

ENCINAS CREEK LOCATION HYDRAULIC STUDY

SECTION 12 Encinas Creek Supplement

Interstate 5 North Coast Corridor Project

SAN DIEGO COUNTY, CALIFORNIA
DISTRICT 11-SD-5 (PM R28.4/R55.4)
EA 235800 (P ID 11-000-0159)

APRIL 2009

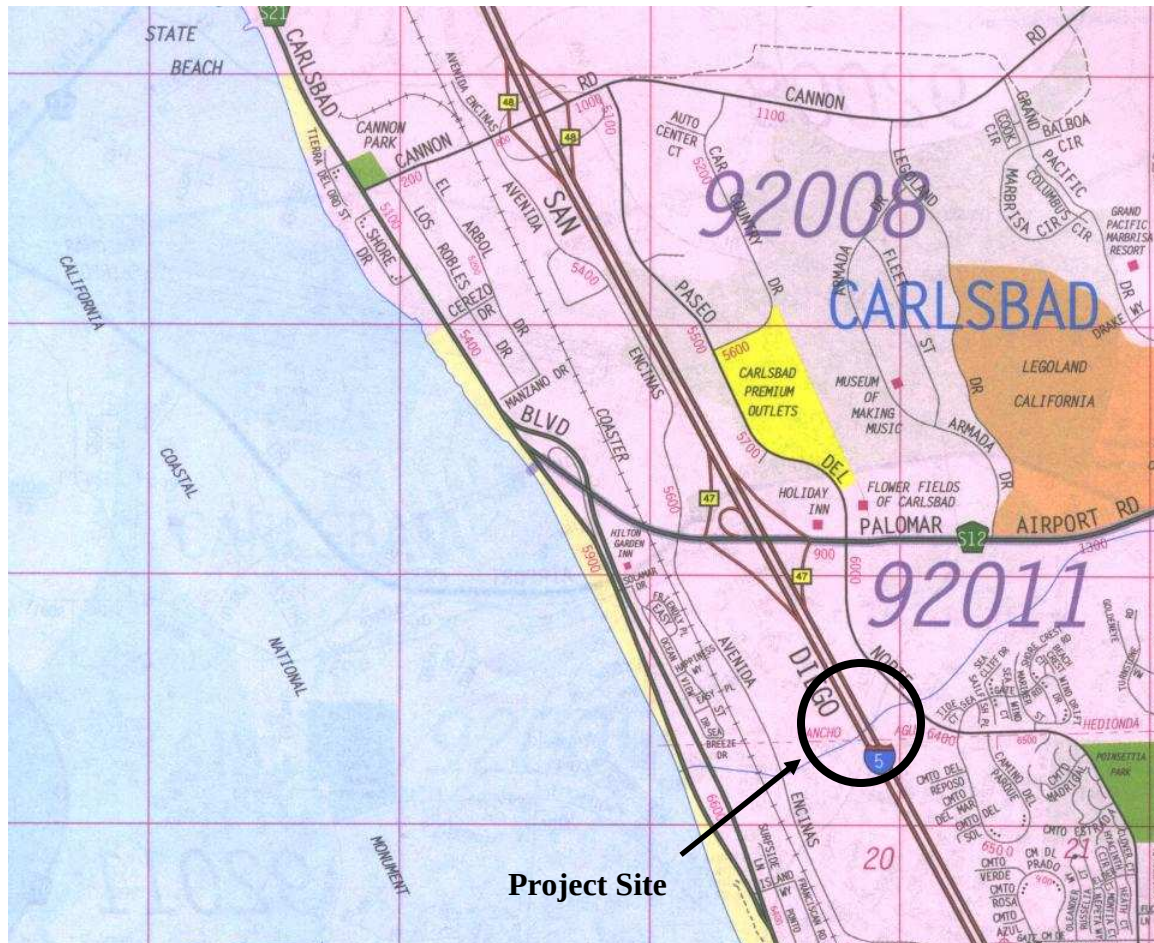
SECTION 12

Encinas Creek Supplement



Encinas Creek

1.0 – Project Purpose and Vicinity Map



A triple 10' x 5' reinforced concrete box culvert (RCB) comprises the I-5 crossing Encinas Creek and is located in the Encinas Canyon in the City of Carlsbad, just south of the Palomar Airport Road. (Thomas Guide page 1126 : H4) The size the RCB warrants the crossing to be classified as a “bridge” structure.

The study was prepared by the California Department of Transportation for the purpose of determining the impacts to the Encinas Creek base (100-year) flood from the proposed improvements to the Interstate 5 (I-5) freeway.

This study specifically addresses the following:

1. The Encinas Creek 100-year floodplain as it presently exists.
2. The Encinas Creek 100-year floodplain after the I-5 bridge widening.
3. Perform a risk assessment associated with any possible floodplain encroachment.

This project requires the existing I-5 RCB's (Bridge No. 57-687) to be extending to accommodate the additional lanes.

Description of Watershed

Encinas Creek (Hydraulic Unit 904.4) is located within the Carlsbad Watershed and covers an area of 2650 acres (approximately 4 sq. miles). The elevation within the basin ranges from sea level to 430 feet. The creek does not have any tributaries and it is the only drainage basin within the Carlsbad Watershed that does not drain into a Lagoon. The headwater of Encinas creek begins behind an industrial park. From there the creek parallels Palomar Airport Road to the south for approximately 3 miles. Then after crossing Paseo Del Norte and Interstate 5, the creek enters a concrete lined channel to a natural basin next to the NCTD rail line before entering the Pacific Ocean.



The majority of the Encinas creek drainage basin has been urbanized. The eastern portion of the basin has been developed with an industrial and office park. Other land uses within the basin include residences and open space.

The types of soil that are found within the basin include Group A, B, and D. There are trace amounts of Group C soils however the majority of soils are composed of Group A and D.

To the east of the project site, Encinas Creek is covered through three 10' X 4' RCB's on Paseo Del Norte with future plans to add an additional 10' X 5' RCB to allow for increased capacity for the crossing. Where Encinas Creek intersects Interstate 5, it travels through three 10' X 5' RCB's before discharging into a concrete lined channel west of I-5.

1.2 – Floodplain Modeling Methodology

The area of analysis ranges from approximately 364 feet upstream to 144 feet downstream of the existing I-5 triple box culvert. In this region, 1,750 cfs flows upstream of Paseo del Norte and increases to 1,880 cfs just before the I-5 box culverts. And after crossing under I-5, the flow increased to 1910 cfs. During the 100-year storm event the main channel of the creek would flow along the natural flow path and through the box culverts with velocities in the area ranging from 1.7 ft/s to 12.8 ft/s. The structures adjacent to the creek will not be flooded since they are located outside the 100 year floodplain boundary.

1.3 – HEC RAS input

1.3.1 Cross Sectional Geometry

Encinas Creek has not been mapped by FEMA and the base flood elevations have to be determine. For this study, HEC-RAS v.3.1.3 was used to analyze the floodplain, using the Standard Step Method under sub-critical flow conditions.

The main channel is relatively straight with varying widths. Expansion / contraction coefficients of 0.1 and 0.3 were utilized throughout the model to represent energy losses due to gradual transitions in the geometry of the creek channel.

ArcGIS 9.2 was use to referenced the contours from an existing topography file from Microstation. The measurements where in Metric and scaled accordingly to create a complete topographic map of the creek.

1.3.1.1 Bridges / Culverts

There is no existing bridge structure in the area. The triple box is classified as a bridge due to its size. The existing roadway is well above the floodplain and a fill slope for the proposed widening will have some effect the floodplain.

The proposed widening will have a 0.3 acre impact on the 100 year floodplain.

1.3.1.2 Ineffective Flow Areas

No ineffective flow areas where considered for this study.

1.3.1.3 Flood Insurance Study Cross Sections

A detailed hydraulic analysis has been performed for this area, and a 100-year base floodplain boundary has been determined. As mention before there is no existing FEMA map available for this creek.

1.3.1.4 Existing Floodplain Conditions

The Encinas Creek has not be mapped by FEMA. There have been studies done for the creek. The report titled Hydrologic / Hydraulic Analysis for the Encinas Creek Channel Between Paseo Del Norte and Interstate Hwy 5 (December 1989) for Tazon Development, INC. by Cooper Engineering and Associates located on the city of Carlsbad's Document Management website was used as a basis for the "existing" floodplain boundary determination. The discharges listed above are taken from this study. These flow magnitude compare favorable with the recent city of Carlsbad's Drainage masterplan study for the "unconstrained" 100-year flood values.

1.3.2 Manning's Roughness Coefficient:

Each cross section contains a left overbank, main channel, and right overbank, which represent the different regions of the waterway in terms of roughness coefficients. The main channel of the creek is made up of a heavily vegetated natural channel, box culverts, and a concrete channel downstream of I-5. The left and right sides of the creek are vegetated slopes with development above and outside the floodplain. The main channel upstream of the RBC was modeled as a natural channel with a Manning's coefficient of 0.030 and a concrete channel downstream of the RCB with a Manning's coefficient of 0.013.

1.3.3 Starting Water Surface Elevation

The Encinas Creek study was model as subcritical flow regime with a downstream starting water surface elevation of 25.6 feet.

1.3.4 Discharge

For the purposes of the floodplain analysis, the discharge value from the Tazon Development, INC. study (1,880 cfs) was used as the peak 100-year storm discharge at the upstream boundary condition.

1.4 – HEC RAS output

The water surface elevations, which are displayed in the appendices and output of this study are based on flooding that would occur during a 100-year storm. As shown in Table A, no significant changes to the existing 100-year floodplain would occur from the proposed I-5 widening.

Table A: Floodplain Comparison

<i>River Station</i>	<i>Q Total</i>	<i>Existing W.S. Elev.</i>	<i>Proposed W.S. Elev.</i>	<i>Changes in Elevation</i>	<i>Existing Top Width</i>	<i>Proposed Top Width</i>	<i>Change in Width</i>
		<i>(ft3/s)</i>	<i>(ft)</i>	<i>(ft)</i>	<i>(ft)</i>	<i>(ft)</i>	<i>(ft)</i>
2752	1880	32.14	32.14	0	147.23	147.23	0
2709	1880	31.64	31.64	0	174.67	174.67	0
2657	1880	31.59	31.67	0.06	168.40	169.92	1.52

2611	1880	31.65	31.76	0.11	162.53	163.56	1.03
2546	1880	31.60	31.71	0.11	148.43	149.14	0.71
2486	1880	31.49	31.63	0.14	126.73	127.37	0.64
2440	1880	31.53	31.66	0.11	153.10	154.69	1.59
2422	1880	31.60	31.74	0.14	223.65	225.08	1.43
2421	1880	29.64	29.86	0.22	30.0	30.0	0
2420	Culvert						
2119	1910	26.48	26.48	0	30.0	30.0	0
2053	1910	25.50	25.50	0	30.0	30.0	0
2001	1910	23.85	23.85	0	30.0	30.0	0

1.4.1 Warning Messages

The energy equation could not be balanced within the specified number of iterations was displayed at cross section #11, #10, #3, and #2. The program selected the water surface that had the least amount of error between computed and assumed values.

Divided flow computed for this cross-section, was displayed at cross section #11. This is due to the cross sections creating island in the upstream portion of the study.

During the standard step iterations, when the assumed water, surface was set equal to critical depth, the calculated water surface came back below critical depth, was displayed at cross section #11, #10, #3, and #2.

The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections, was displayed at cross sections #10, #9, #5, and #4.

The velocity head has changed by more than 0.5 ft (0.15m). This may indicate the need for additional cross sections, was displayed at cross section #10 and #4.

During subcritical analysis, the water surface at the outlet was below critical depth and the culvert is steep. Therefore the inlet will be at critical depth, was displayed at cross section #3.1.

The energy loss was greater than 1.0 ft (0.3m), between the current and previous cross section. This may indicate the need for additional cross sections, was displayed at cross section #2.

1.5 – Risk Assessment

Encinas Creek has limited beneficial uses other than non-contact recreation and wildlife habitat / viewing. At the project site, the floodplain impact is less than a 1 acre.

1.6 – Summary and Conclusion

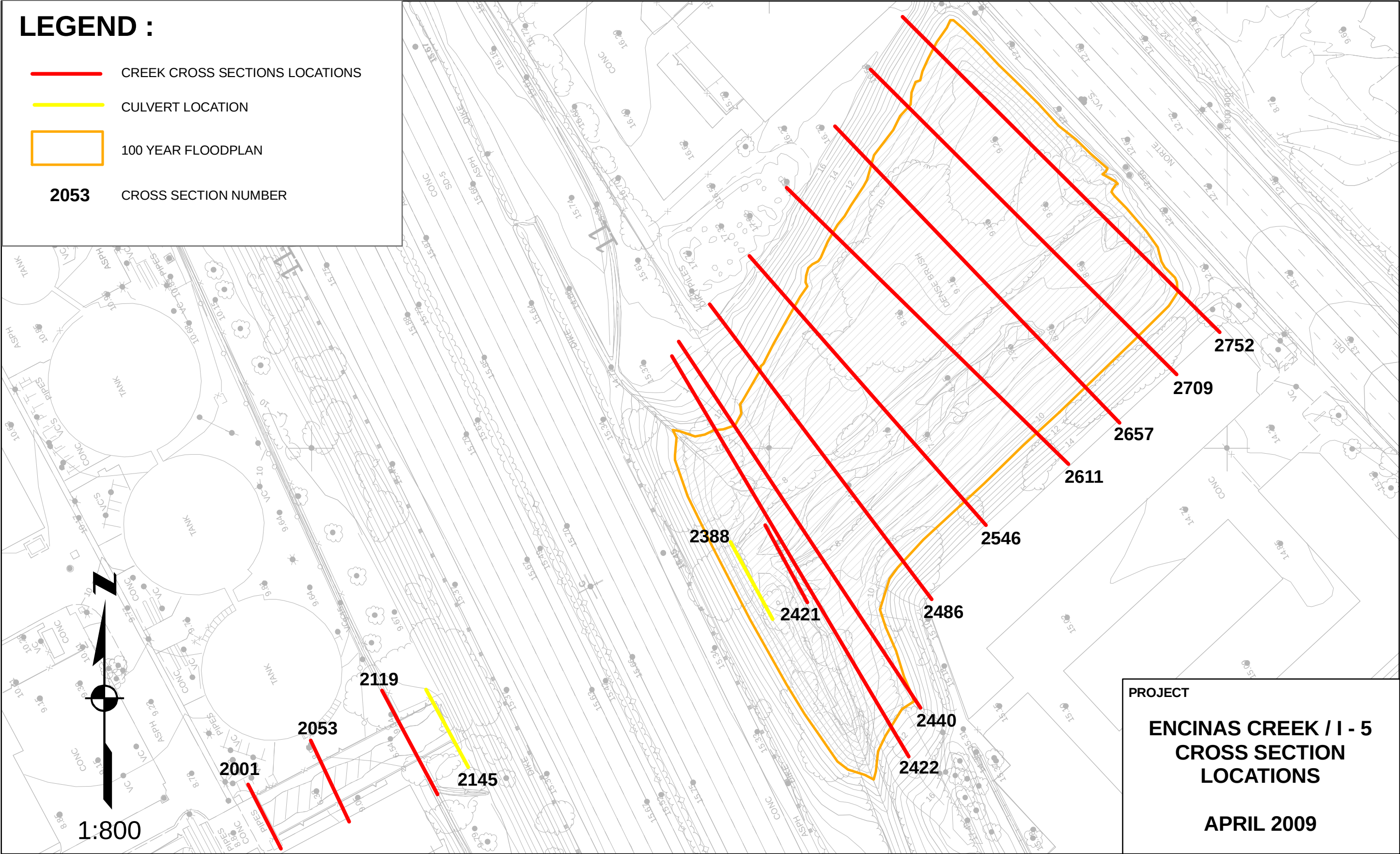
The proposed I-5 widening will have minimal impact on the Encinas Creek floodplain.

