NO PERSON SHALL USE ANY MECHANICAL EQUIPMENT FOR LAND LEVELING OR CLEARING, ROAD CONSTRUCTION, TRENCHING, EXCAVATING, DEMOLITION, OR ENGAGE IN ANY EARTHMOVING ACTIVITY WITHOUT FIRST OBTAINING A PERMIT FROM AIR POLLUTION CONTROL, MARICOPA COUNTY DEPARTMENT OF HEALTH SERVICES, 2406 S. 24TH ST. #E204, PHOENIX, AZ 85006, PHONE: 506-6666. (THIS NOTICE IS ISSUED PURSUANT TO A.R.S. 36-779.07, NOTICE OF BUILDING AGENCIES.)

H. "AS-BUILT" DRAWINGS (ONE SET MYLARS 2 SETS OF PRINTS), CERTIFIED BY THE DEVELOPER'S ENGINEER, SHALL BE SUBMITTED AND APPROVED PRIOR TO ISSUANCE OF A BUILDING "CERTIFICATE OF OCCUPANCY".

ENGINEER'S NOTES

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER OR THE ENGINEER REGARDING ALLEGED INACCURACY OF CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT AND CANNOT BE VERIFIED AS TO THEIR ORIGIN, ANY REMEDIAL WORK REQUIRED TO CORRECT ANY ITEM OR IMPROPER CONSTRUCTION WORK IN THIS DEVELOPMENT SHALL BE PERFORMED AT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE, ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND HE WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA, HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE PAVING CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

ALL PARKWAY GRADING TO BE PER M.A.G. SPEC. 424 (4:1 MAX. SLOPE).

ALL CURB RETURN RADII SHALL BE 20.00' TO BACK OF CURB (UNLESS OTHERWISE NOTED).

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY:

GEC SA&B
PROJECT NO. 05-0668.R01 DATE 2-14-06

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

OWNER/CONTRACTOR IS RESPONSIBLE FOR SURVEY VERIFICATION OF EXISTING HORIZONTAL AND VERTICAL CONDITIONS PRIOR TO START OF CONSTRUCTION. A DEVIATION IN EXISTING CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF COE & VAN LOO BEFORE CONSTRUCTION STARTS. COE & VAN LOO WILL NOT BE RESPONSIBLE FOR REMOVAL, REPLACEMENT, OR OTHER MODIFICATIONS THAT MAY BE REQUIRED AS A RESULT OF EXISTING CONDITIONS NOT PROPERLY VERIFIED AND CONFIRMED. SHOULD AN ERROR BE FOUND IN THE HORIZONTAL & VERTICAL CONDITIONS, COE & VAN LOO WILL BE NOTIFIED AND CONSTRUCTION WILL NOT PROCEED UNTIL REVISIONS/MODIFICATIONS HAVE BEEN PREPARED AND SUBMITTED BY COE & VAN LOO.

ALL CONDUITS (BOX CULVERT, REINFORCED CONCRETE PIPE, CAST-IN-PLACE PIPE, AND/OR CORRUGATED METAL PIPE) SHOWN ON THESE PLANS ARE DESIGNED FOR STANDARD HIGHWAY LOADINGS. THE STANDARD SATISFACTORY MINIMUM COVER REQUIRMENTS AS ESTABLISHED BY THE CONDUIT MANUFACTURER MAY NOT ALWAYS BE ADEQUATE DURING CONSTRUCTION. WHEN CONSTRUCTION EQUIPMENT, FREQUENTLY HEAVIER THAN TRAFFIC LOADS FOR WHICH THE CONDUIT, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE CONDUIT. THE ADEQUACY OF THE COVER REQUIRMENTS FOR CONDUITSHALL BE ANALYZED AND CHECKED BY THE CONTRACTOR TO ADDRESS LOADING CONDITIONS IMPOSED BY THE CONSTRUCTION ACTIVITY. ANY CONDIUT DAMAGE BY CONSTRUCTION ACTIVITY SHALL BE REPLACED AT THE CONTRACTORS EXPENSE.

APPROVAL OF THESE PLANS SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERROR IN THE PLANS WHERE SUCH ERRORS ARE SUBSEQUENTLY FOUND TO BE IN VIOLATION OF ANY LAW, ORDINANCE, OR OTHER HEALTH/SAFTEY ISSUE.

"THIS PLAN IS APPROVED SUBJECT TO COMPLETION OF THOSE LINES LABELED "EXISTING" WHICH HAVE BEEN PROPOSED AS A PART OF ANOTHER DEVELOPMENT. THE DEVELOPER OF THIS PROJECT MAY BE REQUIRED TO CONSTRUCT THOSE LINES PER CITY REQUIREMENTS PRIOR TO RECEIVING SERVICE FOR THIS PROJECT."

RIPRAP SECTION

1. RIPRAP SHALL HAVE THE DENSITY EQUAL TO OR GREATER THAN 2.4
2. RIPRAP SHALL HAVE A DURABLITIY ABSORPTION RATION (DAR) GREATER 10 AND IF DAR > 23 THE MATERIAL IS ACCEPTED IF DENSITY REQUIREMENTS (ABOVE) ARE MET. IF DAR IS BETWEEN 10 AND 23 AND THE DURABILTY INDEX IS GREATER THAN OR EQUAL TO 52 THE MATERIAL IS ACCEPTABLE. IF DAR IS LESS THAN 23 AND THE DURABILITY INDEX IS LESS THAN 52 THE MATERIAL WILL NOT BE ACCEPTED.
3. THE STONE SHALL BE ANGULAR AND NO MORE THAN 25% OF THE STONES SHOULD HAVE A LENGTH (LONGEST AXIS) MORE THAN 2.5 TIMES THE BREADTH (SHORT AXIS).

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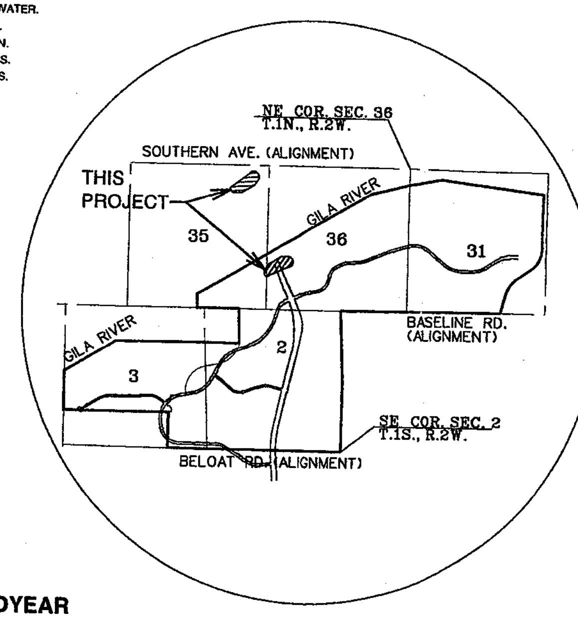
LEGEND

(18)	PLAN SHEET NOS.
	PUBLIC UTILITY EASMENT.
	PROPERTY LINE.
100 YR WSEL 893.53 / 10 YR WSEL 887.12	WATER SURFACE ELEVATION.
TOB 99.5 / STA 183+61.63 / OFF 146.28' LT	TOP OF BASIN, STATION, OFFSET.
	SLOPE ARROW.
TOE 71.1	TOE ELEVATION.
FG 94.8	FINISH GRADE ELEVATION.
	EX JURISDICTIONAL WATER.
	EX FEMA FLOODWAY.
	EX FEMA FLOODPLAIN.
890	EX MAJOR CONTOURS.
	EX MINOR CONTOURS.

GRADING PLANS
FOR

"KING RANCH PHASE 1"
ABUTMENT EMBANKMENT

A PORTION OF SECTIONS 36,TOWNSHIP 1 NORTH, RANGE 2 WEST, GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, GOODYEAR, ARIZONA



CITY OF GOODYEAR GENERAL NOTES FOR CONSTRUCTION

A. ALL CONSTRUCTION SHALL CONFORM WITH THE LATEST MAG STANDARD DETAILS AND SPECIFICATIONS AND THE CITY'S SUPPLEMENTAL DETAILS AND SPECIFICATIONS.

B. THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS. HOWEVER, SUCH REVIEW SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN PLANS FOUND TO BE IN VIOLATION OF ANY LAW OR ORDINANCE.

C. THE CITY DOES NOT WARRANT ANY QUANTITIES SHOWN ON THESE PLANS.

D. THE CITY APPROVAL IS FOR GENERAL LAYOUT IN THE RIGHT-OF-WAY ONLY. THIS APPROVAL IS VALID FOR A PERIOD OF ONE YEAR. CONSTRUCTION PERMITS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE RESUBMITTED FOR REVIEW AND APPROVAL.

E. AN APPROVED SET OF PLANS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES.

F. THE CITY SHALL BE NOTIFIED 24 HOURS PRIOR TO ANY CONSTRUCTION WORK AND INSPECTIONS (623-932-1637). CONSTRUCTION WORK CONCEALED WITHOUT INSPECTION BY THE CITY SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.

G. RIGHT-OF-WAY IMPROVEMENTS SHALL NOT BE ACCEPTED UNTIL "AS-BUILT" PLANS HAVE BEEN SUBMITTED AND APPROVED BY THE CITY (SEE AS-BUILT REQUIREMENTS).

H. THE DEVELOPER IS RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL OBSTRUCTIONS WITHIN THE RIGHT-OF-WAY PRIOR TO STARTING NEW CONSTRUCTION.

I. THE DEVELOPER IS RESPONSIBLE FOR ARRANGING THE RELOCATION AND ASSOCIATED COSTS OF ALL UTILITIES. A UTILITY RELOCATION SCHEDULE SHALL BE SUBMITTED PRIOR TO THE ISSUANCE OF PERMITS.

J. THE DEVELOPER IS RESPONSIBLE FOR OBTAINING OR DEDICATING ALL REQUIRED RIGHTS-OF-WAY AND EASEMENTS TO THE CITY PRIOR TO ISSUANCE OF PERMITS.

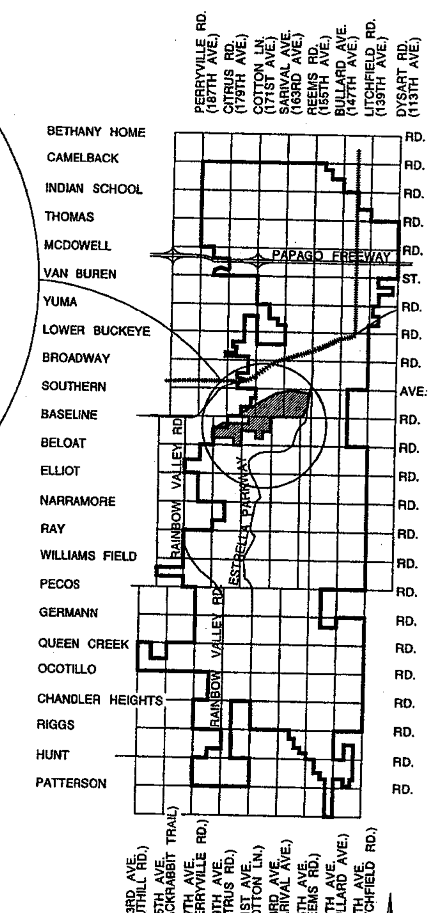
K. THE CONTRACTOR SHALL CONTACT BLUE STAKE (602-263-1100) 48 HOURS PRIOR TO CONSTRUCTION.

L. THE CONTRACTOR SHALL BARRICADE CONSTRUCTION SITES AT ALL TIMES PER THE CITY OF PHOENIX TRAFFIC BARRICADE MANUAL. WHEN REQUIRED BY THE CITY, A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED FOR APPROVAL IN ADVANCE OF CONSTRUCTION.

M. THE CONTRACTOR MAY REQUEST A FIRE HYDRANT METER FOR CONSTRUCTION WATER FROM THE FINANCE DEPARTMENT. THIS METER SHOULD BE ORDERED TWO WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. THE UNLAWFUL REMOVAL OF WATER FROM A FIRE HYDRANT IS A VIOLATION OF THE MUNICIPAL CODE, PUNISHABLE BY FINE AND/OR IMPRISONMENT.

NOTE:
AT THIS TIME, POTABLE WATER WILL NOT BE AVAILABLE FOR CONSTRUCTION PURPOSES.

N. PRIVATE ON-SITE WATER AND SEWER LINES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE UNIFORM PLUMBING CODE, N.F.P.A., AND THE UNIFORM FIRE CODE AS ADOPTED BY THE CITY.



VICINITY MAP
(NOT TO SCALE)

SHEET INDEX

UTILITIES:

SEWER:	CITY OF GOODYEAR
WATER:	CITY OF GOODYEAR
FIRE:	CITY OF GOODYEAR
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CATV:	COX CABLE

ESTIMATED EARTHWORK QUANTITIES

EXCAVATION...........5,122 C.Y. (RAW)
EMBANKMENT.........13,027 CY (RAW)

SEE SOILS REPORT FOR SHRINK FACTORS, PRE-COMPACTION AND OVER-EXCAVATION REQUIREMENTS.

ENGINEER

RIVER RESEARCH & DESIGN, INC.
1345 E. SPUR AVE.,
GILBERT, ARIZONA 85296-1927
PH.: (480) 225-5206
CONTACT: GARY E. FREEMAN

DEVELOPER:

EP - THE KING, L.L.C.
AN ARIZONA LIMITED LIABILITY COMPANY
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

OWNER:

DIAMOND CREEK DEVELOPMENT
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

BENCHMARK

BRASS CAP IN HANDHOLE AT LOWER BUCKEYE AND ESTRELLA PARKWAY
ELEVATION 952.06 (CITY OF GOODYEAR DATUM)
FOR ADDITIONAL BENCHMARK LOCATIONS AND ELEVATIONS SEE THE CONSTRUCTION OF COTTON LANE - MC 85 TO ESTRELLA PARKWAY PROJECT NO. TT-180 SHEETS C-1.1 - C-1.5

BENCHMARK EQUATION

CITY OF GOOD YEAR DATUM +1.70'= KING RANCH (NGVD 1929)

BASIS OF BEARING

THE BASIS OF BEARING FOR THIS PROJECT IS N89°33'36"W BETWEEN THE NORTH QUARTER CORNER OF SECTION 2, TOWNSHIP 1 SOUTH, RANGE 2 WEST AND THE SOUTH QUARTER CORNER OF SECTION 36, TOWNSHIP 1 NORTH, RANGE 2 WEST ACCORDING TO BOOK 643 OF MAPS, PAGE 5, MARICOPA COUNTY RECORDS.

SUBMITTED:

"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD PRIOR TO SUBMISSION FOR CITY APPROVAL."

BY: [signature] 4/17/07
REGISTERED CIVIL ENGINEER DATE

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "AS - BUILT" INFORMATION AS SHOWN HEREON WAS OBTAINED UNDER MY DIRECT SUPERVISION AND IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: John Akin
REGISTERED ~~LAND SURVEYOR~~ Civil Engineer (SEAL)
30484
REGISTRATION NUMBER DATE

REVIEWED BY:
FIELD ENGINEERING

APPROVAL - FLOOD CONTROL DIST. OF MARICOPA COUNTY

BY:
DATE

APPROVAL - MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

BY:
DATE

CITY OF GOODYEAR

REVIEW AND RECOMMENDED APPROVAL BY:

FIRE DEPT.		GRADING & DRAINAGE	
LANDSCAPE & PLANNING		WATER & SEWER	
TRAFFIC		PAVING	

APPROVED BY:
PLANS EXAMINER DATE

602-263-1100
1-800-STAKE-IT

Registered Professional Engineer
CERTIFICATE NO. 36225
GARY E. FREEMAN
ARIZONA, U.S.A.

NO.	REVISION	DATE

CVL
4550 North 12th Street
Phoenix, Arizona 85014
Telephone 602-264-6831
http://www.cvlci.com
Coe & Van Loo Consultants, Inc.
River Research & Design, Inc.

GRADING PLANS
KING RANCH PHASE 1
ABUTMENT EMBANKMENT

SHEET
1 OF 5

CVL Contact: GARY E. FREEMAN
CVL Project #: 800001
CVL File #:

548 / 582

CITY OF GOODYEAR GENERAL NOTES FOR GRADING AND DRAINAGE CONSTRUCTION

A. AN ON-SITE GRADING PERMIT IS REQUIRED.

B. A SEPARATE PERMIT IS NECESSARY FOR ANY OFF-SITE CONSTRUCTION.

C. THE CITY SHALL BE NOTIFIED 24 HOURS BEFORE ANY ON-SITE CONSTRUCTION BEGINS (623-932-1637).

D. THE GRADING CONTRACTOR SHALL DESIGNATE THE LOCATION FOR WASTING SPOIL MATERIALS AND A LETTER FROM THE OWNER GIVING PERMISSION FOR SAID DISPOSAL PRIOR TO STARTING ON-SITE CONSTRUCTION.

E. GRADING AND DRAINAGE PLAN APPROVAL INCLUDES: CONSTRUCTION OF DRAINAGE PLAN INCLUDING, BUT NOT LIMITED TO, RETENTION AREAS AND/OR OTHER DRAINAGE FACILITIES, SURFACE GRADING, WALLS, CURBS, ASPHALT PAVEMENT, AND BUILDING FLOOR ELEVATIONS.

F. THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS AND SHALL BE KEPT AT THE CONSTRUCTION SITE. SUCH REVIEW SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN PLANS WHICH ARE FOUND TO BE IN VIOLATION OF ANY LAW OR ORDINANCE.

G. YOU ARE HEREBY ADVISED THAT NO PERSON SHALL USE ANY MECHANICAL EQUIPMENT FOR LAND LEVELING OR CLEARING, ROAD CONSTRUCTION, TRENCHING, EXCAVATING, DEMOLITION, OR ENGAGE IN ANY EARTHMOVING ACTIVITY WITHOUT FIRST OBTAINING A PERMIT FROM AIR POLLUTION CONTROL, MARICOPA COUNTY DEPARTMENT OF HEALTH SERVICES, 2406 S. 24TH ST. #E204, PHOENIX, AZ 85006, PHONE: 506-6666. (THIS NOTICE IS ISSUED PURSUANT TO A.R.S. 36-779.07, NOTICE OF BUILDING AGENCIES.)

H. "AS-BUILT" DRAWINGS (ONE SET MYLARS 2 SETS OF PRINTS), CERTIFIED BY THE DEVELOPER'S ENGINEER, SHALL BE SUBMITTED AND APPROVED PRIOR TO ISSUANCE OF A BUILDING "CERTIFICATE OF OCCUPANCY".

ENGINEER'S NOTES

THE CONTRACTOR SHALL MAKE NO CLAIM AGAINST THE OWNER OR THE ENGINEER REGARDING ALLEGED INACCURACY OF CONSTRUCTION STAKES SET BY THE ENGINEER UNLESS ALL SURVEY STAKES SET BY THE ENGINEER ARE MAINTAINED INTACT AND CAN BE VERIFIED AS TO THEIR ORIGIN. IF, IN THE OPINION OF THE ENGINEER, THE STAKES ARE NOT MAINTAINED INTACT AND CANNOT BE VERIFIED AS TO THEIR ORIGIN, ANY REMEDIAL WORK REQUIRED TO CORRECT ANY ITEM OR IMPROPER CONSTRUCTION WORK IN THIS DEVELOPMENT SHALL BE PERFORMED AT THE SOLE EXPENSE OF THE RESPONSIBLE CONTRACTOR OR SUBCONTRACTOR.

NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE, ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND HE WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA, HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE PAVING CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

ALL PARKWAY GRADING TO BE PER M.A.G. SPEC. 424 (4:1 MAX. SLOPE).

ALL CURB RETURN RADII SHALL BE 20.00' TO BACK OF CURB (UNLESS OTHERWISE NOTED).

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY:

GEC SA&B
PROJECT NO. 05-0668.R01 DATE 2-14-06

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

OWNER/CONTRACTOR IS RESPONSIBLE FOR SURVEY VERIFICATION OF EXISTING HORIZONTAL AND VERTICAL CONDITIONS PRIOR TO START OF CONSTRUCTION. A DEVIATION IN EXISTING CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF COE & VAN LOO BEFORE CONSTRUCTION STARTS. COE & VAN LOO WILL NOT BE RESPONSIBLE FOR REMOVAL, REPLACEMENT, OR OTHER MODIFICATIONS THAT MAY BE REQUIRED AS A RESULT OF EXISTING CONDITIONS NOT PROPERLY VERIFIED AND CONFIRMED. SHOULD AN ERROR BE FOUND IN THE HORIZONTAL & VERTICAL CONDITIONS, COE & VAN LOO WILL BE NOTIFIED AND CONSTRUCTION WILL NOT PROCEED UNTIL REVISIONS/MODIFICATIONS HAVE BEEN PREPARED AND SUBMITTED BY COE & VAN LOO.

ALL CONDUITS (BOX CULVERT, REINFORCED CONCRETE PIPE, CAST-IN-PLACE PIPE, AND/OR CORRUGATED METAL PIPE) SHOWN ON THESE PLANS ARE DESIGNED FOR STANDARD HIGHWAY LOADINGS. THE STANDARD SATISFACTORY MINIMUM COVER REQUIRMENTS AS ESTABLISHED BY THE CONDUIT MANUFACTURER MAY NOT ALWAYS BE ADEQUATE DURING CONSTRUCTION. WHEN CONSTRUCTION EQUIPMENT , FREQUENTLY HEAVIER THAN TRAFFIC LOADS FOR WHICH THE CONDUIT , IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE CONDUIT. THE ADEQUACY OF THE COVER REQUIRMENTS FOR CONDUITSHALL BE ANALYZED AND CHECKED BY THE CONTRACTOR TO ADDRESS LOADING CONDITIONS IMPOSED BY THE CONSTRUCTION ACTIVITY. ANY CONDIUT DAMAGE BY CONSTRUCTION ACTIVITY SHALL BE REPLACED AT THE CONTRACTORS EXPENSE.

APPROVAL OF THESE PLANS SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERROR IN THE PLANS WHERE SUCH ERRORS ARE SUBSEQUENTLY FOUND TO BE IN VIOLATION OF ANY LAW, ORDINANCE, OR OTHER HEALTH/SAFTEY ISSUE.

"THIS PLAN IS APPROVED SUBJECT TO COMPLETION OF THOSE LINES LABELED "EXISTING" WHICH HAVE BEEN PROPOSED AS A PART OF ANOTHER DEVELOPMENT. THE DEVELOPER OF THIS PROJECT MAY BE REQUIRED TO CONSTRUCT THOSE LINES PER CITY REQUIREMENTS PRIOR TO RECEIVING SERVICE FOR THIS PROJECT."