APPENDIX 'A'

Cross Section Locations Exhibits

LEGEND :

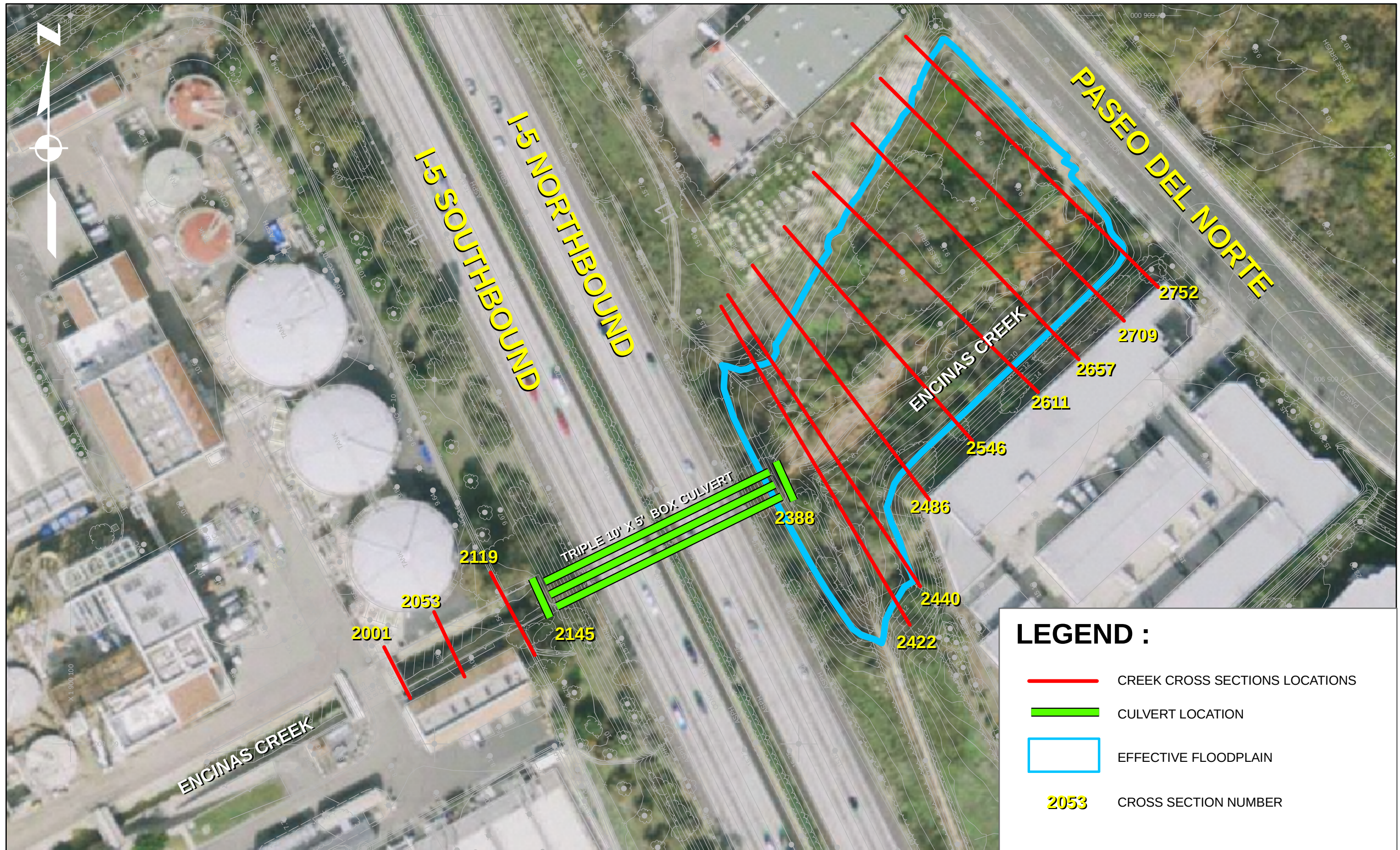
-  CREEK CROSS SECTIONS LOCATIONS
-  CULVERT LOCATION
-  100 YEAR FLOODPLAN
- 2053** CROSS SECTION NUMBER



PROJECT

**ENCINAS CREEK / I - 5
CROSS SECTION
LOCATIONS**

APRIL 2009



APPENDIX 'B'

Results Summary

HEC-RAS Cross Section Input/Output

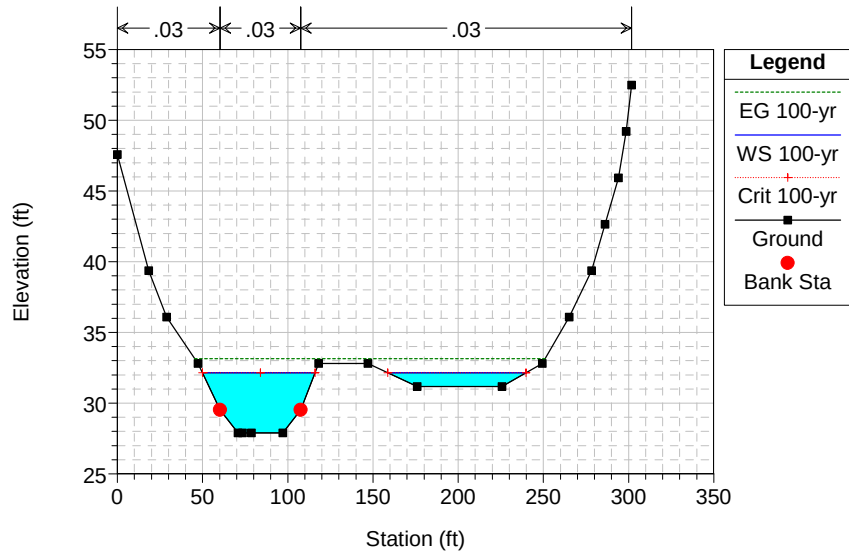
Existing
Proposed

Existing

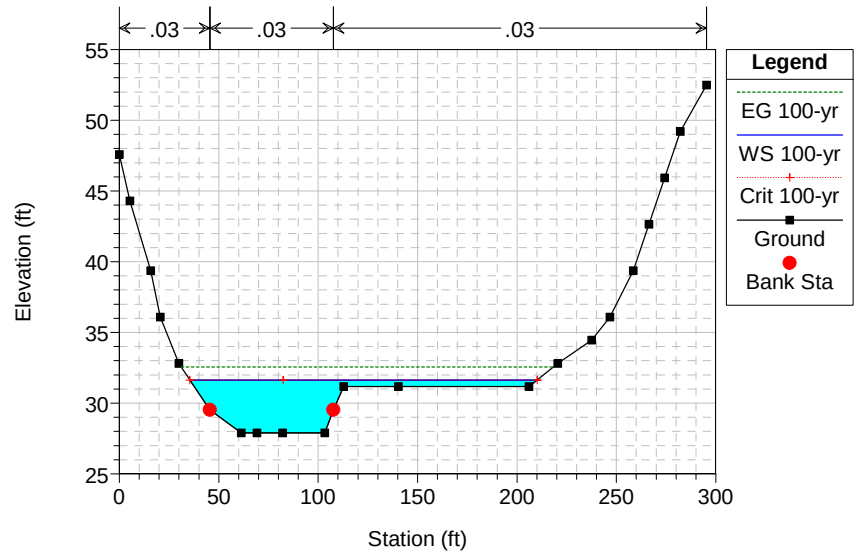
HEC-RAS Plan: Plan 02 River: Encinas Creek Reach: Existing Profile: 100-yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Existing	2752	100-yr	1880.00	27.89	32.14	32.14	33.15	0.004997	8.63	272.60	147.23	0.77
Existing	2709	100-yr	1880.00	27.89	31.64	31.64	32.56	0.004985	8.00	278.01	174.67	0.76
Existing	2657	100-yr	1880.00	24.61	31.66		31.95	0.001048	4.54	481.31	169.72	0.36
Existing	2611	100-yr	1880.00	24.61	31.71		31.87	0.000538	3.47	616.12	163.13	0.27
Existing	2546	100-yr	1880.00	24.61	31.67		31.84	0.000552	3.49	594.26	148.86	0.27
Existing	2486	100-yr	1880.00	24.28	31.56		31.80	0.000640	4.51	530.47	127.05	0.30
Existing	2440	100-yr	1880.00	24.28	31.60		31.74	0.000441	3.24	642.66	153.91	0.24
Existing	2422	100-yr	1880.00	23.95	31.67		31.71	0.000089	1.73	1213.51	224.35	0.11
Existing	2421	100-yr	1880.00	23.95	29.64	28.89	31.52	0.001866	11.01	170.77	30.00	0.81
Existing	2388	100-yr	1880.00	23.95	28.90	28.90	31.39	0.002835	12.66	148.44	30.00	1.00
Existing	2145		Culvert									
Existing	2119	100-yr	1910.00	21.49	26.49	26.49	29.01	0.002843	12.74	149.88	30.00	1.00
Existing	2053	100-yr	1910.00	20.51	25.50	25.50	28.02	0.002842	12.74	149.90	30.00	1.00
Existing	2001	100-yr	1910.00	18.87	23.86	23.86	26.38	0.002846	12.75	149.82	30.00	1.01

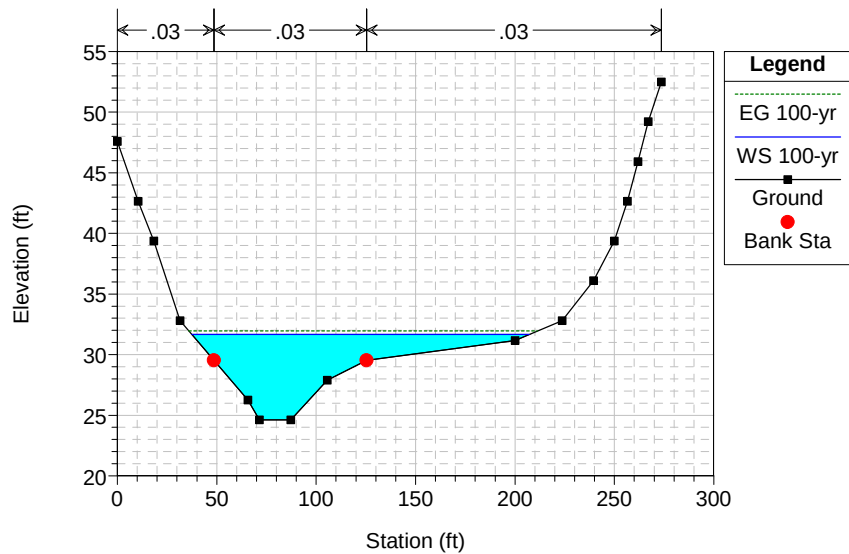
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



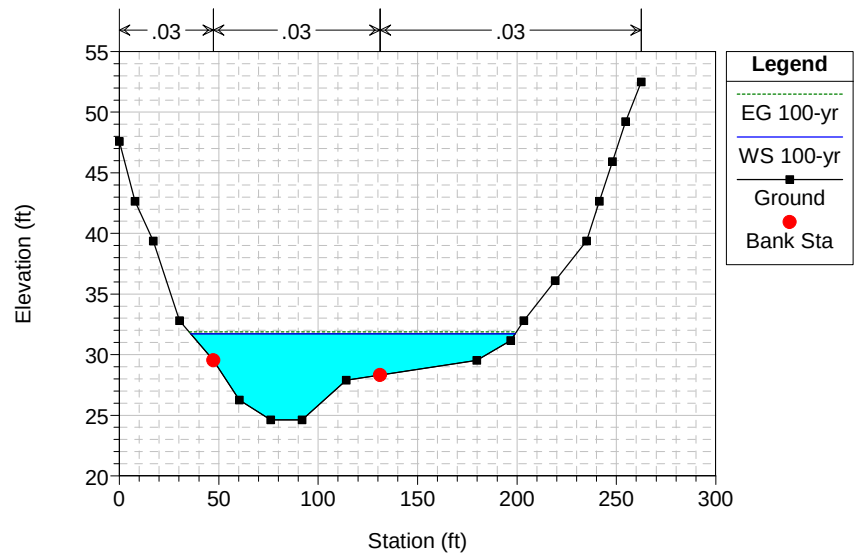
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



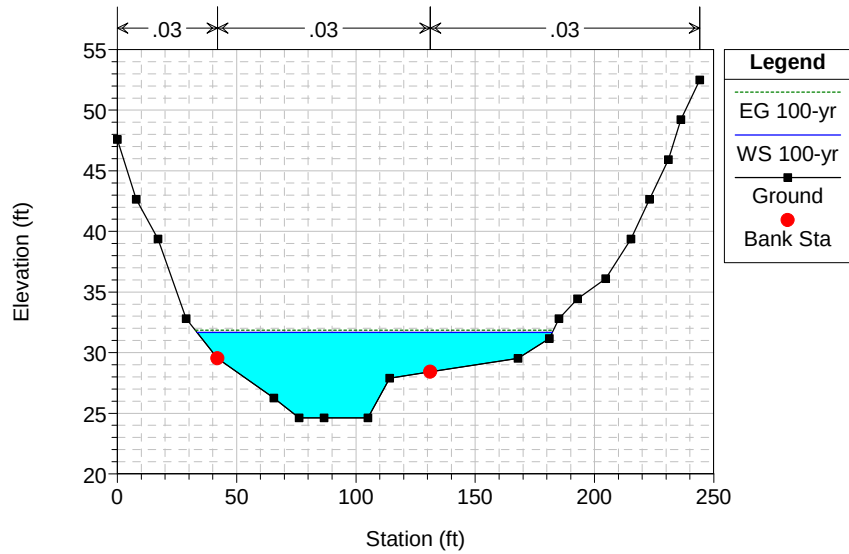
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



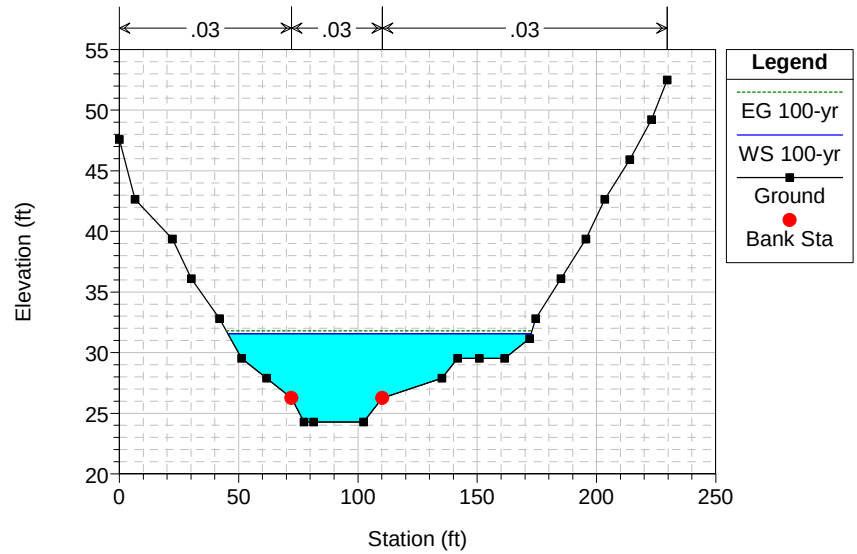
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



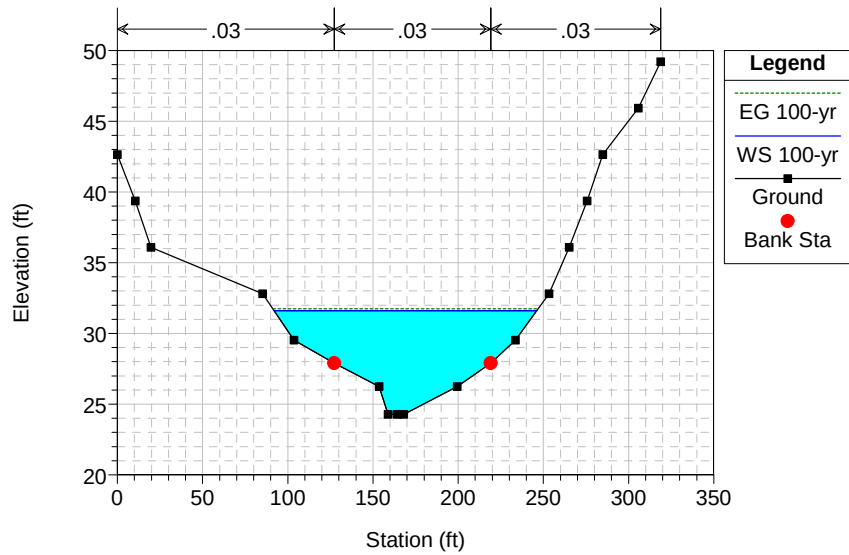
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