RIPRAP SECTION

1. RIPRAP SHALL HAVE THE DENSITY EQUAL TO OR GREATER THAN 2.4
2. RIPRAP SHALL HAVE A DURABLITIY ABSORPTION RATION (DAR) GREATER 10 AND IF DAR > 23 THE MATERIAL IS ACCEPTED IF DENSITY REQUIREMENTS (ABOVE) ARE MET. IF DAR IS BETWEEN 10 AND 23 AND THE DURABILTY INDEX IS GREATER THAN OR EQUAL TO 52 THE MATERIAL IS ACCEPTABLE. IF DAR IS LESS THAN 23 AND THE DURABILITY INDEX IS LESS THAN 52 THE MATERIAL WILL NOT BE ACCEPTED.
3. THE STONE SHALL BE ANGULAR AND NO MORE THAN 25% OF THE STONES SHOULD HAVE A LENGTH (LONGEST AXIS) MORE THAN 2.5 TIMES THE BREADTH (SHORT AXIS).

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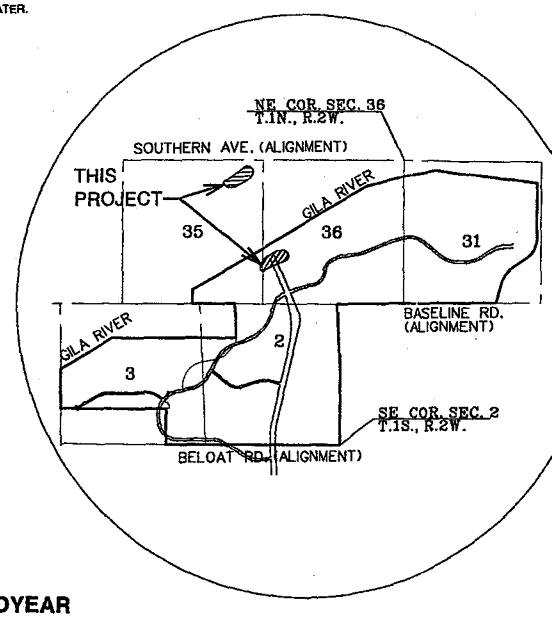
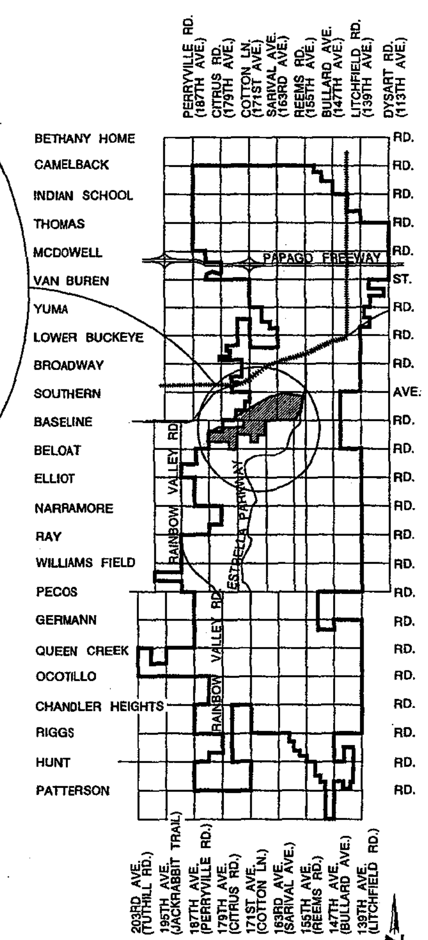
LEGEND

(18) ....PLAN SHEET NOS.
....PUBLIC UTILITY EASMENT.
....PROPERTY LINE.
100 YR WSEL 893.53 / 10 YR WSEL 887.12 ....WATER SURFACE ELEVATION.
TOB 99.5 / STA 183+61.63 / OFF 146.28' LT ....TOP OF BASIN, STATION, OFFSET.
....SLOPE ARROW.
TOE 71.1 ....TOE ELEVATION.
FG 94.8 ....FINISH GRADE ELEVATION.
....EX JURISDICTIONAL WATER.
....EX FEMA FLOODWAY.
....EX FEMA FLOODPLAIN.
890 ....EX MAJOR CONTOURS.
....EX MINOR CONTOURS.

GRADING PLANS FOR "KING RANCH PHASE 1" ABUTMENT EMBANKMENT

A PORTION OF SECTIONS 36, TOWNSHIP 1 NORTH, RANGE 2 WEST, GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, GOODYEAR, ARIZONA





VICINITY MAP
(NOT TO SCALE)

CITY OF GOODYEAR GENERAL NOTES FOR CONSTRUCTION

A. ALL CONSTRUCTION SHALL CONFORM WITH THE LATEST MAG STANDARD DETAILS AND SPECIFICATIONS AND THE CITY'S SUPPLEMENTAL DETAILS AND SPECIFICATIONS.

B. THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS. HOWEVER, SUCH REVIEW SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN PLANS FOUND TO BE IN VIOLATION OF ANY LAW OR ORDINANCE.

C. THE CITY DOES NOT WARRANT ANY QUANTITIES SHOWN ON THESE PLANS.

D. THE CITY APPROVAL IS FOR GENERAL LAYOUT IN THE RIGHT-OF-WAY ONLY. THIS APPROVAL IS VALID FOR A PERIOD OF ONE YEAR. CONSTRUCTION PERMITS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE RESUBMITTED FOR REVIEW AND APPROVAL.

E. AN APPROVED SET OF PLANS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES.

F. THE CITY SHALL BE NOTIFIED 24 HOURS PRIOR TO ANY CONSTRUCTION WORK AND INSPECTIONS (623-932-1637). CONSTRUCTION WORK CONCEALED WITHOUT INSPECTION BY THE CITY SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.

G. RIGHT-OF-WAY IMPROVEMENTS SHALL NOT BE ACCEPTED UNTIL "AS-BUILT" PLANS HAVE BEEN SUBMITTED AND APPROVED BY THE CITY (SEE AS-BUILT REQUIREMENTS).

H. THE DEVELOPER IS RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL OBSTRUCTIONS WITHIN THE RIGHT-OF-WAY PRIOR TO STARTING NEW CONSTRUCTION.

I. THE DEVELOPER IS RESPONSIBLE FOR ARRANGING THE RELOCATION AND ASSOCIATED COSTS OF ALL UTILITIES. A UTILITY RELOCATION SCHEDULE SHALL BE SUBMITTED PRIOR TO THE ISSUANCE OF PERMITS.

J. THE DEVELOPER IS RESPONSIBLE FOR OBTAINING OR DEDICATING ALL REQUIRED RIGHTS-OF-WAY AND EASEMENTS TO THE CITY PRIOR TO ISSUANCE OF PERMITS.

K. THE CONTRACTOR SHALL CONTACT BLUE STAKE (602-263-1100) 48 HOURS PRIOR TO CONSTRUCTION.

L. THE CONTRACTOR SHALL BARRICADE CONSTRUCTION SITES AT ALL TIMES PER THE CITY OF PHOENIX TRAFFIC BARRICADE MANUAL. WHEN REQUIRED BY THE CITY, A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED FOR APPROVAL IN ADVANCE OF CONSTRUCTION.

M. THE CONTRACTOR MAY REQUEST A FIRE HYDRANT METER FOR CONSTRUCTION WATER FROM THE FINANCE DEPARTMENT. THIS METER SHOULD BE ORDERED TWO WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. THE UNLAWFUL REMOVAL OF WATER FROM A FIRE HYDRANT IS A VIOLATION OF THE MUNICIPAL CODE, PUNISHABLE BY FINE AND/OR IMPRISONMENT.

NOTE:
AT THIS TIME, POTABLE WATER WILL NOT BE AVAILABLE FOR CONSTRUCTION PURPOSES.

N. PRIVATE ON-SITE WATER AND SEWER LINES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE UNIFORM PLUMBING CODE, N.F.P.A., AND THE UNIFORM FIRE CODE AS ADOPTED BY THE CITY.

SHEET INDEX

UTILITIES:

SEWER:	CITY OF GOODYEAR
WATER:	CITY OF GOODYEAR
FIRE:	CITY OF GOODYEAR
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CATV:	COX CABLE

ESTIMATED EARTHWORK QUANTITIES

EXCAVATION............5,122 C.Y. (RAW)
EMBANKMENT........13,027 CY (RAW)

SEE SOILS REPORT FOR SHRINK FACTORS, PRE-COMPACTION AND OVER-EXCAVATION REQUIREMENTS.

ENGINEER

RIVER RESEARCH & DESIGN, INC.
1345 E. SPUR AVE..
GILBERT, ARIZONA 85296-1927
PH.: (480) 225-5206
CONTACT: GARY E. FREEMAN

DEVELOPER:

EP - THE KING, L.L.C.
AN ARIZONA LIMITED LIABILITY COMPANY
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

OWNER:

DIAMOND CREEK DEVELOPMENT
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

BENCHMARK

BRASS CAP IN HANDHOLE AT LOWER BUCKEYE AND ESTRELLA PARKWAY
ELEVATION 952.06 (CITY OF GOODYEAR DATUM)
FOR ADDITIONAL BENCHMARK LOCATIONS AND ELEVATIONS SEE THE CONSTRUCTION OF COTTON LANE - MC 85 TO ESTRELLA PARKWAY PROJECT NO. TT-180 SHEETS C-1.1 - C-1.5

BENCHMARK EQUATION

CITY OF GOOD YEAR DATUM +1.70' = KING RANCH (NGVD 1929)

BASIS OF BEARING

THE BASIS OF BEARING FOR THIS PROJECT IS N89°33'36"W BETWEEN THE NORTH QUARTER CORNER OF SECTION 2, TOWNSHIP 1 SOUTH, RANGE 2 WEST AND THE SOUTH QUARTER CORNER OF SECTION 36, TOWNSHIP 1 NORTH, RANGE 2 WEST ACCORDING TO BOOK 643 OF MAPS, PAGE 5, MARICOPA COUNTY RECORDS.

SUBMITTED:

"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD PRIOR TO SUBMISSION FOR CITY APPROVAL"

BY: [signature] 4/17/07
REGISTERED CIVIL ENGINEER DATE

AS-BUILT CERTIFICATION

I HEREBY CERTIFY THAT THE "AS - BUILT" INFORMATION AS SHOWN HEREON WAS OBTAINED UNDER MY DIRECT SUPERVISION AND IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: John Akin
REGISTERED ~~LAND SURVEYOR~~ CIVIL ENGINEER (SEAL)
30484
REGISTRATION NUMBER DATE

REVIEWED BY: ____________
FIELD ENGINEERING

APPROVAL - FLOOD CONTROL DIST. OF MARICOPA COUNTY

BY: ____________ DATE

APPROVAL - MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

BY: ____________ DATE

CITY OF GOODYEAR			
REVIEW AND RECOMMENDED APPROVAL BY:			
FIRE DEPT.		GRADING & DRAINAGE	
LANDSCAPE & PLANNING		WATER & SEWER	
TRAFFIC		PAVING	
APPROVED BY:			
PLANS EXAMINER		DATE	

Two working days before you dig CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

CVL
4550 North 12th Street
Phoenix, Arizona 85014
Telephone 602-264-6831
http://www.cvlci.com
Coe & Van Loo Consultants, Inc.
River Research & Design, Inc.

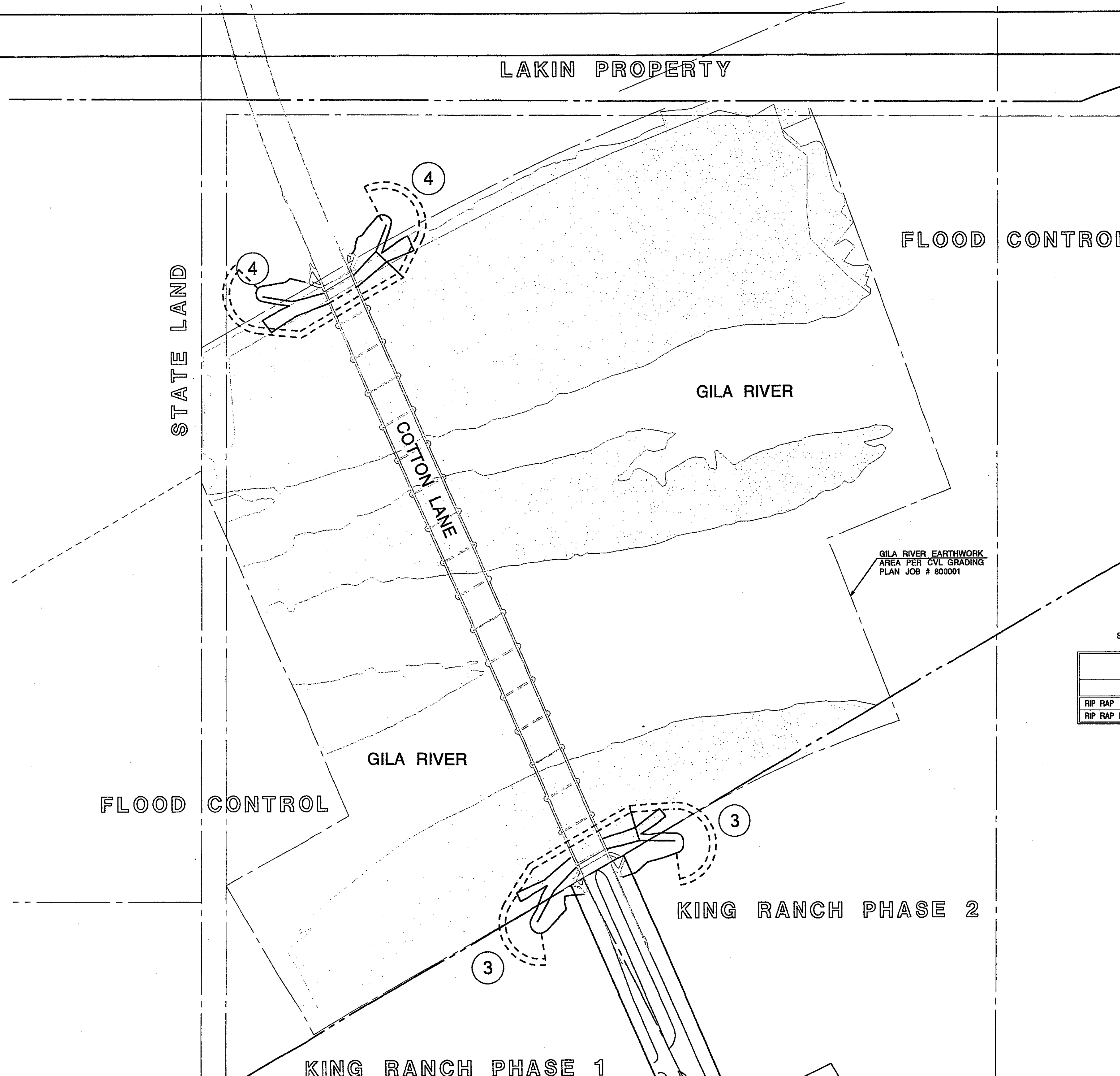
NO.	REVISION	DATE

GRADING PLANS
KING RANCH PHASE 1
ABUTMENT EMBANKMENT

Registered Professional Engineer (Civil) CERTIFICATE NO. 36225 GARY E. FREEMAN Date Signed 4/17/07 ARIZONA, U.S.A.

CVL Contact: GARY E. FREEMAN
CVL Project #: 800001
CVL File #:

549 / 582



THE QUANTITIES SHOWN ARE AN ESTIMATE ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL QUANTITIES BEFORE BIDDING.

GRADING ESTIMATED QUANTITIES		
DESCRIPTION	UNITS	TOTAL
RIP RAP D50 = 6"	SY	762
RIP RAP D100 = 24" TO 26", D85= 19" TO 22", D50= 16" TO 18.4", D15= 6.4" TO 9.6"	SY	12,331

160' 80' 0 160'
SCALE: 1" = 160'

Two working days before you dig CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

CVL
4550 North 12th Street
Phoenix, Arizona 85014
Telephone 602-264-6831
http://www.cvlci.com

Coe & Van Loo Consultants, Inc.
River Research & Design, Inc.

NO.	REVISION	DATE

GRADING PLANS

KING RANCH PHASE 1
ABUTMENT EMBANKMENT

Registered Professional Engineer (Civil)
CERTIFICATE NO. 36225
GARY E. FREEMAN
Date Signed 4/17/07
ARIZONA, U.S.A.

SHEET
2 OF 5

CVL Contact: GARY E. FREEMAN
CVL Project #: 800001
CVL File #:

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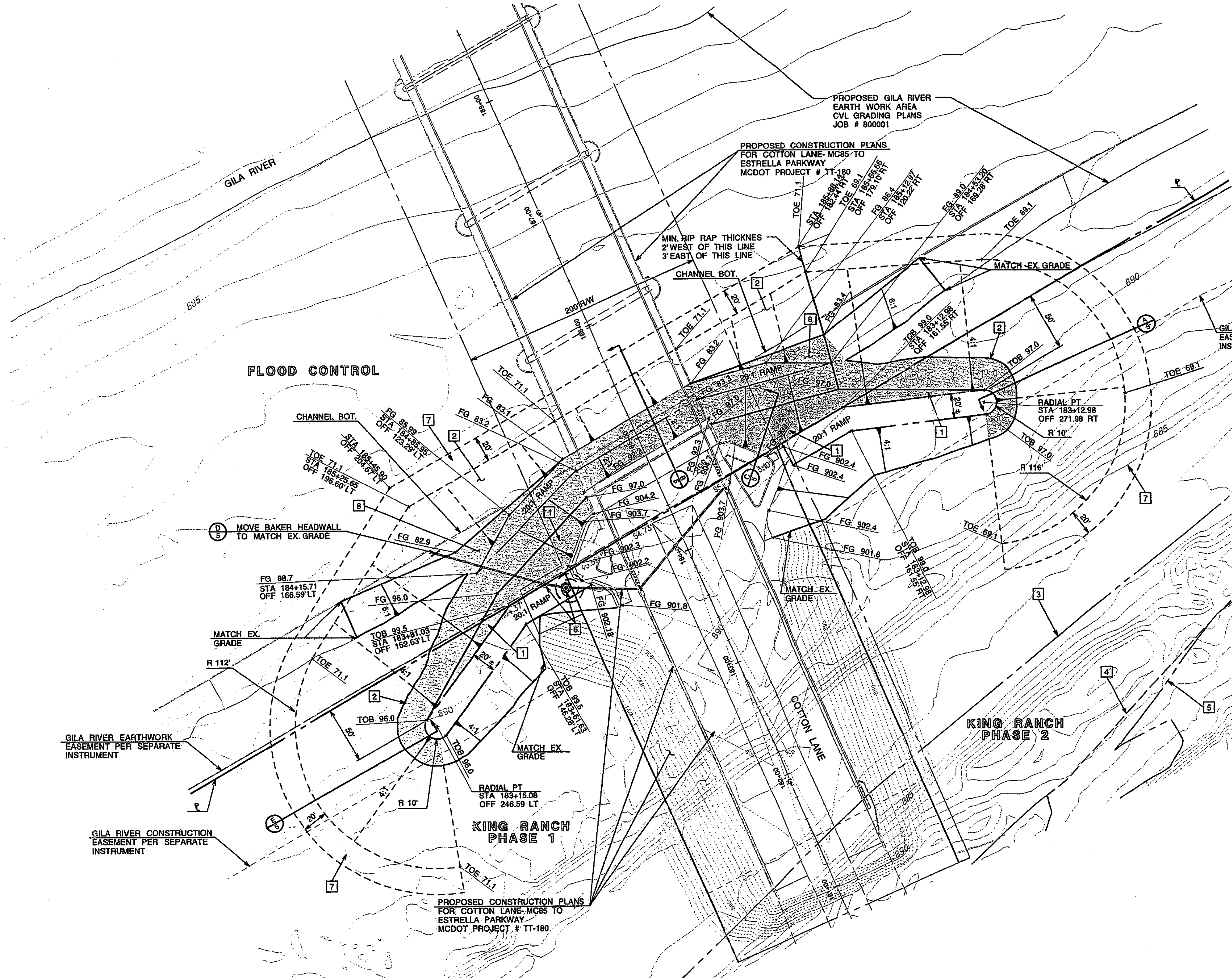

GRADING CONSTRUCTION NOTES

1. INSTALL RIP RAP SLOPE PROTECTION W/MIRAFI I40 FILTER FABRIC OR APPROVED EQUIVALENT D50=6", T=12"
2. INSTALL RIP RAP BANK PROTECTION WITH TYPE II GRAVEL FILTER 8"-10" THICK D100=24"-26", D85=19"-22", D50=16"-18.4", D15=6.4"-9.6"
3. EXISTING JURISDICTIONAL WATERS OF THE U.S.
4. EXISTING FEMA FLOODWAY.
5. EXISTING FEMA FLOODPLAIN.
6. MANHOLE FRAME AND COVER ADJUSTMENT PER M.A.G. STD. DET. 422
7. INSTALL LAUNCHABLE RIP RAP TOE WITH TYPE II GRAVEL FILTER 8"-10" THICK D100=24"-26", D85=19"-22", D50=16"-18.4", D15=6.4"-9.6"
8. SMOOTH TRAIL BENCH INTO BANK - IF NOT SMOOTH INCREASE RIP RAP THICKNESS TO 5 FT MIN. WITH IN 30' RADIUS OF ANY ANGLE GREATER THAN 30°

NOTE:
STATIONED OFF THE COTTON LANE BRIDGE STATIONING PER COTTON LANE CONSTRUCTION PLANS.
MCDOT PROJECT NO. TT-180

NOTE:
ALL ELEVATIONS WITH NO LEADING DIGIT (I.E. 87.5) ARE IN THE 800 RANGE (I.E. 887.5)

40' 20' 0 40'
SCALE: 1"= 40' HORIZ.

Two working days before you dig CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

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Telephone 602-264-6831
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Coe & Van Loo Consultants, Inc.
River Research & Design, Inc.

NO.	REVISION	DATE

GRADING PLANS
KING RANCH PHASE 1 ABUTMENT EMBANKMENT

Registered Professional Engineer (Civil) Certificate No. 36225 GARY E. FREEMAN Date Signed 4/17/07 ARIZONA, U.S.A.