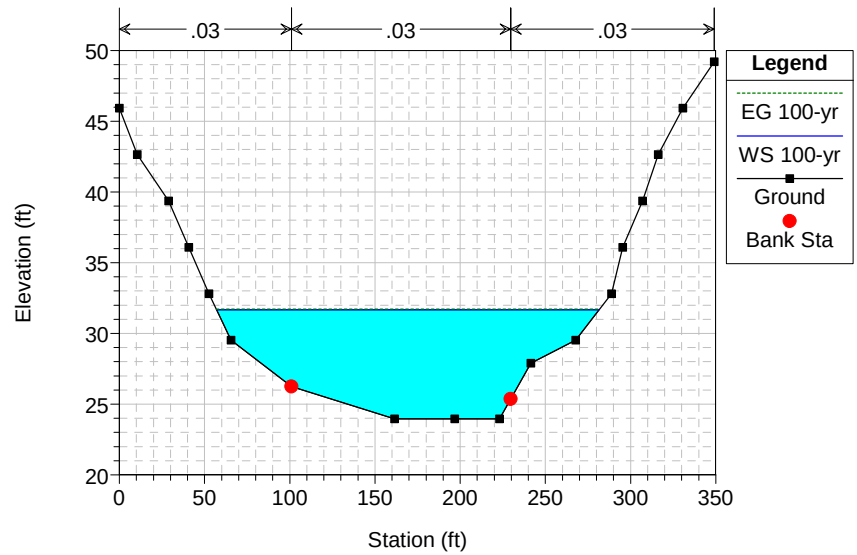
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



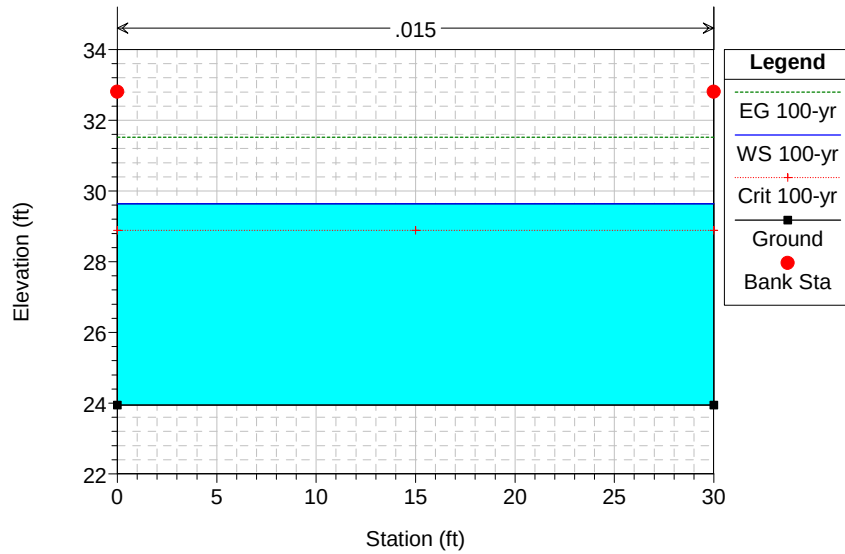
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



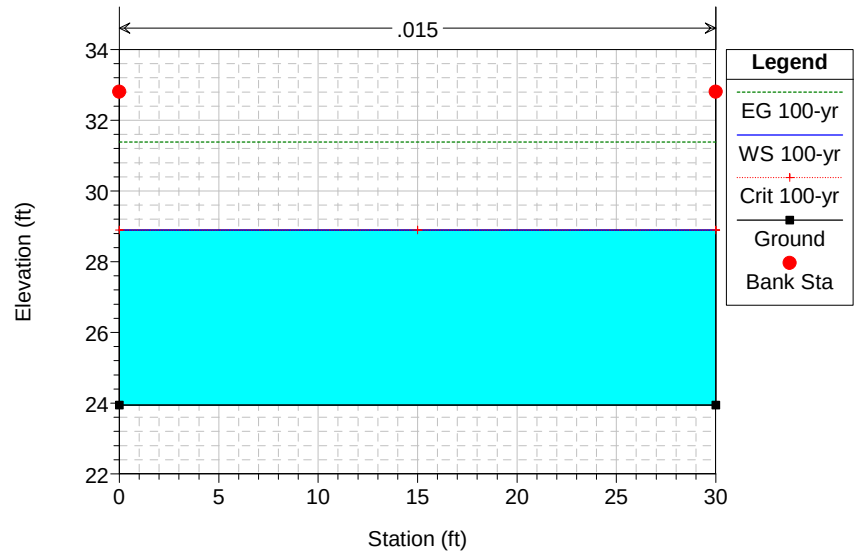
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



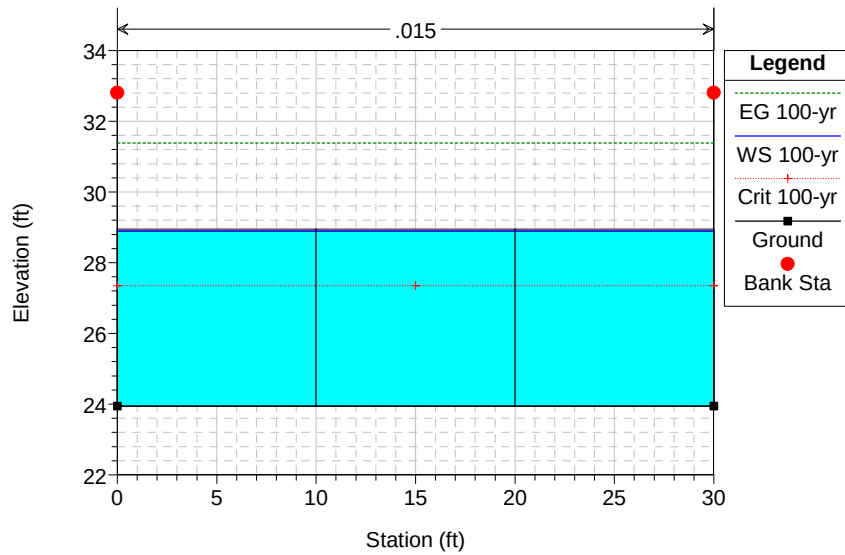
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



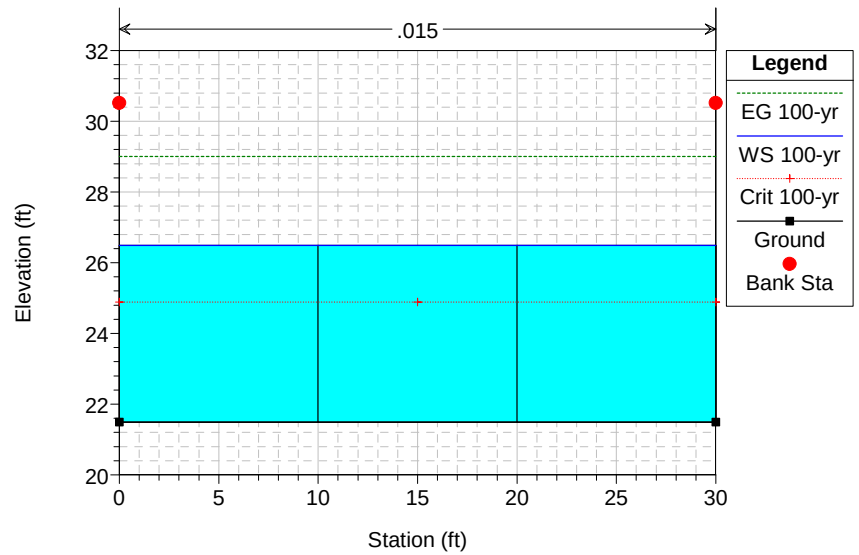
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



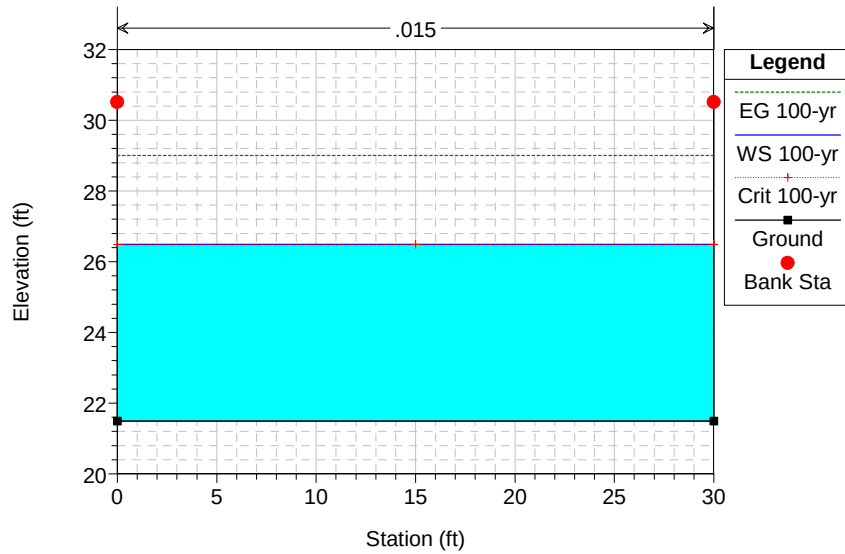
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



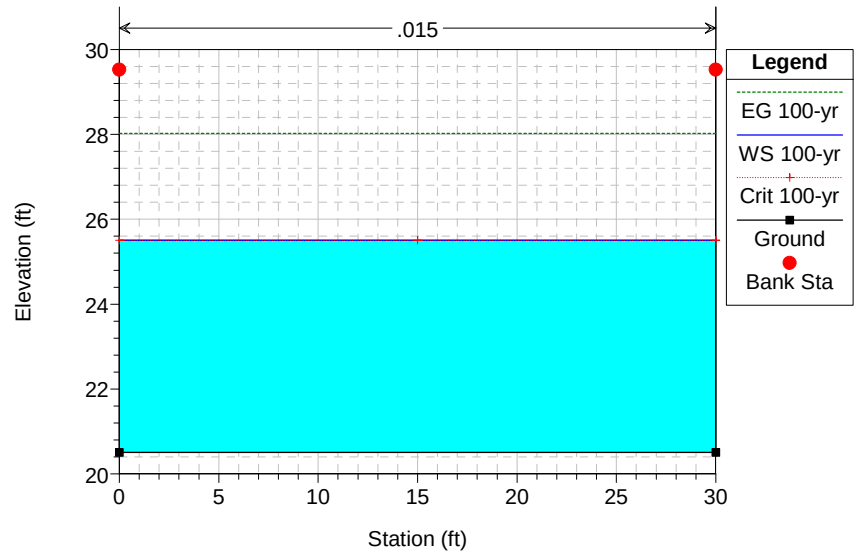
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



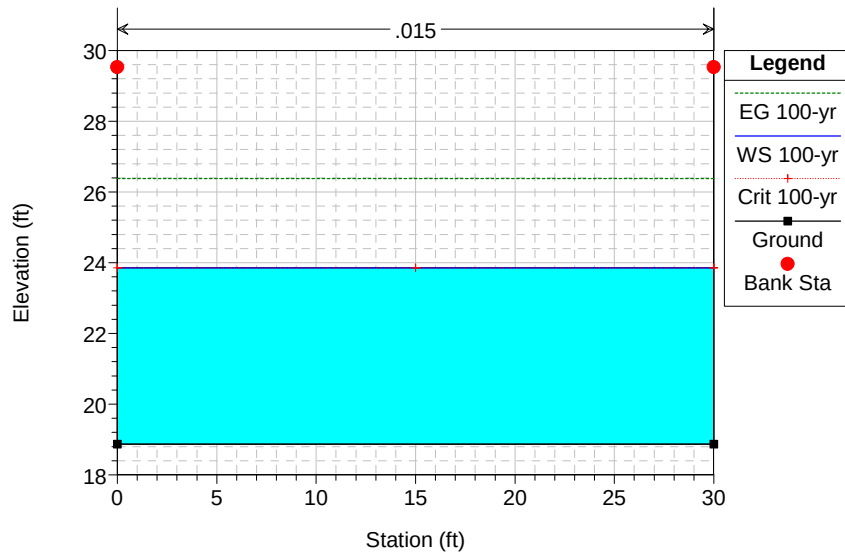
Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