SHEET 3 OF 5

CVL Contact: GARY E. FREEMAN
CVL Project #: 800001
CVL File #:

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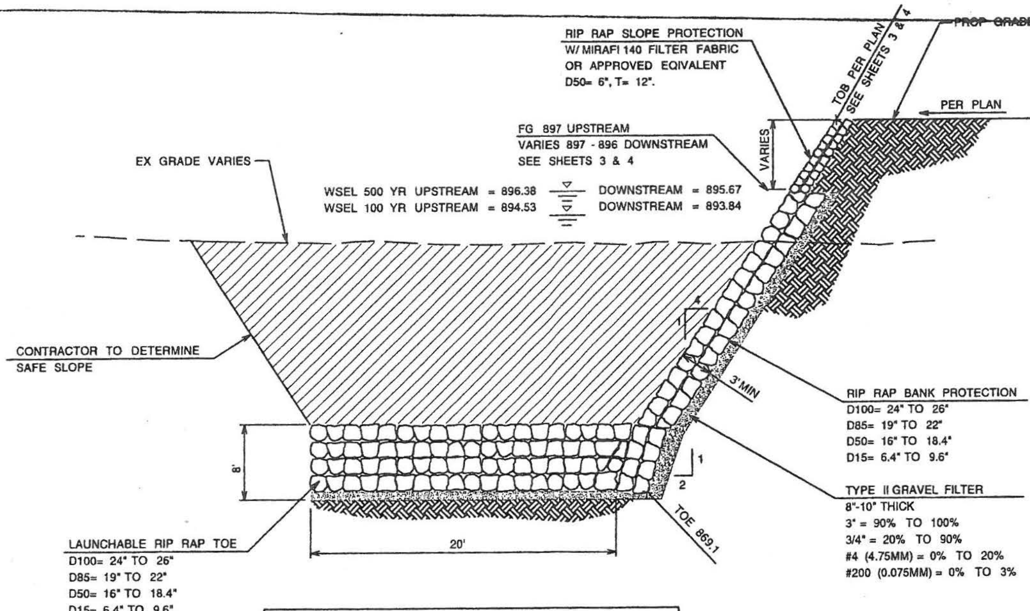
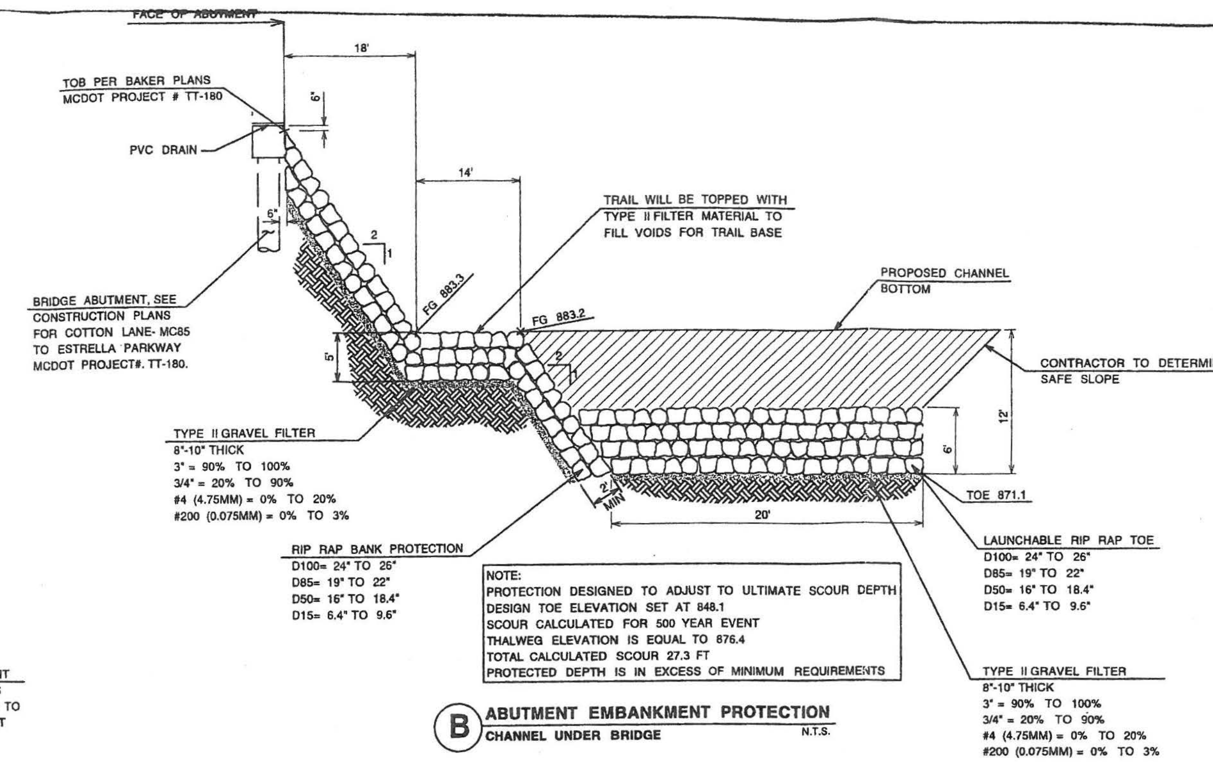


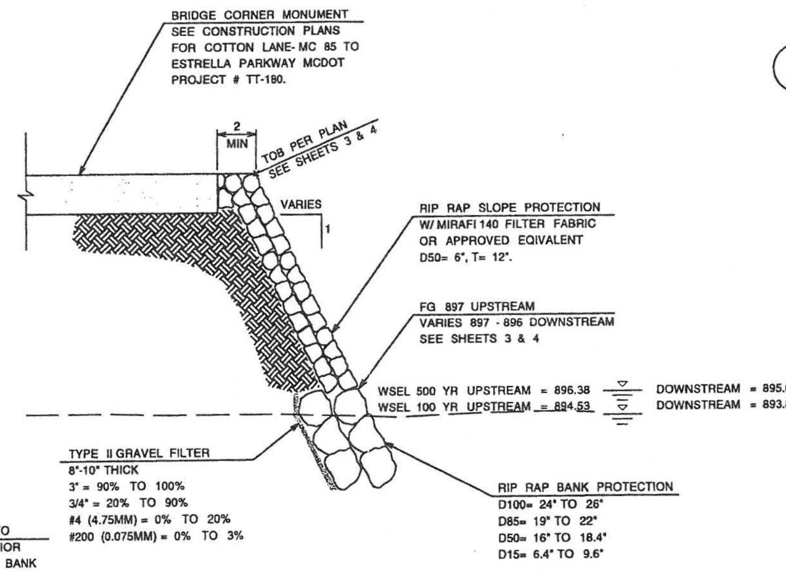
NOTE:
PROTECTION DESIGNED TO ADJUST TO ULTIMATE SCOUR DEPTH
DESIGN TOE ELEVATION SET AT 848.1
SCOUR CALCULATED FOR 500 YEAR EVENT
THALWEG ELEVATION IS EQUAL TO 876.7
TOTAL CALCULATED SCOUR 27.3 FT
PROTECTED DEPTH IS IN EXCESS OF MINIMUM REQUIREMENTS

(A) ABUTMENT EMBANKMENT PROTECTION
UPSTREAM GUIDE BANK NORTH AND SOUTH N.T.S.

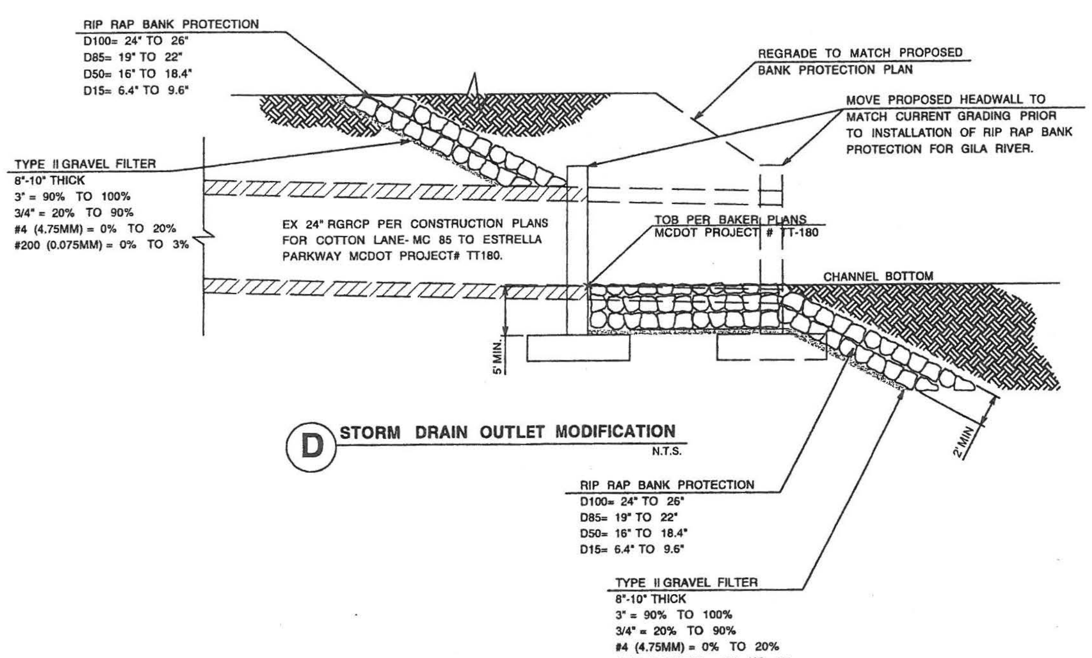


NOTE:
PROTECTION DESIGNED TO ADJUST TO ULTIMATE SCOUR DEPTH
DESIGN TOE ELEVATION SET AT 848.1
SCOUR CALCULATED FOR 500 YEAR EVENT
THALWEG ELEVATION IS EQUAL TO 876.4
TOTAL CALCULATED SCOUR 27.3 FT
PROTECTED DEPTH IS IN EXCESS OF MINIMUM REQUIREMENTS

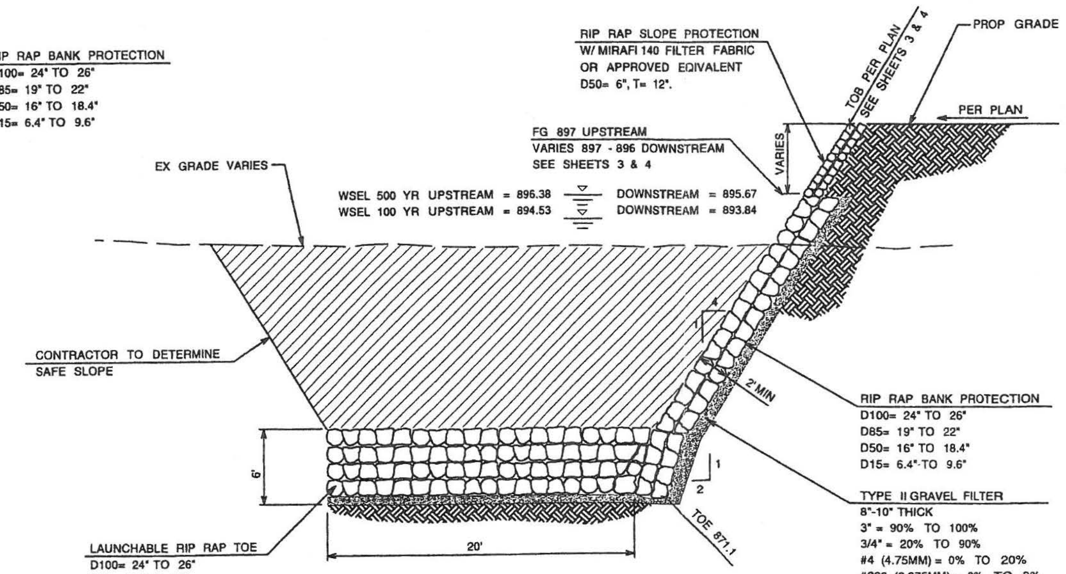
(B) ABUTMENT EMBANKMENT PROTECTION
CHANNEL UNDER BRIDGE N.T.S.



(C) UPPER EMBANKMENT PROTECTION
N.T.S.



(D) STORM DRAIN OUTLET MODIFICATION
N.T.S.



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PROTECTED DEPTH IS IN EXCESS OF MINIMUM REQUIREMENTS

(E) ABUTMENT EMBANKMENT PROTECTION
DOWNSTREAM GUIDE BANK NORTH AND SOUTH N.T.S.

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1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

CVL
4550 North 12th Stree
Phoenix, Arizona 8501
Telephone 602-264-68
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NO.	REVISION	DATE

Coe & Van Loo Consultants, Inc.
River Research & Design, Inc.

GRADING PLANS

KING RANCH PHASE 1
ABUTMENT EMBANKMENT

Registered Professional Engineer
38225
GARY E.
FREEMAN
ARIZONA, U.S.A.

SHEET
5 OF 5

CVL Contact: GARY E. FREEMAN
CVL Project #: 800001
CVL File #:

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CITY OF GOODYEAR GENERAL NOTES FOR GRADING AND DRAINAGE CONSTRUCTION

A. AN ON-SITE GRADING PERMIT IS REQUIRED.

B. A SEPARATE PERMIT IS NECESSARY FOR ANY OFF-SITE CONSTRUCTION.

C. THE CITY SHALL BE NOTIFIED 24 HOURS BEFORE ANY ON-SITE CONSTRUCTION BEGINS (623-932-1637).

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NOTHING CONTAINED IN THE CONTRACT DOCUMENTS SHALL CREATE, NOR SHALL BE CONSTRUED TO CREATE, ANY CONTRACTUAL RELATIONSHIP BETWEEN THE ENGINEER AND THE CONTRACTOR OR ANY SUBCONTRACTOR.

THE ENGINEER WILL NOT BE RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES OR FOR SAFETY PRECAUTIONS OR PROGRAMS UTILIZED IN CONNECTION WITH THE WORK, AND HE WILL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S FAILURE TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

A THOROUGH ATTEMPT HAS BEEN MADE TO SHOW THE LOCATIONS OF ALL UNDERGROUND OBSTRUCTIONS AND UTILITY LINES IN THE WORK AREA, HOWEVER, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO OBSTRUCTIONS AND UTILITY LINES ENCOUNTERED DURING CONSTRUCTION AND SHALL DETERMINE THE EXACT LOCATION OF UTILITIES IN THE AREA.

THE ENGINEER WILL MAKE FIELD RECORD DRAWING MEASUREMENTS OF THE WORK UPON NOTIFICATION BY THE PAVING CONTRACTOR THAT THE WORK IS COMPLETE AND READY FOR RECORD DRAWING SURVEY.

ALL PARKWAY GRADING TO BE PER M.A.G. SPEC. 424 (4:1 MAX. SLOPE).

ALL CURB RETURN RADII SHALL BE 20.00' TO BACK OF CURB (UNLESS OTHERWISE NOTED).

ALL EARTHWORK CONSTRUCTION SHALL CONFORM TO THE LATEST MARICOPA ASSOCIATION OF GOVERNMENTS STANDARD DETAILS AND/OR SPECIFICATIONS INCLUDING ANY SUPPLEMENTS THERETO AND THE SOILS REPORT PREPARED BY:

GEC SA&B
PROJECT NO. 05-0669.R01 DATE 2-14-06

DATA FOR EARTHWORK CALCULATIONS IS PROVIDED IN THE SOILS REPORT AND (IF APPLICABLE) ANY SUPPLEMENTS THERETO.

OWNER/CONTRACTOR IS RESPONSIBLE FOR SURVEY VERIFICATION OF EXISTING HORIZONTAL AND VERTICAL CONDITIONS PRIOR TO START OF CONSTRUCTION. A DEVIATION IN EXISTING CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF COE & VAN LOO BEFORE CONSTRUCTION STARTS. COE & VAN LOO WILL NOT BE RESPONSIBLE FOR REMOVAL, REPLACEMENT, OR OTHER MODIFICATIONS THAT MAY BE REQUIRED AS A RESULT OF EXISTING CONDITIONS NOT PROPERLY VERIFIED AND CONFIRMED. SHOULD AN ERROR BE FOUND IN THE HORIZONTAL & VERTICAL CONDITIONS, COE & VAN LOO WILL BE NOTIFIED AND CONSTRUCTION WILL NOT PROCEED UNTIL REVISIONS/MODIFICATIONS HAVE BEEN PREPARED AND SUBMITTED BY COE & VAN LOO.

ALL CONDUITS (BOX CULVERT, REINFORCED CONCRETE PIPE, CAST-IN-PLACE PIPE, AND/OR CORRUGATED METAL PIPE) SHOWN ON THESE PLANS ARE DESIGNED FOR STANDARD HIGHWAY LOADINGS. THE STANDARD SATISFACTORY MINIMUM COVER REQUIRMENTS AS ESTABLISHED BY THE CONDUIT MANUFACTURER MAY NOT ALWAYS BE ADEQUATE DURING CONSTRUCTION. WHEN CONSTRUCTION EQUIPMENT , FREQUENTLY HEAVIER THAN TRAFFIC LOADS FOR WHICH THE CONDUIT , IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE CONDUIT. THE ADEQUACY OF THE COVER REQUIRMENTS FOR CONDUITSHALL BE ANALYZED AND CHECKED BY THE CONTRACTOR TO ADDRESS LOADING CONDITIONS IMPOSED BY THE CONSTRUCTION ACTIVITY. ANY CONDIUT DAMAGE BY CONSTRUCTION ACTIVITY SHALL BE REPLACED AT THE CONTRACTORS EXPENSE.

APPROVAL OF THESE PLANS SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERROR IN THE PLANS WHERE SUCH ERRORS ARE SUBSEQUENTLY FOUND TO BE IN VIOLATION OF ANY LAW, ORDINANCE, OR OTHER HEALTH/SAFTEY ISSUE.

"THIS PLAN IS APPROVED SUBJECT TO COMPLETION OF THOSE LINES LABELED "EXISTING" WHICH HAVE BEEN PROPOSED AS A PART OF ANOTHER DEVELOPMENT. THE DEVELOPER OF THIS PROJECT MAY BE REQUIRED TO CONSTRUCT THOSE LINES PER CITY REQUIREMENTS PRIOR TO RECEIVING SERVICE FOR THIS PROJECT."

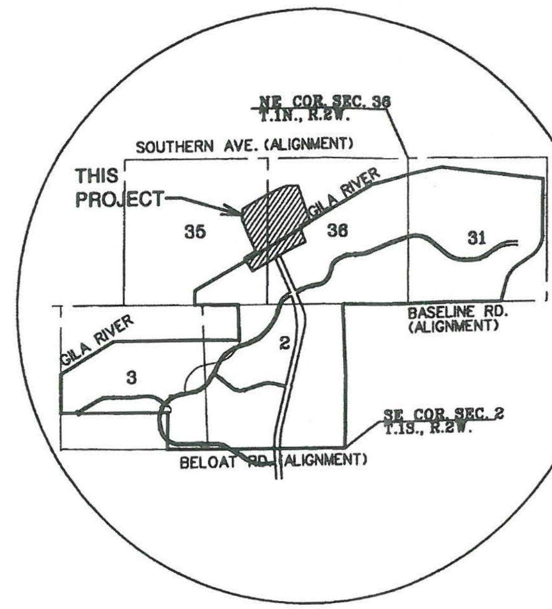
LEGEND

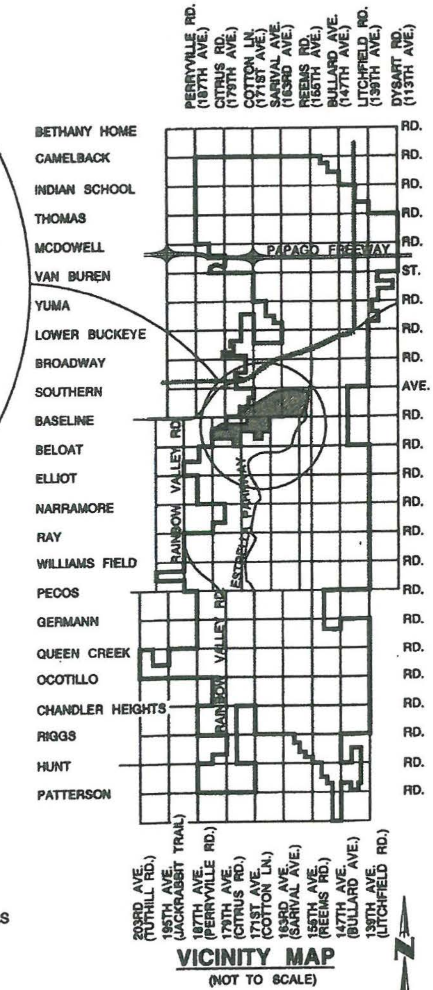
FG	FINISH GRADE
TB	TOP OF BERM
WSEL	WATER SURFACE ELEVATION
▶—	SLOPE
——▶	DIRECTION OF FLOW
13.50 X	SPOT ELEVATION
FG=13.50	FINISHED GRADE
●	SURVEY MONUMENT
R/W	RIGHT OF WAY
ESMT	EASEMENT
PUE	PUBLIC UTILITY EASEMENT
LF	LINEAL FOOT
· —— ——	CUT & FILL LINE
——— — —	PARCEL BOUNDRAY
———	PLAN SHEET / MATCH LINE
(18)	PLAN SHEET NOS.
EOE	EMERGENCY OUTFALL EXIT
WHA	WATER HARVESTING AREA

GRADING PLANS
FOR

"KING RANCH PHASE 1"
GILA RIVER EARTHWORK AREA

A PORTION OF SECTIONS 36,TOWNSHIP 1 NORTH, RANGE 2 WEST, GILA AND SALT RIVER MERIDIAN, MARICOPA COUNTY, GOODYEAR, ARIZONA





VICINITY MAP
(NOT TO SCALE)

ENGINEER
COE & VAN LOO CONSULTANTS
4550 N. 12TH ST.
PHOENIX, ARIZONA 85014
PH.: (602) 264-6831
CONTACT: GARY E. FREEMAN

DEVELOPER:
EP - THE KING, L.L.C.
AN ARIZONA LIMITED LIABILITY COMPANY
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

OWNER:
DIAMOND CREEK DEVELOPMENT
3040 N. 44TH STREET, SUITE 4
PHOENIX, AZ 85018
PH.: (602) 385-1544
FAX: (602) 385-1524
CONTACT: DAVID E. CORNWELL

BENCHMARK
STAINLESS STEEL ROD AT STATION 258+59.78, OFFSET 125.40' RT OF COTTON LANE ALIGNMENT ELEVATION 909.95 NGS3D E520 1992

BASIS OF BEARING
THE BASIS OF BEARING FOR THIS PROJECT IS N89°33'36"W BETWEEN THE NORTH QUARTER CORNER OF SECTION 2, TOWNSHIP 1 SOUTH, RANGE 2 WEST AND THE SOUTH QUARTER CORNER OF SECTION 36, TOWNSHIP 1 NORTH, RANGE 2 WEST ACCORDING TO BOOK 643 OF MAPS, PAGE 5, MARICOPA COUNTY RECORDS.