Encinas Creek Existing Conditions Plan: Plan 02 4/9/2009



encinas_existing.rep

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X   X XXXXXX XXXX XXXX XX XXXX
X   X X      X   X   X   X   X
X   X X      X   X   X   X   X
XXXXXXX XXXX X   XXX XXXX XXXXXX XXXX
X   X X      X   X   X   X   X
X   X X      X   X   X   X   X
X   X XXXXXX XXXX X   X   X   X XXXXX

```

PROJECT DATA

Project Title: Encinas Creek Existing Conditions
Project File : encinas_existing.prj
Run Date and Time: 4/9/2009 1:33:01 PM

Project in English units

Project Description:

PLAN DATA

Plan Title: Plan 02
Plan File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_existing.p02

Geometry Title: Encinas Creek Existing Condition
Geometry File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_existing.g01

Flow Title : encinas_report_data
Flow File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_existing.f01

Plan Summary Information:

Number of:	Cross Sections =	13	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.0328
Critical depth calculation tolerance =	0.0328
Maximum number of iterations =	20
Maximum difference tolerance =	0.9843
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: encinas_report_data
Flow File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_existing.f01

Flow Data (cfs)

River	Reach	RS	100-yr
Encinas Creek	Existing	2752	1880
Encinas Creek	Existing	2119	1910

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Encinas Creek	Existing	100-yr		Critical

GEOMETRY DATA

Geometry Title: Encinas Creek Existing Condition
Geometry File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_existing.g01

CROSS SECTION

encinas_existing.rep

RIVER: Encinas Creek
 REACH: Existing RS: 2752

INPUT

Description:

Station	Elevation	Data	num=	21								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	47.572	18.373	39.37	28.871	36.089	47.244	32.808	60.367	29.528			
70.866	27.887	73.491	27.887	78.74	27.887	97.113	27.887	107.612	29.528			
118.11	32.808	146.982	32.808	175.853	31.168	225.722	31.168	249.344	32.808			
265.092	36.089	278.215	39.37	286.089	42.651	293.963	45.932	298.556	49.213			
301.837	52.493											

Manning's n	Values	num=	3				
Sta	n Val	Sta	n Val	Sta	n Val		
0	.03	60.367	.03	107.612	.03		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	60.367	107.612		43	43	43	.1		.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	33.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	32.14	Reach Len. (ft)	43.00	43.00	43.00
Crit W.S. (ft)	32.14	Flow Area (sq ft)	13.70	183.94	74.96
E.G. Slope (ft/ft)	0.004997	Area (sq ft)	13.70	183.94	74.96
Q Total (cfs)	1880.00	Flow (cfs)	56.24	1588.08	235.68
Top Width (ft)	147.23	Top Width (ft)	10.47	47.25	89.52
Vel Total (ft/s)	6.90	Avg. Vel. (ft/s)	4.10	8.63	3.14
Max Chl Dpth (ft)	4.26	Hydr. Depth (ft)	1.31	3.89	0.84
Conv. Total (cfs)	26596.4	Conv. (cfs)	795.6	22466.7	3334.2
Length Wtd. (ft)	43.00	wetted Per. (ft)	10.79	47.50	89.98
Min Ch El (ft)	27.89	Shear (lb/sq ft)	0.40	1.21	0.26
Alpha	1.36	Stream Power (lb/ft s)	1.63	10.43	0.82
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.26	4.37	0.88
C & E Loss (ft)	0.02	Cum SA (acres)	0.13	0.85	0.52

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2709

INPUT

Description:

Station	Elevation	Data	num=	22								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	47.572	5.249	44.291	15.748	39.37	20.669	36.089	29.856	32.808			
45.604	29.528	61.352	27.887	69.226	27.887	82.021	27.887	103.346	27.887			
107.612	29.528	112.861	31.168	140.42	31.168	206.037	31.168	220.472	32.808			
237.533	34.449	246.719	36.089	258.53	39.37	266.404	42.651	274.278	45.932			
282.152	49.213	295.276	52.493									

Manning's n	Values	num=	3				
Sta	n Val	Sta	n Val	Sta	n Val		
0	.03	45.604	.03	107.612	.03		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	45.604	107.612		52.5	52.5	52.5	.1		.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	32.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.64	Reach Len. (ft)	52.50	52.50	52.50
Crit W.S. (ft)	31.64	Flow Area (sq ft)	10.67	216.03	51.31
E.G. Slope (ft/ft)	0.004985	Area (sq ft)	10.67	216.03	51.31
Q Total (cfs)	1880.00	Flow (cfs)	38.08	1729.03	112.89
Top Width (ft)	174.67	Top Width (ft)	10.12	62.01	102.54
Vel Total (ft/s)	6.76	Avg. Vel. (ft/s)	3.57	8.00	2.20
Max Chl Dpth (ft)	3.75	Hydr. Depth (ft)	1.05	3.48	0.50
Conv. Total (cfs)	26626.4	Conv. (cfs)	539.4	24488.3	1598.8
Length Wtd. (ft)	52.50	wetted Per. (ft)	10.34	62.40	102.82
Min Ch El (ft)	27.89	Shear (lb/sq ft)	0.32	1.08	0.16
Alpha	1.30	Stream Power (lb/ft s)	1.15	8.62	0.34
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.24	4.17	0.81
C & E Loss (ft)	0.19	Cum SA (acres)	0.11	0.80	0.42

encinas_existing.rep

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2657

INPUT

Description:

Station	Elevation	Data	num=	18							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	10.499	42.651	18.373	39.37	31.496	32.808	48.556	29.528		
65.617	26.247	71.522	24.606	87.27	24.606	105.643	27.887	125.328	29.528		
200.131	31.168	223.753	32.808	239.501	36.089	250	39.37	256.562	42.651		
261.811	45.932	267.06	49.213	273.622	52.493						

Station	n Val	Sta	num=	3							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	48.556	.03	125.328	.03						

Bank	Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	48.556	125.328	46	46	46	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	31.95	Element	0.030	0.030	0.030
Vel Head (ft)	0.29	Wt. n-Val.	46.00	46.00	46.00
W.S. Elev (ft)	31.66	Reach Len. (ft)	11.81	369.73	99.77
Crit W.S. (ft)		Flow Area (sq ft)	11.81	369.73	99.77
E.G. Slope (ft/ft)	0.001048	Area (sq ft)	19.51	1677.98	182.50
Q Total (cfs)	1880.00	Flow (cfs)	11.08	76.77	81.87
Top Width (ft)	169.72	Top Width (ft)	1.65	4.54	1.83
Vel Total (ft/s)	3.91	Avg. Vel. (ft/s)	1.07	4.82	1.22
Max Chl Dpth (ft)	7.05	Hydr. Depth (ft)	602.6	51824.1	5636.6
Conv. Total (cfs)	58063.3	Conv. (cfs)	11.28	77.67	81.90
Length Wtd. (ft)	46.00	Wetted Per. (ft)	0.07	0.31	0.08
Min Ch El (ft)	24.61	Shear (lb/sq ft)	0.11	1.41	0.15
Alpha	1.23	Stream Power (lb/ft s)	0.23	3.81	0.72
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.10	0.71	0.31
C & E Loss (ft)	0.04	Cum SA (acres)			

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2611

INPUT

Description:

Station	Elevation	Data	num=	19							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	7.874	42.651	17.06	39.37	30.184	32.808	47.244	29.528		
60.367	26.247	76.115	24.606	91.864	24.606	114.173	27.887	131.234	28.314		
179.79	29.528	196.85	31.168	203.412	32.808	219.16	36.089	234.908	39.37		
241.47	42.651	248.031	45.932	254.593	49.213	262.467	52.493				

Station	n Val	Sta	num=	3							
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	47.244	.03	131.234	.03						

Bank	Sta: Left	Right	Lengths: Left	Channel	Right	Coeff	Contr.	Expan.
	47.244	131.234	66	66	66	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (ft)	31.87	Element	0.030	0.030	0.030
Vel Head (ft)	0.16	Wt. n-Val.	66.00	66.00	66.00
W.S. Elev (ft)	31.71	Reach Len. (ft)	12.38	444.48	159.26
Crit W.S. (ft)		Flow Area (sq ft)	12.38	444.48	159.26
E.G. Slope (ft/ft)	0.000538	Area (sq ft)	14.90	1542.17	322.93
Q Total (cfs)	1880.00	Flow (cfs)	11.35	83.99	67.79
Top Width (ft)	163.13	Top Width (ft)	1.20	3.47	2.03
Vel Total (ft/s)	3.05	Avg. Vel. (ft/s)	1.09	5.29	2.35
Max Chl Dpth (ft)	7.10	Hydr. Depth (ft)	642.3	66468.4	13918.6
Conv. Total (cfs)	81029.3	Conv. (cfs)	11.56	84.72	67.95
Length Wtd. (ft)	66.00	Wetted Per. (ft)	0.04	0.18	0.08
Min Ch El (ft)	24.61	Shear (lb/sq ft)	0.04	0.61	0.16
Alpha	1.14	Stream Power (lb/ft s)	0.22	3.39	0.59
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.09	0.63	0.23
C & E Loss (ft)	0.00	Cum SA (acres)			

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2546

INPUT

Description:

Station	Elevation	Data	num=	21
Sta	Elev	Sta	Elev	Sta
0	47.572	7.874	42.651	17.06
65.617	26.247	76.115	24.606	86.614
131.234	28.409	167.979	29.528	181.102
204.724	36.089	215.223	39.37	223.097
244.094	52.493		42.651	230.971

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	41.995	.03
		131.234	.03

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	41.995	131.234		59	59	59		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.17	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.67	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)		Flow Area (sq ft)	9.15	468.40	116.72
E.G. Slope (ft/ft)	0.000552	Area (sq ft)	9.15	468.40	116.72
Q Total (cfs)	1880.00	Flow (cfs)	10.90	1634.20	234.90
Top Width (ft)	148.86	Top Width (ft)	8.55	89.24	51.06
Vel Total (ft/s)	3.16	Avg. Vel. (ft/s)	1.19	3.49	2.01
Max Chl Dpth (ft)	7.06	Hydr. Depth (ft)	1.07	5.25	2.29
Conv. Total (cfs)	80054.0	Conv. (cfs)	464.1	69587.4	10002.5
Length Wtd. (ft)	59.00	Wetted Per. (ft)	8.82	90.17	51.28
Min Ch El (ft)	24.61	Shear (lb/sq ft)	0.04	0.18	0.08
Alpha	1.11	Stream Power (lb/ft s)	0.04	0.62	0.16
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.20	2.69	0.38
C & E Loss (ft)	0.01	Cum SA (acres)	0.08	0.50	0.14

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2486

INPUT

Description:

Station	Elevation	Data	num=	24
Sta	Elev	Sta	Elev	Sta
0	47.572	6.562	42.651	22.31
51.181	29.528	61.68	27.887	72.178
102.362	24.278	110.236	26.247	135.171
161.417	29.528	171.916	31.168	174.541
203.412	42.651	213.911	45.932	223.097

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	72.178	.03
		110.236	.03

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	72.178	110.236		46	46	46		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.56	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)		Flow Area (sq ft)	82.85	264.15	183.48
E.G. Slope (ft/ft)	0.000640	Area (sq ft)	82.85	264.15	183.48
Q Total (cfs)	1880.00	Flow (cfs)	217.73	1192.24	470.02
Top Width (ft)	127.05	Top Width (ft)	26.68	38.06	62.30
Vel Total (ft/s)	3.54	Avg. Vel. (ft/s)	2.63	4.51	2.56
Max Chl Dpth (ft)	7.28	Hydr. Depth (ft)	3.10	6.94	2.94
Conv. Total (cfs)	74288.1	Conv. (cfs)	8603.7	47111.4	18573.0
Length Wtd. (ft)	46.00	Wetted Per. (ft)	27.29	38.66	62.80
Min Ch El (ft)	24.28	Shear (lb/sq ft)	0.12	0.27	0.12
Alpha	1.22	Stream Power (lb/ft s)	0.32	1.23	0.30
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.14	2.20	0.17
C & E Loss (ft)	0.03	Cum SA (acres)	0.05	0.41	0.07

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2440

encinas_existing.rep

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	42.651	10.499	39.37	19.685
127.297	27.887	153.543	26.247	158.793
199.475	26.247	219.16	27.887	233.596
275.591	39.37	284.777	42.651	305.774

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	127.297	.03	219.16	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	127.297	219.16		20	20		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.60	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	80.20	507.94	54.52