☐ FURNISH AS SUBMITTED
☑ FURNISH AS NOTED
☐ REVISE AND RESUBMIT
2005P042
BY DATE 12/18/07

CITY OF GOODYEAR GENERAL NOTES FOR CONSTRUCTION

A. ALL CONSTRUCTION SHALL CONFORM WITH THE LATEST MAG STANDARD DETAILS AND SPECIFICATIONS AND THE CITY'S SUPPLEMENTAL DETAILS AND SPECIFICATIONS.

B. THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF CONSTRUCTION PERMITS. HOWEVER, SUCH REVIEW SHALL NOT PREVENT THE CITY FROM REQUIRING CORRECTION OF ERRORS IN PLANS FOUND TO BE IN VIOLATION OF ANY LAW OR ORDINANCE.

C. THE CITY DOES NOT WARRANT ANY QUANTITIES SHOWN ON THESE PLANS.

D. THE CITY APPROVAL IS FOR GENERAL LAYOUT IN THE RIGHT-OF-WAY ONLY. THIS APPROVAL IS VALID FOR A PERIOD OF ONE YEAR. CONSTRUCTION PERMITS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE OBTAINED DURING THIS PERIOD OR THE PLANS SHALL BE RESUBMITTED FOR REVIEW AND APPROVAL.

E. AN APPROVED SET OF PLANS SHALL BE AVAILABLE ON THE JOB SITE AT ALL TIMES.

F. THE CITY SHALL BE NOTIFIED 24 HOURS PRIOR TO ANY CONSTRUCTION WORK AND INSPECTIONS (623-932-1637). CONSTRUCTION WORK CONCEALED WITHOUT INSPECTION BY THE CITY SHALL BE SUBJECT TO EXPOSURE AT THE CONTRACTOR'S EXPENSE.

G. RIGHT-OF-WAY IMPROVEMENTS SHALL NOT BE ACCEPTED UNTIL "AS-BUILT" PLANS HAVE BEEN SUBMITTED AND APPROVED BY THE CITY (SEE AS-BUILT REQUIREMENTS).

H. THE DEVELOPER IS RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL OBSTRUCTIONS WITHIN THE RIGHT-OF-WAY PRIOR TO STARTING NEW CONSTRUCTION.

I. THE DEVELOPER IS RESPONSIBLE FOR ARRANGING THE RELOCATION AND ASSOCIATED COSTS OF ALL UTILITIES. A UTILITY RELOCATION SCHEDULE SHALL BE SUBMITTED PRIOR TO THE ISSUANCE OF PERMITS.

J. THE DEVELOPER IS RESPONSIBLE FOR OBTAINING OR DEDICATING ALL REQUIRED RIGHTS-OF-WAY AND EASEMENTS TO THE CITY PRIOR TO ISSUANCE OF PERMITS.

K. THE CONTRACTOR SHALL CONTACT BLUE STAKE (602-263-1100) 48 HOURS PRIOR TO CONSTRUCTION.

L. THE CONTRACTOR SHALL BARRICADE CONSTRUCTION SITES AT ALL TIMES PER THE CITY OF PHOENIX TRAFFIC BARRICADE MANUAL. WHEN REQUIRED BY THE CITY, A TRAFFIC CONTROL PLAN SHALL BE SUBMITTED FOR APPROVAL IN ADVANCE OF CONSTRUCTION.

M. THE CONTRACTOR MAY REQUEST A FIRE HYDRANT METER FOR CONSTRUCTION WATER FROM THE FINANCE DEPARTMENT. THIS METER SHOULD BE ORDERED TWO WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. THE UNLAWFUL REMOVAL OF WATER FROM A FIRE HYDRANT IS A VIOLATION OF THE MUNICIPAL CODE, PUNISHABLE BY FINE AND/OR IMPRISONMENT.

NOTE:
AT THIS TIME, POTABLE WATER WILL NOT BE AVAILABLE FOR CONSTRUCTION PURPOSES.

N. PRIVATE ON-SITE WATER AND SEWER LINES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE UNIFORM PLUMBING CODE, N.F.P.A., AND THE UNIFORM FIRE CODE AS ADOPTED BY THE CITY.

SHEET INDEX

UTILITIES:

SEWER:	CITY OF GOODYEAR
WATER:	CITY OF GOODYEAR
FIRE:	CITY OF GOODYEAR
ELECTRIC:	A.P.S.
TELEPHONE:	QWEST
CATV:	COX CABLE

ESTIMATED EARTHWORK QUANTITIES

EXCAVATION............309,850 C.Y. (RAW)

SEE SOILS REPORT FOR SHRINK FACTORS, PRE-COMPACTION AND OVER-EXCAVATION REQUIREMENTS.

CITY OF GOODYEAR			
REVIEW AND RECOMMENDED APPROVAL BY:			
FIRE DEPT.		GRADING & DRAINAGE	
LANDSCAPE & PLANNING		WATER & SEWER	
TRAFFIC		PAVING	
APPROVED BY:			
PLANS EXAMINER		DATE	

SUBMITTED:
"I HEREBY CERTIFY THAT THIS DESIGN IS BASED ON ACCURATE FIELD DATA WHICH HAS BEEN CHECKED IN THE FIELD PRIOR TO SUBMISSION FOR CITY APPROVAL."

BY: ______ 10/17/07
REGISTERED CIVIL ENGINEER DATE

AS-BUILT CERTIFICATION
I HEREBY CERTIFY THAT THE "AS - BUILT" INFORMATION AS SHOWN HEREON WAS OBTAINED UNDER MY DIRECT SUPERVISION AND IS CORRECT AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: ______
REGISTERED LAND SURVEYOR (SEAL)

______ ______
REGISTRATION NUMBER DATE

REVIEWED BY: ______
FIELD ENGINEERING

FLOOD CONTROL DISTICT OF MARICOPA COUNTY	
APPOVED BY:	
PROJECT MANAGER	DATE

TOPOGRAPHY OVERPLOTTED BY
RIVER RESEARCH AND DESIGN, INC 3/18/2010
AS-BUILT TOPOGRAPHY PROVIDED BY
TRISTAR AND CONSULTANT ENGINEERING
Gary E. Freeman, PhD, PE

CALL FOR THE BLUE STAKES
602-263-1100
1-800-STAKE-IT
(OUTSIDE MARICOPA COUNTY)

CVL
Coe & Van Loo Consultants, Inc.
4550 North 12th Street
Phoenix, Arizona 85014
Telephone 602-264-6831
http://www.cvlci.com

NO.	REVISION	DATE

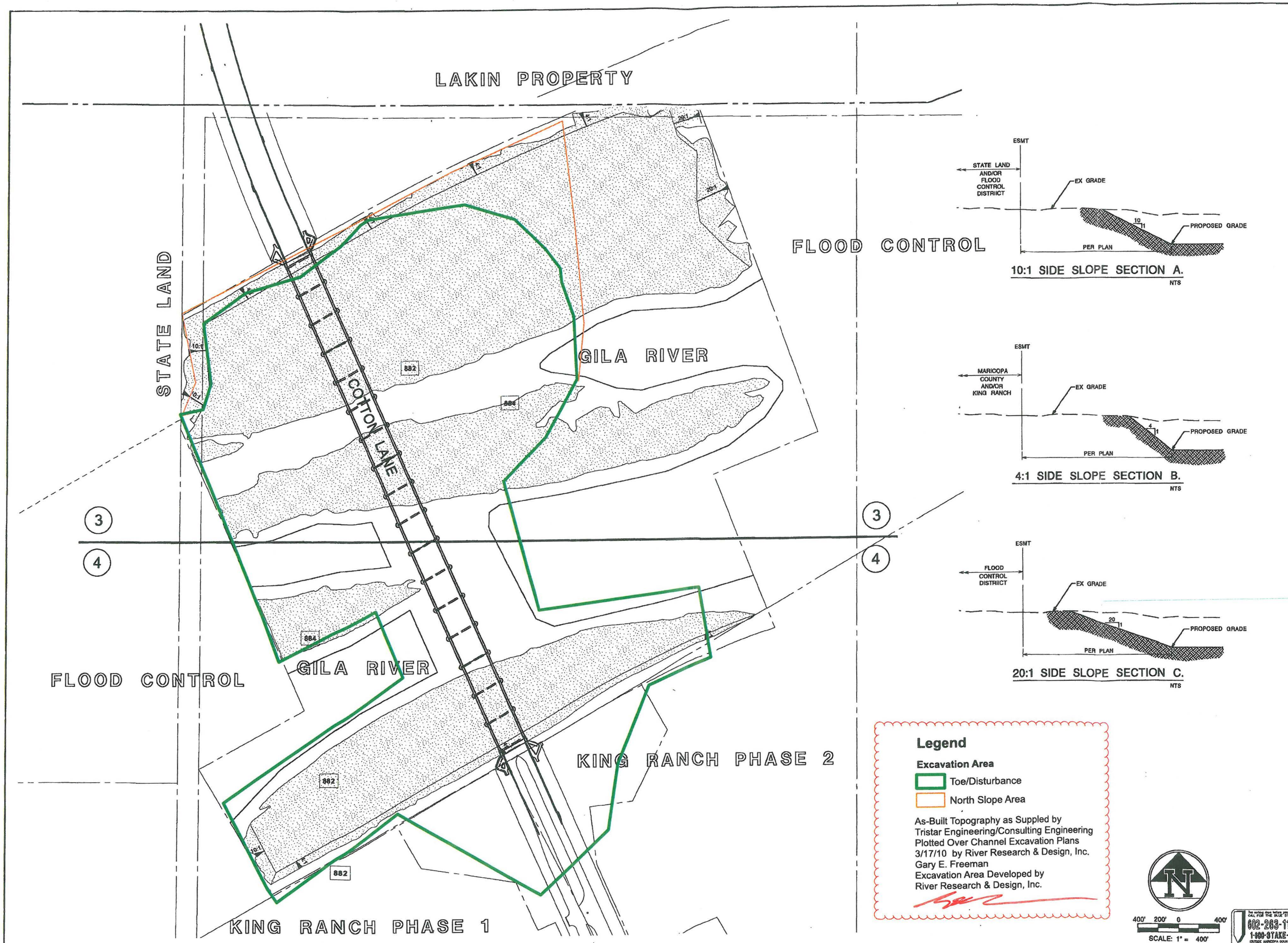
GRADING PLANS
KING RANCH PHASE 1
GILA RIVER EARTHWORK AREA

36225
GARY E.
FREEMAN

SHEET
1 OF 4
CVL Contact: Brian Hensley
CVL Project #: 800001
CVL File #:

HTE: 07-0729

2675 P07k



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Coe & Van Loo Consultants, Inc.