E.G. Slope (ft/ft)	0.000441	Area (sq ft)	80.20	507.94	54.52
Q Total (cfs)	1880.00	Flow (cfs)	143.79	1645.84	90.37
Top Width (ft)	153.91	Top Width (ft)	35.20	91.86	26.84
Vel Total (ft/s)	2.93	Avg. Vel. (ft/s)	1.79	3.24	1.66
Max Chl Dpth (ft)	7.32	Hydr. Depth (ft)	2.28	5.53	2.03
Conv. Total (cfs)	89512.0	Conv. (cfs)	6846.1	78363.2	4302.7
Length Wtd. (ft)	20.00	Wetted Per. (ft)	35.44	92.40	27.11
Min Ch El (ft)	24.28	Shear (lb/sq ft)	0.06	0.15	0.06
Alpha	1.12	Stream Power (lb/ft s)	0.11	0.49	0.09
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.05	1.79	0.05
C & E Loss (ft)	0.03	Cum SA (acres)	0.02	0.34	0.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek

REACH: Existing RS: 2422

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	45.932	10.499	42.651	28.871
65.617	29.528	101.05	26.247	161.417
229.659	25.358	241.47	27.887	267.717
307.087	39.37	316.273	42.651	330.709

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	101.05	.03	229.659	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	101.05	229.659		1	1		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.71	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.67	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)	143.08	918.53	151.91
E.G. Slope (ft/ft)	0.000089	Area (sq ft)	143.08	918.53	151.91
Q Total (cfs)	1880.00	Flow (cfs)	145.79	1589.64	144.57
Top Width (ft)	224.35	Top Width (ft)	43.99	128.61	51.75
Vel Total (ft/s)	1.55	Avg. Vel. (ft/s)	1.02	1.73	0.95
Max Chl Dpth (ft)	7.72	Hydr. Depth (ft)	3.25	7.14	2.94
Conv. Total (cfs)	199346.1	Conv. (cfs)	15459.0	168557.9	15329.2
Length Wtd. (ft)	1.00	Wetted Per. (ft)	44.41	128.80	52.24
Min Ch El (ft)	23.95	Shear (lb/sq ft)	0.02	0.04	0.02
Alpha	1.12	Stream Power (lb/ft s)	0.02	0.07	0.02
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	1.46	0.00
C & E Loss (ft)	0.18	Cum SA (acres)	0.00	0.29	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek

REACH: Existing RS: 2421

encinas_existing.rep

INPUT

Description:

Station Elevation Data		num=	4
Sta	Elev	Sta	Elev
0	32.808	0	23.95
30	23.95	30	32.808

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.015	0	.015
30	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	30		33	33		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	31.52	Wt. n-Val.		0.015	
Vel Head (ft)	1.88	Reach Len. (ft)	33.00	33.00	33.00
W.S. Elev (ft)	29.64	Flow Area (sq ft)		170.77	
Crit W.S. (ft)	28.89	Area (sq ft)		170.77	
E.G. Slope (ft/ft)	0.001866	Flow (cfs)		1880.00	
Q Total (cfs)	1880.00	Top Width (ft)		30.00	
Top Width (ft)	30.00	Avg. Vel. (ft/s)		11.01	
Vel Total (ft/s)	11.01	Hydr. Depth (ft)		5.69	
Max Chl Dpth (ft)	5.69	Conv. (cfs)		43519.9	
Conv. Total (cfs)	43519.9	Wetted Per. (ft)		41.38	
Length Wtd. (ft)	33.00	Shear (lb/sq ft)		0.48	
Min Ch El (ft)	23.95	Stream Power (lb/ft s)		5.29	
Alpha	1.00	Cum Volume (acre-ft)		1.45	
Frctn Loss (ft)	0.08	Cum SA (acres)		0.29	
C & E Loss (ft)	0.06				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2388

INPUT

Description:

Station Elevation Data		num=	4
Sta	Elev	Sta	Elev
0	32.808	0	23.95
30	23.95	30	32.808

Manning's n Values		num=	3
Sta	n Val	Sta	n Val
0	.015	0	.015
30	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	30		269	269		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	31.39	Wt. n-Val.		0.015	
Vel Head (ft)	2.49	Reach Len. (ft)	269.00	269.00	269.00
W.S. Elev (ft)	28.90	Flow Area (sq ft)		148.44	
Crit W.S. (ft)	28.90	Area (sq ft)		148.44	
E.G. Slope (ft/ft)	0.002835	Flow (cfs)		1880.00	
Q Total (cfs)	1880.00	Top Width (ft)		30.00	
Top Width (ft)	30.00	Avg. Vel. (ft/s)		12.66	
Vel Total (ft/s)	12.66	Hydr. Depth (ft)		4.95	
Max Chl Dpth (ft)	4.95	Conv. (cfs)		35308.1	
Conv. Total (cfs)	35308.1	Wetted Per. (ft)		39.90	
Length Wtd. (ft)	269.00	Shear (lb/sq ft)		0.66	
Min Ch El (ft)	23.95	Stream Power (lb/ft s)		8.34	
Alpha	1.00	Cum Volume (acre-ft)		1.33	
Frctn Loss (ft)		Cum SA (acres)		0.27	
C & E Loss (ft)					

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

CULVERT

RIVER: Encinas Creek
 REACH: Existing RS: 2145

INPUT

Description:

Distance from Upstream XS =	43
Deck/Roadway Width =	154
Weir Coefficient =	2.6
Upstream Deck/Roadway Coordinates	
num=	2
Sta Hi Cord Lo Cord	Sta Hi Cord Lo Cord
0 15.5 15.5	32 15.5 15.5

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	32.808	0	23.95	30	23.95	30	32.808	

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
0	30		.1		.3

Downstream Deck/Roadway Coordinates

num=	2	Sta Hi	Cord	Lo	Cord	Sta Hi	Cord	Lo	Cord
0		15.5	15.5	32	15.5	15.5			

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	30.512	0	21.49	30	21.49	30	30.512	

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
0	30		.1		.3

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .95
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	5	10

FHWA Chart # 57- Rectangular

FHWA Scale # 1 - Tapered inlet throat

Solution Criteria = Inlet control

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss	Coef	Exit Loss	Coef
0	243	.013	.013	0	.5		1	

Number of Barrels = 3

Upstream Elevation = 23.95

Centerline Stations

Sta.	Sta.	Sta.
5	15	25

Downstream Elevation = 21.49

Centerline Stations

Sta.	Sta.	Sta.
5	15	25

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (cfs)	1067.36	Culv Full Len (ft)	243.00
# Barrels	3	Culv Vel US (ft/s)	7.12
Q Barrel (cfs)	355.79	Culv Vel DS (ft/s)	7.12
E.G. US. (ft)	29.09	Culv Inv El Up (ft)	23.95
W.S. US. (ft)	28.90	Culv Inv El Dn (ft)	21.49
E.G. DS (ft)	29.01	Culv Frctn Ls (ft)	0.73
W.S. DS (ft)	26.49	Culv Exit Loss (ft)	
Delta EG (ft)	0.08	Culv Entr Loss (ft)	0.39
Delta WS (ft)	2.41	Q Weir (cfs)	846.05
E.G. IC (ft)	29.09	Weir Sta Lft (ft)	0.00
E.G. OC (ft)	29.55	Weir Sta Rgt (ft)	30.00
Culvert Control	Inlet	Weir Submerg	0.90
Culv WS Inlet (ft)	28.95	Weir Max Depth (ft)	5.14
Culv WS Outlet (ft)	28.22	Weir Avg Depth (ft)	5.14
Culv Nml Depth (ft)	2.29	Weir Flow Area (sq ft)	154.21
Culv Crt Depth (ft)	3.40	Min El Weir Flow (ft)	23.96

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

Warning: During the supercritical analysis, the program could not balance the energy equation during the forewater calculations inside of the culvert. The program assumed critical depth at the outlet and continued on.

Warning: The inlet is submerged and the outlet computations indicate that the culvert would flow full over all or part of its length. The program would normally default to the outlet answer. However, the user has requested that the inlet answer be used.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CROSS SECTION

RIVER: Encinas Creek

REACH: Existing

RS: 2119

encinas_existing.rep

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	30.512				30	21.49	30	30.512

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015			30	.015		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	30		66	66		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	29.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	26.49	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	26.49	Flow Area (sq ft)		149.88	
E.G. Slope (ft/ft)	0.002843	Area (sq ft)		149.88	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.74	Avg. Vel. (ft/s)		12.74	
Max Chl Dpth (ft)	5.00	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	35823.0	Conv. (cfs)		35823.0	
Length Wtd. (ft)	66.00	wetted Per. (ft)		39.99	
Min Ch El (ft)	21.49	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		8.48	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)		0.41	
C & E Loss (ft)	0.00	Cum SA (acres)		0.08	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek

REACH: Existing RS: 2053

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	29.528				30	20.505	30	29.528

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015			30	.015		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	30		52.5	52.5		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	28.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	25.50	Reach Len. (ft)	52.50	52.50	52.50
Crit W.S. (ft)	25.50	Flow Area (sq ft)		149.90	
E.G. Slope (ft/ft)	0.002842	Area (sq ft)		149.90	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.74	Avg. Vel. (ft/s)		12.74	
Max Chl Dpth (ft)	5.00	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	35828.9	Conv. (cfs)		35828.9	
Length Wtd. (ft)	52.50	wetted Per. (ft)		39.99	
Min Ch El (ft)	20.51	Shear (lb/sq ft)		0.66	
Alpha	1.00	Stream Power (lb/ft s)		8.47	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.18	
C & E Loss (ft)	0.00	Cum SA (acres)		0.04	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek

REACH: Existing RS: 2001

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	29.528				30	18.865	30	29.528

Manning's n	Values	num=	3	Sta	n Val
0	.015			30	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	0	30		0	0		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	26.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	23.86	Reach Len. (ft)			
Crit W.S. (ft)	23.86	Flow Area (sq ft)		149.82	
E.G. Slope (ft/ft)	0.002846	Area (sq ft)		149.82	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.75	Avg. Vel. (ft/s)		12.75	
Max Chl Dpth (ft)	4.99	Hydr. Depth (ft)		4.99	
Conv. Total (cfs)	35800.4	Conv. (cfs)		35800.4	
Length Wtd. (ft)		wetted Per. (ft)		39.99	
Min Ch El (ft)	18.87	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		8.49	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River: Encinas Creek

Reach	River Sta.	n1	n2	n3
Existing	2752	.03	.03	.03
Existing	2709	.03	.03	.03
Existing	2657	.03	.03	.03
Existing	2611	.03	.03	.03
Existing	2546	.03	.03	.03
Existing	2486	.03	.03	.03
Existing	2440	.03	.03	.03
Existing	2422	.03	.03	.03
Existing	2421	.015	.015	.015
Existing	2388	.015	.015	.015
Existing	2145	Culvert		
Existing	2119	.015	.015	.015
Existing	2053	.015	.015	.015
Existing	2001	.015	.015	.015

SUMMARY OF REACH LENGTHS

River: Encinas Creek

Reach	River Sta.	Left	Channel	Right
Existing	2752	43	43	43
Existing	2709	52.5	52.5	52.5
Existing	2657	46	46	46
Existing	2611	66	66	66
Existing	2546	59	59	59
Existing	2486	46	46	46
Existing	2440	20	20	20
Existing	2422	1	1	1
Existing	2421	33	33	33
Existing	2388	269	269	269
Existing	2145	Culvert		
Existing	2119	66	66	66
Existing	2053	52.5	52.5	52.5
Existing	2001	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Encinas Creek

Reach	River Sta.	Contr.	Expan.
Existing	2752	.1	.3
Existing	2709	.1	.3
Existing	2657	.1	.3

Existing	2611	.1	.3	encinas_existing.rep
Existing	2546	.1	.3	
Existing	2486	.1	.3	
Existing	2440	.1	.3	
Existing	2422	.1	.3	
Existing	2421	.1	.3	
Existing	2388	.1	.3	
Existing	2145	Culvert		
Existing	2119	.1	.3	
Existing	2053	.1	.3	
Existing	2001	.1	.3	

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Plan 02

River: Encinas Creek Reach: Existing RS: 2752 Profile: 100-yr

Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning:Divided flow computed for this cross-section.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2709 Profile: 100-yr

Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2440 Profile: 100-yr

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2422 Profile: 100-yr

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2421 Profile: 100-yr

Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2388 Profile: 100-yr

Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.

River: Encinas Creek Reach: Existing RS: 2145 Profile: 100-yr

Warning:During subcritical analysis, the water surface upstream of culvert went to critical depth.

River: Encinas Creek Reach: Existing RS: 2145 Profile: 100-yr Culv: Culvert #1

Warning:During the supercritical analysis, the program could not balance the energy equation during the forewater calculations inside of the culvert. The program assumed critical depth at the outlet and continued on.

Warning:The inlet is submerged and the outlet computations indicate that the culvert would flow full over all or part of its

length. The program would normally default to the outlet answer. However, the user has requested that the

inlet

answer be used.

Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

River: Encinas Creek Reach: Existing RS: 2119 Profile: 100-yr

Warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2053 Profile: 100-yr

Warning:The energy equation could not be balanced within the specified number of iterations. The program used critical

depth

for the water surface and continued on with the calculations.

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may

indicate the need for additional cross sections.

Warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer.

The

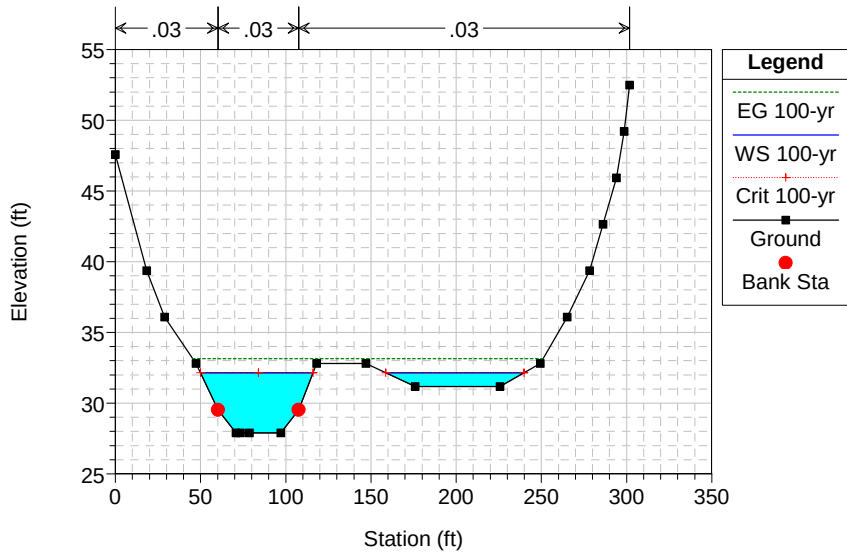
program defaulted to critical depth.

Proposed

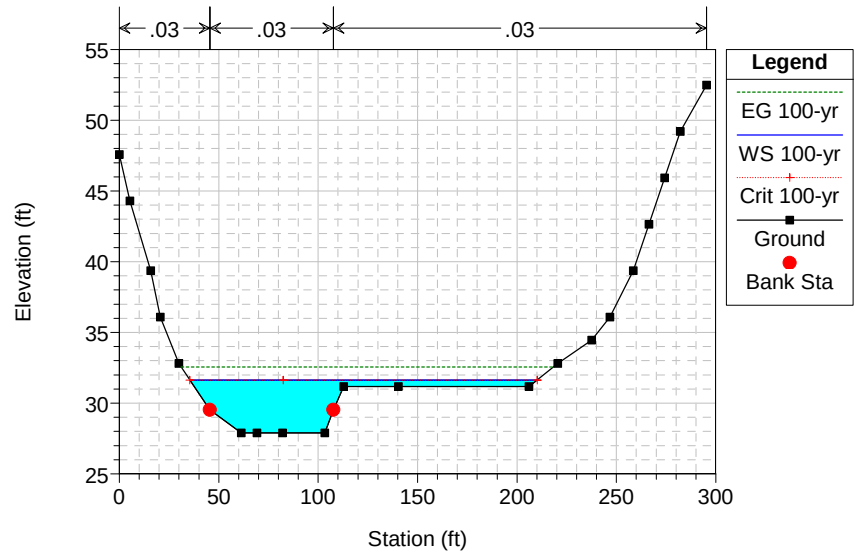
HEC-RAS Plan: Plan 07 River: Encinas Creek Reach: Existing Profile: 100-yr

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Existing	2752	100-yr	1880.00	27.89	32.14	32.14	33.15	0.004997	8.63	272.60	147.23	0.77
Existing	2709	100-yr	1880.00	27.89	31.64	31.64	32.56	0.004985	8.00	278.01	174.67	0.76
Existing	2657	100-yr	1880.00	24.61	31.67		32.02	0.001070	5.72	482.96	169.92	0.39
Existing	2611	100-yr	1880.00	24.61	31.76		31.93	0.000512	3.92	623.86	163.56	0.27
Existing	2546	100-yr	1880.00	24.61	31.71		31.90	0.000515	4.03	600.88	149.14	0.27
Existing	2486	100-yr	1880.00	24.28	31.63		31.86	0.000609	4.43	539.92	127.37	0.29
Existing	2440	100-yr	1880.00	24.28	31.66		31.81	0.000435	3.61	653.07	154.69	0.25
Existing	2422	100-yr	1880.00	23.95	31.74		31.78	0.000086	1.71	1229.18	225.08	0.11
Existing	2421	100-yr	1880.00	23.95	29.86	28.90	31.61	0.001668	10.60	177.35	30.00	0.77
Existing	2145		Culvert									
Existing	2119	100-yr	1910.00	21.49	26.49	26.49	29.01	0.002843	12.74	149.88	30.00	1.00
Existing	2053	100-yr	1910.00	20.51	25.50	25.50	28.02	0.002842	12.74	149.90	30.00	1.00
Existing	2001	100-yr	1910.00	18.87	23.86	23.86	26.38	0.002846	12.75	149.82	30.00	1.01

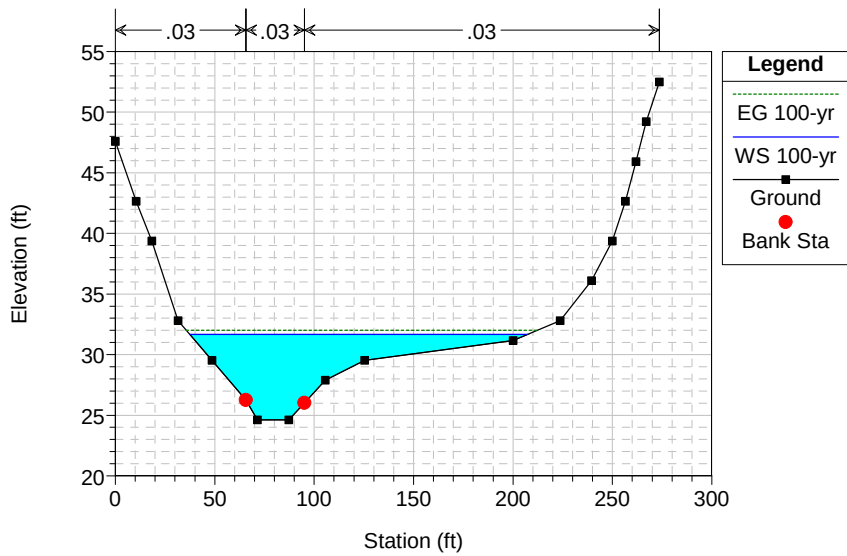
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



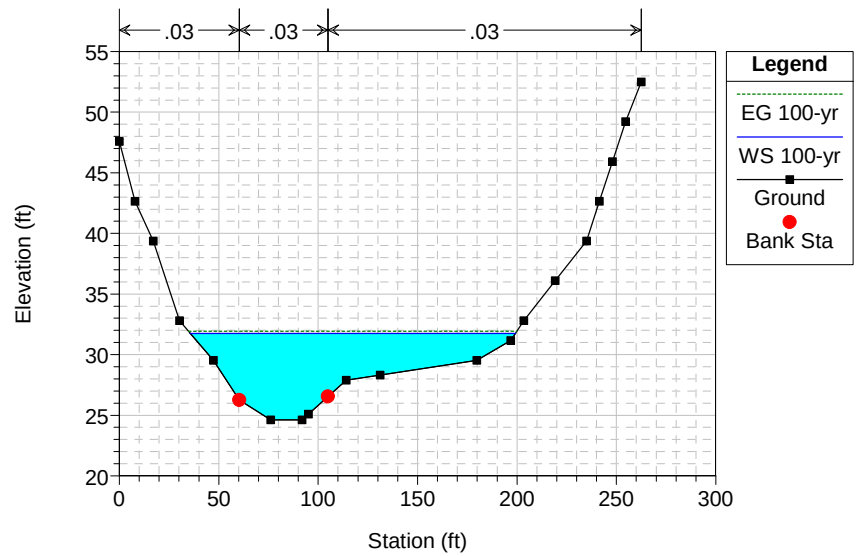
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



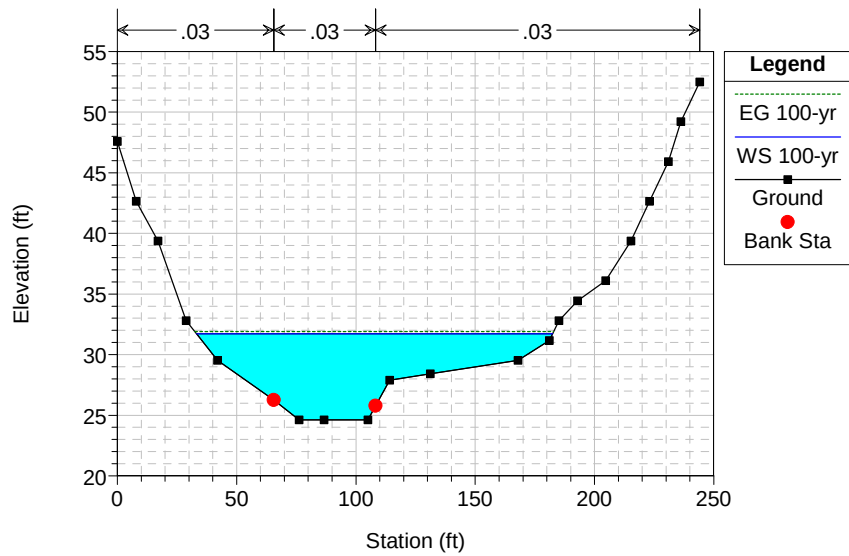
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



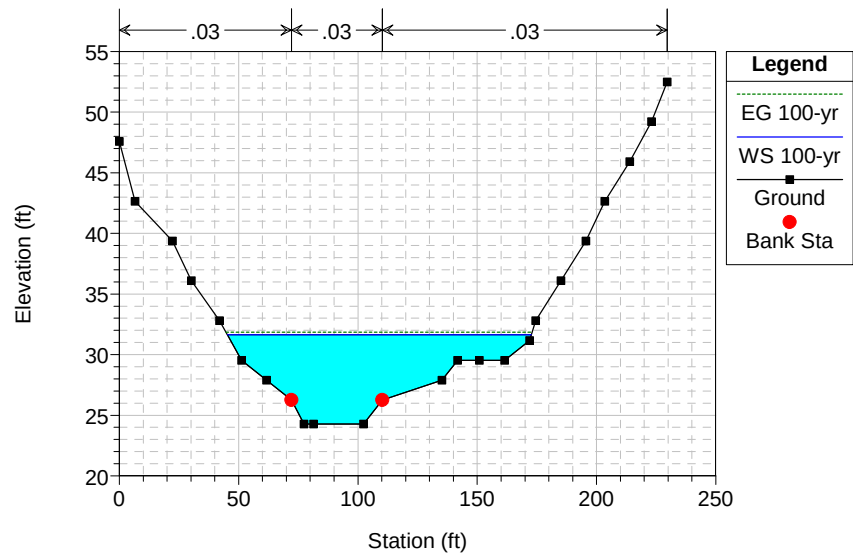
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



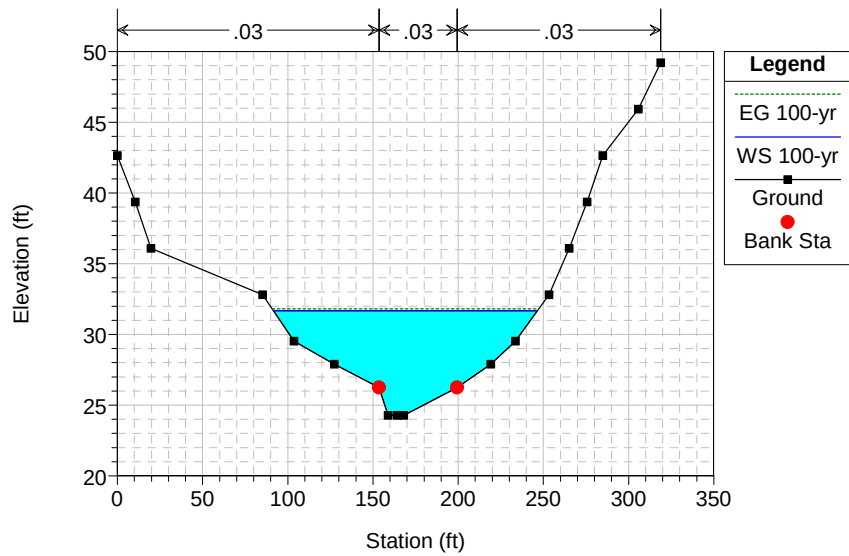
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



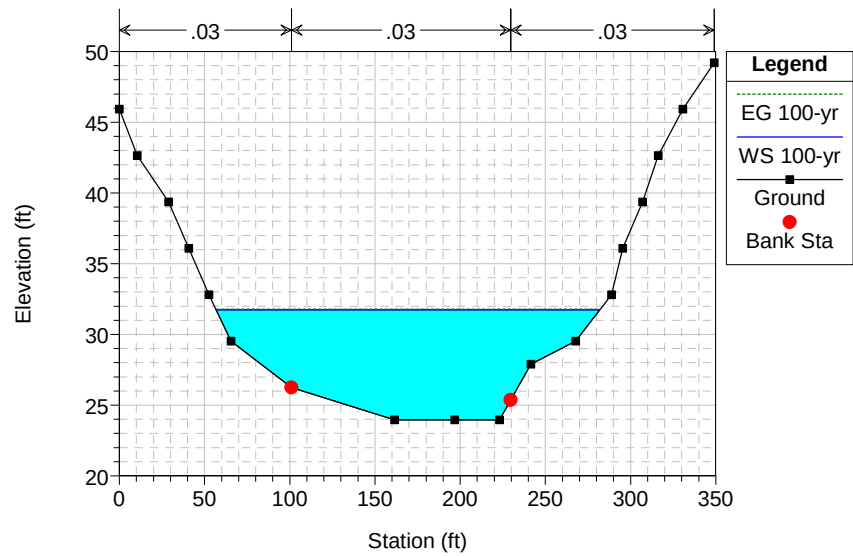
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



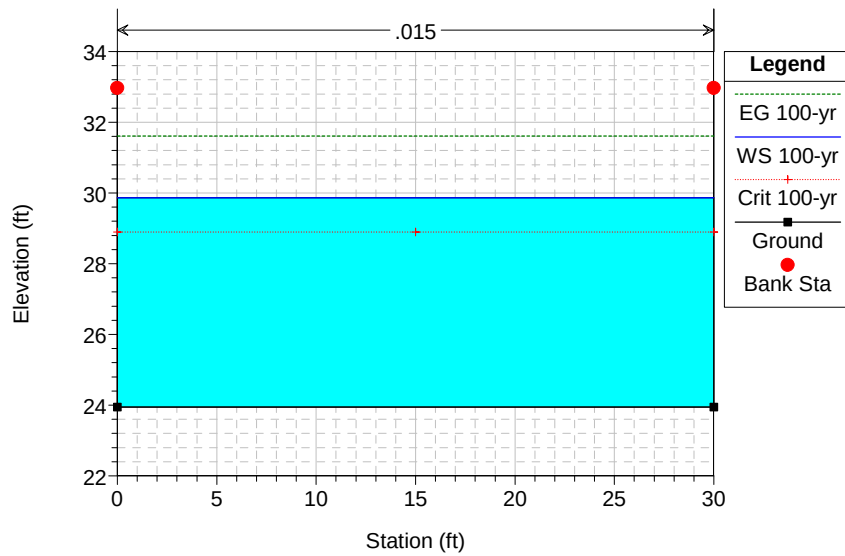
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



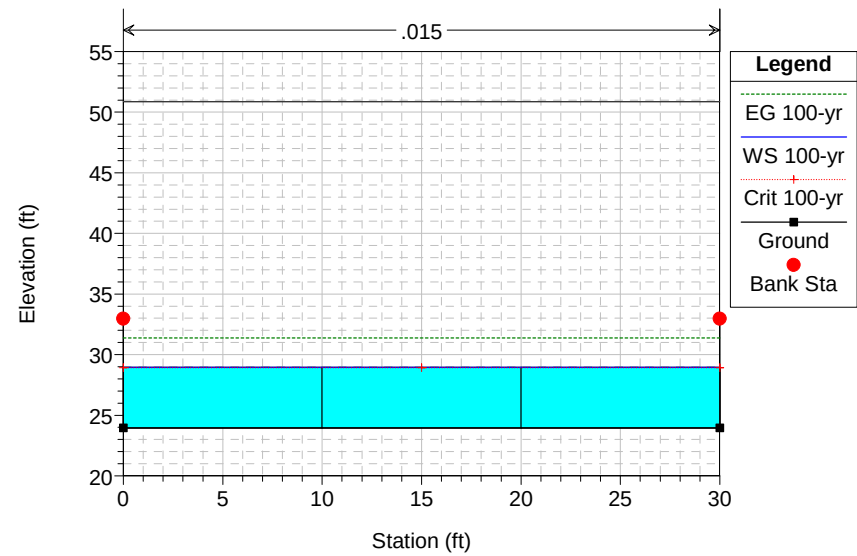
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



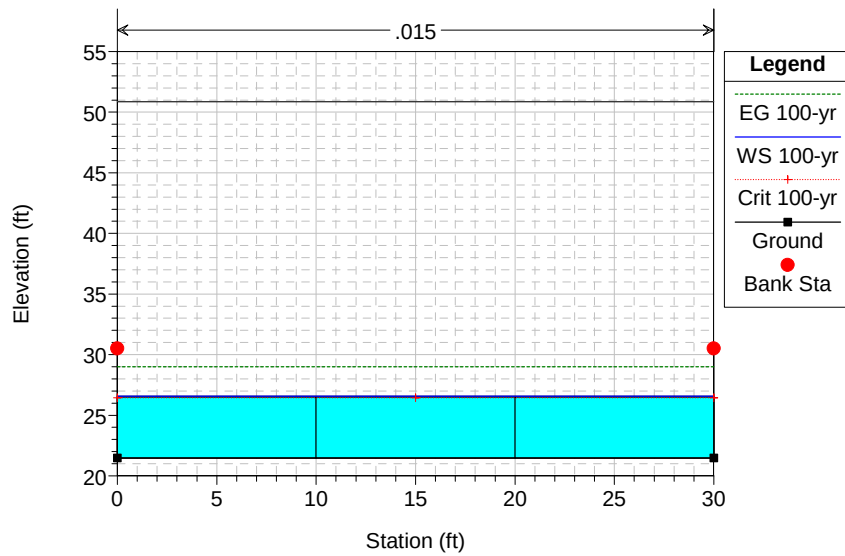
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



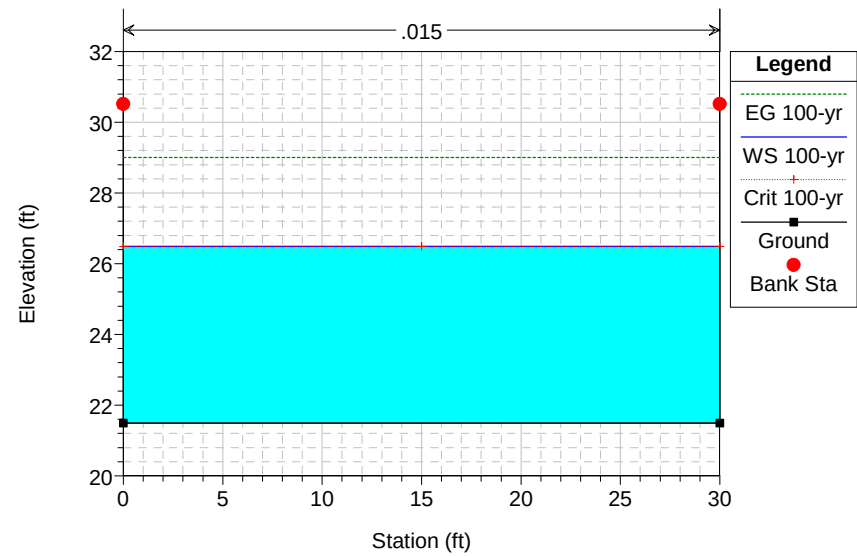
Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009

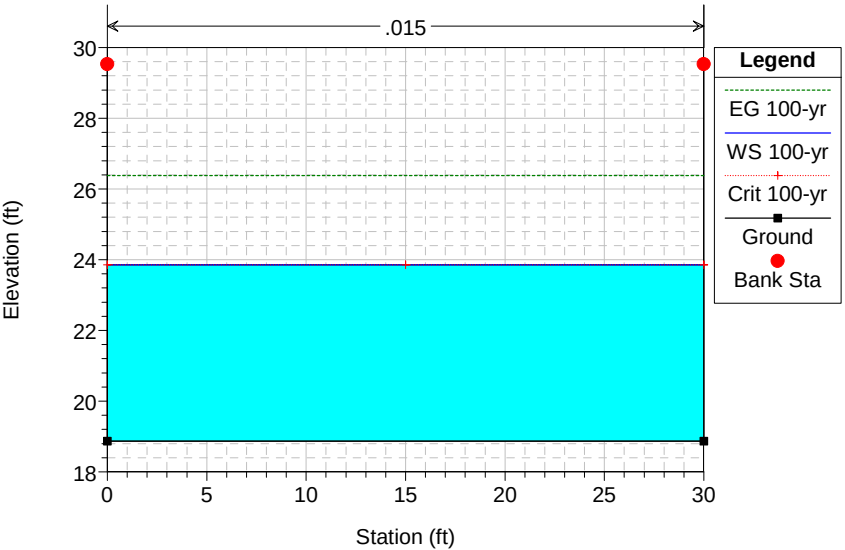
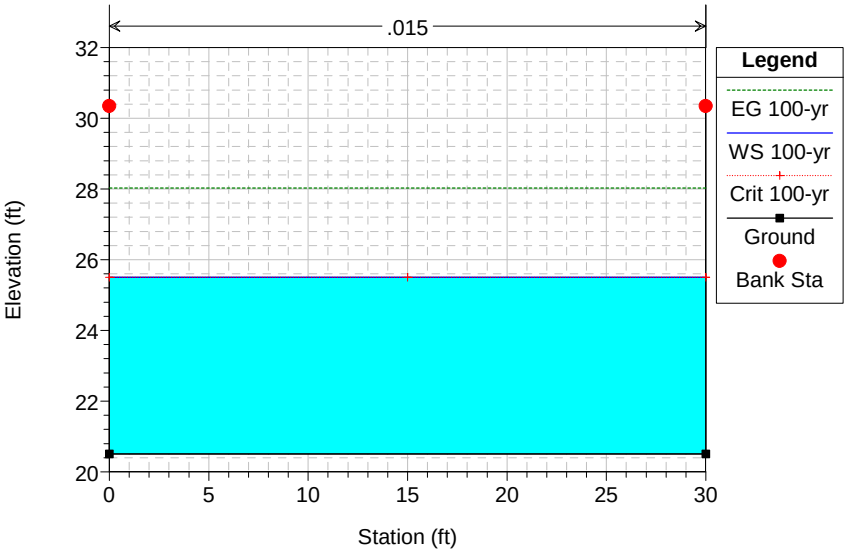


Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009



Encinas Creek Proposed Conditions Plan: Plan 13 4/9/2009





encinas_proposed.rep.txt

HEC-RAS Version 3.1.3 May 2005
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X XXXXXX   XXXX      XXXX      XX      XXXX
X      X X      X      X      X      X      X
X      X X      X      X      X      X      X
XXXXXXX XXXX   X      XXX XXXX   XXXXXX   XXXX
X      X X      X      X      X      X      X
X      X X      X      X      X      X      X
X      X XXXXXX   XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: Encinas Creek Proposed Conditions
Project File : encinas_proposed.prj
Run Date and Time: 4/6/2009 2:45:09 PM

Project in English units

Project Description:

PLAN DATA

Plan Title: Plan 03
Plan File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_proposed.p03

Geometry Title: Encinas Creek proposed
Geometry File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_proposed.g02

Flow Title : encinas_report_data
Flow File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_proposed.f01

Plan Summary Information:

Number of:	Cross Sections =	12	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.0328
Critical depth calculation tolerance =	0.0328
Maximum number of iterations =	20
Maximum difference tolerance =	0.9843
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: encinas_report_data
Flow File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_proposed.f01

Flow Data (cfs)

River	Reach	RS	100-yr
Encinas Creek	Existing	2752	1880
Encinas Creek	Existing	2119	1910

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Encinas Creek	Existing	100-yr		Critical

GEOMETRY DATA

Geometry Title: Encinas Creek proposed
Geometry File : C:\Documents and Settings\s136587\Desktop\Encinas Creek Study\encinas_proposed.g02

CROSS SECTION

encinas_proposed.rep.txt

RIVER: Encinas Creek
 REACH: Existing RS: 2752

INPUT

Description:

Station	Elevation	Data	num=	21								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	47.572	18.373	39.37	28.871	36.089	47.244	32.808	60.367	29.528			
70.866	27.887	73.491	27.887	78.74	27.887	97.113	27.887	107.612	29.528			
118.11	32.808	146.982	32.808	175.853	31.168	225.722	31.168	249.344	32.808			
265.092	36.089	278.215	39.37	286.089	42.651	293.963	45.932	298.556	49.213			
301.837	52.493											

Manning's n	Values	num=	3				
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	60.367	.03	107.612	.03		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	60.367	107.612		43	43	43		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	33.15	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.00	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	32.14	Reach Len. (ft)	43.00	43.00	43.00
Crit W.S. (ft)	32.14	Flow Area (sq ft)	13.70	183.94	74.96
E.G. Slope (ft/ft)	0.004997	Area (sq ft)	13.70	183.94	74.96
Q Total (cfs)	1880.00	Flow (cfs)	56.24	1588.08	235.68
Top Width (ft)	147.23	Top Width (ft)	10.47	47.25	89.52
Vel Total (ft/s)	6.90	Avg. Vel. (ft/s)	4.10	8.63	3.14
Max Chl Dpth (ft)	4.26	Hydr. Depth (ft)	1.31	3.89	0.84
Conv. Total (cfs)	26596.4	Conv. (cfs)	795.6	22466.7	3334.2
Length Wtd. (ft)	43.00	Wetted Per. (ft)	10.79	47.50	89.98
Min Ch El (ft)	27.89	Shear (lb/sq ft)	0.40	1.21	0.26
Alpha	1.36	Stream Power (lb/ft s)	1.63	10.43	0.82
Frctn Loss (ft)	0.21	Cum Volume (acre-ft)	0.62	3.68	1.35
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	0.65	0.63

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: Divided flow computed for this cross-section.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2709

INPUT

Description:

Station	Elevation	Data	num=	22								
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	
0	47.572	5.249	44.291	15.748	39.37	20.669	36.089	29.856	32.808			
45.604	29.528	61.352	27.887	69.226	27.887	82.021	27.887	103.346	27.887			
107.612	29.528	112.861	31.168	140.42	31.168	206.037	31.168	220.472	32.808			
237.533	34.449	246.719	36.089	258.53	39.37	266.404	42.651	274.278	45.932			
282.152	49.213	295.276	52.493									

Manning's n	Values	num=	3				
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	45.604	.03	107.612	.03		

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	45.604	107.612		52.5	52.5	52.5		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	32.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.92	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.64	Reach Len. (ft)	52.50	52.50	52.50
Crit W.S. (ft)	31.64	Flow Area (sq ft)	10.67	216.03	51.31
E.G. Slope (ft/ft)	0.004985	Area (sq ft)	10.67	216.03	51.31
Q Total (cfs)	1880.00	Flow (cfs)	38.08	1729.03	112.89
Top Width (ft)	174.67	Top Width (ft)	10.12	62.01	102.54
Vel Total (ft/s)	6.76	Avg. Vel. (ft/s)	3.57	8.00	2.20
Max Chl Dpth (ft)	3.75	Hydr. Depth (ft)	1.05	3.48	0.50
Conv. Total (cfs)	26626.4	Conv. (cfs)	539.4	24488.3	1598.8
Length Wtd. (ft)	52.50	Wetted Per. (ft)	10.34	62.40	102.82
Min Ch El (ft)	27.89	Shear (lb/sq ft)	0.32	1.08	0.16
Alpha	1.30	Stream Power (lb/ft s)	1.15	8.62	0.34
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.61	3.48	1.28
C & E Loss (ft)	0.17	Cum SA (acres)	0.21	0.59	0.54

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2657

INPUT

Description:

Station Elevation Data		num= 19		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	10.499	42.651	18.373	39.37	31.496	32.808	48.556	29.528		
65.617	26.247	71.522	24.606	87.27	24.606	95.144	26.014	105.643	27.887		
125.328	29.528	200.131	31.168	223.753	32.808	239.501	36.089	250	39.37		
256.562	42.651	261.811	45.932	267.06	49.213	273.622	52.493				

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	65.617	.03	95.144	.03		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	65.617	95.144		46	46	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)		32.02	Element	Left OB	Channel	Right OB
Vel Head (ft)		0.35	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)		31.67	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)			Flow Area (sq ft)	76.42	198.14	208.39
E.G. Slope (ft/ft)		0.001070	Area (sq ft)	76.42	198.14	208.39
Q Total (cfs)		1880.00	Flow (cfs)	237.76	1132.99	509.26
Top Width (ft)		169.92	Top Width (ft)	28.19	29.53	112.19
Vel Total (ft/s)		3.89	Avg. Vel. (ft/s)	3.11	5.72	2.44
Max Chl Dpth (ft)		7.06	Hydr. Depth (ft)	2.71	6.71	1.86
Conv. Total (cfs)		57486.0	Conv. (cfs)	7270.0	34644.1	15571.9
Length Wtd. (ft)		46.00	wetted Per. (ft)	28.71	29.88	112.46
Min Ch El (ft)		24.61	Shear (lb/sq ft)	0.18	0.44	0.12
Alpha		1.49	Stream Power (lb/ft s)	0.55	2.53	0.30
Frctn Loss (ft)		0.03	Cum Volume (acre-ft)	0.56	3.23	1.13
C & E Loss (ft)		0.05	Cum SA (acres)	0.18	0.54	0.41

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2611

INPUT

Description:

Station Elevation Data		num= 21		Sta		Elev		Sta		Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	7.874	42.651	17.06	39.37	30.184	32.808	47.244	29.528		
60.367	26.247	76.115	24.606	91.864	24.606	95.144	25.089	104.987	26.535		
114.173	27.887	131.234	28.314	179.79	29.528	196.85	31.168	203.412	32.808		
219.16	36.089	234.908	39.37	241.47	42.651	248.031	45.932	254.593	49.213		
262.467	52.493										

Manning's n Values		num= 3		Sta		n Val	
Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.03	60.367	.03	104.987	.03		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
	60.367	104.987		66	66	.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)		31.93	Element	Left OB	Channel	Right OB
Vel Head (ft)		0.18	Wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)		31.76	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)			Flow Area (sq ft)	63.71	293.52	266.63
E.G. Slope (ft/ft)		0.000512	Area (sq ft)	63.71	293.52	266.63
Q Total (cfs)		1880.00	Flow (cfs)	132.07	1151.15	596.78
Top Width (ft)		163.56	Top Width (ft)	24.72	44.62	94.22
Vel Total (ft/s)		3.01	Avg. Vel. (ft/s)	2.07	3.92	2.24
Max Chl Dpth (ft)		7.15	Hydr. Depth (ft)	2.58	6.58	2.83
Conv. Total (cfs)		83075.5	Conv. (cfs)	5835.9	50868.4	26371.1
Length Wtd. (ft)		66.00	wetted Per. (ft)	25.34	44.85	94.49

encinas_proposed.rep.txt

Min Ch El (ft)	24.61	Shear (lb/sq ft)	0.08	0.21	0.09
Alpha	1.25	Stream Power (lb/ft s)	0.17	0.82	0.20
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.48	2.97	0.88
C & E Loss (ft)	0.00	Cum SA (acres)	0.16	0.50	0.30

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2546

INPUT
 Description:
 Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	7.874	42.651	17.06	39.37	28.871	32.808	41.995	29.528
65.617	26.247	76.115	24.606	86.614	24.606	104.987	24.606	108.268	25.778
114.173	27.887	131.234	28.409	167.979	29.528	181.102	31.168	185.039	32.808
192.913	34.449	204.724	36.089	215.223	39.37	223.097	42.651	230.971	45.932
236.22	49.213	244.094	52.493						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	65.617	.03	108.268	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	65.617	108.268		59	59		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	wt. n-val.	0.030	0.030	0.030
W.S. Elev (ft)	31.71	Reach Len. (ft)	59.00	59.00	59.00
Crit W.S. (ft)		Flow Area (sq ft)	99.84	292.48	208.57
E.G. Slope (ft/ft)	0.000515	Area (sq ft)	99.84	292.48	208.57
Q Total (cfs)	1880.00	Flow (cfs)	235.36	1180.10	464.54
Top Width (ft)	149.14	Top Width (ft)	32.35	42.65	74.14
Vel Total (ft/s)	3.13	Avg. Vel. (ft/s)	2.36	4.03	2.23
Max Chl Dpth (ft)	7.10	Hydr. Depth (ft)	3.09	6.86	2.81
Conv. Total (cfs)	82872.9	Conv. (cfs)	10375.2	52020.3	20477.4
Length Wtd. (ft)	59.00	Wetted Per. (ft)	32.85	42.98	74.74
Min Ch El (ft)	24.61	Shear (lb/sq ft)	0.10	0.22	0.09
Alpha	1.24	Stream Power (lb/ft s)	0.23	0.88	0.20
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.36	2.52	0.52
C & E Loss (ft)	0.00	Cum SA (acres)	0.11	0.43	0.17

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2486

INPUT
 Description:
 Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	47.572	6.562	42.651	22.31	39.37	30.184	36.089	41.995	32.808
51.181	29.528	61.68	27.887	72.178	26.247	77.428	24.278	81.365	24.278
102.362	24.278	110.236	26.247	135.171	27.887	141.732	29.528	150.919	29.528
161.417	29.528	171.916	31.168	174.541	32.808	185.039	36.089	195.538	39.37
203.412	42.651	213.911	45.932	223.097	49.213	229.659	52.493		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.03	72.178	.03	110.236	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	72.178	110.236		46	46		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	wt. n-val.	0.030	0.030	0.030
W.S. Elev (ft)	31.63	Reach Len. (ft)	46.00	46.00	46.00
Crit W.S. (ft)		Flow Area (sq ft)	84.84	266.97	188.11
E.G. Slope (ft/ft)	0.000609	Area (sq ft)	84.84	266.97	188.11
Q Total (cfs)	1880.00	Flow (cfs)	219.68	1183.30	477.02
Top Width (ft)	127.37	Top Width (ft)	26.89	38.06	62.42
Vel Total (ft/s)	3.48	Avg. Vel. (ft/s)	2.59	4.43	2.54
Max Chl Dpth (ft)	7.35	Hydr. Depth (ft)	3.15	7.01	3.01
Conv. Total (cfs)	76188.4	Conv. (cfs)	8902.6	47954.1	19331.7
Length Wtd. (ft)	46.00	Wetted Per. (ft)	27.51	38.66	62.94
Min Ch El (ft)	24.28	Shear (lb/sq ft)	0.12	0.26	0.11
Alpha	1.22	Stream Power (lb/ft s)	0.30	1.16	0.29
Frctn Loss (ft)	0.02	Cum Volume (acre-ft)	0.23	2.15	0.25
C & E Loss (ft)	0.02	Cum SA (acres)	0.07	0.38	0.08

CROSS SECTION

encinas_proposed.rep.txt

RIVER: Encinas Creek
 REACH: Existing RS: 2440

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	42.651	10.499	39.37	19.685
127.297	27.887	153.543	26.247	158.793
199.475	26.247	219.16	27.887	233.596
275.591	39.37	284.777	42.651	305.774

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	153.543	.03
		199.475	.03

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	153.543	199.475		20	20	20		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.81	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.66	Reach Len. (ft)	20.00	20.00	20.00
Crit W.S. (ft)		Flow Area (sq ft)	203.21	303.04	146.82
E.G. Slope (ft/ft)	0.000435	Area (sq ft)	203.21	303.04	146.82
Q Total (cfs)	1880.00	Flow (cfs)	462.59	1094.55	322.86
Top Width (ft)	154.69	Top width (ft)	61.83	45.93	46.93
Vel Total (ft/s)	2.88	Avg. Vel. (ft/s)	2.28	3.61	2.20
Max Chl Dpth (ft)	7.39	Hydr. Depth (ft)	3.29	6.60	3.13
Conv. Total (cfs)	90139.7	Conv. (cfs)	22179.5	52479.9	15480.2
Length wtd. (ft)	20.00	wetted Per. (ft)	62.12	46.35	47.27
Min Ch El (ft)	24.28	Shear (lb/sq ft)	0.09	0.18	0.08
Alpha	1.17	Stream Power (lb/ft s)	0.20	0.64	0.19
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.08	1.84	0.07
C & E Loss (ft)	0.03	Cum SA (acres)	0.02	0.33	0.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2422

INPUT

Description:

Station	Elevation	Data	num=	19
Sta	Elev	Sta	Elev	Sta
0	45.932	10.499	42.651	28.871
65.617	29.528	101.05	26.247	161.417
229.659	25.358	241.47	27.887	267.717
307.087	39.37	316.273	42.651	330.709

Manning's n	Values	num=	3
Sta	n Val	Sta	n Val
0	.03	101.05	.03
		229.659	.03

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
	101.05	229.659		1	1	1		.1	.3

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.78	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	wt. n-Val.	0.030	0.030	0.030
W.S. Elev (ft)	31.74	Reach Len. (ft)	1.00	1.00	1.00
Crit W.S. (ft)		Flow Area (sq ft)	146.15	927.50	155.53
E.G. Slope (ft/ft)	0.000086	Area (sq ft)	146.15	927.50	155.53
Q Total (cfs)	1880.00	Flow (cfs)	147.62	1585.65	146.73
Top Width (ft)	225.08	Top width (ft)	44.27	128.61	52.20
Vel Total (ft/s)	1.53	Avg. Vel. (ft/s)	1.01	1.71	0.94
Max Chl Dpth (ft)	7.79	Hydr. Depth (ft)	3.30	7.21	2.98
Conv. Total (cfs)	203110.3	Conv. (cfs)	15948.4	171309.7	15852.3
Length wtd. (ft)	1.00	wetted Per. (ft)	44.69	128.80	52.69
Min Ch El (ft)	23.95	Shear (lb/sq ft)	0.02	0.04	0.02
Alpha	1.12	Stream Power (lb/ft s)	0.02	0.07	0.01
Frctn Loss (ft)	0.00	Cum Volume (acre-ft)	0.00	1.56	0.00
C & E Loss (ft)	0.17	Cum SA (acres)	0.00	0.29	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2421

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	32.972	0	23.95	30	23.95	30	32.972	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
0	30	304	304	304	304	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	31.61	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.74	wt. n-Val.		0.015	
W.S. Elev (ft)	29.86	Reach Len. (ft)	304.00	304.00	304.00
Crit W.S. (ft)	28.90	Flow Area (sq ft)		177.35	
E.G. Slope (ft/ft)	0.001668	Area (sq ft)		177.35	
Q Total (cfs)	1880.00	Flow (cfs)		1880.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	10.60	Avg. Vel. (ft/s)		10.60	
Max Chl Dpth (ft)	5.91	Hydr. Depth (ft)		5.91	
Conv. Total (cfs)	46028.0	Conv. (cfs)		46028.0	
Length Wtd. (ft)	304.00	Wetted Per. (ft)		41.82	
Min Ch El (ft)	23.95	Shear (lb/sq ft)		0.44	
Alpha	1.00	Stream Power (lb/ft s)		4.68	
Frctn Loss (ft)		Cum Volume (acre-ft)		1.55	
C & E Loss (ft)		Cum SA (acres)		0.29	

CULVERT

RIVER: Encinas Creek
 REACH: Existing RS: 2145

INPUT

Description:

Distance from Upstream XS = 23
 Deck/Roadway Width = 256
 Weir Coefficient = 2.61
 Upstream Deck/Roadway Coordinates

num=	2	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	50.853	50.853	32.808	50.853	50.853						

Upstream Bridge Cross Section Data

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	32.972	0	23.95	30	23.95	30	32.972	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015	30	.015

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
0	30	30	.1	.3	

Downstream Deck/Roadway Coordinates

num=	2	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	50.853	50.853	32.808	50.853	50.853						

Downstream Bridge Cross Section Data

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	30.512	0	21.49	30	21.49	30	30.512	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015	30	.015

Bank Sta:	Left	Right	Coeff	Contr.	Expan.
0	30	30	.1	.3	

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
 Downstream Embankment side slope = 0 horiz. to 1.0 vertical
 Maximum allowable submergence for weir flow = .95
 Elevation at which weir flow begins =
 Energy head used in spillway design =
 Spillway height used in design =
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
 Culvert #1 Box 5 10
 FHWA Chart # 57- Rectangular
 FHWA Scale # 1 - Tapered inlet throat
 Solution Criteria = Inlet control
 Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef
 0 282 .013 .013 0 .5 1
 Number of Barrels = 3
 Upstream Elevation = 23.95
 Centerline Stations
 Sta. Sta. Sta.
 5 15 25
 Downstream Elevation = 21.49
 Centerline Stations
 Sta. Sta. Sta.
 5 15 25

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (cfs)	1880.00	Culv Full Len (ft)	252.25
# Barrels	3	Culv Vel US (ft/s)	12.53
Q Barrel (cfs)	626.67	Culv Vel DS (ft/s)	12.53
E.G. US. (ft)	31.61	Culv Inv El Up (ft)	23.95
W.S. US. (ft)	29.86	Culv Inv El Dn (ft)	21.49
E.G. DS (ft)	29.01	Culv Frctn Ls (ft)	2.38
W.S. DS (ft)	26.49	Culv Exit Loss (ft)	
Delta EG (ft)	2.60	Culv Entr Loss (ft)	1.22
Delta WS (ft)	3.38	Q Weir (cfs)	
E.G. IC (ft)	31.61	Weir Sta Lft (ft)	
E.G. OC (ft)	31.94	Weir Sta Rgt (ft)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (ft)	28.95	Weir Max Depth (ft)	
Culv WS Outlet (ft)	26.57	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.59	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.96	Min El Weir Flow (ft)	50.86

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

Warning: The inlet is submerged and the outlet computations indicate that the culvert would flow full over all or part of its length. The program would normally default to the outlet answer. However, the user has requested that the inlet answer be used.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2119

INPUT Description:

Station	Elevation	Data	num=	4	Elev	Sta	Elev
0	30.512	0	Elev	21.49	30	21.49	30 30.512

Manning's n	Values	num=	3	n Val	Sta	n Val
0	.015	0	.015	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.	Expan.
0	30	66	66	66	.1	.3	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	29.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	Wt. n-Val.		0.015	
W.S. Elev (ft)	26.49	Reach Len. (ft)	66.00	66.00	66.00
Crit W.S. (ft)	26.49	Flow Area (sq ft)		149.88	
E.G. Slope (ft/ft)	0.002843	Area (sq ft)		149.88	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.74	Avg. Vel. (ft/s)		12.74	
Max Chl Dpth (ft)	5.00	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	35823.0	Conv. (cfs)		35823.0	
Length Wtd. (ft)	66.00	wetted Per. (ft)		39.99	
Min Ch El (ft)	21.49	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		8.48	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)		0.41	
C & E Loss (ft)	0.00	Cum SA (acres)		0.08	

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2053

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	30.348	0	20.505	30	20.505	30	30.348	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
0	30	52.5	52.5	52.5	.1	.3			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	28.02	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	wt. n-Val.		0.015	
W.S. Elev (ft)	25.50	Reach Len. (ft)	52.50	52.50	52.50
Crit W.S. (ft)	25.50	Flow Area (sq ft)		149.90	
E.G. Slope (ft/ft)	0.002842	Area (sq ft)		149.90	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.74	Avg. Vel. (ft/s)		12.74	
Max Chl Dpth (ft)	5.00	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	35828.9	Conv. (cfs)		35828.9	
Length Wtd. (ft)	52.50	wetted Per. (ft)		39.99	
Min Ch El (ft)	20.51	Shear (lb/sq ft)		0.66	
Alpha	1.00	Stream Power (lb/ft s)		8.47	
Frctn Loss (ft)	0.15	Cum Volume (acre-ft)		0.18	
C & E Loss (ft)	0.00	Cum SA (acres)		0.04	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
 Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
 Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Encinas Creek
 REACH: Existing RS: 2001

INPUT

Description:

Station	Elevation	Data	num=	4	Sta	Elev	Sta	Elev
0	29.528	0	18.865	30	18.865	30	29.528	

Manning's n	Values	num=	3	Sta	n Val	Sta	n Val
0	.015	0	.015	30	.015	30	.015

Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff	Contr.	Expan.
0	30	0	0	0	.1	.3			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (ft)	26.38	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.52	wt. n-Val.		0.015	
W.S. Elev (ft)	23.86	Reach Len. (ft)			
Crit W.S. (ft)	23.86	Flow Area (sq ft)		149.82	
E.G. Slope (ft/ft)	0.002846	Area (sq ft)		149.82	
Q Total (cfs)	1910.00	Flow (cfs)		1910.00	
Top Width (ft)	30.00	Top Width (ft)		30.00	
Vel Total (ft/s)	12.75	Avg. Vel. (ft/s)		12.75	
Max Chl Dpth (ft)	4.99	Hydr. Depth (ft)		4.99	
Conv. Total (cfs)	35800.4	Conv. (cfs)		35800.4	
Length Wtd. (ft)		wetted Per. (ft)		39.99	
Min Ch El (ft)	18.87	Shear (lb/sq ft)		0.67	
Alpha	1.00	Stream Power (lb/ft s)		8.49	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River: Encinas Creek

Reach	River Sta.	n1	n2	n3
-------	------------	----	----	----

			encinas_proposed.rep.txt	
Existing	2752	.03	.03	.03
Existing	2709	.03	.03	.03
Existing	2657	.03	.03	.03
Existing	2611	.03	.03	.03
Existing	2546	.03	.03	.03
Existing	2486	.03	.03	.03
Existing	2440	.03	.03	.03
Existing	2422	.03	.03	.03
Existing	2421	.015	.015	.015
Existing	2145	Culvert		
Existing	2119	.015	.015	.015
Existing	2053	.015	.015	.015
Existing	2001	.015	.015	.015

SUMMARY OF REACH LENGTHS

River: Encinas Creek

Reach	River Sta.	Left	Channel	Right
Existing	2752	43	43	43
Existing	2709	52.5	52.5	52.5
Existing	2657	46	46	46
Existing	2611	66	66	66
Existing	2546	59	59	59
Existing	2486	46	46	46
Existing	2440	20	20	20
Existing	2422	1	1	1
Existing	2421	304	304	304
Existing	2145	Culvert		
Existing	2119	66	66	66
Existing	2053	52.5	52.5	52.5
Existing	2001	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Encinas Creek

Reach	River Sta.	Contr.	Expan.
Existing	2752	.1	.3
Existing	2709	.1	.3
Existing	2657	.1	.3
Existing	2611	.1	.3
Existing	2546	.1	.3
Existing	2486	.1	.3
Existing	2440	.1	.3
Existing	2422	.1	.3
Existing	2421	.1	.3
Existing	2145	Culvert	
Existing	2119	.1	.3
Existing	2053	.1	.3
Existing	2001	.1	.3

ERRORS WARNINGS AND NOTES

Errors Warnings and Notes for Plan : Plan 03

River: Encinas Creek Reach: Existing RS: 2752 Profile: 100-yr

warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

warning:Divided flow computed for this cross-section.

warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2709 Profile: 100-yr

warning:The energy equation could not be balanced within the specified number of iterations. The program selected the water

surface that had the least amount of error between computed and assumed values.

warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

warning:During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated

water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2657 Profile: 100-yr

warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2440 Profile: 100-yr

encinas_proposed.rep.txt

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2422 Profile: 100-yr

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

River: Encinas Creek Reach: Existing RS: 2145 Profile: 100-yr Culv: Culvert #1

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

Warning: The inlet is submerged and the outlet computations indicate that the culvert would flow full over all or part of its length. The program would normally default to the outlet answer. However, the user has requested that the inlet answer be used.

River: Encinas Creek Reach: Existing RS: 2119 Profile: 100-yr

Warning: The energy equation could not be balanced within the specified number of iterations. The program selected the water surface that had the least amount of error between computed and assumed values.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

River: Encinas Creek Reach: Existing RS: 2053 Profile: 100-yr

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m) between the current and previous cross section. This may indicate the need for additional cross sections.

Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

APPENDIX 'C'

Location Hydraulic Study Form

Floodplain Encroachment Form

As-builts

LOCATION HYDRAULIC STUDY FORM

Dist. 11 Co. SD Rte. 5 P.M. 46.60
EA 11-235800 Bridge No. 57-687

Floodplain Description:

A single long and narrow heavily vegetated and channelized creek with a triple 10' x 5' box culvert under Interstate 5.

Location of Interest: I-5 / Encinas Creek crossing.

1. Description of Proposal (include any physical barriers i.e. concrete barriers, soundwalls, etc. and design elements to minimize floodplain impacts)

This project will have minimal encroachment into the 100-year floodplain with a fill slope. The existing triple box culvert will be extended to accommodate the proposed fill slope, associated with the freeway widening allowing for the continuous flow of Encinas Creek.

2. ADT: Current 207,000 Projected: 274,000 (year 2030)
(Current and Projected ADT values taken from SANDAG: Transportation Forecast Information Center)

3. Hydraulic Data: Base Flood $Q_{100} =$ 53.2 m^3 / s

$WSE_{100} =$ 10.0 m (~10m upstream of I-5 culvert)

The flood of record, if greater than Q_{100} :

$Q =$ N/A m^3 / s $WSE =$ N/A

Overtopping flood $Q =$ N/A m^3 / s

$WSE =$ N/A

Are NFIP maps and studies available? YES _____ NO X

4. Is the highway location alternative within a regulatory floodway ?

YES _____ NO X

5. Attach map with flood limits outlined showing all buildings or other improvements within the base floodplain.

Potential Q_{100} backwater damages:

A. Residences?	NO <u>X</u>	YES _____
B. Other Bldgs?	NO <u>X</u>	YES _____
C. Crops?	NO <u>X</u>	YES _____
D. Natural and beneficial Floodplain values?	NO <u>X</u>	YES _____

6. Type of Traffic:

- A. Emergency supply or evacuation route? NO _____ YES X
B. Emergency vehicle access? NO _____ YES X
C. Practicable detour available? NO _____ YES X
D. School bus or mail route? NO _____ YES X

7. Estimated duration of traffic interruption for 100-year event hours: 0

8. Estimated value of Q₁₀₀ flood damages (if any) – moderate risk level.

- A. Roadway \$ 0
B. Property \$ 0
Total \$ 0

9. Assessment of Level of Risk Low X
Moderate _____
High _____

For High Risk projects, during design phase, additional Design Study Risk Analysis may be necessary to determine design alternative.

Signature – Dist. Hydraulic Engineer _____ Date _____
(Item numbers 3,4,5,7,9)

Is there any longitudinal encroachment, significant encroachment, or any support of incompatible

Floodplain development? NO X YES _____

If yes, provide evaluation and discussion of practicability of alternatives in accordance with 23 CFR 650.113

Information developed to comply with the Federal requirement for the Location Hydraulic Study shall be retained in the project files.

Signature – Dist. Project Engineer _____ Date _____
(Item numbers 1,2,6,8)

SUMMARY FLOODPLAIN ENCROACHMENT REPORT

Dist.: **11** Co.: **SD** Rte.: **5** P.M: **46.60**
Project No.: **11-235800** Bridge No. **57-687**
Limits: **I-5 / Encinas Creek**

Floodplain Description: **A single long and narrow heavily vegetated and channelized creek with a triple 10' x 5' box culvert at Interstate 5.**

- | | No | Yes |
|---|----------|----------|
| 1. Is the proposed action a longitudinal encroachment of the base floodplain? | <u>X</u> | — |
| 2. Are the risks associated with the implementation of the proposed action significant? | <u>X</u> | — |
| 3. Will the proposed action support probable incompatible floodplain development? | <u>X</u> | — |
| 4. Are there any significant impacts on natural and beneficial floodplain values? | <u>X</u> | — |
| 5. Routine construction procedures are required to minimize impacts on the floodplain. Are there any special mitigation measures necessary to minimize impacts or restore and preserve natural and beneficial floodplain values? If yes, explain. | <u>X</u> | — |
| 6. Does the proposed action constitute a significant floodplain encroachment as defined in 23 CFR, Section 650.105(q). | <u>X</u> | — |
| 7. Are Location Hydraulic Studies that document the above answers on file? If not explain. | — | <u>X</u> |

PREPARED BY:

Signature - Dist. Hydraulic Engineer

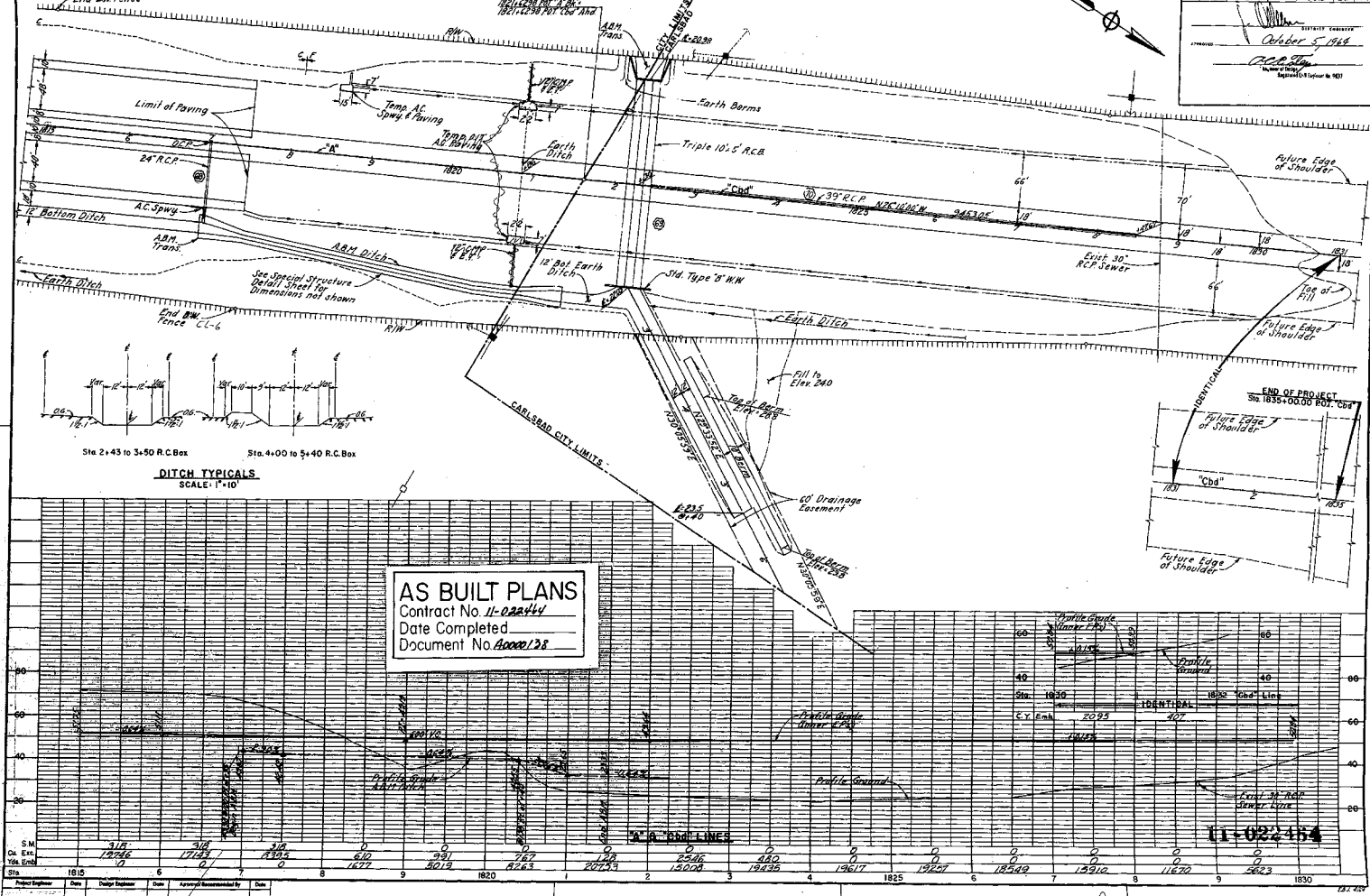
Date

Signature - Dist. Environmental Branch Chief

Date

Signature - Dist. Project Engineer

Date



AS BUILT PLANS
Contract No. 11-022464
Date Completed
Document No. 11-022464-0060