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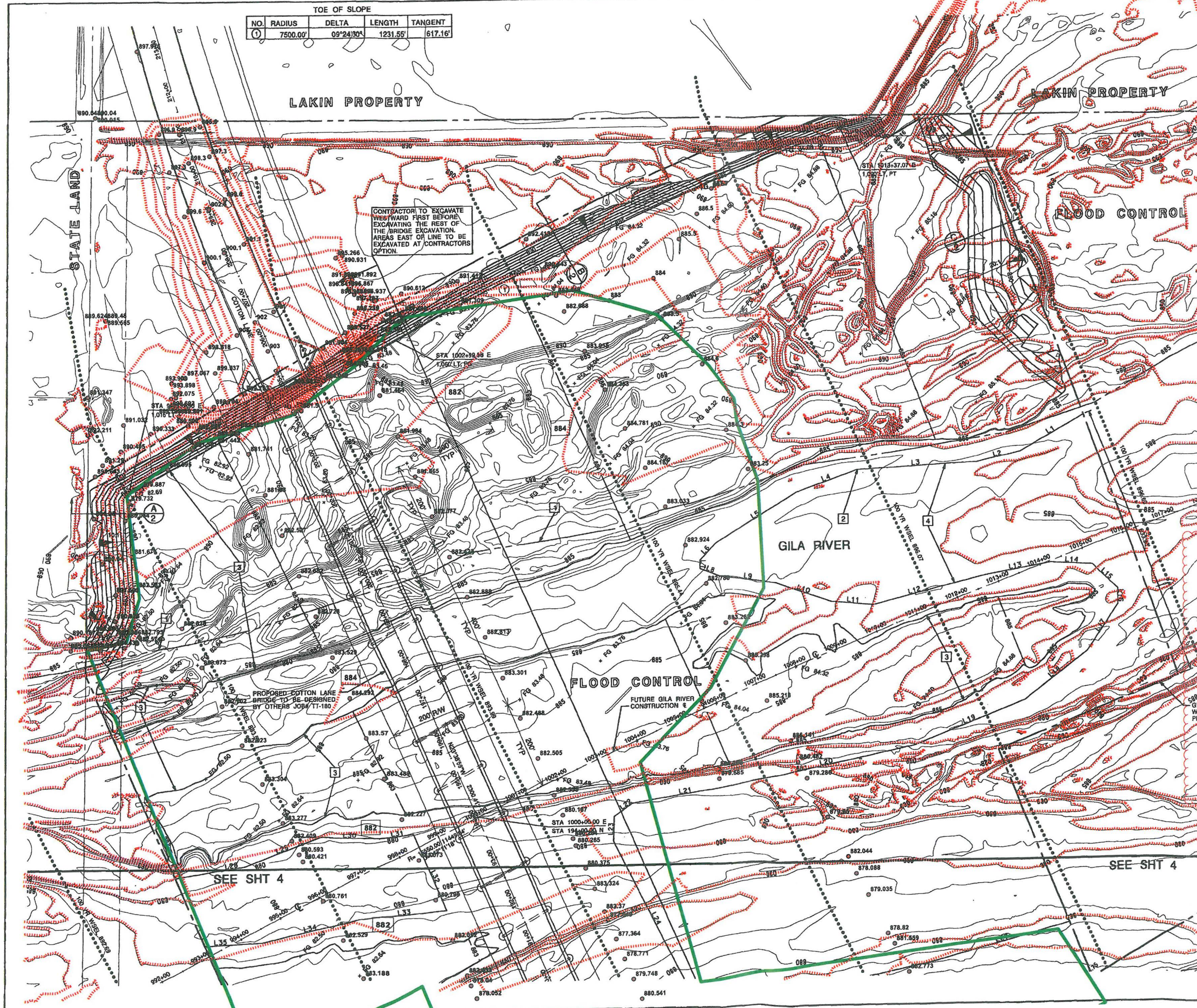
GRADING PLANS

KING RANCH PHASE 1
GILA RIVER EARTHWORK AREA

SHEET 2 OF 4

CVL Contact: Brian Hensley
CVL Project #: 800001
CVL File #:

HTE: 07-0729



TOE OF SLOPE

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	7500.00'	09°24'30"	1231.55'	617.16'

GRADING CONSTRUCTION NOTES

1. EXISTING JURISDICTIONAL WATER BOUNDARY OF THE U.S..
2. CONSTRUCTION ZONE BOUNDARY (NO ACCESS ALLOWED BEYOND THIS AREA).
3. EXCAVATION AREA.
4. EXISTING CHANNEL TO REMAIN UNDISTURBED.

NOTE 4 ANNOTATION TABLE

No.	DIRECTION	DISTANCE
L1	S 59°56'16" W	164.23
L2	S 77°07'55" W	101.21
L3	S 87°07'12" W	274.91
L4	S 70°10'43" W	141.82
L5	S 58°49'34" W	222.78
L6	S 44°10'37" W	51.08
L7	S 0°18'51" E	18.72
L8	S 69°23'25" E	47.03
L9	S 82°01'48" E	131.79
L10	S 70°23'40" E	131.67
L11	S 84°27'12" E	98.92
L12	N 75°54'56" E	271.28
L13	N 80°14'35" E	142.00
L14	S 86°30'48" E	92.97
L15	S 46°39'08" E	80.98
L16	S 0°19'04" E	36.32
L17	S 33°52'30" W	126.84
L18	S 52°09'57" W	176.46
L19	S 68°34'24" W	268.65
L20	S 78°17'02" W	414.91
L21	S 80°52'00" W	247.12
L22	S 54°35'20" W	60.53
L23	S 1°37'48" W	67.30
L24	S 26°54'38" E	401.88
L25	S 67°11'02" E	77.54
L26	N 77°43'07" E	495.64
L27	N 74°24'47" E	312.42
L28	N 80°40'05" E	160.94
L29	N 69°16'25" E	181.94
L30	S 88°20'55" E	133.91
L31	N 82°22'38" E	74.17
L32	S 23°39'06" E	189.87
L33	S 84°27'29" W	195.79
L34	S 76°51'47" W	227.44
L35	S 87°19'07" W	128.83
L36	N 65°09'56" E	259.47
L37	N 59°51'56" E	272.33
L38	S 23°38'57" E	265.20
L39	S 62°36'55" W	347.67
L40	S 53°34'05" W	369.55
L41	S 43°22'53" W	282.75

Legend

- As-Built Topo Contours
- Excavation Toe
- As-Built Topo Points

As-Built Topography as Supplied by Tristar Engineering/Consulting Engineering Plotted Over Channel Excavation Plans 3/17/10 by River Research & Design, Inc. Gary E. Freeman

SCALE: 1" = 100'

602-263-1100
1-800-STAKE-IT

GRADING PLANS

KING RANCH PHASE 1
GILA RIVER EARTHWORK AREA

NO. | REVISION | DATE

CVL
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http://www.cvlci.com

38225
GARY E.
FREEMAN

SHEET 3 OF 4

CVL Contact: Brian Hensley
CVL Project #: 800001
CVL File #:

HTE: 07-0729

TOE OF SLOPE

NO.	RADIUS	DELTA	LENGTH	TANGENT
1	4101.79'	12°57'06"	927.25'	421.01'

GRADING CONSTRUCTION NOTES

1. EXISTING JURISDICTIONAL WATER BOUNDARY OF THE U.S..
2. CONSTRUCTION ZONE BOUNDARY (NO ACCESS ALLOWED BEYOND THIS AREA).
3. EXCAVATION AREA.
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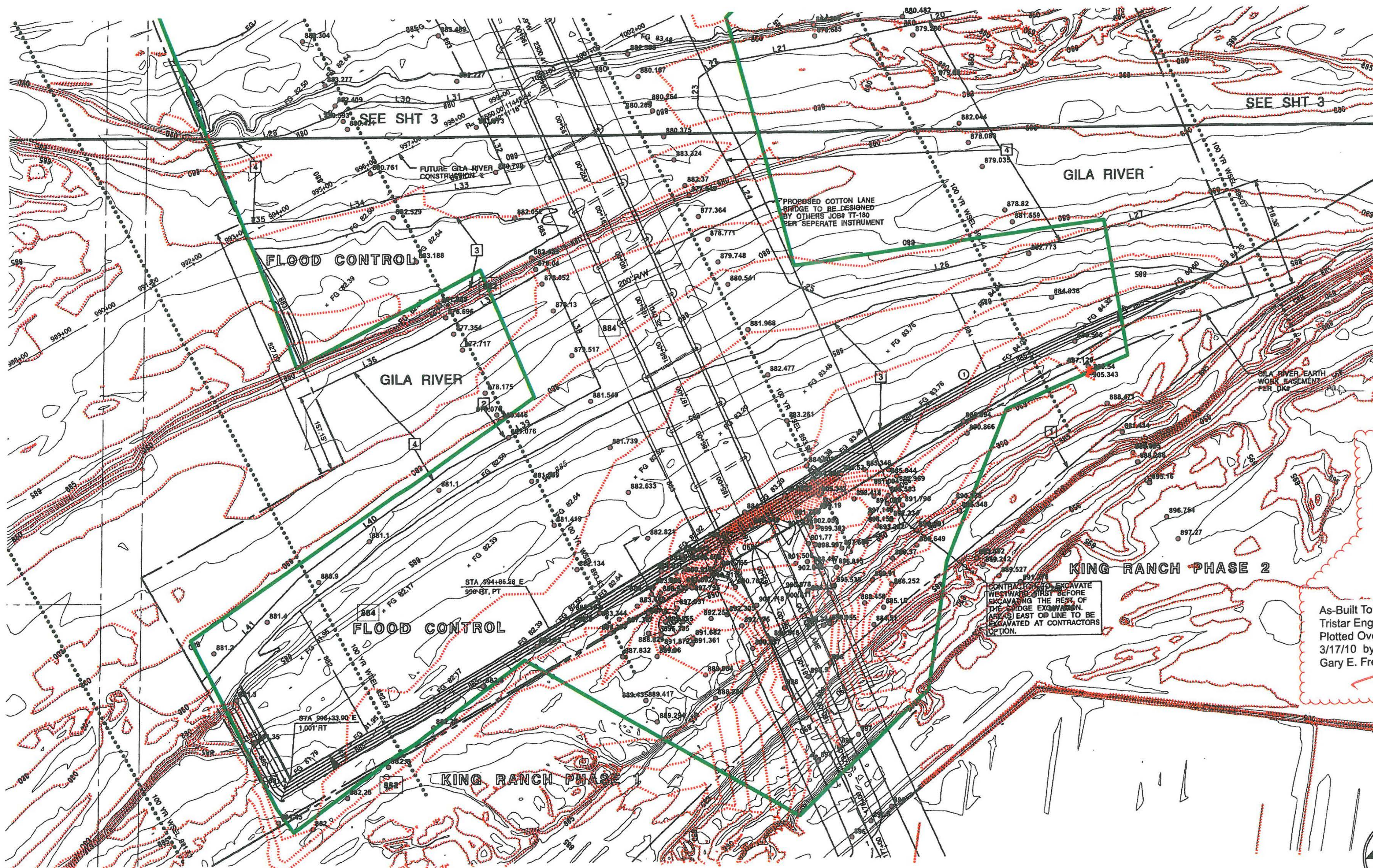

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Legend

- AsBuilttopoLines-Sht4
- Excavation Toe
- As-Built Topo Points

As-Built Topography as Suppled by Tristar Engineering/Consulting Engineering Plotted Over Channel Excavation Plans 3/17/10 by River Research & Design, Inc.
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GRADING PLANS

KING RANCH PHASE 1
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38225
GARY E. FREEMAN

SHEET 4 OF 4

CVL Contact: Brian Hensley
CVL Project #: 800001
CVL File #: