US Army Corps
of Engineers
Los Angeles District
South Pacific Division

Tres Rios, Arizona
Feasibility Study

TECHNICAL APPENDICES
Feasibility Report
April 2000

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APPENDICES

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Appendix A: Hydrology

GILA RIVER BASIN
ARIZONA

APPENDIX A

SURFACE WATER HYDROLOGY FOR SALT AND GILA RIVERS IN VICINITY OF TRES RIOS STUDY AREA

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
MAY 1999

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INTRODUCTION

The information presented in this appendix is limited to surface water hydrology of the Salt River and Gila River (including tributary flow) within the study area. This information is provided to support hydraulic analysis, and design of project features necessary to protect proposed projects from damage resulting from mainstem flood flows.

The basis for development of the surface water hydrology presented within this appendix are three recently completed studies of the Salt River (reference 1), the Gila River (reference 2), and the Agua Fria (reference 3) - hence ***Tres Rios***.

Included in this appendix are 100-year flood hydrographs for the Salt and Gila Rivers in the study area as well as historical flood hydrographs. Each of these hydrographs represents what would have happened or what would be expected to happen (in the case of the *synthetic* floods) under ***existing conditions***.

In addition, applicable discharge-frequency and volume-frequency (flow-duration-frequency) relationships developed within References 1-3, are summarized and presented in tabular form within this appendix.

Finally, basic data for historical flood hydrographs are included in this appendix in an abbreviated format.

STUDY AREA

The Tres Rios study area is in Maricopa County and extends west from 75th Avenue in the City of Phoenix to the Buckeye Diversion Ditch at the confluence of the Agua Fria River with the Gila River, and from Southern Boulevard at the northern boundary to Baseline Road and the Gila River Indian Community. The Salt River bisects the county in an east-west direction. The study area is approximately 9.2 miles long and 1 mile wide, and encompasses 5,600 acres (City of Phoenix 1997). The location is near the confluence of three rivers - the Salt River, the Gila River and the Agua Fria River; the Salt River flows into the Gila River just upstream of the 115th Avenue crossing; and the Agua Fria River flows into the Gila River near the downstream end of the study area. Plate 1 presents the Gila River drainage area along with the Study Area location.

The general area is characterized by a broad alluvial valley surrounded by steeply sloped mountain ranges that rise several thousand feet above the valley floors. The subbasin is bounded on the south by the Sierra Estrella, the South Mountains, and the Buckeye Hills; on the west by the White Tanks Mountains; and on the north by the Wickenberg, Hieroglyphic, and New River Mountains (City of Phoenix 1997).

The proposed Tres Rios project activities will occur mostly within the river floodplain. However, the study area encompasses terrestrial lands north and south of the Gila and Salt Rivers. The surrounding land is relatively flat and rural. The general land uses in the study area consist of rural residential, agricultural and agribusiness, light industry, wastewater treatment facilities, public and semipublic areas, and vacant land.

GILA RIVER DRAINAGE AREA

GILA RIVER

The drainage area of the Gila River (Plate 1) covers approximately 58,000 sq. mi. and extends from the Continental Divide in southwestern New Mexico to the Colorado River at Yuma, Arizona, including practically all the southern half of the State of Arizona. The Gila River, which is 654 miles long, rises in an area of high mountains and plateaus and flows westward in a generally central course through the basin. The Gila River includes the following major tributaries:

- the Salt and Verde Rivers, combined drainage area of 13,000 sq. mi.
- the Santa Cruz River, drainage area of 8,600 sq. mi.
- the San Pedro River, drainage area of 4,500 sq. mi.
- the San Francisco River, drainage area of 2,800 sq. mi.
- the San Simon River, drainage area of 2,200 sq. mi.
- the Agua Fria River, drainage area of 2,000 sq. mi.
- the Centennial Wash, drainage area of 1,800 sq. mi.
- the San Carlos River, drainage area of 1,027 sq.mi.
- others, including Queen Creek, the Hassayampa River, and Waterman Wash.

Elevations in the basin range from more than 12,000 feet in the San Francisco Peaks in the Verde River basin, to 130 feet in the vicinity of Yuma. Much of the northern part of the basin is extremely irregular and rugged with elevations ranging from 7,000 feet to 12,000 feet along the basin boundaries. Most of the streamflow in the study area emanates from the Salt River, which joins the Gila River at mile 198, west of the City of Phoenix. The eastern half of the southern part of the basin consists largely of long desert valleys lying between north-south ranges of rugged mountains; here the elevations are generally lower but in places are above 10,000 feet. The southwest third of the basin consists essentially of broad, flat, low-lying desert valleys and isolated mountains of relatively low relief; comparatively few localities are more than 4,000 feet in elevation, and a large part is below 1,000 feet; the elevation of the river mouth near Yuma is about 130 feet. The major streams are also delineated in Plate 1. The climate of the Gila River Basin is semiarid as a whole, but, depending principally upon elevation, ranges from hot and arid to cool and humid. The average annual precipitation ranges from less than 4 inches in the lower desert to 30 inches or more in the highest mountains. Streamflow characteristics vary considerably throughout the basin. The streams in the southern deserts have very little flow other than immediately after the heavier rains, while the northern and headwater streams are perennial. During major storms streamflow increases rapidly, and in combination with steep gradients and often-barren slopes, results in major floods. Snowmelt is a contributing factor in most winter floods.

Within the Gila River Basin are numerous dams, but only a few of these will exert an appreciable influence on major floods:

- Modified Theodore Roosevelt Dam on the Salt River, recently modified to increase the total storage (including an added flood pool of 565,000 ac-ft) to 2,100,000 ac-ft.
- Horse Mesa on the Salt River, with a storage of approximately 245,000 ac-ft.
- Mormon Flat on the Salt River, with a storage of approximately 58,000 ac-ft.
- Stewart Mountain on the Salt River, with a storage of approximately 70,000 ac-ft.
- Horseshoe on the Verde River with a storage of approximately 131,000 ac-ft.
- Bartlett on the Verde River with a storage of approximately 178,000 ac-ft.
- Coolidge on the Gila River with a storage of approximately 1,100,000 ac-ft.

Other Structures Affecting Runoff (from the Agua Fria River):

- The Phoenix Projects.

Consist of (please refer to Plate 2) the Arizona Canal Diversion Channel (ACDC), which intercepts runoff from Cave Creek (which is partially controlled by Cave Buttes Dam) and releases from Dreamy Draw Dam;
Adobe Dam on Skunk Creek; and
New River Dam on the New River.

They were constructed in the 1980's, for the purpose of flood control for the Phoenix area. The ACDC flows into Skunk Creek downstream of Adobe Dam. Skunk Creek enters the New River downstream of New River Dam, and New River joins the Agua Fria River downstream of New Waddell Dam. In addition levees have been constructed along the Agua Fria River below the confluence with the New River from Indian School Road south to Buckeye Road on the east bank, and south of Lower Buckeye Road on the west bank.

- McMicken Dam. Located on Trilby Wash, a tributary of the Agua Fria River, discharge from this structure joins with local runoff downstream of New Waddell Dam to enter the Agua Fria River at a point between New Waddell Dam and the confluence with New River. McMicken Dam contains nearly all flows of less than a 100-year magnitude with minimal releases.

- New Waddell Dam. Located immediately downstream of the Waddell Dam on the Agua Fria River, it was built to replace the smaller Waddell Dam to provide water supply, regulatory storage of Central Arizona Project (CAP) water, and recreation. The dam was completed in 1992 by the United States Bureau of Reclamation (USBR). The combination of greatly expanded water supply space (increased from about 150,000 ac-ft to more than 800,000 ac-ft) and surcharge space (approximately 90,000 ac-ft) will limit releases during events less than or equal to the 100-year flood to 9,000 ft^3/s.

SALT RIVER

The Salt River is the largest tributary of the Gila River and drains a total area of approximately 13,700 sq.mi. within the northern and eastern portions of the State of Arizona. The Salt River originates on the eastern portion of the Mogollon Plateau, in the White Mountains, with peaks as high as 11,590 feet (Baldy Peak). Formed by the confluence of two westward flowing streams, the White and Black rivers, the Salt River drains directly into Modified Theodore Roosevelt Lake where it is joined by Tonto Creek. The drainage area controlled by Modified Theodore Roosevelt Dam, which forms the lake, is approximately 5,800 sq. mi. The Salt River Project (SRP) operates four dams on the Salt River upstream of the Verde River confluence, including Modified Theodore Roosevelt Dam. Water stored is allocated for hydropower, municipal and industrial supply, as well as agriculture. In addition, the modifications to Theodore Roosevelt Dam include an allocation for flood control. The total space for water supply storage behind these dams is approximately 1.9 million ac-ft, with an additional 0.56 million ac-ft for flood control.

The Verde River flows south from the Chino Valley, and joins the Salt River upstream of the cities of Mesa, Tempe, and Phoenix. The Verde drains approximately 6,700 sq.mi. and is partially controlled by two water supply structures operated by SRP. Horseshoe Dam (the most upstream structure) and Bartlett Dam (approximately 25 mi. upstream of the confluence with the Salt River) provide an additional water supply space of approximately 310,000 ac-ft. The Verde River is the principal tributary of the Salt River. Sycamore Creek (which drains 164 sq.mi) enters the Verde River downstream of Bartlett Dam, and is thus the largest uncontrolled tributary of the Verde River and Salt River.

Granite Reef Diversion Dam is located about 3 mi. downstream of the Salt-Verde confluence, and is the most downstream SRP dam. The purpose of this facility is to divert upstream reservoir releases into the Arizona Canal (for the area north of the Salt River), and the South Canal (for the area south of the Salt River). Only during periods of high flows does water pass over the dam and continue down the Salt River. Studies conducted during the reference 1 hydrologic investigation to develop a water control plan for Modified Theodore Roosevelt indicated that since 1889 there would have been 34 years (out of 105) during which water would have spilled over Granite Reef Diversion Dam, if the current configuration, including Modified Theodore Roosevelt Dam, would have been in place. The resulting frequency of spills is approximately once every 3 years, on the average. During most years there is little runoff in the river below Granite Reef Diversion Dam. When water is spilled over Granite Reef Diversion Dam, the flow is typically sustained for several days or more, and of significant magnitude. For example, the "median" simulated spill, had a peak discharge of 28,000 ft^3/s, a 5-day average flow rate of 15,000 ft^3/s, and a 10-day average flow rate of 10,000 ft^3/s.

AGUA FRIA RIVER

The Agua Fria River originates in the mountains of central Arizona near Prescott and flows south

more than 100 miles before emptying into the Gila River 15 miles west of Phoenix (Fig. 1). Elevations in the watershed range from over 7,000 feet for the highest peaks to about 1,600 feet at New Waddell Dam. The dam is located in the Hieroglyphic Mountains 35 miles northwest of Phoenix and controls the uppermost 1,459 sq.mi. of the total 2,250 sq.mi Agua Fria River drainage area. Construction of New Waddell Dam replaced the pre-existing Waddell Dam. From New Waddell Dam the Agua Fria River flows south to the Gila River at a point just downstream of the Salt River and Gila River confluence, with 2 main tributaries, McMicken Dam-Trilby Wash entering from the west and the New River from the east. Discharge from McMicken Dam, New River Dam, Adobe Dam, and Dreamy Draw Dam, as well as Skunk Creek, ACDC, and Cave Creek (downstream of Cave Buttes Dam), which are located in Phoenix, contribute flow to the Agua Fria River downstream of New Waddell Dam. Although some of the contributing area is developed, a majority of it, especially that portion upstream of the New River confluence, is not.

RUNOFF

STREAMFLOW RECORDS

The only currently operating streamgages which measure runoff in the vicinity of the study area are the Salt River at Priest Drive near Phoenix, Arizona, which measures inflow from the area upstream of the study area (established in December 1993), and the Gila River at Estrella Parkway, near Goodyear, Arizona, which measures outflow from the study area (established in August 1992).

There are numerous other gaging stations upstream of the study reach which were utilized to develop historical and synthetic flood flows for the study area. At some of these gaging stations or their vicinity, streamflow record is available from August 1888. Discharge- frequency relationships developed for flow in the Salt River are based on a record length of 105 years. Similarly, historical information, as available, was used to develop discharge-frequency relationships for the Gila River and the Agua Fria River. The development of discharge-frequency relationships for each of these rivers is discussed in depth in reference 1 through 3.

FLOOD HISTORY

Since completion of the Salt River Project in the 1940's (several subsequent modifications have been made afterward, including the recent raising of the existing Roosevelt Dam which was completed in 1996) significant flows in the study area have occurred in December 1965-January 1966, March-May 1973, March 1978, December 1978-April 1979, February 1980, February-May 1983, October 1983, December 1984-March 1985 , and February-April 1992, January-April 1993, and February 1995. Information on these historical events and others are included in the references.

DISCHARGE-FREQUENCY ANALYSIS

GENERAL

Peak discharge-frequency relationships presented in this report for the Salt and Gila Rivers in the vicinity of the Tres Rios Project were developed in studies documented in reference 1 and are presented in Table 1. Gila River duration-frequency information (volume-frequency) was developed in reference 2, and, although that study did not fully utilize the most recent upstream analysis, is reasonably consistent with those results. A comparison of peak discharge-frequency relationships developed within each of those studies for the Gila River below the Salt River confluence is shown in Table 2.

Discharge frequency relationships for the Agua Fria River above the Gila River are also presented in Table 1. They represent present (1995) conditions with the New Waddell Dam in place and being operated as described in Appendix C of the reference 3 report. No duration-frequency data was developed for that location within that study. Based upon operating criteria provided by the United States Bureau of Reclamation, the determination was been made that New Waddell Dam will store most of the runoff generated by the Agua Fria River upstream of the dam, reducing the volume and peak of flood flows in the river below the dam. The extent of that reduction is dependent upon the operation of the CAP system, the runoff from the basin upstream of the dam, and the operation of the dam itself. Remaining flood flows in the Agua Fria River below New Waddell Dam would generally result from locally severe thunderstorm type of events centered over downstream portions of the Agua Fria River basin or its tributaries. As a consequence, runoff from the Agua Fria River is not expected to add significantly to flood flows from the Salt and/or Gila Rivers, which typically are produced by general winter or summer events.

VOLUME-FREQUENCY ANALYSIS

Due to the magnitude of inflows to the SRP reservoirs, spills over Granite Reef Diversion Dam are expected to occur about once every three years on the average, based upon a period-of-record simulation of inflow (ref. 1). During some of the years when spills occur, sustained flow in the Salt and Gila Rivers will result, which might damage or destroy the restored habitat.

Because of the duration of the 1993 floods in the Salt and Gila Rivers, it became apparent that long duration flows are critical in determining the releases to the Salt River as well as the resulting streamflow in the Gila River. During the initial phase of the Section 7 Study for developing a flood control regulation plan for Modified Roosevelt Dam (ref. 1), duration relationships for 30-, 60-, and 90-days were developed. The resulting set of volume-frequency relationships was then used in the evaluation of water control plans for the regulation of the flood pool at Modified Roosevelt Dam (reference 1), as well as for determining with- and without-project discharge-frequency relationships within the Gila River Reconnaissance Study (ref. 2).

Because these studies were conducted out-of-phase[1], different procedures were used to develop volume-frequency relationships and synthetic flood hydrographs. Those procedures were documented within each report. Duration-frequency relationships for the Salt and Gila Rivers in the Tres Rios vicinity are presented in Table 3.

SYNTHETIC FLOOD INFLOWS

To assist in the analysis of alternative Water Control Plans for Modified Theodore Roosevelt Dam (ref. 1) and in the evaluation of Painted Rock Dam alternatives (ref. 2), synthetic flood hydrographs for a range of frequencies were developed. These synthetic flood hydrographs (or Balanced Flood Hydrographs) maintain the characteristics of the volume-frequency relationships developed for the Salt (ref. 1) and Gila Rivers (ref. 2), e.g. the 100-year flood hydrographs include the 100-year average flow for each duration. Figures 1 and 2 display 100-year synthetic flood hydrographs for the Salt and Gila Rivers developed in these studies.

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[1] The Salt River analysis was completed in 1996, while the downstream Gila River analysis was completed in 1994 (references 1 and 2, respectively). Both studies presented discharge-frequency values for the Gila River in the vicinity of the study area. However, hydrographs for the Gila River were only developed during the reference 2 study. As a consequence of the timing of these studies, the discharge-frequency values presented in the earlier study (ref. 2) were modified somewhat during the latter study (ref. 1). Hydrographs for the Gila River presented within this report were developed during the reference 2 study, and are considered as "adequate" for use in hydraulic analyses. The hydrographs for the Salt River presented within this report were developed during the reference 1 study, and represent the "best" information available.

REFERENCES

1. "Section 7 Study for Modified Roosevelt Dam, Arizona (Theodore Roosevelt Dam), Hydrologic Evaluation of Water Control Plans, Salt River Project to Gila River at Gillespie Dam", U.S. Army Corps of Engineers, Los Angeles District, March 1996.

2. "Gila River Reconnaissance Study, Gillespie Dam to Yuma, Arizona, Hydrologic Analysis, with and Without Project", U.S. Army Corps of Engineers, Los Angeles District, October 1994.

3. "Agua Fria River Study, New Waddell Dam to Gila River Confluence, Arizona, Hydrologic Evaluation of Impacts of New Waddell Dam on Downstream Peak Discharges in the Agua Fria River, U.S. Army Corps of Engineers, Los Angeles District, July 1995.

TABLE 1. PEAK DISCHARGE-FREQUENCY VALUES IN STUDY AREA VICINITY

DRAINAGE AREA, sq.mi.	RETURN PERIOD						
	500-YR	200-YR	100-YR	50-YR	20-YR	10-YR	5-YR
SALT RIVER AT 67TH AVENUE							
12,900	237,000	200,000	164,000	132,000	84,000	51,000	20,000
SALT RIVER ABOVE GILA RIVER CONFLUENCE							
13,000	235,000	198,000	162,000	130,000	82,000	49,000	19,500
GILA RIVER BELOW SALT RIVER CONFLUENCE							
39,700	285,000	243,000	227,000	185,000	92,000	57,000	23,500
AGUA FRIA ABOVE GILA RIVER CONFLUENCE							
2,250	110,000	70,000	48,200	35,000	21,000	14,200	9000
GILA RIVER AT WATERMAN WASH							
44,200*	270,000	225,000	210,000	160,000	68,000	460,00	17,000

NOTES:

All discharges shown are in ft^3/s. Source: Reference 1.
Drainage Areas for Salt River exclude non-contributing areas.
* Drainage Area for Gila River at Waterman Wash approximate.

TABLE 2. COMPARISON OF DISCHARGE-FREQUENCY RELATIONSHIPS, GILA RIVER BELOW SALT RIVER CONFLUENCE, REFERENCE 1 VERSUS REFERENCE 2 RESULTS

FREQUENCY (YRS)	PEAK DISCHARGES FOR GILA RIVER BELOW CONFLUENCE WITH SALT RIVER (ft^3/s)	
	MODIFIED ROOSEVELT STUDY (Ref. 1)	GILA RECON STUDY (Ref. 2)
5	23,500	39,200
10	57,000	64,300
20	92,000	92,600
50	185,000	138,000
100	227,000	175,000
200	243,000	221,000
500	285,000	280,000

NOTES:

Reference 1 Results - Based upon simulation of Period-of-Record runoff through SRP system, plus estimated runoff from Gila River for historic/observed flood events. See report for details.

Reference 2 Results - Starting Storage for simulations in SRP system - Roosevelt Dam, 1,609,000 ac-ft.
Other Salt River dams, 90% full
Verde River dams, full

Bartlett Dam release lagged 6 hrs
Local Inflow - 8 % of Roosevelt inflow on Salt, 8 % of Horseshoe inflow on Verde
% of Gila River at Kelvin for the Gila u/s of Salt as follows -

5-yr, 0%
10-yr, 14%
20-yr, 23%
50-yr, 44%
100-yr, 61%
200-yr, 100%
500-yr, 100%

All discharges represent maximum 6-hour values in ft^3/s .

TABLE 3. VOLUME FREQUENCY FLOWS, SALT AND GILA RIVERS

FLOOD FREQUENCY	DURATION							
	1-DAY	2-DAY	3-DAY	5-DAY	10-DAY	30-DAY	60-DAY	90-DAY
5-yr	17,000	15,000	13,000	10,200	8000	2550	1800	1300
	22,300	20,400	18,300	14,700	11,100	5270	3710	2550
10-yr	46,000	40,000	35,000	28,000	17,500	8000	6000	4700
	46,000	44,000	41,700	36,300	25,600	12,700	8840	6390
20-yr	78,000	70,000	62,000	45,000	30,000	15,000	11,000	8400
	66,300	59,600	54,600	47,300	39,900	20,900	14,700	11,100
50-yr	122,000	110,000	94,000	75,000	50,000	26,000	19,000	15,000
	98,200	86,600	75,300	63,000	52,200	34,600	24,600	18,700
100-yr	155,000	145,000	120,000	90,000	70,000	36,000	27,000	21,000
	124,000	109,000	93,700	75,800	61,500	46,000	32,900	25,100
200-yr	185,000	175,000	150,000	115,000	85,000	47,000	34,500	26,500
	161,000	141,000	121,000	97,500	78,600	61,100	44,300	34,100
500-yr	220,000	205,000	178,000	140,000	100,000	60,000	45,000	34,000
	245,000	210,000	177,000	139,000	99,200	73,300	54,500	41,500

NOTES:
For each frequency, the 1st row (shaded) of maximum average discharges is for the Salt River above the Gila River confluence (source: ref. 1), while the 2nd row of maximum average discharges is for the Gila River below the Salt River confluence (source: ref. 2). All discharges listed are in ft^3/s.

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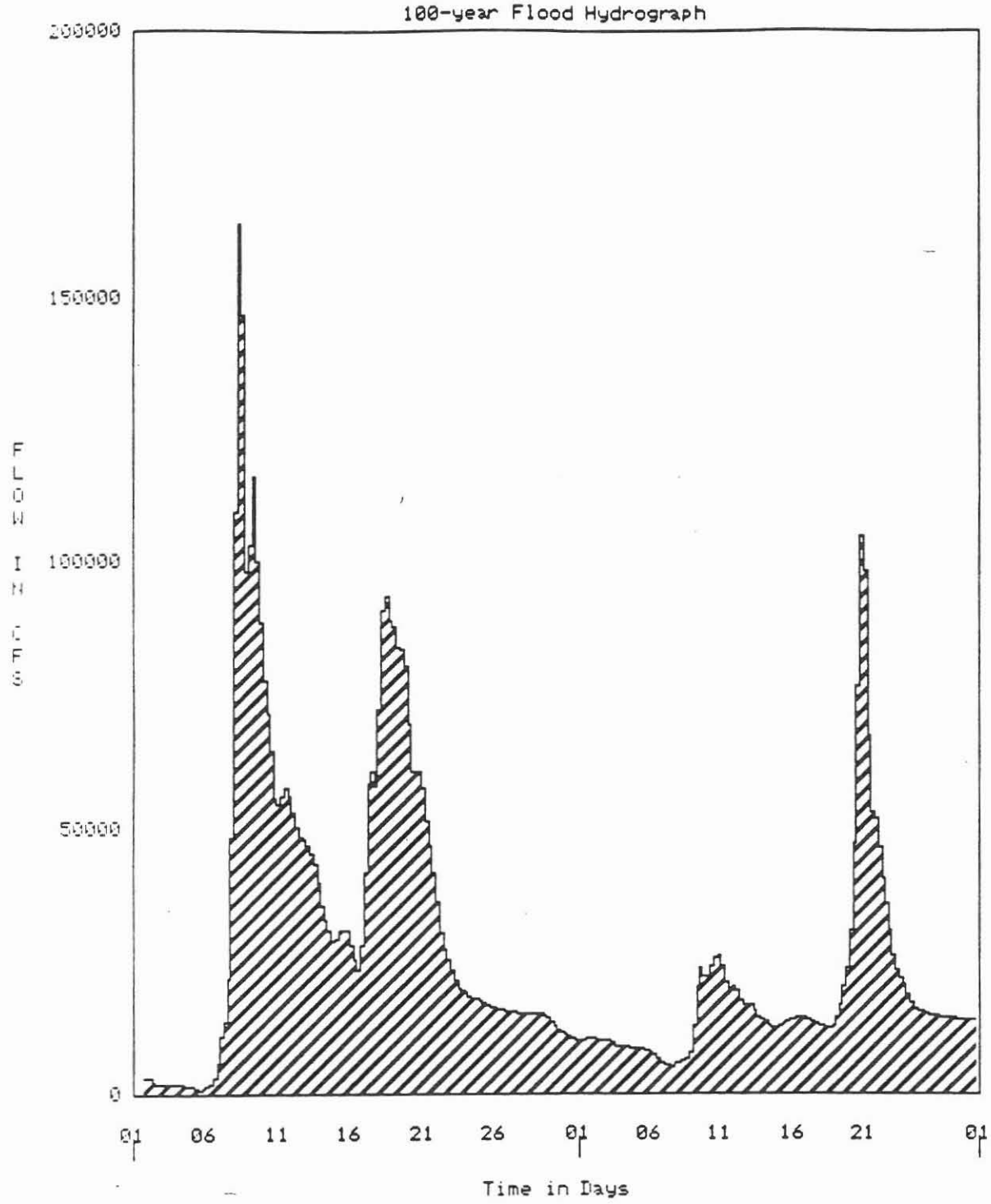

Salt River above Gila River Confluence Source: "Section7\por-wss"

FIGURE 1

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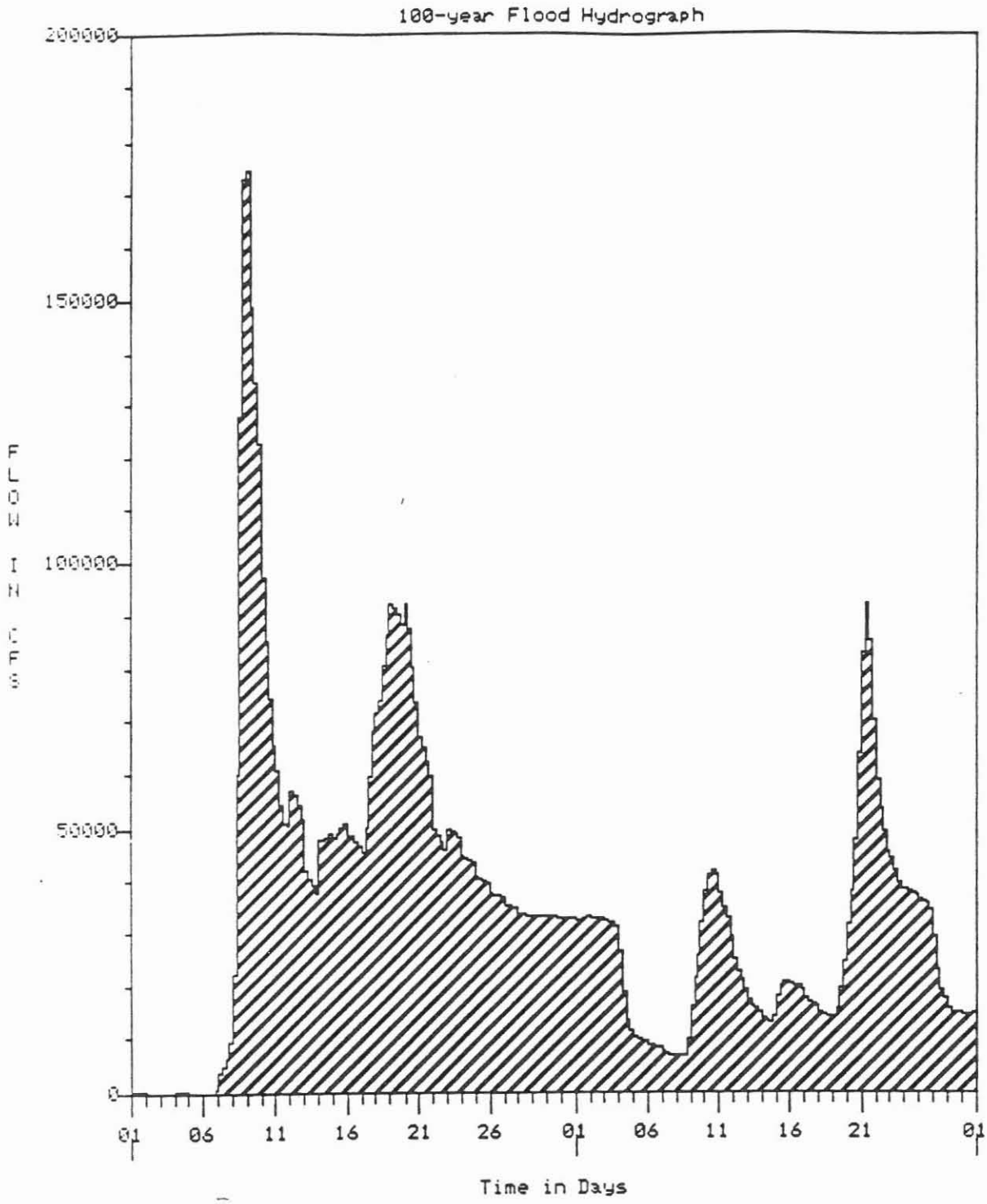
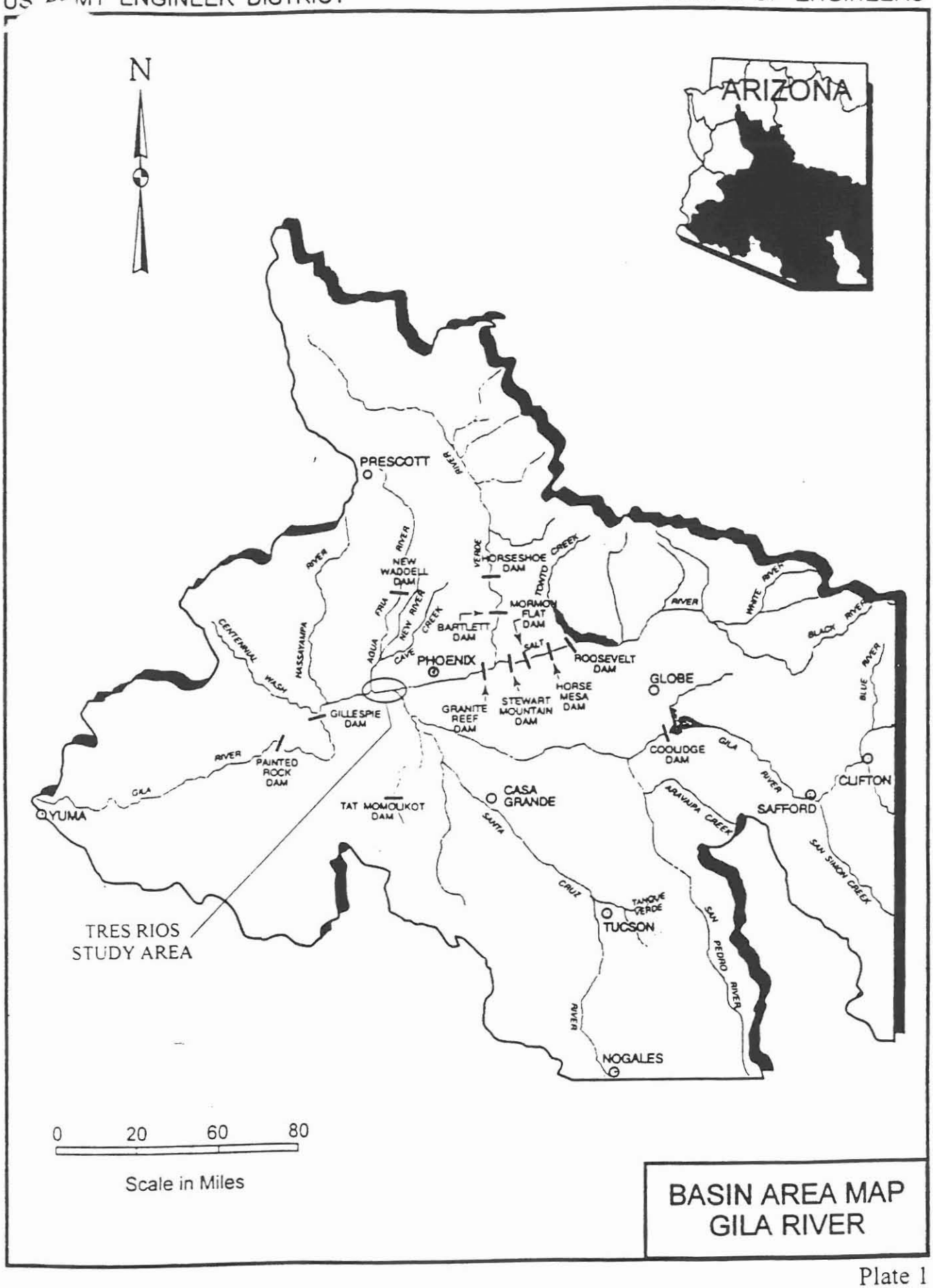


Gila River below Salt River Confluence Source: "Gilarcn\fldcntrl\gilarcn.dss"

FIGURE 2



BASIN AREA MAP
GILA RIVER

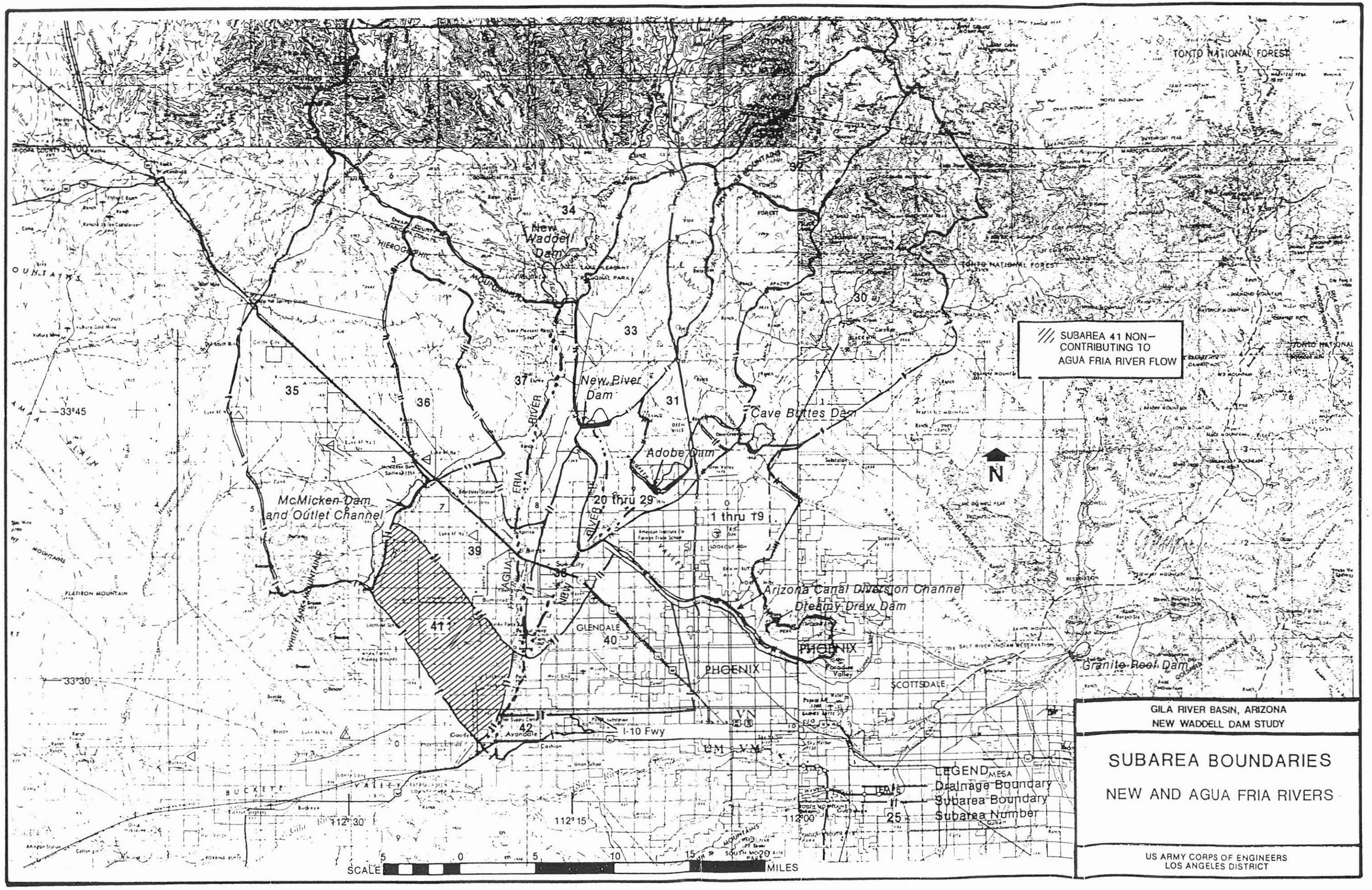

TONTO NATIONAL FOREST
SUBAREA 41 NON-CONTRIBUTING TO AGUA FRIA RIVER FLOW
New Waddell Dam
New River Dam
Cave Buttes Dam
Adobe Dam
McMicken Dam and Outlet Channel
20 thru 29
1 thru 19
Arizona Canal Diversion Channel
Dreamy Draw Dam
Granite Reef Dam
PHOENIX
GLENDALE
SCOTTSDALE
I-10 Fwy
N
SCALE
MILES
LEGEND
Drainage Boundary
Subarea Boundary
Subarea Number
GILA RIVER BASIN, ARIZONA
NEW WADDELL DAM STUDY
SUBAREA BOUNDARIES
NEW AND AGUA FRIA RIVERS
US ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

PLATE 2

EXHIBITS

HISTORICAL FLOOD HYDROGRAPHS. 1889 - 1993,
modified to existing conditions

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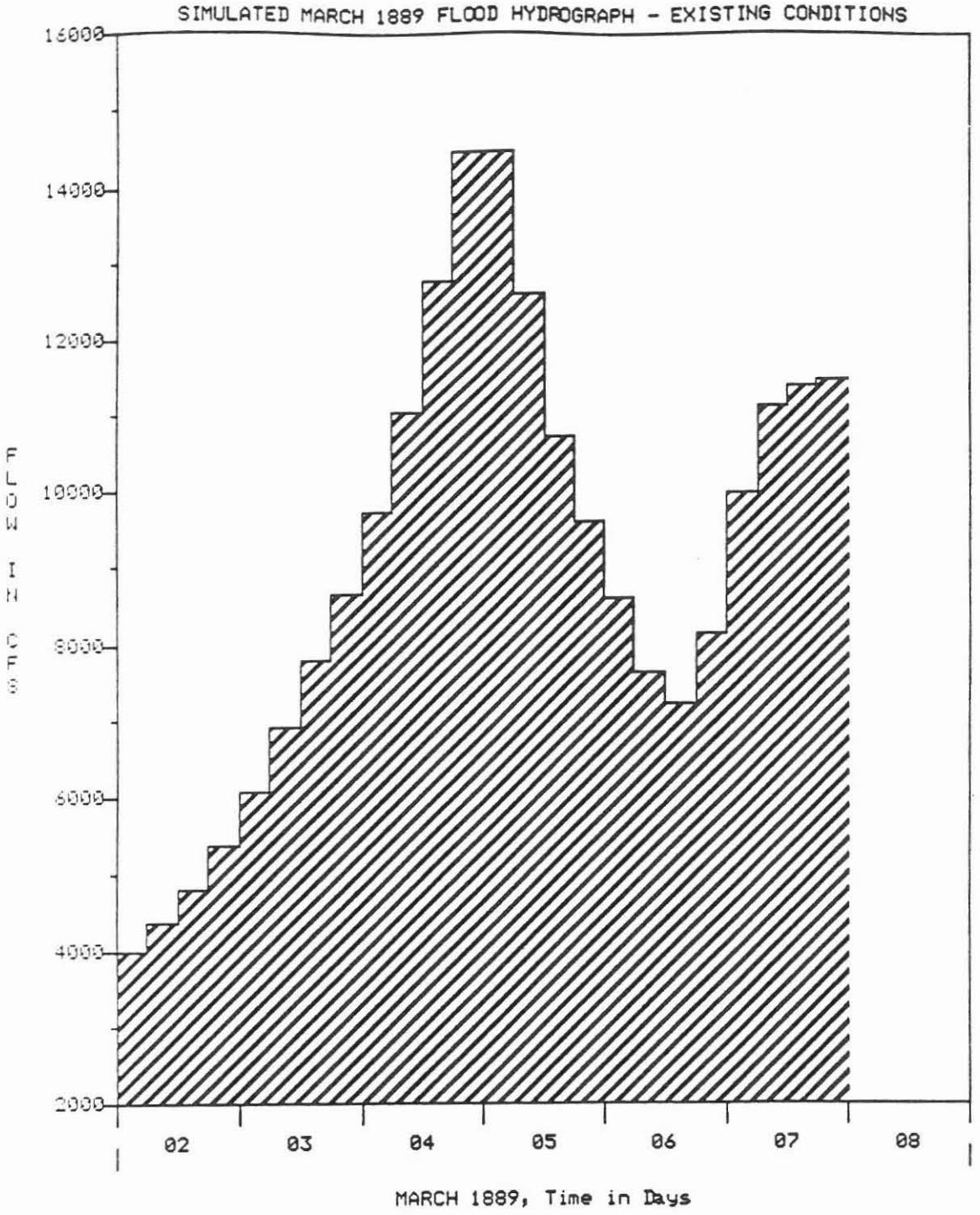

SALT RIVER ABOVE GILA RIVER CONFLUENCE

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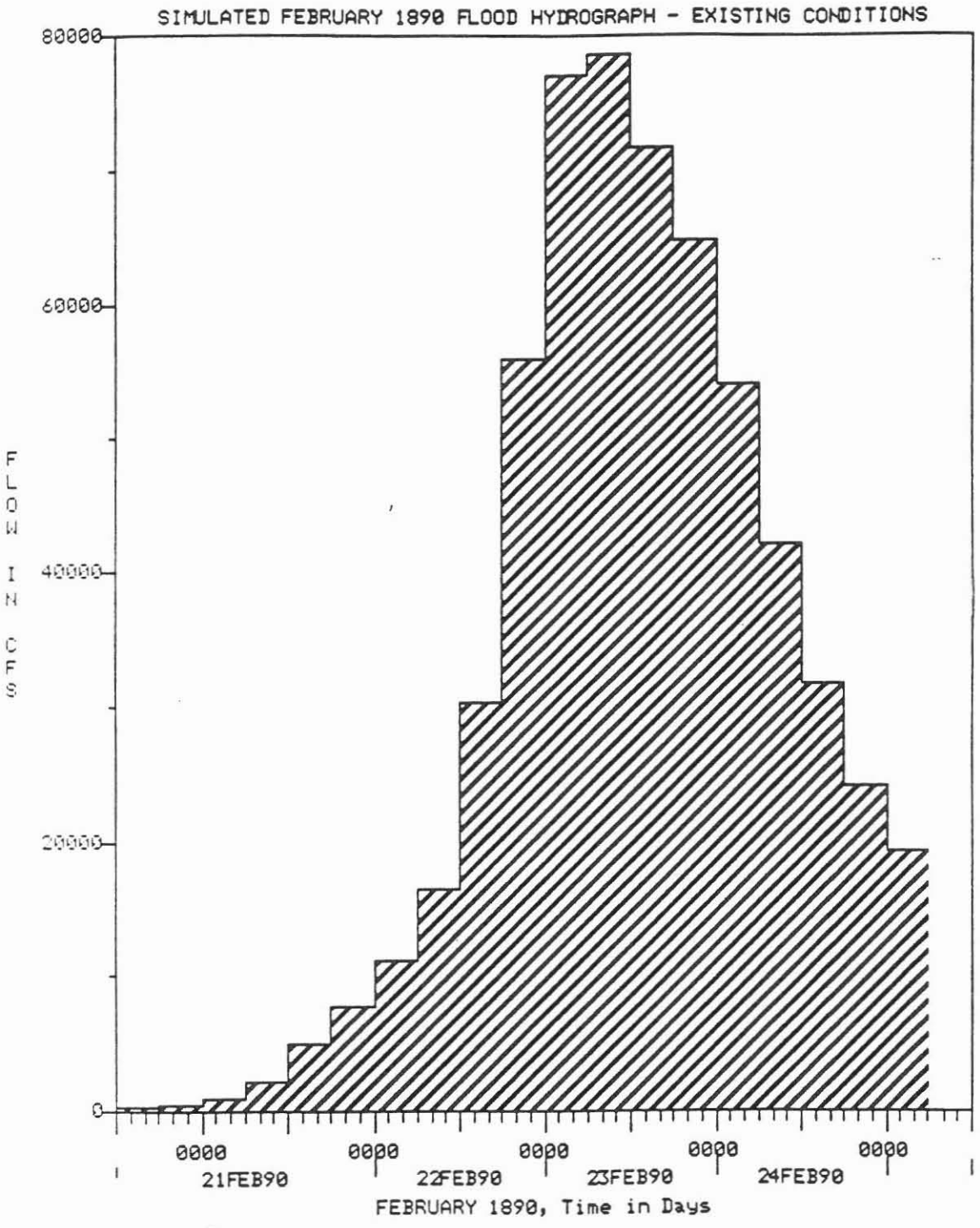

SALT RIVER ABOVE GILA RIVER CONFLUENCE

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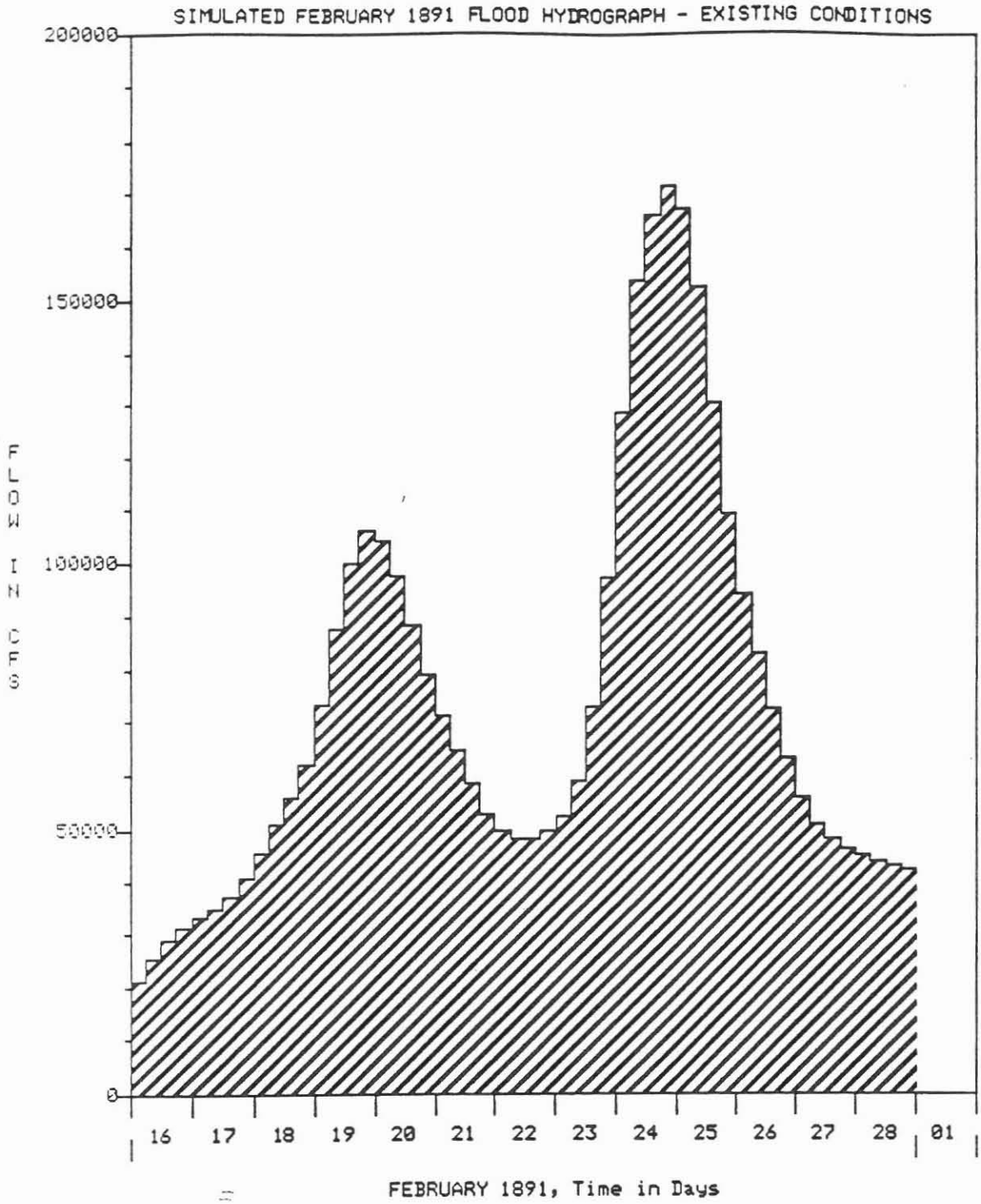

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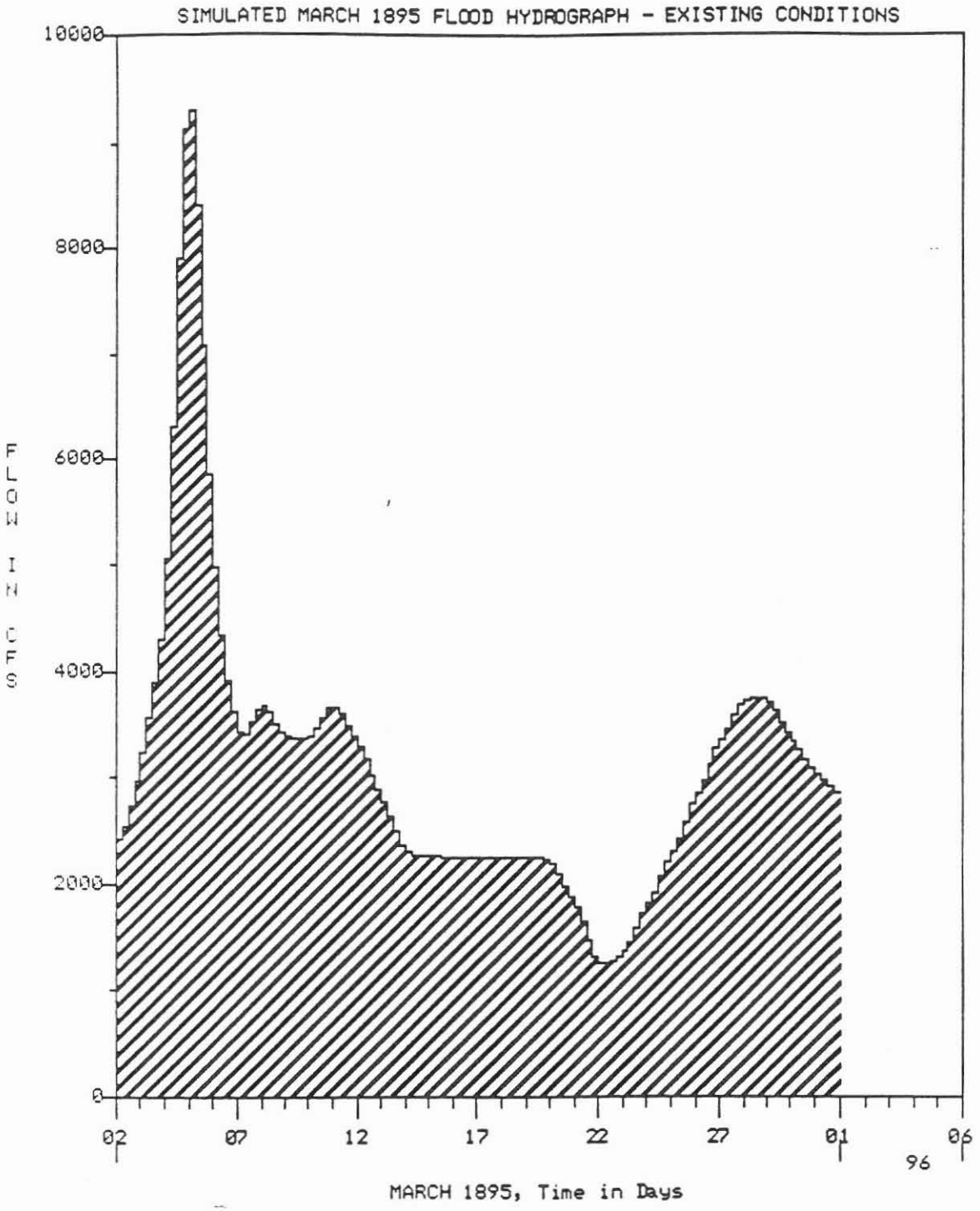

SALT RIVER ABOVE GILA RIVER CONFLUENCE

01MAY98 13:24:18
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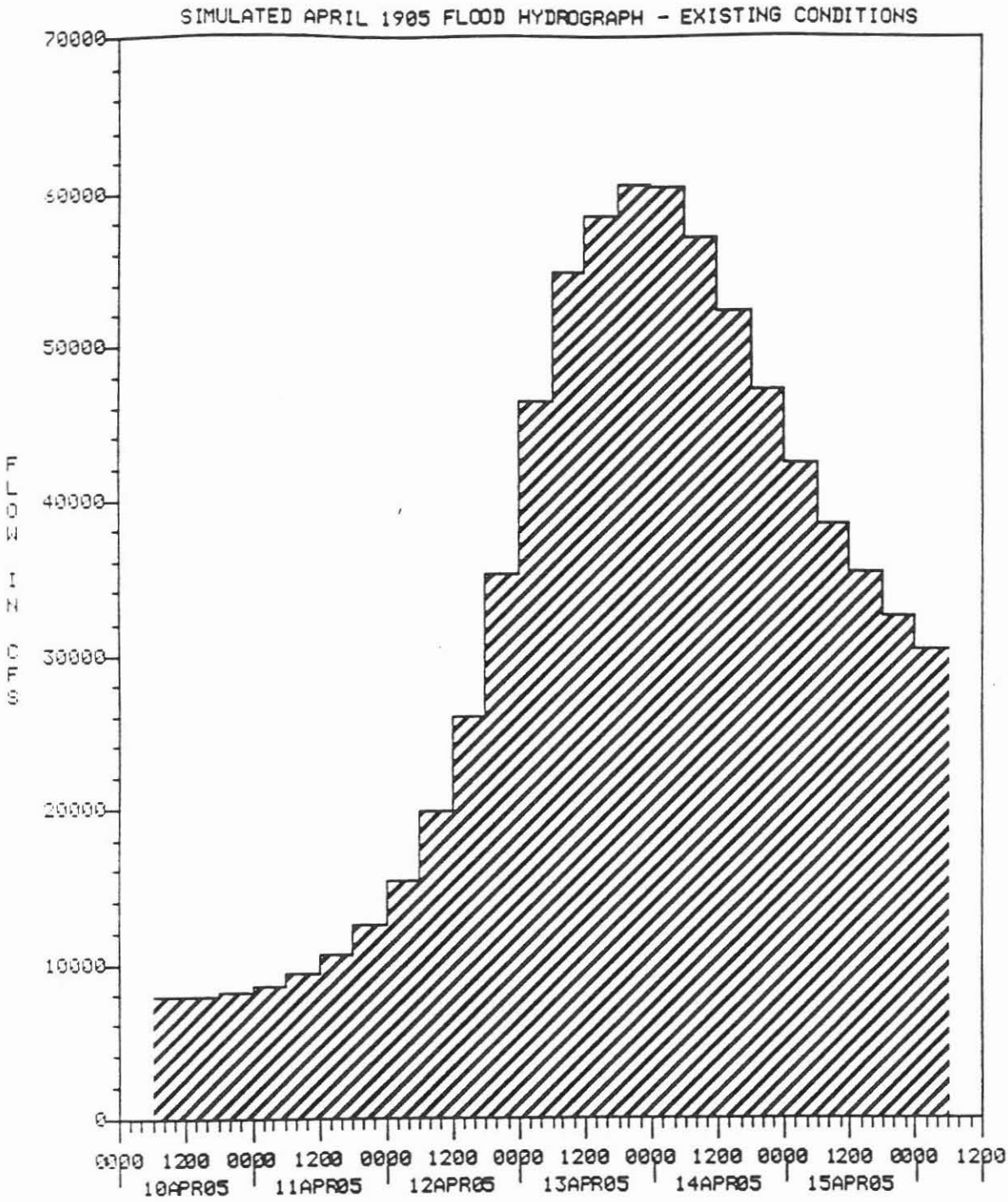

SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 13:54:16
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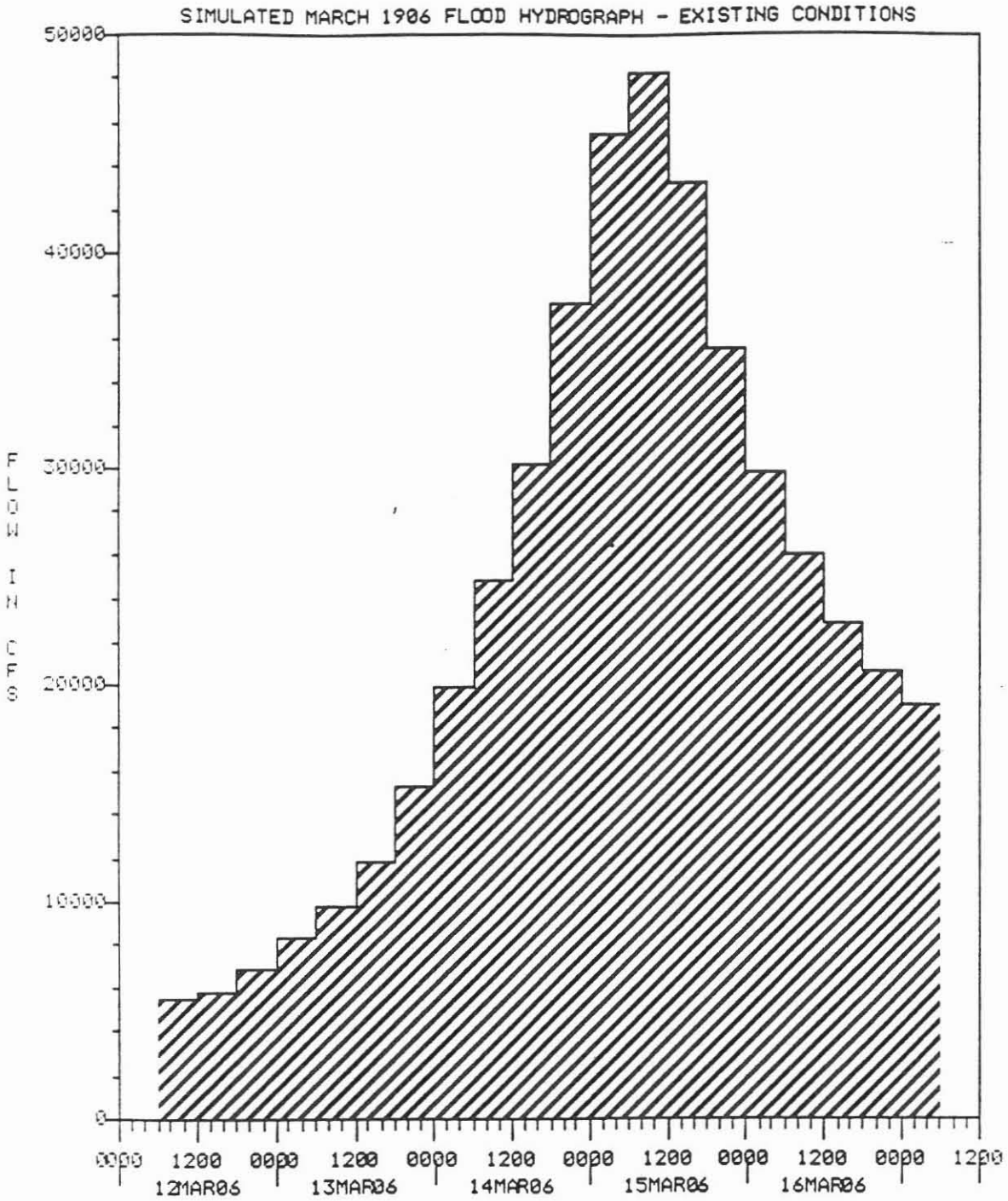


SALT RIVER ABOVE GILA RIVER CONFLUENCE

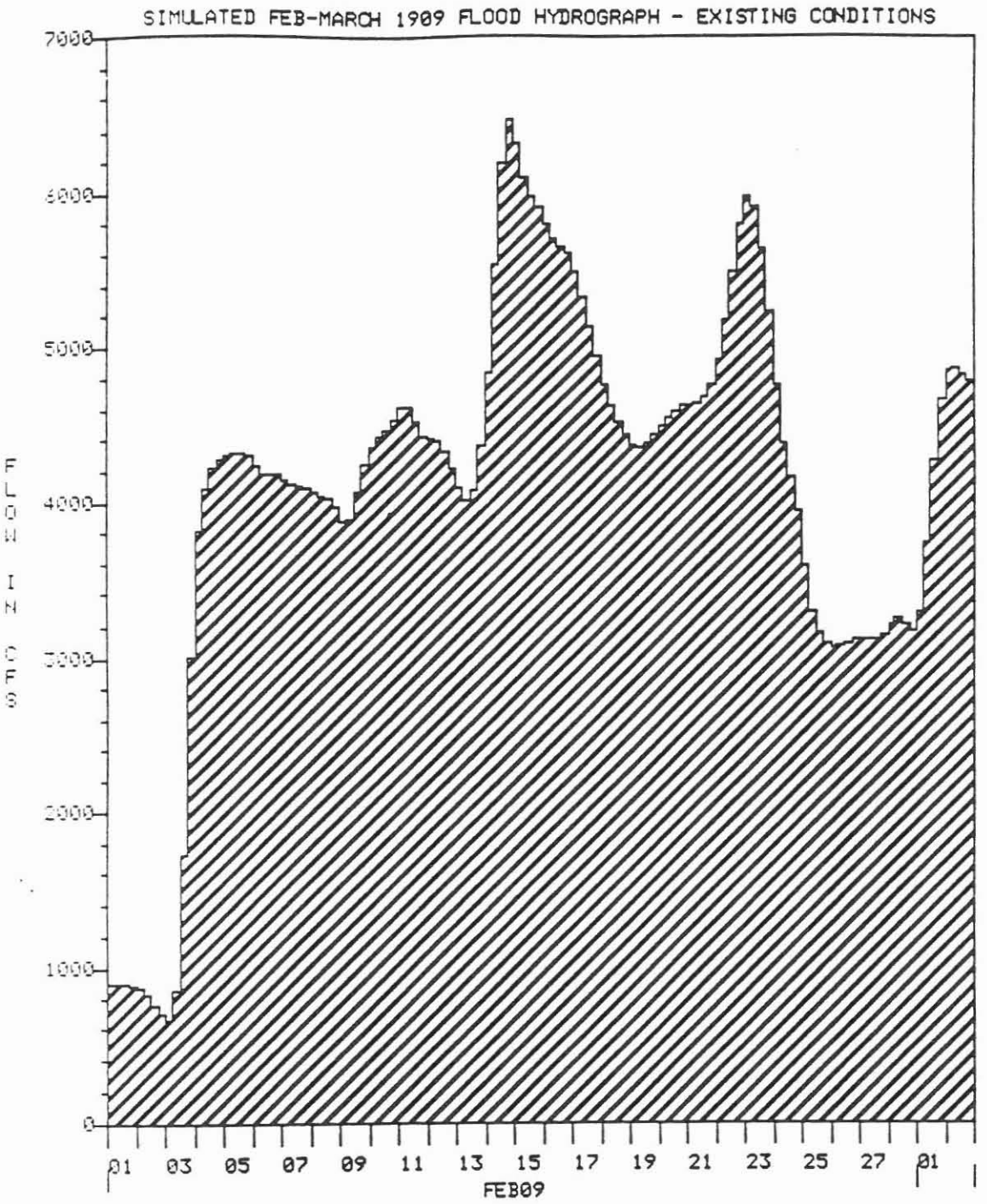
29APR98 13:56:26
PORABGLA.DSS

SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 13:57:34
PORABGLA.DSS

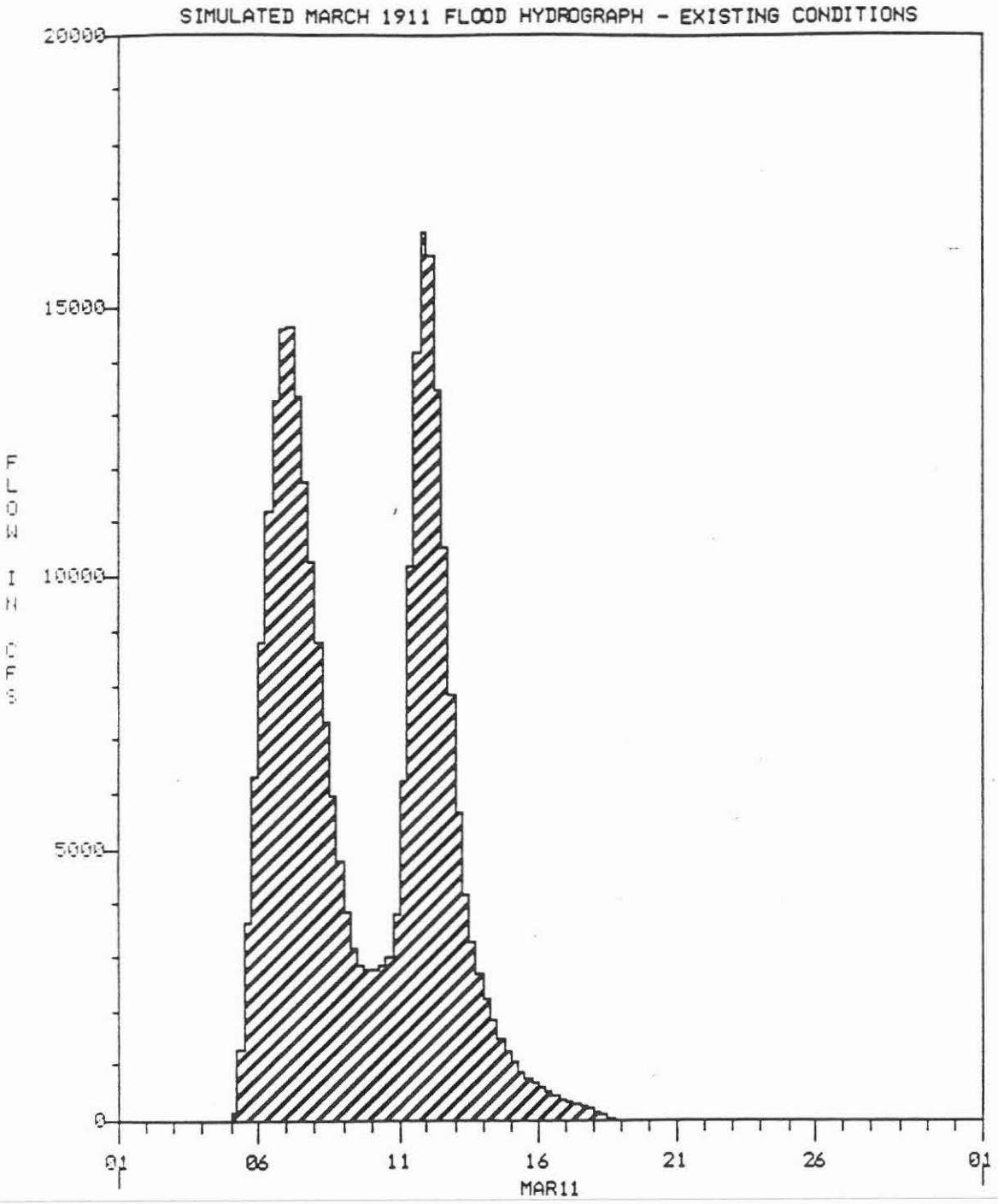
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 14:03:53
PORABGLA.DSS



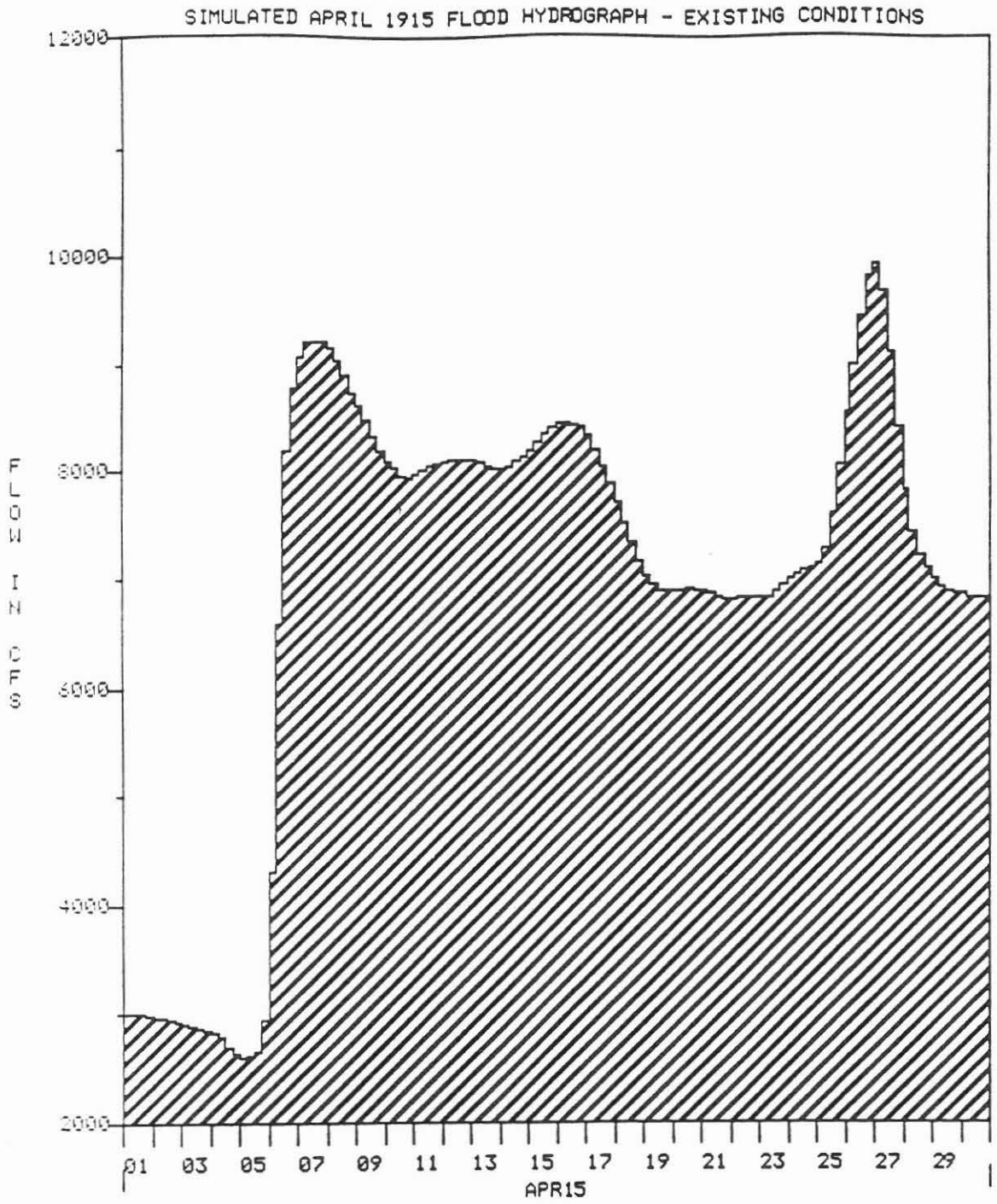
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 14:05:35
PORABGLA.DSS



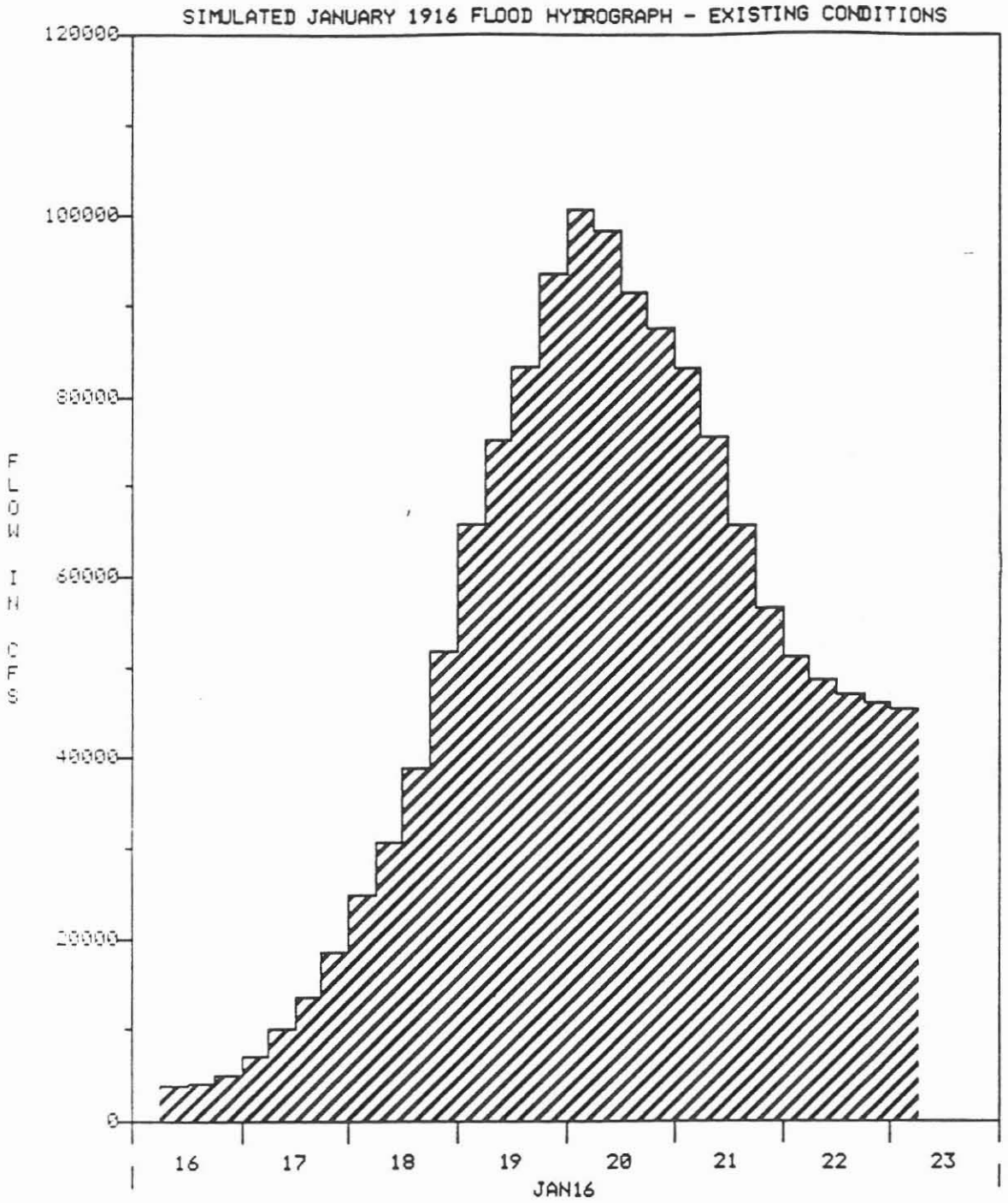
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:08:48
PORABGLA.DSS



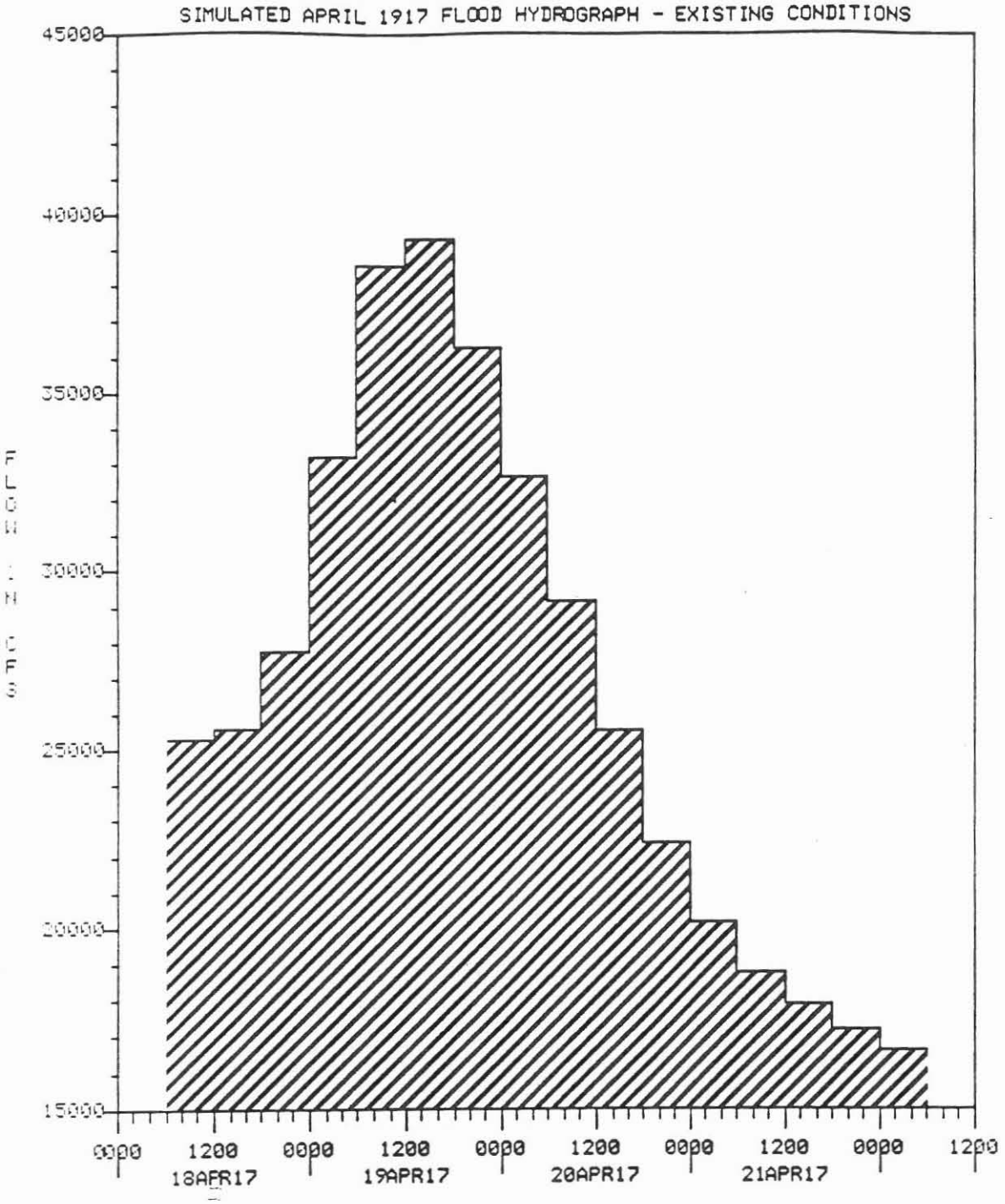
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:10:33
PORABGLA.DSS



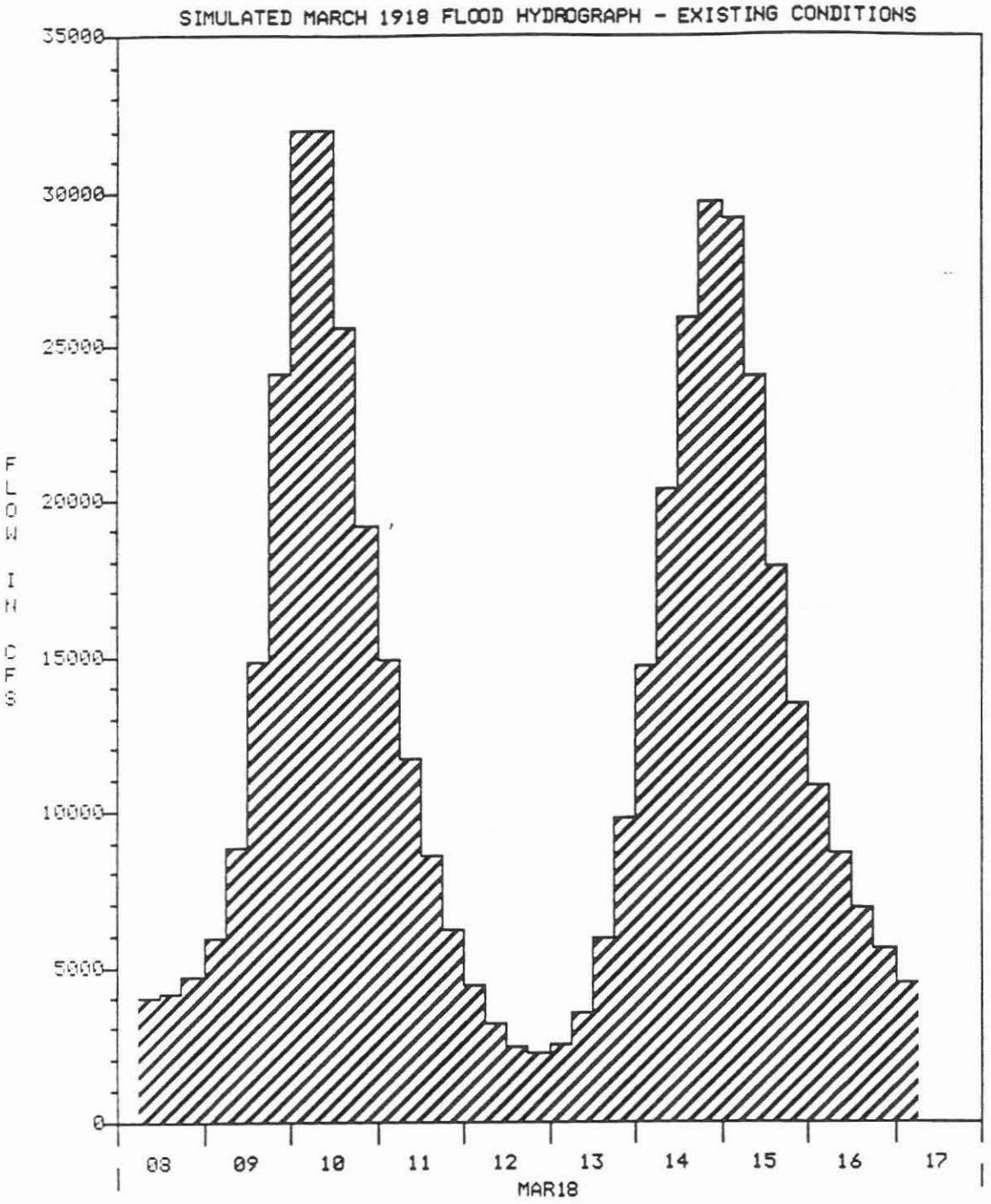
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:13:02
PORABGLA.DSS



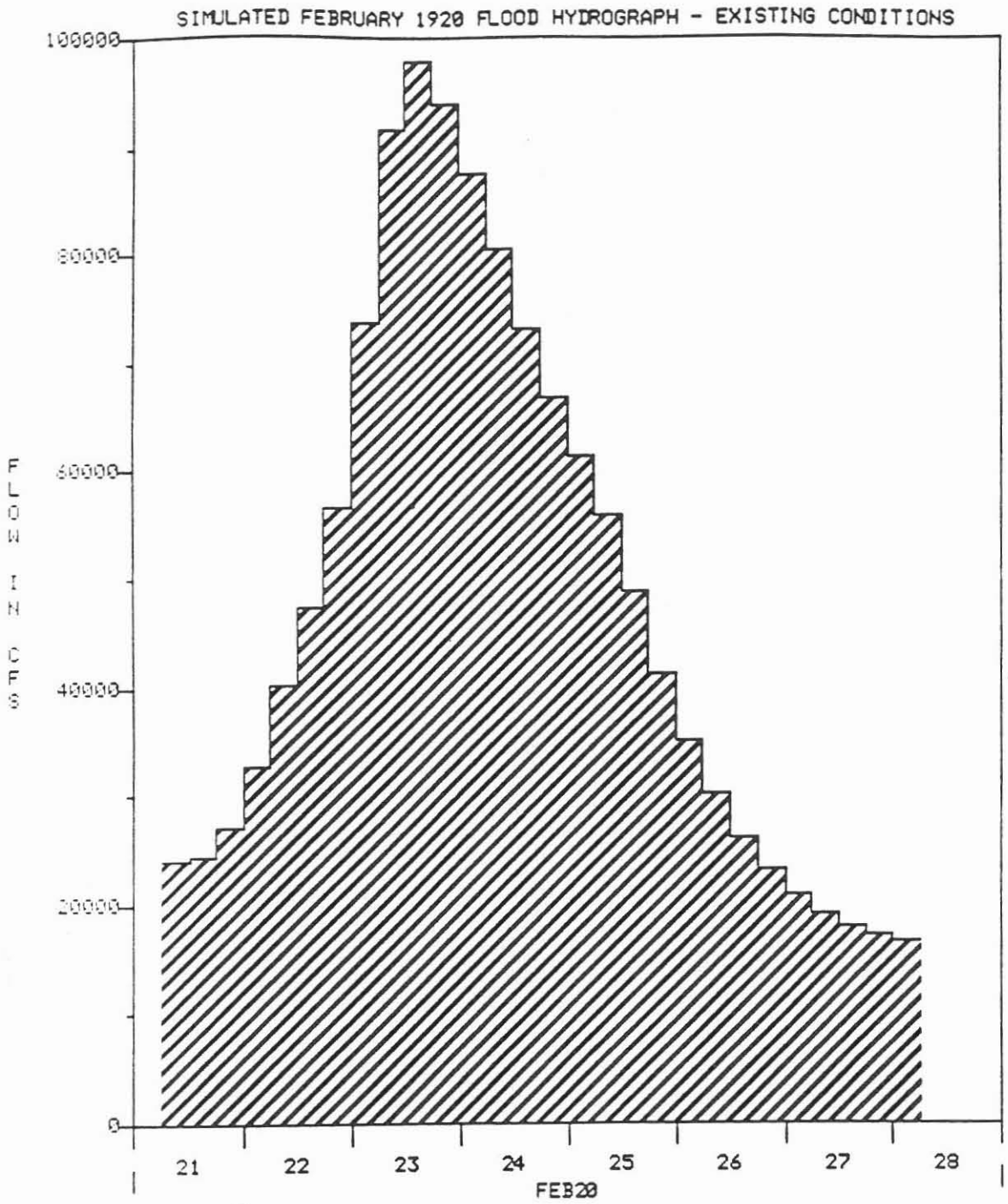
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:14:51
PORABGLA.DSS



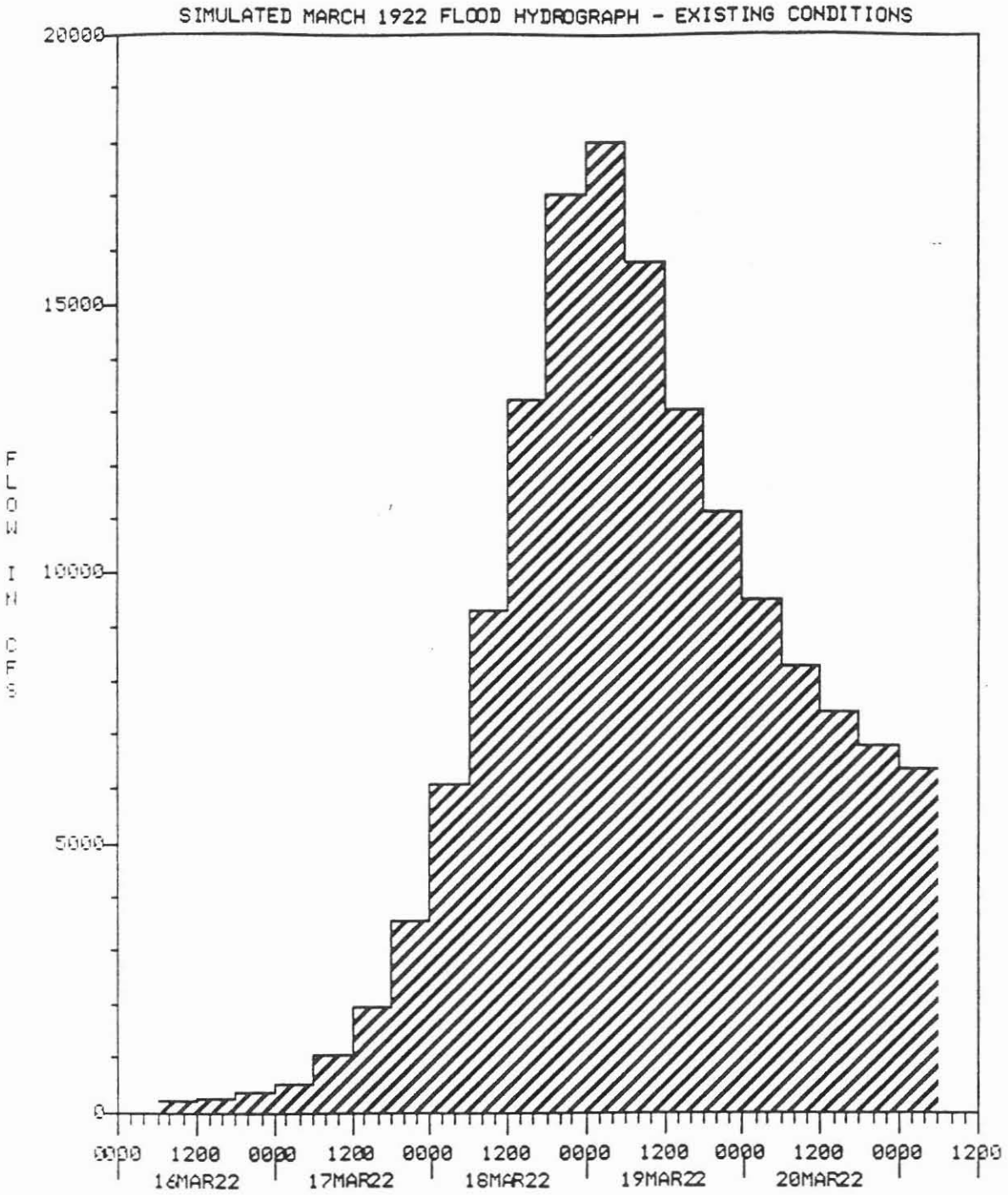
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:17:33
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:19:20
PORABGLA.DSS

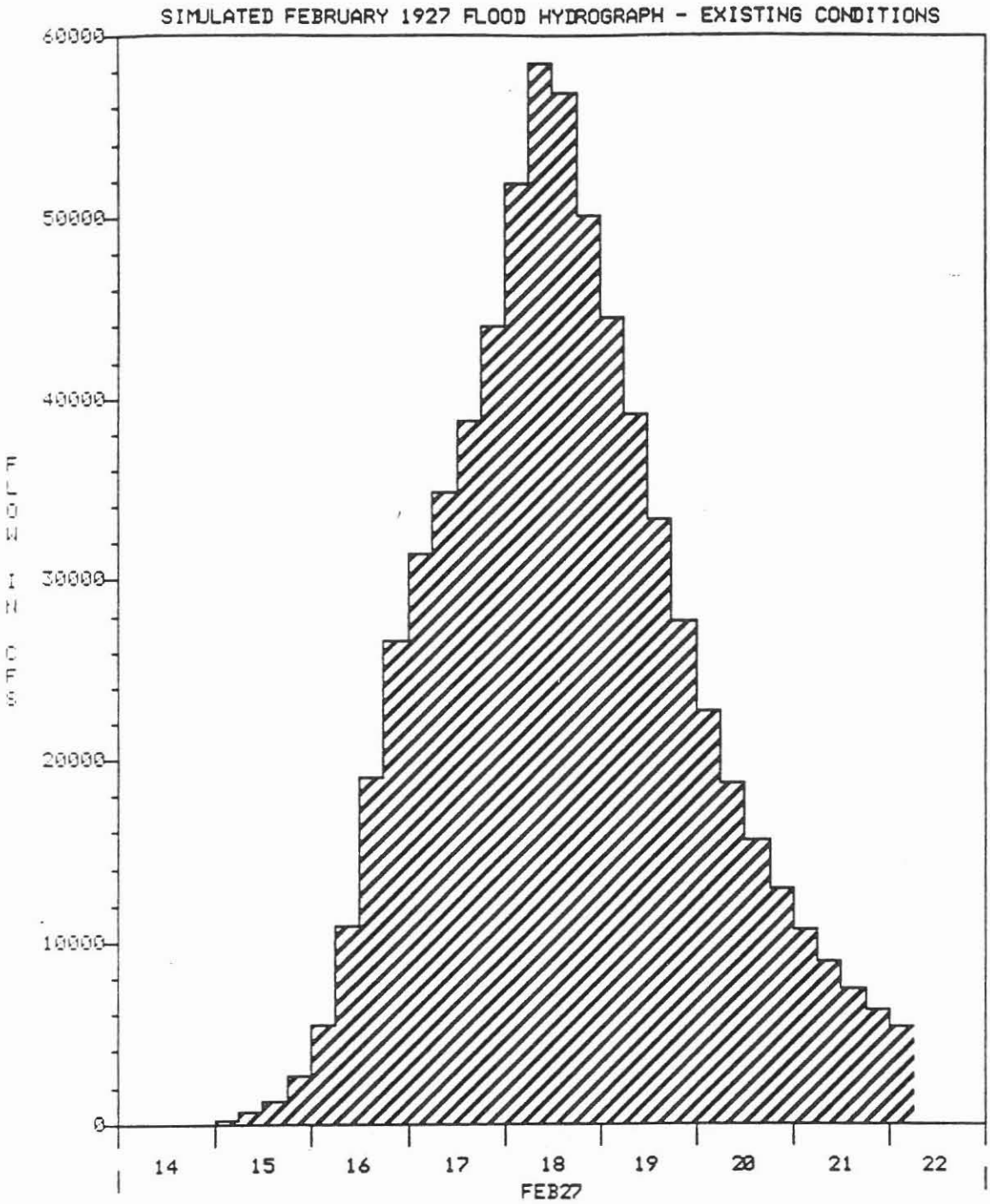


SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:20:59
PORABGLA.DSS

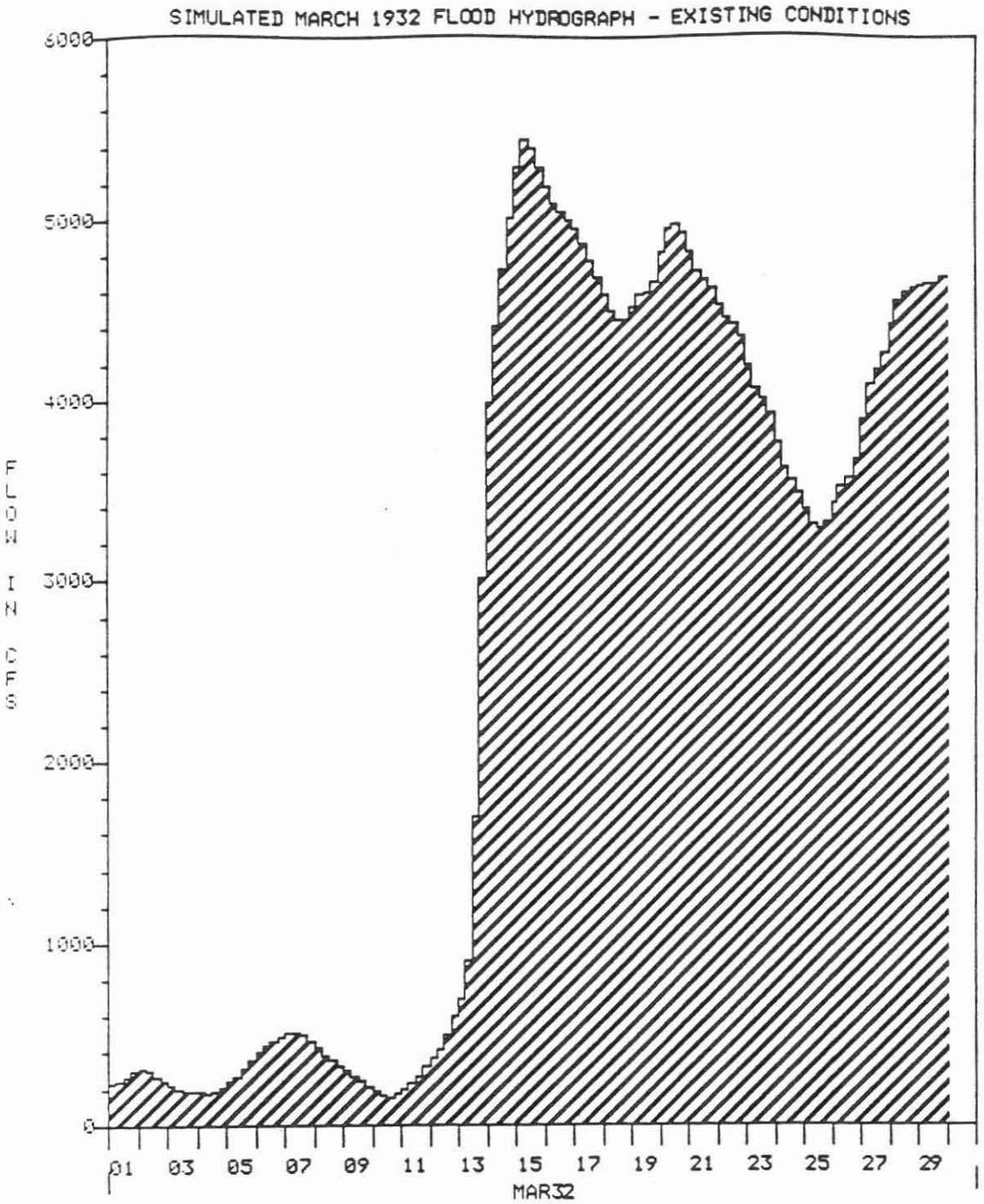
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:22:27
PORABGLA.DSS



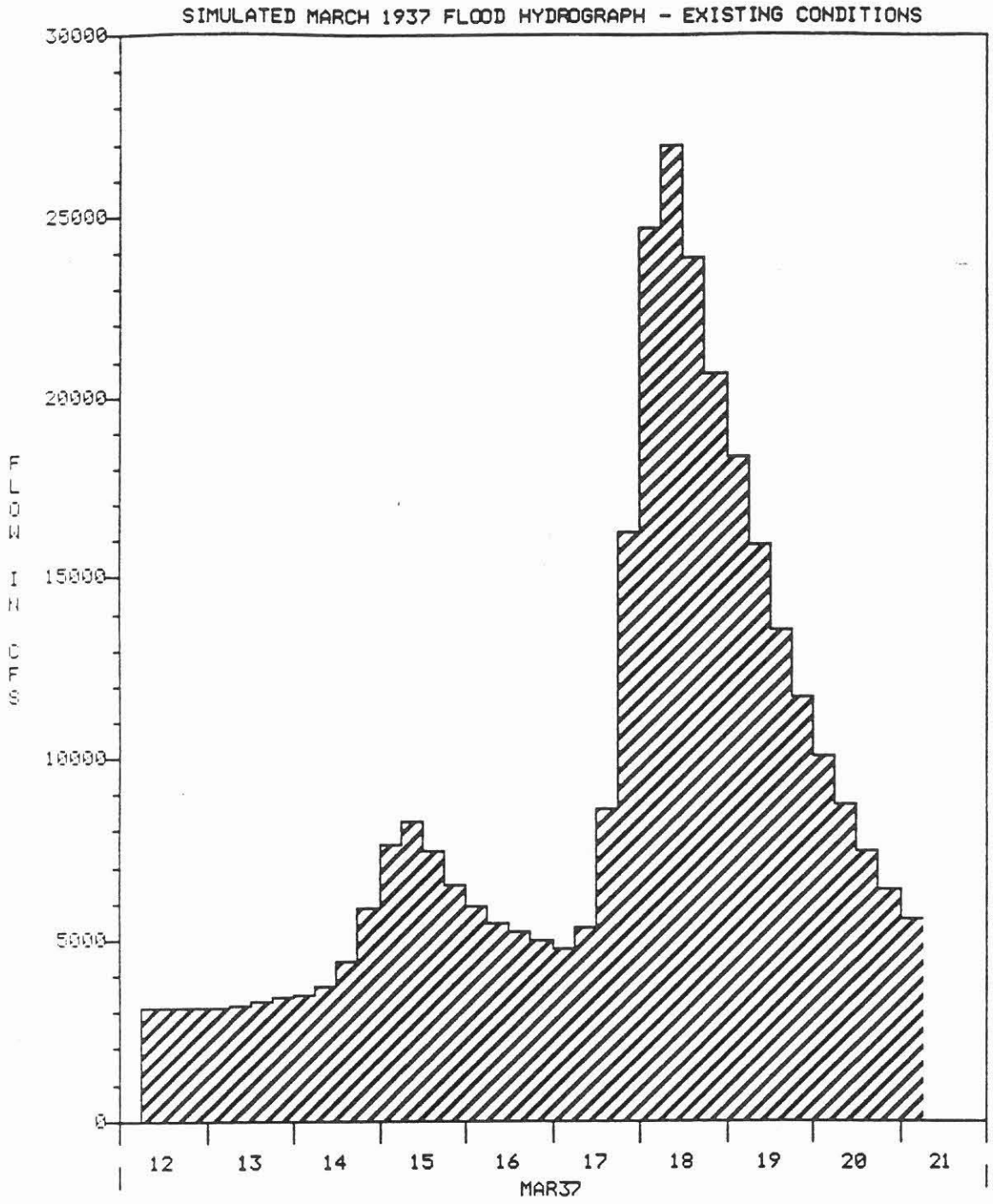
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:24:10
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:47:50
PORABGLA.DSS

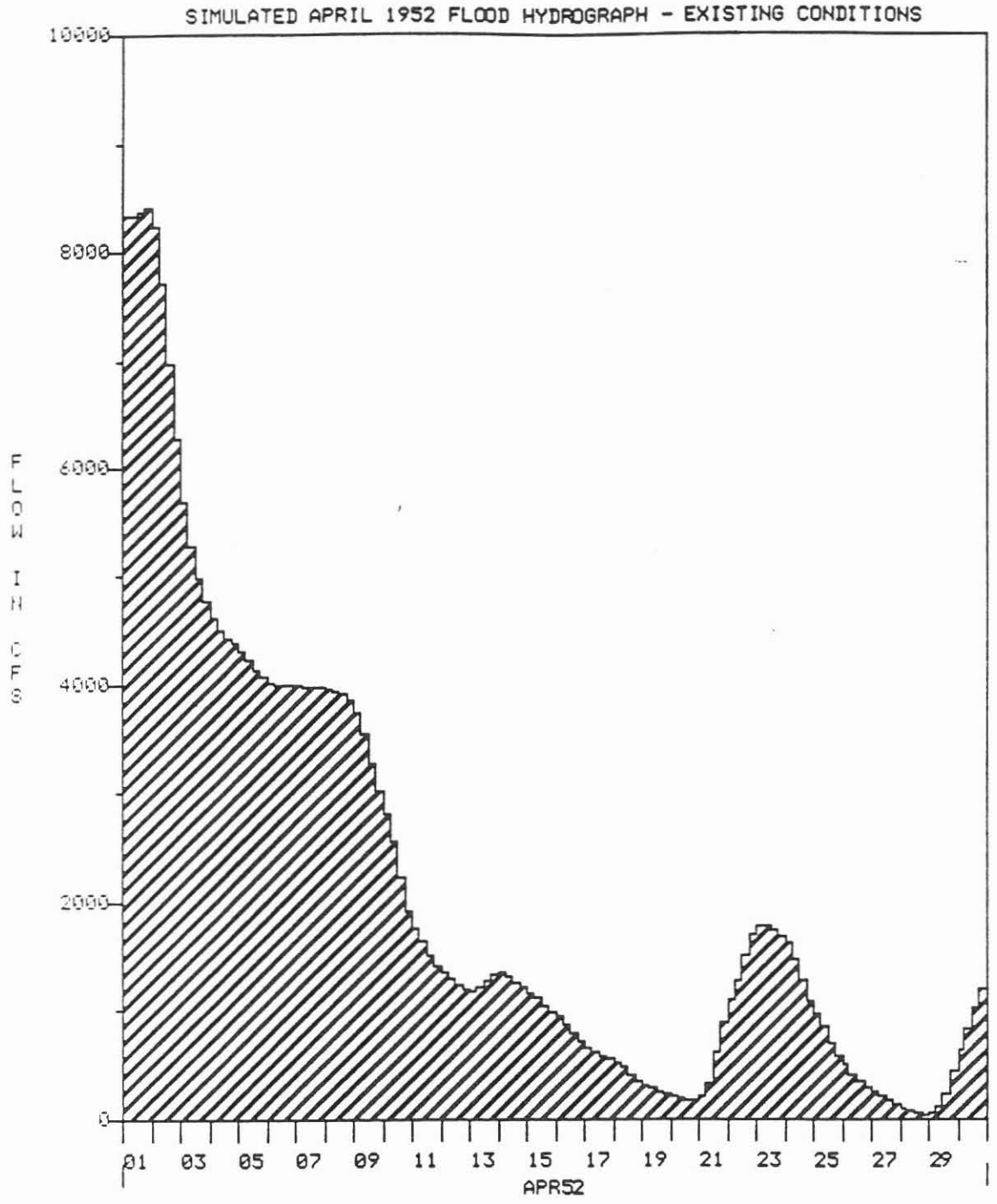


SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:26:48
PORABGLA.DSS

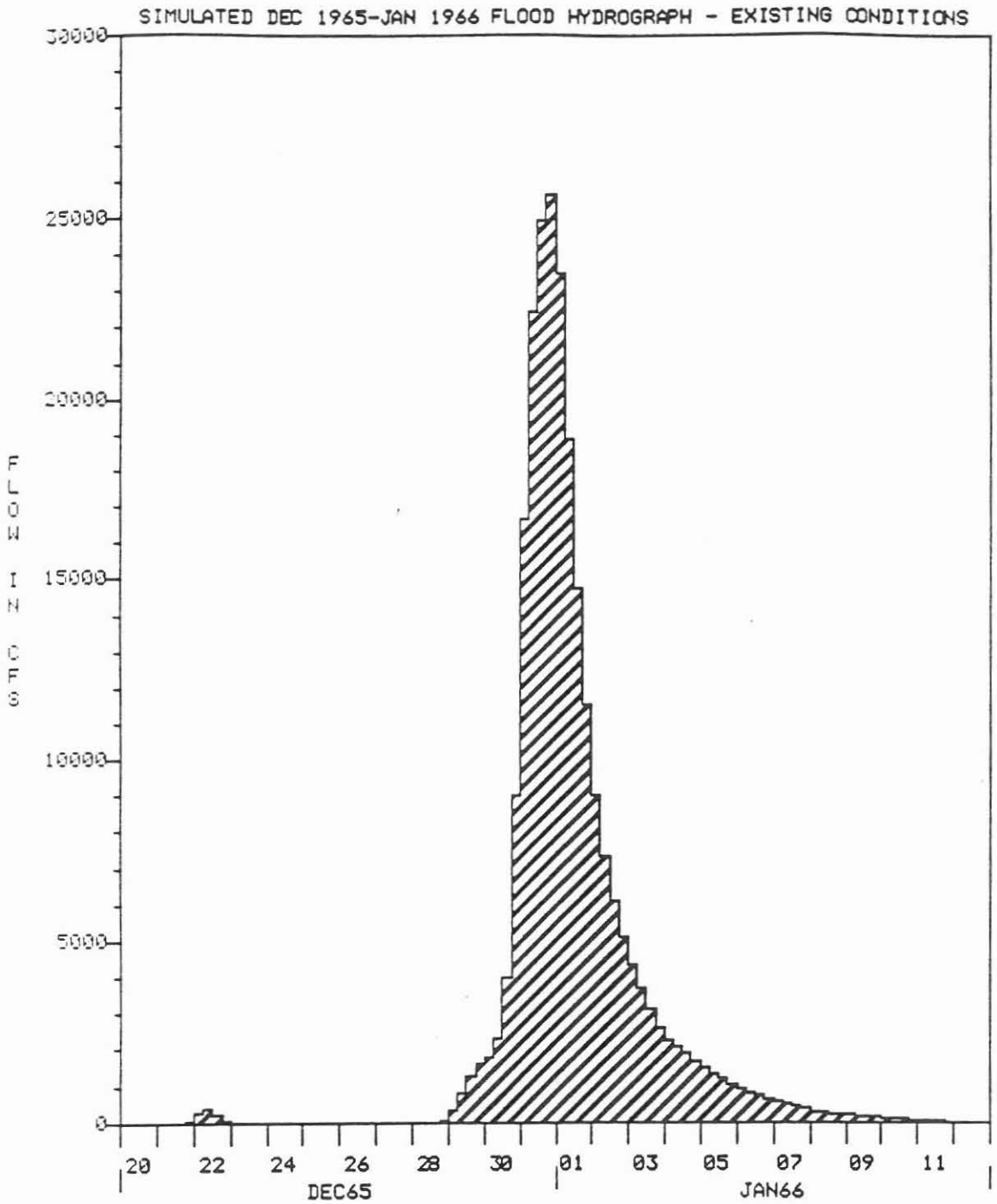
SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:28:17
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:34:20
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:45:38
PORABGLA.DSS

SALT RIVER ABOVE GILA RIVER CONFLUENCE

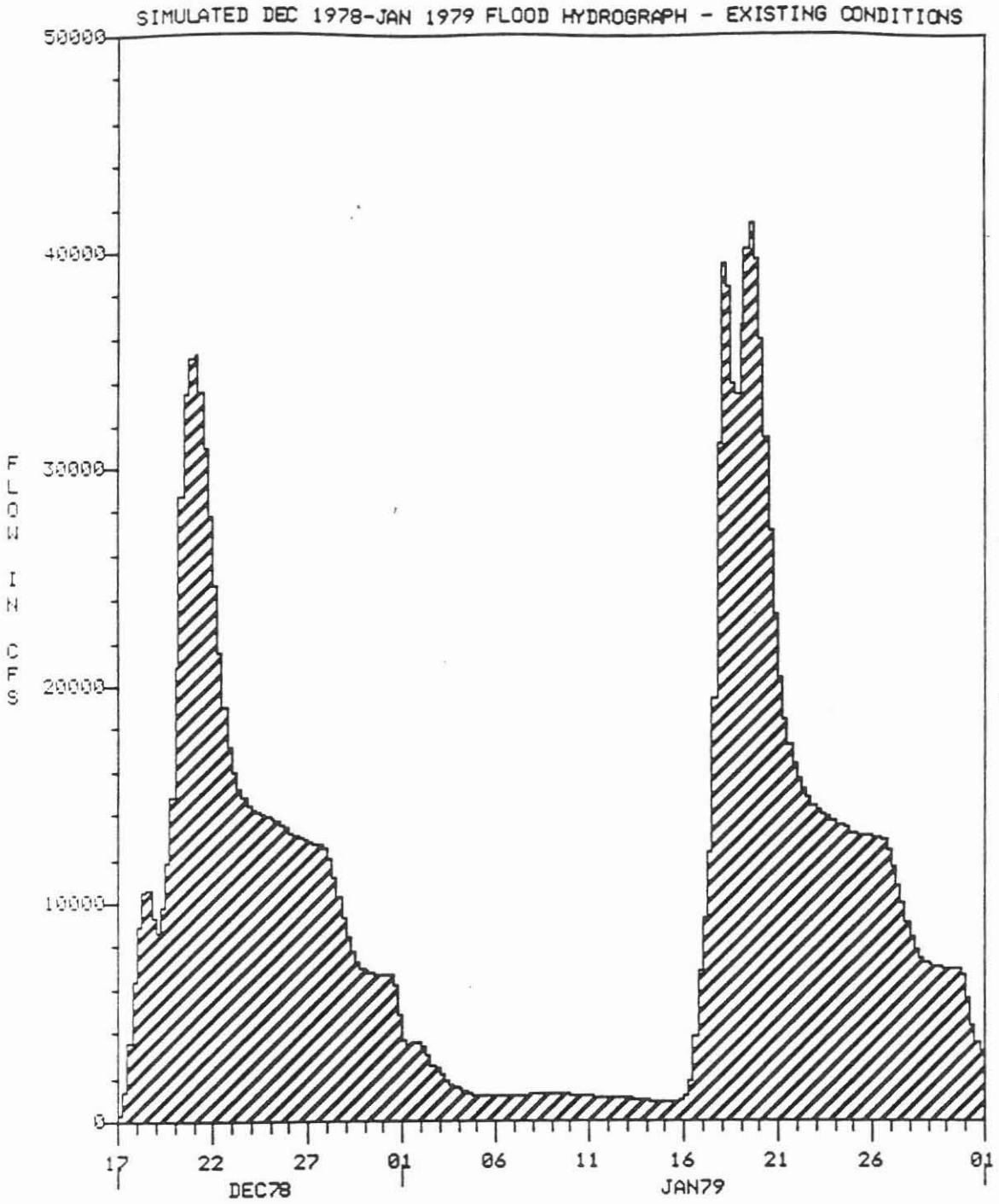
30APR98 15:24:00
PORABGLA.DSS

SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 15:45:40
PORABGLA.DSS

SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 14:59:04
PORABGLA.DSS

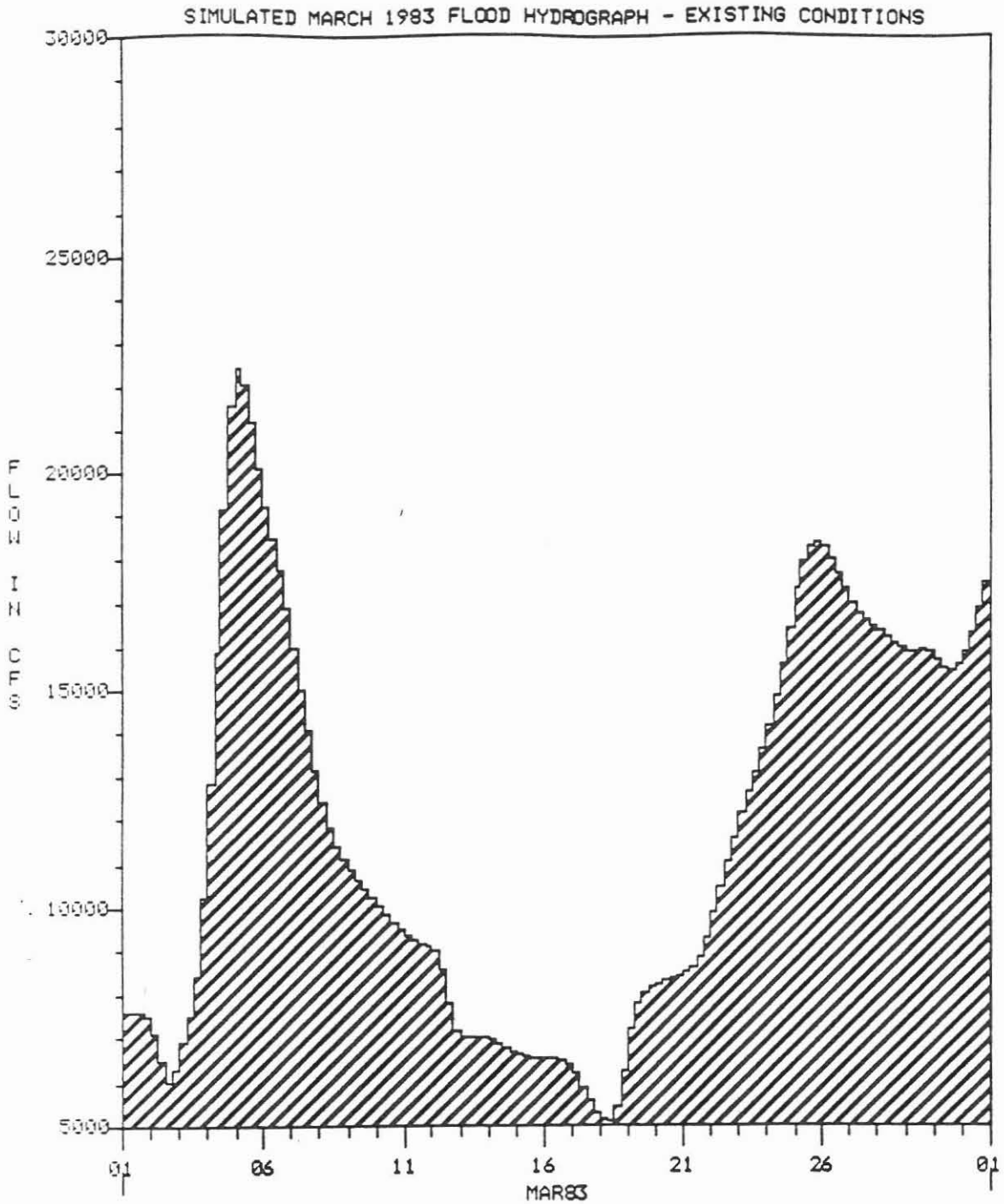


SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:03:33
PORABGLA.DSS

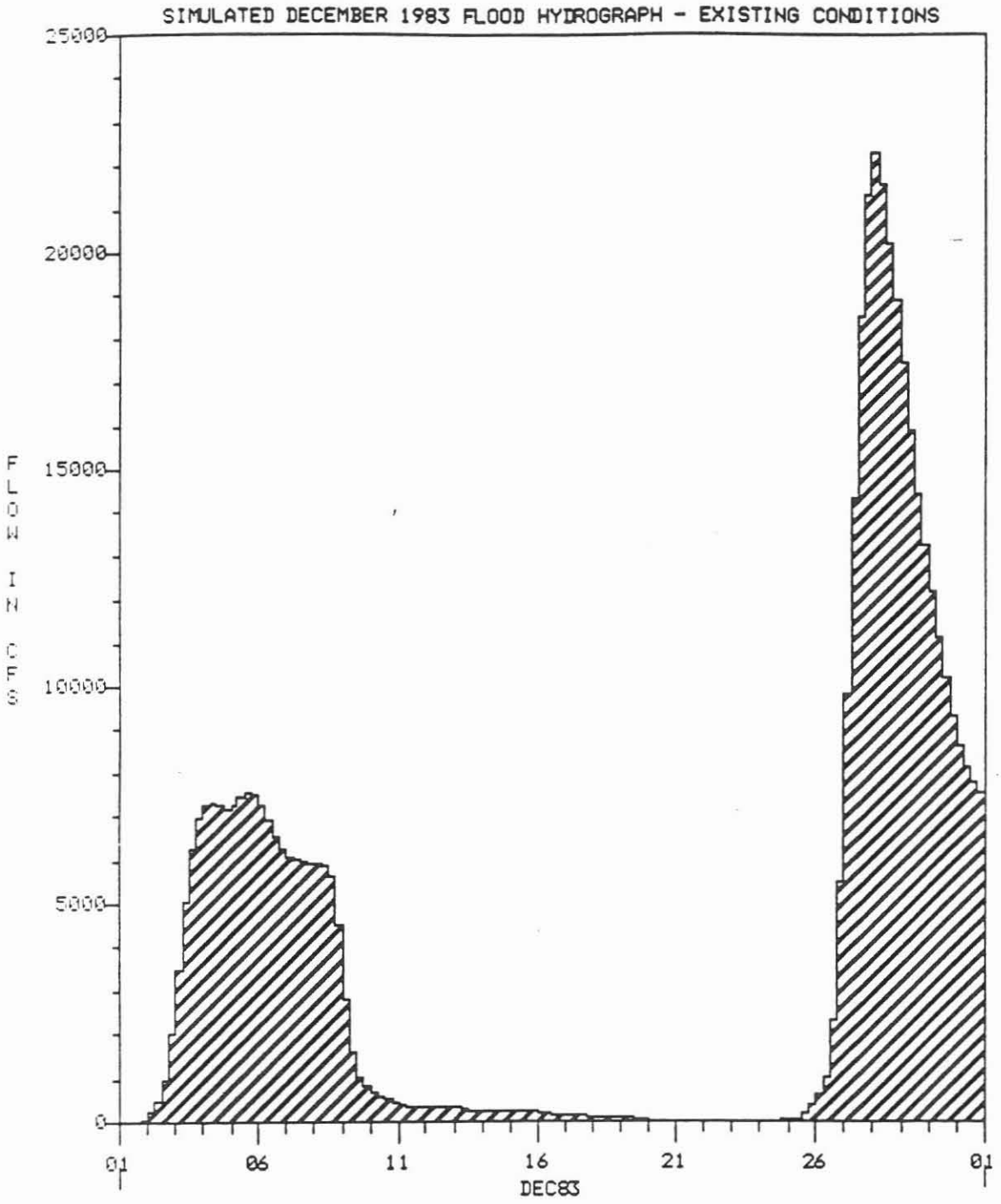
SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:07:32
PORABGLA.DSS



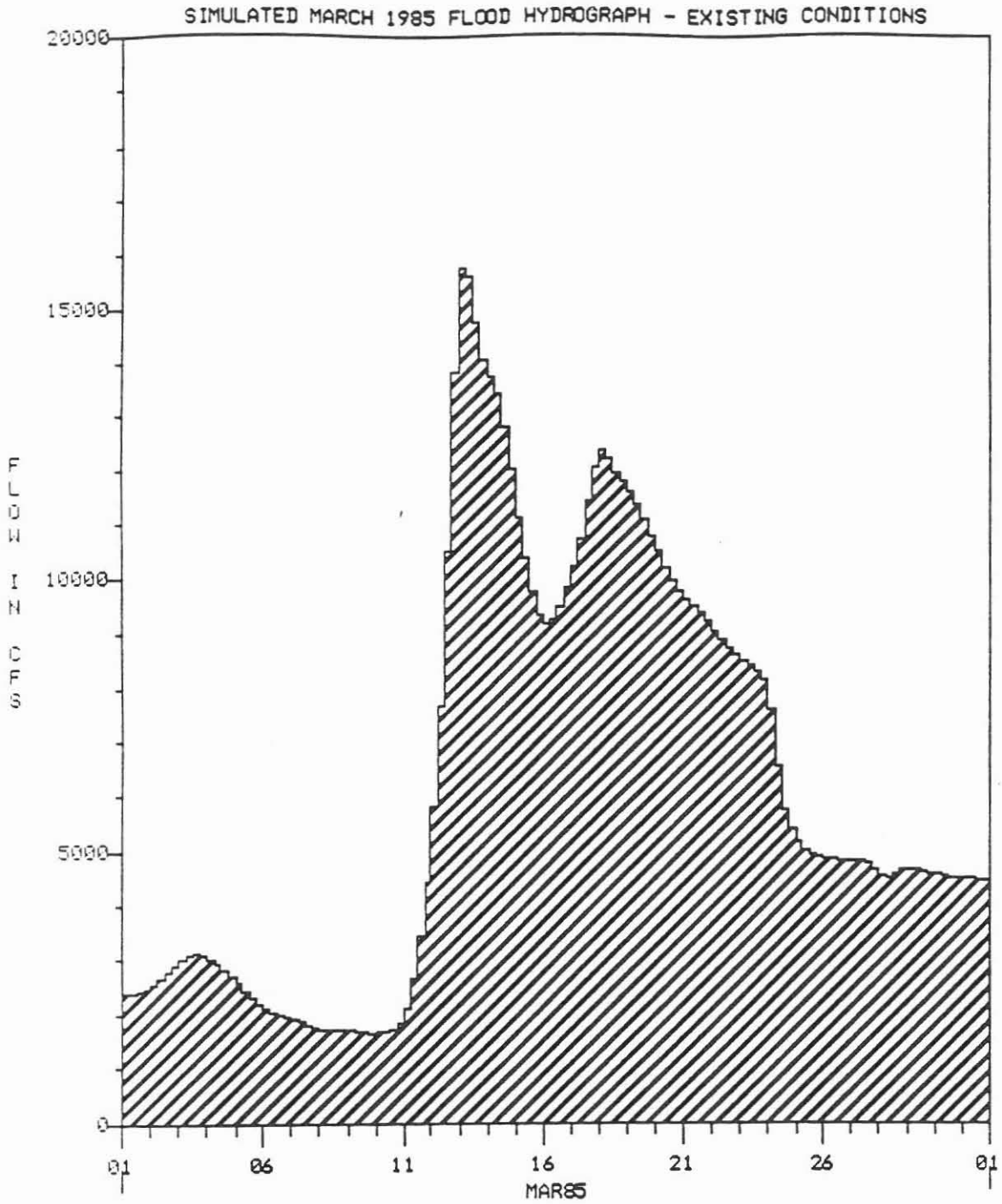
SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:09:37
PORABGLA.DSS



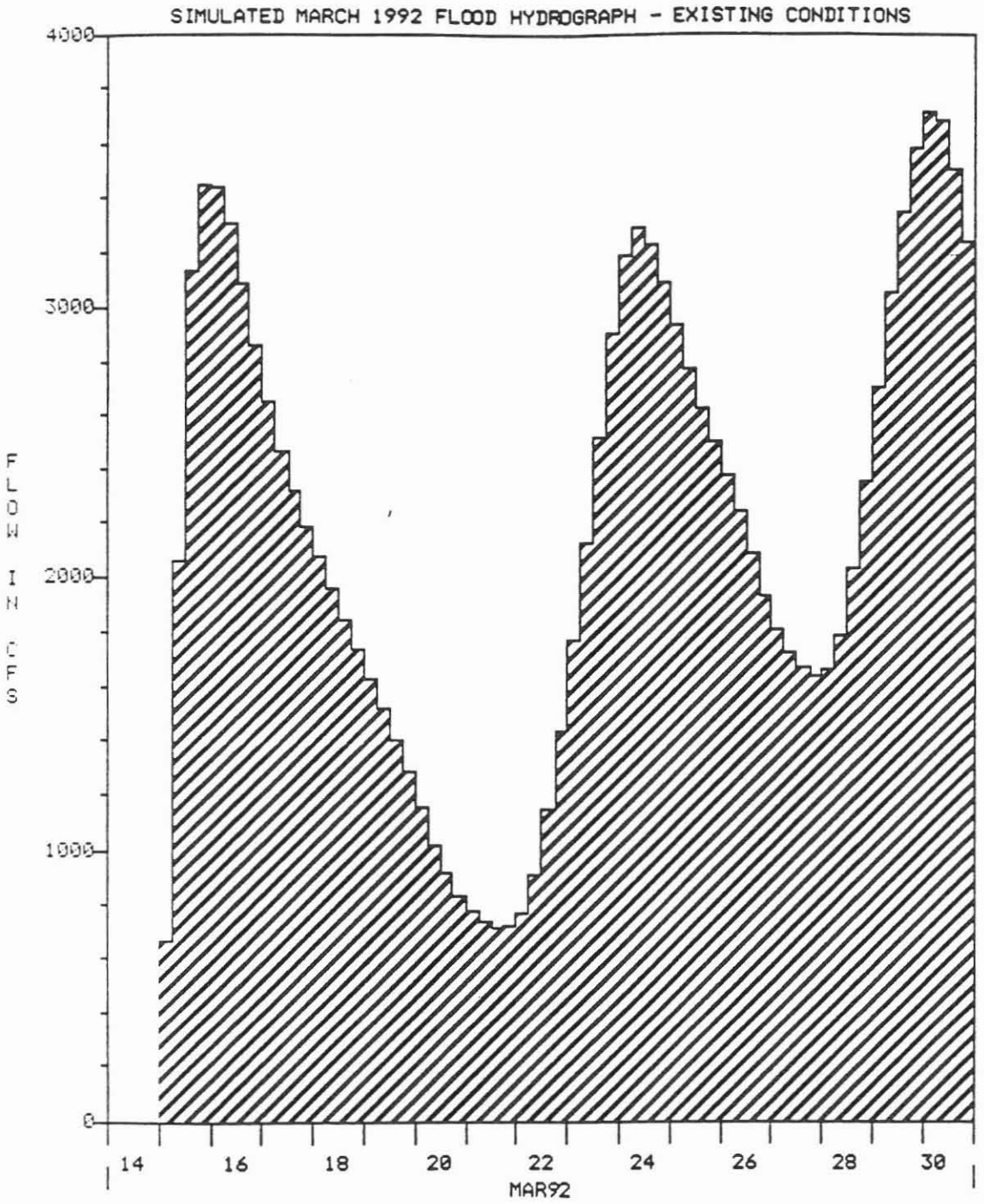
SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:17:51
PORABGLA.DSS



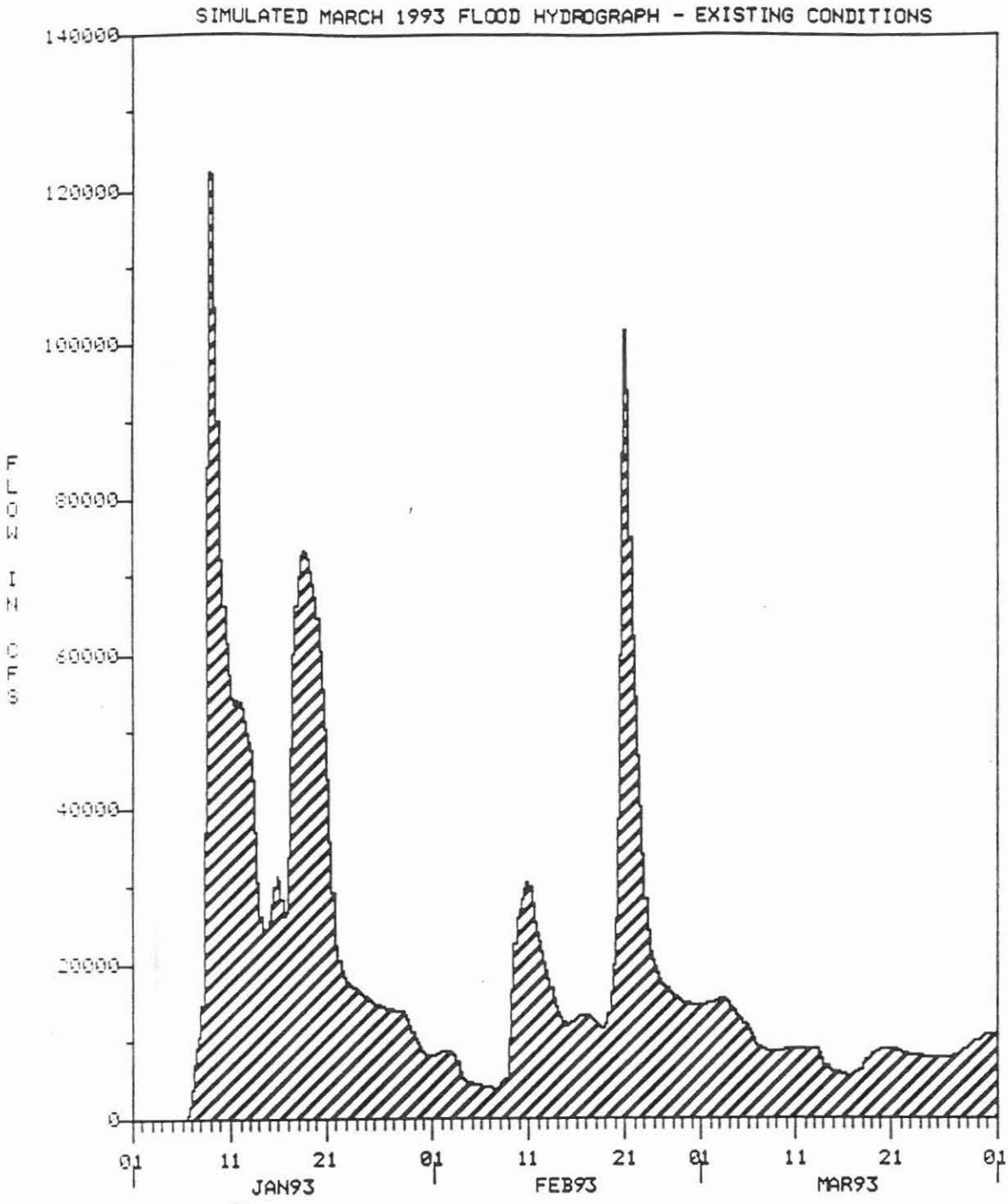
SALT RIVER ABOVE GILA RIVER CONFLUENCE

30APR98 15:20:53
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

29APR98 14:33:51
PORABGLA.DSS



SALT RIVER ABOVE GILA RIVER CONFLUENCE

TABULATED 100-YEAR FLOOD HYDROGRAPHS, existing conditions

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG//6HOUR/100YR-P6OP2/
Start: 01JAN1993 at 0600 hours; End: 31MAR1993 at 2400 hours; Number: 360
Units: CFS Type: PER-AVER

01JAN1993, 0600;	-901.0	3519.9	3519.9	3463.1	3222.0	2728.2
02JAN1993, 1800;	2276.5	2144.0	2212.3	2251.2	2259.6	2202.2
04JAN1993, 0600;	2146.3	2030.3	1914.5	1825.1	1671.1	1334.8
05JAN1993, 1800;	1014.9	1454.1	1603.0	2282.8	3416.9	6218.6
07JAN1993, 0600;	10590.5	13514.2	21705.3	48397.0	109709.7	163945.3
08JAN1993, 1800;	146709.6	98069.1	103506.3	116367.7	100300.4	88990.5
10JAN1993, 0600;	78025.3	71700.9	64501.7	55364.3	54198.8	55957.6
11JAN1993, 1800;	57477.5	55768.7	53270.3	50499.3	48550.6	48092.8
13JAN1993, 0600;	46981.1	45365.2	43398.0	39647.5	35483.5	32891.2
14JAN1993, 1800;	30656.6	28793.2	29226.2	30666.8	30973.0	30803.9
16JAN1993, 0600;	27915.2	25154.1	23527.8	28136.1	41872.5	58257.3
17JAN1993, 1800;	60510.8	58036.0	72518.7	91287.3	93924.7	89402.3
19JAN1993, 0600;	87937.3	83993.9	83541.2	80475.5	69762.7	60531.2
20JAN1993, 1800;	59612.4	60781.5	57359.8	51667.5	46706.7	41770.3
22JAN1993, 0600;	36167.5	30569.6	27211.1	25394.7	23360.7	21245.4
23JAN1993, 1800;	19961.1	19334.6	18857.1	18234.7	17913.6	17849.0
25JAN1993, 0600;	17513.6	16908.6	16507.4	16375.0	16290.0	16010.4
26JAN1993, 1800;	15728.6	15623.6	15583.4	15442.3	15297.5	15237.8
28JAN1993, 0600;	15209.2	15120.6	15031.2	14992.6	14971.5	14909.6
29JAN1993, 1800;	14760.4	14320.5	13531.1	12719.1	12074.2	11558.1
31JAN1993, 0600;	11083.9	10738.5	10455.1	10144.8	9974.0	10102.2
01FEB1993, 1800;	10368.8	10422.1	10307.1	10146.8	10010.2	9920.9
03FEB1993, 0600;	9820.0	9585.4	9356.4	9268.3	9231.4	9107.5
04FEB1993, 1800;	8979.5	8928.1	8851.9	8772.9	8621.0	8360.6
06FEB1993, 0600;	8006.8	7475.1	6725.2	6061.3	5734.8	5598.3
07FEB1993, 1800;	5453.6	6107.0	6137.3	6449.3	6912.8	8214.0
09FEB1993, 0600;	12772.6	20226.5	23703.2	22139.2	22271.4	24118.5
10FEB1993, 1800;	25625.2	25947.8	24195.5	21167.0	19953.4	20010.3
12FEB1993, 0600;	19227.9	17609.5	16820.3	16762.5	16515.9	15583.7
13FEB1993, 1800;	14416.7	13842.8	13404.4	12871.2	12360.8	12267.4
15FEB1993, 0600;	12734.7	13267.5	13650.8	13923.7	14094.7	14150.3
16FEB1993, 1800;	14217.2	14140.8	13893.6	13529.0	13230.2	12912.4
18FEB1993, 0600;	12619.0	12360.9	12357.3	12823.8	14284.4	16645.4
19FEB1993, 1800;	20343.1	23597.4	30778.9	47295.1	76700.8	104849.6
21FEB1993, 0600;	98144.3	67335.5	53051.8	51773.1	46600.5	40527.3
22FEB1993, 1800;	35958.9	30614.6	26108.6	23388.7	21834.9	20459.3
24FEB1993, 0600;	18709.0	17009.4	15972.4	15663.0	15588.5	15243.9
25FEB1993, 1800;	14897.9	14759.1	14690.9	14483.9	14274.1	14221.1
27FEB1993, 0600;	14202.9	14121.8	14034.7	14050.7	14066.2	14080.3
28FEB1993, 1800;	14087.4	14099.3	14119.0	14166.5	14217.7	14248.2
02MAR1993, 0600;	14327.0	14493.7	14654.4	14717.4	14716.1	14752.3
03MAR1993, 1800;	14801.6	14775.6	14578.6	14235.2	13878.2	13407.6
05MAR1993, 0600;	12934.8	12513.0	12137.8	11721.2	11182.4	10457.9
06MAR1993, 1800;	9806.8	9401.7	9178.2	8801.0	8461.2	8281.9
08MAR1993, 0600;	8256.1	8587.1	9324.0	10024.7	10266.1	10308.6
09MAR1993, 1800;	10406.1	10477.2	10515.9	10626.6	10736.7	10762.8
11MAR1993, 0600;	10748.5	10741.8	10741.5	10710.5	10711.2	10708.9
12MAR1993, 1800;	10700.3	10640.4	10544.2	10345.3	10153.5	10058.7
14MAR1993, 0600;	9958.1	9714.2	9476.1	9355.0	9216.8	8939.4
15MAR1993, 1800;	8659.7	8488.5	8299.9	8072.6	7867.7	7802.0
17MAR1993, 0600;	7830.2	7955.6	8069.6	8168.1	8291.4	8544.9
18MAR1993, 1800;	8786.1	8951.3	9154.3	9494.9	9811.8	9945.4
20MAR1993, 0600;	10069.2	10227.3	10367.1	10396.5	10300.2	10020.6
21MAR1993, 1800;	9747.8	9641.1	9576.0	9372.6	9167.0	9102.2
23MAR1993, 0600;	9097.3	9043.1	8981.8	8951.6	8928.1	8866.7
24MAR1993, 1800;	8805.0	8779.3	8749.2	8673.5	8596.4	8621.0
26MAR1993, 0600;	8633.3	8643.0	8653.2	8744.4	8877.8	9155.0
27MAR1993, 1800;	9428.3	9611.7	9826.9	10324.6	10814.2	11086.6
29MAR1993, 0600;	11307.8	11917.0	12416.6	12489.7	12875.8	13603.4
30MAR1993, 1800;	13908.1	13350.0	13184.5	12931.3	12582.6	12084.6

/GILA RECON/SALT CONFLNCE/FLOW-REG//6HOUR/100-YR/
Start: 01JAN1993 at 0600 hours; End: 31MAR1993 at 2400 hours; Number: 360
Units: CFS Type: PER-AVER

01JAN1993, 0600;	492.7	492.7	492.7	454.2	323.5	298.7
02JAN1993, 1800;	287.7	282.7	218.3	217.3	216.9	216.7
04JAN1993, 0600;	441.7	441.7	441.7	441.6	333.1	333.1
05JAN1993, 1800;	333.1	333.1	391.6	391.6	391.6	872.8
07JAN1993, 0600;	4273.9	5288.6	6925.9	9580.6	22580.6	60256.9
08JAN1993, 1800;	128177.6	172979.6	174720.2	148980.1	134567.0	122862.3
10JAN1993, 0600;	97534.0	85788.7	74549.0	65703.6	60975.8	54281.4
11JAN1993, 1800;	51235.9	50880.1	57155.2	56214.7	54435.9	52074.1
13JAN1993, 0600;	42060.1	40615.9	39257.0	38007.2	48106.6	47994.4
14JAN1993, 1800;	48391.4	49167.8	48543.7	49224.0	50199.6	51189.2
16JAN1993, 0600;	48976.6	48627.6	47716.6	46714.4	45499.2	50204.8
17JAN1993, 1800;	59691.5	68520.9	72030.4	74455.8	80795.2	87051.4
19JAN1993, 0600;	92632.4	92009.6	90848.1	88727.1	92607.9	88019.6
20JAN1993, 1800;	80579.4	73868.3	67235.8	65372.7	62612.3	59682.4
22JAN1993, 0600;	49806.4	48788.7	47464.4	45954.8	50090.8	49625.6
23JAN1993, 1800;	49153.1	48563.2	44762.0	44477.4	44129.7	43683.7
25JAN1993, 0600;	40937.7	40676.9	40357.1	39928.4	37821.5	37560.9
26JAN1993, 1800;	37369.1	37135.8	35554.2	35392.9	35284.0	35159.5
28JAN1993, 0600;	33873.3	33786.6	33724.3	33648.2	33483.0	33427.6
29JAN1993, 1800;	33385.4	33333.6	33437.7	33398.4	33366.7	33318.9
31JAN1993, 0600;	33083.5	33084.5	33133.8	33222.9	32738.4	32875.5
01FEB1993, 1800;	33064.9	33344.7	33075.5	33212.6	33211.2	33127.8
03FEB1993, 0600;	32630.4	32522.7	32399.2	31536.4	26921.0	19194.1
04FEB1993, 1800;	13543.8	11610.9	10525.0	10006.6	9803.7	9629.9
06FEB1993, 0600;	9307.3	9156.5	8993.2	8709.3	8079.4	7654.4
07FEB1993, 1800;	7398.3	7299.4	7302.7	7309.8	7319.2	9908.0
09FEB1993, 0600;	16195.7	21733.6	26134.2	32333.8	38362.6	41223.5
10FEB1993, 1800;	42141.5	41252.1	37994.8	35112.8	32948.8	29497.6
12FEB1993, 0600;	25465.5	22787.3	21334.0	19563.0	17601.6	16404.5
13FEB1993, 1800;	15745.1	14968.4	14013.4	13392.7	13062.6	14182.9
15FEB1993, 0600;	18163.6	20234.0	20872.5	20943.2	20638.0	20233.2
16FEB1993, 1800;	20123.3	19492.4	17868.7	16975.4	16675.3	16127.9
18FEB1993, 0600;	15193.6	14518.7	14258.8	14071.4	14369.8	15940.8
19FEB1993, 1800;	19663.8	25001.2	31768.2	38262.5	48133.6	64185.6
21FEB1993, 0600;	83295.5	92847.4	85744.0	70283.0	58981.7	53609.1
22FEB1993, 1800;	49512.8	45835.3	44574.6	41984.7	39966.5	38761.2
24FEB1993, 0600;	38744.0	38371.1	37967.9	37433.6	36658.6	36295.9
25FEB1993, 1800;	36044.6	34737.7	29714.1	23322.2	19329.5	17741.4
27FEB1993, 0600;	15921.2	15260.5	14986.0	14930.0	14610.4	14790.5
28FEB1993, 1800;	14838.3	15110.9	15359.0	15839.2	16024.8	15965.8
02MAR1993, 0600;	15088.4	14829.1	14815.2	14835.3	14195.7	14174.0
03MAR1993, 1800;	14183.4	14139.2	14428.0	14366.0	14423.4	14549.8
05MAR1993, 0600;	14796.2	14864.4	14873.9	14651.5	14554.7	14092.4
06MAR1993, 1800;	13805.9	13413.0	12472.3	12150.6	11991.3	11738.9
08MAR1993, 0600;	10917.5	10654.3	10690.2	10994.5	11261.9	11871.1
09MAR1993, 1800;	12253.0	12537.0	12428.3	12687.2	12820.7	12983.2
11MAR1993, 0600;	12840.0	12980.1	13029.9	13019.0	12886.7	12833.8
12MAR1993, 1800;	12822.0	12738.1	12493.6	12291.7	12153.6	11941.3
14MAR1993, 0600;	11621.1	11362.0	11175.5	10964.2	10718.4	10573.8
15MAR1993, 1800;	10485.1	10361.9	9289.6	9141.1	9051.0	9054.1
17MAR1993, 0600;	9649.0	9832.6	9951.6	10244.0	11138.0	11556.0
18MAR1993, 1800;	11762.3	12095.6	12582.5	12986.4	13203.1	13494.5
20MAR1993, 0600;	13978.3	14243.2	14355.1	14399.2	14476.0	14380.7
21MAR1993, 1800;	14230.5	13921.0	13531.9	13219.3	13035.4	12805.9
23MAR1993, 0600;	12491.3	12302.0	12212.7	12162.0	12113.6	12103.4
24MAR1993, 1800;	12075.8	12027.4	11901.3	11846.5	11799.0	11761.7
26MAR1993, 0600;	11696.9	11700.6	11691.7	11850.0	12424.5	12786.2
27MAR1993, 1800;	13004.8	13238.6	13344.7	13557.1	13818.8	14170.0
29MAR1993, 0600;	14635.2	14926.7	15229.1	15815.0	16578.3	17250.9

30MAR1993, 1800;	17782.8	18187.6	18053.2	17859.5	17768.1	-901.0

TABULATED HISTORICAL FLOOD HYDROGRAPHS, existing conditions

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1905/6HOUR/POR-P6OP2/
Start: 10APR1905 at 1200 hours; End: 16APR1905 at 0600 hours; Number: 24
Units: CFS Type: PER-AVER

10APR1905, 1200;	7880.	7941.	8158.	8600.	9362.	10624.	12549.
12APR1905, 0600;	15441.	19779.	26021.	35218.	46480.	54829.	58546.
13APR1905, 2400;	60542.	60449.	57166.	52350.	47241.	42493.	38561.
15APR1905, 1800;	35314.	32610.	30352.				

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1906/6HOUR/POR-P6OP2/
Start: 12MAR1906 at 1200 hours; End: 17MAR1906 at 0600 hours; Number: 20
Units: CFS Type: PER-AVER

12MAR1906, 1200;	5514.	5861.	6929.	8372.	9847.	11887.	15350.
14MAR1906, 0600;	19970.	24815.	30292.	37698.	45562.	48315.	43324.
15MAR1906, 2400;	35550.	29895.	26074.	22940.	20611.	19022.	

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1907/6HOUR/POR-P6OP2/
Start: 03MAR1907 at 1200 hours; End: 12MAR1907 at 0600 hours; Number: 36
Units: CFS Type: PER-AVER

03MAR1907, 1200;	3779.	3783.	3808.	3880.	4003.	4167.	4368.
05MAR1907, 0600;	4666.	5462.	6374.	7037.	8670.	13001.	22116.
06MAR1907, 2400;	33723.	38503.	34223.	28551.	24262.	20305.	17451.
08MAR1907, 1800;	15625.	14220.	13208.	12457.	11864.	11429.	11070.
10MAR1907, 1200;	10714.	10325.	9744.	8624.	7156.	6117.	5709.
12MAR1907, 0600;	5606.						

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1908/6HOUR/POR-P6OP2/
Start: 01MAR1908 at 0600 hours; End: 31MAR1908 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1908, 0600;	.000	.000	.000	.000	.000	.000
02MAR1908, 1800;	.000	.000	.000	.000	.000	.000
04MAR1908, 0600;	.000	.000	.000	54.861	282.198	672.955
05MAR1908, 1800;	1058.994	1328.242	1404.463	2100.749	4086.347	5748.701
07MAR1908, 0600;	6340.217	6846.273	7265.134	7378.549	7303.314	7126.500
08MAR1908, 1800;	6907.970	6661.593	6485.756	6557.260	6948.047	7366.080
10MAR1908, 0600;	7524.379	7513.784	7468.687	7411.086	7353.025	7272.284
11MAR1908, 1800;	7163.454	7063.206	6796.393	5933.326	4638.914	3681.918
13MAR1908, 0600;	3213.830	2947.963	2810.626	2722.896	2630.082	2561.599
14MAR1908, 1800;	2525.111	2508.257	2500.291	2497.046	2495.591	2499.025
16MAR1908, 0600;	2506.265	2516.395	2533.596	2599.610	2737.402	2865.399
17MAR1908, 1800;	2938.769	3047.602	3241.973	3426.957	3544.423	3647.885
19MAR1908, 0600;	3761.015	3842.845	3878.572	3944.938	4083.313	4184.534
20MAR1908, 1800;	4193.304	4185.241	4197.794	4208.171	4204.279	4167.903
22MAR1908, 0600;	4084.773	4002.656	3946.913	3827.666	3598.048	3394.495
23MAR1908, 1800;	3296.020	3235.203	3186.363	3149.372	3113.788	3028.453
25MAR1908, 0600;	2857.757	2707.393	2642.171	2585.365	2498.173	2429.680
26MAR1908, 1800;	2403.724	2407.316	2436.942	2464.140	2467.121	2480.862
28MAR1908, 0600;	2530.955	2573.042	2579.439	2537.843	2430.243	2332.188
29MAR1908, 1800;	2293.127	2248.583	2166.706	2097.854	2068.741	2029.733
31MAR1908, 0600;	1952.339	1886.879	1861.735	1851.539		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1909/6HOUR/POR-P6OP2/
Start: 01FEB1909 at 0600 hours; End: 28FEB1909 at 2400 hours; Number: 112
Units: CFS Type: PER-AVER

01FEB1909, 0600;	902.000	901.316	898.691	888.994	867.037	823.844
02FEB1909, 1800;	760.356	701.847	661.072	853.608	1732.284	3011.808
04FEB1909, 0600;	3819.871	4099.708	4228.223	4287.733	4310.646	4324.781
05FEB1909, 1800;	4337.000	4321.343	4249.501	4190.892	4189.671	4188.619

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1889/6HOUR/POR-P6OP2/
Start: 01MAR1889 at 0600 hours; End: 07MAR1889 at 2400 hours; Number: 28
Units: CFS Type: PER-AVER

01MAR1889, 0600;	3406.	3427.	3508.	3688.	3983.	4362.	4812.
02MAR1889, 2400;	5381.	6074.	6923.	7797.	8681.	9737.	11042.
04MAR1889, 1800;	12815.	14496.	14497.	12643.	10743.	9606.	8625.
06MAR1889, 1200;	7649.	7240.	8175.	10006.	11153.	11433.	11500.

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1890/6HOUR/POR-P6OP2/
Start: 20FEB1890 at 1200 hours; End: 25FEB1890 at 0600 hours; Number: 20
Units: CFS Type: PER-AVER

20FEB1890, 1200;	447.	466.	567.	954.	2337.	4921.	7828.
22FEB1890, 0600;	11213.	16610.	30310.	56054.	77051.	78658.	71829.
23FEB1890, 2400;	64812.	54266.	42085.	31721.	24039.	19414.	

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1891/6HOUR/POR-P6OP2/
Start: 15FEB1891 at 1200 hours; End: 28FEB1891 at 2400 hours; Number: 55
Units: CFS Type: PER-AVER

15FEB1891, 1200;	15658.7	16003.5	17678.8	21289.5	25706.2	29196.0
16FEB1891, 2400;	31550.4	33438.6	35289.2	37561.0	40850.3	45548.6
18FEB1891, 1200;	51017.4	55961.0	62121.9	73385.5	87904.6	100350.3
19FEB1891, 2400;	106567.1	104548.3	97805.7	89004.0	79411.1	71678.1
21FEB1891, 1200;	65055.3	58467.6	53135.1	49848.5	48460.7	48571.8
22FEB1891, 2400;	49824.7	52696.4	59133.6	73012.4	97453.4	128830.1
24FEB1891, 1200;	153961.0	166611.4	171771.2	167731.6	152809.1	130941.8
25FEB1891, 2400;	109493.5	94748.8	83486.6	72745.6	63265.4	55979.3
27FEB1891, 1200;	51268.7	48288.3	46419.9	45148.0	44156.7	43283.5
28FEB1891, 2400;	42611.3					

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1891/6HOUR/POR-P6OP2/
Start: 01MAR1891 at 0600 hours; End: 01MAR1891 at 0600 hours; Number: 1
Units: CFS Type: PER-AVER

01MAR1891, 0600;	42247.

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1895/6HOUR/POR-P6OP2/
Start: 01MAR1895 at 0600 hours; End: 31MAR1895 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1895, 0600;	2304.000	2308.080	2324.686	2365.214	2442.267	2563.484
02MAR1895, 1800;	2731.914	2962.833	3253.562	3582.446	3910.269	4315.330
04MAR1895, 0600;	5062.625	6328.164	7910.430	9137.586	9308.543	8412.434
05MAR1895, 1800;	7081.938	5879.470	4982.305	4362.512	3937.485	3631.343
07MAR1895, 0600;	3447.451	3427.397	3535.612	3653.272	3688.420	3632.919
08MAR1895, 1800;	3528.017	3437.519	3394.979	3382.395	3379.551	3380.660
10MAR1895, 0600;	3403.246	3474.962	3584.548	3669.584	3681.881	3618.485
11MAR1895, 1800;	3506.397	3392.760	3297.392	3181.683	3026.092	2884.608
13MAR1895, 0600;	2781.508	2664.584	2511.807	2381.020	2315.465	2293.250
14MAR1895, 1800;	2283.217	2277.767	2275.735	2274.802	2274.332	2274.160
16MAR1895, 0600;	2274.068	2274.030	2274.014	2274.006	2274.003	2274.001
17MAR1895, 1800;	2274.000	2274.000	2274.000	2274.000	2274.000	2269.567
19MAR1895, 0600;	2263.158	2259.601	2255.248	2238.992	2198.919	2117.628
20MAR1895, 1800;	1996.811	1883.203	1788.283	1658.205	1480.209	1332.914
22MAR1895, 0600;	1269.933	1266.657	1288.283	1322.687	1374.471	1467.077
23MAR1895, 1800;	1601.903	1731.949	1831.696	1940.889	2083.586	2218.754
25MAR1895, 0600;	2323.790	2443.155	2600.477	2747.201	2857.055	2977.687
26MAR1895, 1800;	3134.890	3275.314	3371.341	3469.518	3593.841	3695.166
28MAR1895, 0600;	3741.624	3756.034	3759.804	3751.270	3717.649	3639.780
29MAR1895, 1800;	3522.607	3413.019	3336.209	3260.461	3164.929	3080.678
31MAR1895, 0600;	3025.771	2974.303	2911.057	2857.605		

07FEB1909, 0600;	4157.852	4127.058	4113.875	4101.680	4071.335	4039.994
08FEB1909, 1800;	4028.384	3979.424	3878.674	3888.125	4064.207	4248.213
10FEB1909, 0600;	4357.959	4422.396	4469.433	4533.399	4616.601	4622.968
11FEB1909, 1800;	4519.048	4427.359	4414.994	4398.627	4326.612	4223.867
13FEB1909, 0600;	4093.774	4009.396	4084.883	4364.718	4855.895	5547.800
14FEB1909, 1800;	6212.618	6472.581	6329.488	6110.269	5995.929	5924.298
16FEB1909, 0600;	5812.311	5712.692	5667.726	5614.384	5500.947	5331.805
17FEB1909, 1800;	5134.682	4942.747	4772.825	4634.810	4526.940	4438.737
19FEB1909, 0600;	4377.236	4362.581	4389.790	4436.584	4495.492	4551.360
20FEB1909, 1800;	4597.939	4628.347	4632.752	4647.609	4691.527	4770.085
22FEB1909, 0600;	4927.875	5179.808	5500.370	5816.391	5990.371	5920.200
23FEB1909, 1800;	5641.350	5230.451	4762.754	4390.330	4172.010	3941.437
25FEB1909, 0600;	3593.729	3299.966	3164.183	3097.871	3068.931	3075.458
26FEB1909, 1800;	3097.251	3116.350	3123.400	3126.214	3126.967	3147.640
28FEB1909, 0600;	3214.392	3253.617	3223.970	3182.469		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1909/6HOUR/POR-P6OP2/
Start: 01MAR1909 at 0600 hours; End: 02MAR1909 at 2400 hours; Number: 8
Units: CFS Type: PER-AVER

01MAR1909, 0600;	3303.397	3734.119	4269.444	4672.631	4867.643	4879.846
02MAR1909, 1800;	4834.625	4793.333				

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1911/6HOUR/POR-P6OP2/
Start: 01MAR1911 at 0600 hours; End: 31MAR1911 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1911, 0600;	.00	.00	.00	.00	.00	.00
02MAR1911, 1800;	.00	.00	.00	.00	.00	.00
04MAR1911, 0600;	.00	.00	.00	.00	191.41	1317.64
05MAR1911, 1800;	3660.08	6339.00	8844.21	11246.26	13304.29	14606.66
07MAR1911, 0600;	14639.02	13402.93	11773.00	10300.58	8845.11	7350.51
08MAR1911, 1800;	5969.50	4791.74	3854.21	3201.18	2886.07	2796.76
10MAR1911, 0600;	2795.90	2884.27	3056.94	3832.99	6235.88	10209.08
11MAR1911, 1800;	14173.15	16397.19	15983.13	13525.40	10552.58	7865.26
13MAR1911, 0600;	5659.58	4179.70	3325.78	2740.10	2250.30	1844.67
14MAR1911, 1800;	1522.13	1273.53	1086.71	937.68	809.07	709.04
16MAR1911, 0600;	640.47	574.54	493.19	418.17	367.72	328.84
17MAR1911, 1800;	285.52	236.54	184.18	129.78	73.66	32.85
19MAR1911, 0600;	14.65	6.53	2.91	1.30	.58	.26
20MAR1911, 1800;	.12	.05	.02	.01	.00	.00
22MAR1911, 0600;	.00	.00	.00	.00	.00	.00
23MAR1911, 1800;	.00	.00	.00	.00	.00	.00
25MAR1911, 0600;	.00	.00	.00	.00	.00	.00
26MAR1911, 1800;	.00	.00	.00	.00	.00	.00
28MAR1911, 0600;	.00	.00	.00	.00	.00	.00
29MAR1911, 1800;	.00	.00	.00	.00	.00	.00
31MAR1911, 0600;	.00	.00	.00	.00		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1915/6HOUR/POR-P6OP2/
Start: 01APR1915 at 0600 hours; End: 30APR1915 at 2400 hours; Number: 120
Units: CFS Type: PER-AVER

01APR1915, 0600;	3008.001	3007.332	3005.160	2994.803	2979.926	2965.022
02APR1915, 1800;	2946.629	2927.224	2910.611	2895.016	2875.552	2861.760
04APR1915, 0600;	2841.539	2785.903	2701.396	2628.699	2601.981	2620.397
05APR1915, 1800;	2662.160	2957.308	4325.728	6616.493	8211.832	8784.607
07APR1915, 0600;	9071.617	9197.274	9215.078	9200.129	9152.553	9057.796
08APR1915, 1800;	8902.078	8744.006	8612.647	8476.590	8318.744	8182.362
10APR1915, 0600;	8095.261	8025.858	7958.177	7933.571	7964.232	8008.556
11APR1915, 1800;	8042.823	8069.881	8092.428	8106.837	8108.628	8109.037
13APR1915, 0600;	8110.052	8091.635	8052.849	8024.431	8026.025	8055.817
14APR1915, 1800;	8101.650	8150.303	8207.878	8279.846	8356.818	8419.056

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16APR1915, 0600;   8454.400   62.182  8450.178  8416.930  8339.935  8212.182
17APR1915, 1800;   8056.952   94.030  7715.393  7521.871  7334.839  7168.903
19APR1915, 0600;   7034.113   45.535  6901.954  6889.099  6890.646  6896.544
20APR1915, 1800;   6902.599  6899.232  6884.417  6865.367  6848.820  6840.646
22APR1915, 0600;   6840.353  6843.991  6850.450  6854.431  6854.419  6858.967
23APR1915, 1800;   6889.796  6949.155  7009.512  7052.325  7081.555  7106.005
25APR1915, 0600;   7142.252  7278.202  7610.490  8078.089  8550.283  9003.816
26APR1915, 1800;   9449.990  9810.787  9924.172  9671.051  9106.564  8427.074
28APR1915, 0600;   7839.138  7450.115  7230.615  7100.857  7008.953  6940.591
29APR1915, 1800;   6899.083  6878.014  6866.714  6859.898  6856.694  6855.242
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01JAN1916/6HOUR/POR-P6OP2/
Start: 16JAN1916 at 1200 hours;   End: 23JAN1916 at 0600 hours;  Number:   28
Units: CFS          Type: PER-AVER
16JAN1916, 1200;     4010.0    4290.7    5256.0    7231.1   10119.9   13743.9
17JAN1916, 2400;    18794.0   24979.0   30962.5   38945.9   52042.2   65991.2
19JAN1916, 1200;    75464.0   83590.5   93732.3  100763.9   98412.4   91677.1
20JAN1916, 2400;    87575.8   83347.8   75703.3   65760.1   56783.5   51433.6
22JAN1916, 1200;    48879.1   47226.7   46173.1   45642.7
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1917/6HOUR/POR-P6OP2/
Start: 18APR1917 at 1200 hours;   End: 22APR1917 at 0600 hours;  Number:   16
Units: CFS          Type: PER-AVER
18APR1917, 1200;   25315.  25598.  27813.  33224.  38570.  39314.  36256.
20APR1917, 0600;   32694.  29229.  25576.  22417.  20208.  18809.  17895.
21APR1917, 2400;   17190.  16592.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1918/6HOUR/POR-P6OP2/
Start: 08MAR1918 at 1200 hours;   End: 17MAR1918 at 0600 hours;  Number:   36
Units: CFS          Type: PER-AVER
08MAR1918, 1200;    3990.   4185.   4730.   5966.   8890.  14867.  24162.
10MAR1918, 0600;   32055.  32105.  25649.  19149.  14956.  11675.   8639.
11MAR1918, 2400;    6209.   4453.   3201.   2449.   2217.   2508.   3539.
13MAR1918, 1800;    5908.   9757.  14700.  20393.  26001.  29744.  29220.
15MAR1918, 1200;   24123.  17851.  13512.  10838.   8654.   6873.   5560.
17MAR1918, 0600;    4523.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1920/6HOUR/POR-P6OP2/
Start: 21FEB1920 at 1200 hours;   End: 28FEB1920 at 0600 hours;  Number:   28
Units: CFS          Type: PER-AVER
21FEB1920, 1200;   24308.  24705.  27175.  32895.  40583.  47729.  56842.
23FEB1920, 0600;   73823.  91901.  97978.  93925.  87737.  80680.  73269.
24FEB1920, 2400;   66910.  61522.  55895.  48969.  41523.  35131.  30208.
26FEB1920, 1800;   26451.  23497.  21128.  19369.  18180.  17356.  16717.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1922/6HOUR/POR-P6OP2/
Start: 16MAR1922 at 1200 hours;   End: 21MAR1922 at 0600 hours;  Number:   20
Units: CFS          Type: PER-AVER
16MAR1922, 1200;     270.    308.    395.    562.   1070.   1995.   3570.
18MAR1922, 0600;    6110.   9351.  13294.  17080.  18060.  15815.  13067.
19MAR1922, 2400;   11139.   9559.   8300.   7444.   6818.   6357.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1924/6HOUR/POR-P6OP2/
Start: 01APR1924 at 0600 hours;   End: 30APR1924 at 2400 hours;  Number:  120
Units: CFS          Type: PER-AVER
01APR1924, 0600;       0.      0.      0.      0.      0.      0.      0.
02APR1924, 2400;       0.      0.      0.      0.      0.      0.    281.
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04APR1924, 1800;	1026.	1743.	2031.	2029.	1914.	1791.	1751.
06APR1924, 1200;	1794.	1882.	1970.	2027.	2062.	2106.	2179.
08APR1924, 0600;	2297.	2473.	2685.	3452.	5576.	8291.	10268.
09APR1924, 2400;	11422.	11814.	11509.	10906.	10262.	9694.	9238.
11APR1924, 1800;	8879.	8627.	8510.	8360.	7947.	7394.	6898.
13APR1924, 1200;	6498.	6203.	6003.	5939.	6020.	6180.	6280.
15APR1924, 0600;	6228.	6119.	6036.	6009.	6049.	6002.	5802.
16APR1924, 2400;	5505.	5131.	4817.	4630.	4386.	3989.	3641.
18APR1924, 1800;	3458.	3258.	2944.	2688.	2574.	2473.	2322.
20APR1924, 1200;	2194.	2123.	2105.	2151.	2202.	2210.	2272.
22APR1924, 0600;	2448.	2596.	2631.	2642.	2681.	2709.	2706.
23APR1924, 2400;	2680.	2623.	2571.	2547.	2530.	2514.	2502.
25APR1924, 1800;	2494.	2481.	2458.	2436.	2420.	2378.	2290.
27APR1924, 1200;	2212.	2174.	2101.	1947.	1813.	1759.	1703.
29APR1924, 0600;	1600.	1514.	1475.	1446.	1410.	1383.	1369.
30APR1924, 2400;	1362.						

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1927/6HOUR/POR-P6OP2/
Start: 14FEB1927 at 1200 hours; End: 22FEB1927 at 0600 hours; Number: 32
Units: CFS Type: PER-AVER

14FEB1927, 1200;	.00	3.23	66.53	332.82	746.49	1395.85
15FEB1927, 2400;	2748.16	5506.77	10991.24	19154.41	26800.85	31466.00
17FEB1927, 1200;	34896.88	38839.67	44001.53	51910.05	58485.91	56872.79
18FEB1927, 2400;	50129.99	44502.50	39211.42	33316.27	27770.16	22766.94
20FEB1927, 1200;	18783.41	15679.39	12992.39	10774.53	8955.24	7450.09
21FEB1927, 2400;	6261.86	5370.76				

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1932/6HOUR/POR-P6OP2/
Start: 01MAR1932 at 0600 hours; End: 29MAR1932 at 2400 hours; Number: 116
Units: CFS Type: PER-AVER

01MAR1932, 0600;	246.000	258.490	280.064	301.656	314.536	302.155
02MAR1932, 1800;	274.539	248.197	227.110	211.027	199.785	192.796
04MAR1932, 0600;	188.739	188.112	199.077	221.530	249.845	280.181
05MAR1932, 1800;	316.096	362.060	407.941	443.182	469.264	490.074
07MAR1932, 0600;	505.883	512.115	499.555	467.537	425.963	386.703
08MAR1932, 1800;	353.851	326.998	302.449	276.574	248.402	217.971
10MAR1932, 0600;	188.352	166.686	161.699	177.115	206.054	239.173
11MAR1932, 1800;	276.246	319.023	367.807	422.999	497.304	600.029
13MAR1932, 0600;	701.700	910.855	1701.386	3023.499	3989.993	4421.416
14MAR1932, 1800;	4730.395	5017.997	5302.072	5449.937	5401.396	5297.803
16MAR1932, 0600;	5190.196	5102.905	5048.952	5006.053	4955.572	4872.965
17MAR1932, 1800;	4779.792	4693.740	4592.097	4504.752	4454.059	4454.210
19MAR1932, 0600;	4527.483	4596.558	4610.070	4667.002	4825.914	4955.957
20MAR1932, 1800;	4983.651	4940.803	4826.133	4718.918	4674.819	4626.056
22MAR1932, 0600;	4540.716	4468.557	4434.575	4362.947	4208.992	4074.097
23MAR1932, 1800;	4017.128	3936.587	3774.886	3630.293	3558.833	3490.688
25MAR1932, 0600;	3392.411	3316.222	3287.639	3319.562	3425.334	3525.819
26MAR1932, 1800;	3570.529	3672.927	3899.698	4098.240	4178.648	4265.953
28MAR1932, 0600;	4425.931	4558.499	4609.862	4631.685	4645.555	4651.899
29MAR1932, 1800;	4657.792	4687.571				

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1937/6HOUR/POR-P6OP2/
Start: 06MAR1937 at 1200 hours; End: 21MAR1937 at 0600 hours; Number: 60
Units: CFS Type: PER-AVER

06MAR1937, 1200;	0.	0.	0.	0.	0.	0.	0.
08MAR1937, 0600;	0.	0.	0.	0.	0.	0.	0.
09MAR1937, 2400;	0.	0.	0.	0.	0.	0.	0.
11MAR1937, 1800;	0.	0.	0.	3144.	3145.	3147.	3163.
13MAR1937, 1200;	3221.	3348.	3447.	3520.	3738.	4428.	5938.
15MAR1937, 0600;	7673.	8262.	7512.	6587.	5980.	5513.	5256.

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16MAR1937, 2400;    5027.   4802.   5366.   8614.  16290.  24706.  27043.
18MAR1937, 1800;   23927.  20713.  18397.  15938.  13636.  11736.  10111.
20MAR1937, 1200;    8709.   7488.   6445.   5599.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1941/6HOUR/POR-P6OP2/
Start: 13MAR1941 at 1200 hours;   End: 18MAR1941 at 0600 hours;  Number:   20
Units: CFS        Type: PER-AVER
13MAR1941, 1200;    7940.   8902.  11318.  14060.  16854.  20599.  28129.
15MAR1941, 0600;   44284.  64615.  75688.  75734.  72390.  67978.  63018.
16MAR1941, 2400;   59021.  55846.  53164.  51089.  49243.  46134.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1952/6HOUR/POR-P6OP2/
Start: 01APR1952 at 0600 hours;   End: 30APR1952 at 2400 hours;  Number:  120
Units: CFS        Type: PER-AVER
01APR1952, 0600;   8346.000  8350.100  8387.425  8420.738  8247.741  7724.877
02APR1952, 1800;   6989.692  6275.133  5696.541  5280.132  4997.347  4792.144
04APR1952, 0600;   4635.519  4523.194  4449.333  4392.195  4324.767  4239.974
05APR1952, 1800;   4152.316  4080.794  4036.426  4016.288  4008.594  4005.018
07APR1952, 0600;   4002.178  3999.878  3998.665  3987.453  3970.569  3954.921
08APR1952, 1800;   3926.124  3863.742  3752.506  3559.114  3285.737  3027.837
10APR1952, 0600;   2823.034  2572.331  2236.832  1940.772  1767.592  1650.880
11APR1952, 1800;   1526.831  1425.116  1364.979  1312.283  1250.136  1199.699
13APR1952, 0600;   1188.555  1225.023  1290.095  1343.522  1356.015  1326.517
14APR1952, 1800;   1271.786  1216.074  1171.553  1122.824  1058.808   998.309
16APR1952, 0600;    947.711   880.998   790.193   708.172   658.415   624.501
17APR1952, 1800;    587.824   552.566   520.691   477.172   416.237   359.800
19APR1952, 0600;    324.110   300.451   274.451   250.295   225.919   198.083
20APR1952, 1800;    178.827   181.673   218.273   350.831   619.665   901.054
22APR1952, 0600;   1099.697  1291.355  1525.860  1714.326  1791.552  1790.828
23APR1952, 1800;   1755.716  1704.612  1628.145  1486.261  1279.208  1088.773
25APR1952, 0600;    961.097   843.405   698.606   570.412   490.652   429.573
26APR1952, 1800;    363.063   304.996   262.917   227.885   190.468   153.414
28APR1952, 0600;    117.485    83.429    60.404    57.941    74.494   120.399
29APR1952, 1800;    247.913   451.492   646.715   829.669  1037.622  1212.745
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1965/6HOUR/POR-P6OP2/
Start: 02APR1965 at 1200 hours;   End: 07APR1965 at 0600 hours;  Number:   20
Units: CFS        Type: PER-AVER
02APR1965, 1200;        0.        0.        0.        0.        0.        0.
03APR1965, 2400;        0.        0.        0.        0.        0.        0.
05APR1965, 1200;        0.        0.        0.        0.        0.        0.
06APR1965, 2400;        0.        0.
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/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01DEC1965/6HOUR/POR-P6OP2/
Start: 01DEC1965 at 0600 hours;   End: 31DEC1965 at 2400 hours;  Number:  124
Units: CFS        Type: PER-AVER
01DEC1965, 0600;      .00       .00       .00       .00       .00       .00
02DEC1965, 1800;      .00       .00       .00       .00       .00       .00
04DEC1965, 0600;      .00       .00       .00       .00       .00       .00
05DEC1965, 1800;      .00       .00       .00       .00       .00       .00
07DEC1965, 0600;      .00       .00       .00       .00       .00       .00
08DEC1965, 1800;      .00       .00       .00       .00       .00       .00
10DEC1965, 0600;      .00       .00       .00       .00       .00       .00
11DEC1965, 1800;      .00       .00       .00       .00       .00       .00
13DEC1965, 0600;      .00       .00       .00       .00       .00       .00
14DEC1965, 1800;      .00       .00       .00       .00       .00       .00
16DEC1965, 0600;      .00       .00       .00       .00       .00       .00
17DEC1965, 1800;      .00       .00       .00       .00       .00       .00
19DEC1965, 0600;      .00       .00       .00       .00       .00       .00
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20DEC1965, 1800;	.00	.00	.00	.00	.00	71.48
22DEC1965, 0600;	331.08	439.08	259.51	115.72	51.60	23.01
23DEC1965, 1800;	10.26	4.58	2.04	.91	.41	.18
25DEC1965, 0600;	.08	.04	.02	.01	.00	.00
26DEC1965, 1800;	.00	.00	.00	.00	.00	.00
28DEC1965, 0600;	.00	.00	.00	75.89	384.31	863.43
29DEC1965, 1800;	1308.31	1596.81	1799.69	2304.31	4045.89	9048.83
31DEC1965, 0600;	16701.83	22445.47	24959.78	25658.88		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01JAN1966/6HOUR/POR-P6OP2/
Start: 01JAN1966 at 0600 hours; End: 31JAN1966 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01JAN1966, 0600;	23479.41	18930.19	14756.26	11557.13	9042.96	7353.50
02JAN1966, 1800;	6152.08	5146.05	4368.86	3731.34	3138.07	2629.11
04JAN1966, 0600;	2275.10	2064.19	1887.62	1684.07	1504.92	1380.50
05JAN1966, 1800;	1254.90	1096.14	954.30	861.79	780.39	682.10
07JAN1966, 0600;	594.98	537.07	482.64	414.28	351.69	313.67
08JAN1966, 1800;	293.77	277.09	256.17	231.99	208.44	186.17
10JAN1966, 0600;	163.86	142.28	123.34	106.62	90.55	75.27
11JAN1966, 1800;	61.85	49.71	37.42	25.38	14.81	7.15
13JAN1966, 0600;	3.19	1.42	.63	.28	.13	.06
14JAN1966, 1800;	.03	.01	.00	.00	.00	.00
16JAN1966, 0600;	.00	.00	.00	.00	.00	.00
17JAN1966, 1800;	.00	.00	.00	.00	.00	.00
19JAN1966, 0600;	.00	.00	.00	.00	.00	.00
20JAN1966, 1800;	.00	.00	.00	.00	.00	.00
22JAN1966, 0600;	.00	.00	.00	.00	.00	.00
23JAN1966, 1800;	.00	.00	.00	.00	.00	.00
25JAN1966, 0600;	.00	.00	.00	.00	.00	.00
26JAN1966, 1800;	.00	.00	.00	.00	.00	.00
28JAN1966, 0600;	.00	.00	.00	.00	.00	.00
29JAN1966, 1800;	.00	.00	.00	.00	.00	.00
31JAN1966, 0600;	.00	.00	.00	.00		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1966/6HOUR/POR-P6OP2/
Start: 01MAR1966 at 0600 hours; End: 31MAR1966 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1966, 0600;	0.	0.	0.	0.	0.	0.	0.
02MAR1966, 2400;	0.	0.	0.	0.	0.	0.	0.
04MAR1966, 1800;	0.	0.	0.	0.	0.	0.	0.
06MAR1966, 1200;	0.	0.	0.	0.	0.	0.	0.
08MAR1966, 0600;	0.	0.	0.	0.	0.	0.	0.
09MAR1966, 2400;	0.	0.	0.	0.	0.	0.	0.
11MAR1966, 1800;	0.	0.	0.	0.	0.	0.	0.
13MAR1966, 1200;	0.	0.	0.	173.	1008.	2435.	3574.
15MAR1966, 0600;	4633.	6626.	8875.	10234.	10821.	10947.	10856.
16MAR1966, 2400;	10744.	10595.	10450.	10354.	10289.	10226.	10141.
18MAR1966, 1800;	10031.	9906.	9754.	9566.	9324.	9075.	8904.
20MAR1966, 1200;	8799.	8701.	8563.	8384.	8209.	8033.	7838.
22MAR1966, 0600;	7654.	7495.	7332.	7159.	6999.	6861.	6711.
23MAR1966, 2400;	6523.	6322.	6117.	5905.	5683.	5449.	5233.
25MAR1966, 1800;	5059.	4911.	4786.	4682.	4572.	4458.	4369.
27MAR1966, 1200;	4295.	4227.	4165.	4112.	4064.	4002.	3950.
29MAR1966, 0600;	3938.	3962.	3986.	3995.	4000.	4016.	4051.
30MAR1966, 2400;	4081.	4088.	4082.	4067.	4047.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1973/6HOUR/POR-P6OP2/
Start: 01MAR1973 at 0600 hours; End: 31MAR1973 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1973, 0600;	2754.	2753.	2751.	2742.	2720.	2677.	2614.

02MAR1973, 2400;	2554.	2504.	2437.	2346.	2266.	2230.	2233.
04MAR1973, 1800;	2251.	2260.	2250.	2226.	2188.	2146.	2087.
06MAR1973, 1200;	1968.	1794.	1652.	1591.	1578.	1583.	1612.
08MAR1973, 0600;	1671.	1772.	1916.	2050.	2157.	2293.	2475.
09MAR1973, 2400;	2620.	2680.	2690.	2682.	2700.	2729.	2701.
11MAR1973, 1800;	2627.	2598.	2705.	3003.	3456.	3874.	4158.
13MAR1973, 1200;	4428.	4764.	5031.	5130.	5126.	5087.	5049.
15MAR1973, 0600;	5007.	4928.	4811.	4729.	4750.	4855.	5029.
16MAR1973, 2400;	5271.	5585.	5959.	6326.	6686.	7105.	7597.
18MAR1973, 1800;	8100.	8417.	8283.	7656.	6816.	6070.	5532.
20MAR1973, 1200;	5194.	4997.	4877.	4820.	4845.	4936.	5005.
22MAR1973, 0600;	5013.	4986.	4935.	4862.	4738.	4494.	4140.
23MAR1973, 2400;	3832.	3657.	3532.	3397.	3290.	3290.	3444.
25MAR1973, 1800;	3702.	3923.	4007.	3969.	3873.	3795.	3763.
27MAR1973, 1200;	3749.	3742.	3799.	3914.	4056.	4258.	4490.
29MAR1973, 0600;	4793.	5332.	6030.	6520.	6688.	6692.	7500.
30MAR1973, 2400;	9745.	11740.	12571.	13030.	13254.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01APR1973/6HOUR/POR-P6OP2/
Start: 01APR1973 at 0600 hours; End: 30APR1973 at 2400 hours; Number: 120
Units: CFS Type: PER-AVER

01APR1973, 0600;	13405.	13831.	14573.	15303.	15571.	15391.	15030.
02APR1973, 2400;	14573.	14003.	13385.	12802.	12287.	11842.	11482.
04APR1973, 1800;	11203.	10979.	10798.	10662.	10573.	10531.	10535.
06APR1973, 1200;	10580.	10666.	10798.	10985.	11265.	11644.	12053.
08APR1973, 0600;	12434.	12772.	13067.	13275.	13299.	13083.	12715.
09APR1973, 2400;	12352.	12089.	11938.	11869.	11894.	12077.	12435.
11APR1973, 1800;	12897.	13369.	13775.	14089.	14353.	14651.	15072.
13APR1973, 1200;	15660.	16342.	17052.	17805.	18559.	19272.	19848.
15APR1973, 0600;	19954.	19452.	18697.	17967.	17261.	16633.	16116.
16APR1973, 2400;	15674.	15337.	15133.	14996.	14890.	14867.	14961.
18APR1973, 1800;	15124.	15246.	15191.	14890.	14412.	13856.	13269.
20APR1973, 1200;	12672.	12072.	11468.	10889.	10364.	9900.	9520.
22APR1973, 0600;	9242.	9054.	8929.	8850.	8835.	8915.	9095.
23APR1973, 2400;	9341.	9626.	9937.	10263.	10589.	10896.	11161.
25APR1973, 1800;	11377.	11574.	11805.	12109.	12461.	12756.	12885.
27APR1973, 1200;	12833.	12695.	12578.	12559.	12718.	13060.	13498.
29APR1973, 0600;	13961.	14424.	14872.	15279.	15630.	15922.	16168.
30APR1973, 2400;	16390.						

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1978/6HOUR/POR-P6OP2/
Start: 01MAR1978 at 0600 hours; End: 31MAR1978 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1978, 0600;	2354.	2211.	1869.	1563.	1730.	9559.	32362.
02MAR1978, 2400;	51736.	53828.	56506.	62314.	59017.	48369.	36344.
04MAR1978, 1800;	27421.	21951.	17867.	14809.	12807.	12525.	14827.
06MAR1978, 1200;	18542.	20505.	19746.	17763.	15437.	13323.	11829.
08MAR1978, 0600;	10556.	9099.	7571.	6236.	5245.	4565.	4050.
09MAR1978, 2400;	3632.	3342.	3155.	2966.	2733.	2555.	2469.
11MAR1978, 1800;	2404.	2336.	2331.	2475.	2852.	3427.	3963.
13MAR1978, 1200;	4412.	4992.	5624.	5959.	5937.	5721.	5447.
15MAR1978, 0600;	5231.	5025.	4688.	4270.	3932.	3691.	3414.
16MAR1978, 2400;	3046.	2715.	2503.	2325.	2113.	1928.	1805.
18MAR1978, 1800;	1685.	1537.	1411.	1343.	1311.	1284.	1268.
20MAR1978, 1200;	1264.	1262.	1262.	1283.	1333.	1420.	1548.
22MAR1978, 0600;	1740.	1978.	2293.	2737.	3173.	3853.	5284.
23MAR1978, 2400;	7014.	7936.	7741.	6797.	5613.	4785.	4371.
25MAR1978, 1800;	3926.	3294.	2739.	2415.	2187.	1942.	1732.
27MAR1978, 1200;	1599.	1483.	1343.	1222.	1151.	1100.	1044.
29MAR1978, 0600;	995.	963.	936.	902.	870.	844.	814.
30MAR1978, 2400;	775.	738.	704.	653.	582.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01DEC1978/6HOUR/POR-P6OP2/
Start: 01DEC1978 at 0600 hours; End: 31DEC1978 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01DEC1978, 0600;	0.	0.	0.	0.	0.	0.	0.
02DEC1978, 2400;	0.	0.	0.	0.	0.	0.	0.
04DEC1978, 1800;	0.	0.	0.	0.	0.	0.	0.
06DEC1978, 1200;	0.	0.	0.	0.	0.	0.	0.
08DEC1978, 0600;	0.	0.	0.	0.	0.	0.	0.
09DEC1978, 2400;	0.	0.	0.	0.	0.	0.	0.
11DEC1978, 1800;	0.	0.	0.	0.	0.	0.	0.
13DEC1978, 1200;	0.	0.	0.	0.	0.	0.	0.
15DEC1978, 0600;	0.	0.	0.	0.	0.	0.	0.
16DEC1978, 2400;	0.	347.	1444.	3582.	6385.	8930.	10545.
18DEC1978, 1800;	10609.	9406.	8653.	9812.	11926.	14804.	20930.
20DEC1978, 1200;	28744.	33542.	35243.	35313.	33693.	31031.	27899.
22DEC1978, 0600;	24643.	21642.	19078.	17195.	16011.	15284.	14810.
23DEC1978, 2400;	14499.	14305.	14186.	14082.	13963.	13849.	13748.
25DEC1978, 1800;	13617.	13440.	13281.	13174.	13075.	12955.	12850.
27DEC1978, 1200;	12790.	12753.	12605.	12103.	11248.	10295.	9370.
29DEC1978, 0600;	8502.	7767.	7265.	7005.	6879.	6805.	6759.
30DEC1978, 2400;	6728.	6709.	6700.	6197.	4813.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01JAN1979/6HOUR/POR-P6OP2/
Start: 01JAN1979 at 0600 hours; End: 31JAN1979 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01JAN1979, 0600;	3646.	3479.	3593.	3584.	3410.	2953.	2538.
02JAN1979, 2400;	2367.	2204.	1937.	1717.	1619.	1536.	1414.
04JAN1979, 1800;	1316.	1273.	1247.	1221.	1202.	1192.	1188.
06JAN1979, 1200;	1189.	1191.	1191.	1203.	1235.	1264.	1276.
08JAN1979, 0600;	1293.	1330.	1360.	1369.	1358.	1326.	1296.
09JAN1979, 2400;	1283.	1267.	1241.	1220.	1211.	1196.	1165.
11JAN1979, 1800;	1138.	1128.	1119.	1108.	1100.	1095.	1084.
13JAN1979, 1200;	1056.	1031.	1018.	1000.	969.	943.	931.
15JAN1979, 0600;	924.	916.	942.	1026.	1269.	1930.	3919.
16JAN1979, 2400;	6882.	9387.	12359.	19440.	31252.	39584.	38457.
18JAN1979, 1800;	34102.	33577.	36705.	40232.	41444.	39720.	36028.
20JAN1979, 1200;	31557.	27174.	23400.	20480.	18510.	17285.	16424.
22JAN1979, 0600;	15769.	15269.	14848.	14484.	14224.	14065.	13926.
23JAN1979, 2400;	13763.	13623.	13531.	13441.	13329.	13236.	13190.
25JAN1979, 1800;	13168.	13150.	13132.	13104.	12945.	12473.	11715.
27JAN1979, 1200;	10862.	10002.	9170.	8435.	7864.	7495.	7294.
29JAN1979, 0600;	7187.	7129.	7092.	7057.	7026.	7004.	6989.
30JAN1979, 2400;	6678.	5660.	4360.	3550.	3223.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1980/6HOUR/POR-P6OP2/
Start: 01FEB1980 at 0600 hours; End: 29FEB1980 at 2400 hours; Number: 116
Units: CFS Type: PER-AVER

01FEB1980, 0600;	.0	.0	.0	.0	.0	.0
02FEB1980, 1800;	.0	.0	.0	.0	.0	.0
04FEB1980, 0600;	.0	.0	.0	.0	.0	.0
05FEB1980, 1800;	.0	.0	.0	.0	.0	.0
07FEB1980, 0600;	.0	.0	.0	.0	.0	.0
08FEB1980, 1800;	.0	.0	.0	.0	.0	.0
10FEB1980, 0600;	.0	.0	.0	.0	.0	.0
11FEB1980, 1800;	.0	.0	.0	.0	.0	.0
13FEB1980, 0600;	.0	115.3	789.8	2121.2	4041.5	6806.5
14FEB1980, 1800;	11885.4	23868.7	44867.4	69632.8	93561.6	111550.5
16FEB1980, 0600;	113093.6	100910.9	88008.7	77782.9	69969.4	64914.8
17FEB1980, 1800;	61498.0	58926.5	57050.8	56039.2	56177.9	57451.6

19FEB1980, 0600;	59702.3	62073.8	63850.9	67300.7	74734.6	84009.2
20FEB1980, 1800;	91605.4	95055.0	92500.2	85586.3	78470.3	72859.3
22FEB1980, 0600;	68758.1	66118.6	64261.7	62564.8	60824.5	58981.5
23FEB1980, 1800;	56879.8	53241.7	46583.2	38172.7	30929.8	26141.6
25FEB1980, 0600;	23378.7	21778.8	20749.1	20057.6	19566.2	19160.6
26FEB1980, 1800;	18781.5	18480.6	18321.7	18255.0	18211.6	18165.3
28FEB1980, 0600;	18073.5	17868.9	17568.0	17303.5	17169.7	17120.1
29FEB1980, 1800;	17080.8	17013.8				

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1983/6HOUR/POR-P6OP2/
Start: 01MAR1983 at 0600 hours; End: 31MAR1983 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1983, 0600;	7646.	7644.	7635.	7530.	7146.	6484.	6046.
02MAR1983, 2400;	6314.	6925.	7501.	8467.	10289.	12852.	15926.
04MAR1983, 1800;	19178.	21594.	22455.	22100.	21181.	20144.	19232.
06MAR1983, 1200;	18491.	17773.	16939.	16002.	15039.	14085.	13175.
08MAR1983, 0600;	12404.	11841.	11458.	11175.	10920.	10678.	10462.
09MAR1983, 2400;	10270.	10079.	9880.	9686.	9512.	9374.	9277.
11MAR1983, 1800;	9209.	9162.	9068.	8624.	7798.	7196.	7040.
13MAR1983, 1200;	7016.	7012.	7017.	6985.	6909.	6809.	6713.
15MAR1983, 0600;	6641.	6593.	6554.	6525.	6523.	6527.	6495.
16MAR1983, 2400;	6403.	6215.	5924.	5601.	5331.	5154.	5130.
18MAR1983, 1800;	5449.	6265.	7227.	7810.	8054.	8195.	8284.
20MAR1983, 1200;	8353.	8416.	8473.	8532.	8631.	8877.	9326.
22MAR1983, 0600;	9904.	10509.	11092.	11643.	12164.	12655.	13137.
23MAR1983, 2400;	13636.	14203.	14862.	15610.	16469.	17343.	17989.
25MAR1983, 1800;	18310.	18404.	18297.	18013.	17662.	17333.	17044.
27MAR1983, 1200;	16810.	16641.	16512.	16382.	16241.	16104.	15991.
29MAR1983, 0600;	15921.	15922.	15952.	15885.	15694.	15518.	15474.
30MAR1983, 2400;	15597.	15900.	16365.	16944.	17484.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01DEC1983/6HOUR/POR-P6OP2/
Start: 01DEC1983 at 0600 hours; End: 31DEC1983 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01DEC1983, 0600;	.00	.00	8.01	95.95	286.83	524.94
02DEC1983, 1800;	1001.00	2015.37	3489.80	5054.00	6296.48	6992.50
04DEC1983, 0600;	7274.31	7339.23	7267.26	7197.28	7286.19	7480.77
05DEC1983, 1800;	7582.72	7507.11	7288.75	6959.79	6587.15	6289.90
07DEC1983, 0600;	6126.14	6045.52	5996.76	5966.01	5945.34	5930.15
08DEC1983, 1800;	5642.53	4522.91	2814.40	1573.65	1071.83	846.26
10DEC1983, 0600;	702.84	614.28	543.61	484.35	429.65	390.41
11DEC1983, 1800;	374.27	367.97	363.80	361.60	359.55	357.59
13DEC1983, 0600;	345.27	313.43	280.70	264.78	259.03	256.21
14DEC1983, 1800;	254.99	254.44	253.64	252.57	251.45	249.91
16DEC1983, 0600;	239.91	211.55	178.47	159.61	152.21	148.75
17DEC1983, 1800;	147.23	146.55	145.69	144.59	143.46	141.91
19DEC1983, 0600;	131.91	103.55	70.47	51.61	44.21	40.75
20DEC1983, 1800;	39.23	38.55	38.24	38.11	38.05	38.02
22DEC1983, 0600;	38.01	38.00	38.00	38.00	38.00	38.00
23DEC1983, 1800;	38.00	38.00	38.00	39.11	45.14	57.85
25DEC1983, 0600;	73.92	96.70	203.84	404.13	661.04	1041.78
26DEC1983, 1800;	2340.04	5498.24	9821.13	14341.18	18490.46	21344.28
28DEC1983, 0600;	22326.24	21593.10	20208.55	18921.20	17499.50	15891.78
29DEC1983, 1800;	14438.99	13253.77	12180.65	11149.62	10196.58	9351.30
31DEC1983, 0600;	8663.53	8170.66	7833.90	7588.85		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1985/6HOUR/POR-P6OP2/
Start: 01MAR1985 at 0600 hours; End: 31MAR1985 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1985, 0600;	2414.	2418.	2438.	2488.	2576.	2687.	2799.

02MAR1985, 2400;	2914.	3030.	3123.	3157.	3124.	3049.	2950.
04MAR1985, 1800;	2833.	2718.	2598.	2456.	2319.	2209.	2121.
06MAR1985, 1200;	2056.	2013.	1979.	1947.	1903.	1840.	1786.
08MAR1985, 0600;	1760.	1746.	1738.	1734.	1730.	1716.	1688.
09MAR1985, 2400;	1678.	1693.	1719.	1761.	1858.	2129.	2678.
11MAR1985, 1800;	3481.	4470.	5822.	7722.	10520.	13872.	15800.
13MAR1985, 1200;	15637.	14754.	14096.	13780.	13456.	12857.	12041.
15MAR1985, 0600;	11171.	10398.	9790.	9398.	9248.	9326.	9563.
16MAR1985, 2400;	9881.	10267.	10778.	11459.	12115.	12396.	12254.
18MAR1985, 1800;	12000.	11819.	11635.	11390.	11115.	10819.	10515.
20MAR1985, 1200;	10226.	9974.	9786.	9665.	9565.	9434.	9263.
22MAR1985, 0600;	9075.	8907.	8771.	8655.	8545.	8438.	8333.
23MAR1985, 2400;	8177.	7613.	6555.	5726.	5402.	5206.	5056.
25MAR1985, 1800;	4966.	4908.	4884.	4863.	4853.	4856.	4852.
27MAR1985, 1200;	4840.	4796.	4693.	4575.	4541.	4606.	4679.
29MAR1985, 0600;	4696.	4677.	4651.	4622.	4589.	4561.	4547.
30MAR1985, 2400;	4541.	4537.	4528.	4509.	4481.		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1992/6HOUR/POR-P6OP2/
Start: 01MAR1992 at 0600 hours; End: 31MAR1992 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1992, 0600;	.000	.000	.000	.000	.000	.000
02MAR1992, 1800;	.000	.000	.000	.000	.000	.000
04MAR1992, 0600;	.000	.000	.000	.000	.000	.000
05MAR1992, 1800;	.000	.000	.000	.000	.000	.000
07MAR1992, 0600;	.000	.000	.000	.000	.000	.000
08MAR1992, 1800;	.000	.000	.000	.000	.000	.000
10MAR1992, 0600;	.000	.000	.000	.000	.000	.000
11MAR1992, 1800;	.000	.000	.000	.000	.000	.000
13MAR1992, 0600;	.000	.000	.000	.000	.000	.000
14MAR1992, 1800;	.000	24.611	667.316	2064.827	3141.994	3458.694
16MAR1992, 0600;	3444.912	3312.321	3095.192	2870.250	2662.893	2478.405
17MAR1992, 1800;	2323.906	2194.609	2078.521	1965.616	1854.195	1744.567
19MAR1992, 0600;	1635.136	1525.685	1411.608	1286.585	1153.798	1025.609
20MAR1992, 1800;	917.814	837.273	779.457	740.853	720.294	723.222
22MAR1992, 0600;	775.521	915.819	1147.291	1441.006	1773.990	2133.136
23MAR1992, 1800;	2518.621	2905.534	3196.938	3297.899	3232.591	3095.955
25MAR1992, 0600;	2939.526	2778.557	2631.283	2504.192	2381.835	2245.187
26MAR1992, 1800;	2092.632	1942.071	1818.253	1732.529	1676.437	1645.303
28MAR1992, 0600;	1667.612	1793.289	2033.795	2353.646	2708.486	3054.209
29MAR1992, 1800;	3356.770	3590.593	3716.412	3689.593	3512.196	3244.083
31MAR1992, 0600;	2955.445	2693.989	2476.071	2288.135		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01JAN1993/6HOUR/POR-P6OP2/
Start: 01JAN1993 at 0600 hours; End: 31JAN1993 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01JAN1993, 0600;	.0	.0	.0	.0	.0	.0
02JAN1993, 1800;	.0	.0	.0	.0	.0	.0
04JAN1993, 0600;	.0	.0	.0	.0	.0	.0
05JAN1993, 1800;	.0	.0	37.3	246.2	754.6	1797.9
07JAN1993, 0600;	3987.2	6878.1	9241.5	10664.1	14773.0	37238.5
08JAN1993, 1800;	84487.3	122442.6	122354.7	104937.1	90471.3	79505.5
10JAN1993, 0600;	72450.2	66610.6	61585.1	57596.8	54422.5	53551.7
11JAN1993, 1800;	54085.8	54061.7	53132.1	51580.6	49882.9	48805.8
13JAN1993, 0600;	47534.8	43730.3	37102.0	30477.0	26322.1	24673.6
14JAN1993, 1800;	24314.9	24474.0	25597.6	27830.8	30030.0	31316.9
16JAN1993, 0600;	30764.0	28458.0	26275.4	26731.0	33862.1	47823.3
17JAN1993, 1800;	60349.5	66542.6	70270.4	72782.2	73314.5	73209.1
19JAN1993, 0600;	72367.8	70670.2	69144.5	67696.6	64952.9	60464.0
20JAN1993, 1800;	55586.4	50498.2	43695.8	35777.3	29183.1	24989.0
22JAN1993, 0600;	22379.2	20407.4	18949.3	18150.7	17771.7	17438.0

23JAN1993, 1800;	17078.8	16790.7	16586.5	16377.9	16114.6	15869.0
25JAN1993, 0600;	15678.1	15459.3	15173.1	14916.5	14752.1	14615.4
26JAN1993, 1800;	14455.3	14314.8	14226.0	14154.0	14071.1	13997.5
28JAN1993, 0600;	13948.6	13905.8	13854.9	13727.8	13344.7	12656.5
29JAN1993, 1800;	11849.8	11076.3	10358.2	9699.7	9109.5	8619.9
31JAN1993, 0600;	8287.7	8136.5	8117.0	8144.8		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01FEB1993/6HOUR/POR-P6OP2/
Start: 01FEB1993 at 0600 hours; End: 28FEB1993 at 2400 hours; Number: 112
Units: CFS Type: PER-AVER

01FEB1993, 0600;	8199.2	8320.4	8502.1	8653.1	8708.6	8684.7
02FEB1993, 1800;	8621.3	8552.7	8488.2	8147.7	7218.8	6121.0
04FEB1993, 0600;	5427.6	5091.8	4896.7	4762.0	4651.6	4563.9
05FEB1993, 1800;	4499.2	4433.0	4353.9	4283.2	4232.4	4181.9
07FEB1993, 0600;	4119.3	4063.2	4025.7	4272.7	4700.1	5050.9
08FEB1993, 1800;	5488.3	6747.9	10347.5	16582.1	22738.2	25836.7
10FEB1993, 0600;	27015.5	28437.1	29793.0	30501.2	30008.5	27885.6
11FEB1993, 1800;	25392.1	23949.7	23027.5	21630.1	20083.5	19002.8
13FEB1993, 0600;	18071.5	16837.5	15484.4	14436.3	13724.9	13105.8
14FEB1993, 1800;	12487.8	12010.7	11880.6	12088.2	12434.5	12766.2
16FEB1993, 0600;	13027.6	13199.6	13302.0	13337.5	13257.5	13043.0
17FEB1993, 1800;	12752.1	12443.2	12142.7	11867.7	11671.3	11729.1
19FEB1993, 0600;	12331.5	13718.4	16230.1	19854.0	26071.8	38610.8
20FEB1993, 1800;	59921.7	86134.7	102012.4	94206.3	75031.2	62336.3
22FEB1993, 0600;	54376.2	46812.8	40339.8	34277.3	28483.1	24157.4
23FEB1993, 1800;	21672.9	20494.3	19722.8	18852.8	17995.2	17427.7
25FEB1993, 0600;	17131.6	16841.2	16449.1	16096.4	15865.1	15660.3
26FEB1993, 1800;	15414.8	15205.8	15082.3	14985.1	14872.7	14788.2
28FEB1993, 0600;	14755.0	14744.4	14738.8	14739.3		

/SECTION7-WSS/GILA CONFLNCE/FLOW-REG/01MAR1993/6HOUR/POR-P6OP2/
Start: 01MAR1993 at 0600 hours; End: 31MAR1993 at 2400 hours; Number: 124
Units: CFS Type: PER-AVER

01MAR1993, 0600;	14753.	14791.	14850.	14910.	14969.	15065.	15202.
02MAR1993, 2400;	15330.	15410.	15434.	15336.	15018.	14548.	14110.
04MAR1993, 1800;	13776.	13447.	13055.	12639.	12234.	11840.	11401.
06MAR1993, 1200;	10831.	10158.	9574.	9210.	8994.	8815.	8684.
08MAR1993, 0600;	8625.	8609.	8607.	8617.	8641.	8684.	8747.
09MAR1993, 2400;	8806.	8850.	8898.	8959.	9010.	9034.	9041.
11MAR1993, 1800;	9042.	9035.	9025.	9019.	9012.	8994.	8837.
13MAR1993, 1200;	8338.	7673.	7191.	6860.	6590.	6395.	6249.
15MAR1993, 0600;	6150.	6080.	6013.	5932.	5817.	5710.	5643.
16MAR1993, 2400;	5692.	5917.	6157.	6308.	6577.	7046.	7433.
18MAR1993, 1800;	7639.	7895.	8266.	8576.	8767.	8898.	8962.
20MAR1993, 1200;	8993.	9019.	9022.	8981.	8872.	8705.	8551.
22MAR1993, 0600;	8448.	8354.	8240.	8142.	8086.	8051.	8016.
23MAR1993, 2400;	7984.	7961.	7936.	7903.	7873.	7851.	7823.
25MAR1993, 1800;	7786.	7764.	7764.	7769.	7778.	7803.	7854.
27MAR1993, 1200;	7947.	8085.	8225.	8357.	8539.	8791.	9038.
29MAR1993, 0600;	9231.	9439.	9710.	9950.	10123.	10326.	10594.
30MAR1993, 2400;	10822.	10929.	10950.	10942.	10929.		

Appendix B: Hydraulics

TRES RIOS, ARIZONA
FEASIBILITY STUDY

HYDRAULICS APPENDIX

U.S. Army Corps of Engineers
Los Angeles District, Hydraulics Section
P.O. Box 532711
Los Angeles, CA 90053-2325

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INTRODUCTION

Purpose

1. The purpose of this appendix is to document the hydraulic analysis completed in support of the Tres Rios Feasibility Study. The hydraulic analysis was conducted to (1) determine without-project conditions, (2) to analyze various channel restoration alternatives, and (3) to analyze the recommended plan. Detailed hydraulic documentation and calculations are maintained in the Hydrology and Hydraulics Section files.

Description of Study Area

2. The study area is located at the confluence of the Salt, Gila, and Agua Fria Rivers, immediately west of the City of Phoenix, Arizona. Because of the confluence of the three rivers within this close proximity, the study area has been identified as "Tres Rios."

3. Tres Rios is approximately nine miles west of downtown Phoenix. The upstream boundary of the study area is located at 87th Avenue, just upstream of where the City of Phoenix operates a wastewater treatment plant. The study area extends west from the treatment plant for approximately seven miles through the confluence of both the Gila and Agua Fria Rivers. The study area ends near Bullard Avenue. The Buckeye Irrigation Company diversion canal serves as the location of the end of the study area. The Gila River Indian Community (GRIC) is on the South bank of the Salt and Gila Rivers from 83rd Avenue to 115th Avenue.

STUDY METHODOLOGY

Guidance

4. The hydraulic design was prepared following the guidance contained in EM 1110-2-1601, "Hydraulic Design of Flood Control Channels" (Reference a). Additional guidance was provided by EM 1110-2-1619, "Risk-Based Analysis for Flood Damage Reduction Studies" (Reference b).

Analysis and Design Tools

5. The computer program HEC-RAS (Reference c) was used for the hydraulic analysis. An existing conditions HEC-2 (Reference d) model was imported into HEC-RAS and modified for the alternatives analysis (Reference e). The original HEC-2 model was from the Tres Rios Flood Control Technical Committee (Reference f).

Hydrology and Design Discharges

6. The following table summarizes the discharges that were analyzed for the model. The methodologies and assumptions used to determine these discharges are documented in the Hydrology Appendix.

Table 1. Discharge-Frequency Values

Location	Return Period (Years)						
	5	10	20	50	100	200	500
Salt R. above Gila R.	19,500 cfs	49,000 cfs	82,000 cfs	130,000 cfs	162,000 cfs	198,000 cfs	235,000 cfs
Gila R. below Salt R.	23,500 cfs	57,000 cfs	92,000 cfs	185,000 cfs	227,000 cfs	243,000 cfs	285,000 cfs

Sediment Transport

7. Results of the existing conditions sedimentation analyses are documented in Reference e. The overall trend of the study area is deposition with a change in average bed elevation on the order of three tenths of a foot. Not counting the upstream most cross-section, maximum changes in average bed elevations are less than three feet for deposition and less than two feet for erosion.

8. Due to time constraints, a detailed sediment transport analysis was not completed for the with-project conditions phase of the study. This will be done during the Preconstruction Engineering and Design (PED) phase of the study using the computer program HEC-6 (Reference g). The existing conditions sediment transport study results were used to determine the Operation and Maintenance requirements as discussed in this report.

Interior Drainage

9. A detailed interior drainage study was not completed for this phase of the study. Instead, results from a previous study done by Dibble and Associates for the Flood Control District of Maricopa County (Reference h) as well as information generated to determine the quantity (both peak and volume) of urban runoff for the Rio Salado Study were used to formulate a preliminary interior drainage analysis.

10. In lieu of any information concerning the "best" locations for connecting interior runoff to the Salt and Gila Rivers along the levee alignment, the tributary area and magnitude of flow at each incremental mile, from 91st Avenue to the end-of-the-levee in the vicinity of Dysart Road, was determined. The presumption was that the levee tie-in at the wastewater treatment plant (91st Avenue) would result in runoff upstream of the plant going directly to the river. The

incremental interior drainage area estimates were based upon a drainage subarea map and flow network contained in a report by Dibble & Associates for the Flood Control District of Maricopa County, FLOODPLAIN DELINEATION OF THE TOLLESON AREA (Figure 2). That study indicated runoff from most of the area to the north of the river is intercepted by the Buckeye Feeder Canal and other drains, including roadways, etc. Hence, very little runoff is currently able to cross Southern Avenue and drain to the Gila River in this vicinity. In some instances the gradient to the river is actually adverse.

11. Estimates of interior area peak discharge and associated 24-hour runoff volume were based upon drainage area versus discharge relationships (Figures 3-1 and 3-3) developed for the Rio Salado restoration study and documented in the Technical Appendices (Appendix A) to support the Feasibility Study (dated April 1998).

12. Interior runoff to the Salt and Gila Rivers is presumed to occur under several differing scenarios:

- During winter months (typically) when large general storms, or a series of such, which may include accumulation and subsequent melt of snowpack, result in releases from the Salt River Project reservoirs to the Salt River and/or Coolidge Dam to the Gila River, there may be coincident runoff from the interior areas. While river stages may be high for an extended period, the quantity and intensity of accompanying general storm precipitation is usually reduced in low elevation areas tributary to the river without production of significant interior runoff peaks and volumes. Allowance of sufficient area to detain the 24-hour local storm volume should be more than sufficient to detain the resulting general storm runoff, if high river stages preclude inflow.
- During mid-to-late summer months monsoonal patterns may result in intense, short-duration thunderstorms, or decaying tropical storms with significant precipitation. During such events, river stages are usually low, since upstream reservoirs are drawn-down and have space available to store runoff. In addition, interior runoff would normally reach the river prior to any mainstem high stages (e.g. October 1983), due to much shorter travel time.

The results presented here are based upon the latter scenario, and provide information to design outlet capacity and detention space to safely accommodate a 100-year local event.

13. Some runoff upstream of Southern Avenue at the first/easternmost location is included in case it is able to bypass the wastewater treatment plant in order to be a little "conservative". Also, the methodology used was developed for the Phoenix urban area, and would likely result in an overestimation of runoff from the area just north of the river; this also provides a factor-of-safety in making the initial interior drainage estimate. Table 11 summarizes the results of the 100-yr peak and volume estimates at several street crossings.

14. Impoundment areas were sized based on the volumes given in Table 11. The impoundment areas necessary were reduced to account for the capacity of the drain. However, the minimum

impoundment volume was not reduced below 10 ac-ft to allow for sufficient head to drive the water. Assuming a 1 ft depth, the required impoundment area for 99th Avenue and 107th Avenue is 54 acres and 25 acres, respectively. Similarly, the required impoundment area for 115th Avenue, El Mirage Road, and Dysart Road is 10 acres each.

15. Pipe sizes, slopes, and lengths were determined based on the surrounding ground. Based on the analysis, 2-24" reinforced concrete pipes (RCP's) with lengths of 280 ft and 440 ft would be required at 99th Avenue and 107th Avenue, respectively. Similarly, 1-24" RCP would be required at 115th Avenue, El Mirage Road, and Dysart Road, with lengths of 200 ft, 100 ft, and 500 ft, respectively.

HYDRAULIC ANALYSIS

Existing Conditions

16. The existing conditions hydraulic analysis is documented in Reference e. The existing capacity of the river is less than the 100-yr flood event. There is an existing levee on the right bank adjacent to the Holly Acres subdivision. This levee would not be subject to overtopping since it would be flanked by flows less than the 100-yr flood event. It is, therefore, not a factor in the determination of benefits. Based on these factors, a reliability analysis of the existing levee would not be required.

17. Proposed levee improvements as discussed in the various alternatives below would extend and raise the existing levee to prevent design flows from breaking out and flanking the levee.

Boundary Conditions

18. A stage-discharge rating curve was used at the downstream end of the study. The starting water surface elevations were based on the existing conditions model.

Bridge Modeling

19. The 116th Avenue bridge is the only bridge in the study reach. The energy method was used to model the bridge in HEC-RAS. Since the bridge piers are 10-ft wide, a standard debris loading was not used.

Determination of Manning's Roughness Coefficient

20. The existing conditions Manning's roughness coefficients ("n values") were used. Cowan's method (Reference I) was used to estimate the "n value" for the different environmental features. By this procedure, the "n value" may be computed by

$$n = (n_0 + n_1 + n_2 + n_3 + n_4)m_5$$

where n_0 is a basic "n value" for a straight, uniform, smooth channel in the natural materials involved, n_1 is a value added to n_0 to correct for the effect of surface irregularities, n_2 is a value for variations in shape and size of the channel cross section, n_3 is a value for obstructions, n_4 is a value for vegetation and flow conditions, and m_5 is a correction factor for meandering of the channel. For this study, it was determined that n_0=0.028 (coarse gravel), n_1=0.002-0.005 (smooth to minor gravel bars), n_2= 0.000 (gradual variation in cross-section), n_3=0.005-0.015 (negligible to minor effect of obstructions), n_4=0.000-0.050 (none to very high vegetation), and m_5= 1.0 (minor).

Environmental Features

21. Open Water Ponds. Open water ponds are proposed within the river. The original concept design for the ponds is an open water area with a marsh terrace on both sides. The open water area is 2 ft below the elevation of the marsh terrace, with a bottom width of 300 to 500 ft, and sideslopes of 3 horizontal to 1 vertical. The marsh terrace is 2 ft below the existing ground surface, with a width of 10 ft on each side of the open water area, and sideslopes of 3 horizontal to 1 vertical. See the Design Appendix for a typical section.

22. To simplify the coding into HEC-RAS, several minor modifications were done. The topwidth of the open water ponds was assumed to be the width measured from the GIS maps. The sideslopes were assumed vertical. The marsh terraces were set at 100 ft on each side. The bottom width of the pond varies. Profiles were drawn for the centerline, left perimeter, and right perimeter elevations. The depth of cut was then determined by drawing a best fit line which is at least 5 ft below the lower of the centerline, left perimeter, or right perimeter elevation. The bottom elevation of each pond was assumed to be flat.

23. For the open water areas, the "n-value" is 0.035 (n_0=0.028, n_1=0.002, n_2= 0.000, n_3=0.005, n_4=0.000, and m_5= 1.0). For the marsh areas, the "n-value" is 0.048 (n_0=0.028, n_1=0.005, n_2= 0.000, n_3=0.005, n_4=0.010, and m_5= 1.0).

24. Cottonwood Willow Corridors. Cottonwood and willow corridors are proposed within the river. The original concept design for the corridors is a trapezoidal low flow channel in the center of the corridor with a cottonwood willow terrace on both sides. The low flow channel is 4 ft below the terrace, with a bottom width of 20 ft, and sideslopes of 2 horizontal to 1 vertical. The terrace is 3 ft below the existing ground surface, with a width of 75 ft on each side of the low flow channel, and sideslopes of 3 horizontal to 1 vertical. See the Design Appendix for a typical section.

25. To simplify the coding into HEC-RAS, several minor modifications were done. The topwidth of the corridors were set at 220 ft wide, regardless of the width of the corridors as shown in the GIS maps. This was agreed upon by the study team since some of the corridors shown on the GIS maps were incorrectly drawn. The sideslopes were not modeled, i.e. they were assumed vertical. The terrace width were set at 100 ft on each side of the 20 ft low flow channel.

Profiles were drawn for the centerline, left perimeter, and right perimeter elevations. The depth of cut was then determined by drawing a best fit line which is at least 7 ft below the lower of the centerline, left perimeter, or right perimeter elevation.

26. Due to variations in the natural topography and the way that the corridors were aligned, the elevation of the low flow channel of a corridor may or may not be higher than the elevation of the low flow channel of the corridor immediately upstream of it. If this was done, this would result in extremely deep cuts below the existing ground. This is a design detail that may be examined in the next phase of the study.

27. The "n-value" of the open water areas is 0.035 (n_0=0.028, n_1=0.002, n_2= 0.000, n_3=0.005, n_4=0.000, and m_5= 1.0). The "n-value" of the cottonwood willow area is 0.100 (n_0=0.028, n_1=0.005, n_2= 0.000, n_3=0.015, n_4=0.050, and m_5= 1.0).

28. Wetland Basins. Wetland basins are proposed outside the right bank of the river. The original concept design for the basins has a 500 ft bottom width, a 4 to 5 ft depth from the ground surface to the bottom of the basin, and sideslopes of 2 horizontal to 1 vertical. See the Design Appendix for a typical section.

29. To simplify the coding into HEC-RAS, several minor modifications were done. The topwidth of the basins were based on the GIS mapping. The basin was assumed rectangular, i.e., the bottom width of the basin was assumed to be the same as the topwidth. Profiles were drawn for the centerline, left perimeter, and right perimeter elevations. The depth of cut was then determined by drawing a best fit line which is at least 5 ft below the lower of the centerline, left perimeter, or right perimeter elevation.

30. Marsh type vegetation is assumed to be in the basin. The "n-value" for the basin is 0.048, (n_0=0.028, n_1=0.005, n_2= 0.000, n_3=0.005, n_4=0.010, and m_5= 1.0).

31. Connecting Streams. The connecting streams between the environmental features were not modeled since they are relatively narrow compared to the total width of the river. However, the contraction and expansion ratios were increased from 0.1 to 0.2, and 0.3 to 0.4, respectively, to simulate the boundary between the environmental features.

Alternatives

32. The study team identified 3 main alternatives to be analyzed for the study (Alternatives 3, 4, and 3.5), with numerous variations of each. Alternatives 3, 4, and 3.5 include the environmental features described above. In addition, two different levee alignments, and removal of a landfill within the river was explored. The naming conventions in parentheses is for HEC-RAS model identification. See the Main Report for a plan view of Alternatives 3, 4, and 5. Plates 1 and 2 and Tables 2 and 3 summarize results for the 100-year discharge only. In general, results for the

other discharges follow a similar trend to the 100-year discharge. Results for other discharges are available in the Hydrology and Hydraulics Section files.

33. Alternative 3, Without Levee (Alternative 3B). The purpose of this alternative is to determine the impact of the environmental features and channel clearing to the water surface. This alternative includes the open water ponds, cottonwood willow corridors, and wetland basins as shown in the GIS maps. The existing conditions model channel geometry was modified to add the environmental features. New levees were not included in this alternative.

34. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.7 ft, 0.1 to 1.0 ft, 0.1 to 0.4 ft, and 0.1 to 0.4 ft, from Stations 196.42 to 197.35, 198.2 to 200.1, 200.58 to 201.33, and 202.09 to 204.42, respectively. The water surface decreased 0.1 to 0.5 ft, 0.2 to 0.5 ft, and 0.1 to 0.7 ft, from Stations 197.45 to 198.11, 200.2 to 200.49, and 201.43 to 201.99, respectively.

35. As expected, the water surface decreased at a few locations due to the addition of the environmental features, vegetation clearing, and excavation. However, the water surface also increased at several locations. This was mainly due to the increase in the composite channel "n-value." This caused the water surface to increase as described above. Except at some locations, the vegetation clearing and excavation was not enough to offset the increase in the composite channel "n-values" to decrease the water surface. One reason for the increase in the composite channel "n-value" is that some of the environmental features, particularly the cottonwood willow corridor, had a higher "n-value" than some of the existing vegetation. Another reason, and more importantly, is that the environmental features and additional planting actually encroached on existing clear areas.

36. Alternative 3, Without Levee, Without Landfill (Alternative 3F). This alternative is similar to "Alternative 3, Without Levee (Alternative 3B)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

37. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.7 ft, 0.1 to 0.5 ft, 0.1 to 0.4 ft, and 0.1 to 0.4 ft, from Stations 196.42 to 197.35, 198.94 to 200.1, 200.58 to 201.33, and 202.09 to 204.42, respectively. The water surface decreased 0.1 to 2.0 ft, 0.2 to 0.5 ft, and 0.1 to 0.7 ft, from Stations 197.45 to 198.85, 200.2 to 200.49, and 201.43 to 201.99, respectively.

38. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 2.0 ft. The effect of the landfill removal on decreasing the water surface extends to Station 200.1, or about 1.5 miles upstream. Upstream of Station 200.1 and downstream of Station 198.02, the water surface is similar to "Alternative 3, Without Levee (Alternative 3B)."

39. Alternative 3, With Levee Alignment 1 (Alternative 3D). This alternative is similar to "Alternative 3, Without Levee (Alternative 3B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface.

40. The levee alignment is based on Levee Alignment 1 as described in the Tres Rios Flood Control Technical Committee (Reference f). Alignment 1 follows the north river bank from 91st Avenue to the existing Holly Acres Levee at 113th Avenue. It then follows the existing levee alignment (existing levee proposed to be raised) from 113th Avenue to El Mirage Road. From El Mirage Road the levee continues along the north bank to Dysart Road. The levee then follows Dysart Road north for 3500 ft.

41. The minimum top of levee elevations were determined by using Federal Emergency Management Agency (FEMA) criteria (Reference j). At the upstream end of the levee, 3.5 ft of freeboard was added to the 100-yr water surface. The freeboard tapers down to 3.0 ft at the downstream end of the levee. For simplicity in calculating quantities, 3.25 ft of freeboard was used in the volume calculations. For a distance of 100 ft upstream and downstream of the 116th Avenue bridge, 4 ft of freeboard was used.

42. It is expected that the levee would be armored, but the armoring type or quantity was not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depth of the armoring.

43. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 3.5 ft and 0.1 to 0.3 ft, from Stations 196.42 to 201.52 and 201.99 to 204.42, respectively. The water surface decreased 0.1 to 0.3 ft from Station 201.62 to 201.9.

44. As expected, the constriction caused by the levee increased the water surface throughout the study reach, except for a few locations. The effect of the environmental features, vegetation clearing, and excavation was not enough to offset the constriction caused by the levee.

45. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3, Without Levee (Alternative 3B)."

46. Alternative 3, With Levee Alignment 1, Without Landfill (Alternative 3G). This alternative is similar to "Alternative 3, With Levee Alignment 1 (Alternative 3D)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

47. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 1.1 ft, 0.1 to 2.9 ft, and 0.1 to 0.3 ft, from Stations 196.42 to 198.2, 198.75 to 201.52, and 201.99 to 204.42, respectively. The water surface decreased 0.1 to 1.3 ft and 0.1 to 0.3 ft, from Station 198.26 to 198.66 and 201.62 to 201.9, respectively.

48. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 1.7 ft. The effect of the landfill removal on decreasing the water surface extends to Station 201.52, or about 2.9 miles upstream. Upstream of Station 201.52 and downstream of Station 198.02, the water surface is similar to "Alternative 3, With Levee Alignment 1 (Alternative 3D)."

49. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3, Without Levee, Without Landfill (Alternative 3F)."

50. Alternative 3, With Levee Alignment 2 (Alternative 3H). This alternative is similar to "Alternative 3, Without Levee (Alternative 3B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface.

51. The levee alignment is based on Levee Alignment 2 as described in the Tres Rios Flood Control Technical Committee (Reference f). Alignment 2 follows the north river bank from 91st Avenue to the existing Holly Acres Levee at 113th Avenue. It then follows the existing levee alignment (existing levee proposed to be raised) from 113th Avenue to El Mirage Road. The levee then turns north along El Mirage Road to Southern Avenue and follows Southern Avenue west to Dysart Road. It then follows Dysart Road north for 3000 ft.

52. The minimum top of levee elevations were determined by using Federal Emergency Management Agency (FEMA) criteria. At the upstream end of the levee, 3.5 ft of freeboard was

added to the 100-yr water surface. The freeboard tapers down to 3.0 ft at the downstream end of the levee. For simplicity in calculating quantities, 3.25 ft of freeboard was used in the volume calculations. For a distance of 100 ft upstream and downstream of the 116th Avenue bridge, 4 ft of freeboard was used.

53. It is expected that the levee would be armored, but the armoring type or quantity were not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

54. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.8 ft, 0.1 to 3.2 ft, and 0.1 to 0.3 ft, from Stations 196.42 to 197.45, 197.74 to 201.52, and 201.99 to 204.42, respectively. The water surface decreased 0.0 to 0.1 ft and 0.0 to 0.3 ft, from Station 197.54 to 197.64 and 201.62 to 201.9, respectively.

55. As expected, the constriction caused by the levee increased the water surface throughout the study reach, except for a few locations. The effect of the environmental features, vegetation clearing, and excavation was not enough to offset the constriction caused by the levee. However, the increase in the water surface with this alternative is lower than with "Alternative 3, With Levee Alignment 1 (Alternative 3D)."

56. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3, Without Levee (Alternative 3B)."

57. Alternative 3, With Levee Alignment 2, Without Landfill (Alternative 3I). This alternative is similar to "Alternative 3, With Levee Alignment 2 (Alternative 3H)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

58. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.8 ft, 0.1 to 0.4 ft, 0.1 to 2.9 ft, and 0.1 to 0.3 ft, from Stations 196.42 to 197.45, 197.74 to 198.11, 198.75 to 201.52, and 201.99 to 204.42, respectively. The water surface decreased 0.0 to 0.1 ft, 0.3 to 1.7 ft, and 0.1 to 0.3 ft, from Station 197.54 to 197.64, 198.2 to 198.66, and 201.62 to 201.9, respectively.

59. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 1.3 ft. The effect of the landfill removal on decreasing the water surface extends to Station 201.62, or about 3.0 miles upstream. Upstream of Station 201.62 and downstream of Station 198.02, the water surface is similar to "Alternative 3, With Levee Alignment 2 (Alternative 3H)."

60. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3, Without Levee, Without Landfill (Alternative 3F)."

61. Alternative 4, Without Levee (Alternative 4B). The purpose of this alternative is to determine the impact of the environmental features and channel clearing to the water surface. This alternative includes the open water ponds, cottonwood willow corridors, and wetland basins as shown in the GIS maps in the Main Report. There are several differences between Alternatives 3 and 4. In this alternative, the environmental features are at different locations. The cottonwood willow corridors are used more extensively in this alternative, particularly downstream of 116th Avenue. Also, there are more wetland basins in the right overbank. The existing conditions HEC-RAS model channel geometry was modified to add the environmental features. New levees were not included in this alternative.

62. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.6 ft and 0.1 to 0.5 ft, from Stations 196.61 to 197.16 and 198.34 to 199.34, respectively. The water surface decreased 0.1 to 0.3 ft and 0.1 to 3.2 ft, from Stations 197.26 to 198.3 and 199.53 to 203.09, respectively.

63. As expected, the water surface decreased throughout most of the study reach due to the addition of the environmental features, vegetation clearing, and excavation. However, the water surface also increased at several locations. This was mainly due to the increase in the composite channel "n-value." This caused the water surface to increase as described above. At these locations, the vegetation clearing and excavation was not enough to offset the increase in the composite channel "n-values" to decrease the water surface. One reason for the increase in the composite channel "n-value" is that some of the environmental features, particularly the cottonwood willow corridor, had a higher "n-value" than some of the existing vegetation. Another reason, and more importantly, is that the environmental features and additional planting actually encroached on existing clear areas.

64. Alternative 4, Without Levee, Without Landfill (Alternative 4F). This alternative is similar to "Alternative 4, Without Levee (Alternative 4B)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood

Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

65. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.6 ft from Station 196.61 to 197.16. The water surface decreased 0.1 to 3.2 ft from Station 197.26 to 203.09.

66. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 2.8 ft. The effect of the landfill removal on decreasing the water surface extends to Station 200.1, or about 1.5 miles upstream. Upstream of Station 200.1 and downstream of Station 198.02, the water surface is similar to "Alternative 4, Without Levee (Alternative 4B)."

67. Alternative 4, With Levee Alignment 1 (Alternative 4D). This alternative is similar to "Alternative 4, Without Levee (Alternative 4B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface.

68. The levee alignment and minimum elevations is similar to "Alternative 3, With Levee Alignment 1 (Alternative 3D)." It is expected that the levee would be armored, but the armoring type or quantity were not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

69. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 2.1 ft from Station 196.61 to 200.1. The water surface decreased 0.1 to 3.0 ft from Station 200.2 to 203.09.

70. As expected, the constriction caused by the levee increased the water surface upstream of Station 200.1. Upstream of Station 200.1, the effect of the environmental features, vegetation clearing, and excavation was enough to offset the constriction caused by the levee. This was not the case downstream of Station 200.1.

71. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 4, Without Levee (Alternative 4B)."

72. Alternative 4, With Levee Alignment 1, Without Landfill (Alternative 4G). This alternative is similar to "Alternative 4, With Levee Alignment 1 (Alternative 4D)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The

limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

73. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.8 ft and 0.1 to 0.9 ft, from Stations 196.61 to 199.02 and 198.94 to 200, respectively. The water surface decreased 0.2 to 2.1 ft and 0.1 to 3.1 ft, from Station 198.11 to 198.85 and 200.1 to 203.09, respectively.

74. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 2.1 ft. The effect of the landfill removal on decreasing the water surface extends to Station 201.81, or about 3.2 miles upstream. Upstream of Station 201.81 and downstream of Station 198.02, the water surface is similar to "Alternative 4, With Levee Alignment 1 (Alternative 4D)."

75. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 4, Without Levee, Without Landfill (Alternative 4F)."

76. Alternative 4, With Levee Alignment 2 (Alternative 4H). This alternative is similar to "Alternative 4, Without Levee (Alternative 4B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface.

77. The levee alignment and minimum elevations is similar to "Alternative 3, With Levee Alignment 2 (Alternative 3H)." It is expected that the levee would be armored, but the armoring type or quantity were not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

78. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 1.9 ft from Station 196.61 to 200.1. The water surface decreased 0.1 to 3.1 ft from Station 200.2 to 203.09.

79. As expected, the constriction caused by the levee increased the water surface upstream of Station 200.1. Upstream of Station 200.1, the effect of the environmental features, vegetation clearing, and excavation was enough to offset the constriction caused by the levee. This was not the case downstream of Station 200.1.

80. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 4, Without Levee (Alternative 4B)."

81. Alternative 4, With Levee Alignment 2, Without Landfill (Alternative 4I). This alternative is similar to "Alternative 4, With Levee Alignment 2 (Alternative 4H)," but in addition, an existing landfill between Stations 198.02 to 198.59 was removed from the model geometry. The purpose of this alternative is to determine the hydraulic impacts of removing the landfill. The limits and depth of excavation of the landfill was based on existing HEC-2 models from the Tres Rios Flood Control Technical Committee (Reference f). The expansion and contraction coefficients were increased to simulate the transition between the landfill excavation and existing ground.

82. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and 6 for the following discussion. The water surface increased 0.1 to 0.6 ft and 0.1 to 0.9 ft, from Stations 196.61 to 199.02 and 198.94 to 200, respectively. The water surface decreased 0.5 to 2.5 ft and 0.1 to 3.1 ft, from Station 198.11 to 198.85 and 200.1 to 203.09, respectively.

83. As expected, the water surface decreased in the immediate vicinity of the excavated landfill by as much as 2.5 ft. The effect of the landfill removal on decreasing the water surface extends to Station 200.86, or about 2.3 miles upstream. Upstream of Station 200.86 and downstream of Station 198.02, the water surface is similar to "Alternative 4, With Levee Alignment 2 (Alternative 4H)."

84. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 4, Without Levee, Without Landfill (Alternative 4F)."

85. Alternative 3.5, Without Levee (Alternative 3.5B). The purpose of this alternative is to determine the impact of the environmental features and channel clearing to the water surface. This alternative includes the open water ponds, cottonwood willow corridors, and wetland basins as shown in the GIS maps in the Main Report. This alternative is a combination of Alternatives 3 and 4. That is, the location and size of the environmental features are similar to Alternatives 3 and 4. There are more open water ponds than cottonwood willow corridors in this alternative, similar to Alternative 3. The wetland basins in the right overbank are similar in size and configuration to Alternative 4. The existing conditions HEC-RAS model channel geometry was modified to add the environmental features. New levees were not included in this alternative.

86. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Table7 for

the following discussion. The water surface increased 0.1 to 0.4 ft and 0.1 ft, from Stations 198.59 to 199.3 and 203.09 to 203.29, respectively. The water surface decreased 0.1 to 2.2 ft, 0.1 to 3.9 ft, and 0.1 ft, from Stations 196.42 to 198.49, 199.34 to 202.99, and 203.39 to 204.25, respectively.

87. As expected, the water surface decreased throughout most of the study reach due to the addition of the environmental features, vegetation clearing, and excavation. However, the water surface also increased at several locations. This was mainly due to the increase in the composite channel "n-value." This caused the water surface to increase as described above. At these locations, the vegetation clearing and excavation was not enough to offset the increase in the composite channel "n-values" to decrease the water surface. One reason for the increase in the composite channel "n-value" is that some of the environmental features, particularly the cottonwood willow corridor, had a higher "n-value" than some of the existing vegetation. Another reason, and more importantly, is that the environmental features and additional planting actually encroached on existing clear areas.

88. Unlike Alternatives 3 and 4, the without-landfill alternatives were not analyzed under alternative 3.5. Instead, levees with different levels of protection were investigated. These with-levee alternatives are discussed below.

89. Alternative 3.5, With Levee Alignment 1 (Alternative 3.5D). This alternative is similar to "Alternative 3.5, Without Levee (Alternative 3.5B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface. This is the recommended alternative.

90. The levee alignment is similar to "Alternative 3, With Levee Alignment 1 (Alternative 3D)." However, the minimum levee elevations are based on uncertainty analysis. The 50-year, 50% confidence, 100-year, 95% confidence, and 500-year, 50% confidence levee elevations were analyzed. It is expected that the levees would be armored, but the armoring type or quantity was not evaluated for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

91. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Table 7 for the following discussion. The water surface increased 0.2 to 1.0 ft, 0.4 to 2.3 ft, and 0.1 ft from Stations 197.83 to 198.11, 198.34 to 199.53, and 203.09 to 203.29, respectively. The water surface decreased 0.1 to 2.5 ft, 0.1 to 0.2 ft, 0.1 to 2.9 ft, and 0.1 ft from Stations 196.42 to 197.42, 198.2 to 198.3, 199.63 to 202.99, and 203.39 to 204.25, respectively.

92. As expected, the constriction caused by the levee increased the water surface upstream of Station 197.74. Upstream of Station 199.63, the effect of the environmental features, vegetation

clearing, and excavation was enough to offset the constriction caused by the levee. This was not the case downstream of Station 199.63.

93. The 50-year, 50% confidence levee elevation corresponds with the 50-year computed water surface elevation, i.e., no freeboard is added. See Table 10 for the minimum recommended levee elevations at the index locations. Since the levee is designed to only contain flows up to the 50-year event, it is expected that the 100-, 200-, and 500-yr flows would break out. The water surface elevations associated with the flood events that breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3.5, Without Levee (Alternative 3.5B)."

94. The 100-year, 95% confidence levee elevation corresponds with the 100-year computed water surface elevation plus two standard deviations of uncertainty. In this case, two standard deviations of uncertainty equal approximately 2.0 to 2.2 ft. See Table 10 for the minimum recommended levee elevations at the index locations. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the flood events that breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3.5, Without Levee (Alternative 3.5B)."

95. The 500-year, 50% confidence levee elevation corresponds with the 500-year computed water surface elevation, i.e., no freeboard is added. See Table 10 for the minimum recommended levee elevations at the index locations.

96. To aid in plan formulation and identify the NED plan, 50% confidence levee elevations for a flood event greater than the 500-year event were computed. An iterative process was used to determine a "target" discharge so that the 50% greater than 500-year levee elevations matched the 100-yr 95% levee elevations. The resulting discharges for the Salt River was 290,000 cfs and 340,000 cfs above and below the Gila River confluence, respectively. See Table 13 for the resulting minimum recommended levee elevations.

97. Alternative 3.5, With Levee Alignment 2 (Alternative 3.5H). This alternative is similar to "Alternative 3.5, Without Levee (Alternative 3.5B)," but in addition, a levee is proposed on the north bank of the river. The purpose of this model is to determine the overall impacts of adding the environmental features, channel clearing, channel excavation, and north bank levee to the water surface.

98. The levee alignment is similar to "Alternative 3, With Levee Alignment 2 (Alternative 3H)." However, the minimum levee elevations are based on uncertainty analysis. The 50-year, 50% confidence, 100-year, 95% confidence, and 500-year, 50% confidence levee elevations were analyzed. It is expected that the levees would be armored, but the armoring type or quantity was not evaluated for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

99. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Table 7 for the following discussion. The water surface increased 0.3 to 2.2 ft, and 0.1 ft from Stations 198.34 to 199.53, and 203.09 to 203.29, respectively. The water surface decreased 0.1 to 2.2 ft, 0.1 to 2.8 ft, and 0.1 ft from Stations 196.42 to 198.3, 199.63 to 202.99, and 203.39 to 204.25, respectively.

100. As expected, the constriction caused by the levee increased the water surface upstream of Station 198.3. Upstream of Station 199.63, the effect of the environmental features, vegetation clearing, and excavation was enough to offset the constriction caused by the levee. This was not the case downstream of Station 199.63.

101. The 50-year, 50% confidence levee elevation corresponds with the 50-year computed water surface elevation, i.e., no freeboard is added. See Table 10 for the minimum recommended levee elevations at the index locations. Since the levee is designed to only contain flows up to the 50-year event, it is expected that the 100-, 200-, and 500-yr flows would break out. The water surface elevations associated with the flood events that breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3.5, Without Levee (Alternative 3.5B)."

102. The 100-year, 95% confidence levee elevation corresponds with the 100-year computed water surface elevation plus two standard deviations of uncertainty. In this case, two standard deviations of uncertainty equal approximately 2.0 to 2.2 ft. See Table 10 for the minimum recommended levee elevations at the index locations. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the flood events that breakout should be similar to the with project, but without levee conditions, i.e. "Alternative 3.5, Without Levee (Alternative 3.5B)."

103. The 500-year, 50% confidence levee elevation corresponds with the 500-year computed water surface elevation, i.e., no freeboard is added. See Table 10 for the minimum recommended levee elevations at the index locations.

104. Existing Conditions, With Levee Alignment 1. The purpose of this alternative is to determine the impact of adding a levee in the study reach without the environmental features, vegetation clearing, and excavation.

105. The levee alignment and minimum elevations is similar to "Alternative 3, With Levee Alignment 1 (Alternative 3D)." It is expected that the levee would be armored, but the armoring type or quantity was not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.

106. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. Refer to Plate 4 (HEC-RAS cross-section locations) and Tables 5 and

6 for the following discussion. The water surface increased 0.0 to 2.5 ft from Station 197.26 to 202.99. This is expected since the levee causes a constriction of the flow.

107. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the without project conditions, previously documented in Reference e.

108. Existing Conditions, With Levee Alignment 2. The purpose of this alternative is to determine the impact of adding a levee in the study reach without the environmental features, vegetation clearing, and excavation.

109. The levee alignment and minimum elevations is similar to "Alternative 3, With Levee Alignment 2 (Alternative 3H)." It is expected that the levee would be armored, but the armoring type or quantity was not analyzed for this phase of the study. This will be done during the next phase of the study when the sediment analysis is completed to determine the required toe depths.
110. Comparisons were made between the 100-yr existing conditions and the 100-yr with project conditions water surfaces. The water surface increased 0.0 to 2.5 ft from Station 197.26 to 202.99. However, water surfaces downstream of El Mirage Road are lower with this levee alignment than with levee alignment 1.

111. Since the levee is designed to only contain flows up to the 100-year event, it is expected that the 200- and 500-yr flows would break out. The water surface elevations associated with the breakout should be similar to the without project conditions, previously documented in Reference e.

Flood Inundation Duration Analysis

112. As stated above, Alternative 3.5D is the recommended alternative. Since this alternative would induce flooding at a short reach on the left bank, detailed flood inundation maps were developed at this particular location. The duration of flooding above the existing conditions was also determined. Since hydrographs were only available for pre-determined flood frequency events, the following simplified procedure was followed to estimate the duration of flooding.

113. The duration of inundation caused by Alternative 3.5D was calculated. Using the Alternative 3.5D HEC-RAS geometric model with a modified flow data model, the water surface elevation was reduced to the existing condition level by reducing the flowrate. The 100-year flowrate at Gila River below Salt River was reduced from 227,000 cfs to 175,000 cfs in order to bring the water surface elevation down to the existing condition level. Likewise, the 50- and 20-year flowrates at Gila River below Salt River were reduced from 185,000 cfs to 155,000 cfs and 92,000 cfs to 88,000 cfs, respectively.

114. Since a hydrograph at this location was not available, the 100-year hydrograph at Salt River above Gila River was used to estimate duration of inundation. The peak flowrate at this location is 164,000 cfs. The ratio of 164,000 cfs to 227,000 cfs (0.7225) was applied to 175,000 cfs, resulting in a target discharge of 126,000 cfs. Plate 6 displays the graphical analysis to determine an overtopping duration of 13 hours for the 100-year event. Plates 7 and 8 show the duration of flood for the 50-year and 20-year event, respectively. The duration calculated from the graphical analysis was multiplied by 0.75 to account for the transient conditions of the rising and falling limb of the hydrograph. Table 14 summarizes the results for all three cases. Plates 9 to 12 are detailed floodplain maps at this location.

RISK AND UNCERTAINTY ANALYSIS

115. Procedures outlined in EM 1110-2-1619, "Risk-Based Analysis for Flood Damage Reduction Studies" (Reference b), were followed to determine the standard deviation for computed water surface profiles at specific index locations. Specifically, Section 5-4, "Uncertainty in Stage for Ungauged Stream Reaches," and Section 5-5, "Uncertainty in Stages for Computed Water Surface Profiles," were followed. Only the 100-year event standard deviation was calculated using these methods since the computer program HEC-FDA (Reference k) would adjust the standard deviation for the other stage discharge values. For discharge values greater than the 100-year event discharge, the standard deviation is assumed equal to the standard deviation of the 100-year event discharge. For discharge values smaller than the 100-year event discharge, the standard deviation is the standard deviation of error associated with the 100-year event discharge multiplied by the ratio of the given discharge to the 100-year event discharge. A summary of the uncertainty analysis for the different alternatives at the index locations is presented in Table 8. The standard deviation for each alternative is tabulated under the column heading "Stotal."

OPERATION AND MAINTENANCE

116. Due to time constraints during this phase of the study, a with-project sediment analysis was not completed. Instead, results from the existing conditions sediment analysis (Reference e) were used to determine the frequency in which the environmental features within the river would have to be excavated due to sediment deposition. Basically, the total volume of the environmental features within the channel was divided by the average annual volume of sediment accumulation in the study area to obtain the number of years before the environmental features fill up with sediment. Note that the frequency of vegetation replacement was not analyzed in this study.

117. The average annual sediment accumulation in the study area is based on results from an existing conditions HEC-6 model (Reference e). In the study, a continuous 50-year hydrograph was constructed from discharge hydrographs developed by the Corps to include the effects of flow regulation upstream at Roosevelt Dam. The data consisted of historical flows between 1889 and 1993. Within this 105-year time span, the "worst case" continuous 50-year period, in terms

of both peak flows and storm volumes, occurred between 1889 and 1939. Therefore, the 50-year period from 1889 to 1939 was selected for the simulation. To determine the average annual volume, the total volume of sediment accumulated in the study area at the end of the simulation (from the HEC-6 $VOL record) was divided by 50 years. The average annual volume of sediment that accumulates in the study area is 50,041 cubic yards (cy) per year.

118. The volume of excavation for the environmental features within the river is from the Design/Cost Appendix. The volume of the environmental features were added and divided by the average annual sediment volume. See Table 12 for a summary of the results of the analysis. As shown in Table 12, excavation for the environmental features within the channel for Alternatives 3, 4, and 3.5, would have to be done every 21.3, 28.4, and 70.1 years, respectively. The above procedure for removal of the sediment assumes that the environmental features would be filled to capacity before being excavated. This, of course, would not be practical. Further guidance is needed to determine how often and at what point the environmental features would need to be excavated.

119. Note that the 50-year simulation did not include flows higher than 170,000 cfs. Including higher flows would likely affect the results of the sediment analysis. This would have to be done during the next phase of the study.

CONCLUSIONS

120. In general, the decrease in the water surface associated with Alternative 4 is greater than with Alternative 3. Alternative 3 and all its variations actually raised the water surfaces higher than the without project conditions. The water surface associated with Alternative 3.5 is comparable to Alternative 4.

121. As expected, the with-levee alternatives generally increased the water surface as compared to the without-levee alternatives. The environmental features in Alternative 3 were not enough to offset the constriction caused by the levee. The same could be said for Alternative 4, except that upstream of 107th Avenue, the water surfaces were generally lower than without project conditions.

122. The with-levee alternatives using levee alignment 2 had lower water surfaces than the with-levee alternatives using levee alignment 1. This was expected since levee alignment 2 used some of the existing floodplain as conveyance area.

123. Since the with-levee alternatives increase the water surface above the existing 100-year water surface at some locations, a levee on the south side may be needed for mitigation.

124. Removing the existing landfill between Station 198.02 and 198.59 not only decreased the water surface in the immediate vicinity of the excavation, but up to 3.2 miles upstream.

125. Due to irregularities in the natural river bottom, the bottom of the connected ponds, corridors, or basins are not always in a positive slope going downstream. Doing so may require unrealistically deep excavations. It is recommended that the designer of the environmental features not only use the plan view but also the profiles of the existing river bottom when designing the environmental features. It is recommended that the downstream environmental features be lower than the upstream environmental features. A continuous clear corridor may be more feasible. These changes would likely increase the conveyance capacity of environmental features.

126. The environmental features would essentially be holes in the ground. This translates into sediment traps and may fill in even during small events. This was examined briefly in the Operation and Maintenance part of this report. This will be explored in detail in the next phase of the study when the sediment analysis is completed.

127. **REFERENCES**:

a. US Army Corps of Engineers, 1994, EM 1110-2-1601, Hydraulic Design of Flood Control Channels, Change 1, Washington, D.C.

b. US Army Corps of Engineers, 1996, EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, Washington, D.C.

c. Hydrologic Engineering Center, 1998, User's Manual - HEC-RAS River Analysis System, Davis, California.

d. Hydrologic Engineering Center, 1990, User's Manual - HEC-2 Water Surface Profiles, Davis, California.

e. WEST Consultants, Inc., 1998, Without Project Hydraulic and Sedimentation Analysis, San Diego, California.

f. Flood Control Technical Committee, 1997, Draft Tres Rios River Management Plan, Flood Control Summary Report, Phoenix, Arizona.

g. Hydrologic Engineering Center, 1993, User's Manual - HEC-6 Scour and Deposition in Rivers and Reservoirs, Davis, California.

h. Flood Control District of Maricopa County, 1999, Floodplain Delineation of the Tolleson Area, Phoenix, Arizona.

I. Chow, V.T., 1959, Open-Channel Hydraulics, New York, New York.

j. Federal Emergency Management Agency, 1991, FEMA 37, Flood Insurance Study, Guidelines and Specifications for Study Contractors, Washington, D.C.

k. Hydrologic Engineering Center, 1998, User's Manual - HEC-FDA Flood Damage Reduction Analysis, Davis, California.

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.16	existing	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3B	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3D	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3F	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3G	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3H	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3I	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.19	existing	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3B	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3D	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3F	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3G	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3H	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3I	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.28	existing	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3B	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3D	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3F	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3G	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3H	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3I	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.38	existing	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3B	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3D	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3F	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3G	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3H	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3I	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.47	existing	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3B	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3D	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3F	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3G	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3H	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3I	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.56	existing	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3B	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3D	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3F	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3G	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3H	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3I	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.66	existing	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3B	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3D	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3F	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3G	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3H	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3I	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.75	existing	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3B	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3D	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3F	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wid Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.75	Alt3G	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3H	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3I	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.85	existing	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3B	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3D	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3F	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3G	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3H	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3I	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.94	existing	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3B	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3D	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3F	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3G	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3H	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3I	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	196.04	existing	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3B	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3D	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3F	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3G	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3H	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3I	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.13	existing	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3B	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3D	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3F	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3G	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3H	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3I	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.23	existing	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3B	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3D	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3F	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3G	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3H	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3I	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.32	existing	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3B	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3D	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3F	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3G	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3H	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3I	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.42	existing	227000.00		42020.24	184979.77	907.30	923.84	924.12	0.000685	4.27	53581.37	5460.19	16.54	0.23	0.044	0.46
Reach-1	196.42	Alt3B	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55
Reach-1	196.42	Alt3D	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55
Reach-1	196.42	Alt3F	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55
Reach-1	196.42	Alt3G	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55
Reach-1	196.42	Alt3H	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55
Reach-1	196.42	Alt3I	227000.00		44975.38	182024.63	907.30	923.87	924.13	0.000772	3.98	56092.12	5460.44	16.57	0.21	0.049	0.55

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.51	existing	227000.00	594.19	42631.91	183773.89	908.20	924.19	924.49	0.000763	4.33	52044.82	5586.78	15.99	0.23	0.044	0.51
Reach-1	196.51	Alt3B	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.51	Alt3D	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.51	Alt3P	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.51	Alt3G	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.51	Alt3H	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.51	Alt3I	227000.00	735.31	51289.91	174974.78	908.20	924.31	924.59	0.001037	3.78	56081.42	5589.38	16.11	0.20	0.057	0.75
Reach-1	196.61	existing	227000.00	3474.25	45531.88	177993.88	908.50	924.58	924.90	0.000823	4.64	50255.55	5910.00	16.08	0.25	0.042	0.54
Reach-1	196.61	Alt3B	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.61	Alt3D	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.61	Alt3P	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.61	Alt3G	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.61	Alt3H	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.61	Alt3I	227000.00	4168.95	53133.16	169697.89	908.50	924.83	925.10	0.000963	3.91	55886.64	5910.00	16.33	0.20	0.054	0.72
Reach-1	196.7	existing	227000.00	978.74	36880.54	187140.72	909.30	925.05	925.38	0.001055	4.69	51345.41	6778.23	15.75	0.25	0.050	0.73
Reach-1	196.7	Alt3B	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.7	Alt3D	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.7	Alt3P	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.7	Alt3G	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.7	Alt3H	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.7	Alt3I	227000.00	1445.33	53430.61	172124.06	909.30	925.45	925.70	0.001447	3.68	59450.15	6810.31	16.15	0.18	0.072	1.17
Reach-1	196.79	existing	227000.00	1546.84	27071.33	196381.83	910.70	925.48	925.92	0.001280	5.57	45430.27	6926.71	14.78	0.31	0.045	0.82
Reach-1	196.79	Alt3B	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.79	Alt3D	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.79	Alt3P	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.79	Alt3G	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.79	Alt3H	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.79	Alt3I	227000.00	2071.04	39399.12	185529.84	910.20	926.07	926.33	0.001431	4.15	56555.56	6986.55	15.87	0.20	0.067	1.14
Reach-1	196.88	existing	227000.00	1927.24	30512.80	194559.94	910.80	926.21	926.75	0.002164	6.09	39905.30	6919.83	15.41	0.37	0.047	1.16
Reach-1	196.88	Alt3B	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.88	Alt3D	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.88	Alt3P	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.88	Alt3G	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.88	Alt3H	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.88	Alt3I	227000.00	2921.94	46234.71	177843.34	910.20	926.88	927.20	0.002271	4.41	50441.72	6957.67	16.68	0.24	0.068	1.53
Reach-1	196.98	existing	227000.00	4124.02	27739.88	195136.11	911.00	927.07	927.48	0.001173	5.41	45275.76	7039.67	16.07	0.32	0.041	0.66
Reach-1	196.98	Alt3B	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	196.98	Alt3D	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	196.98	Alt3P	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	196.98	Alt3G	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	196.98	Alt3H	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	196.98	Alt3I	227000.00	4769.56	31588.35	190642.09	911.00	927.50	927.87	0.000973	5.04	48348.74	7041.67	16.50	0.29	0.041	0.58
Reach-1	197.07	existing	227000.00	2712.55	36512.74	187774.72	913.20	927.65	927.98	0.000937	4.85	50313.78	7246.95	14.45	0.27	0.042	0.60
Reach-1	197.07	Alt3B	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.07	Alt3D	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.07	Alt3P	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.07	Alt3G	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.07	Alt3H	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.07	Alt3I	227000.00	3035.03	39709.42	184255.56	913.20	927.98	928.28	0.000816	4.61	52759.91	7284.40	14.78	0.25	0.042	0.54
Reach-1	197.16	existing	227000.00	462.61	27543.88	198993.52	913.40	928.10	928.46	0.000989	5.09	49989.44	7447.59	14.70	0.28	0.044	0.66
Reach-1	197.16	Alt3B	227000.00	950.58	43097.42	182951.98	912.20	928.55	928.81	0.001486	4.24	55713.53	7484.71	16.35	0.22	0.063	1.08
Reach-1	197.16	Alt3D	227000.00	1144.39	1415.17	224440.44	912.20	928.53	928.95	0.002251	5.22	44415.32	4152.45	16.33	0.27	0.070	1.63
Reach-1	197.16	Alt3P	227000.00	950.58	43097.42	182951.98	912.20	928.55	928.81	0.001486	4.24	55713.53	7484.71	16.35	0.22	0.063	1.08

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.16	Alt3G	227000.00	1144.39	1415.17	224440.44	912.20	928.53	928.95	0.002251	5.22	44415.32	4152.45	16.33	0.27	0.070	1.63
Reach-1	197.16	Alt3H	227000.00	1029.44	25725.17	200245.39	912.20	928.54	928.88	0.001787	4.65	50309.96	5591.68	16.34	0.24	0.066	1.30
Reach-1	197.16	Alt3I	227000.00	1029.44	25725.17	200245.39	912.20	928.54	928.88	0.001787	4.65	50309.96	5591.68	16.34	0.24	0.066	1.30
Reach-1	197.26	existing	227000.00	3471.46	34505.11	189023.44	913.00	928.69	929.07	0.001576	5.28	49794.94	8005.73	15.69	0.29	0.053	1.00
Reach-1	197.26	Alt3B	227000.00	4972.61	43858.60	178168.80	912.20	929.30	929.53	0.001447	4.05	60765.32	8008.79	17.10	0.20	0.070	1.13
Reach-1	197.26	Alt3D	227000.00	7152.43		219847.56	912.20	929.66	930.01	0.002020	4.86	47755.58	4284.38	17.46	0.24	0.074	1.61
Reach-1	197.26	Alt3F	227000.00	4972.61	43858.60	178168.80	912.20	929.30	929.53	0.001447	4.05	60765.32	8008.79	17.10	0.20	0.070	1.13
Reach-1	197.26	Alt3G	227000.00	7152.43		219847.56	912.20	929.66	930.01	0.002020	4.86	47755.58	4284.38	17.46	0.24	0.074	1.61
Reach-1	197.26	Alt3H	227000.00	5792.74	25774.40	195432.88	912.20	929.44	929.71	0.001679	4.39	55095.12	5799.48	17.24	0.22	0.073	1.32
Reach-1	197.26	Alt3I	227000.00	5792.74	25774.40	195432.88	912.20	929.44	929.71	0.001679	4.39	55095.12	5799.48	17.24	0.22	0.073	1.32
Reach-1	197.35	existing	227000.00	4826.66	69687.19	152486.16	914.20	929.57	929.91	0.001917	4.49	49701.91	8161.77	15.37	0.26	0.055	1.13
Reach-1	197.35	Alt3B	227000.00	4675.69	64310.32	158013.98	912.50	929.95	930.17	0.001214	3.56	61865.88	8220.27	17.45	0.18	0.064	0.93
Reach-1	197.35	Alt3D	227000.00	8264.74	2038.39	216696.88	912.50	930.64	930.97	0.001904	4.62	49976.25	4425.20	18.14	0.23	0.076	1.54
Reach-1	197.35	Alt3F	227000.00	4675.69	64310.32	158013.98	912.50	929.95	930.17	0.001214	3.56	61865.88	8220.27	17.45	0.18	0.064	0.93
Reach-1	197.35	Alt3G	227000.00	8264.74	2038.39	216696.88	912.50	930.64	930.97	0.001904	4.62	49976.25	4425.20	18.14	0.23	0.076	1.54
Reach-1	197.35	Alt3H	227000.00	5640.99	45314.61	176044.39	912.50	930.18	930.46	0.001420	3.89	55516.82	5839.43	17.68	0.19	0.067	1.11
Reach-1	197.35	Alt3I	227000.00	5640.99	45314.61	176044.39	912.50	930.18	930.46	0.001420	3.89	55516.82	5839.43	17.68	0.19	0.067	1.11
Reach-1	197.45	existing	227000.00	3917.62	43786.81	179295.56	915.60	930.40	930.71	0.001353	4.68	52466.50	8298.04	14.80	0.27	0.049	0.78
Reach-1	197.45	Alt3B	227000.00	2044.39	23168.42	201787.19	912.50	930.28	930.51	0.000426	4.05	63463.00	8284.84	17.78	0.21	0.041	0.32
Reach-1	197.45	Alt3D	227000.00	3156.50		223843.50	912.50	931.10	931.38	0.000430	4.20	55463.29	4728.76	18.60	0.21	0.042	0.34
Reach-1	197.45	Alt3F	227000.00	2044.39	23168.42	201787.19	912.50	930.28	930.51	0.000426	4.05	63463.00	8284.84	17.78	0.21	0.041	0.32
Reach-1	197.45	Alt3G	227000.00	3156.50		223843.50	912.50	931.10	931.38	0.000430	4.20	55463.29	4728.76	18.60	0.21	0.042	0.34
Reach-1	197.45	Alt3H	227000.00	2468.10	10721.62	213812.28	912.50	930.57	930.83	0.000445	4.19	57154.92	5838.97	18.07	0.21	0.041	0.34
Reach-1	197.45	Alt3I	227000.00	2468.10	10721.62	213812.28	912.50	930.57	930.83	0.000445	4.19	57154.92	5838.97	18.07	0.21	0.041	0.34
Reach-1	197.54	existing	227000.00	1030.05	61772.48	164197.47	916.10	931.06	931.32	0.001119	4.00	56011.18	8088.47	14.96	0.23	0.049	0.66
Reach-1	197.54	Alt3B	227000.00	754.08	49198.69	177047.22	912.50	930.59	930.82	0.001049	3.83	59441.54	8012.42	18.09	0.21	0.054	0.69
Reach-1	197.54	Alt3D	227000.00	1454.75		225545.25	912.50	931.41	931.73	0.001333	4.53	50558.99	4716.18	18.91	0.24	0.060	0.95
Reach-1	197.54	Alt3F	227000.00	754.08	49198.69	177047.22	912.50	930.59	930.82	0.001049	3.83	59441.54	8012.42	18.09	0.21	0.054	0.69
Reach-1	197.54	Alt3G	227000.00	1454.75		225545.25	912.50	931.41	931.73	0.001333	4.53	50558.99	4716.18	18.91	0.24	0.060	0.95
Reach-1	197.54	Alt3H	227000.00	1007.78	15907.70	210084.53	912.50	930.89	931.19	0.001348	4.42	51780.87	5669.78	18.39	0.24	0.058	0.92
Reach-1	197.54	Alt3I	227000.00	1007.78	15907.70	210084.53	912.50	930.89	931.19	0.001348	4.42	51780.87	5669.78	18.39	0.24	0.058	0.92
Reach-1	197.64	existing	227000.00	1831.26	59582.39	165586.36	918.20	931.72	932.01	0.001415	4.29	52563.56	8221.79	13.52	0.26	0.049	0.76
Reach-1	197.64	Alt3B	227000.00	1486.24	51553.83	173959.94	918.20	931.25	931.54	0.001613	4.28	52855.72	8215.40	13.05	0.25	0.054	0.91
Reach-1	197.64	Alt3D	227000.00	2676.82	3026.34	221296.84	918.20	932.21	932.58	0.001870	4.92	46470.80	4918.57	14.01	0.27	0.060	1.17
Reach-1	197.64	Alt3F	227000.00	1486.24	51553.83	173959.94	918.20	931.25	931.54	0.001613	4.28	52855.72	8215.40	13.05	0.25	0.054	0.91
Reach-1	197.64	Alt3G	227000.00	2676.82	3026.34	221296.84	918.20	932.21	932.58	0.001870	4.92	46470.80	4918.57	14.01	0.27	0.060	1.17
Reach-1	197.64	Alt3H	227000.00	2164.37	14474.44	210361.17	918.20	931.71	932.08	0.001998	4.92	46635.62	5762.10	13.51	0.28	0.059	1.19
Reach-1	197.64	Alt3I	227000.00	2164.37	14474.44	210361.17	918.20	931.71	932.08	0.001998	4.92	46635.62	5762.10	13.51	0.28	0.059	1.19
Reach-1	197.74	existing	227000.00	2415.01	38094.59	186490.42	919.10	932.48	932.86	0.001764	5.10	46670.54	8146.97	13.38	0.31	0.048	0.92
Reach-1	197.74	Alt3B	227000.00	1905.12	29763.97	195330.91	918.80	932.08	932.43	0.001746	4.83	49045.38	8065.79	13.28	0.28	0.053	1.01
Reach-1	197.74	Alt3D	227000.00	3163.12		223836.88	918.80	933.11	933.49	0.001618	4.99	46063.88	4713.71	14.31	0.27	0.057	1.04
Reach-1	197.74	Alt3F	227000.00	1905.12	29763.97	195330.91	918.80	932.08	932.43	0.001746	4.83	49045.38	8065.79	13.28	0.28	0.053	1.01
Reach-1	197.74	Alt3G	227000.00	3163.12		223836.88	918.80	933.11	933.49	0.001618	4.99	46063.88	4713.71	14.31	0.27	0.057	1.04
Reach-1	197.74	Alt3H	227000.00	2685.00	6387.34	217927.66	918.80	932.88	933.07	0.001766	5.07	46060.81	5762.70	13.88	0.28	0.056	1.08
Reach-1	197.74	Alt3I	227000.00	2685.00	6387.34	217927.66	918.80	932.88	933.07	0.001766	5.07	46060.81	5762.70	13.88	0.28	0.056	1.08
Reach-1	197.83	existing	227000.00	1729.87	31591.98	193678.14	919.60	933.27	933.69	0.001536	5.43	45477.11	8100.38	13.67	0.32	0.044	0.84
Reach-1	197.83	Alt3B	227000.00	1514.46	27942.52	197543.02	918.80	932.95	933.34	0.001892	5.21	46472.98	8061.65	14.15	0.30	0.052	1.10
Reach-1	197.83	Alt3D	227000.00	2936.72		224063.30	918.80	933.91	934.35	0.001762	5.36	43118.80	4582.00	15.11	0.29	0.055	1.13
Reach-1	197.83	Alt3F	227000.00	1514.46	27942.52	197543.02	918.80	932.95	933.34	0.001892	5.21	46472.98	8061.65	14.15	0.30	0.052	1.10
Reach-1	197.83	Alt3G	227000.00	2936.72		224063.30	918.80	933.91	934.35	0.001762	5.36	43118.80	4582.00	15.11	0.29	0.055	1.13
Reach-1	197.83	Alt3H	227000.00	2327.24	7250.43	217422.31	918.80	933.55	933.99	0.001865	5.39	43793.73	5888.60	14.75	0.30	0.054	1.15
Reach-1	197.83	Alt3I	227000.00	2327.24	7250.43	217422.31	918.80	933.55	933.99	0.001865	5.39	43793.73	5888.60	14.75	0.30	0.054	1.15

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.92	existing	227000.00	661.05	29269.05	197069.92	920.60	933.98	934.42	0.001425	5.57	45728.34	7989.40	13.38	0.33	0.043	0.80
Reach-1	197.92	Alt3B	227000.00	469.73	26619.16	199911.13	920.60	933.74	934.22	0.001596	5.81	43810.96	7989.40	13.14	0.34	0.043	0.88
Reach-1	197.92	Alt3D	227000.00	1441.95		225558.05	920.60	934.63	935.18	0.001503	5.95	38743.94	4394.00	14.03	0.34	0.044	0.91
Reach-1	197.92	Alt3F	227000.00	469.73	26619.16	199911.13	920.60	933.74	934.22	0.001596	5.81	43810.96	7989.40	13.14	0.34	0.043	0.88
Reach-1	197.92	Alt3G	227000.00	1441.95		225558.05	920.60	934.63	935.18	0.001503	5.95	38743.94	4394.00	14.03	0.34	0.044	0.91
Reach-1	197.92	Alt3H	227000.00	1058.43	8998.90	216942.66	920.60	934.32	934.84	0.001541	5.92	40228.73	5776.10	13.72	0.34	0.044	0.90
Reach-1	197.92	Alt3I	227000.00	1058.43	8998.90	216942.66	920.60	934.32	934.84	0.001541	5.92	40228.73	5776.10	13.72	0.34	0.044	0.90
Reach-1	198.02	existing	227000.00	1482.46	26391.86	199125.69	922.80	934.70	935.26	0.001825	6.31	40953.00	8073.70	11.90	0.38	0.042	0.98
Reach-1	198.02	Alt3B	227000.00	1215.54	22720.09	203064.36	916.40	934.56	935.04	0.001679	5.80	43818.72	8073.70	18.16	0.33	0.046	1.00
Reach-1	198.02	Alt3D	227000.00	2551.20		224448.80	916.40	935.41	935.94	0.001546	5.89	39389.88	4207.70	19.01	0.32	0.047	1.00
Reach-1	198.02	Alt3F	227000.00	938.64	17926.33	208135.03	916.40	934.51	934.91	0.001143	5.26	48079.72	8073.70	18.11	0.28	0.046	0.77
Reach-1	198.02	Alt3G	227000.00	2052.13		224947.86	916.40	935.39	935.82	0.001028	5.26	44021.37	4207.70	18.99	0.27	0.046	0.74
Reach-1	198.02	Alt3H	227000.00	2011.89	14369.88	210618.22	916.40	935.13	935.61	0.001490	5.68	42378.85	5920.80	18.73	0.31	0.046	0.94
Reach-1	198.02	Alt3I	227000.00	1809.63	11557.70	213832.67	916.40	935.10	935.49	0.001011	5.13	46883.18	5920.80	18.70	0.27	0.046	0.71
Reach-1	198.11	existing	227000.00	292.81	42284.44	184422.75	922.40	935.74	936.30	0.003105	8.46	40277.29	7935.53	13.34	0.39	0.052	1.62
Reach-1	198.11	Alt3B	227000.00	328.45	47320.42	179351.13	916.40	935.73	936.14	0.003947	5.41	44822.13	7926.82	19.33	0.31	0.071	2.37
Reach-1	198.11	Alt3D	227000.00	1325.52		225674.48	916.40	936.58	937.18	0.004752	6.26	36647.94	3914.34	20.18	0.34	0.078	3.10
Reach-1	198.11	Alt3F	227000.00	119.73	28231.93	198648.34	916.40	935.29	935.66	0.002527	5.06	49002.59	7843.41	18.89	0.26	0.071	1.80
Reach-1	198.11	Alt3G	227000.00	479.55		226520.45	916.40	936.13	936.58	0.002617	5.38	42485.21	3872.22	19.73	0.27	0.075	2.00
Reach-1	198.11	Alt3H	227000.00	705.00	25295.94	200999.06	916.40	936.21	936.69	0.004223	5.78	41502.19	6003.16	19.81	0.32	0.075	2.66
Reach-1	198.11	Alt3I	227000.00	274.16	14984.03	211741.81	916.40	935.80	936.20	0.002488	5.16	46671.78	5852.81	19.40	0.26	0.073	1.85
Reach-1	198.2	existing	227000.00	322.15	62623.75	164054.09	918.80	936.99	937.39	0.001727	5.33	46257.24	7993.56	18.19	0.30	0.047	1.02
Reach-1	198.2	Alt3B	227000.00	426.75	73444.24	153129.00	916.40	937.13	937.46	0.002085	4.57	49695.05	8019.63	20.73	0.25	0.058	1.33
Reach-1	198.2	Alt3D	227000.00	2191.17		224808.83	916.40	938.48	939.02	0.002983	5.95	38692.50	3660.50	22.08	0.30	0.070	2.15
Reach-1	198.2	Alt3F	227000.00	80.06	35934.11	190985.83	916.40	936.23	936.52	0.001324	4.53	54079.74	7847.52	19.83	0.22	0.061	1.07
Reach-1	198.2	Alt3G	227000.00	364.48		226635.52	916.40	937.14	937.53	0.001475	5.03	45387.47	3532.80	20.74	0.24	0.065	1.27
Reach-1	198.2	Alt3H	227000.00	872.88	57035.98	169091.14	916.40	937.69	938.09	0.002134	4.78	45641.63	6013.01	21.29	0.25	0.060	1.44
Reach-1	198.2	Alt3I	227000.00	186.52	28099.75	198713.73	916.40	936.73	937.04	0.001264	4.54	51456.09	5854.58	20.33	0.22	0.061	1.06
Reach-1	198.26	existing	227000.00	5.68	64819.75	162174.58	918.70	937.50	937.87	0.001629	5.17	46849.87	7784.66	18.80	0.30	0.047	0.96
Reach-1	198.26	Alt3B	227000.00	9.72	66390.94	160599.34	918.70	937.62	937.98	0.001529	5.06	47796.06	7795.74	18.92	0.29	0.047	0.91
Reach-1	198.26	Alt3D	227000.00	328.71		226671.30	918.70	939.14	939.73	0.001843	6.16	37008.66	3588.84	20.44	0.33	0.052	1.27
Reach-1	198.26	Alt3F	227000.00		19742.86	207257.14	918.70	936.40	936.78	0.000510	5.16	50753.06	7725.93	17.70	0.26	0.036	0.39
Reach-1	198.26	Alt3G	227000.00	1.29		226998.72	918.70	937.35	937.78	0.000488	5.24	43321.57	3332.46	18.65	0.25	0.036	0.40
Reach-1	198.26	Alt3H	227000.00	54.59	51009.91	175935.48	918.70	938.20	938.61	0.001503	5.23	43847.83	5788.43	19.50	0.29	0.047	0.95
Reach-1	198.26	Alt3I	227000.00		15618.80	211381.19	918.70	936.90	937.28	0.000470	5.05	46861.45	5674.10	18.20	0.25	0.036	0.37
Reach-1	198.3	existing	227000.00	24.68	38571.15	188404.19	921.70	937.71	938.63	0.006652	8.14	30808.68	7430.49	16.01	0.54	0.052	2.92
Reach-1	198.3	Alt3B	227000.00	35.14	40497.56	186467.30	921.70	937.81	938.69	0.006199	7.93	31604.64	7465.00	16.11	0.52	0.052	2.76
Reach-1	198.3	Alt3D	227000.00	372.32		226627.67	921.70	939.44	940.39	0.004610	7.84	29032.80	3415.41	17.74	0.47	0.054	2.48
Reach-1	198.3	Alt3F	227000.00		2287.71	224712.28	920.70	936.29	937.01	0.000839	6.85	34966.30	6491.81	15.59	0.38	0.033	0.53
Reach-1	198.3	Alt3G	227000.00	1.05		226998.94	920.70	937.34	937.95	0.000664	6.27	36221.40	3289.76	16.64	0.33	0.033	0.46
Reach-1	198.3	Alt3H	227000.00	112.07	14612.83	212275.11	921.70	938.31	939.35	0.006437	8.45	29670.63	5506.55	16.61	0.54	0.055	3.05
Reach-1	198.3	Alt3I	227000.00		825.58	226174.42	920.70	936.82	937.48	0.000747	6.55	35968.85	5139.36	16.12	0.35	0.033	0.50
Reach-1	198.34	existing	227000.00		55736.97	171263.03	922.70	938.84	939.23	0.001479	5.45	48228.18	7877.15	16.14	0.31	0.046	0.86
Reach-1	198.34	Alt3B	227000.00		62769.12	164230.88	915.00	938.99	939.32	0.001844	4.91	50940.89	7878.00	23.99	0.27	0.052	1.01
Reach-1	198.34	Alt3D	227000.00			227000.00	915.00	940.47	941.01	0.001983	5.90	38465.67	3377.30	25.47	0.31	0.058	1.40
Reach-1	198.34	Alt3F	227000.00		15651.79	211348.20	915.00	936.83	937.25	0.001402	5.35	47336.00	7731.69	21.83	0.27	0.053	1.02
Reach-1	198.34	Alt3G	227000.00			227000.00	915.00	937.70	938.15	0.001292	5.35	42416.49	3368.94	22.70	0.27	0.054	1.01
Reach-1	198.34	Alt3H	227000.00			227000.00	915.00	939.54	940.18	0.002632	6.43	35306.67	3377.10	24.54	0.35	0.056	1.70
Reach-1	198.34	Alt3I	227000.00		8320.87	218679.14	915.00	937.27	937.70	0.001338	5.34	46377.92	5816.38	22.27	0.27	0.054	1.01
Reach-1	198.4	existing	227000.00		44305.43	182694.56	921.50	939.31	939.70	0.001324	5.46	49948.98	7944.56	17.81	0.30	0.048	0.83
Reach-1	198.4	Alt3B	227000.00		49799.36	177200.66	915.10	939.51	939.83	0.001383	4.91	53546.45	7948.53	24.41	0.26	0.053	0.92
Reach-1	198.4	Alt3D	227000.00			227000.00	915.10	941.07	941.54	0.001456	5.49	41331.02	3338.20	25.97	0.28	0.055	1.11
Reach-1	198.4	Alt3F	227000.00		12912.95	214087.05	915.10	937.26	937.68	0.001307	5.38	47114.79	7193.39	22.16	0.27	0.052	0.96

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.4	Alt3G	227000.00			227000.00	915.10	938.09	938.53	0.001182	5.34	42538.50	3331.87	22.99	0.26	0.052	0.93
Reach-1	198.4	Alt3H	227000.00			227000.00	915.10	940.32	940.85	0.001791	5.85	38826.15	3338.20	25.22	0.30	0.055	1.26
Reach-1	198.4	Alt3I	227000.00			227000.00	915.10	937.85	938.13	0.001322	5.52	41096.96	3330.51	22.55	0.28	0.052	1.01
Reach-1	198.49	existing	227000.00		53563.97	173436.03	921.90	939.86	940.12	0.000555	4.52	50341.80	7989.44	17.96	0.23	0.040	0.40
Reach-1	198.49	Alt3B	227000.00		57714.25	169285.75	915.30	940.04	940.26	0.000569	4.11	64020.63	7990.00	24.74	0.20	0.045	0.44
Reach-1	198.49	Alt3D	227000.00			227000.00	915.30	941.66	942.03	0.000682	4.88	46545.10	3296.90	26.36	0.23	0.046	0.59
Reach-1	198.49	Alt3F	227000.00		24297.84	202702.16	915.30	937.81	938.17	0.000732	5.03	52702.83	7954.48	22.51	0.25	0.042	0.55
Reach-1	198.49	Alt3G	227000.00			227000.00	915.30	938.56	939.00	0.000792	5.36	42362.12	3292.44	23.26	0.26	0.043	0.63
Reach-1	198.49	Alt3H	227000.00			227000.00	915.30	941.03	941.44	0.000794	5.10	44468.44	3296.90	25.73	0.24	0.046	0.66
Reach-1	198.49	Alt3I	227000.00			227000.00	915.30	938.18	938.65	0.000874	5.52	41120.65	3291.18	22.88	0.28	0.043	0.67
Reach-1	198.59	existing	227000.00		63685.97	163314.02	921.30	940.15	940.41	0.000561	4.39	57467.48	7757.68	18.85	0.22	0.039	0.41
Reach-1	198.59	Alt3B	227000.00		84815.70	142184.30	915.40	940.40	940.61	0.000831	3.58	61152.89	7760.00	25.00	0.18	0.052	0.65
Reach-1	198.59	Alt3D	227000.00			227000.00	915.40	942.15	942.54	0.001381	5.02	45234.14	3137.70	26.75	0.23	0.065	1.23
Reach-1	198.59	Alt3F	227000.00		48963.50	178036.50	915.40	938.39	938.74	0.001802	4.98	47902.46	7732.54	22.99	0.26	0.057	1.27
Reach-1	198.59	Alt3G	227000.00			227000.00	915.40	939.18	939.72	0.002356	5.94	38243.15	3133.79	23.78	0.30	0.064	1.77
Reach-1	198.59	Alt3H	227000.00			227000.00	915.40	941.60	942.02	0.001571	5.22	43507.10	3137.70	26.20	0.25	0.065	1.34
Reach-1	198.59	Alt3I	227000.00			227000.00	915.40	938.86	939.44	0.002563	6.09	37266.32	3132.59	23.46	0.31	0.064	1.88
Reach-1	198.66	existing	227000.00	17.75	61286.66	165695.59	921.50	940.36	940.64	0.000588	4.50	56470.92	7670.30	18.86	0.23	0.041	0.45
Reach-1	198.66	Alt3B	227000.00	24.71	90739.38	136235.92	915.60	940.74	940.98	0.000975	3.45	60909.53	7680.00	25.14	0.17	0.057	0.79
Reach-1	198.66	Alt3D	227000.00	45.99		226954.00	915.60	942.74	943.12	0.001693	4.98	45571.96	3006.80	27.14	0.23	0.075	1.59
Reach-1	198.66	Alt3F	227000.00	24.60	65504.74	161470.66	915.60	939.14	939.48	0.002089	4.64	48720.12	7652.62	23.54	0.24	0.062	1.50
Reach-1	198.66	Alt3G	227000.00	39.27		226960.73	915.60	940.19	940.75	0.003105	5.99	37933.02	3005.39	24.59	0.30	0.075	2.42
Reach-1	198.66	Alt3H	227000.00	45.11		226954.89	915.60	942.26	942.67	0.001879	5.14	44156.29	3006.80	26.66	0.24	0.075	1.71
Reach-1	198.66	Alt3I	227000.00	38.38		226961.63	915.60	939.97	940.54	0.003297	6.10	37246.70	3004.60	24.37	0.31	0.074	2.53
Reach-1	198.75	existing	227000.00		53241.10	173758.92	921.40	940.64	940.90	0.000610	4.42	57166.60	7760.09	19.24	0.22	0.042	0.48
Reach-1	198.75	Alt3B	227000.00		78163.37	148836.64	915.80	941.14	941.35	0.000868	3.46	63168.82	7770.00	25.34	0.18	0.058	0.74
Reach-1	198.75	Alt3D	227000.00			227000.00	915.80	943.50	943.82	0.001201	4.52	50259.37	3099.80	27.70	0.20	0.073	1.20
Reach-1	198.75	Alt3F	227000.00		60072.44	166927.56	915.80	939.97	940.25	0.001459	4.24	54069.34	7746.35	24.17	0.21	0.061	1.15
Reach-1	198.75	Alt3G	227000.00			227000.00	915.80	941.50	941.91	0.001857	5.15	44068.47	3099.80	25.70	0.24	0.072	1.63
Reach-1	198.75	Alt3H	227000.00			227000.00	915.80	943.10	943.44	0.001303	4.63	49036.58	3099.80	27.30	0.21	0.073	1.27
Reach-1	198.75	Alt3I	227000.00			227000.00	915.80	941.34	941.76	0.001928	5.21	43571.25	3099.80	25.54	0.24	0.072	1.68
Reach-1	198.85	existing	227000.00		28662.20	198337.80	922.30	940.89	941.32	0.001120	5.56	47495.98	7666.74	18.59	0.28	0.046	0.84
Reach-1	198.85	Alt3B	227000.00		53412.14	173587.84	916.00	941.61	941.88	0.001677	4.35	55035.34	7689.09	25.61	0.21	0.069	1.38
Reach-1	198.85	Alt3D	227000.00			227000.00	916.00	944.15	944.51	0.001611	4.78	47455.52	2987.56	28.15	0.21	0.078	1.57
Reach-1	198.85	Alt3F	227000.00		38518.91	188481.09	916.00	940.75	941.11	0.002457	5.05	48428.69	7665.33	24.75	0.25	0.071	1.90
Reach-1	198.85	Alt3G	227000.00			227000.00	916.00	942.50	942.94	0.002316	5.34	42516.53	2980.69	26.50	0.25	0.078	2.03
Reach-1	198.85	Alt3H	227000.00			227000.00	916.00	943.81	944.18	0.001730	4.89	46440.29	2986.15	27.81	0.22	0.078	1.65
Reach-1	198.85	Alt3I	227000.00			227000.00	916.00	942.37	942.82	0.002385	5.39	42145.07	2980.17	26.37	0.25	0.078	2.08
Reach-1	198.94	existing	227000.00		59835.71	167164.28	923.20	941.49	941.83	0.001003	4.98	50050.65	7505.44	18.29	0.26	0.044	0.73
Reach-1	198.94	Alt3B	227000.00		91968.70	135031.31	916.20	942.28	942.53	0.001213	3.53	58354.41	7515.79	26.08	0.17	0.061	1.00
Reach-1	198.94	Alt3D	227000.00			227000.00	916.20	945.00	945.38	0.001859	4.94	45964.29	2850.00	28.80	0.22	0.082	1.84
Reach-1	198.94	Alt3F	227000.00		83648.19	143351.81	916.20	941.74	942.02	0.001565	3.91	54288.80	7508.69	25.54	0.19	0.063	1.24
Reach-1	198.94	Alt3G	227000.00			227000.00	916.20	943.69	944.14	0.002465	5.38	42215.49	2850.00	27.49	0.25	0.082	2.24
Reach-1	198.94	Alt3H	227000.00			227000.00	916.20	944.72	945.11	0.001971	5.03	45164.29	2850.00	28.52	0.22	0.082	1.92
Reach-1	198.94	Alt3I	227000.00			227000.00	916.20	943.59	944.05	0.002517	5.41	41950.04	2850.00	27.39	0.25	0.082	2.27
Reach-1	199.07	existing	227000.00		10040.60	216959.39	926.80	941.87	942.91	0.001731	8.37	32939.40	7887.01	15.07	0.43	0.038	1.24
Reach-1	199.07	Alt3B	227000.00		20765.40	206234.59	926.80	942.84	943.60	0.001199	7.34	41259.82	9163.86	16.04	0.37	0.039	0.93
Reach-1	199.07	Alt3D	227000.00			227000.00	926.80	945.27	945.98	0.000813	6.76	33557.38	2242.00	18.47	0.31	0.038	0.75
Reach-1	199.07	Alt3F	227000.00		15656.15	211343.84	926.80	942.39	943.28	0.001418	7.80	37296.19	8579.34	15.59	0.40	0.039	1.07
Reach-1	199.07	Alt3G	227000.00			227000.00	926.80	944.07	944.91	0.001070	7.36	30854.63	2242.00	17.27	0.35	0.038	0.91
Reach-1	199.07	Alt3H	227000.00			227000.00	926.80	945.01	945.75	0.000861	6.88	32972.93	2242.00	18.21	0.32	0.038	0.79
Reach-1	199.07	Alt3I	227000.00			227000.00	926.80	943.98	944.83	0.001092	7.40	30667.30	2242.00	17.18	0.35	0.038	0.93

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.11	existing	227000.00	2234.18	11012.97	213752.84	926.80	942.59	943.41	0.001403	7.49	36654.49	7612.18	15.79	0.38	0.039	1.03
Reach-1	199.11	Alt3B	227000.00	2395.23	16521.55	208083.22	926.80	943.27	943.95	0.001105	6.89	42136.14	8688.64	16.47	0.34	0.040	0.86
Reach-1	199.11	Alt3D	227000.00	3301.36		223698.64	926.80	945.64	946.23	0.000722	6.23	36922.26	2537.00	18.84	0.28	0.039	0.67
Reach-1	199.11	Alt3F	227000.00	2318.07	14307.44	210374.50	926.80	942.95	943.69	0.001230	7.15	39483.12	7991.93	16.15	0.36	0.039	0.93
Reach-1	199.11	Alt3G	227000.00	2991.66		224008.34	926.80	944.53	945.23	0.000933	6.74	34123.26	2537.00	17.73	0.32	0.039	0.80
Reach-1	199.11	Alt3H	227000.00	3236.97		223763.03	926.80	945.39	946.01	0.000762	6.33	36309.38	2537.00	18.59	0.29	0.039	0.69
Reach-1	199.11	Alt3I	227000.00	2969.11		224030.89	926.80	944.46	945.16	0.000950	6.78	33933.11	2537.00	17.66	0.32	0.039	0.81
Reach-1	199.12	existing	227000.00		8954.81	218045.19	926.80	942.53	943.47	0.001136	7.91	34462.99	6787.30	15.73	0.38	0.036	0.92
Reach-1	199.12	Alt3B	227000.00		13836.49	213163.52	926.80	943.22	944.01	0.000918	7.35	39367.81	7839.77	16.42	0.35	0.036	0.78
Reach-1	199.12	Alt3D	227000.00			227000.00	926.80	945.59	946.28	0.000817	6.68	33960.36	2094.00	18.79	0.29	0.035	0.61
Reach-1	199.12	Alt3F	227000.00		11725.70	215274.30	926.80	942.90	943.75	0.001012	7.60	36986.34	7179.82	16.10	0.36	0.036	0.84
Reach-1	199.12	Alt3G	227000.00			227000.00	926.80	944.48	945.28	0.000779	7.17	31648.06	2094.00	17.68	0.33	0.035	0.72
Reach-1	199.12	Alt3H	227000.00			227000.00	926.80	945.35	946.06	0.000646	6.79	33453.87	2094.00	18.55	0.30	0.035	0.64
Reach-1	199.12	Alt3I	227000.00			227000.00	926.80	944.41	945.22	0.000792	7.21	31491.12	2094.00	17.61	0.33	0.035	0.73
Reach-	199.12		Bridge														
Reach-1	199.13	existing	227000.00		11448.98	215551.02	926.80	942.86	943.72	0.001024	7.63	36736.34	7141.89	16.06	0.37	0.036	0.85
Reach-1	199.13	Alt3B	227000.00		16021.89	210978.31	926.80	943.45	944.19	0.000852	7.16	41183.08	7994.50	16.65	0.34	0.036	0.74
Reach-1	199.13	Alt3D	227000.00			227000.00	926.80	945.77	946.45	0.000594	6.61	34337.90	2094.00	18.97	0.29	0.035	0.60
Reach-1	199.13	Alt3F	227000.00		13960.05	213039.95	926.80	943.17	943.96	0.000928	7.37	38997.95	7477.99	16.37	0.35	0.036	0.79
Reach-1	199.13	Alt3G	227000.00			227000.00	926.80	944.71	945.46	0.000742	7.07	32113.29	2094.00	17.91	0.32	0.035	0.70
Reach-1	199.13	Alt3H	227000.00			227000.00	926.80	945.54	946.23	0.000623	6.71	33848.39	2094.00	18.74	0.29	0.035	0.62
Reach-1	199.13	Alt3I	227000.00			227000.00	926.80	944.64	945.42	0.000754	7.10	31963.24	2094.00	17.84	0.32	0.035	0.71
Reach-1	199.14	existing	227000.00	256.36	13793.45	212950.19	926.80	943.14	943.79	0.000787	6.67	42605.48	8099.78	16.34	0.32	0.036	0.65
Reach-1	199.14	Alt3B	227000.00	257.34	17923.09	208819.56	926.80	943.68	944.24	0.000662	6.28	47367.18	8935.14	16.88	0.30	0.036	0.57
Reach-1	199.14	Alt3D	227000.00	298.14		226701.86	926.80	945.96	946.49	0.000469	5.85	38837.59	2417.00	19.16	0.26	0.035	0.47
Reach-1	199.14	Alt3F	227000.00	257.91	15095.71	211646.41	926.80	943.41	944.02	0.000727	6.50	44942.92	8880.13	16.61	0.31	0.036	0.61
Reach-1	199.14	Alt3G	227000.00	291.17		226708.84	926.80	944.93	945.54	0.000585	6.26	36339.01	2417.00	18.13	0.28	0.035	0.55
Reach-1	199.14	Alt3H	227000.00	296.78		226703.22	926.80	945.73	946.28	0.000492	5.94	38286.44	2417.00	18.93	0.26	0.035	0.49
Reach-1	199.14	Alt3I	227000.00	290.63		226709.38	926.80	944.86	945.47	0.000595	6.28	36171.13	2417.00	18.06	0.29	0.035	0.56
Reach-1	199.24	existing	227000.00		48134.13	178865.88	927.10	943.57	944.07	0.001431	6.17	44726.23	7385.68	16.47	0.32	0.045	1.02
Reach-1	199.24	Alt3B	227000.00		54489.79	172510.22	927.10	944.06	944.48	0.001165	5.70	48345.65	7398.76	16.96	0.29	0.045	0.86
Reach-1	199.24	Alt3D	227000.00			227000.00	927.10	946.10	946.73	0.001218	6.40	35467.13	2582.12	19.00	0.30	0.047	1.04
Reach-1	199.24	Alt3F	227000.00		51499.81	175500.19	927.10	943.83	944.28	0.001285	5.92	46602.82	7392.47	16.73	0.31	0.045	0.94
Reach-1	199.24	Alt3G	227000.00			227000.00	927.10	945.10	945.84	0.001547	6.90	32889.45	2567.40	18.00	0.34	0.046	1.24
Reach-1	199.24	Alt3H	227000.00			227000.00	927.10	945.87	946.53	0.001283	6.51	34895.41	2581.60	18.77	0.31	0.047	1.08
Reach-1	199.24	Alt3I	227000.00			227000.00	927.10	945.03	945.78	0.001573	6.94	32718.07	2565.87	17.93	0.34	0.046	1.25
Reach-1	199.3	existing	227000.00		26726.67	200273.33	928.80	944.00	944.57	0.002186	6.36	40529.02	6865.02	15.20	0.34	0.053	1.51
Reach-1	199.3	Alt3B	227000.00		31419.44	195580.56	928.80	944.40	944.90	0.001847	5.99	43348.24	7142.81	15.60	0.31	0.052	1.32
Reach-1	199.3	Alt3D	227000.00			227000.00	928.80	946.56	947.09	0.001388	5.85	38790.80	2858.72	17.76	0.28	0.054	1.17
Reach-1	199.3	Alt3F	227000.00		29147.02	197852.98	928.80	944.21	944.74	0.002004	6.17	41955.98	7006.32	15.41	0.32	0.053	1.41
Reach-1	199.3	Alt3G	227000.00			227000.00	928.80	945.68	946.29	0.001740	6.26	36282.32	2856.21	16.88	0.31	0.054	1.38
Reach-1	199.3	Alt3H	227000.00			227000.00	928.80	946.37	946.91	0.001459	5.94	38226.23	2858.15	17.57	0.29	0.054	1.21
Reach-1	199.3	Alt3I	227000.00			227000.00	928.80	945.83	946.24	0.001766	6.28	36118.98	2856.04	16.83	0.31	0.054	1.39
Reach-1	199.34	existing	227000.00		66717.09	160282.92	929.50	944.71	945.11	0.002092	5.53	47720.97	7324.67	15.21	0.29	0.058	1.44
Reach-1	199.34	Alt3B	227000.00		84439.36	142560.64	924.00	945.15	945.45	0.002394	4.56	52069.63	7340.55	21.15	0.23	0.070	1.76
Reach-1	199.34	Alt3D	227000.00			227000.00	924.00	947.03	947.64	0.003786	6.26	36283.93	2674.95	23.03	0.30	0.083	3.18
Reach-1	199.34	Alt3F	227000.00		82777.66	144222.33	924.00	945.02	945.33	0.002541	4.66	51086.97	7335.71	21.02	0.24	0.071	1.85
Reach-1	199.34	Alt3G	227000.00			227000.00	924.00	946.28	946.96	0.004546	6.62	34265.82	2660.32	22.28	0.33	0.083	3.62
Reach-1	199.34	Alt3H	227000.00			227000.00	924.00	946.86	947.46	0.003949	6.34	35821.59	2673.95	22.86	0.31	0.083	3.27
Reach-1	199.34	Alt3I	227000.00			227000.00	924.00	946.23	946.92	0.004601	6.65	34138.22	2659.20	22.23	0.33	0.083	3.65
Reach-1	199.44	existing	227000.00		57331.15	169668.86	931.70	945.78	946.13	0.001928	5.15	50303.97	7646.73	14.08	0.28	0.057	1.22
Reach-1	199.44	Alt3B	227000.00		54353.99	172646.02	925.00	946.11	946.36	0.001362	4.29	59065.86	7651.92	21.11	0.21	0.064	1.04

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.44	Alt3D	227000.00			227000.00	925.00	948.40	948.75	0.001361	4.76	47706.75	3264.06	23.40	0.22	0.068	1.22
Reach-1	199.44	Alt3F	227000.00		53418.88	173581.11	925.00	946.02	946.28	0.001408	4.34	58406.46	7650.58	21.02	0.22	0.064	1.07
Reach-1	199.44	Alt3G	227000.00			227000.00	925.00	947.86	948.24	0.001536	4.94	45952.94	3257.60	22.86	0.23	0.068	1.33
Reach-1	199.44	Alt3H	227000.00			227000.00	925.00	948.27	948.63	0.001400	4.80	47296.44	3262.55	23.27	0.22	0.068	1.25
Reach-1	199.44	Alt3I	227000.00			227000.00	925.00	947.83	948.21	0.001547	4.95	45845.97	3257.21	22.83	0.23	0.068	1.34
Reach-1	199.53	existing	227000.00		83229.05	143770.94	932.70	946.73	947.05	0.001795	4.24	50029.45	7540.16	14.03	0.24	0.055	1.12
Reach-1	199.53	Alt3B	227000.00		77450.88	149549.13	926.00	946.80	947.06	0.001463	3.75	56281.64	7541.67	20.80	0.19	0.062	1.06
Reach-1	199.53	Alt3D	227000.00			227000.00	926.00	949.17	949.52	0.001828	4.74	47932.17	3381.40	23.17	0.22	0.078	1.60
Reach-1	199.53	Alt3F	227000.00		76542.46	150457.53	926.00	946.73	947.00	0.001506	3.79	55612.16	7540.35	20.73	0.20	0.062	1.09
Reach-1	199.53	Alt3G	227000.00			227000.00	926.00	948.73	949.11	0.002030	4.89	46444.54	3381.40	22.73	0.23	0.078	1.72
Reach-1	199.53	Alt3H	227000.00			227000.00	926.00	949.07	949.42	0.001874	4.77	47580.28	3381.40	23.07	0.22	0.078	1.62
Reach-1	199.53	Alt3I	227000.00			227000.00	926.00	948.71	949.08	0.002043	4.90	46355.18	3381.40	22.71	0.23	0.078	1.73
Reach-1	199.63	existing	227000.00		88456.41	138543.59	930.90	947.80	948.17	0.002640	4.01	49312.10	7358.40	16.90	0.22	0.067	1.72
Reach-1	199.63	Alt3B	227000.00		99978.68	127021.31	927.00	947.78	948.20	0.003441	3.51	50792.24	7358.40	20.78	0.19	0.081	2.33
Reach-1	199.63	Alt3D	227000.00		11873.95	215126.05	927.00	950.53	950.97	0.004677	4.75	46326.53	3479.40	23.53	0.23	0.117	3.96
Reach-1	199.63	Alt3F	227000.00		89415.86	127584.13	927.00	947.75	948.17	0.003506	3.54	50554.66	7358.40	20.75	0.19	0.081	2.36
Reach-1	199.63	Alt3G	227000.00		11361.56	215638.44	927.00	950.24	950.69	0.005052	4.87	45302.07	3479.40	23.24	0.23	0.117	4.18
Reach-1	199.63	Alt3H	227000.00		11751.79	215248.20	927.00	950.46	950.90	0.004764	4.78	46079.33	3479.40	23.46	0.23	0.117	4.01
Reach-1	199.63	Alt3I	227000.00		11331.11	215668.89	927.00	950.22	950.67	0.005075	4.88	45242.19	3479.40	23.22	0.23	0.117	4.20
Reach-1	199.72	existing	227000.00		69131.19	157868.81	930.60	948.69	949.00	0.001183	4.60	50636.22	7243.90	18.09	0.25	0.047	0.79
Reach-1	199.72	Alt3B	227000.00		83801.05	143198.95	928.00	948.94	949.20	0.001299	3.67	56939.54	7243.90	20.94	0.18	0.060	1.00
Reach-1	199.72	Alt3D	227000.00		21453.68	205546.33	928.00	951.79	952.10	0.001353	4.29	51301.16	3538.90	23.79	0.19	0.074	1.27
Reach-1	199.72	Alt3F	227000.00		83557.09	143442.92	928.00	948.93	949.18	0.001310	3.68	56805.13	7243.90	20.93	0.18	0.060	1.00
Reach-1	199.72	Alt3G	227000.00		21055.71	205944.28	928.00	951.57	951.90	0.001424	4.36	50528.75	3538.90	23.57	0.20	0.074	1.32
Reach-1	199.72	Alt3H	227000.00		21357.56	205642.44	928.00	951.73	952.05	0.001370	4.30	51113.03	3538.90	23.73	0.19	0.074	1.28
Reach-1	199.72	Alt3I	227000.00		21032.40	205967.59	928.00	951.55	951.88	0.001429	4.36	50484.04	3538.90	23.55	0.20	0.074	1.32
Reach-1	199.82	existing	227000.00		105982.10	121017.89	931.20	949.47	949.93	0.002846	4.18	44968.26	6966.31	18.27	0.23	0.061	1.80
Reach-1	199.82	Alt3B	227000.00		103396.71	123603.29	929.00	949.67	950.00	0.001790	3.66	52493.23	6980.22	20.67	0.19	0.063	1.31
Reach-1	199.82	Alt3D	227000.00		51089.55	175910.45	929.00	952.51	952.92	0.001776	4.20	48701.26	3570.10	23.51	0.19	0.077	1.60
Reach-1	199.82	Alt3F	227000.00		103243.56	123756.44	929.00	949.65	949.98	0.001801	3.67	52403.76	6979.40	20.65	0.19	0.063	1.31
Reach-1	199.82	Alt3G	227000.00		50640.20	176359.80	929.00	952.33	952.75	0.001859	4.26	48061.93	3570.10	23.33	0.20	0.078	1.66
Reach-1	199.82	Alt3H	227000.00		50980.29	176019.70	929.00	952.47	952.88	0.001796	4.22	48544.59	3570.10	23.47	0.19	0.077	1.62
Reach-1	199.82	Alt3I	227000.00		50614.03	176385.97	929.00	952.32	952.74	0.001864	4.27	48025.11	3570.10	23.32	0.20	0.078	1.66
Reach-1	199.91	existing	227000.00		58069.82	168930.17	932.10	950.30	950.68	0.001020	5.29	46767.04	6609.66	18.20	0.27	0.042	0.73
Reach-1	199.91	Alt3B	227000.00		92346.88	134653.13	932.10	950.39	950.65	0.001114	3.76	55917.03	6612.80	18.29	0.18	0.058	0.89
Reach-1	199.91	Alt3D	227000.00	1.20	63398.20	163600.61	932.10	953.21	953.49	0.000869	3.75	55554.82	7979.00	21.11	0.17	0.065	0.84
Reach-1	199.91	Alt3F	227000.00		92262.38	134737.61	932.10	950.38	950.64	0.001118	3.76	55855.28	6612.47	18.28	0.18	0.058	0.90
Reach-1	199.91	Alt3G	227000.00		62834.89	164165.11	932.10	953.06	953.34	0.000891	3.80	54920.38	3781.80	20.96	0.17	0.065	0.86
Reach-1	199.91	Alt3H	227000.00		63014.41	163985.58	932.10	953.17	953.45	0.000868	3.77	55355.71	3781.80	21.07	0.17	0.065	0.84
Reach-1	199.91	Alt3I	227000.00		62821.10	164178.91	932.10	953.05	953.33	0.000893	3.80	54887.13	3781.80	20.95	0.17	0.065	0.86
Reach-1	200	existing	227000.00		59133.24	167866.77	933.40	950.78	951.24	0.001040	5.99	43997.08	6544.62	17.38	0.30	0.041	0.81
Reach-1	200	Alt3B	227000.00		74358.53	152641.47	933.40	950.82	951.19	0.000853	5.43	48093.15	6572.85	17.42	0.27	0.042	0.67
Reach-1	200	Alt3D	227000.00		58055.32	168944.69	933.40	953.53	953.88	0.000584	4.94	47807.78	3508.00	20.13	0.22	0.045	0.56
Reach-1	200	Alt3F	227000.00		74273.73	152726.27	933.40	950.81	951.19	0.000855	5.43	48041.40	6572.83	17.41	0.27	0.042	0.67
Reach-1	200	Alt3G	227000.00		57702.77	169297.23	933.40	953.38	953.74	0.000604	5.00	47294.98	3508.00	19.98	0.23	0.045	0.57
Reach-1	200	Alt3H	227000.00		57960.76	169039.23	933.40	953.49	953.85	0.000589	4.96	47669.46	3508.00	20.09	0.22	0.045	0.56
Reach-1	200	Alt3I	227000.00		57682.87	169317.13	933.40	953.37	953.74	0.000605	5.00	47266.29	3508.00	19.97	0.23	0.045	0.57
Reach-1	200.1	existing	227000.00	7022.91	58059.82	161917.28	934.50	951.29	951.97	0.001795	7.39	39953.39	6933.94	16.79	0.38	0.045	1.30
Reach-1	200.1	Alt3B	227000.00	6141.56	97745.91	123112.52	934.50	951.35	951.72	0.001344	5.13	49295.86	6935.60	16.85	0.25	0.054	1.06
Reach-1	200.1	Alt3D	227000.00	7420.24	84769.80	134809.95	934.50	953.89	954.23	0.000878	4.68	50924.40	3775.40	19.39	0.21	0.057	0.83
Reach-1	200.1	Alt3F	227000.00	6142.60	97687.40	123170.00	934.50	951.35	951.71	0.001348	5.14	49253.11	6935.43	16.85	0.25	0.054	1.06
Reach-1	200.1	Alt3G	227000.00	7400.90	84575.67	135023.44	934.50	953.75	954.11	0.000907	4.73	50420.68	3775.40	19.25	0.21	0.057	0.85
Reach-1	200.1	Alt3H	227000.00	7415.05	84717.63	134867.31	934.50	953.85	954.20	0.000886	4.70	50788.22	3775.40	19.35	0.21	0.057	0.83

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.1	Alt3I	227000.00	7399.81	84564.74	135035.44	934.50	953.75	954.10	0.000909	4.74	50392.57	3775.40	19.25	0.21	0.057	0.85
Reach-1	200.2	existing	227000.00		66339.87	160660.13	937.00	952.48	952.91	0.001727	5.58	43596.01	7092.30	15.48	0.31	0.047	1.11
Reach-1	200.2	Alt3B	227000.00		60914.80	166085.19	937.00	952.17	952.57	0.001972	5.23	45289.16	7070.77	15.17	0.27	0.055	1.40
Reach-1	200.2	Alt3D	227000.00		39162.92	187837.08	937.00	954.43	954.82	0.001389	4.94	45471.18	4039.83	17.43	0.24	0.059	1.18
Reach-1	200.2	Alt3F	227000.00		60846.44	166153.55	937.00	952.17	952.57	0.001976	5.23	45260.25	7070.48	15.17	0.27	0.055	1.40
Reach-1	200.2	Alt3G	227000.00		38611.94	188388.05	937.00	954.31	954.71	0.001436	4.99	45007.08	4036.50	17.31	0.24	0.059	1.21
Reach-1	200.2	Alt3H	227000.00		39014.20	187985.80	937.00	954.40	954.79	0.001401	4.95	45345.20	4038.93	17.40	0.24	0.059	1.18
Reach-1	200.2	Alt3I	227000.00		38580.97	188419.03	937.00	954.31	954.70	0.001439	4.99	44981.20	4036.32	17.31	0.24	0.059	1.21
Reach-1	200.3	existing	227000.00		20168.57	206831.42	937.70	953.37	953.97	0.002146	6.34	36956.71	4713.39	15.67	0.35	0.050	1.40
Reach-1	200.3	Alt3B	227000.00		61604.24	165395.77	937.40	953.19	953.53	0.001685	4.54	48373.50	5416.58	15.79	0.23	0.062	1.23
Reach-1	200.3	Alt3D	227000.00		50633.86	176366.14	937.40	955.18	955.48	0.001139	4.14	52160.46	3969.68	17.78	0.20	0.064	0.97
Reach-1	200.3	Alt3F	227000.00		61590.01	165409.98	937.40	953.19	953.53	0.001686	4.54	48360.95	5416.34	15.79	0.23	0.062	1.23
Reach-1	200.3	Alt3G	227000.00		50561.64	176438.36	937.40	955.09	955.39	0.001166	4.17	51794.98	3956.42	17.69	0.20	0.064	0.98
Reach-1	200.3	Alt3H	227000.00		50613.70	176386.30	937.40	955.15	955.46	0.001147	4.15	52060.70	3966.07	17.75	0.20	0.064	0.97
Reach-1	200.3	Alt3I	227000.00		50557.42	176442.59	937.40	955.08	955.39	0.001168	4.17	51774.93	3955.70	17.68	0.20	0.064	0.98
Reach-1	200.38	existing	227000.00		36495.60	190504.41	937.00	954.36	954.69	0.000961	4.78	51052.27	7114.17	17.36	0.24	0.047	0.71
Reach-1	200.38	Alt3B	227000.00		44460.10	182539.91	937.00	953.91	954.18	0.001016	4.39	54446.32	7103.26	16.91	0.22	0.054	0.78
Reach-1	200.38	Alt3D	227000.00		32783.53	194216.47	937.00	955.68	955.94	0.000737	4.08	55535.84	4218.50	18.66	0.19	0.056	0.65
Reach-1	200.38	Alt3F	227000.00		44442.05	182557.94	937.00	953.91	954.18	0.001017	4.39	54433.75	7103.21	16.91	0.22	0.054	0.78
Reach-1	200.38	Alt3G	227000.00		32643.37	194356.63	937.00	955.60	955.86	0.000752	4.11	55193.45	4218.50	18.60	0.19	0.056	0.66
Reach-1	200.38	Alt3H	227000.00		32745.48	194254.52	937.00	955.66	955.92	0.000741	4.09	55442.43	4218.50	18.66	0.19	0.056	0.65
Reach-1	200.38	Alt3I	227000.00		32635.74	194364.27	937.00	955.60	955.86	0.000753	4.11	55174.91	4218.50	18.60	0.19	0.056	0.66
Reach-1	200.49	existing	227000.00		28416.46	198583.55	936.90	954.87	955.24	0.001203	5.07	47798.46	7068.52	17.97	0.27	0.050	0.85
Reach-1	200.49	Alt3B	227000.00		31086.29	195913.70	936.90	954.56	954.91	0.002057	4.85	47841.20	6956.53	17.66	0.25	0.066	1.49
Reach-1	200.49	Alt3D	227000.00		22587.18	204412.81	936.90	956.13	956.47	0.001469	4.46	49624.73	4141.70	19.23	0.22	0.067	1.21
Reach-1	200.49	Alt3F	227000.00		31088.13	195931.88	936.90	954.55	954.91	0.002058	4.86	47831.43	6953.15	17.65	0.25	0.066	1.49
Reach-1	200.49	Alt3G	227000.00		22334.33	204665.67	936.90	956.06	956.40	0.001499	4.49	49330.98	4141.70	19.16	0.22	0.067	1.23
Reach-1	200.49	Alt3H	227000.00		22518.63	204481.38	936.90	956.12	956.45	0.001477	4.47	49544.84	4141.70	19.22	0.22	0.067	1.22
Reach-1	200.49	Alt3I	227000.00		22320.34	204679.67	936.90	956.06	956.40	0.001500	4.49	49314.80	4141.70	19.16	0.22	0.067	1.23
Reach-1	200.58	existing	227000.00		15150.76	211849.23	937.60	955.49	955.94	0.001663	5.51	43188.53	6356.80	17.89	0.30	0.053	1.08
Reach-1	200.58	Alt3B	227000.00		24573.42	202426.58	937.00	955.74	956.10	0.002962	4.84	47176.19	6383.50	18.74	0.25	0.078	2.08
Reach-1	200.58	Alt3D	227000.00		4560.35	222439.66	937.00	957.02	957.38	0.002502	4.78	47220.94	3836.00	20.02	0.24	0.083	1.96
Reach-1	200.58	Alt3F	227000.00		24562.92	202437.08	937.00	955.74	956.10	0.002963	4.84	47171.13	6383.41	18.74	0.25	0.078	2.08
Reach-1	200.58	Alt3G	227000.00		4508.47	222491.53	937.00	956.97	957.33	0.002540	4.80	47013.26	3836.00	19.97	0.24	0.083	1.98
Reach-1	200.58	Alt3H	227000.00		4546.28	222453.72	937.00	957.01	957.37	0.002513	4.78	47164.52	3836.00	20.01	0.24	0.083	1.96
Reach-1	200.58	Alt3I	227000.00		4505.60	222494.41	937.00	956.97	957.33	0.002542	4.80	47001.79	3836.00	19.97	0.24	0.083	1.98
Reach-1	200.67	existing	227000.00		16794.14	210205.86	939.80	956.32	956.74	0.001502	5.33	44134.34	5601.55	16.52	0.29	0.051	0.99
Reach-1	200.67	Alt3B	227000.00		16611.22	210388.77	937.00	956.68	956.91	0.000953	3.89	59466.66	5614.69	19.68	0.18	0.067	0.85
Reach-1	200.67	Alt3D	227000.00		6811.80	220188.20	937.00	957.85	958.07	0.000808	3.76	60105.04	4029.70	20.85	0.17	0.068	0.78
Reach-1	200.67	Alt3F	227000.00		16607.42	210392.58	937.00	956.68	956.91	0.000953	3.89	59463.58	5614.65	19.68	0.18	0.067	0.85
Reach-1	200.67	Alt3G	227000.00		6752.11	220247.89	937.00	957.81	958.03	0.000815	3.78	59926.71	4029.70	20.81	0.17	0.068	0.79
Reach-1	200.67	Alt3H	227000.00		6795.59	220204.41	937.00	957.84	958.06	0.000809	3.77	60056.58	4029.70	20.84	0.17	0.068	0.78
Reach-1	200.67	Alt3I	227000.00		6748.81	220251.19	937.00	957.81	958.03	0.000815	3.78	59916.88	4029.70	20.81	0.17	0.068	0.79
Reach-1	200.77	existing	227000.00		19749.77	207250.23	936.90	957.03	957.38	0.001074	4.81	48806.86	5967.73	20.13	0.26	0.048	0.70
Reach-1	200.77	Alt3B	227000.00		22645.11	204354.89	936.90	957.20	957.44	0.001191	3.96	57603.23	5971.17	20.30	0.20	0.066	0.92
Reach-1	200.77	Alt3D	227000.00		3096.99	223903.02	936.90	958.29	958.54	0.001062	3.99	56706.58	4222.20	21.39	0.19	0.069	0.91
Reach-1	200.77	Alt3F	227000.00		22641.90	204358.11	936.90	957.20	957.44	0.001191	3.96	57600.68	5971.16	20.30	0.20	0.066	0.92
Reach-1	200.77	Alt3G	227000.00		3078.73	223921.28	936.90	958.25	958.50	0.001093	4.00	56538.56	4222.20	21.35	0.19	0.069	0.92
Reach-1	200.77	Alt3H	227000.00		3092.04	223907.97	936.90	958.28	958.53	0.001085	3.99	56660.97	4222.20	21.38	0.19	0.069	0.91
Reach-1	200.77	Alt3I	227000.00		3077.72	223922.30	936.90	958.25	958.50	0.001093	4.00	56529.29	4222.20	21.35	0.19	0.069	0.92
Reach-1	200.86	existing	227000.00		21144.23	205855.78	938.50	957.68	958.02	0.001414	4.70	48855.99	5550.02	19.18	0.25	0.056	0.95
Reach-1	200.86	Alt3B	227000.00		22734.49	204265.52	937.00	957.86	958.11	0.001379	3.98	56583.46	5556.83	20.86	0.20	0.070	1.08

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.86	Alt3D	227000.00		6238.98	220761.02	937.00	958.90	959.15	0.001247	3.97	56788.64	4337.90	21.90	0.19	0.074	1.05
Reach-1	200.86	Alt3F	227000.00		22732.32	204267.69	937.00	957.86	958.11	0.001379	3.98	56581.76	5556.82	20.86	0.20	0.070	1.08
Reach-1	200.86	Alt3G	227000.00		6197.48	220802.52	937.00	958.87	959.12	0.001258	3.98	56641.96	4337.90	21.87	0.19	0.074	1.06
Reach-1	200.86	Alt3H	227000.00		6227.68	220772.31	937.00	958.89	959.14	0.001250	3.98	56748.66	4337.90	21.89	0.19	0.074	1.05
Reach-1	200.86	Alt3I	227000.00		6195.16	220804.84	937.00	958.87	959.12	0.001258	3.98	56633.75	4337.90	21.87	0.19	0.074	1.06
Reach-1	200.95	existing	227000.00		14081.06	212918.94	939.80	958.19	958.52	0.000811	4.65	50030.29	5282.90	18.39	0.25	0.046	0.56
Reach-1	200.95	Alt3B	227000.00		21289.28	205710.72	937.00	958.40	958.85	0.000936	3.99	57056.55	5282.90	21.40	0.20	0.059	0.73
Reach-1	200.95	Alt3D	227000.00		12238.89	214761.11	937.00	959.38	959.62	0.000794	3.86	58495.21	4459.60	22.38	0.19	0.060	0.66
Reach-1	200.95	Alt3F	227000.00		21288.06	205711.94	937.00	958.40	958.85	0.000936	3.99	57054.94	5282.90	21.40	0.20	0.059	0.73
Reach-1	200.95	Alt3G	227000.00		12214.85	214785.16	937.00	959.35	959.59	0.000800	3.87	58362.11	4459.60	22.35	0.19	0.060	0.67
Reach-1	200.95	Alt3H	227000.00		12232.36	214767.64	937.00	959.38	959.61	0.000795	3.86	58459.01	4459.60	22.38	0.19	0.060	0.67
Reach-1	200.95	Alt3I	227000.00		12213.57	214786.42	937.00	959.35	959.59	0.000800	3.87	58355.04	4459.60	22.35	0.19	0.060	0.67
Reach-1	201.05	existing	227000.00		14274.72	212725.28	941.50	958.65	959.00	0.001074	4.83	47820.34	4958.02	17.15	0.25	0.050	0.78
Reach-1	201.05	Alt3B	227000.00		22342.86	204657.14	937.00	958.88	959.18	0.001029	4.22	53887.92	4957.41	21.88	0.21	0.058	0.79
Reach-1	201.05	Alt3D	227000.00		17686.82	209313.17	937.00	959.79	960.05	0.000852	4.02	56057.64	4391.20	22.79	0.19	0.059	0.70
Reach-1	201.05	Alt3F	227000.00		22342.02	204657.98	937.00	958.88	959.18	0.001029	4.22	53886.71	4957.41	21.88	0.21	0.058	0.79
Reach-1	201.05	Alt3G	227000.00		17653.89	209346.11	937.00	959.76	960.02	0.000858	4.03	55939.98	4391.20	22.76	0.19	0.059	0.71
Reach-1	201.05	Alt3H	227000.00		17677.83	209322.17	937.00	959.78	960.04	0.000854	4.03	56025.48	4391.20	22.78	0.19	0.059	0.71
Reach-1	201.05	Alt3I	227000.00		17652.17	209347.84	937.00	959.76	960.02	0.000858	4.03	55933.81	4391.20	22.76	0.19	0.059	0.71
Reach-1	201.14	existing	227000.00		9685.40	217314.61	940.40	959.08	959.54	0.001008	5.54	42360.28	4797.93	18.68	0.30	0.041	0.67
Reach-1	201.14	Alt3B	227000.00		19810.92	207189.08	940.40	959.25	959.65	0.000870	5.19	45352.75	4798.38	18.85	0.28	0.042	0.59
Reach-1	201.14	Alt3D	227000.00		18400.87	208599.14	940.40	960.09	960.45	0.000696	4.85	47892.17	4318.72	19.69	0.25	0.042	0.51
Reach-1	201.14	Alt3F	227000.00		19810.23	207189.77	940.40	959.25	959.65	0.000870	5.19	45351.57	4798.38	18.85	0.28	0.042	0.59
Reach-1	201.14	Alt3G	227000.00		18369.81	208630.17	940.40	960.07	960.42	0.000701	4.86	47785.95	4318.66	19.67	0.25	0.042	0.51
Reach-1	201.14	Alt3H	227000.00		18392.32	208607.69	940.40	960.08	960.44	0.000697	4.85	47862.91	4318.71	19.68	0.25	0.042	0.51
Reach-1	201.14	Alt3I	227000.00		18368.11	208631.88	940.40	960.07	960.42	0.000701	4.86	47780.15	4318.66	19.67	0.25	0.042	0.51
Reach-1	201.24	existing	162000.00		10652.55	151347.45	943.00	959.73	960.03	0.000946	4.49	37069.46	4647.40	18.73	0.26	0.046	0.57
Reach-1	201.24	Alt3B	162000.00		23235.75	138764.25	939.60	959.90	960.10	0.000886	3.57	45140.08	4685.27	20.30	0.19	0.059	0.61
Reach-1	201.24	Alt3D	162000.00		22751.17	139248.83	939.60	960.63	960.81	0.000723	3.36	47401.89	4216.50	21.03	0.17	0.059	0.53
Reach-1	201.24	Alt3F	162000.00		23235.42	138764.58	939.60	959.90	960.10	0.000886	3.57	45139.22	4685.23	20.30	0.19	0.059	0.61
Reach-1	201.24	Alt3G	162000.00		22727.53	139272.47	939.60	960.60	960.79	0.000728	3.37	47312.34	4216.50	21.00	0.17	0.059	0.53
Reach-1	201.24	Alt3H	162000.00		22744.72	139255.28	939.60	960.62	960.80	0.000724	3.36	47377.45	4216.50	21.02	0.17	0.059	0.53
Reach-1	201.24	Alt3I	162000.00		22726.23	139273.77	939.60	960.60	960.79	0.000728	3.37	47307.45	4216.50	21.00	0.17	0.059	0.53
Reach-1	201.33	existing	162000.00		10578.92	151421.08	943.00	960.30	960.65	0.001507	4.81	34440.81	4587.83	17.30	0.28	0.053	0.86
Reach-1	201.33	Alt3B	162000.00		24336.85	137663.16	939.60	960.37	960.55	0.000865	3.42	46947.27	4597.42	20.77	0.18	0.063	0.63
Reach-1	201.33	Alt3D	162000.00		24918.38	137081.61	939.60	961.01	961.18	0.000728	3.23	49391.38	4371.01	21.41	0.16	0.063	0.56
Reach-1	201.33	Alt3F	162000.00		24336.15	137663.84	939.60	960.37	960.55	0.000865	3.42	46946.42	4597.40	20.77	0.18	0.063	0.63
Reach-1	201.33	Alt3G	162000.00		24884.22	137115.78	939.60	961.00	961.16	0.000732	3.24	49308.42	4370.78	21.40	0.16	0.063	0.56
Reach-1	201.33	Alt3H	162000.00		24909.05	137090.94	939.60	961.01	961.18	0.000729	3.23	49368.71	4370.95	21.41	0.16	0.063	0.56
Reach-1	201.33	Alt3I	162000.00		24882.45	137117.55	939.60	960.99	961.16	0.000732	3.24	49304.15	4370.75	21.40	0.16	0.063	0.56
Reach-1	201.43	existing	162000.00		8194.11	153805.91	941.30	961.02	961.36	0.001248	4.78	34683.77	4466.62	19.72	0.28	0.049	0.72
Reach-1	201.43	Alt3B	162000.00		23650.53	138349.47	939.60	960.83	961.02	0.000935	3.37	47369.34	4460.44	21.23	0.17	0.066	0.68
Reach-1	201.43	Alt3D	162000.00		24722.87	137277.14	939.60	961.41	961.57	0.000786	3.19	49925.57	4446.29	21.81	0.16	0.066	0.60
Reach-1	201.43	Alt3F	162000.00		23650.30	138349.70	939.60	960.83	961.02	0.000935	3.37	47368.80	4460.43	21.23	0.17	0.066	0.68
Reach-1	201.43	Alt3G	162000.00		24692.18	137307.83	939.60	961.39	961.56	0.000790	3.19	49850.39	4446.24	21.79	0.16	0.066	0.60
Reach-1	201.43	Alt3H	162000.00		24714.45	137285.56	939.60	961.41	961.57	0.000787	3.19	49904.95	4446.27	21.81	0.16	0.066	0.60
Reach-1	201.43	Alt3I	162000.00		24690.63	137309.38	939.60	961.39	961.56	0.000790	3.19	49846.60	4446.24	21.79	0.16	0.066	0.60
Reach-1	201.52	existing	162000.00		10460.73	151539.27	940.90	961.74	962.06	0.001584	4.54	35911.16	4291.26	20.84	0.26	0.058	0.95
Reach-1	201.52	Alt3B	162000.00		8189.13	153810.88	939.60	961.38	961.60	0.001471	3.74	43298.71	4267.66	21.78	0.19	0.077	1.09
Reach-1	201.52	Alt3D	162000.00		10152.30	151847.70	939.60	961.88	962.07	0.001292	3.55	45420.27	4300.13	22.28	0.18	0.077	0.98
Reach-1	201.52	Alt3F	162000.00		8188.65	153811.34	939.60	961.38	961.60	0.001471	3.74	43298.19	4267.66	21.78	0.19	0.077	1.09
Reach-1	201.52	Alt3G	162000.00		10093.74	151906.27	939.60	961.86	962.06	0.001297	3.55	45356.76	4299.18	22.26	0.18	0.077	0.99
Reach-1	201.52	Alt3H	162000.00		10136.32	151863.67	939.60	961.87	962.07	0.001294	3.55	45402.95	4299.87	22.27	0.18	0.077	0.99

Table 2

Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.52	Alt3I	162000.00		10090.83	151909.17	939.60	961.86	962.06	0.001297	3.55	45353.61	4299.12	22.26	0.18	0.077	0.99
Reach-1	201.62	existing	162000.00		3968.02	158031.97	945.60	962.35	962.72	0.001135	4.94	33493.37	3973.12	16.75	0.28	0.046	0.70
Reach-1	201.62	Alt3B	162000.00		14051.31	147948.69	939.60	961.86	962.10	0.000736	3.98	41695.27	3955.71	22.26	0.21	0.051	0.52
Reach-1	201.62	Alt3D	162000.00		14547.42	147452.58	939.60	962.29	962.51	0.000647	3.82	43413.50	3953.81	22.69	0.20	0.051	0.48
Reach-1	201.62	Alt3F	162000.00		14051.24	147948.77	939.60	961.86	962.10	0.000736	3.98	41695.03	3955.71	22.26	0.21	0.051	0.52
Reach-1	201.62	Alt3G	162000.00		14532.62	147467.39	939.60	962.28	962.50	0.000649	3.82	43361.85	3953.78	22.68	0.20	0.051	0.48
Reach-1	201.62	Alt3H	162000.00		14543.41	147456.59	939.60	962.29	962.51	0.000647	3.82	43399.49	3953.80	22.69	0.20	0.051	0.48
Reach-1	201.62	Alt3I	162000.00		14531.86	147468.14	939.60	962.28	962.50	0.000649	3.82	43359.19	3953.78	22.68	0.20	0.051	0.48
Reach-1	201.71	existing	162000.00		4451.49	157548.50	946.00	962.95	963.38	0.001516	5.32	30855.26	3934.26	16.95	0.32	0.046	0.82
Reach-1	201.71	Alt3B	162000.00		14627.31	147372.70	946.00	962.24	962.69	0.001731	5.42	30418.80	3898.31	16.24	0.34	0.046	0.86
Reach-1	201.71	Alt3D	162000.00		14868.81	147131.20	946.00	962.63	963.03	0.001489	5.16	31909.08	3910.64	16.63	0.32	0.047	0.77
Reach-1	201.71	Alt3F	162000.00		14627.27	147372.73	946.00	962.24	962.69	0.001731	5.42	30418.56	3898.31	16.24	0.34	0.046	0.86
Reach-1	201.71	Alt3G	162000.00		14861.61	147138.39	946.00	962.61	963.02	0.001496	5.17	31863.74	3909.63	16.61	0.32	0.047	0.78
Reach-1	201.71	Alt3H	162000.00		14866.84	147133.17	946.00	962.62	963.03	0.001491	5.17	31896.67	3910.36	16.62	0.32	0.047	0.77
Reach-1	201.71	Alt3I	162000.00		14861.19	147138.81	946.00	962.61	963.02	0.001497	5.17	31861.11	3909.57	16.61	0.32	0.047	0.78
Reach-1	201.81	existing	162000.00			162000.00	946.00	963.57	963.86	0.000602	4.30	37686.48	3706.27	17.57	0.24	0.043	0.38
Reach-1	201.81	Alt3B	162000.00			162000.00	946.00	963.12	963.43	0.001184	4.45	36398.93	3665.58	17.12	0.25	0.053	0.73
Reach-1	201.81	Alt3D	162000.00			162000.00	946.00	963.40	963.69	0.001088	4.33	37414.13	3676.30	17.40	0.24	0.053	0.69
Reach-1	201.81	Alt3F	162000.00			162000.00	946.00	963.12	963.43	0.001184	4.45	36398.93	3665.58	17.12	0.25	0.053	0.73
Reach-1	201.81	Alt3G	162000.00			162000.00	946.00	963.39	963.68	0.001091	4.33	37382.49	3675.97	17.39	0.24	0.053	0.69
Reach-1	201.81	Alt3H	162000.00			162000.00	946.00	963.39	963.69	0.001089	4.33	37405.38	3676.21	17.39	0.24	0.053	0.69
Reach-1	201.81	Alt3I	162000.00			162000.00	946.00	963.39	963.68	0.001091	4.33	37380.47	3675.95	17.39	0.24	0.053	0.69
Reach-1	201.9	existing	162000.00			162000.00	947.20	963.87	964.20	0.000730	4.57	35468.82	3873.11	16.67	0.27	0.041	0.42
Reach-1	201.9	Alt3B	162000.00			162000.00	947.20	963.62	963.93	0.000878	4.50	35999.51	3863.64	16.42	0.26	0.043	0.51
Reach-1	201.9	Alt3D	162000.00			162000.00	947.20	963.85	964.15	0.000811	4.39	36913.88	3872.93	16.65	0.25	0.043	0.48
Reach-1	201.9	Alt3F	162000.00			162000.00	947.20	963.62	963.93	0.000878	4.50	35999.51	3863.64	16.42	0.26	0.043	0.51
Reach-1	201.9	Alt3G	162000.00			162000.00	947.20	963.85	964.15	0.000813	4.39	36885.05	3872.86	16.65	0.25	0.043	0.48
Reach-1	201.9	Alt3H	162000.00			162000.00	947.20	963.85	964.15	0.000812	4.39	36905.85	3872.91	16.65	0.25	0.043	0.48
Reach-1	201.9	Alt3I	162000.00			162000.00	947.20	963.85	964.15	0.000813	4.39	36883.16	3872.85	16.65	0.25	0.043	0.48
Reach-1	201.99	existing	162000.00			162000.00	948.70	964.24	964.67	0.001215	5.28	30682.95	3714.88	15.54	0.32	0.042	0.62
Reach-1	201.99	Alt3B	162000.00			162000.00	948.70	964.11	964.53	0.001626	5.22	31015.12	3697.63	15.41	0.32	0.047	0.84
Reach-1	201.99	Alt3D	162000.00			162000.00	948.70	964.31	964.71	0.001516	5.10	31750.97	3723.81	15.61	0.31	0.047	0.80
Reach-1	201.99	Alt3F	162000.00			162000.00	948.70	964.11	964.53	0.001626	5.22	31015.12	3697.63	15.41	0.32	0.047	0.84
Reach-1	201.99	Alt3G	162000.00			162000.00	948.70	964.30	964.71	0.001520	5.11	31727.56	3722.98	15.60	0.31	0.047	0.80
Reach-1	201.99	Alt3H	162000.00			162000.00	948.70	964.31	964.71	0.001517	5.10	31744.60	3723.59	15.61	0.31	0.047	0.80
Reach-1	201.99	Alt3I	162000.00			162000.00	948.70	964.30	964.71	0.001520	5.11	31725.96	3722.92	15.60	0.31	0.047	0.80
Reach-1	202.00	existing	162000.00	3195.57		158804.44	950.00	965.02	965.67	0.003055	6.52	25475.77	4201.12	15.02	0.45	0.044	1.24
Reach-1	202.00	Alt3B	162000.00	3244.20		158755.80	950.00	965.06	965.70	0.002999	6.48	25625.79	4201.87	15.06	0.45	0.044	1.23
Reach-1	202.09	Alt3D	162000.00	3420.02		158579.97	950.00	965.19	965.80	0.002804	6.35	26174.28	4204.60	15.19	0.43	0.044	1.17
Reach-1	202.09	Alt3F	162000.00	3244.20		158755.80	950.00	965.06	965.70	0.002999	6.48	25625.79	4201.87	15.06	0.45	0.044	1.23
Reach-1	202.00	Alt3G	162000.00	3414.39		158585.61	950.00	965.18	965.80	0.002810	6.35	26156.58	4204.51	15.18	0.43	0.044	1.17
Reach-1	202.00	Alt3H	162000.00	3418.47		158581.53	950.00	965.19	965.80	0.002806	6.35	26169.41	4204.57	15.19	0.43	0.044	1.17
Reach-1	202.09	Alt3I	162000.00	3413.99		158586.02	950.00	965.18	965.80	0.002811	6.35	26155.30	4204.51	15.18	0.43	0.044	1.17
Reach-1	202.18	existing	162000.00	3776.69		158223.30	950.00	966.35	966.78	0.001559	5.31	31403.63	4359.40	16.35	0.33	0.044	0.76
Reach-1	202.18	Alt3B	162000.00	3800.17		158199.83	950.00	966.36	966.79	0.001549	5.30	31478.72	4365.30	16.36	0.33	0.044	0.76
Reach-1	202.18	Alt3D	162000.00	3885.46		158114.53	950.00	966.43	966.85	0.001509	5.25	31764.66	4378.61	16.43	0.33	0.044	0.74
Reach-1	202.18	Alt3F	162000.00	3800.17		158199.83	950.00	966.36	966.79	0.001549	5.30	31478.72	4365.30	16.36	0.33	0.044	0.76
Reach-1	202.18	Alt3G	162000.00	3882.88		158117.13	950.00	966.43	966.85	0.001510	5.25	31755.58	4378.52	16.43	0.33	0.044	0.75
Reach-1	202.18	Alt3H	162000.00	3884.77		158115.23	950.00	966.43	966.85	0.001509	5.25	31762.26	4378.58	16.43	0.33	0.044	0.74
Reach-1	202.18	Alt3I	162000.00	3882.66		158117.34	950.00	966.43	966.85	0.001511	5.25	31754.77	4378.51	16.43	0.33	0.044	0.75
Reach-1	202.29	existing	162000.00	2777.67		159222.33	955.50	967.14	967.45	0.000856	4.52	36764.31	4103.26	11.64	0.25	0.044	0.52
Reach-1	202.29	Alt3B	162000.00	2787.24		159212.77	955.50	967.15	967.46	0.000852	4.51	36815.40	4104.16	11.65	0.25	0.044	0.52

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.29	Alt3D	162000.00	2823.59		159176.41	955.50	967.20	967.50	0.000838	4.49	37009.38	4107.57	11.70	0.25	0.044	0.51
Reach-1	202.29	Alt3F	162000.00	2787.24		159212.77	955.50	967.15	967.46	0.000852	4.51	36815.40	4104.16	11.65	0.25	0.044	0.52
Reach-1	202.29	Alt3G	162000.00	2822.42		159177.58	955.50	967.19	967.50	0.000839	4.49	37003.10	4107.46	11.69	0.25	0.044	0.51
Reach-1	202.29	Alt3H	162000.00	2823.31		159176.69	955.50	967.20	967.50	0.000838	4.49	37007.86	4107.54	11.70	0.25	0.044	0.51
Reach-1	202.29	Alt3I	162000.00	2822.37		159177.64	955.50	967.19	967.50	0.000839	4.49	37002.86	4107.46	11.69	0.25	0.044	0.51
Reach-1	202.37	existing	162000.00	13160.30		148839.70	954.60	967.47	967.94	0.001489	5.69	30344.27	3998.52	12.87	0.34	0.044	0.82
Reach-1	202.37	Alt3B	162000.00	13132.19		148867.81	949.50	967.53	967.97	0.001651	5.46	31430.99	4014.12	18.03	0.32	0.048	0.94
Reach-1	202.37	Alt3D	162000.00	13216.36		148783.64	949.50	967.57	968.01	0.001625	5.45	31594.50	4018.40	18.07	0.32	0.048	0.93
Reach-1	202.37	Alt3F	162000.00	13132.19		148867.81	949.50	967.53	967.97	0.001651	5.46	31430.99	4014.12	18.03	0.32	0.048	0.94
Reach-1	202.37	Alt3G	162000.00	13213.59		148786.41	949.50	967.57	968.01	0.001626	5.46	31589.10	4018.26	18.07	0.32	0.048	0.93
Reach-1	202.37	Alt3H	162000.00	13215.72		148784.28	949.50	967.57	968.01	0.001625	5.46	31593.27	4018.37	18.07	0.32	0.048	0.93
Reach-1	202.37	Alt3I	162000.00	13213.46		148786.53	949.50	967.57	968.01	0.001626	5.46	31588.86	4018.25	18.07	0.32	0.048	0.93
Reach-1	202.48	existing	162000.00	12696.42		149303.58	952.50	968.35	968.84	0.001555	5.81	29990.69	3868.86	15.85	0.34	0.045	0.89
Reach-1	202.48	Alt3B	162000.00	13425.60		148574.41	949.80	968.49	968.92	0.001558	5.42	31815.92	3878.46	18.69	0.31	0.049	0.94
Reach-1	202.48	Alt3D	162000.00	13500.62		148499.38	949.80	968.52	968.94	0.001543	5.41	31921.05	3880.32	18.72	0.31	0.049	0.93
Reach-1	202.48	Alt3F	162000.00	13425.60		148574.41	949.80	968.49	968.92	0.001558	5.42	31815.92	3878.46	18.69	0.31	0.049	0.94
Reach-1	202.48	Alt3G	162000.00	13498.08		148501.92	949.80	968.51	968.94	0.001543	5.41	31917.50	3880.26	18.71	0.31	0.049	0.93
Reach-1	202.48	Alt3H	162000.00	13500.11		148499.89	949.80	968.51	968.94	0.001543	5.41	31920.34	3880.30	18.71	0.31	0.049	0.93
Reach-1	202.48	Alt3I	162000.00	13497.92		148502.08	949.80	968.51	968.94	0.001543	5.41	31917.26	3880.25	18.71	0.31	0.049	0.93
Reach-1	202.59	existing	162000.00	12759.56		149240.44	953.70	969.22	969.75	0.001696	5.97	28394.92	3821.26	15.52	0.35	0.044	0.96
Reach-1	202.59	Alt3B	162000.00	13542.98		148457.02	950.20	969.36	969.81	0.001668	5.52	30433.11	3842.66	19.16	0.31	0.048	1.00
Reach-1	202.59	Alt3D	162000.00	13621.33		148378.68	950.20	969.38	969.83	0.001656	5.51	30507.02	3845.60	19.18	0.31	0.048	0.99
Reach-1	202.59	Alt3F	162000.00	13542.98		148457.02	950.20	969.36	969.81	0.001668	5.52	30433.11	3842.66	19.16	0.31	0.048	1.00
Reach-1	202.59	Alt3G	162000.00	13618.61		148381.39	950.20	969.38	969.83	0.001657	5.51	30504.44	3845.50	19.18	0.31	0.048	0.99
Reach-1	202.59	Alt3H	162000.00	13620.83		148379.18	950.20	969.38	969.83	0.001657	5.51	30506.55	3845.58	19.18	0.31	0.048	0.99
Reach-1	202.59	Alt3I	162000.00	13618.34		148381.66	950.20	969.38	969.83	0.001657	5.51	30504.20	3845.49	19.18	0.31	0.048	0.99
Reach-1	202.69	existing	162000.00	13763.00		148237.00	953.70	970.13	970.64	0.001458	5.87	29353.76	3717.87	16.43	0.33	0.045	0.90
Reach-1	202.69	Alt3B	162000.00	14271.67		147728.33	950.60	970.25	970.68	0.001406	5.39	31636.88	3720.97	19.65	0.29	0.049	0.93
Reach-1	202.69	Alt3D	162000.00	14322.66		147677.34	950.60	970.27	970.69	0.001399	5.38	31686.16	3721.31	19.67	0.29	0.049	0.93
Reach-1	202.69	Alt3F	162000.00	14271.67		147728.33	950.60	970.25	970.68	0.001406	5.39	31636.88	3720.97	19.65	0.29	0.049	0.93
Reach-1	202.69	Alt3G	162000.00	14321.02		147678.97	950.60	970.27	970.69	0.001400	5.38	31684.57	3721.30	19.67	0.29	0.049	0.93
Reach-1	202.69	Alt3H	162000.00	14322.44		147677.56	950.60	970.27	970.69	0.001399	5.38	31685.94	3721.31	19.67	0.29	0.049	0.93
Reach-1	202.69	Alt3I	162000.00	14321.02		147678.97	950.60	970.27	970.69	0.001400	5.38	31684.57	3721.30	19.67	0.29	0.049	0.93
Reach-1	202.8	existing	162000.00	14197.73		147802.27	956.40	970.96	971.39	0.001212	5.46	31346.70	3637.56	14.56	0.30	0.045	0.78
Reach-1	202.8	Alt3B	162000.00	14577.04		147422.95	951.00	971.04	971.42	0.001211	5.06	33466.25	3675.65	20.04	0.27	0.050	0.83
Reach-1	202.8	Alt3D	162000.00	14596.02		147403.98	951.00	971.05	971.43	0.001207	5.06	33501.95	3682.67	20.05	0.27	0.050	0.83
Reach-1	202.8	Alt3F	162000.00	14577.04		147422.95	951.00	971.04	971.42	0.001211	5.06	33466.25	3675.65	20.04	0.27	0.050	0.83
Reach-1	202.8	Alt3G	162000.00	14595.30		147404.70	951.00	971.05	971.43	0.001208	5.06	33500.60	3682.40	20.05	0.27	0.050	0.83
Reach-1	202.8	Alt3H	162000.00	14595.90		147404.09	951.00	971.05	971.43	0.001207	5.06	33501.72	3682.62	20.05	0.27	0.050	0.83
Reach-1	202.8	Alt3I	162000.00	14595.30		147404.70	951.00	971.05	971.43	0.001208	5.06	33500.60	3682.40	20.05	0.27	0.050	0.83
Reach-1	202.9	existing	162000.00	12545.95		149454.05	956.50	971.61	972.11	0.001330	5.81	29492.12	3297.52	15.11	0.32	0.044	0.84
Reach-1	202.9	Alt3B	162000.00	13710.44		148289.56	951.40	971.72	972.17	0.001475	5.53	30686.17	3301.58	20.32	0.30	0.049	0.97
Reach-1	202.9	Alt3D	162000.00	13727.09		148272.91	951.40	971.73	972.18	0.001471	5.52	30711.16	3301.85	20.33	0.30	0.049	0.97
Reach-1	202.9	Alt3F	162000.00	13710.44		148289.56	951.40	971.72	972.17	0.001475	5.53	30686.17	3301.58	20.32	0.30	0.049	0.97
Reach-1	202.9	Alt3G	162000.00	13726.42		148273.59	951.40	971.73	972.18	0.001471	5.52	30710.15	3301.84	20.33	0.30	0.049	0.97
Reach-1	202.9	Alt3H	162000.00	13727.09		148272.91	951.40	971.73	972.18	0.001471	5.52	30711.16	3301.85	20.33	0.30	0.049	0.97
Reach-1	202.9	Alt3I	162000.00	13726.42		148273.59	951.40	971.73	972.18	0.001471	5.52	30710.15	3301.84	20.33	0.30	0.049	0.97
Reach-1	202.99	existing	162000.00	9714.18	16.11	152269.70	959.20	972.23	972.84	0.001715	6.39	27022.25	3274.49	13.03	0.36	0.044	1.04
Reach-1	202.99	Alt3B	162000.00	10929.21	21.45	151049.34	951.80	972.43	972.96	0.001851	5.98	28590.07	3278.23	20.63	0.33	0.050	1.18
Reach-1	202.99	Alt3D	162000.00	10942.72	21.57	151035.70	951.80	972.44	972.97	0.001847	5.98	28608.88	3278.34	20.64	0.33	0.050	1.18
Reach-1	202.99	Alt3F	162000.00	10929.21	21.45	151049.34	951.80	972.43	972.96	0.001851	5.98	28590.07	3278.23	20.63	0.33	0.050	1.18
Reach-1	202.99	Alt3G	162000.00	10942.29	21.57	151036.16	951.80	972.44	972.97	0.001847	5.98	28608.28	3278.34	20.64	0.33	0.050	1.18
Reach-1	202.99	Alt3H	162000.00	10942.72	21.57	151035.70	951.80	972.44	972.97	0.001847	5.98	28608.88	3278.34	20.64	0.33	0.050	1.18

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.99	Alt3I	162000.00	10942.29	21.57	151036.16	951.80	972.44	972.97	0.001847	5.98	28608.28	3278.34	20.64	0.33	0.050	1.18
Reach-1	203.00	existing	162000.00	13545.04		148454.95	958.70	973.17	973.83	0.002066	6.75	25736.70	3262.14	14.47	0.39	0.044	1.18
Reach-1	203.00	Alt3B	162000.00	15007.88		146992.13	952.20	973.43	974.01	0.002120	6.26	27451.04	3276.81	21.23	0.35	0.050	1.28
Reach-1	203.00	Alt3D	162000.00	15015.99		146984.00	952.20	973.44	974.01	0.002117	6.26	27463.45	3277.02	21.24	0.35	0.050	1.28
Reach-1	203.00	Alt3F	162000.00	15007.88		146992.13	952.20	973.43	974.01	0.002120	6.26	27451.04	3276.81	21.23	0.35	0.050	1.28
Reach-1	203.00	Alt3G	162000.00	15015.87		146984.13	952.20	973.44	974.01	0.002117	6.26	27463.25	3277.01	21.24	0.35	0.050	1.28
Reach-1	203.00	Alt3H	162000.00	15015.99		146984.00	952.20	973.44	974.01	0.002117	6.26	27463.45	3277.02	21.24	0.35	0.050	1.28
Reach-1	203.00	Alt3I	162000.00	15015.87		146984.13	952.20	973.44	974.01	0.002117	6.26	27463.25	3277.01	21.24	0.35	0.050	1.28
Reach-1	203.10	existing	162000.00	14787.75		147212.25	956.70	974.29	974.85	0.001781	6.16	27657.38	3645.06	17.59	0.36	0.044	0.99
Reach-1	203.10	Alt3B	162000.00	15176.55		146823.45	956.70	974.46	974.99	0.001666	6.03	28282.23	3714.89	17.76	0.35	0.044	0.94
Reach-1	203.10	Alt3D	162000.00	15182.21		146817.78	956.70	974.46	974.99	0.001664	6.03	28291.31	3715.89	17.76	0.35	0.044	0.94
Reach-1	203.10	Alt3F	162000.00	15176.55		146823.45	956.70	974.46	974.99	0.001666	6.03	28282.23	3714.89	17.76	0.35	0.044	0.94
Reach-1	203.10	Alt3G	162000.00	15182.07		146817.92	956.70	974.46	974.99	0.001664	6.03	28291.08	3715.87	17.76	0.35	0.044	0.94
Reach-1	203.10	Alt3H	162000.00	15182.21		146817.78	956.70	974.46	974.99	0.001664	6.03	28291.31	3715.89	17.76	0.35	0.044	0.94
Reach-1	203.10	Alt3I	162000.00	15182.07		146817.92	956.70	974.46	974.99	0.001664	6.03	28291.08	3715.87	17.76	0.35	0.044	0.94
Reach-1	203.29	existing	162000.00	8068.63		153931.38	960.70	975.14	975.74	0.001416	6.30	26657.98	3488.93	14.44	0.39	0.036	0.72
Reach-1	203.29	Alt3B	162000.00	8201.55		153798.44	960.70	975.26	975.84	0.001349	6.21	27064.96	3489.63	14.56	0.38	0.036	0.69
Reach-1	203.29	Alt3D	162000.00	8203.48		153796.52	960.70	975.26	975.84	0.001348	6.21	27070.93	3489.65	14.56	0.38	0.036	0.69
Reach-1	203.29	Alt3F	162000.00	8201.55		153798.44	960.70	975.26	975.84	0.001349	6.21	27064.96	3489.63	14.56	0.38	0.036	0.69
Reach-1	203.29	Alt3G	162000.00	8203.48		153796.52	960.70	975.26	975.84	0.001348	6.21	27070.93	3489.65	14.56	0.38	0.036	0.69
Reach-1	203.29	Alt3H	162000.00	8203.48		153796.52	960.70	975.26	975.84	0.001348	6.21	27070.93	3489.65	14.56	0.38	0.036	0.69
Reach-1	203.29	Alt3I	162000.00	8203.48		153796.52	960.70	975.26	975.84	0.001348	6.21	27070.93	3489.65	14.56	0.38	0.036	0.69
Reach-1	203.39	existing	162000.00	5432.97	6.21	156560.83	959.90	975.84	976.42	0.001303	6.23	26929.80	3470.87	15.94	0.38	0.036	0.69
Reach-1	203.39	Alt3B	162000.00	6240.27	19.57	155740.17	954.40	976.05	976.55	0.001438	5.75	28956.49	3488.83	21.65	0.34	0.042	0.81
Reach-1	203.39	Alt3D	162000.00	6241.80	19.65	155738.55	954.40	976.05	976.55	0.001438	5.75	28960.54	3488.87	21.65	0.34	0.042	0.81
Reach-1	203.39	Alt3F	162000.00	6240.27	19.57	155740.17	954.40	976.05	976.55	0.001438	5.75	28956.49	3488.83	21.65	0.34	0.042	0.81
Reach-1	203.39	Alt3G	162000.00	6241.80	19.65	155738.55	954.40	976.05	976.55	0.001438	5.75	28960.54	3488.87	21.65	0.34	0.042	0.81
Reach-1	203.39	Alt3H	162000.00	6241.80	19.65	155738.55	954.40	976.05	976.55	0.001438	5.75	28960.54	3488.87	21.65	0.34	0.042	0.81
Reach-1	203.39	Alt3I	162000.00	6241.80	19.65	155738.55	954.40	976.05	976.55	0.001438	5.75	28960.54	3488.87	21.65	0.34	0.042	0.81
Reach-1	203.48	existing	162000.00	7212.43		154787.56	962.20	976.49	977.05	0.001181	6.12	27598.22	3467.00	14.29	0.37	0.036	0.64
Reach-1	203.48	Alt3B	162000.00	8896.55		153103.44	957.90	976.79	977.28	0.001441	5.74	29139.03	3473.34	18.89	0.34	0.043	0.81
Reach-1	203.48	Alt3D	162000.00	8897.75		153102.25	957.90	976.79	977.28	0.001440	5.74	29141.79	3473.36	18.89	0.34	0.043	0.81
Reach-1	203.48	Alt3F	162000.00	8896.55		153103.44	957.90	976.79	977.28	0.001441	5.74	29139.03	3473.34	18.89	0.34	0.043	0.81
Reach-1	203.48	Alt3G	162000.00	8897.75		153102.25	957.90	976.79	977.28	0.001440	5.74	29141.79	3473.36	18.89	0.34	0.043	0.81
Reach-1	203.48	Alt3H	162000.00	8897.75		153102.25	957.90	976.79	977.28	0.001440	5.74	29141.79	3473.36	18.89	0.34	0.043	0.81
Reach-1	203.48	Alt3I	162000.00	8897.75		153102.25	957.90	976.79	977.28	0.001440	5.74	29141.79	3473.36	18.89	0.34	0.043	0.81
Reach-1	203.58	existing	162000.00	2064.30		159935.70	962.10	977.02	977.60	0.000928	6.19	26990.80	2995.74	14.92	0.34	0.036	0.60
Reach-1	203.58	Alt3B	162000.00	2413.07		159586.94	962.10	977.31	977.86	0.000844	6.00	27880.89	2996.89	15.21	0.32	0.036	0.56
Reach-1	203.58	Alt3D	162000.00	2413.79		159586.22	962.10	977.31	977.87	0.000844	6.00	27882.71	2996.90	15.21	0.32	0.036	0.56
Reach-1	203.58	Alt3F	162000.00	2413.07		159586.94	962.10	977.31	977.86	0.000844	6.00	27880.89	2996.89	15.21	0.32	0.036	0.56
Reach-1	203.58	Alt3G	162000.00	2413.79		159586.22	962.10	977.31	977.87	0.000844	6.00	27882.71	2996.90	15.21	0.32	0.036	0.56
Reach-1	203.58	Alt3H	162000.00	2413.79		159586.22	962.10	977.31	977.87	0.000844	6.00	27882.71	2996.90	15.21	0.32	0.036	0.56
Reach-1	203.58	Alt3I	162000.00	2413.79		159586.22	962.10	977.31	977.87	0.000844	6.00	27882.71	2996.90	15.21	0.32	0.036	0.56
Reach-1	203.67	existing	162000.00	5602.80	0.08	156397.11	962.30	977.47	978.06	0.000937	6.23	27180.89	2862.91	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt3B	162000.00	5953.17	0.45	156046.39	962.30	977.73	978.28	0.000865	6.07	27910.86	2864.89	15.43	0.32	0.036	0.59
Reach-1	203.67	Alt3D	162000.00	5953.84	0.45	156045.72	962.30	977.73	978.28	0.000865	6.07	27912.25	2864.90	15.43	0.32	0.036	0.59
Reach-1	203.67	Alt3F	162000.00	5953.17	0.45	156046.39	962.30	977.73	978.28	0.000865	6.07	27910.86	2864.89	15.43	0.32	0.036	0.59
Reach-1	203.67	Alt3G	162000.00	5953.84	0.45	156045.72	962.30	977.73	978.28	0.000865	6.07	27912.25	2864.90	15.43	0.32	0.036	0.59
Reach-1	203.67	Alt3H	162000.00	5953.84	0.45	156045.72	962.30	977.73	978.28	0.000865	6.07	27912.25	2864.90	15.43	0.32	0.036	0.59
Reach-1	203.67	Alt3I	162000.00	5953.84	0.45	156045.72	962.30	977.73	978.28	0.000865	6.07	27912.25	2864.90	15.43	0.32	0.036	0.59
Reach-1	203.77	existing	162000.00			162000.00	963.30	977.95	978.51	0.000880	5.99	27062.09	2519.46	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt3B	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27601.94	2521.87	14.87	0.31	0.036	0.58

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.77	Alt3D	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27603.02	2521.87	14.87	0.31	0.036	0.56
Reach-1	203.77	Alt3F	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27601.94	2521.87	14.87	0.31	0.036	0.56
Reach-1	203.77	Alt3G	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27603.02	2521.87	14.87	0.31	0.036	0.56
Reach-1	203.77	Alt3H	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27603.02	2521.87	14.87	0.31	0.036	0.56
Reach-1	203.77	Alt3I	162000.00			162000.00	963.30	978.17	978.70	0.000827	5.87	27603.02	2521.87	14.87	0.31	0.036	0.56
Reach-1	203.66	existing	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25206.77	2220.30	16.04	0.34	0.036	0.65
Reach-1	203.66	Alt3B	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25631.22	2250.11	16.23	0.33	0.036	0.62
Reach-1	203.66	Alt3D	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25632.04	2250.12	16.23	0.33	0.036	0.62
Reach-1	203.66	Alt3F	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25631.22	2250.11	16.23	0.33	0.036	0.62
Reach-1	203.66	Alt3G	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25632.04	2250.12	16.23	0.33	0.036	0.62
Reach-1	203.66	Alt3H	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25632.04	2250.12	16.23	0.33	0.036	0.62
Reach-1	203.66	Alt3I	162000.00			162000.00	962.30	978.53	979.15	0.000872	6.32	25632.04	2250.12	16.23	0.33	0.036	0.62
Reach-1	203.96	existing	162000.00			162000.00	964.10	978.52	980.14	0.004331	10.22	15846.95	2247.21	14.42	0.68	0.036	1.90
Reach-1	203.96	Alt3B	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16262.76	2262.31	14.60	0.65	0.036	1.79
Reach-1	203.96	Alt3D	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16263.59	2262.34	14.60	0.65	0.036	1.79
Reach-1	203.96	Alt3F	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16262.76	2262.31	14.60	0.65	0.036	1.79
Reach-1	203.96	Alt3G	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16263.59	2262.34	14.60	0.65	0.036	1.79
Reach-1	203.96	Alt3H	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16263.59	2262.34	14.60	0.65	0.036	1.79
Reach-1	203.96	Alt3I	162000.00			162000.00	964.10	978.70	980.24	0.003998	9.96	16263.59	2262.34	14.60	0.65	0.036	1.79
Reach-1	204.05	existing	162000.00			162000.00	965.00	980.54	981.57	0.001867	8.15	19883.74	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt3B	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.11	19987.56	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.05	Alt3D	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.10	19987.69	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.05	Alt3F	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.11	19987.56	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.05	Alt3G	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.10	19987.69	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.05	Alt3H	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.10	19987.69	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.05	Alt3I	162000.00			162000.00	965.00	980.59	981.61	0.001836	8.10	19987.69	2118.54	15.59	0.47	0.035	1.08
Reach-1	204.15	existing	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23605.22	2155.15	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt3B	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.00	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.15	Alt3D	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.13	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.15	Alt3F	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.00	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.15	Alt3G	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.13	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.15	Alt3H	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.13	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.15	Alt3I	162000.00			162000.00	966.00	981.61	982.33	0.001069	6.84	23676.13	2155.61	15.61	0.36	0.035	0.73
Reach-1	204.25	existing	162000.00	1290.52		160709.48	968.00	981.96	983.37	0.003005	9.55	17109.19	2133.78	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt3B	162000.00	1298.30		160701.70	968.00	981.99	983.38	0.002976	9.52	17169.56	2138.69	13.99	0.58	0.035	1.55
Reach-1	204.25	Alt3D	162000.00	1298.32		160701.67	968.00	981.99	983.38	0.002976	9.52	17169.82	2138.70	13.99	0.58	0.035	1.55
Reach-1	204.25	Alt3F	162000.00	1298.30		160701.70	968.00	981.99	983.38	0.002976	9.52	17169.56	2138.69	13.99	0.58	0.035	1.55
Reach-1	204.25	Alt3G	162000.00	1298.32		160701.67	968.00	981.99	983.38	0.002976	9.52	17169.82	2138.70	13.99	0.58	0.035	1.55
Reach-1	204.25	Alt3H	162000.00	1298.32		160701.67	968.00	981.99	983.38	0.002976	9.52	17169.82	2138.70	13.99	0.58	0.035	1.55
Reach-1	204.25	Alt3I	162000.00	1298.32		160701.67	968.00	981.99	983.38	0.002976	9.52	17169.82	2138.70	13.99	0.58	0.035	1.55
Reach-1	204.34	existing	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.85	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt3B	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.34	Alt3D	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.34	Alt3F	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.34	Alt3G	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.34	Alt3H	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.34	Alt3I	162000.00			162000.00	969.30	983.78	985.46	0.005891	10.38	15608.79	2004.47	14.48	0.66	0.043	2.85
Reach-1	204.42	existing	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt3B	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23
Reach-1	204.42	Alt3D	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23
Reach-1	204.42	Alt3F	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23
Reach-1	204.42	Alt3G	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23
Reach-1	204.42	Alt3H	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23

Table 2
Alternative 3 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	204.42	Alt3I	162000.00	2276.17		159723.83	971.40	986.09	987.50	0.003565	9.60	17141.50	1804.16	14.69	0.53	0.043	2.23
Reach-1	204.53	existing	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3B	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3D	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3F	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3G	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3H	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3I	162000.00	10991.38		151008.61	972.70	987.89	989.10	0.002299	9.03	18827.73	1680.00	15.19	0.45	0.043	1.83

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Depth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.16	existing	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4B	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4D	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4F	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4G	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4H	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt4I	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.19	existing	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4B	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4D	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4F	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4G	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4H	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt4I	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.28	existing	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4B	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4D	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4F	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4G	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4H	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt4I	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.38	existing	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4B	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4D	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4F	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4G	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4H	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt4I	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.47	existing	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4B	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4D	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4F	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4G	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4H	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt4I	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.56	existing	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4B	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4D	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4F	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4G	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4H	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt4I	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.66	existing	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4B	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4D	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4F	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4G	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4H	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt4I	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.75	existing	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt4B	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt4D	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt4F	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.75	Alt4G	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt4H	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt4I	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.85	existing	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4B	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4D	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4F	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4G	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4H	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt4I	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.94	existing	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4B	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4D	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4F	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4G	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4H	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt4I	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	196.04	existing	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4B	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4D	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4F	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4G	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4H	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt4I	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.13	existing	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4B	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4D	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4F	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4G	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4H	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt4I	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.23	existing	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4B	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4D	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4F	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4G	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4H	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt4I	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.32	existing	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4B	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4D	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4F	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4G	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4H	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt4I	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.42	existing	227000.00		42020.24	184979.77	907.30	923.84	924.12	0.000685	4.27	53581.37	5460.19	16.54	0.23	0.044	0.46
Reach-1	196.42	Alt4B	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45
Reach-1	196.42	Alt4D	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45
Reach-1	196.42	Alt4F	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45
Reach-1	196.42	Alt4G	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45
Reach-1	196.42	Alt4H	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45
Reach-1	196.42	Alt4I	227000.00		40954.25	186045.75	906.30	923.84	924.11	0.000650	4.18	54742.59	5460.20	17.54	0.22	0.044	0.45

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.51	existing	227000.00	594.19	42631.91	183773.89	908.20	924.19	924.49	0.000763	4.33	52044.82	5586.78	15.99	0.23	0.044	0.51
Reach-1	198.51	Alt4B	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.51	Alt4D	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.51	Alt4F	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.51	Alt4G	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.51	Alt4H	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.51	Alt4I	227000.00	576.03	41472.76	184951.20	907.60	924.18	924.46	0.000728	4.24	53235.88	5586.74	16.58	0.23	0.045	0.49
Reach-1	198.61	existing	227000.00	3474.25	45531.88	177993.88	908.50	924.58	924.90	0.000823	4.64	50255.55	5910.00	16.08	0.25	0.042	0.54
Reach-1	198.61	Alt4B	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.61	Alt4D	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.61	Alt4F	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.61	Alt4G	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.61	Alt4H	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.61	Alt4I	227000.00	4896.38	63505.55	158598.08	905.00	924.67	925.00	0.001514	3.86	53239.00	5910.00	19.67	0.20	0.062	1.06
Reach-1	198.7	existing	227000.00	978.74	38880.54	187140.72	909.30	925.05	925.38	0.001055	4.69	51345.41	6778.23	15.75	0.25	0.050	0.73
Reach-1	198.7	Alt4B	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.7	Alt4D	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.7	Alt4F	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.7	Alt4G	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.7	Alt4H	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.7	Alt4I	227000.00	1015.88	38585.63	187398.50	906.00	925.29	925.57	0.000854	4.32	55525.08	6797.56	19.29	0.22	0.050	0.64
Reach-1	198.79	existing	227000.00	1546.84	27071.33	198381.83	910.70	925.48	925.92	0.001280	5.57	45430.27	6928.71	14.78	0.31	0.045	0.82
Reach-1	198.79	Alt4B	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.79	Alt4D	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.79	Alt4F	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.79	Alt4G	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.79	Alt4H	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.79	Alt4I	227000.00	2829.50	52069.01	172101.50	909.00	925.88	926.23	0.003028	4.38	50435.49	6957.99	16.88	0.23	0.079	2.11
Reach-1	198.88	existing	227000.00	1927.24	30512.80	194559.94	910.80	926.21	926.75	0.002164	6.09	39905.30	6919.83	15.41	0.37	0.047	1.16
Reach-1	198.88	Alt4B	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.88	Alt4D	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.88	Alt4F	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.88	Alt4G	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.88	Alt4H	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.88	Alt4I	227000.00	2313.39	36626.10	188060.52	910.80	926.83	927.23	0.001501	5.27	45634.17	6954.94	16.03	0.30	0.048	0.90
Reach-1	198.98	existing	227000.00	4124.02	27739.88	195136.11	911.00	927.07	927.48	0.001173	5.41	45275.76	7039.67	16.07	0.32	0.041	0.66
Reach-1	198.98	Alt4B	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	198.98	Alt4D	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	198.98	Alt4F	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	198.98	Alt4G	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	198.98	Alt4H	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	198.98	Alt4I	227000.00	4307.34	28590.10	194102.56	905.00	927.43	927.75	0.000853	4.73	51356.38	7041.35	22.43	0.26	0.043	0.54
Reach-1	197.07	existing	227000.00	2712.55	36512.74	187774.72	913.20	927.65	927.98	0.000937	4.85	50313.78	7246.95	14.45	0.27	0.042	0.60
Reach-1	197.07	Alt4B	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.07	Alt4D	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.07	Alt4F	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.07	Alt4G	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.07	Alt4H	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.07	Alt4I	227000.00	2737.06	36207.23	188055.70	905.40	927.86	928.13	0.000759	4.41	54932.09	7270.21	22.46	0.23	0.045	0.53
Reach-1	197.16	existing	227000.00	462.61	27543.88	198993.52	913.40	928.10	928.46	0.000989	5.09	49989.44	7447.59	14.70	0.28	0.044	0.66
Reach-1	197.16	Alt4B	227000.00	448.23	25217.36	201334.41	906.00	928.18	928.53	0.000756	4.97	51683.13	7452.51	22.18	0.26	0.040	0.52
Reach-1	197.16	Alt4D	227000.00	478.46	824.40	225697.14	906.00	928.13	928.62	0.000963	5.60	41537.09	4122.91	22.13	0.30	0.041	0.65
Reach-1	197.16	Alt4F	227000.00	448.23	25217.36	201334.41	906.00	928.18	928.53	0.000756	4.97	51683.13	7452.51	22.18	0.26	0.040	0.52

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan T
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.16	Alt4G	227000.00	478.46	824.40	225697.14	906.00	928.13	928.62	0.000963	5.60	41537.09	4122.91	22.13	0.30	0.041	0.65
Reach-1	197.16	Alt4H	227000.00	462.79	15029.13	211508.06	906.00	928.16	928.56	0.000838	5.23	46967.38	5561.54	22.16	0.28	0.041	0.57
Reach-1	197.16	Alt4I	227000.00	462.79	15029.13	211508.06	906.00	928.16	928.56	0.000838	5.23	46967.38	5561.54	22.16	0.28	0.041	0.57
Reach-1	197.26	existing	227000.00	3471.46	34505.11	189023.44	913.00	928.69	929.07	0.001576	5.28	49794.94	8005.73	15.69	0.29	0.053	1.00
Reach-1	197.26	Alt4B	227000.00	3130.25	31345.04	192524.72	906.50	928.66	929.01	0.001340	5.07	51829.81	8005.58	22.16	0.27	0.053	0.90
Reach-1	197.26	Alt4D	227000.00	3815.01		223184.98	906.50	928.74	929.26	0.001759	5.83	40039.09	4279.80	22.24	0.31	0.054	1.18
Reach-1	197.26	Alt4F	227000.00	3130.25	31345.04	192524.72	906.50	928.66	929.01	0.001340	5.07	51829.81	8005.58	22.16	0.27	0.053	0.90
Reach-1	197.26	Alt4G	227000.00	3815.01		223184.98	906.50	928.74	929.26	0.001759	5.83	40039.09	4279.80	22.24	0.31	0.054	1.18
Reach-1	197.26	Alt4H	227000.00	3406.18	18666.34	204927.48	906.50	928.69	929.11	0.001503	5.38	46994.65	5795.77	22.19	0.29	0.055	1.01
Reach-1	197.26	Alt4I	227000.00	3406.18	18666.34	204927.48	906.50	928.69	929.11	0.001503	5.38	46994.65	5795.77	22.19	0.29	0.055	1.01
Reach-1	197.35	existing	227000.00	4826.86	69687.19	152486.16	914.20	929.57	929.91	0.001917	4.49	49701.91	8161.77	15.37	0.26	0.055	1.13
Reach-1	197.35	Alt4B	227000.00	3988.49	58856.57	164154.94	907.00	929.42	929.71	0.001552	4.31	53091.02	8138.00	22.42	0.23	0.059	1.01
Reach-1	197.35	Alt4D	227000.00	6189.69	1862.97	218947.34	907.00	929.80	930.27	0.002475	5.55	41798.23	4387.06	22.80	0.30	0.068	1.67
Reach-1	197.35	Alt4F	227000.00	3988.49	58856.57	164154.94	907.00	929.42	929.71	0.001552	4.31	53091.02	8138.00	22.42	0.23	0.059	1.01
Reach-1	197.35	Alt4G	227000.00	6189.69	1862.97	218947.34	907.00	929.80	930.27	0.002475	5.55	41798.23	4387.06	22.80	0.30	0.068	1.67
Reach-1	197.35	Alt4H	227000.00	4602.39	41662.19	180735.42	907.00	929.53	929.91	0.001821	4.70	47339.88	5772.81	22.53	0.25	0.061	1.20
Reach-1	197.35	Alt4I	227000.00	4602.39	41662.19	180735.42	907.00	929.53	929.91	0.001821	4.70	47339.88	5772.81	22.53	0.25	0.061	1.20
Reach-1	197.45	existing	227000.00	3917.62	43786.81	179295.56	915.60	930.40	930.71	0.001353	4.68	52466.50	8298.04	14.80	0.27	0.049	0.78
Reach-1	197.45	Alt4B	227000.00	3163.50	36545.12	187291.39	907.50	930.12	930.40	0.001239	4.51	54475.21	8268.24	22.62	0.25	0.053	0.77
Reach-1	197.45	Alt4D	227000.00	4988.28		222011.72	907.50	930.82	931.20	0.001407	5.00	46450.68	4728.03	23.32	0.27	0.056	0.93
Reach-1	197.45	Alt4F	227000.00	3163.50	36545.12	187291.39	907.50	930.12	930.40	0.001239	4.51	54475.21	8268.24	22.62	0.25	0.053	0.77
Reach-1	197.45	Alt4G	227000.00	4988.28		222011.72	907.50	930.82	931.20	0.001407	5.00	46450.68	4728.03	23.32	0.27	0.056	0.93
Reach-1	197.45	Alt4H	227000.00	3866.44	17192.17	205941.39	907.50	930.35	930.71	0.001392	4.84	48220.31	5838.41	22.85	0.27	0.054	0.88
Reach-1	197.45	Alt4I	227000.00	3866.44	17192.17	205941.39	907.50	930.35	930.71	0.001392	4.84	48220.31	5838.41	22.85	0.27	0.054	0.88
Reach-1	197.54	existing	227000.00	1030.05	61772.48	164197.47	916.10	931.06	931.32	0.001119	4.00	56011.16	8088.47	14.96	0.23	0.049	0.66
Reach-1	197.54	Alt4B	227000.00	939.78	59835.32	166224.89	907.90	930.80	931.04	0.001296	3.65	59574.13	8049.96	22.90	0.20	0.059	0.83
Reach-1	197.54	Alt4D	227000.00	2011.80		224988.20	907.90	931.66	931.98	0.001830	4.57	50179.08	4727.36	23.76	0.24	0.069	1.27
Reach-1	197.54	Alt4F	227000.00	939.78	59835.32	166224.89	907.90	930.80	931.04	0.001296	3.65	59574.13	8049.96	22.90	0.20	0.059	0.83
Reach-1	197.54	Alt4G	227000.00	2011.80		224988.20	907.90	931.66	931.98	0.001830	4.57	50179.08	4727.36	23.76	0.24	0.069	1.27
Reach-1	197.54	Alt4H	227000.00	1403.45	20511.02	205085.53	907.90	931.17	931.47	0.001759	4.35	51808.00	5695.63	23.27	0.23	0.066	1.17
Reach-1	197.54	Alt4I	227000.00	1403.45	20511.02	205085.53	907.90	931.17	931.47	0.001759	4.35	51808.00	5695.63	23.27	0.23	0.066	1.17
Reach-1	197.64	existing	227000.00	1831.26	59582.39	165586.36	918.20	931.72	932.01	0.001415	4.29	52583.56	8221.79	13.52	0.26	0.049	0.76
Reach-1	197.64	Alt4B	227000.00	1561.77	52030.97	173407.27	911.50	931.49	931.76	0.001337	4.25	53892.70	8219.55	19.99	0.25	0.052	0.75
Reach-1	197.64	Alt4D	227000.00	2812.88	3185.93	221001.19	911.50	932.53	932.89	0.001552	4.86	47120.48	4921.61	21.03	0.27	0.059	0.97
Reach-1	197.64	Alt4F	227000.00	1561.77	52030.97	173407.27	911.50	931.49	931.76	0.001337	4.25	53892.70	8219.55	19.99	0.25	0.052	0.75
Reach-1	197.64	Alt4G	227000.00	2812.88	3185.93	221001.19	911.50	932.53	932.89	0.001552	4.86	47120.48	4921.61	21.03	0.27	0.059	0.97
Reach-1	197.64	Alt4H	227000.00	2302.48	15443.89	209253.63	911.50	932.04	932.39	0.001623	4.84	47581.88	5765.18	20.54	0.27	0.057	0.97
Reach-1	197.64	Alt4I	227000.00	2302.48	15443.89	209253.63	911.50	932.04	932.39	0.001623	4.84	47581.88	5765.18	20.54	0.27	0.057	0.97
Reach-1	197.74	existing	227000.00	2415.01	38094.59	186490.42	919.10	932.48	932.86	0.001764	5.10	46670.54	8146.97	13.38	0.31	0.048	0.92
Reach-1	197.74	Alt4B	227000.00	1990.81	31037.85	193971.34	912.50	932.20	932.56	0.001647	4.94	48376.37	8091.13	19.70	0.29	0.052	0.91
Reach-1	197.74	Alt4D	227000.00	3356.10		223643.89	912.50	933.31	933.70	0.001522	5.07	45371.33	4718.41	20.81	0.28	0.056	0.95
Reach-1	197.74	Alt4F	227000.00	1990.81	31037.85	193971.34	912.50	932.20	932.56	0.001647	4.94	48376.37	8091.13	19.70	0.29	0.052	0.91
Reach-1	197.74	Alt4G	227000.00	3356.10		223643.89	912.50	933.31	933.70	0.001522	5.07	45371.33	4718.41	20.81	0.28	0.056	0.95
Reach-1	197.74	Alt4H	227000.00	2845.46	7197.53	216957.02	912.50	932.86	933.26	0.001651	5.14	45474.14	5766.97	20.36	0.29	0.055	0.98
Reach-1	197.74	Alt4I	227000.00	2845.46	7197.53	216957.02	912.50	932.86	933.26	0.001651	5.14	45474.14	5766.97	20.36	0.29	0.055	0.98
Reach-1	197.83	existing	227000.00	1729.87	31591.98	193678.14	919.60	933.27	933.69	0.001536	5.43	45477.11	8100.38	13.67	0.32	0.044	0.84
Reach-1	197.83	Alt4B	227000.00	1345.15	24818.48	200836.38	913.50	932.95	933.35	0.001492	5.26	46696.74	8061.66	19.45	0.30	0.048	0.86
Reach-1	197.83	Alt4D	227000.00	2704.93		224295.06	913.50	933.99	934.42	0.001336	5.29	43730.03	4582.00	20.49	0.29	0.051	0.86
Reach-1	197.83	Alt4F	227000.00	1345.15	24818.48	200836.38	913.50	932.95	933.35	0.001492	5.26	46696.74	8061.66	19.45	0.30	0.048	0.86
Reach-1	197.83	Alt4G	227000.00	2704.93		224295.06	913.50	933.99	934.42	0.001336	5.29	43730.03	4582.00	20.49	0.29	0.051	0.86
Reach-1	197.83	Alt4H	227000.00	2121.79	6662.58	218215.64	913.50	933.60	934.04	0.001426	5.35	44332.41	5888.60	20.10	0.30	0.050	0.88
Reach-1	197.83	Alt4I	227000.00	2121.79	6662.58	218215.64	913.50	933.60	934.04	0.001426	5.35	44332.41	5888.60	20.10	0.30	0.050	0.88

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.92	existing	227000.00	861.05	29269.05	197069.92	920.60	933.98	934.42	0.001425	5.57	45728.34	7989.40	13.38	0.33	0.043	0.80
Reach-1	197.92	Alt4B	227000.00	374.64	24083.25	202542.13	914.20	933.65	934.09	0.001486	5.60	45179.11	7989.40	19.45	0.32	0.046	0.85
Reach-1	197.92	Alt4D	227000.00	1337.87		225662.14	914.20	934.61	935.10	0.001350	5.65	40779.16	4394.00	20.41	0.31	0.047	0.85
Reach-1	197.92	Alt4F	227000.00	374.64	24083.25	202542.13	914.20	933.65	934.09	0.001486	5.60	45179.11	7989.40	19.45	0.32	0.046	0.85
Reach-1	197.92	Alt4G	227000.00	1337.87		225662.14	914.20	934.61	935.10	0.001350	5.65	40779.16	4394.00	20.41	0.31	0.047	0.85
Reach-1	197.92	Alt4H	227000.00	947.61	8209.38	217843.00	914.20	934.26	934.74	0.001402	5.65	42047.21	5776.10	20.06	0.32	0.046	0.85
Reach-1	197.92	Alt4I	227000.00	947.61	8209.38	217843.00	914.20	934.26	934.74	0.001402	5.65	42047.21	5776.10	20.06	0.32	0.046	0.85
Reach-1	196.02	existing	227000.00	1482.46	26391.86	199125.69	922.80	934.70	935.26	0.001825	6.31	40953.00	8073.70	11.90	0.38	0.042	0.98
Reach-1	196.02	Alt4B	227000.00	1104.60	21755.88	204139.52	916.40	934.41	935.01	0.001984	6.51	39492.44	8065.02	18.01	0.39	0.043	1.06
Reach-1	196.02	Alt4D	227000.00	2470.94		224529.05	916.40	935.28	935.93	0.001759	6.50	35763.70	4207.70	18.88	0.37	0.044	1.03
Reach-1	196.02	Alt4F	227000.00	635.43	13387.87	212976.72	916.40	934.22	934.75	0.001057	6.02	42680.04	8047.05	17.82	0.34	0.039	0.64
Reach-1	196.02	Alt4G	227000.00	1578.57		225421.44	916.40	935.14	935.86	0.000906	5.82	39861.28	4207.70	18.74	0.31	0.039	0.60
Reach-1	196.02	Alt4H	227000.00	1892.87	13868.73	211238.59	916.40	934.98	935.57	0.001730	6.32	38366.39	5920.80	18.58	0.37	0.043	0.98
Reach-1	196.02	Alt4I	227000.00	1183.17	8943.93	216872.91	916.40	934.81	935.31	0.000920	5.77	42116.52	5920.80	18.41	0.32	0.039	0.59
Reach-1	196.11	existing	227000.00	292.81	42284.44	184422.75	922.40	935.74	936.30	0.003105	6.46	40277.29	7935.53	13.34	0.39	0.052	1.62
Reach-1	196.11	Alt4B	227000.00	210.51	36465.24	190324.25	916.90	935.53	936.11	0.003036	6.51	39986.04	7880.53	18.63	0.39	0.053	1.61
Reach-1	196.11	Alt4D	227000.00	764.20		226235.81	916.90	936.33	937.10	0.003264	7.08	32417.58	3890.95	19.43	0.41	0.055	1.89
Reach-1	196.11	Alt4F	227000.00	12.59	11431.79	215555.63	916.90	934.69	935.29	0.001156	6.35	41061.08	7734.40	17.79	0.35	0.040	0.71
Reach-1	196.11	Alt4G	227000.00	129.65		226870.36	916.90	935.56	936.15	0.001020	6.15	37079.93	3632.10	18.66	0.33	0.040	0.68
Reach-1	196.11	Alt4H	227000.00	382.68	18802.67	207814.64	916.90	935.98	936.64	0.003093	6.75	36876.51	5969.66	19.08	0.40	0.054	1.73
Reach-1	196.11	Alt4I	227000.00	66.23	6173.75	220760.03	916.90	935.23	935.80	0.001052	6.17	40100.51	5702.68	18.33	0.34	0.040	0.68
Reach-1	196.2	existing	227000.00	322.15	62623.75	164054.09	918.80	936.99	937.39	0.001727	5.33	46257.24	7993.56	18.19	0.30	0.047	1.02
Reach-1	196.2	Alt4B	227000.00	238.15	56800.71	169961.13	917.40	936.78	937.20	0.001756	5.50	45393.05	7953.39	19.38	0.31	0.047	1.04
Reach-1	196.2	Alt4D	227000.00	966.58		226033.44	917.40	937.76	938.44	0.002255	6.65	34533.70	3616.87	20.36	0.36	0.052	1.47
Reach-1	196.2	Alt4F	227000.00	2.19	11340.00	215657.80	917.40	935.22	935.71	0.000637	5.77	44672.75	7822.44	17.82	0.30	0.035	0.46
Reach-1	196.2	Alt4G	227000.00	36.61		226963.41	917.40	936.03	936.53	0.000580	5.68	40025.06	3319.19	18.63	0.28	0.035	0.45
Reach-1	196.2	Alt4H	227000.00	470.83	43001.30	183527.84	917.40	937.28	937.75	0.001734	5.65	41613.88	5956.77	19.88	0.31	0.048	1.08
Reach-1	196.2	Alt4I	227000.00	17.28	9853.05	217129.66	917.40	935.72	936.19	0.000570	5.57	44100.98	5687.88	18.32	0.28	0.035	0.43
Reach-1	196.26	existing	227000.00	5.68	64819.75	162174.58	918.70	937.50	937.87	0.001629	5.17	46849.87	7784.66	18.80	0.30	0.047	0.96
Reach-1	196.26	Alt4B	227000.00	1.47	59691.72	167306.81	918.00	937.29	937.70	0.001681	5.41	45484.27	7785.96	19.29	0.31	0.047	0.97
Reach-1	196.26	Alt4D	227000.00	105.30		226894.69	918.00	938.43	939.10	0.002103	6.55	34757.83	3428.17	20.43	0.36	0.051	1.36
Reach-1	196.26	Alt4F	227000.00		10564.67	216435.33	918.00	935.40	935.91	0.000681	5.83	43405.13	7459.36	17.40	0.31	0.036	0.48
Reach-1	196.26	Alt4G	227000.00			227000.00	918.00	936.20	936.71	0.000614	5.71	39737.05	3298.05	18.20	0.29	0.036	0.46
Reach-1	196.26	Alt4H	227000.00	18.85	45352.09	181629.05	918.00	937.78	938.25	0.001669	5.58	41694.02	5750.77	19.78	0.31	0.047	1.02
Reach-1	196.26	Alt4I	227000.00		9253.00	217747.02	918.00	935.89	936.36	0.000810	5.62	43377.52	5595.96	17.89	0.29	0.036	0.44
Reach-1	196.3	existing	227000.00	24.68	38571.15	188404.19	921.70	937.71	938.63	0.006652	8.14	30808.68	7430.49	16.01	0.54	0.052	2.92
Reach-1	196.3	Alt4B	227000.00	9.28	34422.13	192568.59	921.70	937.49	938.52	0.007726	8.59	29167.75	7350.33	15.79	0.58	0.052	3.30
Reach-1	196.3	Alt4D	227000.00	211.03		226788.98	921.70	938.78	939.90	0.006021	8.49	26784.98	3397.68	17.08	0.53	0.054	3.01
Reach-1	196.3	Alt4F	227000.00		75.11	226924.89	920.70	935.29	936.20	0.001107	7.66	29784.99	4024.23	14.59	0.44	0.032	0.65
Reach-1	196.3	Alt4G	227000.00			227000.00	920.70	936.17	936.93	0.000882	7.00	32428.66	3206.59	15.47	0.39	0.033	0.56
Reach-1	196.3	Alt4H	227000.00	50.16	11436.58	215513.27	921.70	937.89	939.11	0.008000	9.07	27373.77	5429.27	16.19	0.60	0.055	3.60
Reach-1	196.3	Alt4I	227000.00		43.47	226956.53	920.70	935.80	936.62	0.000969	7.26	31378.03	3596.48	15.10	0.41	0.032	0.59
Reach-1	196.34	existing	227000.00		55736.97	171263.03	922.70	938.84	939.23	0.001479	5.45	48228.18	7877.15	16.14	0.31	0.046	0.86
Reach-1	196.34	Alt4B	227000.00		61232.96	165767.03	916.30	938.89	939.22	0.001707	4.95	50519.11	7877.44	22.59	0.28	0.053	1.05
Reach-1	196.34	Alt4D	227000.00			227000.00	916.30	940.07	940.64	0.002210	6.06	37475.66	3377.30	23.77	0.32	0.057	1.52
Reach-1	196.34	Alt4F	227000.00		8161.77	218838.23	916.30	936.00	936.53	0.001877	5.90	41534.97	6747.24	19.70	0.31	0.054	1.30
Reach-1	196.34	Alt4G	227000.00			227000.00	916.30	936.67	937.19	0.001677	5.77	39335.01	3342.39	20.37	0.30	0.054	1.22
Reach-1	196.34	Alt4H	227000.00			227000.00	916.30	939.39	940.04	0.002722	6.45	35180.02	3376.63	23.09	0.35	0.057	1.75
Reach-1	196.34	Alt4I	227000.00			227000.00	916.30	936.36	936.91	0.001826	5.93	38291.98	3334.31	20.06	0.31	0.054	1.30
Reach-1	196.4	existing	227000.00		44305.43	182694.56	921.50	939.31	939.70	0.001324	5.46	49948.98	7944.56	17.81	0.30	0.048	0.83
Reach-1	196.4	Alt4B	227000.00		50711.63	176288.38	916.80	939.46	939.77	0.001510	4.87	53337.05	7947.42	22.66	0.26	0.056	1.01
Reach-1	196.4	Alt4D	227000.00			227000.00	916.80	940.78	941.25	0.001723	5.60	40529.55	3338.20	23.96	0.28	0.058	1.29
Reach-1	196.4	Alt4F	227000.00		9376.15	217623.84	916.80	936.61	937.10	0.001775	5.75	43051.02	6082.58	19.81	0.30	0.055	1.25

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manni Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.4	Alt4G	227000.00			227000.00	916.80	937.20	937.70	0.001637	5.70	39826.41	3329.08	20.40	0.29	0.055	1.21
Reach-1	198.4	Alt4H	227000.00			227000.00	916.80	940.23	940.76	0.001997	5.86	38760.20	3338.20	23.43	0.30	0.058	1.43
Reach-1	198.4	Alt4I	227000.00			227000.00	916.80	936.93	937.46	0.001761	5.83	38946.70	3328.25	20.13	0.30	0.055	1.27
Reach-1	198.49	existing	227000.00		53563.97	173436.03	921.90	939.86	940.12	0.000555	4.52	60341.80	7989.44	17.96	0.23	0.040	0.40
Reach-1	198.49	Alt4B	227000.00		56607.63	170392.38	917.40	939.99	940.21	0.000566	4.12	63952.29	7990.00	22.59	0.21	0.045	0.44
Reach-1	198.49	Alt4D	227000.00			227000.00	917.40	941.40	941.78	0.000704	4.93	46013.59	3296.90	24.00	0.23	0.046	0.61
Reach-1	198.49	Alt4F	227000.00		18658.34	208341.66	917.40	937.29	937.70	0.000863	5.35	48907.50	7937.80	19.89	0.27	0.042	0.63
Reach-1	198.49	Alt4G	227000.00			227000.00	917.40	937.81	938.29	0.000889	5.59	40621.92	3289.93	20.41	0.28	0.042	0.68
Reach-1	198.49	Alt4H	227000.00			227000.00	917.40	940.96	941.37	0.000783	5.09	44563.95	3296.90	23.56	0.24	0.046	0.65
Reach-1	198.49	Alt4I	227000.00			227000.00	917.40	937.59	938.09	0.000943	5.69	39901.33	3289.20	20.19	0.29	0.042	0.71
Reach-1	198.59	existing	227000.00		63685.97	163314.02	921.30	940.15	940.41	0.000561	4.39	57467.48	7757.68	18.85	0.22	0.039	0.41
Reach-1	198.59	Alt4B	227000.00		83397.45	143602.55	918.00	940.35	940.57	0.000833	3.61	60916.12	7760.00	22.35	0.18	0.051	0.65
Reach-1	198.59	Alt4D	227000.00			227000.00	918.00	941.90	942.31	0.001419	5.09	44611.07	3137.70	23.90	0.24	0.064	1.24
Reach-1	198.59	Alt4F	227000.00		40932.62	186067.38	918.00	937.98	938.39	0.002179	5.37	44905.06	7718.99	19.98	0.28	0.058	1.49
Reach-1	198.59	Alt4G	227000.00			227000.00	918.00	938.50	939.11	0.002743	6.26	36280.91	3131.21	20.50	0.32	0.063	1.96
Reach-1	198.59	Alt4H	227000.00			227000.00	918.00	941.52	941.94	0.001553	5.23	43407.44	3137.70	23.52	0.25	0.064	1.32
Reach-1	198.59	Alt4I	227000.00			227000.00	918.00	938.33	938.95	0.002883	6.35	35731.71	3130.54	20.33	0.33	0.063	2.03
Reach-1	198.66	existing	227000.00	17.75	61286.66	165695.59	921.50	940.38	940.64	0.000588	4.50	58470.92	7670.30	18.86	0.23	0.041	0.45
Reach-1	198.66	Alt4B	227000.00	17.16	61353.07	165629.78	918.50	940.57	940.82	0.000502	4.26	59496.84	7678.92	22.07	0.21	0.041	0.40
Reach-1	198.66	Alt4D	227000.00	26.33		226973.69	918.50	942.25	942.66	0.000644	5.17	43928.53	3006.80	23.75	0.24	0.045	0.58
Reach-1	198.66	Alt4F	227000.00	15.05	33742.50	193242.44	918.50	938.52	939.00	0.001162	5.90	43778.71	7639.20	20.02	0.31	0.043	0.78
Reach-1	198.66	Alt4G	227000.00	19.89		226980.11	918.50	939.17	939.84	0.001344	6.54	34691.07	3001.84	20.67	0.34	0.046	0.96
Reach-1	198.66	Alt4H	227000.00	25.84		226974.16	918.50	941.89	942.33	0.000696	5.30	42869.62	3006.80	23.39	0.25	0.045	0.61
Reach-1	198.66	Alt4I	227000.00	19.44		226980.56	918.50	939.03	939.71	0.001396	6.63	34262.02	3001.35	20.53	0.35	0.046	0.99
Reach-1	198.75	existing	227000.00		53241.10	173758.92	921.40	940.64	940.90	0.000610	4.42	57166.60	7760.09	19.24	0.22	0.042	0.48
Reach-1	198.75	Alt4B	227000.00		53352.39	173647.63	919.00	940.80	941.04	0.000531	4.22	59749.09	7763.66	21.80	0.20	0.042	0.44
Reach-1	198.75	Alt4D	227000.00			227000.00	919.00	942.60	942.97	0.000593	4.86	46701.26	3099.80	23.60	0.22	0.045	0.55
Reach-1	198.75	Alt4F	227000.00		30343.63	196656.38	919.00	939.11	939.53	0.001079	5.48	46589.95	7741.51	20.11	0.28	0.044	0.77
Reach-1	198.75	Alt4G	227000.00			227000.00	919.00	939.91	940.45	0.001147	5.92	38365.17	3095.79	20.91	0.30	0.046	0.88
Reach-1	198.75	Alt4H	227000.00			227000.00	919.00	942.27	942.66	0.000638	4.97	45697.19	3099.80	23.27	0.23	0.045	0.58
Reach-1	198.75	Alt4I	227000.00			227000.00	919.00	939.79	940.35	0.001184	5.97	38010.53	3095.41	20.79	0.30	0.046	0.90
Reach-1	198.85	existing	227000.00		28662.20	198337.80	922.30	940.89	941.32	0.001120	5.56	47495.98	7666.74	18.59	0.28	0.046	0.84
Reach-1	198.85	Alt4B	227000.00		28969.39	198030.61	919.50	941.02	941.41	0.000965	5.29	49869.83	7668.05	21.52	0.26	0.046	0.75
Reach-1	198.85	Alt4D	227000.00			227000.00	919.50	942.89	943.32	0.000802	5.28	43031.83	2982.32	23.39	0.24	0.047	0.71
Reach-1	198.85	Alt4F	227000.00		11664.02	215335.98	919.50	939.60	940.22	0.001695	6.48	39109.13	7267.60	20.10	0.34	0.047	1.17
Reach-1	198.85	Alt4G	227000.00			227000.00	919.50	940.49	941.11	0.001462	6.33	35884.10	2969.24	20.99	0.32	0.048	1.09
Reach-1	198.85	Alt4H	227000.00			227000.00	919.50	942.59	943.04	0.000860	5.39	42135.72	2981.07	23.09	0.25	0.047	0.75
Reach-1	198.85	Alt4I	227000.00			227000.00	919.50	940.39	941.02	0.001501	6.38	35599.79	2968.54	20.89	0.32	0.048	1.11
Reach-1	198.94	existing	227000.00		59835.71	167164.28	923.20	941.49	941.83	0.001003	4.98	50050.65	7505.44	18.29	0.26	0.044	0.73
Reach-1	198.94	Alt4B	227000.00		84966.06	142033.94	920.00	941.71	942.00	0.001650	3.96	53340.54	7508.38	21.71	0.20	0.062	1.28
Reach-1	198.94	Alt4D	227000.00			227000.00	920.00	943.53	944.01	0.002697	5.53	41015.29	2850.00	23.53	0.26	0.082	2.39
Reach-1	198.94	Alt4F	227000.00		69531.27	157468.73	920.00	940.88	941.24	0.002539	4.71	47088.72	7497.45	20.88	0.24	0.066	1.84
Reach-1	198.94	Alt4G	227000.00			227000.00	920.00	941.65	942.28	0.004289	6.37	35636.41	2847.07	21.65	0.32	0.082	3.30
Reach-1	198.94	Alt4H	227000.00			227000.00	920.00	943.28	943.77	0.002861	5.63	40290.96	2850.00	23.28	0.26	0.082	2.49
Reach-1	198.94	Alt4I	227000.00			227000.00	920.00	941.58	942.22	0.004365	6.40	35446.66	2846.87	21.58	0.32	0.082	3.35
Reach-1	199.07	existing	227000.00		10040.60	216959.39	926.80	941.87	942.91	0.001731	8.37	32939.40	7887.01	15.07	0.43	0.038	1.24
Reach-1	199.07	Alt4B	227000.00		15783.89	211216.11	926.80	942.41	943.28	0.001412	7.78	37394.72	8594.35	15.61	0.39	0.039	1.06
Reach-1	199.07	Alt4D	227000.00			227000.00	926.80	943.95	944.81	0.001100	7.42	30597.10	2242.00	17.15	0.35	0.038	0.93
Reach-1	199.07	Alt4F	227000.00		9078.88	217921.11	926.80	941.77	942.84	0.001795	8.48	32177.79	7759.64	14.97	0.44	0.038	1.28
Reach-1	199.07	Alt4G	227000.00			227000.00	926.80	942.35	943.44	0.001658	8.41	26997.78	2242.00	15.55	0.43	0.038	1.24
Reach-1	199.07	Alt4H	227000.00			227000.00	926.80	943.73	944.61	0.001162	7.54	30093.12	2242.00	16.93	0.36	0.038	0.97
Reach-1	199.07	Alt4I	227000.00			227000.00	926.80	942.29	943.40	0.001683	8.45	26877.90	2242.00	15.49	0.43	0.038	1.25

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.11	existing	227000.00	2234.18	11012.97	213752.84	926.80	942.59	943.41	0.001403	7.49	36654.49	7612.18	15.79	0.38	0.039	1.03
Reach-1	199.11	Alt4B	227000.00	2319.86	14364.41	210295.72	926.80	942.96	943.70	0.001227	7.15	39549.00	8000.56	16.16	0.36	0.039	0.93
Reach-1	199.11	Alt4D	227000.00	2960.63		224039.38	926.80	944.43	945.14	0.000957	6.79	33862.04	2537.00	17.63	0.32	0.039	0.81
Reach-1	199.11	Alt4F	227000.00	2218.61	10463.78	214317.63	926.80	942.52	943.36	0.001435	7.55	36178.93	7546.46	15.72	0.39	0.039	1.05
Reach-1	199.11	Alt4G	227000.00	2508.58		224491.42	926.80	943.05	943.93	0.001364	7.57	30361.61	2536.68	16.25	0.38	0.039	1.04
Reach-1	199.11	Alt4H	227000.00	2899.16		224100.83	926.80	944.23	944.96	0.001005	6.89	33353.98	2537.00	17.43	0.33	0.039	0.84
Reach-1	199.11	Alt4I	227000.00	2493.86		224506.14	926.80	943.01	943.89	0.001380	7.60	30251.37	2536.59	16.21	0.38	0.039	1.05
Reach-1	199.12	existing	227000.00		8954.81	218045.19	926.80	942.53	943.47	0.001136	7.91	34462.99	6787.30	15.73	0.38	0.036	0.92
Reach-1	199.12	Alt4B	227000.00		11791.25	215208.75	926.80	942.90	943.75	0.001010	7.59	37045.55	7188.77	16.10	0.36	0.036	0.84
Reach-1	199.12	Alt4D	227000.00			227000.00	926.80	944.38	945.19	0.000797	7.22	31432.32	2094.00	17.58	0.33	0.035	0.74
Reach-1	199.12	Alt4F	227000.00		8498.93	218501.06	926.80	942.47	943.42	0.001159	7.96	34041.73	6719.54	15.67	0.39	0.036	0.94
Reach-1	199.12	Alt4G	227000.00			227000.00	926.80	943.00	943.99	0.001097	7.95	28546.44	2094.00	16.20	0.38	0.035	0.92
Reach-1	199.12	Alt4H	227000.00			227000.00	926.80	944.18	945.01	0.000833	7.32	31012.99	2094.00	17.38	0.34	0.035	0.76
Reach-1	199.12	Alt4I	227000.00			227000.00	926.80	942.96	943.95	0.001108	7.98	28455.69	2094.00	16.16	0.38	0.035	0.93
Reach-1	199.125		Bridge														
Reach-1	199.13	existing	227000.00		11448.98	215551.02	926.80	942.86	943.72	0.001024	7.63	36736.34	7141.89	16.06	0.37	0.036	0.85
Reach-1	199.13	Alt4B	227000.00		14020.51	212979.50	926.80	943.18	943.97	0.000925	7.37	39052.29	7485.88	16.38	0.35	0.036	0.79
Reach-1	199.13	Alt4D	227000.00			227000.00	926.80	944.61	945.39	0.000758	7.11	31907.26	2094.00	17.81	0.32	0.035	0.71
Reach-1	199.13	Alt4F	227000.00		11035.89	215964.11	926.80	942.81	943.68	0.001041	7.68	36362.54	7084.80	16.01	0.37	0.036	0.86
Reach-1	199.13	Alt4G	227000.00			227000.00	926.80	943.31	944.25	0.001018	7.78	29190.07	2094.00	16.51	0.37	0.035	0.87
Reach-1	199.13	Alt4H	227000.00			227000.00	926.80	944.42	945.22	0.000790	7.20	31507.99	2094.00	17.62	0.33	0.035	0.73
Reach-1	199.13	Alt4I	227000.00			227000.00	926.80	943.27	944.22	0.001028	7.80	29105.97	2094.00	16.47	0.37	0.035	0.88
Reach-1	199.14	existing	227000.00	256.38	13793.45	212950.19	926.80	943.14	943.79	0.000787	6.67	42605.48	8099.78	16.34	0.32	0.036	0.65
Reach-1	199.14	Alt4B	227000.00	257.90	15166.96	211575.14	926.80	943.41	944.02	0.000725	6.49	45004.17	8881.52	16.61	0.31	0.036	0.61
Reach-1	199.14	Alt4D	227000.00	290.42		226709.58	926.80	944.83	945.45	0.000598	6.30	36108.43	2417.00	18.03	0.29	0.035	0.56
Reach-1	199.14	Alt4F	227000.00	256.25	13392.17	213351.58	926.80	943.09	943.75	0.000800	6.71	42216.07	8052.24	16.29	0.33	0.036	0.66
Reach-1	199.14	Alt4G	227000.00	278.36		226721.64	926.80	943.58	944.31	0.000799	6.87	33086.30	2417.00	16.78	0.33	0.035	0.68
Reach-1	199.14	Alt4H	227000.00	288.89		226711.11	926.80	944.65	945.28	0.000623	6.37	35662.18	2417.00	17.85	0.29	0.035	0.57
Reach-1	199.14	Alt4I	227000.00	277.92		226722.08	926.80	943.54	944.28	0.000807	6.89	32993.51	2417.00	16.74	0.33	0.035	0.69
Reach-1	199.24	existing	227000.00		48134.13	178865.88	927.10	943.57	944.07	0.001431	6.17	44726.23	7385.68	16.47	0.32	0.045	1.02
Reach-1	199.24	Alt4B	227000.00		51576.51	175423.48	927.10	943.83	944.28	0.001281	5.91	46646.59	7392.63	16.73	0.30	0.045	0.93
Reach-1	199.24	Alt4D	227000.00			227000.00	927.10	945.00	945.75	0.001583	6.95	32654.02	2565.30	17.90	0.34	0.046	1.26
Reach-1	199.24	Alt4F	227000.00		47542.35	179457.66	927.10	943.53	944.03	0.001458	6.21	44404.65	7384.52	16.43	0.32	0.045	1.04
Reach-1	199.24	Alt4G	227000.00			227000.00	927.10	943.81	944.73	0.002155	7.66	29617.94	2538.13	16.71	0.40	0.046	1.57
Reach-1	199.24	Alt4H	227000.00			227000.00	927.10	944.83	945.60	0.001654	7.05	32200.00	2561.26	17.73	0.35	0.046	1.30
Reach-1	199.24	Alt4I	227000.00			227000.00	927.10	943.78	944.70	0.002177	7.69	29526.40	2537.31	16.68	0.40	0.046	1.58
Reach-1	199.3	existing	227000.00		26726.67	200273.33	928.80	944.00	944.57	0.002186	6.36	40529.02	6865.02	15.20	0.34	0.053	1.51
Reach-1	199.3	Alt4B	227000.00		29202.20	197797.80	928.80	944.21	944.74	0.002000	6.17	41989.78	7009.96	15.41	0.32	0.053	1.40
Reach-1	199.3	Alt4D	227000.00			227000.00	928.80	945.61	946.22	0.001776	6.30	36057.97	2855.98	16.81	0.31	0.054	1.40
Reach-1	199.3	Alt4F	227000.00		26972.33	200027.67	928.80	943.97	944.54	0.002203	6.37	40303.68	6808.16	15.17	0.34	0.053	1.51
Reach-1	199.3	Alt4G	227000.00			227000.00	928.80	944.63	945.35	0.002332	6.82	33268.90	2853.19	15.83	0.35	0.054	1.69
Reach-1	199.3	Alt4H	227000.00			227000.00	928.80	945.46	946.09	0.001850	6.37	35628.32	2855.55	16.66	0.32	0.054	1.44
Reach-1	199.3	Alt4I	227000.00			227000.00	928.80	944.60	945.33	0.002351	6.84	33188.44	2853.11	15.80	0.35	0.054	1.70
Reach-1	199.34	existing	227000.00		66717.09	160282.92	929.50	944.71	945.11	0.002092	5.53	47720.97	7324.67	15.21	0.29	0.058	1.44
Reach-1	199.34	Alt4B	227000.00		55474.33	171525.67	923.80	944.83	945.17	0.001320	5.14	52645.13	7328.83	21.03	0.25	0.056	1.03
Reach-1	199.34	Alt4D	227000.00		10599.63	216400.39	923.80	946.12	946.64	0.001558	5.88	39931.03	3289.89	22.32	0.28	0.058	1.33
Reach-1	199.34	Alt4F	227000.00		53336.27	173663.73	923.80	944.64	945.00	0.001416	5.28	51281.88	7322.10	20.84	0.26	0.056	1.09
Reach-1	199.34	Alt4G	227000.00		8671.21	218328.78	923.80	945.28	945.88	0.001920	6.31	37182.43	3268.02	21.48	0.31	0.058	1.55
Reach-1	199.34	Alt4H	227000.00		10302.70	216697.30	923.80	945.99	946.52	0.001609	5.95	39497.14	3286.45	22.19	0.28	0.058	1.36
Reach-1	199.34	Alt4I	227000.00		8615.95	218384.06	923.80	945.26	945.86	0.001932	6.33	37105.84	3267.41	21.46	0.31	0.058	1.56
Reach-1	199.44	existing	227000.00		57331.15	169668.86	931.70	945.78	946.13	0.001928	5.15	50303.97	7646.73	14.08	0.28	0.057	1.22
Reach-1	199.44	Alt4B	227000.00		61606.85	165393.14	925.60	945.78	946.04	0.002236	4.29	55891.95	7646.61	20.18	0.22	0.075	1.64

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.44	Alt4D	227000.00		13124.68	213875.31	925.60	947.28	947.65	0.002537	4.92	46311.47	3788.13	21.68	0.24	0.083	2.09
Reach-1	199.44	Alt4F	227000.00		60092.78	166907.23	925.60	945.66	945.93	0.002354	4.37	54981.07	7644.14	20.06	0.22	0.075	1.71
Reach-1	199.44	Alt4G	227000.00		11760.34	215239.66	925.60	946.69	947.10	0.002975	5.18	44091.77	3778.99	21.09	0.26	0.083	2.34
Reach-1	199.44	Alt4H	227000.00		12906.50	214093.52	925.60	947.18	947.56	0.002603	4.97	45947.84	3786.64	21.58	0.24	0.083	2.12
Reach-1	199.44	Alt4I	227000.00		11723.13	215276.88	925.60	946.67	947.09	0.002987	5.19	44032.95	3778.75	21.07	0.26	0.083	2.35
Reach-1	199.63	existing	227000.00		83229.05	143770.94	932.70	946.73	947.05	0.001795	4.24	50029.45	7540.16	14.03	0.24	0.055	1.12
Reach-1	199.53	Alt4B	227000.00		54089.75	172910.25	927.50	946.47	946.73	0.000955	4.25	55648.61	7535.11	18.97	0.22	0.051	0.70
Reach-1	199.53	Alt4D	227000.00		10963.24	216036.77	927.50	948.07	948.41	0.001028	4.69	48625.70	3968.66	20.57	0.22	0.057	0.85
Reach-1	199.53	Alt4F	227000.00		52869.61	174130.39	927.50	946.38	946.65	0.000989	4.32	54990.52	7534.40	18.88	0.22	0.051	0.73
Reach-1	199.53	Alt4G	227000.00		9725.49	217274.52	927.50	947.61	947.97	0.001154	4.88	46773.76	3958.78	20.11	0.24	0.057	0.93
Reach-1	199.53	Alt4H	227000.00		10759.39	216240.61	927.50	947.99	948.34	0.001048	4.72	48317.16	3967.02	20.49	0.23	0.057	0.87
Reach-1	199.53	Alt4I	227000.00		9692.92	217307.08	927.50	947.59	947.96	0.001158	4.89	46725.67	3958.52	20.09	0.24	0.057	0.93
Reach-1	199.63	existing	227000.00		88456.41	138543.59	930.90	947.80	948.17	0.002640	4.01	49312.10	7358.40	16.90	0.22	0.067	1.72
Reach-1	199.63	Alt4B	227000.00		57624.97	169375.03	928.60	946.99	947.29	0.001225	4.49	52282.02	7307.17	18.39	0.23	0.055	0.86
Reach-1	199.63	Alt4D	227000.00		26095.02	200904.98	928.60	948.63	948.98	0.001178	4.65	48348.06	3819.40	20.03	0.23	0.061	0.95
Reach-1	199.63	Alt4F	227000.00		56746.07	170253.92	928.60	946.93	947.23	0.001259	4.54	51778.53	7306.02	18.33	0.24	0.055	0.88
Reach-1	199.63	Alt4G	227000.00		25574.54	201425.47	928.60	948.23	948.60	0.001295	4.81	46817.64	3819.40	19.63	0.24	0.060	1.01
Reach-1	199.63	Alt4H	227000.00		26009.26	200990.73	928.60	948.57	948.91	0.001197	4.68	48090.93	3819.40	19.97	0.23	0.060	0.96
Reach-1	199.63	Alt4I	227000.00		25560.81	201439.19	928.60	948.22	948.59	0.001298	4.82	46778.25	3819.40	19.62	0.24	0.060	1.01
Reach-1	199.72	existing	227000.00		69131.19	157868.81	930.60	948.69	949.00	0.001163	4.60	50636.22	7243.90	18.09	0.25	0.047	0.79
Reach-1	199.72	Alt4B	227000.00		83713.42	143286.58	930.40	947.75	948.07	0.002091	3.99	51238.79	7228.62	17.35	0.21	0.067	1.47
Reach-1	199.72	Alt4D	227000.00		38880.99	188119.00	930.40	949.38	949.79	0.002314	4.59	46416.98	3697.90	18.98	0.22	0.079	1.86
Reach-1	199.72	Alt4F	227000.00		83095.59	143904.41	930.40	947.70	948.03	0.002138	4.03	50893.84	7225.74	17.30	0.21	0.067	1.50
Reach-1	199.72	Alt4G	227000.00		38443.21	188556.80	930.40	949.05	949.48	0.002527	4.71	45221.20	3697.90	18.65	0.23	0.079	1.98
Reach-1	199.72	Alt4H	227000.00		38807.73	188192.27	930.40	949.32	949.73	0.002349	4.61	46213.84	3697.90	18.92	0.23	0.079	1.88
Reach-1	199.72	Alt4I	227000.00		38431.86	188568.14	930.40	949.05	949.48	0.002532	4.72	45190.74	3697.90	18.65	0.23	0.079	1.98
Reach-1	199.82	existing	227000.00		105982.10	121017.89	931.20	949.47	949.93	0.002846	4.18	44968.26	6966.31	18.27	0.23	0.061	1.80
Reach-1	199.82	Alt4B	227000.00		75864.79	151135.22	930.40	948.61	948.97	0.001461	4.93	47159.52	6871.88	18.21	0.27	0.051	0.97
Reach-1	199.82	Alt4D	227000.00		41476.04	185523.95	930.40	950.28	950.73	0.001471	5.24	42291.44	3471.10	19.88	0.26	0.058	1.13
Reach-1	199.82	Alt4F	227000.00		75486.57	151513.44	930.40	948.57	948.94	0.001480	4.96	46939.80	6868.31	18.17	0.27	0.051	0.98
Reach-1	199.82	Alt4G	227000.00		41161.38	185838.61	930.40	950.03	950.50	0.001564	5.36	41417.73	3471.10	19.63	0.27	0.058	1.16
Reach-1	199.82	Alt4H	227000.00		41422.79	185577.22	930.40	950.23	950.69	0.001487	5.26	42141.44	3471.10	19.83	0.26	0.058	1.14
Reach-1	199.82	Alt4I	227000.00		41153.30	185846.70	930.40	950.02	950.49	0.001567	5.36	41395.70	3471.10	19.62	0.27	0.058	1.16
Reach-1	199.91	existing	227000.00		58069.82	168930.17	932.10	950.30	950.68	0.001020	5.29	46767.04	6609.86	18.20	0.27	0.042	0.73
Reach-1	199.91	Alt4B	227000.00		47665.71	179334.28	930.40	949.08	949.46	0.000791	5.29	48440.20	6552.52	18.68	0.27	0.043	0.60
Reach-1	199.91	Alt4D	227000.00		28279.84	198720.16	930.40	950.79	951.18	0.000662	5.15	45683.09	3420.80	20.39	0.24	0.045	0.57
Reach-1	199.91	Alt4F	227000.00		47408.36	179591.64	930.40	949.06	949.44	0.000798	5.31	48268.24	6551.58	18.66	0.27	0.043	0.60
Reach-1	199.91	Alt4G	227000.00		28033.15	198966.84	930.40	950.58	950.97	0.000696	5.24	44926.65	3420.80	20.16	0.25	0.045	0.59
Reach-1	199.91	Alt4H	227000.00		28237.80	198762.20	930.40	950.75	951.14	0.000667	5.17	45552.80	3420.80	20.35	0.24	0.045	0.58
Reach-1	199.91	Alt4I	227000.00		28026.88	198973.13	930.40	950.56	950.96	0.000697	5.24	44907.65	3420.80	20.16	0.25	0.045	0.59
Reach-1	200	existing	227000.00		59133.24	167866.77	933.40	950.78	951.24	0.001040	5.99	43997.08	6544.62	17.38	0.30	0.041	0.81
Reach-1	200	Alt4B	227000.00		30345.10	196654.91	930.40	949.38	949.99	0.000984	6.61	39849.18	6061.08	18.98	0.32	0.040	0.81
Reach-1	200	Alt4D	227000.00		16566.08	210433.94	930.40	951.03	951.62	0.000809	6.30	37447.57	2883.52	20.63	0.29	0.042	0.75
Reach-1	200	Alt4F	227000.00		30069.24	196930.75	930.40	949.36	949.97	0.000992	6.63	39707.23	6051.84	18.96	0.32	0.040	0.82
Reach-1	200	Alt4G	227000.00		16078.51	210921.50	930.40	950.82	951.43	0.000846	6.40	36851.08	2880.49	20.42	0.29	0.042	0.77
Reach-1	200	Alt4H	227000.00		16482.42	210517.58	930.40	950.99	951.58	0.000815	6.32	37344.62	2883.00	20.59	0.29	0.042	0.75
Reach-1	200	Alt4I	227000.00		16066.21	210933.80	930.40	950.81	951.43	0.000847	6.41	36836.14	2880.42	20.41	0.29	0.042	0.77
Reach-1	200.1	existing	227000.00	7022.91	58059.82	161917.28	934.50	951.29	951.97	0.001795	7.39	39953.39	6933.94	16.79	0.38	0.045	1.30
Reach-1	200.1	Alt4B	227000.00	4501.86	39197.69	183300.45	930.40	949.84	950.59	0.001312	7.58	38232.04	6173.41	19.44	0.37	0.043	1.04
Reach-1	200.1	Alt4D	227000.00	5435.06	30253.38	191311.56	930.40	951.40	952.10	0.001034	7.05	37693.30	3055.40	21.00	0.33	0.045	0.92
Reach-1	200.1	Alt4F	227000.00	4497.63	38987.02	183515.34	930.40	949.82	950.58	0.001320	7.60	38111.17	6166.34	19.42	0.37	0.043	1.04
Reach-1	200.1	Alt4G	227000.00	5364.05	29891.90	191744.05	930.40	951.21	951.93	0.001079	7.16	37116.50	3055.40	20.81	0.33	0.045	0.94
Reach-1	200.1	Alt4H	227000.00	5422.91	30191.41	191385.67	930.40	951.37	952.07	0.001042	7.06	37593.72	3055.40	20.97	0.33	0.045	0.92

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.1	Alt4I	227000.00	5362.26	29882.82	191754.91	930.40	951.21	951.93	0.001080	7.16	37102.14	3055.40	20.81	0.34	0.045	0.94
Reach-1	200.2	existing	227000.00		66339.87	160660.13	937.00	952.48	952.91	0.001727	5.58	43596.01	7092.30	15.48	0.31	0.047	1.11
Reach-1	200.2	Alt4B	227000.00		19790.07	207209.94	932.00	950.67	951.32	0.001445	6.73	38002.31	6723.81	18.67	0.36	0.044	0.99
Reach-1	200.2	Alt4D	227000.00		7476.14	219523.86	932.00	952.08	952.68	0.001175	6.33	36975.06	3341.68	20.08	0.32	0.046	0.91
Reach-1	200.2	Alt4F	227000.00		19610.84	207389.16	932.00	950.68	951.31	0.001453	6.74	37910.45	6714.36	18.66	0.36	0.044	0.99
Reach-1	200.2	Alt4G	227000.00		7175.69	219824.31	932.00	951.92	952.54	0.001221	6.42	36438.82	3337.03	19.92	0.32	0.046	0.93
Reach-1	200.2	Alt4H	227000.00		7424.05	219575.95	932.00	952.05	952.66	0.001183	6.34	36881.87	3340.87	20.05	0.32	0.046	0.91
Reach-1	200.2	Alt4I	227000.00		7168.26	219831.73	932.00	951.91	952.54	0.001222	6.42	36425.58	3336.91	19.91	0.32	0.046	0.93
Reach-1	200.3	existing	227000.00		20168.57	206831.42	937.70	953.37	953.97	0.002146	6.34	36956.71	4713.39	15.67	0.35	0.050	1.40
Reach-1	200.3	Alt4B	227000.00		23884.16	203115.83	932.00	951.48	952.02	0.001187	6.06	39628.72	4848.87	19.48	0.32	0.045	0.79
Reach-1	200.3	Alt4D	227000.00		21999.25	205000.75	932.00	952.78	953.23	0.000896	5.46	42643.31	3587.18	20.78	0.28	0.046	0.67
Reach-1	200.3	Alt4F	227000.00		23844.70	203155.31	932.00	951.47	952.01	0.001190	6.06	39585.22	4847.57	19.47	0.33	0.045	0.80
Reach-1	200.3	Alt4G	227000.00		21873.27	205126.73	932.00	952.65	953.11	0.000924	5.52	42183.84	3586.94	20.65	0.28	0.046	0.68
Reach-1	200.3	Alt4H	227000.00		21977.49	205022.50	932.00	952.76	953.21	0.000901	5.47	42559.90	3587.14	20.76	0.28	0.046	0.67
Reach-1	200.3	Alt4I	227000.00		21870.15	205129.84	932.00	952.65	953.10	0.000925	5.52	42152.02	3586.94	20.65	0.28	0.046	0.68
Reach-1	200.38	existing	227000.00		36495.60	190504.41	937.00	954.36	954.69	0.000961	4.78	51052.27	7114.17	17.36	0.24	0.047	0.71
Reach-1	200.38	Alt4B	227000.00		19144.12	207855.89	932.00	952.11	952.54	0.000880	5.43	44684.86	6450.38	20.11	0.28	0.044	0.62
Reach-1	200.38	Alt4D	227000.00		17551.38	209448.63	932.00	953.26	953.63	0.000681	4.97	46950.18	3858.50	21.26	0.25	0.045	0.53
Reach-1	200.38	Alt4F	227000.00		19101.57	207898.44	932.00	952.10	952.53	0.000882	5.43	44636.84	6447.80	20.10	0.28	0.044	0.62
Reach-1	200.38	Alt4G	227000.00		17441.55	209558.45	932.00	953.14	953.52	0.000700	5.02	46492.12	3858.50	21.14	0.25	0.045	0.54
Reach-1	200.38	Alt4H	227000.00		17532.35	209467.66	932.00	953.24	953.61	0.000684	4.97	46870.34	3858.50	21.24	0.25	0.045	0.53
Reach-1	200.38	Alt4I	227000.00		17438.88	209561.13	932.00	953.14	953.51	0.000701	5.02	46481.05	3858.50	21.14	0.25	0.045	0.54
Reach-1	200.49	existing	227000.00		28416.46	198583.55	936.90	954.87	955.24	0.001203	5.07	47798.46	7068.52	17.97	0.27	0.050	0.85
Reach-1	200.49	Alt4B	227000.00		3616.11	223383.89	932.00	952.53	953.06	0.001105	5.88	39633.54	5394.83	20.53	0.31	0.046	0.76
Reach-1	200.49	Alt4D	227000.00		5697.43	221302.58	932.00	953.59	954.03	0.000855	5.31	43536.07	4071.70	21.59	0.27	0.047	0.64
Reach-1	200.49	Alt4F	227000.00		3593.05	223406.94	932.00	952.52	953.05	0.001107	5.88	39599.00	5382.78	20.52	0.31	0.046	0.76
Reach-1	200.49	Alt4G	227000.00		5430.96	221569.05	932.00	953.49	953.93	0.000877	5.37	43090.24	4071.70	21.49	0.27	0.047	0.65
Reach-1	200.49	Alt4H	227000.00		5650.89	221349.11	932.00	953.58	954.01	0.000858	5.32	43458.29	4071.70	21.58	0.27	0.047	0.64
Reach-1	200.49	Alt4I	227000.00		5424.58	221575.42	932.00	953.48	953.92	0.000878	5.37	43079.55	4071.70	21.48	0.27	0.047	0.65
Reach-1	200.58	existing	227000.00		15150.76	211849.23	937.60	955.49	955.94	0.001663	5.51	43168.53	6358.80	17.89	0.30	0.053	1.08
Reach-1	200.58	Alt4B	227000.00		6960.40	220039.59	932.00	953.09	953.53	0.000842	5.37	43151.39	4334.38	21.09	0.28	0.046	0.57
Reach-1	200.58	Alt4D	227000.00		7902.17	219097.84	932.00	954.03	954.40	0.000682	4.93	46990.30	4176.00	22.03	0.25	0.047	0.50
Reach-1	200.58	Alt4F	227000.00		6953.87	220046.13	932.00	953.08	953.52	0.000843	5.37	43128.11	4333.07	21.08	0.28	0.046	0.58
Reach-1	200.58	Alt4G	227000.00		7789.64	219210.34	932.00	953.93	954.31	0.000697	4.97	46582.24	4176.00	21.93	0.25	0.046	0.51
Reach-1	200.58	Alt4H	227000.00		7882.50	219117.52	932.00	954.01	954.38	0.000685	4.93	46919.19	4176.00	22.01	0.25	0.047	0.51
Reach-1	200.58	Alt4I	227000.00		7786.98	219213.03	932.00	953.93	954.30	0.000697	4.97	46572.56	4176.00	21.93	0.25	0.046	0.51
Reach-1	200.67	existing	227000.00		16794.14	210205.86	939.80	956.32	956.74	0.001502	5.33	44134.34	5601.55	16.52	0.29	0.051	0.99
Reach-1	200.67	Alt4B	227000.00		2789.29	224210.70	932.00	953.92	954.38	0.004805	5.47	41761.63	4608.51	21.92	0.29	0.091	3.22
Reach-1	200.67	Alt4D	227000.00		5724.93	221275.06	932.00	954.69	955.08	0.003735	5.05	45092.48	4409.31	22.69	0.26	0.090	2.68
Reach-1	200.67	Alt4F	227000.00		2772.74	224227.27	932.00	953.91	954.37	0.004812	5.48	41742.24	4598.70	21.91	0.29	0.091	3.22
Reach-1	200.67	Alt4G	227000.00		5391.02	221608.98	932.00	954.60	955.00	0.003835	5.09	44730.61	4407.07	22.60	0.26	0.090	2.73
Reach-1	200.67	Alt4H	227000.00		5666.39	221333.61	932.00	954.67	955.07	0.003752	5.06	45029.25	4408.92	22.67	0.26	0.090	2.69
Reach-1	200.67	Alt4I	227000.00		5383.34	221616.66	932.00	954.60	955.00	0.003837	5.09	44722.27	4407.02	22.60	0.26	0.090	2.73
Reach-1	200.77	existing	227000.00		19749.77	207250.23	936.90	957.03	957.38	0.001074	4.81	48606.86	5967.73	20.13	0.26	0.048	0.70
Reach-1	200.77	Alt4B	227000.00		20457.07	206542.92	934.70	955.23	955.66	0.001610	5.40	43090.83	5886.05	20.53	0.31	0.051	0.93
Reach-1	200.77	Alt4D	227000.00		18789.66	208210.33	934.70	955.74	956.15	0.001388	5.16	44222.95	4582.20	21.04	0.29	0.051	0.84
Reach-1	200.77	Alt4F	227000.00		20446.13	206553.88	934.70	955.23	955.66	0.001612	5.40	43075.02	5885.29	20.53	0.31	0.051	0.93
Reach-1	200.77	Alt4G	227000.00		18751.24	208248.75	934.70	955.68	956.10	0.001414	5.19	43957.82	4582.20	20.98	0.29	0.051	0.85
Reach-1	200.77	Alt4H	227000.00		18782.92	208217.06	934.70	955.73	956.14	0.001393	5.16	44176.25	4582.20	21.03	0.29	0.051	0.84
Reach-1	200.77	Alt4I	227000.00		18750.35	208249.66	934.70	955.68	956.10	0.001415	5.19	43951.67	4582.20	20.98	0.29	0.051	0.85
Reach-1	200.86	existing	227000.00		21144.23	205855.78	938.50	957.68	958.02	0.001414	4.70	48855.99	5550.02	19.18	0.25	0.056	0.95
Reach-1	200.86	Alt4B	227000.00		28241.21	198758.78	934.90	956.36	956.63	0.002049	4.01	55091.20	5481.95	21.46	0.20	0.083	1.55

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.86	Alt4D	227000.00		26437.29	200562.70	934.90	956.74	957.01	0.001899	3.93	55685.57	4705.96	21.84	0.19	0.084	1.48
Reach-1	200.86	Alt4F	227000.00		26232.28	198767.75	934.90	956.36	956.63	0.002050	4.01	55081.82	5481.88	21.46	0.20	0.083	1.55
Reach-1	200.86	Alt4G	227000.00		26332.45	200667.55	934.90	956.70	956.97	0.001919	3.94	55490.28	4704.38	21.80	0.20	0.084	1.49
Reach-1	200.86	Alt4H	227000.00		26418.66	200581.34	934.90	956.73	957.00	0.001902	3.93	55650.82	4705.68	21.83	0.20	0.084	1.48
Reach-1	200.86	Alt4I	227000.00		26329.98	200670.02	934.90	956.70	956.97	0.001920	3.94	55485.69	4704.34	21.80	0.20	0.084	1.49
Reach-1	200.95	existing	227000.00		14081.06	212918.94	939.80	958.19	958.52	0.000811	4.65	50030.29	5282.90	18.39	0.25	0.046	0.56
Reach-1	200.95	Alt4B	227000.00		13925.14	213074.86	935.20	956.74	957.00	0.000404	4.16	56960.79	5187.95	21.54	0.21	0.043	0.32
Reach-1	200.95	Alt4D	227000.00		13202.66	213797.33	935.20	957.10	957.35	0.000375	4.06	57813.10	4722.20	21.90	0.20	0.043	0.30
Reach-1	200.95	Alt4F	227000.00		13921.68	213078.33	935.20	956.74	957.00	0.000404	4.17	56952.88	5187.84	21.54	0.21	0.043	0.32
Reach-1	200.95	Alt4G	227000.00		13155.07	213844.92	935.20	957.07	957.32	0.000379	4.07	57633.02	4719.32	21.87	0.20	0.043	0.30
Reach-1	200.95	Alt4H	227000.00		13194.22	213805.77	935.20	957.10	957.35	0.000378	4.06	57781.11	4721.69	21.90	0.20	0.043	0.30
Reach-1	200.95	Alt4I	227000.00		13153.93	213846.06	935.20	957.07	957.31	0.000379	4.07	57628.70	4719.26	21.87	0.20	0.043	0.30
Reach-1	201.05	existing	227000.00		14274.72	212725.28	941.50	958.65	959.00	0.001074	4.83	47820.34	4956.02	17.15	0.25	0.050	0.76
Reach-1	201.05	Alt4B	227000.00		23844.23	203155.77	935.40	957.08	957.37	0.001573	4.30	52404.12	4944.52	21.88	0.22	0.069	1.18
Reach-1	201.05	Alt4D	227000.00		23778.41	203221.58	935.40	957.42	957.70	0.001437	4.18	53598.95	4645.58	22.02	0.21	0.069	1.11
Reach-1	201.05	Alt4F	227000.00		23840.28	203159.73	935.40	957.08	957.37	0.001574	4.30	52397.48	4944.45	21.88	0.22	0.069	1.18
Reach-1	201.05	Alt4G	227000.00		23705.37	203294.64	935.40	957.38	957.67	0.001451	4.20	53435.90	4645.50	21.98	0.21	0.069	1.12
Reach-1	201.05	Alt4H	227000.00		23765.60	203234.41	935.40	957.41	957.69	0.001439	4.18	53570.30	4645.57	22.01	0.21	0.069	1.11
Reach-1	201.05	Alt4I	227000.00		23703.58	203296.41	935.40	957.38	957.66	0.001452	4.20	53431.93	4645.50	21.98	0.21	0.069	1.12
Reach-1	201.14	existing	227000.00		9685.40	217314.61	940.40	959.08	959.54	0.001008	5.54	42360.28	4797.93	18.68	0.30	0.041	0.67
Reach-1	201.14	Alt4B	227000.00		2090.90	224909.09	936.40	957.45	957.88	0.000662	5.28	43949.64	4714.44	21.05	0.27	0.042	0.47
Reach-1	201.14	Alt4D	227000.00		2701.96	224298.03	936.40	957.76	958.17	0.000612	5.13	45170.98	4442.77	21.36	0.26	0.042	0.45
Reach-1	201.14	Alt4F	227000.00		2088.24	224911.76	936.40	957.45	957.88	0.000662	5.28	43944.18	4714.38	21.05	0.27	0.042	0.47
Reach-1	201.14	Alt4G	227000.00		2637.23	224362.77	936.40	957.73	958.14	0.000617	5.14	45029.16	4442.69	21.33	0.26	0.042	0.45
Reach-1	201.14	Alt4H	227000.00		2690.43	224309.56	936.40	957.76	958.16	0.000613	5.13	45145.77	4442.76	21.36	0.26	0.042	0.45
Reach-1	201.14	Alt4I	227000.00		2635.75	224364.27	936.40	957.73	958.14	0.000617	5.14	45025.91	4442.69	21.33	0.26	0.042	0.45
Reach-1	201.24	existing	162000.00		10652.55	151347.45	943.00	959.73	960.03	0.000946	4.49	37069.46	4647.40	16.73	0.26	0.046	0.57
Reach-1	201.24	Alt4B	162000.00		19094.07	142905.94	937.80	957.95	958.31	0.001318	4.88	33878.84	4422.48	20.15	0.30	0.048	0.68
Reach-1	201.24	Alt4D	162000.00		18806.36	143193.64	937.80	958.22	958.56	0.001200	4.74	34683.23	4122.07	20.42	0.28	0.048	0.64
Reach-1	201.24	Alt4F	162000.00		19092.74	142907.27	937.80	957.95	958.31	0.001319	4.88	33874.05	4422.36	20.15	0.30	0.048	0.68
Reach-1	201.24	Alt4G	162000.00		18787.19	143212.80	937.80	958.19	958.53	0.001213	4.75	34566.75	4121.99	20.39	0.29	0.048	0.65
Reach-1	201.24	Alt4H	162000.00		18802.93	143197.08	937.80	958.21	958.56	0.001202	4.74	34662.36	4122.05	20.41	0.28	0.048	0.64
Reach-1	201.24	Alt4I	162000.00		18786.73	143213.27	937.80	958.19	958.53	0.001213	4.75	34563.98	4121.99	20.39	0.29	0.048	0.65
Reach-1	201.33	existing	162000.00		10578.92	151421.08	943.00	960.30	960.65	0.001507	4.81	34440.81	4587.83	17.30	0.28	0.053	0.86
Reach-1	201.33	Alt4B	162000.00		1089.96	160910.02	938.00	958.43	958.74	0.000577	4.49	36720.52	4275.72	20.43	0.24	0.044	0.38
Reach-1	201.33	Alt4D	162000.00		1351.60	160648.41	938.00	958.67	958.98	0.000545	4.39	37565.13	4007.18	20.67	0.23	0.045	0.37
Reach-1	201.33	Alt4F	162000.00		1088.63	160911.38	938.00	958.43	958.74	0.000578	4.49	36716.87	4275.33	20.43	0.24	0.044	0.38
Reach-1	201.33	Alt4G	162000.00		1315.79	160684.22	938.00	958.64	958.94	0.000549	4.40	37468.28	4007.12	20.64	0.23	0.045	0.37
Reach-1	201.33	Alt4H	162000.00		1345.25	160654.75	938.00	958.66	958.96	0.000546	4.39	37548.01	4007.17	20.66	0.23	0.045	0.37
Reach-1	201.33	Alt4I	162000.00		1314.89	160685.11	938.00	958.64	958.94	0.000549	4.40	37465.84	4007.12	20.64	0.23	0.045	0.37
Reach-1	201.43	existing	162000.00		8194.11	153805.91	941.30	961.02	961.36	0.001248	4.78	34683.77	4466.62	19.72	0.28	0.049	0.72
Reach-1	201.43	Alt4B	162000.00		9789.74	152210.27	938.00	958.76	959.06	0.000653	4.50	37442.77	4053.73	20.76	0.25	0.046	0.41
Reach-1	201.43	Alt4D	162000.00		10045.40	151954.59	938.00	958.98	959.27	0.000617	4.40	38238.73	3948.08	20.98	0.24	0.046	0.40
Reach-1	201.43	Alt4F	162000.00		9788.55	152211.45	938.00	958.76	959.06	0.000653	4.50	37439.56	4053.60	20.76	0.25	0.046	0.41
Reach-1	201.43	Alt4G	162000.00		10014.73	151985.27	938.00	958.95	959.25	0.000620	4.41	38151.02	3947.85	20.95	0.24	0.046	0.40
Reach-1	201.43	Alt4H	162000.00		10040.09	151959.91	938.00	958.97	959.26	0.000617	4.41	38223.55	3948.04	20.97	0.24	0.046	0.40
Reach-1	201.43	Alt4I	162000.00		10014.06	151985.94	938.00	958.95	959.24	0.000620	4.41	38149.09	3947.84	20.95	0.24	0.046	0.40
Reach-1	201.52	existing	162000.00		10460.73	151539.27	940.90	961.74	962.06	0.001584	4.54	35911.16	4291.26	20.84	0.26	0.058	0.95
Reach-1	201.52	Alt4B	162000.00		8048.06	153951.94	938.00	959.10	959.42	0.000769	4.61	36376.75	4021.09	21.10	0.26	0.048	0.48
Reach-1	201.52	Alt4D	162000.00		8365.16	153634.84	938.00	959.29	959.60	0.000730	4.51	37171.51	4021.66	21.29	0.25	0.048	0.46
Reach-1	201.52	Alt4F	162000.00		8046.89	153953.13	938.00	959.10	959.42	0.000770	4.61	36373.81	4021.09	21.10	0.26	0.048	0.48
Reach-1	201.52	Alt4G	162000.00		8332.08	153667.92	938.00	959.27	959.58	0.000734	4.52	37089.77	4021.60	21.27	0.25	0.048	0.46
Reach-1	201.52	Alt4H	162000.00		8359.39	153640.61	938.00	959.29	959.60	0.000730	4.51	37157.27	4021.65	21.29	0.25	0.048	0.46

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.52	Alt4I	162000.00		8331.39	153668.61	938.00	959.27	959.58	0.000734	4.52	37088.05	4021.60	21.27	0.25	0.048	0.46
Reach-1	201.62	existing	162000.00		3968.02	158031.97	945.60	962.35	962.72	0.001135	4.94	33493.37	3973.12	16.75	0.28	0.046	0.70
Reach-1	201.62	Alt4B	162000.00		6258.33	155741.67	938.00	959.42	959.75	0.000601	4.67	36094.51	3741.60	21.42	0.26	0.043	0.38
Reach-1	201.62	Alt4D	162000.00		6452.88	155547.13	938.00	959.60	959.92	0.000573	4.58	36775.22	3801.75	21.60	0.25	0.043	0.37
Reach-1	201.62	Alt4F	162000.00		6257.60	155742.41	938.00	959.42	959.75	0.000601	4.67	36091.99	3741.38	21.42	0.26	0.043	0.38
Reach-1	201.62	Alt4G	162000.00		6432.56	155567.44	938.00	959.58	959.90	0.000576	4.59	36704.50	3795.54	21.58	0.25	0.043	0.37
Reach-1	201.62	Alt4H	162000.00		6449.26	155550.73	938.00	959.60	959.91	0.000574	4.58	36762.70	3800.65	21.60	0.25	0.043	0.37
Reach-1	201.62	Alt4I	162000.00		6432.09	155567.91	938.00	959.58	959.90	0.000576	4.59	36702.88	3795.40	21.58	0.25	0.043	0.37
Reach-1	201.71	existing	162000.00		4451.49	157548.50	946.00	962.95	963.38	0.001516	5.32	30855.26	3934.26	16.95	0.32	0.046	0.82
Reach-1	201.71	Alt4B	162000.00		13461.27	148538.72	943.60	959.74	960.51	0.004329	7.12	23232.49	3820.73	16.14	0.50	0.049	1.69
Reach-1	201.71	Alt4D	162000.00		13680.41	148319.59	943.60	959.91	960.63	0.003988	6.93	23873.15	3908.63	16.31	0.48	0.049	1.59
Reach-1	201.71	Alt4F	162000.00		13460.44	148539.56	943.60	959.74	960.51	0.004330	7.12	23230.16	3820.41	16.14	0.50	0.049	1.69
Reach-1	201.71	Alt4G	162000.00		13659.52	148340.48	943.60	959.89	960.62	0.004022	6.95	23806.18	3899.53	16.29	0.48	0.049	1.60
Reach-1	201.71	Alt4H	162000.00		13676.22	148323.78	943.60	959.90	960.63	0.003994	6.93	23861.22	3907.01	16.30	0.48	0.049	1.59
Reach-1	201.71	Alt4I	162000.00		13658.93	148341.06	943.60	959.89	960.62	0.004023	6.95	23804.52	3899.30	16.29	0.48	0.049	1.60
Reach-1	201.81	existing	162000.00			162000.00	946.00	963.57	963.86	0.000602	4.30	37686.48	3706.27	17.57	0.24	0.043	0.38
Reach-1	201.81	Alt4B	162000.00			162000.00	944.80	961.16	961.59	0.001147	5.30	30581.46	3582.25	16.36	0.32	0.044	0.60
Reach-1	201.81	Alt4D	162000.00			162000.00	944.80	961.24	961.67	0.001117	5.25	30872.40	3585.81	16.44	0.32	0.044	0.59
Reach-1	201.81	Alt4F	162000.00			162000.00	944.80	961.16	961.59	0.001147	5.30	30580.36	3582.23	16.36	0.32	0.044	0.60
Reach-1	201.81	Alt4G	162000.00			162000.00	944.80	961.23	961.66	0.001120	5.25	30841.31	3585.43	16.43	0.32	0.044	0.59
Reach-1	201.81	Alt4H	162000.00			162000.00	944.80	961.24	961.67	0.001118	5.25	30866.70	3585.74	16.44	0.32	0.044	0.59
Reach-1	201.81	Alt4I	162000.00			162000.00	944.80	961.23	961.66	0.001120	5.25	30840.66	3585.42	16.43	0.32	0.044	0.59
Reach-1	201.9	existing	162000.00			162000.00	947.20	963.87	964.20	0.000730	4.57	35468.82	3873.11	16.67	0.27	0.041	0.42
Reach-1	201.9	Alt4B	162000.00			162000.00	946.00	961.75	962.25	0.001435	5.68	28527.68	3569.02	15.75	0.35	0.043	0.71
Reach-1	201.9	Alt4D	162000.00			162000.00	946.00	961.81	962.31	0.001405	5.63	28767.14	3669.89	15.81	0.35	0.043	0.68
Reach-1	201.9	Alt4F	162000.00			162000.00	946.00	961.75	962.25	0.001436	5.68	28526.80	3568.59	15.75	0.35	0.043	0.71
Reach-1	201.9	Alt4G	162000.00			162000.00	946.00	961.81	962.30	0.001408	5.64	28741.39	3665.88	15.81	0.35	0.043	0.68
Reach-1	201.9	Alt4H	162000.00			162000.00	946.00	961.81	962.30	0.001405	5.63	28762.43	3669.16	15.81	0.35	0.043	0.68
Reach-1	201.9	Alt4I	162000.00			162000.00	946.00	961.81	962.30	0.001408	5.64	28740.94	3665.81	15.81	0.35	0.043	0.68
Reach-1	201.99	existing	162000.00			162000.00	948.70	964.24	964.67	0.001215	5.28	30682.95	3714.88	15.54	0.32	0.042	0.62
Reach-1	201.99	Alt4B	162000.00			162000.00	948.70	962.45	963.14	0.002200	6.67	24294.64	3472.17	13.75	0.44	0.041	0.96
Reach-1	201.99	Alt4D	162000.00			162000.00	948.70	962.50	963.18	0.002160	6.62	24469.52	3482.55	13.80	0.44	0.041	0.94
Reach-1	201.99	Alt4F	162000.00			162000.00	948.70	962.45	963.14	0.002201	6.67	24294.20	3472.13	13.75	0.44	0.041	0.96
Reach-1	201.99	Alt4G	162000.00			162000.00	948.70	962.50	963.18	0.002164	6.63	24451.25	3481.97	13.80	0.44	0.041	0.94
Reach-1	201.99	Alt4H	162000.00			162000.00	948.70	962.50	963.18	0.002161	6.62	24466.13	3482.48	13.80	0.44	0.041	0.94
Reach-1	201.99	Alt4I	162000.00			162000.00	948.70	962.50	963.18	0.002164	6.63	24450.82	3481.95	13.80	0.44	0.041	0.94
Reach-1	202.00	existing	162000.00	3195.57		158804.44	950.00	965.02	965.67	0.003055	6.52	25475.77	4201.12	15.02	0.45	0.044	1.24
Reach-1	202.00	Alt4B	162000.00	2158.28		159841.72	950.00	963.96	964.90	0.005461	7.82	21069.58	4004.54	13.96	0.58	0.044	1.89
Reach-1	202.09	Alt4D	162000.00	2159.19		159840.81	950.00	963.98	964.91	0.005394	7.79	21155.94	4012.39	13.98	0.58	0.044	1.88
Reach-1	202.09	Alt4F	162000.00	2158.27		159841.73	950.00	963.96	964.90	0.005461	7.82	21069.33	4004.52	13.96	0.58	0.044	1.89
Reach-1	202.09	Alt4G	162000.00	2159.05		159840.94	950.00	963.98	964.91	0.005401	7.80	21146.88	4011.57	13.98	0.58	0.044	1.88
Reach-1	202.09	Alt4H	162000.00	2159.16		159840.84	950.00	963.98	964.91	0.005395	7.79	21154.23	4012.24	13.98	0.58	0.044	1.88
Reach-1	202.09	Alt4I	162000.00	2159.04		159840.95	950.00	963.98	964.91	0.005401	7.80	21146.64	4011.55	13.98	0.58	0.044	1.88
Reach-1	202.18	existing	162000.00	3776.69		158223.30	950.00	966.35	966.78	0.001559	5.31	31403.63	4359.40	16.35	0.33	0.044	0.76
Reach-1	202.18	Alt4B	162000.00	3254.15		158745.84	950.00	965.96	966.44	0.001814	5.60	29742.47	4262.49	15.96	0.36	0.044	0.87
Reach-1	202.18	Alt4D	162000.00	3261.25		158738.75	950.00	965.97	966.45	0.001810	5.60	29765.62	4262.96	15.97	0.36	0.044	0.86
Reach-1	202.18	Alt4F	162000.00	3254.15		158745.84	950.00	965.96	966.44	0.001814	5.60	29742.47	4262.49	15.96	0.36	0.044	0.87
Reach-1	202.18	Alt4G	162000.00	3260.45		158739.55	950.00	965.97	966.44	0.001811	5.60	29763.02	4262.91	15.97	0.36	0.044	0.86
Reach-1	202.18	Alt4H	162000.00	3261.09		158738.91	950.00	965.97	966.44	0.001810	5.60	29765.10	4262.95	15.97	0.36	0.044	0.86
Reach-1	202.18	Alt4I	162000.00	3260.45		158739.55	950.00	965.97	966.44	0.001811	5.60	29763.02	4262.91	15.97	0.36	0.044	0.86
Reach-1	202.29	existing	162000.00	2777.67		159222.33	955.50	967.14	967.45	0.000856	4.52	36764.31	4103.26	11.64	0.25	0.044	0.52
Reach-1	202.29	Alt4B	162000.00	2570.49		159429.50	955.50	966.87	967.20	0.000941	4.65	35656.74	4083.72	11.37	0.27	0.044	0.56

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.29	Alt4D	162000.00	2573.28		159426.72	955.50	966.87	967.20	0.000939	4.65	35671.69	4083.99	11.37	0.27	0.044	0.56
Reach-1	202.29	Alt4F	162000.00	2570.49		159429.50	955.50	966.87	967.20	0.000941	4.65	35656.74	4083.72	11.37	0.27	0.044	0.56
Reach-1	202.29	Alt4G	162000.00	2572.91		159427.09	955.50	966.87	967.20	0.000939	4.65	35669.70	4083.96	11.37	0.27	0.044	0.56
Reach-1	202.29	Alt4H	162000.00	2573.19		159426.81	955.50	966.87	967.20	0.000939	4.65	35671.20	4083.98	11.37	0.27	0.044	0.56
Reach-1	202.29	Alt4I	162000.00	2572.91		159427.09	955.50	966.87	967.20	0.000939	4.65	35669.70	4083.96	11.37	0.27	0.044	0.56
Reach-1	202.37	existing	162000.00	13160.30		148839.70	954.60	967.47	967.94	0.001489	5.69	30344.27	3998.52	12.87	0.34	0.044	0.82
Reach-1	202.37	Alt4B	162000.00	12670.41		149329.59	954.60	967.23	967.74	0.001637	5.87	29416.12	3914.61	12.63	0.35	0.044	0.88
Reach-1	202.37	Alt4D	162000.00	12677.23		149322.77	954.60	967.23	967.74	0.001635	5.87	29428.54	3915.78	12.63	0.35	0.044	0.88
Reach-1	202.37	Alt4F	162000.00	12670.41		149329.59	954.60	967.23	967.74	0.001637	5.87	29416.12	3914.61	12.63	0.35	0.044	0.88
Reach-1	202.37	Alt4G	162000.00	12676.31		149323.69	954.60	967.23	967.74	0.001635	5.87	29426.88	3915.63	12.63	0.35	0.044	0.88
Reach-1	202.37	Alt4H	162000.00	12677.09		149322.91	954.60	967.23	967.74	0.001635	5.87	29428.31	3915.76	12.63	0.35	0.044	0.88
Reach-1	202.37	Alt4I	162000.00	12676.31		149323.69	954.60	967.23	967.74	0.001635	5.87	29426.88	3915.63	12.63	0.35	0.044	0.88
Reach-1	202.48	existing	162000.00	12696.42		149303.58	952.50	968.35	968.84	0.001555	5.81	29990.69	3868.86	15.85	0.34	0.045	0.89
Reach-1	202.48	Alt4B	162000.00	12272.31		149727.70	952.50	968.19	968.71	0.001650	5.92	29385.13	3858.09	15.69	0.35	0.045	0.93
Reach-1	202.48	Alt4D	162000.00	12277.99		149722.02	952.50	968.19	968.71	0.001649	5.92	29393.13	3858.22	15.69	0.35	0.045	0.93
Reach-1	202.48	Alt4F	162000.00	12272.31		149727.70	952.50	968.19	968.71	0.001650	5.92	29385.13	3858.09	15.69	0.35	0.045	0.93
Reach-1	202.48	Alt4G	162000.00	12277.32		149722.69	952.50	968.19	968.71	0.001649	5.92	29392.20	3858.21	15.69	0.35	0.045	0.93
Reach-1	202.48	Alt4H	162000.00	12277.99		149722.02	952.50	968.19	968.71	0.001649	5.92	29393.13	3858.22	15.69	0.35	0.045	0.93
Reach-1	202.48	Alt4I	162000.00	12277.32		149722.69	952.50	968.19	968.71	0.001649	5.92	29392.20	3858.21	15.69	0.35	0.045	0.93
Reach-1	202.50	existing	162000.00	12759.56		149240.44	953.70	969.22	969.75	0.001696	5.97	28394.92	3821.26	15.52	0.35	0.044	0.96
Reach-1	202.50	Alt4B	162000.00	12334.37		149665.63	953.70	969.11	969.66	0.001765	6.06	27987.64	3804.92	15.41	0.36	0.044	0.99
Reach-1	202.50	Alt4D	162000.00	12339.98		149660.02	953.70	969.12	969.66	0.001765	6.06	27992.98	3805.13	15.42	0.36	0.044	0.99
Reach-1	202.50	Alt4F	162000.00	12334.37		149665.63	953.70	969.11	969.66	0.001765	6.06	27987.64	3804.92	15.41	0.36	0.044	0.99
Reach-1	202.50	Alt4G	162000.00	12339.26		149660.75	953.70	969.12	969.66	0.001765	6.06	27992.29	3805.11	15.42	0.36	0.044	0.99
Reach-1	202.50	Alt4H	162000.00	12339.98		149660.02	953.70	969.12	969.66	0.001765	6.06	27992.98	3805.13	15.42	0.36	0.044	0.99
Reach-1	202.50	Alt4I	162000.00	12339.26		149660.75	953.70	969.12	969.66	0.001765	6.06	27992.29	3805.11	15.42	0.36	0.044	0.99
Reach-1	202.69	existing	162000.00	13763.00		148237.00	953.70	970.13	970.64	0.001458	5.87	29353.76	3717.87	16.43	0.33	0.045	0.90
Reach-1	202.69	Alt4B	162000.00	13499.95		148500.05	953.70	970.06	970.58	0.001498	5.92	29094.00	3716.06	16.36	0.33	0.045	0.92
Reach-1	202.69	Alt4D	162000.00	13503.20		148496.81	953.70	970.06	970.58	0.001498	5.92	29097.18	3716.08	16.36	0.33	0.045	0.92
Reach-1	202.69	Alt4F	162000.00	13499.95		148500.05	953.70	970.06	970.58	0.001498	5.92	29094.00	3716.06	16.36	0.33	0.045	0.92
Reach-1	202.69	Alt4G	162000.00	13502.97		148497.03	953.70	970.06	970.58	0.001498	5.92	29096.95	3716.08	16.36	0.33	0.045	0.92
Reach-1	202.69	Alt4H	162000.00	13503.20		148496.81	953.70	970.06	970.58	0.001498	5.92	29097.18	3716.08	16.36	0.33	0.045	0.92
Reach-1	202.69	Alt4I	162000.00	13502.97		148497.03	953.70	970.06	970.58	0.001498	5.92	29096.95	3716.08	16.36	0.33	0.045	0.92
Reach-1	202.8	existing	162000.00	14197.73		147802.27	956.40	970.96	971.39	0.001212	5.46	31346.70	3637.56	14.56	0.30	0.045	0.78
Reach-1	202.8	Alt4B	162000.00	14091.75		147908.25	956.40	970.91	971.35	0.001233	5.49	31169.94	3629.93	14.51	0.30	0.045	0.79
Reach-1	202.8	Alt4D	162000.00	14093.08		147906.92	956.40	970.91	971.35	0.001233	5.49	31172.15	3630.03	14.51	0.30	0.045	0.79
Reach-1	202.8	Alt4F	162000.00	14091.75		147908.25	956.40	970.91	971.35	0.001233	5.49	31169.94	3629.93	14.51	0.30	0.045	0.79
Reach-1	202.8	Alt4G	162000.00	14092.94		147907.06	956.40	970.91	971.35	0.001233	5.49	31171.93	3630.02	14.51	0.30	0.045	0.79
Reach-1	202.8	Alt4H	162000.00	14093.08		147906.92	956.40	970.91	971.35	0.001233	5.49	31172.15	3630.03	14.51	0.30	0.045	0.79
Reach-1	202.8	Alt4I	162000.00	14092.94		147907.06	956.40	970.91	971.35	0.001233	5.49	31171.93	3630.02	14.51	0.30	0.045	0.79
Reach-1	202.9	existing	162000.00	12545.95		149454.05	956.50	971.61	972.11	0.001330	5.81	29492.12	3297.52	15.11	0.32	0.044	0.84
Reach-1	202.9	Alt4B	162000.00	12468.15		149531.86	956.50	971.57	972.07	0.001348	5.84	29367.76	3296.16	15.07	0.32	0.044	0.85
Reach-1	202.9	Alt4D	162000.00	12469.14		149530.84	956.50	971.57	972.07	0.001347	5.83	29369.37	3296.18	15.07	0.32	0.044	0.85
Reach-1	202.9	Alt4F	162000.00	12468.15		149531.86	956.50	971.57	972.07	0.001348	5.84	29367.76	3296.16	15.07	0.32	0.044	0.85
Reach-1	202.9	Alt4G	162000.00	12469.01		149531.00	956.50	971.57	972.07	0.001347	5.84	29369.17	3296.18	15.07	0.32	0.044	0.85
Reach-1	202.9	Alt4H	162000.00	12469.14		149530.84	956.50	971.57	972.07	0.001347	5.83	29369.37	3296.18	15.07	0.32	0.044	0.85
Reach-1	202.9	Alt4I	162000.00	12469.01		149531.00	956.50	971.57	972.07	0.001347	5.84	29369.17	3296.18	15.07	0.32	0.044	0.85
Reach-1	202.99	existing	162000.00	9714.18	16.11	152269.70	959.20	972.23	972.84	0.001715	6.39	27022.25	3274.49	13.03	0.36	0.044	1.04
Reach-1	202.99	Alt4B	162000.00	9648.95	15.58	152335.47	959.20	972.20	972.81	0.001734	6.41	26926.13	3273.94	13.00	0.36	0.044	1.05
Reach-1	202.99	Alt4D	162000.00	9649.77	15.59	152334.64	959.20	972.20	972.81	0.001734	6.41	26927.33	3273.94	13.00	0.36	0.044	1.05
Reach-1	202.99	Alt4F	162000.00	9648.95	15.58	152335.47	959.20	972.20	972.81	0.001734	6.41	26926.13	3273.94	13.00	0.36	0.044	1.05
Reach-1	202.99	Alt4G	162000.00	9649.63	15.58	152334.78	959.20	972.20	972.81	0.001734	6.41	26927.13	3273.94	13.00	0.36	0.044	1.05
Reach-1	202.99	Alt4H	162000.00	9649.77	15.59	152334.64	959.20	972.20	972.81	0.001734	6.41	26927.33	3273.94	13.00	0.36	0.044	1.05

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.99	Alt4I	162000.00	9649.63	15.58	152334.78	959.20	972.20	972.81	0.001734	6.41	26927.13	3273.94	13.00	0.36	0.044	1.05
Reach-1	203.00	existing	162000.00	13545.04		148454.95	958.70	973.17	973.83	0.002066	6.75	25736.70	3262.14	14.47	0.39	0.044	1.18
Reach-1	203.09	Alt4B	162000.00	13505.38		148494.61	958.70	973.15	973.82	0.002082	6.77	25672.99	3261.07	14.45	0.39	0.044	1.18
Reach-1	203.09	Alt4D	162000.00	13506.00		148494.00	958.70	973.15	973.82	0.002082	6.77	25673.99	3261.08	14.45	0.39	0.044	1.18
Reach-1	203.09	Alt4F	162000.00	13505.38		148494.61	958.70	973.15	973.82	0.002082	6.77	25672.99	3261.07	14.45	0.39	0.044	1.18
Reach-1	203.09	Alt4G	162000.00	13505.88		148494.11	958.70	973.15	973.82	0.002082	6.77	25673.79	3261.08	14.45	0.39	0.044	1.18
Reach-1	203.09	Alt4H	162000.00	13506.00		148494.00	958.70	973.15	973.82	0.002082	6.77	25673.99	3261.08	14.45	0.39	0.044	1.18
Reach-1	203.09	Alt4I	162000.00	13505.88		148494.11	958.70	973.15	973.82	0.002082	6.77	25673.79	3261.08	14.45	0.39	0.044	1.18
Reach-1	203.10	existing	162000.00	14787.75		147212.25	956.70	974.29	974.85	0.001781	6.16	27657.38	3645.06	17.59	0.36	0.044	0.99
Reach-1	203.19	Alt4B	162000.00	14761.23		147238.77	956.70	974.28	974.84	0.001789	6.17	27614.69	3640.25	17.58	0.36	0.044	0.99
Reach-1	203.19	Alt4D	162000.00	14761.65		147238.34	956.70	974.28	974.84	0.001789	6.17	27615.35	3640.32	17.58	0.36	0.044	0.99
Reach-1	203.19	Alt4F	162000.00	14761.23		147238.77	956.70	974.28	974.84	0.001789	6.17	27614.69	3640.25	17.58	0.36	0.044	0.99
Reach-1	203.19	Alt4G	162000.00	14761.65		147238.34	956.70	974.28	974.84	0.001789	6.17	27615.35	3640.32	17.58	0.36	0.044	0.99
Reach-1	203.19	Alt4H	162000.00	14761.65		147238.34	956.70	974.28	974.84	0.001789	6.17	27615.35	3640.32	17.58	0.36	0.044	0.99
Reach-1	203.19	Alt4I	162000.00	14761.65		147238.34	956.70	974.28	974.84	0.001789	6.17	27615.35	3640.32	17.58	0.36	0.044	0.99
Reach-1	203.29	existing	162000.00	8068.63		153931.38	960.70	975.14	975.74	0.001416	6.30	26657.98	3488.93	14.44	0.39	0.036	0.72
Reach-1	203.29	Alt4B	162000.00	8059.48		153940.53	960.70	975.13	975.73	0.001421	6.31	26630.30	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.29	Alt4D	162000.00	8059.61		153940.39	960.70	975.13	975.73	0.001421	6.31	26630.72	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.29	Alt4F	162000.00	8059.48		153940.53	960.70	975.13	975.73	0.001421	6.31	26630.30	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.29	Alt4G	162000.00	8059.61		153940.39	960.70	975.13	975.73	0.001421	6.31	26630.72	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.29	Alt4H	162000.00	8059.61		153940.39	960.70	975.13	975.73	0.001421	6.31	26630.72	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.29	Alt4I	162000.00	8059.61		153940.39	960.70	975.13	975.73	0.001421	6.31	26630.72	3488.89	14.43	0.39	0.036	0.72
Reach-1	203.39	existing	162000.00	5432.97	6.21	156560.83	959.90	975.84	976.42	0.001303	6.23	26929.80	3470.87	15.94	0.38	0.036	0.69
Reach-1	203.39	Alt4B	162000.00	5424.60	5.96	156569.44	959.90	975.83	976.42	0.001305	6.23	26909.67	3469.71	15.93	0.38	0.036	0.69
Reach-1	203.39	Alt4D	162000.00	5424.78	5.96	156569.27	959.90	975.83	976.42	0.001305	6.23	26910.10	3469.73	15.93	0.38	0.036	0.69
Reach-1	203.39	Alt4F	162000.00	5424.60	5.96	156569.44	959.90	975.83	976.42	0.001305	6.23	26909.67	3469.71	15.93	0.38	0.036	0.69
Reach-1	203.39	Alt4G	162000.00	5424.78	5.96	156569.27	959.90	975.83	976.42	0.001305	6.23	26910.10	3469.73	15.93	0.38	0.036	0.69
Reach-1	203.39	Alt4H	162000.00	5424.78	5.96	156569.27	959.90	975.83	976.42	0.001305	6.23	26910.10	3469.73	15.93	0.38	0.036	0.69
Reach-1	203.39	Alt4I	162000.00	5424.78	5.96	156569.27	959.90	975.83	976.42	0.001305	6.23	26910.10	3469.73	15.93	0.38	0.036	0.69
Reach-1	203.48	existing	162000.00	7212.43		154787.56	962.20	976.49	977.05	0.001181	6.12	27598.22	3467.00	14.29	0.37	0.036	0.64
Reach-1	203.48	Alt4B	162000.00	7206.36		154793.64	962.20	976.48	977.05	0.001183	6.13	27582.99	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.48	Alt4D	162000.00	7206.44		154793.56	962.20	976.48	977.05	0.001183	6.13	27583.20	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.48	Alt4F	162000.00	7206.36		154793.64	962.20	976.48	977.05	0.001183	6.13	27582.99	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.48	Alt4G	162000.00	7206.44		154793.56	962.20	976.48	977.05	0.001183	6.13	27583.20	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.48	Alt4H	162000.00	7206.44		154793.56	962.20	976.48	977.05	0.001183	6.13	27583.20	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.48	Alt4I	162000.00	7206.44		154793.56	962.20	976.48	977.05	0.001183	6.13	27583.20	3466.91	14.28	0.37	0.036	0.64
Reach-1	203.58	existing	162000.00	2064.30		159935.70	962.10	977.02	977.60	0.000928	6.19	26990.80	2995.74	14.92	0.34	0.036	0.60
Reach-1	203.58	Alt4B	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.58	Alt4D	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.58	Alt4F	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.58	Alt4G	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.58	Alt4H	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.58	Alt4I	162000.00	2060.22		159939.78	962.10	977.01	977.60	0.000929	6.19	26980.38	2995.72	14.91	0.34	0.036	0.60
Reach-1	203.67	existing	162000.00	5602.80	0.08	156397.11	962.30	977.47	978.06	0.000937	6.23	27180.89	2862.91	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4B	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4D	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4F	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4G	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4H	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt4I	162000.00	5598.64	0.08	156401.28	962.30	977.47	978.05	0.000938	6.23	27172.33	2862.88	15.17	0.34	0.036	0.62
Reach-1	203.77	existing	162000.00			162000.00	963.30	977.95	978.51	0.000880	5.99	27062.09	2519.46	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt4B	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.77	Alt4D	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt4F	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt4G	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt4H	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt4I	162000.00			162000.00	963.30	977.95	978.51	0.000881	5.99	27055.79	2519.43	14.65	0.32	0.036	0.59
Reach-1	203.86	existing	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25206.77	2220.30	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4B	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4D	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4F	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4G	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4H	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt4I	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25201.89	2219.89	16.04	0.34	0.036	0.65
Reach-1	203.96	existing	162000.00			162000.00	964.10	978.52	980.14	0.004331	10.22	15846.95	2247.21	14.42	0.68	0.036	1.90
Reach-1	203.96	Alt4B	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	203.96	Alt4D	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	203.96	Alt4F	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	203.96	Alt4G	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	203.96	Alt4H	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	203.96	Alt4I	162000.00			162000.00	964.10	978.51	980.14	0.004335	10.22	15844.28	2247.03	14.41	0.68	0.036	1.90
Reach-1	204.05	existing	162000.00			162000.00	965.00	980.54	981.57	0.001867	8.15	19883.74	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4B	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4D	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4F	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4G	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4H	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt4I	162000.00			162000.00	965.00	980.54	981.57	0.001868	8.15	19882.70	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.15	existing	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23605.22	2155.15	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4B	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4D	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4F	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4G	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4H	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt4I	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23604.56	2155.14	15.57	0.37	0.035	0.74
Reach-1	204.25	existing	162000.00	1290.52		160709.48	968.00	981.96	983.37	0.003005	9.55	17109.19	2133.78	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4B	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4D	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4F	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4G	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4H	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt4I	162000.00	1290.44		160709.55	968.00	981.96	983.37	0.003005	9.55	17108.54	2133.73	13.96	0.58	0.035	1.56
Reach-1	204.34	existing	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.85	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4B	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4D	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4F	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4G	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4H	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt4I	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.61	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.42	existing	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt4B	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt4D	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt4F	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt4G	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt4H	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23

Table 3
Alternative 4 Hydraulic Pertinent Data for 100-Year Event Water Surface

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	204.42	Alt4I	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.53	existing	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4B	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4D	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4F	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4G	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4H	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt4I	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.16	existing	23500.00			23500.00	900.60	905.67	905.85	0.000985	3.38	6956.90	1722.21	5.07	0.30	0.035	0.25
Reach-1	195.16	Alt3.5B	23500.00			23500.00	900.60	905.67	905.85	0.000985	3.38	6956.90	1722.21	5.07	0.30	0.035	0.25
Reach-1	195.16	Alt3.5D	23500.00			23500.00	900.60	905.67	905.85	0.000985	3.38	6956.90	1722.21	5.07	0.30	0.035	0.25
Reach-1	195.16	Alt3.5H	23500.00			23500.00	900.60	905.67	905.85	0.000985	3.38	6956.90	1722.21	5.07	0.30	0.035	0.25
Reach-1	195.16	existing	57000.00			57000.00	900.60	908.57	908.92	0.000963	4.76	11985.25	1745.59	7.97	0.32	0.035	0.41
Reach-1	195.16	Alt3.5B	57000.00			57000.00	900.60	908.57	908.92	0.000963	4.76	11985.25	1745.59	7.97	0.32	0.035	0.41
Reach-1	195.16	Alt3.5D	57000.00			57000.00	900.60	908.57	908.92	0.000963	4.76	11985.25	1745.59	7.97	0.32	0.035	0.41
Reach-1	195.16	Alt3.5H	57000.00			57000.00	900.60	908.57	908.92	0.000963	4.76	11985.25	1745.59	7.97	0.32	0.035	0.41
Reach-1	195.16	existing	92000.00			92000.00	900.60	910.45	911.01	0.001130	6.02	15281.21	1760.74	9.85	0.36	0.035	0.61
Reach-1	195.16	Alt3.5B	92000.00			92000.00	900.60	910.45	911.01	0.001130	6.02	15281.21	1760.74	9.85	0.36	0.035	0.61
Reach-1	195.16	Alt3.5D	92000.00			92000.00	900.60	910.45	911.01	0.001130	6.02	15281.21	1760.74	9.85	0.36	0.035	0.61
Reach-1	195.16	Alt3.5H	92000.00			92000.00	900.60	910.45	911.01	0.001130	6.02	15281.21	1760.74	9.85	0.36	0.035	0.61
Reach-1	195.16	existing	185000.00			185000.00	900.60	914.20	915.30	0.001400	8.43	21940.68	1790.97	13.60	0.42	0.035	1.07
Reach-1	195.16	Alt3.5B	185000.00			185000.00	900.60	914.20	915.30	0.001400	8.43	21940.68	1790.97	13.60	0.42	0.035	1.07
Reach-1	195.16	Alt3.5D	185000.00			185000.00	900.60	914.20	915.30	0.001400	8.43	21940.68	1790.97	13.60	0.42	0.035	1.07
Reach-1	195.16	Alt3.5H	185000.00			185000.00	900.60	914.20	915.30	0.001400	8.43	21940.68	1790.97	13.60	0.42	0.035	1.07
Reach-1	195.16	existing	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3.5B	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3.5D	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	Alt3.5H	227000.00			227000.00	900.60	915.58	916.92	0.001488	9.30	24419.89	1802.09	14.98	0.45	0.035	1.26
Reach-1	195.16	existing	243000.00			243000.00	900.60	916.08	917.51	0.001516	9.60	25321.95	1806.12	15.48	0.45	0.035	1.32
Reach-1	195.16	Alt3.5B	243000.00			243000.00	900.60	916.08	917.51	0.001516	9.60	25321.95	1806.12	15.48	0.45	0.035	1.32
Reach-1	195.16	Alt3.5D	243000.00			243000.00	900.60	916.08	917.51	0.001516	9.60	25321.95	1806.12	15.48	0.45	0.035	1.32
Reach-1	195.16	Alt3.5H	243000.00			243000.00	900.60	916.08	917.51	0.001516	9.60	25321.95	1806.12	15.48	0.45	0.035	1.32
Reach-1	195.16	existing	285000.00			285000.00	900.60	916.58	918.41	0.001860	10.87	26226.02	1810.15	15.98	0.50	0.035	1.68
Reach-1	195.16	Alt3.5B	285000.00			285000.00	900.60	916.58	918.41	0.001860	10.87	26226.02	1810.15	15.98	0.50	0.035	1.68
Reach-1	195.16	Alt3.5D	285000.00			285000.00	900.60	916.58	918.41	0.001860	10.87	26226.02	1810.15	15.98	0.50	0.035	1.68
Reach-1	195.16	Alt3.5H	285000.00			285000.00	900.60	916.58	918.41	0.001860	10.87	26226.02	1810.15	15.98	0.50	0.035	1.68
Reach-1	195.19	existing	23500.00			23500.00	900.70	905.86	906.07	0.001317	3.68	6391.57	1732.58	5.16	0.34	0.035	0.30
Reach-1	195.19	Alt3.5B	23500.00			23500.00	900.70	905.86	906.07	0.001317	3.68	6391.57	1732.58	5.16	0.34	0.035	0.30
Reach-1	195.19	Alt3.5D	23500.00			23500.00	900.70	905.86	906.07	0.001317	3.68	6391.57	1732.58	5.16	0.34	0.035	0.30
Reach-1	195.19	Alt3.5H	23500.00			23500.00	900.70	905.86	906.07	0.001317	3.68	6391.57	1732.58	5.16	0.34	0.035	0.30
Reach-1	195.19	existing	57000.00			57000.00	900.70	908.74	909.12	0.001142	4.98	11456.70	1771.95	8.04	0.34	0.035	0.46
Reach-1	195.19	Alt3.5B	57000.00			57000.00	900.70	908.74	909.12	0.001142	4.98	11456.70	1771.95	8.04	0.34	0.035	0.46
Reach-1	195.19	Alt3.5D	57000.00			57000.00	900.70	908.74	909.12	0.001142	4.98	11456.70	1771.95	8.04	0.34	0.035	0.46
Reach-1	195.19	Alt3.5H	57000.00			57000.00	900.70	908.74	909.12	0.001142	4.98	11456.70	1771.95	8.04	0.34	0.035	0.46
Reach-1	195.19	existing	92000.00			92000.00	900.70	910.65	911.24	0.001270	6.19	14855.96	1791.29	9.95	0.38	0.035	0.66
Reach-1	195.19	Alt3.5B	92000.00			92000.00	900.70	910.65	911.24	0.001270	6.19	14855.96	1791.29	9.95	0.38	0.035	0.66
Reach-1	195.19	Alt3.5D	92000.00			92000.00	900.70	910.65	911.24	0.001270	6.19	14855.96	1791.29	9.95	0.38	0.035	0.66
Reach-1	195.19	Alt3.5H	92000.00			92000.00	900.70	910.65	911.24	0.001270	6.19	14855.96	1791.29	9.95	0.38	0.035	0.66
Reach-1	195.19	existing	185000.00			185000.00	900.70	914.45	915.58	0.001484	8.51	21743.08	1829.85	13.75	0.43	0.035	1.10
Reach-1	195.19	Alt3.5B	185000.00			185000.00	900.70	914.45	915.58	0.001484	8.51	21743.08	1829.85	13.75	0.43	0.035	1.10
Reach-1	195.19	Alt3.5D	185000.00			185000.00	900.70	914.45	915.58	0.001484	8.51	21743.08	1829.85	13.75	0.43	0.035	1.10
Reach-1	195.19	Alt3.5H	185000.00			185000.00	900.70	914.45	915.58	0.001484	8.51	21743.08	1829.85	13.75	0.43	0.035	1.10
Reach-1	195.19	existing	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3.5B	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3.5D	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	Alt3.5H	227000.00		0.99	226999.02	900.70	915.85	917.21	0.001554	9.34	24319.17	1869.46	15.15	0.45	0.035	1.28
Reach-1	195.19	existing	243000.00		18.86	242981.14	900.70	916.36	917.80	0.001573	9.62	25281.17	1925.71	15.66	0.46	0.035	1.34
Reach-1	195.19	Alt3.5B	243000.00		18.86	242981.14	900.70	916.36	917.80	0.001573	9.62	25281.17	1925.71	15.66	0.46	0.035	1.34
Reach-1	195.19	Alt3.5D	243000.00		18.86	242981.14	900.70	916.36	917.80	0.001573	9.62	25281.17	1925.71	15.66	0.46	0.035	1.34
Reach-1	195.19	Alt3.5H	243000.00		18.86	242981.14	900.70	916.36	917.80	0.001573	9.62	25281.17	1925.71	15.66	0.46	0.035	1.34
Reach-1	195.19	existing	285000.00		102.32	284897.69	900.70	916.94	918.76	0.001886	10.82	26414.86	1954.14	16.24	0.51	0.035	1.67
Reach-1	195.19	Alt3.5B	285000.00		102.32	284897.69	900.70	916.94	918.76	0.001886	10.82	26414.86	1954.14	16.24	0.51	0.035	1.67
Reach-1	195.19	Alt3.5D	285000.00		102.32	284897.69	900.70	916.94	918.76	0.001886	10.82	26414.86	1954.14	16.24	0.51	0.035	1.67
Reach-1	195.19	Alt3.5H	285000.00		102.32	284897.69	900.70	916.94	918.76	0.001886	10.82	26414.86	1954.14	16.24	0.51	0.035	1.67
Reach-1	195.28	existing	23500.00			23500.00	901.30	906.41	906.55	0.000809	3.06	7671.38	1896.99	5.11	0.27	0.035	0.20
Reach-1	195.28	Alt3.5B	23500.00			23500.00	901.30	906.41	906.55	0.000809	3.06	7671.38	1896.99	5.11	0.27	0.035	0.20

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Manri Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.28	Alt3.5D	23500.00			23500.00	901.30	906.41	906.55	0.000809	3.06	7671.38	1896.99	5.11	0.27	0.035	0.20
Reach-1	195.28	Alt3.5H	23500.00			23500.00	901.30	906.41	906.55	0.000809	3.06	7671.38	1896.99	5.11	0.27	0.035	0.20
Reach-1	195.28	existing	57000.00		59.54	56940.46	901.30	909.31	909.59	0.000821	4.23	13571.78	2252.58	8.01	0.29	0.035	0.33
Reach-1	195.28	Alt3.5B	57000.00		59.54	56940.46	901.30	909.31	909.59	0.000821	4.23	13571.78	2252.58	8.01	0.29	0.035	0.33
Reach-1	195.28	Alt3.5D	57000.00		59.54	56940.46	901.30	909.31	909.59	0.000821	4.23	13571.78	2252.58	8.01	0.29	0.035	0.33
Reach-1	195.28	Alt3.5H	57000.00		59.54	56940.46	901.30	909.31	909.59	0.000821	4.23	13571.78	2252.58	8.01	0.29	0.035	0.33
Reach-1	195.28	existing	92000.00		796.36	91203.64	901.30	911.34	911.75	0.000857	5.15	18239.97	2319.38	10.04	0.31	0.035	0.45
Reach-1	195.28	Alt3.5B	92000.00		796.36	91203.64	901.30	911.34	911.75	0.000857	5.15	18239.97	2319.38	10.04	0.31	0.035	0.45
Reach-1	195.28	Alt3.5D	92000.00		796.36	91203.64	901.30	911.34	911.75	0.000857	5.15	18239.97	2319.38	10.04	0.31	0.035	0.45
Reach-1	195.28	Alt3.5H	92000.00		796.36	91203.64	901.30	911.34	911.75	0.000857	5.15	18239.97	2319.38	10.04	0.31	0.035	0.45
Reach-1	195.28	existing	185000.00		4293.34	180706.66	901.30	915.44	916.18	0.000905	6.85	27776.15	2336.18	14.14	0.34	0.035	0.70
Reach-1	195.28	Alt3.5B	185000.00		4293.34	180706.66	901.30	915.44	916.18	0.000905	6.85	27776.15	2336.18	14.14	0.34	0.035	0.70
Reach-1	195.28	Alt3.5D	185000.00		4293.34	180706.66	901.30	915.44	916.18	0.000905	6.85	27776.15	2336.18	14.14	0.34	0.035	0.70
Reach-1	195.28	Alt3.5H	185000.00		4293.34	180706.66	901.30	915.44	916.18	0.000905	6.85	27776.15	2336.18	14.14	0.34	0.035	0.70
Reach-1	195.28	existing	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3.5B	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3.5D	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	Alt3.5H	227000.00		6145.71	220854.28	901.30	916.97	917.81	0.000924	7.46	31351.20	2345.59	15.67	0.35	0.035	0.80
Reach-1	195.28	existing	243000.00		6878.03	236121.97	901.30	917.52	918.41	0.000930	7.67	32647.20	2348.99	16.22	0.36	0.035	0.84
Reach-1	195.28	Alt3.5B	243000.00		6878.03	236121.97	901.30	917.52	918.41	0.000930	7.67	32647.20	2348.99	16.22	0.36	0.035	0.84
Reach-1	195.28	Alt3.5D	243000.00		6878.03	236121.97	901.30	917.52	918.41	0.000930	7.67	32647.20	2348.99	16.22	0.36	0.035	0.84
Reach-1	195.28	Alt3.5H	243000.00		6878.03	236121.97	901.30	917.52	918.41	0.000930	7.67	32647.20	2348.99	16.22	0.36	0.035	0.84
Reach-1	195.28	existing	285000.00		8577.68	276422.31	901.30	918.40	919.48	0.001050	8.46	34709.20	2353.80	17.10	0.38	0.035	1.00
Reach-1	195.28	Alt3.5B	285000.00		8577.68	276422.31	901.30	918.40	919.48	0.001050	8.46	34709.20	2353.80	17.10	0.38	0.035	1.00
Reach-1	195.28	Alt3.5D	285000.00		8577.68	276422.31	901.30	918.40	919.48	0.001050	8.46	34709.20	2353.80	17.10	0.38	0.035	1.00
Reach-1	195.28	Alt3.5H	285000.00		8577.68	276422.31	901.30	918.40	919.48	0.001050	8.46	34709.20	2353.80	17.10	0.38	0.035	1.00
Reach-1	195.38	existing	23500.00		1386.64	22113.36	902.10	906.90	907.08	0.001159	3.48	6895.45	1859.75	6.50	0.32	0.036	0.27
Reach-1	195.38	Alt3.5B	23500.00		1386.64	22113.36	902.10	906.90	907.08	0.001159	3.48	6895.45	1859.75	6.50	0.32	0.036	0.27
Reach-1	195.38	Alt3.5D	23500.00		1386.64	22113.36	902.10	906.90	907.08	0.001159	3.48	6895.45	1859.75	6.50	0.32	0.036	0.27
Reach-1	195.38	Alt3.5H	23500.00		1386.64	22113.36	902.10	906.90	907.08	0.001159	3.48	6895.45	1859.75	6.50	0.32	0.036	0.27
Reach-1	195.38	existing	57000.00		2999.89	54000.11	902.10	909.80	910.10	0.001058	4.46	13148.80	2477.13	9.40	0.33	0.036	0.37
Reach-1	195.38	Alt3.5B	57000.00		2999.89	54000.11	902.10	909.80	910.10	0.001058	4.46	13148.80	2477.13	9.40	0.33	0.036	0.37
Reach-1	195.38	Alt3.5D	57000.00		2999.89	54000.11	902.10	909.80	910.10	0.001058	4.46	13148.80	2477.13	9.40	0.33	0.036	0.37
Reach-1	195.38	Alt3.5H	57000.00		2999.89	54000.11	902.10	909.80	910.10	0.001058	4.46	13148.80	2477.13	9.40	0.33	0.036	0.37
Reach-1	195.38	existing	92000.00		4854.92	87145.08	902.10	911.84	912.26	0.001025	5.25	18267.46	2511.59	11.44	0.34	0.036	0.48
Reach-1	195.38	Alt3.5B	92000.00		4854.92	87145.08	902.10	911.84	912.26	0.001025	5.25	18267.46	2511.59	11.44	0.34	0.036	0.48
Reach-1	195.38	Alt3.5D	92000.00		4854.92	87145.08	902.10	911.84	912.26	0.001025	5.25	18267.46	2511.59	11.44	0.34	0.036	0.48
Reach-1	195.38	Alt3.5H	92000.00		4854.92	87145.08	902.10	911.84	912.26	0.001025	5.25	18267.46	2511.59	11.44	0.34	0.036	0.48
Reach-1	195.38	existing	185000.00		11635.75	173364.25	902.10	916.00	916.67	0.000983	6.74	28789.47	2570.80	15.60	0.35	0.037	0.71
Reach-1	195.38	Alt3.5B	185000.00		11635.75	173364.25	902.10	916.00	916.67	0.000983	6.74	28789.47	2570.80	15.60	0.35	0.037	0.71
Reach-1	195.38	Alt3.5D	185000.00		11635.75	173364.25	902.10	916.00	916.67	0.000983	6.74	28789.47	2570.80	15.60	0.35	0.037	0.71
Reach-1	195.38	Alt3.5H	185000.00		11635.75	173364.25	902.10	916.00	916.67	0.000983	6.74	28789.47	2570.80	15.60	0.35	0.037	0.71
Reach-1	195.38	existing	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3.5B	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3.5D	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	Alt3.5H	227000.00		15345.59	211654.41	902.10	917.55	918.33	0.000973	7.26	32789.55	2570.80	17.15	0.35	0.037	0.80
Reach-1	195.38	existing	243000.00		16779.55	226220.44	902.10	918.11	918.94	0.000970	7.44	34235.00	2570.80	17.71	0.35	0.037	0.83
Reach-1	195.38	Alt3.5B	243000.00		16779.55	226220.44	902.10	918.11	918.94	0.000970	7.44	34235.00	2570.80	17.71	0.35	0.037	0.83
Reach-1	195.38	Alt3.5D	243000.00		16779.55	226220.44	902.10	918.11	918.94	0.000970	7.44	34235.00	2570.80	17.71	0.35	0.037	0.83
Reach-1	195.38	Alt3.5H	243000.00		16779.55	226220.44	902.10	918.11	918.94	0.000970	7.44	34235.00	2570.80	17.71	0.35	0.037	0.83
Reach-1	195.38	existing	285000.00		20322.24	264677.78	902.10	919.09	920.07	0.001062	8.13	36736.29	2570.80	18.69	0.37	0.037	0.98
Reach-1	195.38	Alt3.5B	285000.00		20322.24	264677.78	902.10	919.09	920.07	0.001062	8.13	36736.29	2570.80	18.69	0.37	0.037	0.98
Reach-1	195.38	Alt3.5D	285000.00		20322.24	264677.78	902.10	919.09	920.07	0.001062	8.13	36736.29	2570.80	18.69	0.37	0.037	0.98
Reach-1	195.38	Alt3.5H	285000.00		20322.24	264677.78	902.10	919.09	920.07	0.001062	8.13	36736.29	2570.80	18.69	0.37	0.037	0.98
Reach-1	195.47	existing	23500.00		521.06	22978.94	902.10	907.55	907.78	0.001838	3.86	6147.26	1986.40	5.45	0.39	0.036	0.35
Reach-1	195.47	Alt3.5B	23500.00		521.06	22978.94	902.10	907.55	907.78	0.001838	3.86	6147.26	1986.40	5.45	0.39	0.036	0.35
Reach-1	195.47	Alt3.5D	23500.00		521.06	22978.94	902.10	907.55	907.78	0.001838	3.86	6147.26	1986.40	5.45	0.39	0.036	0.35
Reach-1	195.47	Alt3.5H	23500.00		521.06	22978.94	902.10	907.55	907.78	0.001838	3.86	6147.26	1986.40	5.45	0.39	0.036	0.35

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.47	existing	57000.00		1156.49	55843.52	902.10	910.33	910.67	0.001340	4.71	12206.27	2300.08	8.23	0.36	0.036	0.44
Reach-1	195.47	Alt3.5B	57000.00		1156.49	55843.52	902.10	910.33	910.67	0.001340	4.71	12206.27	2300.08	8.23	0.36	0.036	0.44
Reach-1	195.47	Alt3.5D	57000.00		1156.49	55843.52	902.10	910.33	910.67	0.001340	4.71	12206.27	2300.08	8.23	0.36	0.036	0.44
Reach-1	195.47	Alt3.5H	57000.00		1156.49	55843.52	902.10	910.33	910.67	0.001340	4.71	12206.27	2300.08	8.23	0.36	0.036	0.44
Reach-1	195.47	existing	92000.00		1700.74	90299.27	902.10	912.35	912.81	0.001250	5.44	17113.78	2482.15	10.25	0.36	0.036	0.54
Reach-1	195.47	Alt3.5B	92000.00		1700.74	90299.27	902.10	912.35	912.81	0.001250	5.44	17113.78	2482.15	10.25	0.36	0.036	0.54
Reach-1	195.47	Alt3.5D	92000.00		1700.74	90299.27	902.10	912.35	912.81	0.001250	5.44	17113.78	2482.15	10.25	0.36	0.036	0.54
Reach-1	195.47	Alt3.5H	92000.00		1700.74	90299.27	902.10	912.35	912.81	0.001250	5.44	17113.78	2482.15	10.25	0.36	0.036	0.54
Reach-1	195.47	existing	185000.00		3847.35	181152.64	902.10	916.47	917.18	0.001136	6.84	27380.83	2501.46	14.37	0.36	0.037	0.78
Reach-1	195.47	Alt3.5B	185000.00		3847.35	181152.64	902.10	916.47	917.18	0.001136	6.84	27380.83	2501.46	14.37	0.36	0.037	0.78
Reach-1	195.47	Alt3.5D	185000.00		3847.35	181152.64	902.10	916.47	917.18	0.001136	6.84	27380.83	2501.46	14.37	0.36	0.037	0.78
Reach-1	195.47	Alt3.5H	185000.00		3847.35	181152.64	902.10	916.47	917.18	0.001136	6.84	27380.83	2501.46	14.37	0.36	0.037	0.78
Reach-1	195.47	existing	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3.5B	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3.5D	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	Alt3.5H	227000.00		4842.96	222157.05	902.10	918.01	918.84	0.001116	7.36	31248.88	2503.60	15.91	0.37	0.037	0.87
Reach-1	195.47	existing	243000.00		5231.28	237768.73	902.10	918.57	919.44	0.001110	7.54	32648.15	2504.00	16.47	0.37	0.037	0.91
Reach-1	195.47	Alt3.5B	243000.00		5231.28	237768.73	902.10	918.57	919.44	0.001110	7.54	32648.15	2504.00	16.47	0.37	0.037	0.91
Reach-1	195.47	Alt3.5D	243000.00		5231.28	237768.73	902.10	918.57	919.44	0.001110	7.54	32648.15	2504.00	16.47	0.37	0.037	0.91
Reach-1	195.47	Alt3.5H	243000.00		5231.28	237768.73	902.10	918.57	919.44	0.001110	7.54	32648.15	2504.00	16.47	0.37	0.037	0.91
Reach-1	195.47	existing	285000.00		6233.46	278766.53	902.10	919.59	920.62	0.001197	8.21	35188.98	2504.00	17.49	0.38	0.037	1.05
Reach-1	195.47	Alt3.5B	285000.00		6233.46	278766.53	902.10	919.59	920.62	0.001197	8.21	35188.98	2504.00	17.49	0.38	0.037	1.05
Reach-1	195.47	Alt3.5D	285000.00		6233.46	278766.53	902.10	919.59	920.62	0.001197	8.21	35188.98	2504.00	17.49	0.38	0.037	1.05
Reach-1	195.47	Alt3.5H	285000.00		6233.46	278766.53	902.10	919.59	920.62	0.001197	8.21	35188.98	2504.00	17.49	0.38	0.037	1.05
Reach-1	195.56	existing	23500.00			23500.00	901.40	908.27	908.42	0.000902	3.14	7483.73	1885.84	6.87	0.28	0.036	0.22
Reach-1	195.56	Alt3.5B	23500.00			23500.00	901.40	908.27	908.42	0.000902	3.14	7483.73	1885.84	6.87	0.28	0.036	0.22
Reach-1	195.56	Alt3.5D	23500.00			23500.00	901.40	908.27	908.42	0.000902	3.14	7483.73	1885.84	6.87	0.28	0.036	0.22
Reach-1	195.56	Alt3.5H	23500.00			23500.00	901.40	908.27	908.42	0.000902	3.14	7483.73	1885.84	6.87	0.28	0.036	0.22
Reach-1	195.56	existing	57000.00			57000.00	901.40	910.95	911.26	0.001006	4.49	12696.16	2034.82	9.55	0.32	0.036	0.39
Reach-1	195.56	Alt3.5B	57000.00			57000.00	901.40	910.95	911.26	0.001006	4.49	12696.16	2034.82	9.55	0.32	0.036	0.39
Reach-1	195.56	Alt3.5D	57000.00			57000.00	901.40	910.95	911.26	0.001006	4.49	12696.16	2034.82	9.55	0.32	0.036	0.39
Reach-1	195.56	Alt3.5H	57000.00			57000.00	901.40	910.95	911.26	0.001006	4.49	12696.16	2034.82	9.55	0.32	0.036	0.39
Reach-1	195.56	existing	92000.00			92000.00	901.40	912.95	913.40	0.001102	5.42	16978.54	2213.99	11.55	0.34	0.036	0.53
Reach-1	195.56	Alt3.5B	92000.00			92000.00	901.40	912.95	913.40	0.001102	5.42	16978.54	2213.99	11.55	0.34	0.036	0.53
Reach-1	195.56	Alt3.5D	92000.00			92000.00	901.40	912.95	913.40	0.001102	5.42	16978.54	2213.99	11.55	0.34	0.036	0.53
Reach-1	195.56	Alt3.5H	92000.00			92000.00	901.40	912.95	913.40	0.001102	5.42	16978.54	2213.99	11.55	0.34	0.036	0.53
Reach-1	195.56	existing	185000.00			185000.00	901.40	917.00	917.78	0.001118	7.08	26121.08	2287.44	15.60	0.37	0.036	0.79
Reach-1	195.56	Alt3.5B	185000.00			185000.00	901.40	917.00	917.78	0.001118	7.08	26121.08	2287.44	15.60	0.37	0.036	0.79
Reach-1	195.56	Alt3.5D	185000.00			185000.00	901.40	917.00	917.78	0.001118	7.08	26121.08	2287.44	15.60	0.37	0.036	0.79
Reach-1	195.56	Alt3.5H	185000.00			185000.00	901.40	917.00	917.78	0.001118	7.08	26121.08	2287.44	15.60	0.37	0.036	0.79
Reach-1	195.56	existing	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3.5B	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3.5D	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	Alt3.5H	227000.00			227000.00	901.40	918.52	919.44	0.001118	7.66	29616.15	2293.62	17.12	0.38	0.036	0.90
Reach-1	195.56	existing	243000.00			243000.00	901.40	919.08	920.04	0.001118	7.87	30882.30	2295.86	17.68	0.38	0.036	0.93
Reach-1	195.56	Alt3.5B	243000.00			243000.00	901.40	919.08	920.04	0.001118	7.87	30882.30	2295.86	17.68	0.38	0.036	0.93
Reach-1	195.56	Alt3.5D	243000.00			243000.00	901.40	919.08	920.04	0.001118	7.87	30882.30	2295.86	17.68	0.38	0.036	0.93
Reach-1	195.56	Alt3.5H	243000.00			243000.00	901.40	919.08	920.04	0.001118	7.87	30882.30	2295.86	17.68	0.38	0.036	0.93
Reach-1	195.56	existing	285000.00			285000.00	901.40	920.12	921.26	0.001204	8.56	33289.39	2300.00	18.72	0.40	0.036	1.08
Reach-1	195.56	Alt3.5B	285000.00			285000.00	901.40	920.12	921.26	0.001204	8.56	33289.39	2300.00	18.72	0.40	0.036	1.08
Reach-1	195.56	Alt3.5D	285000.00			285000.00	901.40	920.12	921.26	0.001204	8.56	33289.39	2300.00	18.72	0.40	0.036	1.08
Reach-1	195.56	Alt3.5H	285000.00			285000.00	901.40	920.12	921.26	0.001204	8.56	33289.39	2300.00	18.72	0.40	0.036	1.08
Reach-1	195.66	existing	23500.00		597.87	22902.13	903.10	908.73	908.90	0.001000	3.28	7332.87	1967.12	5.63	0.30	0.035	0.24
Reach-1	195.66	Alt3.5B	23500.00		597.87	22902.13	903.10	908.73	908.90	0.001000	3.28	7332.87	1967.12	5.63	0.30	0.035	0.24
Reach-1	195.66	Alt3.5D	23500.00		597.87	22902.13	903.10	908.73	908.90	0.001000	3.28	7332.87	1967.12	5.63	0.30	0.035	0.24
Reach-1	195.66	Alt3.5H	23500.00		597.87	22902.13	903.10	908.73	908.90	0.001000	3.28	7332.87	1967.12	5.63	0.30	0.035	0.24
Reach-1	195.66	existing	57000.00		2116.42	54883.58	903.10	911.46	911.77	0.001031	4.52	13016.72	2293.15	8.36	0.32	0.036	0.39
Reach-1	195.66	Alt3.5B	57000.00		2116.42	54883.58	903.10	911.46	911.77	0.001031	4.52	13016.72	2293.15	8.36	0.32	0.036	0.39

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.66	Alt3.5D	57000.00		2116.42	54883.58	903.10	911.46	911.77	0.001031	4.52	13016.72	2293.15	8.36	0.32	0.036	0.39
Reach-1	195.66	Alt3.5H	57000.00		2116.42	54883.58	903.10	911.46	911.77	0.001031	4.52	13016.72	2293.15	8.36	0.32	0.036	0.39
Reach-1	195.66	existing	92000.00		3755.75	88244.25	903.10	913.49	913.93	0.001024	5.43	17938.89	2493.79	10.39	0.34	0.036	0.51
Reach-1	195.66	Alt3.5B	92000.00		3755.75	88244.25	903.10	913.49	913.93	0.001024	5.43	17938.89	2493.79	10.39	0.34	0.036	0.51
Reach-1	195.66	Alt3.5D	92000.00		3755.75	88244.25	903.10	913.49	913.93	0.001024	5.43	17938.89	2493.79	10.39	0.34	0.036	0.51
Reach-1	195.66	Alt3.5H	92000.00		3755.75	88244.25	903.10	913.49	913.93	0.001024	5.43	17938.89	2493.79	10.39	0.34	0.036	0.51
Reach-1	195.66	existing	185000.00	50.45	12837.35	172112.20	903.10	917.59	918.30	0.000992	6.97	28337.05	2577.04	14.49	0.36	0.036	0.74
Reach-1	195.66	Alt3.5B	185000.00	50.45	12837.35	172112.20	903.10	917.59	918.30	0.000992	6.97	28337.05	2577.04	14.49	0.36	0.036	0.74
Reach-1	195.66	Alt3.5D	185000.00	50.45	12837.35	172112.20	903.10	917.59	918.30	0.000992	6.97	28337.05	2577.04	14.49	0.36	0.036	0.74
Reach-1	195.66	Alt3.5H	185000.00	50.45	12837.35	172112.20	903.10	917.59	918.30	0.000992	6.97	28337.05	2577.04	14.49	0.36	0.036	0.74
Reach-1	195.66	existing	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3.5B	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3.5D	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	Alt3.5H	227000.00	206.44	17301.89	209491.66	903.10	919.13	919.96	0.000978	7.51	32326.07	2581.29	16.03	0.36	0.036	0.82
Reach-1	195.66	existing	243000.00	283.81	19035.56	223680.63	903.10	919.69	920.56	0.000974	7.70	33770.91	2582.83	16.59	0.36	0.036	0.85
Reach-1	195.66	Alt3.5B	243000.00	283.81	19035.56	223680.63	903.10	919.69	920.56	0.000974	7.70	33770.91	2582.83	16.59	0.36	0.036	0.85
Reach-1	195.66	Alt3.5D	243000.00	283.81	19035.56	223680.63	903.10	919.69	920.56	0.000974	7.70	33770.91	2582.83	16.59	0.36	0.036	0.85
Reach-1	195.66	Alt3.5H	243000.00	283.81	19035.56	223680.63	903.10	919.69	920.56	0.000974	7.70	33770.91	2582.83	16.59	0.36	0.036	0.85
Reach-1	195.66	existing	285000.00	484.67	23399.32	261116.02	903.10	920.81	921.82	0.001028	8.32	36657.66	2585.90	17.71	0.38	0.036	0.97
Reach-1	195.66	Alt3.5B	285000.00	484.67	23399.32	261116.02	903.10	920.81	921.82	0.001028	8.32	36657.66	2585.90	17.71	0.38	0.036	0.97
Reach-1	195.66	Alt3.5D	285000.00	484.67	23399.32	261116.02	903.10	920.81	921.82	0.001028	8.32	36657.66	2585.90	17.71	0.38	0.036	0.97
Reach-1	195.66	Alt3.5H	285000.00	484.67	23399.32	261116.02	903.10	920.81	921.82	0.001028	8.32	36657.66	2585.90	17.71	0.38	0.036	0.97
Reach-1	195.75	existing	23500.00		704.82	22795.18	903.40	909.33	909.64	0.002145	4.57	5361.84	1641.15	5.93	0.43	0.035	0.48
Reach-1	195.75	Alt3.5B	23500.00		704.82	22795.18	903.40	909.33	909.64	0.002145	4.57	5361.84	1641.15	5.93	0.43	0.035	0.48
Reach-1	195.75	Alt3.5D	23500.00		704.82	22795.18	903.40	909.33	909.64	0.002145	4.57	5361.84	1641.15	5.93	0.43	0.035	0.48
Reach-1	195.75	Alt3.5H	23500.00		704.82	22795.18	903.40	909.33	909.64	0.002145	4.57	5361.84	1641.15	5.93	0.43	0.035	0.48
Reach-1	195.75	existing	57000.00		3886.88	53113.12	903.40	911.99	912.51	0.001903	5.96	10291.16	2063.00	8.59	0.44	0.036	0.69
Reach-1	195.75	Alt3.5B	57000.00		3886.88	53113.12	903.40	911.99	912.51	0.001903	5.96	10291.16	2063.00	8.59	0.44	0.036	0.69
Reach-1	195.75	Alt3.5D	57000.00		3886.88	53113.12	903.40	911.99	912.51	0.001903	5.96	10291.16	2063.00	8.59	0.44	0.036	0.69
Reach-1	195.75	Alt3.5H	57000.00		3886.88	53113.12	903.40	911.99	912.51	0.001903	5.96	10291.16	2063.00	8.59	0.44	0.036	0.69
Reach-1	195.75	existing	92000.00		8204.33	83795.66	903.40	913.97	914.67	0.001801	7.00	14771.09	2436.91	10.57	0.45	0.036	0.86
Reach-1	195.75	Alt3.5B	92000.00		8204.33	83795.66	903.40	913.97	914.67	0.001801	7.00	14771.09	2436.91	10.57	0.45	0.036	0.86
Reach-1	195.75	Alt3.5D	92000.00		8204.33	83795.66	903.40	913.97	914.67	0.001801	7.00	14771.09	2436.91	10.57	0.45	0.036	0.86
Reach-1	195.75	Alt3.5H	92000.00		8204.33	83795.66	903.40	913.97	914.67	0.001801	7.00	14771.09	2436.91	10.57	0.45	0.036	0.86
Reach-1	195.75	existing	185000.00		27716.84	157283.17	903.40	917.99	919.01	0.001573	8.59	24803.60	2516.25	14.59	0.45	0.037	1.13
Reach-1	195.75	Alt3.5B	185000.00		27716.84	157283.17	903.40	917.99	919.01	0.001573	8.59	24803.60	2516.25	14.59	0.45	0.037	1.13
Reach-1	195.75	Alt3.5D	185000.00		27716.84	157283.17	903.40	917.99	919.01	0.001573	8.59	24803.60	2516.25	14.59	0.45	0.037	1.13
Reach-1	195.75	Alt3.6H	185000.00		27716.84	157283.17	903.40	917.99	919.01	0.001573	8.59	24803.60	2516.25	14.59	0.45	0.037	1.13
Reach-1	195.75	existing	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3.5B	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3.5D	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	Alt3.6H	227000.00		37759.14	189240.88	903.40	919.52	920.65	0.001514	9.12	28650.92	2525.34	16.12	0.45	0.037	1.23
Reach-1	195.75	existing	243000.00		41638.54	201361.45	903.40	920.07	921.25	0.001495	9.31	30046.20	2527.21	16.67	0.45	0.038	1.26
Reach-1	195.75	Alt3.5B	243000.00		41638.54	201361.45	903.40	920.07	921.25	0.001495	9.31	30046.20	2527.21	16.67	0.45	0.038	1.26
Reach-1	195.75	Alt3.5D	243000.00		41638.54	201361.45	903.40	920.07	921.25	0.001495	9.31	30046.20	2527.21	16.67	0.45	0.038	1.26
Reach-1	195.75	Alt3.5H	243000.00		41638.54	201361.45	903.40	920.07	921.25	0.001495	9.31	30046.20	2527.21	16.67	0.45	0.038	1.26
Reach-1	195.75	existing	285000.00		51423.31	233576.67	903.40	921.20	922.55	0.001544	9.97	32901.02	2531.02	17.80	0.46	0.038	1.41
Reach-1	195.75	Alt3.5B	285000.00		51423.31	233576.67	903.40	921.20	922.55	0.001544	9.97	32901.02	2531.02	17.80	0.46	0.038	1.41
Reach-1	195.75	Alt3.5D	285000.00		51423.31	233576.67	903.40	921.20	922.55	0.001544	9.97	32901.02	2531.02	17.80	0.46	0.038	1.41
Reach-1	195.75	Alt3.5H	285000.00		51423.31	233576.67	903.40	921.20	922.55	0.001544	9.97	32901.02	2531.02	17.80	0.46	0.038	1.41
Reach-1	195.85	existing	23500.00		82.62	23417.38	904.50	910.21	910.47	0.001277	4.12	5752.60	1424.66	5.71	0.34	0.035	0.36
Reach-1	195.85	Alt3.5B	23500.00		82.62	23417.38	904.50	910.21	910.47	0.001277	4.12	5752.60	1424.66	5.71	0.34	0.035	0.36
Reach-1	195.85	Alt3.6D	23500.00		82.62	23417.38	904.50	910.21	910.47	0.001277	4.12	5752.60	1424.66	5.71	0.34	0.035	0.36
Reach-1	195.85	Alt3.5H	23500.00		82.62	23417.38	904.50	910.21	910.47	0.001277	4.12	5752.60	1424.66	5.71	0.34	0.035	0.36
Reach-1	195.85	existing	57000.00		1994.72	55005.28	904.50	912.83	913.39	0.001534	6.10	10502.34	2107.60	8.33	0.40	0.036	0.67
Reach-1	195.85	Alt3.5B	57000.00		1994.72	55005.28	904.50	912.83	913.39	0.001534	6.10	10502.34	2107.60	8.33	0.40	0.036	0.67
Reach-1	195.85	Alt3.5D	57000.00		1994.72	55005.28	904.50	912.83	913.39	0.001534	6.10	10502.34	2107.60	8.33	0.40	0.036	0.67
Reach-1	195.85	Alt3.5H	57000.00		1994.72	55005.28	904.50	912.83	913.39	0.001534	6.10	10502.34	2107.60	8.33	0.40	0.036	0.67

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	195.85	existing	92000.00		6015.67	85984.33	904.50	914.78	915.59	0.001674	7.47	14898.13	2483.79	10.28	0.44	0.037	0.93
Reach-1	195.85	Alt3.5B	92000.00		6015.67	85984.33	904.50	914.78	915.59	0.001674	7.47	14898.13	2483.79	10.28	0.44	0.037	0.93
Reach-1	195.85	Alt3.5D	92000.00		6015.67	85984.33	904.50	914.78	915.59	0.001674	7.47	14898.13	2483.79	10.28	0.44	0.037	0.93
Reach-1	195.85	Alt3.5H	92000.00		6015.67	85984.33	904.50	914.78	915.59	0.001674	7.47	14898.13	2483.79	10.28	0.44	0.037	0.93
Reach-1	195.85	existing	185000.00		24104.88	160895.13	904.50	918.65	919.95	0.001775	9.74	24994.32	2621.61	14.15	0.48	0.040	1.41
Reach-1	195.85	Alt3.5B	185000.00		24104.88	160895.13	904.50	918.65	919.95	0.001775	9.74	24994.32	2621.61	14.15	0.48	0.040	1.41
Reach-1	195.85	Alt3.5D	185000.00		24104.88	160895.13	904.50	918.65	919.95	0.001775	9.74	24994.32	2621.61	14.15	0.48	0.040	1.41
Reach-1	195.85	Alt3.5H	185000.00		24104.88	160895.13	904.50	918.65	919.95	0.001775	9.74	24994.32	2621.61	14.15	0.48	0.040	1.41
Reach-1	195.85	existing	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3.5B	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3.5D	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	Alt3.5H	227000.00		33841.78	193158.20	904.50	920.12	921.60	0.001783	10.49	28850.89	2623.35	15.62	0.49	0.041	1.58
Reach-1	195.85	existing	243000.00		37674.03	205325.97	904.50	920.65	922.20	0.001784	10.75	30248.40	2623.98	16.15	0.49	0.041	1.63
Reach-1	195.85	Alt3.5B	243000.00		37674.03	205325.97	904.50	920.65	922.20	0.001784	10.75	30248.40	2623.98	16.15	0.49	0.041	1.63
Reach-1	195.85	Alt3.5D	243000.00		37674.03	205325.97	904.50	920.65	922.20	0.001784	10.75	30248.40	2623.98	16.15	0.49	0.041	1.63
Reach-1	195.85	Alt3.5H	243000.00		37674.03	205325.97	904.50	920.65	922.20	0.001784	10.75	30248.40	2623.98	16.15	0.49	0.041	1.63
Reach-1	195.85	existing	285000.00		47416.00	237584.00	904.50	921.78	923.54	0.001872	11.56	33201.43	2625.30	17.28	0.51	0.042	1.84
Reach-1	195.85	Alt3.5B	285000.00		47416.00	237584.00	904.50	921.78	923.54	0.001872	11.56	33201.43	2625.30	17.28	0.51	0.042	1.84
Reach-1	195.85	Alt3.5D	285000.00		47416.00	237584.00	904.50	921.78	923.54	0.001872	11.56	33201.43	2625.30	17.28	0.51	0.042	1.84
Reach-1	195.85	Alt3.5H	285000.00		47416.00	237584.00	904.50	921.78	923.54	0.001872	11.56	33201.43	2625.30	17.28	0.51	0.042	1.84
Reach-1	195.94	existing	23500.00		623.20	22876.80	904.50	910.90	911.17	0.001485	4.27	6079.33	1826.72	6.40	0.37	0.036	0.39
Reach-1	195.94	Alt3.5B	23500.00		623.20	22876.80	904.50	910.90	911.17	0.001485	4.27	6079.33	1826.72	6.40	0.37	0.036	0.39
Reach-1	195.94	Alt3.5D	23500.00		623.20	22876.80	904.50	910.90	911.17	0.001485	4.27	6079.33	1826.72	6.40	0.37	0.036	0.39
Reach-1	195.94	Alt3.5H	23500.00		623.20	22876.80	904.50	910.90	911.17	0.001485	4.27	6079.33	1826.72	6.40	0.37	0.036	0.39
Reach-1	195.94	existing	57000.00		4218.98	52781.02	904.50	913.64	914.16	0.001499	5.96	12215.15	2745.90	9.14	0.40	0.038	0.65
Reach-1	195.94	Alt3.5B	57000.00		4218.98	52781.02	904.50	913.64	914.16	0.001499	5.96	12215.15	2745.90	9.14	0.40	0.038	0.65
Reach-1	195.94	Alt3.5D	57000.00		4218.98	52781.02	904.50	913.64	914.16	0.001499	5.96	12215.15	2745.90	9.14	0.40	0.038	0.65
Reach-1	195.94	Alt3.5H	57000.00		4218.98	52781.02	904.50	913.64	914.16	0.001499	5.96	12215.15	2745.90	9.14	0.40	0.038	0.65
Reach-1	195.94	existing	92000.00		11886.36	80113.64	904.50	915.72	916.38	0.001446	6.96	18014.63	2840.13	11.22	0.41	0.041	0.81
Reach-1	195.94	Alt3.5B	92000.00		11886.36	80113.64	904.50	915.72	916.38	0.001446	6.96	18014.63	2840.13	11.22	0.41	0.041	0.81
Reach-1	195.94	Alt3.5D	92000.00		11886.36	80113.64	904.50	915.72	916.38	0.001446	6.96	18014.63	2840.13	11.22	0.41	0.041	0.81
Reach-1	195.94	Alt3.5H	92000.00		11886.36	80113.64	904.50	915.72	916.38	0.001446	6.96	18014.63	2840.13	11.22	0.41	0.041	0.81
Reach-1	195.94	existing	185000.00		36669.42	148330.58	904.50	919.76	920.77	0.001444	8.89	29498.55	2843.04	15.26	0.43	0.044	1.17
Reach-1	195.94	Alt3.5B	185000.00		36669.42	148330.58	904.50	919.76	920.77	0.001444	8.89	29498.55	2843.04	15.26	0.43	0.044	1.17
Reach-1	195.94	Alt3.5D	185000.00		36669.42	148330.58	904.50	919.76	920.77	0.001444	8.89	29498.55	2843.04	15.26	0.43	0.044	1.17
Reach-1	195.94	Alt3.5H	185000.00		36669.42	148330.58	904.50	919.76	920.77	0.001444	8.89	29498.55	2843.04	15.26	0.43	0.044	1.17
Reach-1	195.94	existing	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3.5B	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3.5D	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	Alt3.5H	227000.00		48656.68	178343.31	904.50	921.27	922.42	0.001450	9.58	33797.26	2844.13	16.77	0.44	0.045	1.31
Reach-1	195.94	existing	243000.00		53307.04	189692.95	904.50	921.82	923.02	0.001451	9.82	35350.85	2844.53	17.32	0.45	0.045	1.35
Reach-1	195.94	Alt3.5B	243000.00		53307.04	189692.95	904.50	921.82	923.02	0.001451	9.82	35350.85	2844.53	17.32	0.45	0.045	1.35
Reach-1	195.94	Alt3.5D	243000.00		53307.04	189692.95	904.50	921.82	923.02	0.001451	9.82	35350.85	2844.53	17.32	0.45	0.045	1.35
Reach-1	195.94	Alt3.5H	243000.00		53307.04	189692.95	904.50	921.82	923.02	0.001451	9.82	35350.85	2844.53	17.32	0.45	0.045	1.35
Reach-1	195.94	existing	285000.00		65366.17	219633.84	904.50	923.04	924.41	0.001502	10.51	38823.01	2845.41	18.54	0.46	0.045	1.51
Reach-1	195.94	Alt3.5B	285000.00		65366.17	219633.84	904.50	923.04	924.41	0.001502	10.51	38823.01	2845.41	18.54	0.46	0.045	1.51
Reach-1	195.94	Alt3.5D	285000.00		65366.17	219633.84	904.50	923.04	924.41	0.001502	10.51	38823.01	2845.41	18.54	0.46	0.045	1.51
Reach-1	195.94	Alt3.5H	285000.00		65366.17	219633.84	904.50	923.04	924.41	0.001502	10.51	38823.01	2845.41	18.54	0.46	0.045	1.51
Reach-1	196.04	existing	23500.00		2637.26	20862.74	904.50	911.64	911.77	0.000926	2.95	9108.12	2996.46	7.14	0.25	0.042	0.26
Reach-1	196.04	Alt3.5B	23500.00		2637.26	20862.74	904.50	911.64	911.77	0.000926	2.95	9108.12	2996.46	7.14	0.25	0.042	0.26
Reach-1	196.04	Alt3.5D	23500.00		2637.26	20862.74	904.50	911.64	911.77	0.000926	2.95	9108.12	2996.46	7.14	0.25	0.042	0.26
Reach-1	196.04	Alt3.5H	23500.00		2637.26	20862.74	904.50	911.64	911.77	0.000926	2.95	9108.12	2996.46	7.14	0.25	0.042	0.26
Reach-1	196.04	existing	57000.00		14660.18	42339.82	904.50	914.54	914.71	0.000755	3.57	19421.65	3762.12	10.04	0.24	0.044	0.33
Reach-1	196.04	Alt3.5B	57000.00		14660.18	42339.82	904.50	914.54	914.71	0.000755	3.57	19421.65	3762.12	10.04	0.24	0.044	0.33
Reach-1	196.04	Alt3.5D	57000.00		14660.18	42339.82	904.50	914.54	914.71	0.000755	3.57	19421.65	3762.12	10.04	0.24	0.044	0.33
Reach-1	196.04	Alt3.5H	57000.00		14660.18	42339.82	904.50	914.54	914.71	0.000755	3.57	19421.65	3762.12	10.04	0.24	0.044	0.33
Reach-1	196.04	existing	92000.00		29762.59	62237.41	904.50	916.70	916.90	0.000668	4.00	27528.14	3766.32	12.20	0.23	0.044	0.38
Reach-1	196.04	Alt3.5B	92000.00		29762.59	62237.41	904.50	916.70	916.90	0.000668	4.00	27528.14	3766.32	12.20	0.23	0.044	0.38

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.04	Alt3.5D	92000.00		29762.59	62237.41	904.50	916.70	916.90	0.000668	4.00	27528.14	3766.32	12.20	0.23	0.044	0.38
Reach-1	196.04	Alt3.5H	92000.00		29762.59	62237.41	904.50	916.70	916.90	0.000668	4.00	27528.14	3766.32	12.20	0.23	0.044	0.38
Reach-1	196.04	existing	185000.00		71630.48	113369.52	904.50	920.98	921.29	0.000617	4.96	43684.82	3774.66	16.48	0.24	0.045	0.51
Reach-1	196.04	Alt3.5B	185000.00		71630.48	113369.52	904.50	920.98	921.29	0.000617	4.96	43684.82	3774.66	16.48	0.24	0.045	0.51
Reach-1	196.04	Alt3.5D	185000.00		71630.48	113369.52	904.50	920.98	921.29	0.000617	4.96	43684.82	3774.66	16.48	0.24	0.045	0.51
Reach-1	196.04	Alt3.5H	185000.00		71630.48	113369.52	904.50	920.98	921.29	0.000617	4.96	43684.82	3774.66	16.48	0.24	0.045	0.51
Reach-1	196.04	existing	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3.5B	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3.5D	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	Alt3.5H	227000.00		91010.93	135989.06	904.50	922.60	922.95	0.000608	5.30	49791.00	3777.81	18.10	0.24	0.045	0.56
Reach-1	196.04	existing	243000.00		98445.38	144554.63	904.50	923.18	923.55	0.000605	5.42	52000.30	3778.95	18.68	0.24	0.045	0.58
Reach-1	196.04	Alt3.5B	243000.00		98445.38	144554.63	904.50	923.18	923.55	0.000605	5.42	52000.30	3778.95	18.68	0.24	0.045	0.58
Reach-1	196.04	Alt3.5D	243000.00		98445.38	144554.63	904.50	923.18	923.55	0.000605	5.42	52000.30	3778.95	18.68	0.24	0.045	0.58
Reach-1	196.04	Alt3.5H	243000.00		98445.38	144554.63	904.50	923.18	923.55	0.000605	5.42	52000.30	3778.95	18.68	0.24	0.045	0.58
Reach-1	196.04	existing	285000.00		117886.92	167113.09	904.50	924.54	924.96	0.000613	5.76	57130.56	3781.60	20.04	0.25	0.045	0.64
Reach-1	196.04	Alt3.5B	285000.00		117886.92	167113.09	904.50	924.54	924.96	0.000613	5.76	57130.56	3781.60	20.04	0.25	0.045	0.64
Reach-1	196.04	Alt3.5D	285000.00		117886.92	167113.09	904.50	924.54	924.96	0.000613	5.76	57130.56	3781.60	20.04	0.25	0.045	0.64
Reach-1	196.04	Alt3.5H	285000.00		117886.92	167113.09	904.50	924.54	924.96	0.000613	5.76	57130.56	3781.60	20.04	0.25	0.045	0.64
Reach-1	196.13	existing	23500.00		961.21	22538.79	904.90	912.10	912.20	0.000854	2.66	9139.47	2693.09	7.20	0.24	0.041	0.21
Reach-1	196.13	Alt3.5B	23500.00		961.21	22538.79	904.90	912.10	912.20	0.000854	2.66	9139.47	2693.09	7.20	0.24	0.041	0.21
Reach-1	196.13	Alt3.5D	23500.00		961.21	22538.79	904.90	912.10	912.20	0.000854	2.66	9139.47	2693.09	7.20	0.24	0.041	0.21
Reach-1	196.13	Alt3.5H	23500.00		961.21	22538.79	904.90	912.10	912.20	0.000854	2.66	9139.47	2693.09	7.20	0.24	0.041	0.21
Reach-1	196.13	existing	57000.00		7470.90	49529.10	904.90	914.92	915.07	0.000747	3.33	18839.65	4307.05	10.02	0.23	0.041	0.30
Reach-1	196.13	Alt3.5B	57000.00		7470.90	49529.10	904.90	914.92	915.07	0.000747	3.33	18839.65	4307.05	10.02	0.23	0.041	0.30
Reach-1	196.13	Alt3.5D	57000.00		7470.90	49529.10	904.90	914.92	915.07	0.000747	3.33	18839.65	4307.05	10.02	0.23	0.041	0.30
Reach-1	196.13	Alt3.5H	57000.00		7470.90	49529.10	904.90	914.92	915.07	0.000747	3.33	18839.65	4307.05	10.02	0.23	0.041	0.30
Reach-1	196.13	existing	92000.00		20747.14	71252.85	904.90	917.05	917.22	0.000640	3.53	28734.35	4735.71	12.15	0.22	0.042	0.31
Reach-1	196.13	Alt3.5B	92000.00		20747.14	71252.85	904.90	917.05	917.22	0.000640	3.53	28734.35	4735.71	12.15	0.22	0.042	0.31
Reach-1	196.13	Alt3.5D	92000.00		20747.14	71252.85	904.90	917.05	917.22	0.000640	3.53	28734.35	4735.71	12.15	0.22	0.042	0.31
Reach-1	196.13	Alt3.5H	92000.00		20747.14	71252.85	904.90	917.05	917.22	0.000640	3.53	28734.35	4735.71	12.15	0.22	0.042	0.31
Reach-1	196.13	existing	185000.00		57388.43	127611.57	904.90	921.34	921.56	0.000499	4.08	49157.88	4774.00	16.44	0.21	0.043	0.38
Reach-1	196.13	Alt3.5B	185000.00		57388.43	127611.57	904.90	921.34	921.56	0.000499	4.08	49157.88	4774.00	16.44	0.21	0.043	0.38
Reach-1	196.13	Alt3.5D	185000.00		57388.43	127611.57	904.90	921.34	921.56	0.000499	4.08	49157.88	4774.00	16.44	0.21	0.043	0.38
Reach-1	196.13	Alt3.5H	185000.00		57388.43	127611.57	904.90	921.34	921.56	0.000499	4.08	49157.88	4774.00	16.44	0.21	0.043	0.38
Reach-1	196.13	existing	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3.5B	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3.5D	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	Alt3.5H	227000.00		74366.45	152633.55	904.90	922.96	923.22	0.000472	4.30	56927.87	4774.00	18.06	0.20	0.043	0.40
Reach-1	196.13	existing	243000.00		80886.95	162113.06	904.90	923.55	923.82	0.000464	4.38	59740.87	4774.00	18.65	0.20	0.043	0.41
Reach-1	196.13	Alt3.5B	243000.00		80886.95	162113.06	904.90	923.55	923.82	0.000464	4.38	59740.87	4774.00	18.65	0.20	0.043	0.41
Reach-1	196.13	Alt3.5D	243000.00		80886.95	162113.06	904.90	923.55	923.82	0.000464	4.38	59740.87	4774.00	18.65	0.20	0.043	0.41
Reach-1	196.13	Alt3.5H	243000.00		80886.95	162113.06	904.90	923.55	923.82	0.000464	4.38	59740.87	4774.00	18.65	0.20	0.043	0.41
Reach-1	196.13	existing	285000.00		97906.09	187093.92	904.90	924.93	925.22	0.000456	4.61	66315.31	4774.00	20.03	0.21	0.043	0.44
Reach-1	196.13	Alt3.5B	285000.00		97906.09	187093.92	904.90	924.93	925.22	0.000456	4.61	66315.31	4774.00	20.03	0.21	0.043	0.44
Reach-1	196.13	Alt3.5D	285000.00		97906.09	187093.92	904.90	924.93	925.22	0.000456	4.61	66315.31	4774.00	20.03	0.21	0.043	0.44
Reach-1	196.13	Alt3.5H	285000.00		97906.09	187093.92	904.90	924.93	925.22	0.000456	4.61	66315.31	4774.00	20.03	0.21	0.043	0.44
Reach-1	196.23	existing	23500.00			23500.00	906.00	912.59	912.77	0.001384	3.36	6984.58	2008.68	6.59	0.32	0.039	0.30
Reach-1	196.23	Alt3.5B	23500.00			23500.00	906.00	912.59	912.77	0.001384	3.36	6984.58	2008.68	6.59	0.32	0.039	0.30
Reach-1	196.23	Alt3.5D	23500.00			23500.00	906.00	912.59	912.77	0.001384	3.36	6984.58	2008.68	6.59	0.32	0.039	0.30
Reach-1	196.23	Alt3.5H	23500.00			23500.00	906.00	912.59	912.77	0.001384	3.36	6984.58	2008.68	6.59	0.32	0.039	0.30
Reach-1	196.23	existing	57000.00		1418.61	55581.39	906.00	915.33	915.58	0.001263	4.04	15547.25	4911.08	9.33	0.32	0.041	0.40
Reach-1	196.23	Alt3.5B	57000.00		1418.61	55581.39	906.00	915.33	915.58	0.001263	4.04	15547.25	4911.08	9.33	0.32	0.041	0.40
Reach-1	196.23	Alt3.5D	57000.00		1418.61	55581.39	906.00	915.33	915.58	0.001263	4.04	15547.25	4911.08	9.33	0.32	0.041	0.40
Reach-1	196.23	Alt3.5H	57000.00		1418.61	55581.39	906.00	915.33	915.58	0.001263	4.04	15547.25	4911.08	9.33	0.32	0.041	0.40
Reach-1	196.23	existing	92000.00		11032.67	80967.33	906.00	917.38	917.62	0.000954	4.18	26047.79	5177.37	11.38	0.28	0.043	0.42
Reach-1	196.23	Alt3.5B	92000.00		11032.67	80967.33	906.00	917.38	917.62	0.000954	4.18	26047.79	5177.37	11.38	0.28	0.043	0.42
Reach-1	196.23	Alt3.5D	92000.00		11032.67	80967.33	906.00	917.38	917.62	0.000954	4.18	26047.79	5177.37	11.38	0.28	0.043	0.42
Reach-1	196.23	Alt3.5H	92000.00		11032.67	80967.33	906.00	917.38	917.62	0.000954	4.18	26047.79	5177.37	11.38	0.28	0.043	0.42

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manin Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.23	existing	185000.00		44037.09	140962.91	906.00	921.59	921.86	0.000654	4.54	47899.23	5208.22	15.59	0.24	0.045	0.45
Reach-1	196.23	Alt3.5B	185000.00		44037.09	140962.91	906.00	921.59	921.86	0.000654	4.54	47899.23	5208.22	15.59	0.24	0.045	0.45
Reach-1	196.23	Alt3.5D	185000.00		44037.09	140962.91	906.00	921.59	921.86	0.000654	4.54	47899.23	5208.22	15.59	0.24	0.045	0.45
Reach-1	196.23	Alt3.5H	185000.00		44037.09	140962.91	906.00	921.59	921.86	0.000654	4.54	47899.23	5208.22	15.59	0.24	0.045	0.45
Reach-1	196.23	existing	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3.5B	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3.5D	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	Alt3.5H	227000.00		59734.93	167265.08	906.00	923.20	923.49	0.000597	4.70	56309.23	5218.13	17.20	0.23	0.045	0.47
Reach-1	196.23	existing	243000.00		65781.45	177218.55	906.00	923.79	924.08	0.000580	4.76	59363.32	5221.72	17.79	0.23	0.045	0.48
Reach-1	196.23	Alt3.5B	243000.00		65781.45	177218.55	906.00	923.79	924.08	0.000580	4.76	59363.32	5221.72	17.79	0.23	0.045	0.48
Reach-1	196.23	Alt3.5D	243000.00		65781.45	177218.55	906.00	923.79	924.08	0.000580	4.76	59363.32	5221.72	17.79	0.23	0.045	0.48
Reach-1	196.23	Alt3.5H	243000.00		65781.45	177218.55	906.00	923.79	924.08	0.000580	4.76	59363.32	5221.72	17.79	0.23	0.045	0.48
Reach-1	196.23	existing	285000.00	8.28	81462.64	203529.08	906.00	925.16	925.48	0.000557	4.96	66571.84	5340.67	19.16	0.23	0.045	0.51
Reach-1	196.23	Alt3.5B	285000.00	8.28	81462.64	203529.08	906.00	925.16	925.48	0.000557	4.96	66571.84	5340.67	19.16	0.23	0.045	0.51
Reach-1	196.23	Alt3.5D	285000.00	8.28	81462.64	203529.08	906.00	925.16	925.48	0.000557	4.96	66571.84	5340.67	19.16	0.23	0.045	0.51
Reach-1	196.23	Alt3.5H	285000.00	8.28	81462.64	203529.08	906.00	925.16	925.48	0.000557	4.96	66571.84	5340.67	19.16	0.23	0.045	0.51
Reach-1	196.32	existing	23500.00		1241.85	22258.15	906.20	913.27	913.43	0.001214	3.18	7366.57	2113.90	7.07	0.30	0.040	0.26
Reach-1	196.32	Alt3.5B	23500.00		1241.85	22258.15	906.20	913.27	913.43	0.001214	3.18	7366.57	2113.90	7.07	0.30	0.040	0.26
Reach-1	196.32	Alt3.5D	23500.00		1241.85	22258.15	906.20	913.27	913.43	0.001214	3.18	7366.57	2113.90	7.07	0.30	0.040	0.26
Reach-1	196.32	Alt3.5H	23500.00		1241.85	22258.15	906.20	913.27	913.43	0.001214	3.18	7366.57	2113.90	7.07	0.30	0.040	0.26
Reach-1	196.32	existing	57000.00		5029.15	51970.85	906.20	916.04	916.21	0.001187	3.44	17016.67	4733.01	9.84	0.29	0.042	0.31
Reach-1	196.32	Alt3.5B	57000.00		5029.15	51970.85	906.20	916.04	916.21	0.001187	3.44	17016.67	4733.01	9.84	0.29	0.042	0.31
Reach-1	196.32	Alt3.5D	57000.00		5029.15	51970.85	906.20	916.04	916.21	0.001187	3.44	17016.67	4733.01	9.84	0.29	0.042	0.31
Reach-1	196.32	Alt3.5H	57000.00		5029.15	51970.85	906.20	916.04	916.21	0.001187	3.44	17016.67	4733.01	9.84	0.29	0.042	0.31
Reach-1	196.32	existing	92000.00		12900.85	79099.14	906.20	917.94	918.13	0.000982	3.60	26610.20	5260.34	11.74	0.26	0.043	0.37
Reach-1	196.32	Alt3.5B	92000.00		12900.85	79099.14	906.20	917.94	918.13	0.000982	3.60	26610.20	5260.34	11.74	0.26	0.043	0.37
Reach-1	196.32	Alt3.5D	92000.00		12900.85	79099.14	906.20	917.94	918.13	0.000982	3.60	26610.20	5260.34	11.74	0.26	0.043	0.37
Reach-1	196.32	Alt3.5H	92000.00		12900.85	79099.14	906.20	917.94	918.13	0.000982	3.60	26610.20	5260.34	11.74	0.26	0.043	0.37
Reach-1	196.32	existing	185000.00		43768.32	141231.69	906.20	921.97	922.20	0.000669	3.81	48105.78	5343.00	15.77	0.21	0.044	0.41
Reach-1	196.32	Alt3.5B	185000.00		43768.32	141231.69	906.20	921.97	922.20	0.000669	3.81	48105.78	5343.00	15.77	0.21	0.044	0.41
Reach-1	196.32	Alt3.5D	185000.00		43768.32	141231.69	906.20	921.97	922.20	0.000669	3.81	48105.78	5343.00	15.77	0.21	0.044	0.41
Reach-1	196.32	Alt3.5H	185000.00		43768.32	141231.69	906.20	921.97	922.20	0.000669	3.81	48105.78	5343.00	15.77	0.21	0.044	0.41
Reach-1	196.32	existing	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3.5B	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3.5D	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	Alt3.5H	227000.00		58458.96	168541.05	906.20	923.55	923.80	0.000604	3.92	56534.11	5343.00	17.35	0.20	0.045	0.43
Reach-1	196.32	existing	243000.00		64104.93	178895.06	906.20	924.12	924.38	0.000584	3.96	59602.82	5343.00	17.92	0.20	0.045	0.44
Reach-1	196.32	Alt3.5B	243000.00		64104.93	178895.06	906.20	924.12	924.38	0.000584	3.96	59602.82	5343.00	17.92	0.20	0.045	0.44
Reach-1	196.32	Alt3.5D	243000.00		64104.93	178895.06	906.20	924.12	924.38	0.000584	3.96	59602.82	5343.00	17.92	0.20	0.045	0.44
Reach-1	196.32	Alt3.5H	243000.00		64104.93	178895.06	906.20	924.12	924.38	0.000584	3.96	59602.82	5343.00	17.92	0.20	0.045	0.44
Reach-1	196.32	existing	285000.00		78806.71	206193.30	906.20	925.48	925.76	0.000556	4.10	66861.39	5343.00	19.28	0.20	0.045	0.46
Reach-1	196.32	Alt3.5B	285000.00		78806.71	206193.30	906.20	925.48	925.76	0.000556	4.10	66861.39	5343.00	19.28	0.20	0.045	0.46
Reach-1	196.32	Alt3.5D	285000.00		78806.71	206193.30	906.20	925.48	925.76	0.000556	4.10	66861.39	5343.00	19.28	0.20	0.045	0.46
Reach-1	196.32	Alt3.5H	285000.00		78806.71	206193.30	906.20	925.48	925.76	0.000556	4.10	66861.39	5343.00	19.28	0.20	0.045	0.46
Reach-1	196.42	existing	23500.00		85.24	23414.76	907.30	913.87	914.07	0.001347	3.59	6577.89	2207.81	6.57	0.36	0.037	0.25
Reach-1	196.42	Alt3.5B	23500.00		57.30	23442.70	907.30	913.78	913.90	0.000746	2.75	8567.40	2654.56	6.48	0.27	0.036	0.15
Reach-1	196.42	Alt3.5D	23500.00		57.30	23442.70	907.30	913.78	913.90	0.000746	2.75	8567.40	2654.56	6.48	0.27	0.036	0.15
Reach-1	196.42	Alt3.5H	23500.00		57.30	23442.70	907.30	913.78	913.90	0.000746	2.75	8567.40	2654.56	6.48	0.27	0.036	0.15
Reach-1	196.42	existing	57000.00		985.77	56014.23	907.30	916.60	916.83	0.001263	3.85	15090.91	4276.70	9.30	0.34	0.040	0.31
Reach-1	196.42	Alt3.5B	57000.00		658.86	56341.14	907.30	916.49	916.66	0.000711	3.29	17615.09	4279.37	9.19	0.27	0.037	0.20
Reach-1	196.42	Alt3.5D	57000.00		658.86	56341.14	907.30	916.49	916.66	0.000711	3.29	17615.09	4279.37	9.19	0.27	0.037	0.20
Reach-1	196.42	Alt3.5H	57000.00		658.86	56341.14	907.30	916.49	916.66	0.000711	3.29	17615.09	4279.37	9.19	0.27	0.037	0.20
Reach-1	196.42	existing	92000.00		5486.42	86513.59	907.30	918.41	918.65	0.001127	4.01	24126.02	5348.09	11.11	0.30	0.042	0.38
Reach-1	196.42	Alt3.5B	92000.00		3899.78	88100.23	907.30	918.32	918.52	0.000670	3.63	26669.17	5343.55	11.02	0.26	0.038	0.25
Reach-1	196.42	Alt3.5D	92000.00		3899.78	88100.23	907.30	918.32	918.52	0.000670	3.63	26669.17	5343.55	11.02	0.26	0.038	0.25
Reach-1	196.42	Alt3.5H	92000.00		3899.78	88100.23	907.30	918.32	918.52	0.000670	3.63	26669.17	5343.55	11.02	0.26	0.038	0.25
Reach-1	196.42	existing	185000.00		29813.41	155186.58	907.30	922.29	922.56	0.000771	4.18	45157.66	5450.09	14.99	0.24	0.043	0.44
Reach-1	196.42	Alt3.5B	185000.00		23510.97	161489.03	907.30	922.24	922.48	0.000495	4.04	47895.64	5449.98	14.94	0.23	0.038	0.31

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Depth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	106.42	Alt3.5D	185000.00		23510.97	161489.03	907.30	922.24	922.48	0.000495	4.04	47895.64	5449.98	14.94	0.23	0.038	0.31
Reach-1	106.42	Alt3.5H	185000.00		23510.97	161489.03	907.30	922.24	922.48	0.000495	4.04	47895.64	5449.98	14.94	0.23	0.038	0.31
Reach-1	106.42	existing	227000.00		42020.24	184979.77	907.30	923.84	924.12	0.000685	4.27	53581.37	5460.19	16.54	0.23	0.044	0.46
Reach-1	106.42	Alt3.5B	227000.00		33643.64	193356.36	907.30	923.79	924.05	0.000448	4.19	56365.14	5459.86	16.49	0.22	0.038	0.32
Reach-1	106.42	Alt3.5D	227000.00		33643.64	193356.36	907.30	923.79	924.05	0.000448	4.19	56365.14	5459.86	16.49	0.22	0.038	0.32
Reach-1	106.42	Alt3.5H	227000.00		33643.64	193356.36	907.30	923.79	924.05	0.000448	4.19	56365.14	5459.86	16.49	0.22	0.038	0.32
Reach-1	106.42	existing	243000.00		46743.67	196256.33	907.30	924.40	924.69	0.000659	4.31	56665.21	5464.27	17.10	0.23	0.044	0.47
Reach-1	106.42	Alt3.5B	243000.00		37586.80	205413.20	907.30	924.36	924.62	0.000434	4.24	59462.46	5463.97	17.06	0.22	0.039	0.33
Reach-1	106.42	Alt3.5D	243000.00		37586.80	205413.20	907.30	924.36	924.62	0.000434	4.24	59462.46	5463.97	17.06	0.22	0.039	0.33
Reach-1	106.42	Alt3.5H	243000.00		37586.80	205413.20	907.30	924.36	924.62	0.000434	4.24	59462.46	5463.97	17.06	0.22	0.039	0.33
Reach-1	106.42	existing	285000.00		59137.55	225862.45	907.30	925.75	926.05	0.000617	4.43	64013.02	5468.60	18.45	0.22	0.044	0.49
Reach-1	106.42	Alt3.5B	285000.00		47958.56	237041.44	907.30	925.71	925.99	0.000411	4.40	66835.45	5468.60	18.41	0.21	0.039	0.34
Reach-1	106.42	Alt3.5D	285000.00		47958.56	237041.44	907.30	925.71	925.99	0.000411	4.40	66835.45	5468.60	18.41	0.21	0.039	0.34
Reach-1	106.42	Alt3.5H	285000.00		47958.56	237041.44	907.30	925.71	925.99	0.000411	4.40	66835.45	5468.60	18.41	0.21	0.039	0.34
Reach-1	106.51	existing	23500.00			23500.00	908.20	914.47	914.62	0.000904	3.08	7632.51	2139.50	6.27	0.29	0.038	0.20
Reach-1	106.51	Alt3.5B	23500.00			23500.00	908.20	914.25	914.34	0.001022	2.38	9858.22	2707.86	6.05	0.22	0.047	0.23
Reach-1	106.51	Alt3.5D	23500.00			23500.00	908.20	914.25	914.34	0.001022	2.38	9858.22	2707.86	6.05	0.22	0.047	0.23
Reach-1	106.51	Alt3.5H	23500.00			23500.00	908.20	914.25	914.34	0.001022	2.38	9858.22	2707.86	6.05	0.22	0.047	0.23
Reach-1	106.51	existing	57000.00		363.20	56636.80	908.20	917.18	917.39	0.001015	3.73	15481.95	3780.80	8.98	0.31	0.040	0.28
Reach-1	106.51	Alt3.5B	57000.00		331.83	56668.16	908.20	917.02	917.16	0.001493	3.02	18937.18	3869.78	8.82	0.23	0.057	0.49
Reach-1	106.51	Alt3.5D	57000.00		331.83	56668.16	908.20	917.02	917.16	0.001493	3.02	18937.18	3869.78	8.82	0.23	0.057	0.49
Reach-1	106.51	Alt3.5H	57000.00		331.83	56668.16	908.20	917.02	917.16	0.001493	3.02	18937.18	3869.78	8.82	0.23	0.057	0.49
Reach-1	106.51	existing	92000.00	0.05	3746.72	88253.23	908.20	918.95	919.20	0.001053	4.05	23498.76	4932.73	10.75	0.30	0.042	0.37
Reach-1	106.51	Alt3.5B	92000.00	0.00	4343.41	87656.59	908.20	918.85	919.03	0.001730	3.43	27164.55	4905.56	10.65	0.23	0.062	0.72
Reach-1	106.51	Alt3.5D	92000.00	0.00	4343.41	87656.59	908.20	918.85	919.03	0.001730	3.43	27164.55	4905.56	10.65	0.23	0.062	0.72
Reach-1	106.51	Alt3.5H	92000.00	0.00	4343.41	87656.59	908.20	918.85	919.03	0.001730	3.43	27164.55	4905.56	10.65	0.23	0.062	0.72
Reach-1	106.51	existing	185000.00	250.26	28468.52	156281.22	908.20	922.69	922.97	0.000855	4.29	43669.09	5572.76	14.49	0.25	0.044	0.49
Reach-1	106.51	Alt3.5B	185000.00	277.51	32699.84	152022.66	908.20	922.61	922.85	0.001197	3.77	47361.50	5571.80	14.41	0.21	0.058	0.75
Reach-1	106.51	Alt3.5D	185000.00	277.51	32699.84	152022.66	908.20	922.61	922.85	0.001197	3.77	47361.50	5571.80	14.41	0.21	0.058	0.75
Reach-1	106.51	Alt3.5H	185000.00	277.51	32699.84	152022.66	908.20	922.61	922.85	0.001197	3.77	47361.50	5571.80	14.41	0.21	0.058	0.75
Reach-1	106.51	existing	227000.00	594.19	42631.91	183773.89	908.20	924.19	924.49	0.000763	4.33	52044.82	5586.78	15.99	0.23	0.044	0.51
Reach-1	106.51	Alt3.5B	227000.00	663.77	48519.46	177816.77	908.20	924.11	924.39	0.001031	3.84	55759.91	5586.57	15.91	0.20	0.056	0.74
Reach-1	106.51	Alt3.5D	227000.00	663.77	48519.46	177816.77	908.20	924.11	924.39	0.001031	3.84	55759.91	5586.57	15.91	0.20	0.056	0.74
Reach-1	106.51	Alt3.5H	227000.00	663.77	48519.46	177816.77	908.20	924.11	924.39	0.001031	3.84	55759.91	5586.57	15.91	0.20	0.056	0.74
Reach-1	106.51	existing	243000.00	752.25	48010.25	194237.50	908.20	924.74	925.05	0.000735	4.35	55126.67	5599.23	16.54	0.23	0.044	0.51
Reach-1	106.51	Alt3.5B	243000.00	841.45	54507.71	187650.84	908.20	924.66	924.95	0.000983	3.87	58846.98	5597.45	16.46	0.20	0.056	0.74
Reach-1	106.51	Alt3.5D	243000.00	841.45	54507.71	187650.84	908.20	924.66	924.95	0.000983	3.87	58846.98	5597.45	16.46	0.20	0.056	0.74
Reach-1	106.51	Alt3.5H	243000.00	841.45	54507.71	187650.84	908.20	924.66	924.95	0.000983	3.87	58846.98	5597.45	16.46	0.20	0.056	0.74
Reach-1	106.51	existing	285000.00	1179.26	62409.09	221411.64	908.20	926.06	926.39	0.000686	4.44	62533.73	5612.00	17.86	0.22	0.044	0.54
Reach-1	106.51	Alt3.5B	285000.00	1318.71	70372.28	213309.02	908.20	925.99	926.30	0.000901	3.97	66259.15	5612.00	17.79	0.19	0.055	0.75
Reach-1	106.51	Alt3.5D	285000.00	1318.71	70372.28	213309.02	908.20	925.99	926.30	0.000901	3.97	66259.15	5612.00	17.79	0.19	0.055	0.75
Reach-1	106.51	Alt3.5H	285000.00	1318.71	70372.28	213309.02	908.20	925.99	926.30	0.000901	3.97	66259.15	5612.00	17.79	0.19	0.055	0.75
Reach-1	106.61	existing	23500.00			23500.00	908.50	914.96	915.12	0.001046	3.23	7282.76	2120.35	6.46	0.31	0.037	0.22
Reach-1	106.61	Alt3.5B	23500.00			23500.00	908.50	914.62	914.72	0.000571	2.49	9429.77	2560.59	6.12	0.23	0.036	0.13
Reach-1	106.61	Alt3.5D	23500.00			23500.00	908.50	914.62	914.72	0.000571	2.49	9429.77	2560.59	6.12	0.23	0.036	0.13
Reach-1	106.61	Alt3.5H	23500.00			23500.00	908.50	914.62	914.72	0.000571	2.49	9429.77	2560.59	6.12	0.23	0.036	0.13
Reach-1	106.61	existing	57000.00	0.00	115.61	56884.39	908.50	917.71	917.96	0.001177	4.05	14141.98	3109.29	9.21	0.32	0.039	0.36
Reach-1	106.61	Alt3.5B	57000.00		35.09	56964.92	908.50	917.46	917.62	0.000606	3.26	17513.47	3244.83	8.96	0.24	0.037	0.21
Reach-1	106.61	Alt3.5D	57000.00		35.09	56964.92	908.50	917.46	917.62	0.000606	3.26	17513.47	3244.83	8.96	0.24	0.037	0.21
Reach-1	106.61	Alt3.5H	57000.00		35.09	56964.92	908.50	917.46	917.62	0.000606	3.26	17513.47	3244.83	8.96	0.24	0.037	0.21
Reach-1	106.61	existing	92000.00	41.89	2801.08	89157.03	908.50	919.50	919.81	0.001273	4.47	21414.54	4971.40	11.00	0.33	0.041	0.45
Reach-1	106.61	Alt3.5B	92000.00	16.83	1591.28	90391.89	908.50	919.34	919.56	0.000656	3.83	24863.20	4829.73	10.84	0.26	0.038	0.27
Reach-1	106.61	Alt3.5D	92000.00	16.83	1591.28	90391.89	908.50	919.34	919.56	0.000656	3.83	24863.20	4829.73	10.84	0.26	0.038	0.27
Reach-1	106.61	Alt3.5H	92000.00	16.83	1591.28	90391.89	908.50	919.34	919.56	0.000656	3.83	24863.20	4829.73	10.84	0.26	0.038	0.27
Reach-1	106.61	existing	185000.00	2307.21	29263.78	153429.02	908.50	923.13	923.44	0.000944	4.64	41741.43	5814.73	14.63	0.27	0.042	0.54
Reach-1	106.61	Alt3.5B	185000.00	1599.94	20469.93	162930.13	908.50	922.97	923.25	0.000527	4.43	45108.04	5813.79	14.47	0.25	0.036	0.33
Reach-1	106.61	Alt3.5D	185000.00	1599.94	20469.93	162930.13	908.50	922.97	923.25	0.000527	4.43	45108.04	5813.79	14.47	0.25	0.036	0.33
Reach-1	106.61	Alt3.5H	185000.00	1599.94	20469.93	162930.13	908.50	922.97	923.25	0.000527	4.43	45108.04	5813.79	14.47	0.25	0.036	0.33

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.61	existing	227000.00	3474.25	45531.88	177993.88	908.50	924.58	924.90	0.000823	4.64	50255.55	5910.00	16.08	0.25	0.042	0.54
Reach-1	196.61	Alt3.5B	227000.00	2465.45	32856.45	191678.09	908.50	924.44	924.74	0.000467	4.55	53701.34	5910.00	15.94	0.24	0.036	0.34
Reach-1	196.61	Alt3.5D	227000.00	2465.45	32856.45	191678.09	908.50	924.44	924.74	0.000467	4.55	53701.34	5910.00	15.94	0.24	0.036	0.34
Reach-1	196.61	Alt3.5H	227000.00	2465.45	32856.45	191678.09	908.50	924.44	924.74	0.000467	4.55	53701.34	5910.00	15.94	0.24	0.036	0.34
Reach-1	196.61	existing	243000.00	4183.29	51869.95	186946.75	908.50	925.12	925.44	0.000783	4.64	53424.46	5910.00	16.62	0.25	0.042	0.54
Reach-1	196.61	Alt3.5B	243000.00	3004.86	37739.72	202255.42	908.50	924.98	925.28	0.000447	4.59	56901.27	5910.00	16.48	0.23	0.036	0.34
Reach-1	196.61	Alt3.5D	243000.00	3004.86	37739.72	202255.42	908.50	924.98	925.28	0.000447	4.59	56901.27	5910.00	16.48	0.23	0.036	0.34
Reach-1	196.61	Alt3.5H	243000.00	3004.86	37739.72	202255.42	908.50	924.98	925.28	0.000447	4.59	56901.27	5910.00	16.48	0.23	0.036	0.34
Reach-1	196.61	existing	285000.00	6068.39	68399.41	210532.19	908.50	926.41	926.76	0.000713	4.68	61077.08	5910.00	17.91	0.23	0.042	0.55
Reach-1	196.61	Alt3.5B	285000.00	4450.30	50535.74	230013.95	908.50	926.29	926.60	0.000412	4.72	64618.46	5910.00	17.79	0.23	0.036	0.34
Reach-1	196.61	Alt3.5D	285000.00	4450.30	50535.74	230013.95	908.50	926.29	926.60	0.000412	4.72	64618.46	5910.00	17.79	0.23	0.036	0.34
Reach-1	196.61	Alt3.5H	285000.00	4450.30	50535.74	230013.95	908.50	926.29	926.60	0.000412	4.72	64618.46	5910.00	17.79	0.23	0.036	0.34
Reach-1	196.7	existing	23500.00			23500.00	909.30	915.53	915.65	0.001038	2.77	8481.23	2556.18	6.23	0.27	0.044	0.21
Reach-1	196.7	Alt3.5B	23500.00			23500.00	909.30	914.94	915.03	0.000643	2.35	9999.47	2751.63	5.64	0.22	0.041	0.15
Reach-1	196.7	Alt3.5D	23500.00			23500.00	909.30	914.94	915.03	0.000643	2.35	9999.47	2751.63	5.64	0.22	0.041	0.15
Reach-1	196.7	Alt3.5H	23500.00			23500.00	909.30	914.94	915.03	0.000643	2.35	9999.47	2751.63	5.64	0.22	0.041	0.15
Reach-1	196.7	existing	57000.00			57000.00	909.30	918.35	918.54	0.001074	3.45	16511.38	3090.61	9.05	0.26	0.047	0.36
Reach-1	196.7	Alt3.5B	57000.00			57000.00	909.30	917.80	917.95	0.000663	3.09	18442.27	3134.92	8.50	0.22	0.043	0.24
Reach-1	196.7	Alt3.5D	57000.00			57000.00	909.30	917.80	917.95	0.000663	3.09	18442.27	3134.92	8.50	0.22	0.043	0.24
Reach-1	196.7	Alt3.5H	57000.00			57000.00	909.30	917.80	917.95	0.000663	3.09	18442.27	3134.92	8.50	0.22	0.043	0.24
Reach-1	196.7	existing	92000.00	1.21	170.94	91827.84	909.30	920.18	920.44	0.001232	4.09	22631.54	3784.65	10.88	0.28	0.049	0.50
Reach-1	196.7	Alt3.5B	92000.00		26.76	91973.23	909.30	919.70	919.91	0.000751	3.73	24697.47	3534.54	10.40	0.24	0.044	0.34
Reach-1	196.7	Alt3.5D	92000.00		26.76	91973.23	909.30	919.70	919.91	0.000751	3.73	24697.47	3534.54	10.40	0.24	0.044	0.34
Reach-1	196.7	Alt3.5H	92000.00		26.76	91973.23	909.30	919.70	919.91	0.000751	3.73	24697.47	3534.54	10.40	0.24	0.044	0.34
Reach-1	196.7	existing	185000.00	497.71	20044.20	164458.08	909.30	923.66	923.98	0.001197	4.71	42042.61	6532.33	14.36	0.27	0.050	0.73
Reach-1	196.7	Alt3.5B	185000.00	311.50	12597.08	172091.42	909.30	923.28	923.59	0.000801	4.60	43405.25	6435.54	13.98	0.25	0.045	0.52
Reach-1	196.7	Alt3.5D	185000.00	311.50	12597.08	172091.42	909.30	923.28	923.59	0.000801	4.60	43405.25	6435.54	13.98	0.25	0.045	0.52
Reach-1	196.7	Alt3.5H	185000.00	311.50	12597.08	172091.42	909.30	923.28	923.59	0.000801	4.60	43405.25	6435.54	13.98	0.25	0.045	0.52
Reach-1	196.7	existing	227000.00	978.74	38880.54	187140.72	909.30	925.05	925.38	0.001055	4.69	51345.41	6778.23	15.75	0.25	0.050	0.73
Reach-1	196.7	Alt3.5B	227000.00	651.31	27813.36	198535.33	909.30	924.72	925.03	0.000725	4.66	52937.37	6751.21	15.42	0.24	0.044	0.53
Reach-1	196.7	Alt3.5D	227000.00	651.31	27813.36	198535.33	909.30	924.72	925.03	0.000725	4.66	52937.37	6751.21	15.42	0.24	0.044	0.53
Reach-1	196.7	Alt3.5H	227000.00	651.31	27813.36	198535.33	909.30	924.72	925.03	0.000725	4.66	52937.37	6751.21	15.42	0.24	0.044	0.53
Reach-1	196.7	existing	243000.00	1285.46	46596.80	195117.73	909.30	925.57	925.89	0.001004	4.67	54857.04	6820.10	16.27	0.24	0.049	0.73
Reach-1	196.7	Alt3.5B	243000.00	896.60	34297.66	207805.75	909.30	925.25	925.57	0.000696	4.67	56542.85	6794.36	15.95	0.23	0.044	0.53
Reach-1	196.7	Alt3.5D	243000.00	896.60	34297.66	207805.75	909.30	925.25	925.57	0.000696	4.67	56542.85	6794.36	15.95	0.23	0.044	0.53
Reach-1	196.7	Alt3.5H	243000.00	896.60	34297.66	207805.75	909.30	925.25	925.57	0.000696	4.67	56542.85	6794.36	15.95	0.23	0.044	0.53
Reach-1	196.7	existing	285000.00	2249.12	67045.29	215705.58	909.30	926.83	927.16	0.000906	4.66	63484.74	6864.89	17.53	0.23	0.049	0.73
Reach-1	196.7	Alt3.5B	285000.00	1667.25	51741.94	231590.81	909.30	926.54	926.86	0.000641	4.71	65366.01	6861.50	17.24	0.22	0.044	0.54
Reach-1	196.7	Alt3.5D	285000.00	1667.25	51741.94	231590.81	909.30	926.54	926.86	0.000641	4.71	65366.01	6861.50	17.24	0.22	0.044	0.54
Reach-1	196.7	Alt3.5H	285000.00	1667.25	51741.94	231590.81	909.30	926.54	926.86	0.000641	4.71	65366.01	6861.50	17.24	0.22	0.044	0.54
Reach-1	196.79	existing	23500.00			23500.00	910.70	916.12	916.30	0.001980	3.39	6939.79	2256.72	5.42	0.34	0.042	0.38
Reach-1	196.79	Alt3.5B	23500.00			23500.00	909.40	915.26	915.38	0.000897	2.71	8683.48	2679.88	5.86	0.26	0.039	0.18
Reach-1	196.79	Alt3.5D	23500.00			23500.00	909.40	915.26	915.38	0.000897	2.71	8683.48	2679.88	5.86	0.26	0.039	0.18
Reach-1	196.79	Alt3.5H	23500.00			23500.00	909.40	915.26	915.38	0.000897	2.71	8683.48	2679.88	5.86	0.26	0.039	0.18
Reach-1	196.79	existing	57000.00	0.68	4.86	56994.46	910.70	918.85	919.13	0.001456	4.22	13521.56	2553.41	8.15	0.32	0.042	0.49
Reach-1	196.79	Alt3.5B	57000.00			57000.00	909.40	918.10	918.27	0.000747	3.32	17154.93	3133.88	8.70	0.25	0.040	0.25
Reach-1	196.79	Alt3.5D	57000.00			57000.00	909.40	918.10	918.27	0.000747	3.32	17154.93	3133.88	8.70	0.25	0.040	0.25
Reach-1	196.79	Alt3.5H	57000.00			57000.00	909.40	918.10	918.27	0.000747	3.32	17154.93	3133.88	8.70	0.25	0.040	0.25
Reach-1	196.79	existing	92000.00	89.47	91.39	91819.15	910.70	920.73	921.09	0.001491	4.80	19360.24	3589.58	10.03	0.36	0.042	0.52
Reach-1	196.79	Alt3.5B	92000.00	22.78	36.10	91941.13	909.40	920.03	920.27	0.000775	3.94	23435.27	3435.10	10.63	0.26	0.040	0.34
Reach-1	196.79	Alt3.5D	92000.00	22.78	36.10	91941.13	909.40	920.03	920.27	0.000775	3.94	23435.27	3435.10	10.63	0.26	0.040	0.34
Reach-1	196.79	Alt3.5H	92000.00	22.78	36.10	91941.13	909.40	920.03	920.27	0.000775	3.94	23435.27	3435.10	10.63	0.26	0.040	0.34
Reach-1	196.79	existing	185000.00	1020.88	13045.88	170933.23	910.70	924.15	924.60	0.001412	5.51	36552.60	6155.24	13.45	0.33	0.045	0.78
Reach-1	196.79	Alt3.5B	185000.00	589.73	6261.27	178149.00	909.40	923.60	923.97	0.000830	5.00	39763.43	5838.58	14.20	0.28	0.041	0.53
Reach-1	196.79	Alt3.5D	185000.00	589.73	6261.27	178149.00	909.40	923.60	923.97	0.000830	5.00	39763.43	5838.58	14.20	0.28	0.041	0.53
Reach-1	196.79	Alt3.5H	185000.00	589.73	6261.27	178149.00	909.40	923.60	923.97	0.000830	5.00	39763.43	5838.58	14.20	0.28	0.041	0.53
Reach-1	196.79	existing	227000.00	1546.84	27071.33	198381.83	910.70	925.48	925.92	0.001280	5.57	45430.27	6928.71	14.78	0.31	0.045	0.82
Reach-1	196.79	Alt3.5B	227000.00	951.41	17185.73	208862.86	909.40	925.00	925.39	0.000771	5.15	48669.55	6851.70	15.60	0.27	0.041	0.58

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manin Wid Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.79	Alt3.5D	227000.00	951.41	17185.73	208862.86	909.40	925.00	925.39	0.000771	5.15	48669.55	6851.70	15.60	0.27	0.041	0.56
Reach-1	196.79	Alt3.5H	227000.00	951.41	17185.73	208862.86	909.40	925.00	925.39	0.000771	5.15	48669.55	6851.70	15.60	0.27	0.041	0.56
Reach-1	196.79	existing	243000.00	1848.73	34601.22	206550.05	910.70	925.98	926.41	0.001210	5.53	48870.90	6971.85	15.28	0.30	0.045	0.81
Reach-1	196.79	Alt3.5B	243000.00	1205.15	21200.58	220594.28	909.40	925.52	925.91	0.000752	5.21	52242.68	6931.36	16.12	0.26	0.042	0.57
Reach-1	196.79	Alt3.5D	243000.00	1205.15	21200.58	220594.28	909.40	925.52	925.91	0.000752	5.21	52242.68	6931.36	16.12	0.26	0.042	0.57
Reach-1	196.79	Alt3.5H	243000.00	1205.15	21200.58	220594.28	909.40	925.52	925.91	0.000752	5.21	52242.68	6931.36	16.12	0.26	0.042	0.57
Reach-1	196.79	existing	285000.00	2568.49	55229.29	227202.22	910.70	927.20	927.62	0.001069	5.46	57481.21	7161.13	16.50	0.28	0.045	0.80
Reach-1	196.79	Alt3.5B	285000.00	1806.04	37634.23	245559.72	909.40	926.79	927.18	0.000685	5.25	61121.61	7101.92	17.39	0.25	0.041	0.57
Reach-1	196.79	Alt3.5D	285000.00	1806.04	37634.23	245559.72	909.40	926.79	927.18	0.000685	5.25	61121.61	7101.92	17.39	0.25	0.041	0.57
Reach-1	196.79	Alt3.5H	285000.00	1806.04	37634.23	245559.72	909.40	926.79	927.18	0.000685	5.25	61121.61	7101.92	17.39	0.25	0.041	0.57
Reach-1	196.88	existing	23500.00			23500.00	910.80	917.59	917.90	0.005555	4.49	5232.55	1664.92	6.79	0.45	0.058	1.09
Reach-1	196.88	Alt3.5B	23500.00			23500.00	909.20	915.73	915.88	0.001092	3.09	7598.91	2150.02	6.53	0.29	0.043	0.24
Reach-1	196.88	Alt3.5D	23500.00			23500.00	909.20	915.73	915.88	0.001092	3.09	7598.91	2150.02	6.53	0.29	0.043	0.24
Reach-1	196.88	Alt3.5H	23500.00			23500.00	909.20	915.73	915.88	0.001092	3.09	7598.91	2150.02	6.53	0.29	0.043	0.24
Reach-1	196.88	existing	57000.00	4.07		56995.93	910.80	919.91	920.43	0.004913	5.78	9863.19	2485.71	9.11	0.51	0.050	1.23
Reach-1	196.88	Alt3.5B	57000.00			57000.00	909.20	918.52	918.75	0.001152	3.90	14624.86	2790.51	9.32	0.30	0.044	0.37
Reach-1	196.88	Alt3.5D	57000.00			57000.00	909.20	918.52	918.75	0.001152	3.90	14624.86	2790.51	9.32	0.30	0.044	0.37
Reach-1	196.88	Alt3.5H	57000.00			57000.00	909.20	918.52	918.75	0.001152	3.90	14624.86	2790.51	9.32	0.30	0.044	0.37
Reach-1	196.88	existing	92000.00	104.87		91895.13	910.80	921.72	922.27	0.003758	6.00	15367.55	3682.28	10.92	0.52	0.047	0.98
Reach-1	196.88	Alt3.5B	92000.00	9.24		91990.76	909.20	920.46	920.76	0.001187	4.46	20647.44	3350.52	11.26	0.32	0.044	0.45
Reach-1	196.88	Alt3.5D	92000.00	9.24		91990.76	909.20	920.46	920.76	0.001187	4.46	20647.44	3350.52	11.26	0.32	0.044	0.45
Reach-1	196.88	Alt3.5H	92000.00	9.24		91990.76	909.20	920.46	920.76	0.001187	4.46	20647.44	3350.52	11.26	0.32	0.044	0.45
Reach-1	196.88	existing	185000.00	815.76	13146.11	171038.13	910.80	924.99	925.57	0.002627	6.24	31540.91	6590.11	14.19	0.40	0.048	1.21
Reach-1	196.88	Alt3.5B	185000.00	298.60	2456.32	182245.08	909.20	924.03	924.48	0.001153	5.43	35374.52	5841.06	14.83	0.32	0.043	0.64
Reach-1	196.88	Alt3.5D	185000.00	298.60	2456.32	182245.08	909.20	924.03	924.48	0.001153	5.43	35374.52	5841.06	14.83	0.32	0.043	0.64
Reach-1	196.88	Alt3.5H	185000.00	298.60	2456.32	182245.08	909.20	924.03	924.48	0.001153	5.43	35374.52	5841.06	14.83	0.32	0.043	0.64
Reach-1	196.88	existing	227000.00	1927.24	30512.80	194559.94	910.80	926.21	926.75	0.002164	6.09	39905.30	6919.83	15.41	0.37	0.047	1.16
Reach-1	196.88	Alt3.5B	227000.00	719.82	11708.97	214571.22	909.20	925.39	925.85	0.001045	5.56	43952.44	6858.23	16.19	0.30	0.043	0.67
Reach-1	196.88	Alt3.5D	227000.00	719.82	11708.97	214571.22	909.20	925.39	925.85	0.001045	5.56	43952.44	6858.23	16.19	0.30	0.043	0.67
Reach-1	196.88	Alt3.5H	227000.00	719.82	11708.97	214571.22	909.20	925.39	925.85	0.001045	5.56	43952.44	6858.23	16.19	0.30	0.043	0.67
Reach-1	196.88	existing	243000.00	2430.34	38532.13	202037.55	910.80	926.66	927.18	0.002008	6.02	42986.68	6945.30	15.86	0.35	0.047	1.13
Reach-1	196.88	Alt3.5B	243000.00	1054.13	16586.72	225359.16	909.20	925.90	926.35	0.000996	5.57	47442.82	6897.30	16.70	0.30	0.042	0.67
Reach-1	196.88	Alt3.5D	243000.00	1054.13	16586.72	225359.16	909.20	925.90	926.35	0.000996	5.57	47442.82	6897.30	16.70	0.30	0.042	0.67
Reach-1	196.88	Alt3.5H	243000.00	1054.13	16586.72	225359.16	909.20	925.90	926.35	0.000996	5.57	47442.82	6897.30	16.70	0.30	0.042	0.67
Reach-1	196.88	existing	285000.00	3879.58	60216.10	220904.31	910.80	927.77	928.28	0.001689	5.88	50767.37	7007.39	16.97	0.32	0.046	1.07
Reach-1	196.88	Alt3.5B	285000.00	2070.64	32641.22	250288.13	909.20	927.13	927.57	0.000883	5.56	55962.12	6971.39	17.93	0.28	0.042	0.66
Reach-1	196.88	Alt3.5D	285000.00	2070.64	32641.22	250288.13	909.20	927.13	927.57	0.000883	5.56	55962.12	6971.39	17.93	0.28	0.042	0.66
Reach-1	196.88	Alt3.5H	285000.00	2070.64	32641.22	250288.13	909.20	927.13	927.57	0.000883	5.56	55962.12	6971.39	17.93	0.28	0.042	0.66
Reach-1	196.98	existing	23500.00			23500.00	911.00	918.86	919.01	0.001185	3.04	7734.51	2203.71	7.86	0.29	0.039	0.26
Reach-1	196.98	Alt3.5B	23500.00			23500.00	909.40	916.15	916.27	0.000577	2.73	8599.71	2110.09	6.75	0.24	0.038	0.15
Reach-1	196.98	Alt3.5D	23500.00			23500.00	909.40	916.15	916.27	0.000577	2.73	8599.71	2110.09	6.75	0.24	0.038	0.15
Reach-1	196.98	Alt3.5H	23500.00			23500.00	909.40	916.15	916.27	0.000577	2.73	8599.71	2110.09	6.75	0.24	0.038	0.15
Reach-1	196.98	existing	57000.00			57000.00	911.00	921.27	921.53	0.001237	4.11	13878.92	3165.05	10.27	0.35	0.037	0.34
Reach-1	196.98	Alt3.5B	57000.00			57000.00	909.40	919.00	919.19	0.000700	3.56	16021.16	3048.36	9.60	0.27	0.038	0.23
Reach-1	196.98	Alt3.5D	57000.00			57000.00	909.40	919.00	919.19	0.000700	3.56	16021.16	3048.36	9.60	0.27	0.038	0.23
Reach-1	196.98	Alt3.5H	57000.00			57000.00	909.40	919.00	919.19	0.000700	3.56	16021.16	3048.36	9.60	0.27	0.038	0.23
Reach-1	196.98	existing	92000.00		271.55	91728.45	911.00	922.98	923.31	0.001297	4.60	20146.42	4281.52	11.98	0.35	0.039	0.42
Reach-1	196.98	Alt3.5B	92000.00			92000.00	909.40	920.95	921.22	0.000711	4.14	22232.30	3325.79	11.55	0.28	0.037	0.29
Reach-1	196.98	Alt3.5D	92000.00			92000.00	909.40	920.95	921.22	0.000711	4.14	22232.30	3325.79	11.55	0.28	0.037	0.29
Reach-1	196.98	Alt3.5H	92000.00			92000.00	909.40	920.95	921.22	0.000711	4.14	22232.30	3325.79	11.55	0.28	0.037	0.29
Reach-1	196.98	existing	185000.00	1951.05	15961.15	167087.80	911.00	926.01	926.41	0.001238	5.24	37862.79	6986.04	15.01	0.33	0.040	0.62
Reach-1	196.98	Alt3.5B	185000.00	91.39	3724.83	181183.78	909.40	924.55	924.94	0.000754	5.08	37865.14	5939.61	15.15	0.30	0.037	0.42
Reach-1	196.98	Alt3.5D	185000.00	91.39	3724.83	181183.78	909.40	924.55	924.94	0.000754	5.08	37865.14	5939.61	15.15	0.30	0.037	0.42
Reach-1	196.98	Alt3.5H	185000.00	91.39	3724.83	181183.78	909.40	924.55	924.94	0.000754	5.08	37865.14	5939.61	15.15	0.30	0.037	0.42
Reach-1	196.98	existing	227000.00	4124.02	27739.88	195136.11	911.00	927.07	927.48	0.001173	5.41	45275.76	7039.67	16.07	0.32	0.041	0.66
Reach-1	196.98	Alt3.5B	227000.00	1270.72	10827.51	214901.77	909.40	925.86	926.27	0.000708	5.26	46386.40	6977.74	16.46	0.29	0.037	0.45
Reach-1	196.98	Alt3.5D	227000.00	1270.72	10827.51	214901.77	909.40	925.86	926.27	0.000708	5.26	46386.40	6977.74	16.46	0.29	0.037	0.45
Reach-1	196.98	Alt3.5H	227000.00	1270.72	10827.51	214901.77	909.40	925.86	926.27	0.000708	5.26	46386.40	6977.74	16.46	0.29	0.037	0.45

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	196.98	existing	243000.00	5028.01	33353.22	204618.78	911.00	927.45	927.87	0.001139	5.44	47993.31	7041.44	16.45	0.31	0.041	0.67
Reach-1	196.98	Alt3.5B	243000.00	1924.19	14720.34	226355.45	909.40	926.34	926.75	0.000683	5.29	49763.96	7011.32	16.94	0.28	0.037	0.46
Reach-1	196.98	Alt3.5D	243000.00	1924.19	14720.34	226355.45	909.40	926.34	926.75	0.000683	5.29	49763.96	7011.32	16.94	0.28	0.037	0.46
Reach-1	196.98	Alt3.5H	243000.00	1924.19	14720.34	226355.45	909.40	926.34	926.75	0.000683	5.29	49763.96	7011.32	16.94	0.28	0.037	0.46
Reach-1	196.98	existing	285000.00	7572.45	48991.42	228436.14	911.00	928.45	928.88	0.001051	5.50	55014.25	7046.00	17.45	0.30	0.040	0.66
Reach-1	196.98	Alt3.5B	285000.00	3864.46	25590.84	255544.70	909.40	927.51	927.92	0.000637	5.39	57965.36	7041.69	18.11	0.28	0.037	0.47
Reach-1	196.98	Alt3.5D	285000.00	3864.46	25590.84	255544.70	909.40	927.51	927.92	0.000637	5.39	57965.36	7041.69	18.11	0.28	0.037	0.47
Reach-1	196.98	Alt3.5H	285000.00	3864.46	25590.84	255544.70	909.40	927.51	927.92	0.000637	5.39	57965.36	7041.69	18.11	0.28	0.037	0.47
Reach-1	197.07	existing	23500.00		12.52	23487.48	913.20	919.42	919.51	0.000893	2.33	10080.80	2908.79	6.22	0.22	0.044	0.19
Reach-1	197.07	Alt3.5B	23500.00			23500.00	913.20	916.79	917.58	0.034374	7.09	3313.24	2146.57	3.59	1.01	0.056	3.31
Reach-1	197.07	Alt3.5D	23500.00			23500.00	913.20	916.79	917.58	0.034374	7.09	3313.24	2146.57	3.59	1.01	0.056	3.31
Reach-1	197.07	Alt3.5H	23500.00			23500.00	913.20	916.79	917.58	0.034374	7.09	3313.24	2146.57	3.59	1.01	0.056	3.31
Reach-1	197.07	existing	57000.00	2.19	278.42	56719.39	913.20	921.89	922.05	0.000912	3.18	17973.52	3461.78	8.69	0.24	0.043	0.31
Reach-1	197.07	Alt3.5B	57000.00		36.29	56963.71	913.20	919.52	919.99	0.004848	5.51	10356.39	2955.63	6.32	0.52	0.043	1.06
Reach-1	197.07	Alt3.5D	57000.00		36.29	56963.71	913.20	919.52	919.99	0.004848	5.51	10356.39	2955.63	6.32	0.52	0.043	1.06
Reach-1	197.07	Alt3.5H	57000.00		36.29	56963.71	913.20	919.52	919.99	0.004848	5.51	10356.39	2955.63	6.32	0.52	0.043	1.06
Reach-1	197.07	existing	92000.00	41.95	2049.38	89908.66	913.20	923.63	923.85	0.000952	3.79	24970.22	4902.01	10.43	0.26	0.043	0.40
Reach-1	197.07	Alt3.5B	92000.00	0.38	302.81	91696.80	913.20	921.43	921.92	0.003164	5.63	16379.66	3353.81	8.23	0.44	0.044	0.99
Reach-1	197.07	Alt3.5D	92000.00	0.38	302.81	91696.80	913.20	921.43	921.92	0.003164	5.63	16379.66	3353.81	8.23	0.44	0.044	0.99
Reach-1	197.07	Alt3.5H	92000.00	0.38	302.81	91696.80	913.20	921.43	921.92	0.003164	5.63	16379.66	3353.81	8.23	0.44	0.044	0.99
Reach-1	197.07	existing	185000.00	1434.62	23596.36	159969.02	913.20	926.62	926.93	0.000941	4.59	42982.23	6952.21	13.42	0.27	0.042	0.54
Reach-1	197.07	Alt3.5B	185000.00	487.90	12099.39	172412.72	913.20	925.00	925.54	0.001970	6.00	32363.97	5828.90	11.80	0.38	0.042	0.94
Reach-1	197.07	Alt3.5D	185000.00	487.90	12099.39	172412.72	913.20	925.00	925.54	0.001970	6.00	32363.97	5828.90	11.80	0.38	0.042	0.94
Reach-1	197.07	Alt3.5H	185000.00	487.90	12099.39	172412.72	913.20	925.00	925.54	0.001970	6.00	32363.97	5828.90	11.80	0.38	0.042	0.94
Reach-1	197.07	existing	227000.00	2712.55	36512.74	187774.72	913.20	927.65	927.98	0.000937	4.85	50313.78	7246.95	14.45	0.27	0.042	0.60
Reach-1	197.07	Alt3.5B	227000.00	1469.85	26124.98	199405.17	913.20	926.28	926.79	0.001643	5.94	40614.63	6769.32	13.08	0.35	0.042	0.91
Reach-1	197.07	Alt3.5D	227000.00	1469.85	26124.98	199405.17	913.20	926.28	926.79	0.001643	5.94	40614.63	6769.32	13.08	0.35	0.042	0.91
Reach-1	197.07	Alt3.5H	227000.00	1469.85	26124.98	199405.17	913.20	926.28	926.79	0.001643	5.94	40614.63	6769.32	13.08	0.35	0.042	0.91
Reach-1	197.07	existing	243000.00	3282.24	42823.64	196894.11	913.20	928.01	928.36	0.000923	4.91	52993.39	7287.96	14.81	0.27	0.042	0.61
Reach-1	197.07	Alt3.5B	243000.00	1995.39	32125.20	208879.41	913.20	926.74	927.25	0.001542	5.92	43819.09	7017.49	13.54	0.34	0.042	0.90
Reach-1	197.07	Alt3.5D	243000.00	1995.39	32125.20	208879.41	913.20	926.74	927.25	0.001542	5.92	43819.09	7017.49	13.54	0.34	0.042	0.90
Reach-1	197.07	Alt3.5H	243000.00	1995.39	32125.20	208879.41	913.20	926.74	927.25	0.001542	5.92	43819.09	7017.49	13.54	0.34	0.042	0.90
Reach-1	197.07	existing	285000.00	4951.90	60311.58	219736.53	913.20	928.97	929.33	0.000879	5.03	59980.84	7374.08	15.77	0.26	0.042	0.64
Reach-1	197.07	Alt3.5B	285000.00	3678.16	48580.19	232741.66	913.20	927.87	928.36	0.001344	5.88	51965.63	7272.26	14.67	0.32	0.042	0.88
Reach-1	197.07	Alt3.5D	285000.00	3678.16	48580.19	232741.66	913.20	927.87	928.36	0.001344	5.88	51965.63	7272.26	14.67	0.32	0.042	0.88
Reach-1	197.07	Alt3.5H	285000.00	3678.16	48580.19	232741.66	913.20	927.87	928.36	0.001344	5.88	51965.63	7272.26	14.67	0.32	0.042	0.88
Reach-1	197.16	existing	23500.00		61.37	23438.63	913.40	919.87	919.94	0.000832	2.16	10867.94	2854.79	6.47	0.19	0.049	0.20
Reach-1	197.16	Alt3.5B	23500.00		4.76	23495.24	909.70	918.47	918.54	0.000520	2.14	10978.34	3133.38	8.77	0.20	0.043	0.11
Reach-1	197.16	Alt3.5D	23500.00			23500.00	909.70	918.47	918.54	0.000520	2.14	10971.67	3117.52	8.77	0.20	0.043	0.11
Reach-1	197.16	Alt3.5H	23500.00			23500.00	909.70	918.47	918.54	0.000520	2.14	10971.67	3117.52	8.77	0.20	0.043	0.11
Reach-1	197.16	existing	57000.00		334.28	56665.72	913.40	922.38	922.52	0.000981	3.06	18698.62	3508.44	8.98	0.23	0.048	0.33
Reach-1	197.16	Alt3.5B	57000.00		112.72	56887.28	909.70	920.67	920.82	0.000744	3.15	18166.30	3352.84	10.97	0.24	0.043	0.25
Reach-1	197.16	Alt3.5D	57000.00		8.10	56991.90	909.70	920.67	920.82	0.000747	3.15	18121.87	3331.96	10.97	0.24	0.043	0.25
Reach-1	197.16	Alt3.5H	57000.00		8.10	56991.90	909.70	920.67	920.82	0.000747	3.15	18121.87	3331.96	10.97	0.24	0.043	0.25
Reach-1	197.16	existing	92000.00		681.47	91318.52	913.40	924.12	924.33	0.000983	3.71	25106.94	3955.97	10.72	0.25	0.046	0.42
Reach-1	197.16	Alt3.5B	92000.00		316.01	91683.99	909.70	922.46	922.69	0.000814	3.80	24344.05	3514.36	12.76	0.25	0.043	0.36
Reach-1	197.16	Alt3.5D	92000.00		47.61	91952.39	909.70	922.47	922.69	0.000819	3.81	24257.15	3489.37	12.77	0.25	0.043	0.36
Reach-1	197.16	Alt3.5H	92000.00		47.61	91952.39	909.70	922.47	922.69	0.000819	3.81	24257.15	3489.37	12.77	0.25	0.043	0.36
Reach-1	197.16	existing	185000.00	42.96	13758.13	171198.92	913.40	927.08	927.42	0.001033	4.84	42469.17	7365.79	13.68	0.28	0.044	0.62
Reach-1	197.16	Alt3.5B	185000.00		4466.18	180533.83	909.70	925.83	926.21	0.000919	5.00	39253.93	5967.34	16.13	0.28	0.043	0.57
Reach-1	197.16	Alt3.5D	185000.00		330.21	184669.78	909.70	925.82	926.23	0.000966	5.12	36590.61	3808.55	16.12	0.29	0.043	0.59
Reach-1	197.16	Alt3.5H	185000.00		3230.74	181769.25	909.70	925.83	926.22	0.000933	5.03	38604.16	5188.63	16.13	0.28	0.043	0.57
Reach-1	197.16	existing	227000.00	462.61	27543.88	198993.52	913.40	928.10	928.46	0.000989	5.09	49989.44	7447.59	14.70	0.28	0.044	0.66
Reach-1	197.16	Alt3.5B	227000.00	22.47	12127.39	214850.14	909.70	926.98	927.40	0.000922	5.32	47091.02	7354.73	17.28	0.28	0.043	0.63
Reach-1	197.16	Alt3.5D	227000.00	16.68	568.41	226414.72	909.70	926.94	927.43	0.001037	5.63	40917.32	4050.31	17.24	0.30	0.043	0.70
Reach-1	197.16	Alt3.5H	227000.00	20.81	8518.22	218460.97	909.70	926.97	927.41	0.000957	5.42	44642.48	5489.07	17.27	0.29	0.043	0.65
Reach-1	197.16	existing	243000.00	698.86	33257.87	209043.27	913.40	928.46	928.83	0.000974	5.17	52678.96	7469.53	15.06	0.27	0.043	0.67
Reach-1	197.16	Alt3.5B	243000.00	127.88	16720.41	226151.70	909.70	927.41	927.83	0.000903	5.40	50219.44	7401.22	17.71	0.28	0.042	0.64

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manin Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.16	Alt3.5D	243000.00	120.08	667.77	242212.16	909.70	927.38	927.88	0.001051	5.80	42607.58	4075.83	17.66	0.30	0.043	0.74
Reach-1	197.16	Alt3.5H	243000.00	124.45	10925.60	231949.95	909.70	927.39	927.85	0.000955	5.54	46930.61	5514.38	17.69	0.29	0.043	0.67
Reach-1	197.16	existing	285000.00	1554.47	49332.52	234113.02	913.40	929.39	929.78	0.000925	5.34	59715.37	7669.06	15.99	0.27	0.043	0.69
Reach-1	197.16	Alt3.5B	285000.00	654.00	31082.70	253263.31	909.70	928.46	928.89	0.000848	5.53	58043.67	7469.68	18.76	0.28	0.042	0.66
Reach-1	197.16	Alt3.5D	285000.00	694.64	944.75	283360.63	909.70	928.40	929.00	0.001078	6.22	46910.13	4139.37	18.70	0.31	0.043	0.83
Reach-1	197.16	Alt3.5H	285000.00	662.93	17856.41	266480.66	909.70	928.42	928.92	0.000949	5.84	52657.84	5577.22	18.72	0.29	0.043	0.73
Reach-1	197.26	existing	23500.00		53.79	23446.21	913.00	920.39	920.50	0.001507	2.64	8974.46	2516.75	7.39	0.24	0.052	0.34
Reach-1	197.26	Alt3.5B	23500.00		0.48	23499.52	909.70	918.71	918.79	0.000469	2.32	10117.57	2841.10	9.01	0.22	0.041	0.10
Reach-1	197.26	Alt3.5D	23500.00			23500.00	909.70	918.71	918.79	0.000469	2.32	10113.31	2824.84	9.01	0.22	0.041	0.10
Reach-1	197.26	Alt3.5H	23500.00		0.48	23499.52	909.70	918.71	918.79	0.000469	2.32	10118.26	2841.15	9.01	0.22	0.041	0.10
Reach-1	197.26	existing	57000.00	0.11	374.42	56625.47	913.00	922.95	923.14	0.001528	3.55	16341.38	3343.62	9.95	0.28	0.049	0.48
Reach-1	197.26	Alt3.5B	57000.00		75.92	56924.08	909.70	921.03	921.20	0.000780	3.35	17161.24	3207.80	11.33	0.25	0.043	0.26
Reach-1	197.26	Alt3.5D	57000.00			57000.00	909.70	921.03	921.21	0.000781	3.35	17021.22	3110.49	11.33	0.25	0.043	0.26
Reach-1	197.26	Alt3.5H	57000.00		41.14	56958.86	909.70	921.03	921.21	0.000780	3.35	17136.59	3189.29	11.33	0.25	0.043	0.26
Reach-1	197.26	existing	92000.00	103.13	1180.46	90716.41	913.00	924.70	924.96	0.001597	4.15	23433.21	4874.61	11.70	0.29	0.051	0.63
Reach-1	197.26	Alt3.5B	92000.00	0.01	275.80	91724.19	909.70	922.87	923.12	0.000895	4.00	23317.38	3481.01	13.17	0.27	0.044	0.38
Reach-1	197.26	Alt3.5D	92000.00	0.01		91999.98	909.70	922.87	923.12	0.000899	4.01	22945.00	3314.78	13.17	0.27	0.043	0.39
Reach-1	197.26	Alt3.5H	92000.00	0.01	155.26	91844.72	909.70	922.87	923.12	0.000896	4.00	23257.26	3457.84	13.17	0.27	0.044	0.38
Reach-1	197.26	existing	185000.00	1461.53	20497.81	163040.66	913.00	927.70	928.05	0.001609	5.04	41988.93	7555.53	14.70	0.29	0.053	0.92
Reach-1	197.26	Alt3.5B	185000.00	372.34	5513.16	179114.50	909.70	926.30	926.70	0.001038	5.16	39552.67	6429.69	16.60	0.29	0.045	0.64
Reach-1	197.26	Alt3.5D	185000.00	382.40		184617.59	909.70	926.31	926.75	0.001100	5.31	35075.29	3725.75	16.61	0.30	0.045	0.67
Reach-1	197.26	Alt3.5H	185000.00	374.30	4300.12	180325.58	909.70	926.30	926.71	0.001051	5.19	38612.32	5169.66	16.60	0.29	0.046	0.64
Reach-1	197.26	existing	227000.00	3471.46	34505.11	189023.44	913.00	928.69	929.07	0.001576	5.28	49794.94	8005.73	15.69	0.29	0.053	1.00
Reach-1	197.26	Alt3.5B	227000.00	939.80	14128.58	211931.63	909.70	927.46	927.89	0.001044	5.47	47489.30	7351.75	17.76	0.29	0.046	0.71
Reach-1	197.26	Alt3.5D	227000.00	1012.60		225987.39	909.70	927.47	927.99	0.001183	5.82	39646.61	4130.08	17.77	0.31	0.045	0.81
Reach-1	197.26	Alt3.5H	227000.00	964.84	9028.57	217006.58	909.70	927.46	927.92	0.001093	5.59	44892.18	5643.53	17.76	0.30	0.046	0.75
Reach-1	197.26	existing	243000.00	4399.88	40569.92	198030.20	913.00	929.04	929.43	0.001556	5.35	52617.09	8007.50	16.04	0.29	0.053	1.02
Reach-1	197.26	Alt3.5B	243000.00	1370.13	18296.49	223333.38	909.70	927.87	928.31	0.001036	5.55	50609.56	7705.18	18.17	0.29	0.046	0.74
Reach-1	197.26	Alt3.5D	243000.00	1506.76		241493.23	909.70	927.89	928.45	0.001205	5.99	41425.49	4246.71	18.19	0.31	0.045	0.86
Reach-1	197.26	Alt3.5H	243000.00	1418.43	11214.02	230367.55	909.70	927.87	928.36	0.001101	5.72	47265.01	5758.04	18.17	0.30	0.046	0.78
Reach-1	197.26	existing	285000.00	7087.74	57486.78	220425.48	913.00	929.94	930.34	0.001492	5.48	59846.60	8012.01	16.94	0.29	0.052	1.07
Reach-1	197.26	Alt3.5B	285000.00	3218.38	30537.96	251243.67	909.70	928.89	929.35	0.001009	5.73	58740.67	8006.77	19.19	0.29	0.046	0.78
Reach-1	197.26	Alt3.5D	285000.00	3735.07		281264.94	909.70	928.96	929.58	0.001245	6.38	45987.57	4280.90	19.26	0.32	0.046	0.97
Reach-1	197.26	Alt3.5H	285000.00	3409.07	17420.28	264170.69	909.70	928.91	929.43	0.001112	6.02	53246.36	5796.84	19.21	0.30	0.047	0.86
Reach-1	197.35	existing	23500.00		666.45	22833.55	914.20	921.41	921.55	0.003308	2.95	7936.65	2399.89	7.21	0.28	0.067	0.70
Reach-1	197.35	Alt3.5B	23500.00		3.55	23496.46	909.70	918.88	918.96	0.000256	2.20	10690.06	2636.12	9.18	0.19	0.039	0.06
Reach-1	197.35	Alt3.5D	23500.00			23500.00	909.70	918.88	918.96	0.000256	2.20	10682.30	2614.67	9.18	0.19	0.039	0.06
Reach-1	197.35	Alt3.5H	23500.00		3.55	23496.45	909.70	918.88	918.96	0.000256	2.20	10690.71	2636.20	9.18	0.19	0.039	0.06
Reach-1	197.35	existing	57000.00	0.02	3451.22	53548.76	914.20	923.98	924.21	0.003345	3.74	14986.61	3380.43	9.78	0.31	0.062	0.96
Reach-1	197.35	Alt3.5B	57000.00		253.94	56746.05	909.70	921.36	921.51	0.000525	3.19	17990.38	3289.79	11.66	0.24	0.041	0.18
Reach-1	197.35	Alt3.5D	57000.00			57000.00	909.70	921.36	921.52	0.000529	3.20	17813.66	3150.95	11.66	0.24	0.042	0.19
Reach-1	197.35	Alt3.5H	57000.00		219.91	56780.09	909.70	921.36	921.52	0.000525	3.19	17962.89	3252.21	11.66	0.24	0.041	0.18
Reach-1	197.35	existing	92000.00	77.94	6186.79	85735.27	914.20	925.75	926.02	0.003119	4.21	22495.61	5609.45	11.55	0.31	0.062	1.12
Reach-1	197.35	Alt3.5B	92000.00		1056.49	90943.51	909.70	923.27	923.50	0.000666	3.79	24473.62	3486.50	13.57	0.25	0.043	0.30
Reach-1	197.35	Alt3.5D	92000.00			92000.00	909.70	923.28	923.51	0.000681	3.84	23977.46	3270.44	13.58	0.25	0.043	0.31
Reach-1	197.35	Alt3.5H	92000.00		944.35	91055.65	909.70	923.28	923.50	0.000667	3.80	24411.98	3463.91	13.58	0.25	0.043	0.30
Reach-1	197.35	existing	185000.00	2752.75	48108.45	134138.80	914.20	928.63	928.94	0.002077	4.38	42170.64	7762.73	14.43	0.26	0.056	1.11
Reach-1	197.35	Alt3.5B	185000.00	206.04	9981.17	174812.80	909.70	926.82	927.16	0.000855	4.82	40993.45	6519.40	17.12	0.27	0.045	0.54
Reach-1	197.35	Alt3.5D	185000.00	225.22	348.57	184426.22	909.70	926.85	927.25	0.000944	5.08	36699.80	3920.47	17.15	0.28	0.046	0.60
Reach-1	197.35	Alt3.5H	185000.00	210.40	7615.04	177174.56	909.70	926.82	927.18	0.000877	4.89	39552.33	5249.85	17.12	0.27	0.045	0.56
Reach-1	197.35	existing	227000.00	4826.66	69687.19	152486.16	914.20	929.57	929.91	0.001917	4.49	49701.91	8161.77	15.37	0.28	0.055	1.13
Reach-1	197.35	Alt3.5B	227000.00	962.66	21984.94	204052.41	909.70	927.99	928.36	0.000862	5.05	49334.78	7552.86	18.29	0.26	0.045	0.61
Reach-1	197.35	Alt3.5D	227000.00	1140.48	665.71	225193.80	909.70	928.06	928.53	0.001032	5.54	41756.52	4242.53	18.36	0.29	0.046	0.73
Reach-1	197.35	Alt3.5H	227000.00	1017.81	15728.67	210253.52	909.70	928.02	928.41	0.000909	5.19	46138.00	5633.45	18.32	0.27	0.045	0.64
Reach-1	197.35	existing	243000.00	5663.16	78336.30	159000.53	914.20	929.90	930.25	0.001866	4.52	52403.44	8213.30	15.70	0.25	0.054	1.14
Reach-1	197.35	Alt3.5B	243000.00	1467.91	27528.39	214003.70	909.70	928.41	928.78	0.000857	5.11	52499.68	7686.67	18.71	0.26	0.045	0.62
Reach-1	197.35	Alt3.5D	243000.00	1773.98	800.49	240425.53	909.70	928.50	929.00	0.001057	5.69	43631.30	4257.97	18.80	0.29	0.047	0.77
Reach-1	197.35	Alt3.5H	243000.00	1565.84	19224.11	222210.05	909.70	928.44	928.85	0.000916	5.29	48538.61	5660.71	18.74	0.27	0.045	0.67

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.35	existing	285000.00	8301.27	100760.77	175937.97	914.20	930.75	931.12	0.001745	4.60	59369.39	8275.20	16.55	0.25	0.053	1.15
Reach-1	197.35	Alt3.5B	285000.00	2936.95	43336.21	238726.83	909.70	929.42	929.81	0.000841	5.24	60550.72	8138.08	19.72	0.26	0.045	0.66
Reach-1	197.35	Alt3.5D	285000.00	3727.85	1178.63	280093.50	909.70	929.60	930.16	0.001113	6.07	48366.48	4366.94	19.90	0.30	0.047	0.89
Reach-1	197.35	Alt3.5H	285000.00	3197.88	29245.94	252556.17	909.70	929.49	929.93	0.000928	5.52	54515.62	5767.68	19.79	0.27	0.045	0.73
Reach-1	197.45	existing	23500.00		120.43	23379.57	915.60	922.58	922.71	0.001684	2.80	8405.30	2642.78	6.98	0.28	0.049	0.33
Reach-1	197.45	Alt3.5B	23500.00		0.00	23500.00	909.70	919.00	919.08	0.000242	2.24	10485.57	2219.69	9.30	0.18	0.038	0.07
Reach-1	197.45	Alt3.5D	23500.00			23500.00	909.70	919.00	919.08	0.000242	2.24	10486.11	2219.35	9.30	0.18	0.038	0.07
Reach-1	197.45	Alt3.5H	23500.00			23500.00	909.70	919.00	919.08	0.000242	2.24	10485.97	2219.33	9.30	0.18	0.038	0.07
Reach-1	197.45	existing	57000.00		331.53	56668.46	915.60	925.17	925.34	0.001621	3.37	16908.14	4084.11	9.57	0.29	0.048	0.42
Reach-1	197.45	Alt3.5B	57000.00		35.33	56964.68	909.70	921.60	921.77	0.000469	3.30	17277.37	3059.84	11.90	0.24	0.039	0.16
Reach-1	197.45	Alt3.5D	57000.00			57000.00	909.70	921.60	921.77	0.000469	3.30	17254.84	3043.92	11.90	0.24	0.039	0.16
Reach-1	197.45	Alt3.5H	57000.00			57000.00	909.70	921.60	921.77	0.000469	3.30	17248.52	3043.09	11.90	0.24	0.039	0.16
Reach-1	197.45	existing	92000.00	13.90	1622.19	90363.91	915.60	926.86	927.08	0.001515	3.81	25013.11	6481.86	11.26	0.28	0.050	0.54
Reach-1	197.45	Alt3.5B	92000.00		111.83	91888.16	909.70	923.58	923.81	0.000579	3.80	24256.83	3865.58	13.88	0.27	0.040	0.22
Reach-1	197.45	Alt3.5D	92000.00			92000.00	909.70	923.60	923.82	0.000577	3.80	24230.45	3844.00	13.90	0.27	0.040	0.22
Reach-1	197.45	Alt3.5H	92000.00			92000.00	909.70	923.59	923.81	0.000579	3.80	24196.20	3843.17	13.89	0.27	0.040	0.22
Reach-1	197.45	existing	185000.00	2162.73	27634.02	155203.25	915.60	929.50	929.78	0.001397	4.48	45025.98	8201.26	13.90	0.27	0.049	0.73
Reach-1	197.45	Alt3.5B	185000.00	44.30	2207.43	182748.28	909.70	927.21	927.55	0.000702	4.71	41022.86	6809.20	17.51	0.27	0.041	0.41
Reach-1	197.45	Alt3.5D	185000.00	61.17		184938.83	909.70	927.32	927.66	0.000698	4.71	39378.95	4411.40	17.62	0.27	0.042	0.41
Reach-1	197.45	Alt3.5H	185000.00	47.71	778.55	184173.73	909.70	927.23	927.58	0.000709	4.73	39728.82	5352.90	17.53	0.27	0.041	0.41
Reach-1	197.45	existing	227000.00	3917.62	43786.81	179295.56	915.60	930.40	930.71	0.001353	4.68	52466.50	8298.04	14.80	0.27	0.049	0.78
Reach-1	197.45	Alt3.5B	227000.00	466.80	8650.58	217882.63	909.70	928.38	928.75	0.000723	4.99	49575.64	7927.51	18.68	0.27	0.042	0.47
Reach-1	197.45	Alt3.5D	227000.00	601.58		226398.42	909.70	928.58	928.98	0.000740	5.09	45134.34	4895.44	18.88	0.27	0.042	0.49
Reach-1	197.45	Alt3.5H	227000.00	505.61	3927.23	222567.16	909.70	928.43	928.83	0.000744	5.08	46358.52	5688.19	18.73	0.27	0.042	0.49
Reach-1	197.45	existing	243000.00	4627.63	50179.16	188193.20	915.60	930.72	931.04	0.001340	4.75	55112.54	8331.28	15.12	0.27	0.049	0.80
Reach-1	197.45	Alt3.5B	243000.00	766.03	12145.15	230088.81	909.70	928.79	929.17	0.000723	5.07	52893.89	8109.18	19.09	0.27	0.042	0.49
Reach-1	197.45	Alt3.5D	243000.00	1034.16		241965.84	909.70	929.04	929.46	0.000752	5.22	47288.63	4723.38	19.34	0.27	0.042	0.52
Reach-1	197.45	Alt3.5H	243000.00	847.31	5508.80	236643.88	909.70	928.86	929.27	0.000752	5.19	46806.24	5770.21	19.16	0.28	0.042	0.51
Reach-1	197.45	existing	285000.00	8583.38	66168.13	210228.48	915.60	931.53	931.87	0.001294	4.89	61862.33	8341.47	15.93	0.27	0.048	0.84
Reach-1	197.45	Alt3.5B	285000.00	1949.54	23555.20	259495.25	909.70	929.60	930.20	0.000715	5.24	61151.10	8235.50	20.10	0.27	0.042	0.53
Reach-1	197.45	Alt3.5D	285000.00	2591.97		282408.03	909.70	930.17	930.64	0.000776	5.53	52649.09	4726.34	20.47	0.28	0.043	0.59
Reach-1	197.45	Alt3.5H	285000.00	2176.97	10342.15	272480.88	909.70	929.91	930.36	0.000769	5.46	54894.63	5823.47	20.21	0.28	0.042	0.57
Reach-1	197.54	existing	23500.00		234.86	23265.13	916.10	923.35	923.45	0.001409	2.53	9250.70	3084.06	7.25	0.26	0.048	0.26
Reach-1	197.54	Alt3.5B	23500.00			23500.00	914.40	918.90	919.59	0.005784	6.69	3513.34	1524.39	4.50	0.78	0.037	0.83
Reach-1	197.54	Alt3.5D	23500.00			23500.00	914.40	918.90	919.59	0.005782	6.69	3513.81	1524.47	4.50	0.78	0.037	0.83
Reach-1	197.54	Alt3.5H	23500.00			23500.00	914.40	918.90	919.59	0.005782	6.69	3513.71	1524.46	4.50	0.78	0.037	0.83
Reach-1	197.54	existing	57000.00	0.00	583.72	56416.27	916.10	925.93	926.08	0.001401	3.00	18928.65	4331.03	9.83	0.25	0.052	0.38
Reach-1	197.54	Alt3.5B	57000.00		153.97	56846.03	914.40	921.80	922.37	0.003313	6.04	9451.07	2364.65	7.40	0.53	0.040	0.82
Reach-1	197.54	Alt3.5D	57000.00			57000.00	914.40	921.80	922.37	0.003326	6.05	9421.49	2348.13	7.40	0.53	0.040	0.83
Reach-1	197.54	Alt3.5H	57000.00			57000.00	914.40	921.80	922.37	0.003330	6.05	9417.04	2347.88	7.40	0.53	0.040	0.83
Reach-1	197.54	existing	92000.00	61.51	6314.76	85623.73	916.10	927.59	927.75	0.001259	3.30	29119.69	7208.04	11.49	0.24	0.052	0.47
Reach-1	197.54	Alt3.5B	92000.00		406.94	91593.06	914.40	923.88	924.43	0.002709	5.94	15496.61	3408.55	9.48	0.49	0.041	0.77
Reach-1	197.54	Alt3.5D	92000.00			92000.00	914.40	923.89	924.44	0.002719	5.95	15455.89	3388.76	9.49	0.49	0.041	0.77
Reach-1	197.54	Alt3.5H	92000.00			92000.00	914.40	923.88	924.44	0.002730	5.96	15429.01	3387.19	9.48	0.49	0.041	0.77
Reach-1	197.54	existing	185000.00	654.33	42370.82	141974.84	916.10	930.19	930.41	0.001137	3.81	48960.36	7939.96	14.09	0.23	0.050	0.61
Reach-1	197.54	Alt3.5B	185000.00	80.70	8201.17	176718.13	914.40	927.63	928.13	0.001905	5.74	34063.80	7215.36	13.23	0.38	0.044	0.84
Reach-1	197.54	Alt3.5D	185000.00	93.67		184906.33	914.40	927.71	928.26	0.002023	5.94	31192.49	4419.41	13.31	0.39	0.045	0.90
Reach-1	197.54	Alt3.5H	185000.00	84.33	2082.55	182833.13	914.40	927.64	928.18	0.002033	5.93	31644.52	4989.48	13.24	0.39	0.045	0.90
Reach-1	197.54	existing	227000.00	1030.05	61772.48	164197.47	916.10	931.06	931.32	0.001119	4.00	56011.16	8088.47	14.96	0.23	0.049	0.66
Reach-1	197.54	Alt3.5B	227000.00	303.20	22399.77	204297.03	914.40	928.82	929.29	0.001647	5.68	42940.50	7765.07	14.42	0.35	0.044	0.85
Reach-1	197.54	Alt3.5D	227000.00	379.50		226620.50	914.40	928.99	929.58	0.001914	6.18	36900.77	4483.66	14.59	0.37	0.046	1.00
Reach-1	197.54	Alt3.5H	227000.00	336.12	5097.40	221566.47	914.40	928.85	929.43	0.001918	6.14	37932.56	5453.62	14.45	0.38	0.046	0.99
Reach-1	197.54	existing	243000.00	1296.22	69303.77	172400.00	916.10	931.37	931.65	0.001113	4.07	58523.19	8105.52	15.27	0.23	0.049	0.68
Reach-1	197.54	Alt3.5B	243000.00	420.15	29319.96	213259.89	914.40	929.24	929.70	0.001560	5.65	46166.40	7807.48	14.84	0.34	0.044	0.84
Reach-1	197.54	Alt3.5D	243000.00	544.41		242455.59	914.40	929.45	930.06	0.001880	6.27	38967.62	4504.64	15.05	0.37	0.046	1.04
Reach-1	197.54	Alt3.5H	243000.00	476.92	7323.41	235199.67	914.40	929.28	929.87	0.001869	6.20	40284.71	5477.48	14.88	0.37	0.046	1.02
Reach-1	197.54	existing	285000.00	2092.56	89094.64	193812.80	916.10	932.16	932.47	0.001100	4.23	64950.72	8209.92	16.06	0.23	0.048	0.72
Reach-1	197.54	Alt3.5B	285000.00	738.51	48140.37	236121.13	914.40	930.24	930.69	0.001392	5.61	54054.25	7949.59	15.84	0.32	0.044	0.84

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manri Wtd Total	Shear Chnl
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.54	Alt3.5D	285000.00	991.15		284008.84	914.40	930.59	931.25	0.001814	8.51	44152.79	4629.32	16.19	0.36	0.047	1.13
Reach-1	197.54	Alt3.5H	285000.00	866.80	13926.32	270204.88	914.40	930.34	930.95	0.001770	8.35	46100.13	5576.90	15.94	0.36	0.046	1.08
Reach-1	197.64	existing	23500.00		299.23	23200.77	918.20	924.15	924.26	0.001620	2.60	9007.64	2654.01	5.95	0.25	0.054	0.34
Reach-1	197.64	Alt3.5B	23500.00		9.95	23490.05	914.40	920.57	920.77	0.001098	3.61	6517.76	1972.11	6.17	0.35	0.038	0.23
Reach-1	197.64	Alt3.5D	23500.00			23500.00	914.40	920.57	920.77	0.001098	3.61	6510.21	1960.30	6.17	0.35	0.038	0.23
Reach-1	197.64	Alt3.5H	23500.00			23500.00	914.40	920.57	920.77	0.001098	3.61	6510.21	1960.30	6.17	0.35	0.038	0.23
Reach-1	197.64	existing	57000.00		755.83	56244.18	918.20	926.73	926.91	0.001715	3.33	17050.18	3773.59	8.53	0.27	0.053	0.49
Reach-1	197.64	Alt3.5B	57000.00		173.77	56826.23	914.40	923.18	923.50	0.001423	4.54	12575.69	2712.38	8.78	0.37	0.040	0.41
Reach-1	197.64	Alt3.5D	57000.00			57000.00	914.40	923.18	923.51	0.001427	4.54	12541.83	2693.76	8.78	0.37	0.040	0.41
Reach-1	197.64	Alt3.5H	57000.00			57000.00	914.40	923.18	923.50	0.001427	4.55	12540.02	2693.53	8.78	0.37	0.040	0.41
Reach-1	197.64	existing	92000.00	16.05	5503.31	86480.63	918.20	928.35	928.55	0.001739	3.68	25904.65	7219.96	10.15	0.28	0.053	0.58
Reach-1	197.64	Alt3.5B	92000.00		413.81	91586.19	914.40	925.09	925.48	0.001474	5.05	18223.89	3203.69	10.69	0.37	0.041	0.52
Reach-1	197.64	Alt3.5D	92000.00			92000.00	914.40	925.10	925.50	0.001478	5.06	18169.56	3181.87	10.70	0.37	0.041	0.52
Reach-1	197.64	Alt3.5H	92000.00			92000.00	914.40	925.10	925.50	0.001480	5.07	18158.11	3180.71	10.70	0.37	0.041	0.52
Reach-1	197.64	existing	185000.00	1094.93	40386.59	143518.47	918.20	930.86	931.12	0.001477	4.13	45490.38	8197.90	12.66	0.26	0.050	0.72
Reach-1	197.64	Alt3.5B	185000.00	33.17	6349.52	178617.31	914.40	928.54	929.03	0.001505	5.68	34424.22	7512.11	14.14	0.38	0.043	0.66
Reach-1	197.64	Alt3.5D	185000.00	54.88	113.95	184831.17	914.40	928.68	929.20	0.001534	5.76	32229.87	4710.91	14.28	0.38	0.043	0.69
Reach-1	197.64	Alt3.5H	185000.00	42.87	1040.05	183917.08	914.40	928.61	929.13	0.001557	5.79	32387.77	5212.21	14.21	0.38	0.043	0.69
Reach-1	197.64	existing	227000.00	1831.26	59582.39	165586.36	918.20	931.72	932.01	0.001415	4.29	52563.58	8221.79	13.52	0.26	0.049	0.78
Reach-1	197.64	Alt3.5B	227000.00	328.73	18352.04	208319.23	914.40	929.83	930.11	0.001410	5.73	42787.97	7781.90	15.23	0.35	0.043	0.71
Reach-1	197.64	Alt3.5D	227000.00	476.85	534.39	225988.75	914.40	929.93	930.49	0.001506	6.00	38229.93	4868.60	15.53	0.36	0.044	0.79
Reach-1	197.64	Alt3.5H	227000.00	411.84	3992.50	222595.67	914.40	929.79	930.34	0.001530	6.01	38662.38	5402.16	15.39	0.37	0.044	0.79
Reach-1	197.64	existing	243000.00	2123.58	67281.99	173594.42	918.20	932.03	932.33	0.001395	4.35	55068.57	8224.68	13.83	0.26	0.049	0.78
Reach-1	197.64	Alt3.5B	243000.00	493.34	24010.90	218495.75	914.40	930.01	930.49	0.001372	5.75	45748.84	7844.10	15.61	0.35	0.043	0.72
Reach-1	197.64	Alt3.5D	243000.00	744.14	800.97	241454.89	914.40	930.38	930.95	0.001492	6.08	40432.59	4901.28	15.98	0.36	0.044	0.82
Reach-1	197.64	Alt3.5H	243000.00	629.38	5414.79	236955.84	914.40	930.20	930.77	0.001521	6.10	40891.99	5450.05	15.80	0.36	0.044	0.82
Reach-1	197.64	existing	285000.00	2926.98	87971.84	194101.22	918.20	932.80	933.14	0.001343	4.47	61402.54	8231.98	14.60	0.25	0.048	0.81
Reach-1	197.64	Alt3.5B	285000.00	1086.41	39488.55	244425.03	914.40	930.94	931.42	0.001291	5.79	53274.47	8201.66	16.54	0.33	0.043	0.76
Reach-1	197.64	Alt3.5D	285000.00	1647.77	1847.53	281504.72	914.40	931.51	932.12	0.001456	6.30	45943.84	4911.94	17.11	0.35	0.045	0.90
Reach-1	197.64	Alt3.5H	285000.00	1404.76	9325.68	274269.56	914.40	931.22	931.82	0.001501	6.32	46683.74	5757.38	16.82	0.36	0.044	0.90
Reach-1	197.74	existing	23500.00		384.59	23115.41	919.10	924.96	925.08	0.001506	2.66	8778.60	2651.49	5.86	0.26	0.049	0.31
Reach-1	197.74	Alt3.5B	23500.00		1.82	23498.18	914.40	921.10	921.35	0.001055	3.98	5911.09	1760.08	6.70	0.38	0.037	0.22
Reach-1	197.74	Alt3.5D	23500.00			23500.00	914.40	923.02	924.05	0.015641	8.11	2896.08	1412.69	8.62	1.00	0.041	2.00
Reach-1	197.74	Alt3.5H	23500.00			23500.00	914.40	921.10	921.35	0.001055	3.98	5908.73	1743.94	6.70	0.38	0.037	0.22
Reach-1	197.74	existing	57000.00		908.42	56091.58	919.10	927.57	927.75	0.001516	3.40	16649.95	3406.48	8.47	0.27	0.050	0.46
Reach-1	197.74	Alt3.5B	57000.00		208.68	56791.32	914.40	923.87	924.21	0.001285	4.64	12313.29	2765.85	9.47	0.39	0.039	0.36
Reach-1	197.74	Alt3.5D	57000.00			57000.00	914.40	924.70	926.45	0.016444	10.60	5379.50	1547.01	10.30	1.00	0.042	3.57
Reach-1	197.74	Alt3.5H	57000.00			57000.00	914.40	923.88	924.22	0.001289	4.65	12270.61	2742.17	9.48	0.39	0.039	0.36
Reach-1	197.74	existing	92000.00	18.84	1047.68	90933.48	919.10	929.22	929.47	0.001716	4.03	23168.41	4855.07	10.12	0.30	0.050	0.61
Reach-1	197.74	Alt3.5B	92000.00		505.71	91494.29	914.40	925.82	926.22	0.001353	5.12	18003.73	3087.24	11.42	0.37	0.040	0.49
Reach-1	197.74	Alt3.5D	92000.00			92000.00	914.40	926.22	928.34	0.014645	11.88	7879.89	1856.91	11.82	1.00	0.042	3.87
Reach-1	197.74	Alt3.5H	92000.00			92000.00	914.40	925.83	926.24	0.001360	5.13	17926.14	3061.68	11.43	0.37	0.040	0.49
Reach-1	197.74	existing	185000.00	1451.23	22373.21	161175.56	919.10	931.65	932.00	0.001820	4.89	39980.61	7872.11	12.55	0.31	0.049	0.86
Reach-1	197.74	Alt3.5B	185000.00	23.10	1041.04	183935.84	914.40	929.27	929.84	0.001511	6.06	31011.88	4964.00	14.87	0.39	0.041	0.71
Reach-1	197.74	Alt3.5D	185000.00	1.15		184998.84	914.40	928.82	931.93	0.013441	14.15	13079.99	2129.83	14.42	1.00	0.043	5.23
Reach-1	197.74	Alt3.5H	185000.00	35.27	16.07	184948.66	914.40	929.37	929.93	0.001482	6.01	30836.07	4335.19	14.97	0.38	0.041	0.70
Reach-1	197.74	existing	227000.00	2415.01	38094.59	186490.42	919.10	932.48	932.88	0.001764	5.10	46670.54	8146.97	13.38	0.31	0.048	0.92
Reach-1	197.74	Alt3.5B	227000.00	342.42	4624.99	222032.58	914.40	930.31	930.93	0.001583	6.39	37491.84	7306.18	15.91	0.40	0.042	0.79
Reach-1	197.74	Alt3.5D	227000.00	603.52		226396.48	914.40	930.02	933.23	0.012146	14.39	15936.85	2596.04	15.62	0.98	0.043	5.07
Reach-1	197.74	Alt3.5H	227000.00	451.89	609.51	225938.61	914.40	930.54	931.16	0.001522	6.33	36412.62	5041.19	16.14	0.39	0.042	0.78
Reach-1	197.74	existing	243000.00	2820.88	43333.32	196845.81	919.10	932.78	933.17	0.001763	5.20	49102.19	8175.02	13.68	0.31	0.048	0.96
Reach-1	197.74	Alt3.5B	243000.00	534.70	7965.22	234500.08	914.40	930.67	931.30	0.001573	6.47	40134.70	7411.89	16.27	0.39	0.042	0.82
Reach-1	197.74	Alt3.5D	243000.00	983.13		242016.88	914.40	930.34	933.68	0.012082	14.69	16760.69	2624.58	15.94	0.98	0.043	5.27
Reach-1	197.74	Alt3.5H	243000.00	718.30	1145.85	241135.84	914.40	930.94	931.58	0.001526	6.44	38475.23	5138.81	16.54	0.39	0.042	0.82
Reach-1	197.74	existing	285000.00	3875.46	61785.65	219338.86	919.10	933.52	933.94	0.001691	5.34	55174.05	8192.43	14.42	0.31	0.047	1.00
Reach-1	197.74	Alt3.5B	285000.00	1242.76	19112.84	264644.41	914.40	931.56	932.20	0.001523	6.60	46863.82	7804.28	17.16	0.38	0.042	0.87
Reach-1	197.74	Alt3.5D	285000.00	2446.46		282553.56	914.40	931.15	934.79	0.011782	15.37	18914.72	2667.81	16.75	0.97	0.043	5.73
Reach-1	197.74	Alt3.5H	285000.00	1630.23	3552.57	279817.22	914.40	931.95	932.63	0.001521	6.69	43856.25	5629.78	17.55	0.38	0.043	0.91

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Manin Wid Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	197.83	existing	23500.00		356.35	23143.65	919.60	925.74	925.86	0.001633	2.74	8526.35	2869.81	6.14	0.28	0.045	0.30
Reach-1	197.83	Alt3.5B	23500.00		3.58	23496.42	914.40	921.84	921.90	0.001142	4.13	5697.08	1681.72	7.24	0.39	0.037	0.24
Reach-1	197.83	Alt3.5D	23500.00			23500.00	914.40	924.55	924.61	0.000233	2.02	11636.46	2453.91	10.15	0.16	0.039	0.07
Reach-1	197.83	Alt3.5H	23500.00			23500.00	914.40	921.84	921.90	0.001142	4.13	5693.74	1672.34	7.24	0.39	0.037	0.24
Reach-1	197.83	existing	57000.00		735.17	56264.84	919.60	928.27	928.46	0.001304	3.47	16347.62	3486.59	8.67	0.28	0.045	0.38
Reach-1	197.83	Alt3.5B	57000.00		180.51	56819.49	914.40	924.51	924.69	0.001382	4.91	11617.99	2464.35	10.11	0.40	0.039	0.41
Reach-1	197.83	Alt3.5D	57000.00			57000.00	914.40	927.25	927.38	0.000407	2.87	19863.06	3289.81	12.85	0.21	0.040	0.15
Reach-1	197.83	Alt3.5H	57000.00			57000.00	914.40	924.53	924.90	0.001385	4.92	11586.82	2446.04	10.13	0.40	0.039	0.41
Reach-1	197.83	existing	92000.00		1351.26	90648.74	919.60	929.97	930.22	0.001338	4.03	23187.08	4627.97	10.37	0.29	0.045	0.48
Reach-1	197.83	Alt3.5B	92000.00		454.35	91545.66	914.40	926.51	926.94	0.001471	5.24	17562.83	3247.58	12.11	0.40	0.039	0.49
Reach-1	197.83	Alt3.5D	92000.00			92000.00	914.40	929.23	929.41	0.000479	3.42	26908.36	3714.41	14.83	0.22	0.040	0.22
Reach-1	197.83	Alt3.5H	92000.00			92000.00	914.40	926.53	926.96	0.001474	5.25	17511.36	3222.51	12.13	0.40	0.040	0.50
Reach-1	197.83	existing	185000.00	862.90	18969.65	165167.45	919.60	932.45	932.83	0.001507	5.11	38923.18	7736.56	12.85	0.32	0.045	0.75
Reach-1	197.83	Alt3.5B	185000.00	0.00	1463.95	183536.06	914.40	930.00	930.59	0.001457	6.15	30581.77	4644.96	15.60	0.39	0.040	0.70
Reach-1	197.83	Alt3.5D	185000.00	860.49		184139.52	914.40	932.98	933.29	0.000579	4.41	42577.50	4519.24	18.58	0.24	0.041	0.37
Reach-1	197.83	Alt3.5H	185000.00	0.14		184999.84	914.40	930.09	930.67	0.001437	6.13	30183.23	3902.29	15.69	0.39	0.040	0.69
Reach-1	197.83	existing	227000.00	1729.87	31591.98	193678.14	919.60	933.27	933.69	0.001536	5.43	45477.11	8100.38	13.67	0.32	0.044	0.84
Reach-1	197.83	Alt3.5B	227000.00	112.63	4698.31	222189.06	914.40	931.06	931.71	0.001499	6.54	36358.59	6423.42	16.66	0.39	0.040	0.80
Reach-1	197.83	Alt3.5D	227000.00	2169.24		224830.75	914.40	934.27	934.62	0.000613	4.79	48435.93	4582.00	19.87	0.25	0.042	0.44
Reach-1	197.83	Alt3.5H	227000.00	173.17	392.75	226434.08	914.40	931.26	931.92	0.001462	6.51	35237.64	4618.54	16.86	0.39	0.041	0.79
Reach-1	197.83	existing	243000.00	2124.41	37901.43	202974.17	919.60	933.56	933.99	0.001524	5.51	47874.61	8128.60	13.96	0.32	0.044	0.86
Reach-1	197.83	Alt3.5B	243000.00	233.48	6794.72	235971.81	914.40	931.41	932.09	0.001514	6.67	38733.92	6883.71	17.01	0.40	0.040	0.83
Reach-1	197.83	Alt3.5D	243000.00	2811.68		240188.31	914.40	934.73	935.10	0.000623	4.92	50545.43	4582.00	20.33	0.25	0.042	0.46
Reach-1	197.83	Alt3.5H	243000.00	342.71	767.83	241889.66	914.40	931.67	932.35	0.001470	6.64	37135.55	4757.90	17.27	0.39	0.041	0.82
Reach-1	197.83	existing	285000.00	3420.35	55012.60	226567.05	919.60	934.28	934.74	0.001499	5.70	53703.16	8128.60	14.68	0.32	0.044	0.92
Reach-1	197.83	Alt3.5B	285000.00	724.69	16479.79	267795.53	914.40	932.28	932.98	0.001500	6.89	44837.29	7577.88	17.88	0.39	0.040	0.89
Reach-1	197.83	Alt3.5D	285000.00	4696.43		280303.56	914.40	935.86	936.28	0.000648	5.25	55750.51	4582.00	21.46	0.25	0.042	0.53
Reach-1	197.83	Alt3.5H	285000.00	1044.22	2025.37	281930.41	914.40	932.66	933.41	0.001487	6.97	42272.91	5793.10	18.26	0.39	0.041	0.92
Reach-1	197.92	existing	23500.00		282.43	23217.57	920.60	926.45	926.57	0.001288	2.73	8583.04	2953.96	5.85	0.28	0.040	0.23
Reach-1	197.92	Alt3.5B	23500.00		197.57	23302.43	917.00	924.06	924.85	0.021830	7.13	3294.19	2088.20	7.06	1.00	0.045	2.14
Reach-1	197.92	Alt3.5D	23500.00			23500.00	917.00	924.67	925.08	0.008064	5.11	4598.84	2254.81	7.67	0.63	0.044	1.02
Reach-1	197.92	Alt3.5H	23500.00			23500.00	917.00	924.07	924.88	0.021745	7.14	3291.77	2089.55	7.07	1.00	0.045	2.14
Reach-1	197.92	existing	57000.00		626.38	56373.63	920.60	928.86	929.05	0.001123	3.49	16313.64	3390.11	8.26	0.28	0.041	0.34
Reach-1	197.92	Alt3.5B	57000.00		616.02	56383.98	917.00	925.70	926.67	0.013249	7.89	7212.51	2724.62	8.70	0.85	0.043	2.18
Reach-1	197.92	Alt3.5D	57000.00			57000.00	917.00	927.54	927.86	0.002533	4.53	12583.03	3235.08	10.54	0.40	0.043	0.61
Reach-1	197.92	Alt3.5H	57000.00			57000.00	917.00	925.71	926.69	0.013361	7.93	7183.80	2704.56	8.71	0.86	0.043	2.20
Reach-1	197.92	existing	92000.00	0.23	1218.84	90780.93	920.60	930.57	930.83	0.001151	4.08	22902.12	4899.54	9.97	0.29	0.042	0.44
Reach-1	197.92	Alt3.5B	92000.00		983.72	91016.27	917.00	927.59	928.39	0.006218	7.14	12853.48	3267.35	10.59	0.83	0.043	1.52
Reach-1	197.92	Alt3.5D	92000.00			92000.00	917.00	929.54	929.89	0.001838	4.76	19319.62	3572.48	12.54	0.38	0.044	0.62
Reach-1	197.92	Alt3.5H	92000.00			92000.00	917.00	927.61	928.41	0.006259	7.18	12805.98	3241.62	10.61	0.64	0.043	1.53
Reach-1	197.92	existing	185000.00	87.09	16971.16	167941.73	920.60	933.15	933.55	0.001400	5.23	39112.25	7781.21	12.55	0.32	0.043	0.72
Reach-1	197.92	Alt3.5B	185000.00	3.59	3239.72	181756.69	917.00	930.92	931.77	0.003710	7.49	25461.69	5434.41	13.92	0.51	0.044	1.52
Reach-1	197.92	Alt3.5D	185000.00	153.40		184846.59	917.00	933.32	933.79	0.001523	5.52	33732.57	4394.00	16.32	0.33	0.045	0.81
Reach-1	197.92	Alt3.5H	185000.00	4.70	118.09	184877.22	917.00	930.98	931.86	0.003745	7.54	24595.95	3895.38	13.98	0.52	0.044	1.54
Reach-1	197.92	existing	227000.00	661.05	29269.05	197069.92	920.60	933.98	934.42	0.001425	5.57	45728.34	7989.40	13.38	0.33	0.043	0.80
Reach-1	197.92	Alt3.5B	227000.00	54.12	9403.23	217542.64	917.00	932.00	932.88	0.003522	7.67	31931.63	6514.37	15.00	0.50	0.044	1.61
Reach-1	197.92	Alt3.5D	227000.00	1385.89		225614.11	917.00	934.60	935.13	0.001460	5.85	39389.46	4394.00	17.60	0.33	0.045	0.89
Reach-1	197.92	Alt3.5H	227000.00	69.30	1542.06	225388.63	917.00	932.16	933.09	0.003546	7.78	29516.18	4367.50	15.16	0.50	0.044	1.65
Reach-1	197.92	existing	243000.00	970.00	34663.87	207366.14	920.60	934.27	934.72	0.001428	5.68	48056.30	7989.40	13.67	0.33	0.043	0.83
Reach-1	197.92	Alt3.5B	243000.00	88.81	13668.71	229242.48	917.00	932.36	933.23	0.003386	7.70	34260.76	6581.19	15.36	0.49	0.044	1.61
Reach-1	197.92	Alt3.5D	243000.00	2033.24		240966.75	917.00	935.06	935.61	0.001440	5.97	41417.78	4394.00	18.06	0.33	0.045	0.92
Reach-1	197.92	Alt3.5H	243000.00	113.53	2454.98	240431.50	917.00	932.56	933.51	0.003444	7.87	31273.82	4441.66	15.56	0.50	0.044	1.67
Reach-1	197.92	existing	285000.00	1911.91	49496.81	233591.28	920.60	934.99	935.47	0.001437	5.95	53732.85	7989.40	14.39	0.33	0.043	0.90
Reach-1	197.92	Alt3.5B	285000.00	149.19	26107.17	258743.63	917.00	933.19	934.08	0.003122	7.83	40196.92	7825.06	16.19	0.48	0.044	1.64
Reach-1	197.92	Alt3.5D	285000.00	4006.97		280993.03	917.00	936.20	936.81	0.001403	6.27	46422.98	4394.00	19.20	0.33	0.046	1.00
Reach-1	197.92	Alt3.5H	285000.00	427.49	5876.10	278696.44	917.00	933.54	934.54	0.003196	8.11	36480.99	5776.10	16.54	0.48	0.045	1.74
Reach-1	198.02	existing	23500.00		327.36	23172.64	922.80	927.28	927.46	0.002503	3.37	6948.94	2506.00	4.48	0.36	0.043	0.43

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Manning Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.02	Alt3.5B	23500.00		112.47	23387.53	915.80	926.20	926.36	0.001019	3.17	7416.55	2260.14	10.40	0.31	0.042	0.20
Reach-1	198.02	Alt3.5D	23500.00			23500.00	915.80	926.13	926.29	0.001081	3.26	7206.74	2236.74	10.33	0.32	0.042	0.21
Reach-1	198.02	Alt3.5H	23500.00			23500.00	915.80	926.21	926.37	0.001020	3.18	7398.79	2262.60	10.41	0.31	0.042	0.20
Reach-1	198.02	existing	57000.00		721.50	56278.50	922.80	929.55	929.83	0.002108	4.26	13347.97	3079.99	6.75	0.36	0.043	0.57
Reach-1	198.02	Alt3.5B	57000.00		410.48	56589.52	915.80	928.30	928.60	0.001628	4.40	12960.89	2979.90	12.50	0.37	0.042	0.44
Reach-1	198.02	Alt3.5D	57000.00			57000.00	915.80	928.53	928.81	0.001440	4.20	13561.36	3003.13	12.73	0.35	0.042	0.40
Reach-1	198.02	Alt3.5H	57000.00			57000.00	915.80	928.32	928.62	0.001629	4.41	12935.20	2958.69	12.52	0.37	0.042	0.44
Reach-1	198.02	existing	92000.00		1128.99	90871.01	922.80	931.24	931.59	0.001914	4.80	19151.21	3765.88	8.44	0.37	0.042	0.63
Reach-1	198.02	Alt3.5B	92000.00		723.34	91276.66	915.80	929.64	930.09	0.001995	5.36	17146.44	3209.91	13.84	0.41	0.042	0.66
Reach-1	198.02	Alt3.5D	92000.00			92000.00	915.80	930.35	930.70	0.001406	4.76	19330.57	3523.78	14.55	0.36	0.042	0.48
Reach-1	198.02	Alt3.5H	92000.00			92000.00	915.80	929.67	930.12	0.001997	5.38	17101.07	3181.81	13.87	0.41	0.042	0.66
Reach-1	198.02	existing	185000.00	486.58	12780.55	171732.88	922.80	933.87	934.40	0.001883	6.03	34242.57	7744.51	11.07	0.38	0.042	0.92
Reach-1	198.02	Alt3.5B	185000.00	3.44	3122.16	181874.41	915.80	932.49	933.18	0.002103	6.73	28344.46	5309.22	16.69	0.44	0.042	0.96
Reach-1	198.02	Alt3.5D	185000.00	485.84		184514.16	915.80	933.99	934.49	0.001239	5.68	32981.44	4158.72	18.19	0.34	0.042	0.68
Reach-1	198.02	Alt3.5H	185000.00	6.74	624.95	184368.31	915.80	932.57	933.27	0.002091	6.75	27696.37	4361.23	16.77	0.43	0.042	0.97
Reach-1	198.02	existing	227000.00	1482.46	26391.86	199125.69	922.80	934.70	935.26	0.001825	6.31	40953.00	8073.70	11.90	0.38	0.042	0.98
Reach-1	198.02	Alt3.5B	227000.00	231.98	9268.72	217501.30	915.80	933.48	934.23	0.002061	7.10	34845.01	7391.38	17.68	0.43	0.042	1.07
Reach-1	198.02	Alt3.5D	227000.00	2004.24		224995.77	915.80	935.25	935.82	0.001222	6.06	38281.13	4207.70	19.45	0.34	0.042	0.78
Reach-1	198.02	Alt3.5H	227000.00	338.90	3630.66	223030.42	915.80	933.67	934.44	0.002026	7.12	33307.46	5809.98	17.87	0.43	0.042	1.07
Reach-1	198.02	existing	243000.00	1959.81	32191.48	208848.91	922.80	934.99	935.58	0.001804	6.41	43294.20	8073.70	12.19	0.38	0.042	1.00
Reach-1	198.02	Alt3.5B	243000.00	433.90	12220.18	230345.94	915.80	933.78	934.56	0.002073	7.25	37155.84	7711.72	17.98	0.43	0.042	1.11
Reach-1	198.02	Alt3.5D	243000.00	2766.11		240233.89	915.80	935.70	936.29	0.001215	6.20	40188.51	4207.70	19.90	0.34	0.042	0.79
Reach-1	198.02	Alt3.5H	243000.00	673.48	6163.92	236162.61	915.80	934.04	934.83	0.001991	7.22	35509.38	5877.16	18.24	0.43	0.042	1.10
Reach-1	198.02	existing	285000.00	3325.70	48135.18	233539.13	922.80	935.70	936.30	0.001761	6.64	49014.39	8073.70	12.90	0.38	0.042	1.06
Reach-1	198.02	Alt3.5B	285000.00	1289.95	24405.07	259304.97	915.80	934.53	935.34	0.002038	7.52	43134.47	8073.70	18.73	0.43	0.041	1.19
Reach-1	198.02	Alt3.5D	285000.00	5040.12		279959.88	915.80	936.82	937.48	0.001202	6.53	44910.10	4207.70	21.02	0.34	0.042	0.87
Reach-1	198.02	Alt3.5H	285000.00	1966.43	14433.49	268600.09	915.80	934.97	935.79	0.001900	7.45	40973.18	5920.80	19.17	0.42	0.041	1.16
Reach-1	198.11	existing	23500.00		583.92	22916.08	922.40	928.48	928.64	0.002407	3.11	7485.51	2182.18	6.08	0.30	0.053	0.51
Reach-1	198.11	Alt3.5B	23500.00		177.64	23322.36	915.80	926.72	926.90	0.001217	3.46	6808.65	2208.36	10.92	0.35	0.044	0.23
Reach-1	198.11	Alt3.5D	23500.00			23500.00	915.80	926.67	926.87	0.001269	3.53	6654.44	2187.88	10.87	0.36	0.044	0.24
Reach-1	198.11	Alt3.5H	23500.00			23500.00	915.80	926.73	926.92	0.001225	3.47	6781.48	2185.23	10.93	0.35	0.044	0.23
Reach-1	198.11	existing	57000.00		1310.42	55689.58	922.40	930.71	931.03	0.002939	4.43	12738.22	2586.21	8.31	0.35	0.053	0.90
Reach-1	198.11	Alt3.5B	57000.00		636.28	56363.72	915.80	929.11	929.43	0.001815	4.58	12438.38	2510.62	13.31	0.36	0.046	0.56
Reach-1	198.11	Alt3.5D	57000.00			57000.00	915.80	929.27	929.58	0.001717	4.49	12702.33	2501.26	13.47	0.35	0.046	0.54
Reach-1	198.11	Alt3.5H	57000.00			57000.00	915.80	929.14	929.47	0.001829	4.60	12384.96	2484.05	13.34	0.36	0.046	0.56
Reach-1	198.11	existing	92000.00		2258.30	89741.70	922.40	932.36	932.78	0.003193	5.22	17722.56	4067.60	9.96	0.39	0.051	1.09
Reach-1	198.11	Alt3.5B	92000.00		1148.54	90851.46	915.80	930.65	931.14	0.002329	5.58	16453.75	2761.42	14.85	0.40	0.047	0.86
Reach-1	198.11	Alt3.5D	92000.00			92000.00	915.80	931.09	931.52	0.001985	5.25	17510.66	2817.41	15.29	0.37	0.047	0.76
Reach-1	198.11	Alt3.5H	92000.00			92000.00	915.80	930.69	931.18	0.002353	5.62	16379.07	2738.42	14.89	0.40	0.047	0.87
Reach-1	198.11	existing	185000.00	56.03	24171.77	160772.20	922.40	934.96	935.50	0.003168	6.20	34183.60	7789.99	12.56	0.40	0.052	1.51
Reach-1	198.11	Alt3.5B	185000.00		6535.11	178464.89	915.80	933.62	934.35	0.002852	6.98	28477.67	6656.25	17.62	0.45	0.047	1.33
Reach-1	198.11	Alt3.5D	185000.00	15.25		184984.75	915.80	934.67	935.30	0.002128	6.35	29164.11	3489.54	18.87	0.38	0.048	1.13
Reach-1	198.11	Alt3.5H	185000.00		1171.41	183828.59	915.80	933.70	934.48	0.002936	7.11	27016.55	5044.21	17.90	0.45	0.048	1.38
Reach-1	198.11	existing	227000.00	292.81	42284.44	184422.75	922.40	935.74	936.30	0.003105	6.46	40277.29	7935.53	13.34	0.39	0.052	1.62
Reach-1	198.11	Alt3.5B	227000.00	11.79	16111.09	210877.11	915.80	934.59	935.37	0.002839	7.30	35506.30	7704.98	18.79	0.44	0.048	1.49
Reach-1	198.11	Alt3.5D	227000.00	292.70		226707.30	915.80	935.92	936.63	0.002163	6.79	33650.07	3804.22	20.12	0.38	0.049	1.31
Reach-1	198.11	Alt3.5H	227000.00	27.54	6372.93	220599.53	915.80	934.77	935.62	0.002928	7.48	32757.19	5629.28	18.97	0.45	0.048	1.57
Reach-1	198.11	existing	243000.00	401.02	49502.05	193096.94	922.40	936.01	936.58	0.003090	6.55	42441.19	8114.35	13.61	0.39	0.052	1.67
Reach-1	198.11	Alt3.5B	243000.00	43.35	21608.22	221348.45	915.80	934.90	935.68	0.002826	7.40	37901.58	7780.04	19.10	0.44	0.048	1.54
Reach-1	198.11	Alt3.5D	243000.00	658.85		242341.16	915.80	936.36	937.11	0.002169	6.94	35379.20	3894.26	20.56	0.38	0.049	1.37
Reach-1	198.11	Alt3.5H	243000.00	85.63	9351.32	233563.06	915.80	935.12	935.99	0.002926	7.61	34766.96	5686.21	19.32	0.45	0.049	1.63
Reach-1	198.11	existing	285000.00	1199.77	69009.91	214790.31	922.40	936.67	937.28	0.003045	6.77	47852.94	8177.09	14.27	0.39	0.052	1.77
Reach-1	198.11	Alt3.5B	285000.00	238.27	37277.10	247484.63	915.80	935.61	936.43	0.002821	7.65	43509.83	7894.72	19.81	0.44	0.048	1.66
Reach-1	198.11	Alt3.5D	285000.00	2246.86		282753.13	915.80	937.47	938.30	0.002178	7.31	39755.32	3998.98	21.67	0.38	0.050	1.53
Reach-1	198.11	Alt3.5H	285000.00	378.19	18397.59	266224.22	915.80	935.99	936.91	0.002916	7.92	39773.23	5977.59	20.19	0.44	0.049	1.78
Reach-1	198.2	existing	23500.00		420.52	23079.48	918.80	929.41	929.53	0.001413	2.76	8455.48	2032.96	10.61	0.24	0.054	0.36
Reach-1	198.2	Alt3.5B	23500.00		74.00	23426.00	915.80	927.17	927.28	0.000521	2.74	8608.42	1696.32	11.37	0.21	0.043	0.16
Reach-1	198.2	Alt3.5D	23500.00			23500.00	915.80	927.14	927.26	0.000530	2.76	8521.10	1667.57	11.34	0.21	0.043	0.17

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach R	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.2	Alt3.5H	23500.00			23500.00	915.80	927.18	927.30	0.000521	2.73	8593.45	1678.38	11.38	0.21	0.043	0.16
Reach-1	198.2	existing	57000.00		1483.23	55536.77	918.80	932.00	932.21	0.001989	3.73	15260.21	3280.25	13.20	0.29	0.052	0.61
Reach-1	198.2	Alt3.5B	57000.00		420.39	56579.61	915.80	929.85	930.10	0.001009	4.01	14243.99	2358.59	14.05	0.29	0.045	0.38
Reach-1	198.2	Alt3.5D	57000.00			57000.00	915.80	929.97	930.21	0.000976	3.95	14412.61	2351.51	14.17	0.28	0.046	0.37
Reach-1	198.2	Alt3.5H	57000.00			57000.00	915.80	929.88	930.13	0.001010	4.01	14207.83	2334.36	14.08	0.29	0.046	0.38
Reach-1	198.2	existing	92000.00		4223.34	87776.66	918.80	933.72	934.00	0.001972	4.33	22049.02	5581.20	14.92	0.30	0.052	0.78
Reach-1	198.2	Alt3.5B	92000.00		993.79	91006.21	915.80	931.65	932.01	0.001365	4.81	19218.22	3190.36	15.85	0.34	0.046	0.54
Reach-1	198.2	Alt3.5D	92000.00			92000.00	915.80	931.96	932.30	0.001240	4.63	19859.03	3007.11	16.16	0.32	0.046	0.50
Reach-1	198.2	Alt3.5H	92000.00		133.45	91866.55	915.80	931.70	932.06	0.001367	4.82	19181.95	3168.48	15.90	0.33	0.046	0.54
Reach-1	198.2	existing	185000.00	95.48	41640.27	143264.27	918.80	936.25	936.60	0.001725	5.05	40398.37	7852.07	17.45	0.30	0.048	0.94
Reach-1	198.2	Alt3.5B	185000.00	0.02	13003.95	171996.02	915.80	934.86	935.38	0.001543	5.94	34737.07	7428.06	19.06	0.35	0.045	0.86
Reach-1	198.2	Alt3.5D	185000.00	18.99		184981.00	915.80	935.61	936.15	0.001404	5.90	31384.76	3276.83	19.81	0.33	0.046	0.84
Reach-1	198.2	Alt3.5H	185000.00	0.44	8378.49	176621.08	915.80	934.99	935.53	0.001558	6.01	32737.16	5518.16	19.19	0.35	0.045	0.88
Reach-1	198.2	existing	227000.00	322.15	62623.75	164054.09	918.80	936.99	937.39	0.001727	5.33	46257.24	7993.56	18.19	0.30	0.047	1.02
Reach-1	198.2	Alt3.5B	227000.00	37.81	29145.08	197817.13	915.80	935.83	936.36	0.001498	6.16	42170.81	7787.39	20.03	0.34	0.044	0.92
Reach-1	198.2	Alt3.5D	227000.00	246.05		226753.95	915.80	936.87	937.51	0.001451	6.41	35628.54	3480.51	21.07	0.34	0.046	0.99
Reach-1	198.2	Alt3.5H	227000.00	64.03	20688.29	206247.69	915.80	936.07	936.64	0.001515	6.26	38817.85	5727.83	20.27	0.35	0.045	0.95
Reach-1	198.2	existing	243000.00	456.51	70828.33	171715.17	918.80	937.25	937.66	0.001730	5.44	48341.62	8043.28	18.45	0.31	0.047	1.05
Reach-1	198.2	Alt3.5B	243000.00	71.30	35918.50	207010.19	915.80	936.13	936.67	0.001498	6.26	44517.34	7828.92	20.33	0.34	0.044	0.95
Reach-1	198.2	Alt3.5D	243000.00	454.77		242545.23	915.80	937.32	937.99	0.001467	6.59	37208.95	3566.30	21.52	0.34	0.046	1.04
Reach-1	198.2	Alt3.5H	243000.00	121.84	25855.92	217022.25	915.80	936.43	937.02	0.001510	6.38	40869.18	5795.92	20.63	0.35	0.044	0.98
Reach-1	198.2	existing	285000.00	984.52	92751.58	191263.91	918.80	937.89	938.35	0.001737	5.69	53510.03	8114.10	19.09	0.31	0.046	1.12
Reach-1	198.2	Alt3.5B	285000.00	240.20	54227.14	230532.66	915.80	936.84	937.41	0.001513	6.53	50084.89	7963.78	21.04	0.35	0.044	1.02
Reach-1	198.2	Alt3.5D	285000.00	1489.70		283510.31	915.80	938.43	939.19	0.001500	7.02	41222.22	3657.30	22.63	0.35	0.046	1.16
Reach-1	198.2	Alt3.5H	285000.00	443.97	40197.07	244358.95	915.80	937.29	937.92	0.001500	6.65	45938.14	5960.85	21.49	0.35	0.044	1.06
Reach-1	198.26	existing	23500.00		245.57	23254.43	918.70	929.80	929.91	0.001111	2.64	8888.30	1716.50	11.10	0.20	0.059	0.36
Reach-1	198.26	Alt3.5B	23500.00		19.65	23480.35	915.80	927.33	927.41	0.000329	2.26	10392.30	1501.84	11.53	0.15	0.047	0.14
Reach-1	198.26	Alt3.5D	23500.00			23500.00	915.80	927.31	927.39	0.000332	2.27	10338.50	1481.50	11.51	0.15	0.047	0.14
Reach-1	198.26	Alt3.5H	23500.00			23500.00	915.80	927.35	927.43	0.000327	2.26	10397.69	1484.07	11.55	0.15	0.047	0.14
Reach-1	198.26	existing	57000.00		1177.76	55822.24	918.70	932.61	932.82	0.002052	3.63	15696.82	3344.96	13.91	0.28	0.057	0.64
Reach-1	198.26	Alt3.5B	57000.00		247.50	56752.50	915.80	930.16	930.37	0.000808	3.72	15355.01	2186.89	14.36	0.25	0.048	0.35
Reach-1	198.26	Alt3.5D	57000.00			57000.00	915.80	930.27	930.48	0.000788	3.67	15518.68	2216.79	14.47	0.24	0.048	0.34
Reach-1	198.26	Alt3.5H	57000.00			57000.00	915.80	930.19	930.41	0.000806	3.71	15347.30	2177.66	14.39	0.25	0.048	0.35
Reach-1	198.26	existing	92000.00		5685.01	86314.99	918.70	934.32	934.58	0.001860	4.13	23270.50	6028.50	15.62	0.29	0.053	0.73
Reach-1	198.26	Alt3.5B	92000.00		653.11	91346.89	915.80	932.08	932.40	0.001200	4.53	20346.91	3250.70	16.28	0.31	0.048	0.48
Reach-1	198.26	Alt3.5D	92000.00			92000.00	915.80	932.36	932.65	0.001106	4.38	21015.44	3167.75	16.56	0.30	0.048	0.45
Reach-1	198.26	Alt3.5H	92000.00		37.24	91962.77	915.80	932.13	932.45	0.001198	4.53	20357.87	3258.28	16.33	0.31	0.048	0.48
Reach-1	198.26	existing	185000.00		44197.55	140802.45	918.70	936.76	937.09	0.001619	4.87	41156.13	7731.88	18.06	0.29	0.048	0.88
Reach-1	198.26	Alt3.5B	185000.00		14072.38	170927.63	915.80	935.36	935.81	0.001306	5.55	36948.48	7433.35	19.56	0.32	0.046	0.75
Reach-1	198.26	Alt3.5D	185000.00			185000.00	915.80	936.07	936.55	0.001226	5.58	33152.77	3297.82	20.27	0.31	0.047	0.76
Reach-1	198.26	Alt3.5H	185000.00		9901.42	175098.58	915.80	935.51	935.97	0.001309	5.59	35098.21	5474.10	19.71	0.32	0.046	0.76
Reach-1	198.26	existing	227000.00	5.68	64819.75	162174.58	918.70	937.50	937.87	0.001629	5.17	46849.87	7784.66	18.80	0.30	0.047	0.96
Reach-1	198.26	Alt3.5B	227000.00		29757.28	197242.72	915.80	936.31	936.78	0.001295	5.81	44185.82	7724.59	20.51	0.32	0.045	0.82
Reach-1	198.26	Alt3.5D	227000.00	2.07		226997.94	915.80	937.35	937.93	0.001271	6.07	37394.29	3332.40	21.55	0.32	0.047	0.88
Reach-1	198.26	Alt3.5H	227000.00		21334.94	205665.06	915.80	936.56	937.07	0.001307	5.91	41028.42	5668.66	20.76	0.32	0.045	0.85
Reach-1	198.26	existing	243000.00	17.00	72908.89	170074.11	918.70	937.76	938.15	0.001634	5.28	48867.98	7808.28	19.06	0.30	0.047	0.99
Reach-1	198.26	Alt3.5B	243000.00		36201.92	206798.08	915.80	936.61	937.10	0.001303	5.92	46487.32	7729.40	20.81	0.32	0.045	0.85
Reach-1	198.26	Alt3.5D	243000.00	17.98		242982.02	915.80	937.81	938.42	0.001287	6.25	38921.68	3373.95	22.01	0.32	0.047	0.93
Reach-1	198.26	Alt3.5H	243000.00	0.00	26310.31	216689.69	915.80	936.92	937.44	0.001309	6.03	43031.30	5674.48	21.12	0.32	0.045	0.88
Reach-1	198.26	existing	285000.00	85.47	94547.84	190366.69	918.70	938.39	938.83	0.001648	5.55	53858.15	7868.35	19.69	0.30	0.046	1.06
Reach-1	198.26	Alt3.5B	285000.00	1.57	53735.94	231262.48	915.80	937.31	937.84	0.001333	6.21	51939.61	7767.95	21.51	0.33	0.044	0.93
Reach-1	198.26	Alt3.5D	285000.00	203.87		284796.13	915.80	938.93	939.62	0.001325	6.69	42772.68	3536.21	23.13	0.33	0.047	1.05
Reach-1	198.26	Alt3.5H	285000.00	16.18	40134.34	244849.47	915.80	937.77	938.35	0.001319	6.31	47920.93	5749.82	21.97	0.32	0.044	0.95
Reach-1	198.3	existing	23500.00			23500.00	921.70	929.86	930.63	0.011937	7.06	3327.75	1084.84	8.16	0.71	0.051	2.27
Reach-1	198.3	Alt3.5B	23500.00			23500.00	918.00	927.08	928.77	0.060301	10.42	2254.23	685.57	9.08	1.01	0.076	11.97
Reach-1	198.3	Alt3.5D	23500.00			23500.00	918.00	927.12	928.77	0.058420	10.28	2285.96	691.49	9.12	1.00	0.076	11.66
Reach-1	198.3	Alt3.5H	23500.00			23500.00	918.00	927.12	928.77	0.058420	10.28	2285.96	691.49	9.12	1.00	0.076	11.66
Reach-1	198.3	existing	57000.00			57000.00	921.70	933.15	933.80	0.013504	6.48	8801.27	2669.42	11.45	0.63	0.060	2.77

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Tptal	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.3	Alt3.5B	57000.00			57000.00	918.00	930.06	932.08	0.072635	11.39	5006.42	1244.04	12.06	1.00	0.088	17.83
Reach-1	198.3	Alt3.5D	57000.00			57000.00	918.00	930.07	932.08	0.072674	11.37	5011.05	1245.53	12.07	1.00	0.088	17.83
Reach-1	198.3	Alt3.5H	57000.00			57000.00	918.00	930.07	932.08	0.072674	11.37	5011.05	1245.53	12.07	1.00	0.088	17.83
Reach-1	198.3	existing	92000.00			92000.00	921.70	934.72	935.44	0.009658	6.78	13576.00	3140.83	13.02	0.57	0.058	2.60
Reach-1	198.3	Alt3.5B	92000.00			92000.00	918.00	931.78	934.06	0.079511	12.12	7588.63	1712.65	13.78	1.01	0.092	21.58
Reach-1	198.3	Alt3.5D	92000.00			92000.00	918.00	931.99	934.06	0.069440	11.54	7969.28	1796.01	13.99	0.97	0.090	18.88
Reach-1	198.3	Alt3.5H	92000.00			92000.00	918.00	931.85	934.06	0.076098	11.93	7711.27	1739.94	13.85	1.00	0.092	20.66
Reach-1	198.3	existing	185000.00		19531.60	165468.41	921.70	936.96	937.88	0.007420	7.98	25381.42	7153.74	15.26	0.56	0.053	2.95
Reach-1	198.3	Alt3.5B	185000.00		304.26	184695.75	918.00	935.26	937.09	0.032460	10.86	17130.57	4021.34	17.26	0.83	0.074	10.85
Reach-1	198.3	Alt3.5D	185000.00			185000.00	918.00	936.19	937.52	0.019249	9.26	19977.96	3221.06	18.19	0.66	0.075	7.36
Reach-1	198.3	Alt3.5H	185000.00		31.00	184969.00	918.00	935.49	937.18	0.028506	10.44	17750.21	3392.76	17.49	0.78	0.075	9.72
Reach-1	198.3	existing	227000.00	24.68	38571.15	188404.19	921.70	937.71	938.83	0.006652	8.14	30808.68	7430.49	16.01	0.54	0.052	2.92
Reach-1	198.3	Alt3.5B	227000.00		12282.25	214717.73	918.00	936.28	937.96	0.024672	10.59	22422.25	6492.86	18.28	0.74	0.072	9.57
Reach-1	198.3	Alt3.5D	227000.00	13.62		226986.39	918.00	937.49	938.86	0.015421	9.38	24209.40	3288.90	19.49	0.61	0.074	7.07
Reach-1	198.3	Alt3.5H	227000.00		2266.95	224733.05	918.00	936.51	938.27	0.024075	10.70	21906.05	4940.90	18.51	0.74	0.074	9.65
Reach-1	198.3	existing	243000.00	55.75	46259.79	196684.47	921.70	937.97	938.90	0.006423	8.19	32768.11	7515.15	16.27	0.53	0.051	2.92
Reach-1	198.3	Alt3.5B	243000.00		21548.54	221451.45	918.00	936.64	938.21	0.021843	10.33	24867.10	6995.60	18.64	0.71	0.071	8.93
Reach-1	198.3	Alt3.5D	243000.00	80.20		242919.80	918.00	937.95	939.34	0.014496	9.45	25730.05	3313.86	19.95	0.59	0.074	7.04
Reach-1	198.3	Alt3.5H	243000.00		5019.98	237980.03	918.00	936.86	938.62	0.022651	10.74	23705.64	5143.57	18.86	0.72	0.074	9.56
Reach-1	198.3	existing	285000.00	189.84	67613.80	217216.36	921.70	938.61	939.58	0.005917	8.31	37655.19	7633.79	16.91	0.52	0.050	2.90
Reach-1	198.3	Alt3.5B	285000.00	11.93	49666.89	235321.19	918.00	937.46	938.84	0.016806	9.77	30740.27	7321.83	19.46	0.63	0.068	7.88
Reach-1	198.3	Alt3.5D	285000.00	439.08		284560.94	918.00	939.08	940.54	0.012783	9.68	29494.88	3345.00	21.08	0.57	0.074	7.05
Reach-1	198.3	Alt3.5H	285000.00	51.89	15762.73	269185.38	918.00	937.76	939.47	0.019291	10.73	28431.12	5370.90	19.76	0.68	0.074	9.15
Reach-1	198.34	existing	23500.00		193.58	23306.42	922.70	931.18	931.30	0.001325	2.77	8484.48	2035.97	8.48	0.24	0.057	0.35
Reach-1	198.34	Alt3.5B	23500.00		122.94	23377.06	916.20	930.12	930.25	0.002052	2.86	8218.33	1429.46	13.92	0.21	0.075	0.73
Reach-1	198.34	Alt3.5D	23500.00			23500.00	916.20	930.12	930.25	0.002078	2.87	8175.18	1408.95	13.92	0.21	0.075	0.74
Reach-1	198.34	Alt3.5H	23500.00			23500.00	916.20	930.12	930.25	0.002078	2.87	8175.18	1408.95	13.92	0.21	0.075	0.74
Reach-1	198.34	existing	57000.00		1850.31	55149.69	922.70	934.29	934.46	0.001309	3.40	17271.45	4140.97	11.59	0.27	0.053	0.41
Reach-1	198.34	Alt3.5B	57000.00		1110.86	55889.13	916.20	933.50	933.70	0.002169	3.62	15863.08	3565.55	17.30	0.27	0.058	0.73
Reach-1	198.34	Alt3.5D	57000.00			57000.00	916.20	933.52	933.73	0.002231	3.68	15506.53	2858.40	17.32	0.28	0.059	0.75
Reach-1	198.34	Alt3.5H	57000.00			57000.00	916.20	933.52	933.73	0.002231	3.68	15506.53	2858.40	17.32	0.28	0.059	0.75
Reach-1	198.34	existing	92000.00		6188.91	85811.09	922.70	935.82	936.06	0.001347	4.03	25116.91	6270.80	13.12	0.28	0.051	0.54
Reach-1	198.34	Alt3.5B	92000.00		4626.87	87373.34	916.20	935.40	935.64	0.001968	4.07	24209.87	5795.86	19.20	0.28	0.055	0.79
Reach-1	198.34	Alt3.5D	92000.00			92000.00	916.20	935.39	935.68	0.002185	4.29	21469.55	3321.95	19.19	0.30	0.056	0.87
Reach-1	198.34	Alt3.5H	92000.00			92000.00	916.20	935.42	935.71	0.002151	4.26	21570.93	3322.10	19.22	0.29	0.056	0.86
Reach-1	198.34	existing	185000.00		38611.07	146388.94	922.70	938.15	938.48	0.001408	5.03	42768.36	7871.74	15.45	0.30	0.047	0.76
Reach-1	198.34	Alt3.5B	185000.00		40397.80	144602.20	916.20	938.02	938.33	0.001773	4.78	43370.16	7867.55	21.82	0.28	0.053	0.98
Reach-1	198.34	Alt3.5D	185000.00			185000.00	916.20	938.26	938.81	0.002662	5.96	31054.89	3372.96	22.06	0.35	0.056	1.52
Reach-1	198.34	Alt3.5H	185000.00			185000.00	916.20	938.13	938.70	0.002785	6.04	30627.53	3372.55	21.93	0.35	0.056	1.56
Reach-1	198.34	existing	227000.00		55736.97	171263.03	922.70	938.84	939.23	0.001479	5.45	48228.18	7877.15	16.14	0.31	0.046	0.86
Reach-1	198.34	Alt3.5B	227000.00		59929.30	167070.69	916.20	938.77	939.12	0.001818	5.10	49291.56	7876.77	22.57	0.29	0.052	1.09
Reach-1	198.34	Alt3.5D	227000.00			227000.00	916.20	939.43	940.08	0.002710	6.49	34997.43	3376.74	23.23	0.36	0.056	1.74
Reach-1	198.34	Alt3.5H	227000.00			227000.00	916.20	939.10	939.80	0.003009	6.70	33896.21	3375.69	22.90	0.37	0.056	1.87
Reach-1	198.34	existing	243000.00		62487.67	180512.34	922.70	939.08	939.49	0.001503	5.60	50168.95	7880.64	16.38	0.32	0.046	0.89
Reach-1	198.34	Alt3.5B	243000.00		66827.13	176172.88	916.20	938.97	939.35	0.001889	5.26	50884.91	7877.91	22.77	0.29	0.052	1.16
Reach-1	198.34	Alt3.5D	243000.00			243000.00	916.20	939.85	940.54	0.002721	6.67	36427.96	3377.30	23.65	0.36	0.056	1.81
Reach-1	198.34	Alt3.5H	243000.00			243000.00	916.20	939.40	940.15	0.003129	6.96	34917.05	3376.66	23.20	0.38	0.056	2.00
Reach-1	198.34	existing	285000.00		80621.16	204378.84	922.70	939.69	940.15	0.001561	5.96	54958.86	7896.40	16.99	0.33	0.046	0.99
Reach-1	198.34	Alt3.5B	285000.00		85663.93	199336.06	916.20	939.49	939.92	0.002049	5.68	54951.68	7893.01	23.29	0.31	0.052	1.32
Reach-1	198.34	Alt3.5D	285000.00			285000.00	916.20	940.91	941.70	0.002746	7.12	40001.91	3377.30	24.71	0.36	0.056	2.01
Reach-1	198.34	Alt3.5H	285000.00			285000.00	916.20	940.10	941.00	0.003474	7.65	37257.85	3377.30	23.90	0.41	0.056	2.37
Reach-1	198.4	existing	23500.00		169.46	23330.54	921.50	931.54	931.64	0.000924	2.49	9448.40	2146.38	10.04	0.21	0.055	0.25
Reach-1	198.4	Alt3.5B	23500.00		76.93	23423.07	917.00	930.51	930.61	0.000737	2.54	9253.84	1410.63	13.51	0.17	0.057	0.30
Reach-1	198.4	Alt3.5D	23500.00			23500.00	917.00	930.51	930.61	0.000742	2.55	9212.73	1388.90	13.51	0.17	0.057	0.30
Reach-1	198.4	Alt3.5H	23500.00			23500.00	917.00	930.51	930.61	0.000742	2.55	9212.73	1388.90	13.51	0.17	0.057	0.30
Reach-1	198.4	existing	57000.00		1054.17	55945.82	921.50	934.67	934.82	0.000995	3.10	18907.87	4540.15	13.17	0.23	0.052	0.34
Reach-1	198.4	Alt3.5B	57000.00		585.44	56414.56	917.00	934.01	934.17	0.001090	3.18	18025.00	3888.74	17.01	0.24	0.056	0.36
Reach-1	198.4	Alt3.5D	57000.00			57000.00	917.00	934.04	934.20	0.001094	3.20	17824.10	3281.13	17.04	0.24	0.056	0.37

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.4	Alt3.5H	57000.00			57000.00	917.00	934.04	934.20	0.001094	3.20	17824.10	3281.13	17.04	0.24	0.056	0.37
Reach-1	198.4	existing	92000.00		5212.40	86787.59	921.50	936.23	936.43	0.001036	3.74	27352.54	5905.89	14.73	0.25	0.050	0.45
Reach-1	198.4	Alt3.5B	92000.00		3678.77	88321.22	917.00	935.88	936.08	0.001015	3.69	27200.40	5777.04	18.88	0.24	0.052	0.45
Reach-1	198.4	Alt3.5D	92000.00			92000.00	917.00	935.92	936.14	0.001080	3.83	24045.53	3325.05	18.92	0.25	0.052	0.48
Reach-1	198.4	Alt3.5H	92000.00			92000.00	917.00	935.94	936.17	0.001069	3.81	24123.06	3325.13	18.94	0.25	0.052	0.48
Reach-1	198.4	existing	185000.00		29346.84	155653.16	921.50	938.58	938.92	0.001241	5.01	44203.10	7872.56	17.06	0.29	0.048	0.72
Reach-1	198.4	Alt3.5B	185000.00		26515.22	158484.77	917.00	938.48	938.80	0.001147	4.87	45263.83	7865.34	21.48	0.27	0.050	0.69
Reach-1	198.4	Alt3.5D	185000.00			185000.00	917.00	938.93	939.38	0.001341	5.43	34065.36	3334.51	21.93	0.30	0.049	0.85
Reach-1	198.4	Alt3.5H	185000.00			185000.00	917.00	938.83	939.30	0.001386	5.46	33740.35	3334.20	21.83	0.30	0.049	0.87
Reach-1	198.4	existing	227000.00		44305.43	182694.56	921.50	939.31	939.70	0.001324	5.46	49948.98	7944.56	17.81	0.30	0.048	0.83
Reach-1	198.4	Alt3.5B	227000.00		41280.70	185719.30	917.00	939.25	939.63	0.001213	5.28	51399.41	7943.48	22.25	0.29	0.049	0.79
Reach-1	198.4	Alt3.5D	227000.00			227000.00	917.00	940.12	940.67	0.001384	5.97	38039.32	3338.20	23.12	0.31	0.048	0.97
Reach-1	198.4	Alt3.5H	227000.00			227000.00	917.00	939.86	940.44	0.001495	6.10	37194.68	3337.46	22.86	0.32	0.049	1.03
Reach-1	198.4	existing	243000.00		50429.16	192570.83	921.50	939.57	939.98	0.001350	5.61	51994.93	7949.59	18.07	0.31	0.048	0.86
Reach-1	198.4	Alt3.5B	243000.00		46797.03	196202.97	917.00	939.48	939.88	0.001259	5.46	53182.83	7947.87	22.48	0.29	0.049	0.84
Reach-1	198.4	Alt3.5D	243000.00			243000.00	917.00	940.55	941.14	0.001397	6.16	39475.74	3338.20	23.55	0.32	0.048	1.02
Reach-1	198.4	Alt3.5H	243000.00			243000.00	917.00	940.20	940.82	0.001547	6.34	38317.45	3338.20	23.20	0.33	0.048	1.10
Reach-1	198.4	existing	285000.00		67174.20	217825.80	921.50	940.20	940.67	0.001408	5.98	57045.87	7960.00	18.70	0.32	0.047	0.96
Reach-1	198.4	Alt3.5B	285000.00		62128.58	222871.41	917.00	940.05	940.50	0.001363	5.90	57690.40	7958.95	23.05	0.31	0.048	0.95
Reach-1	198.4	Alt3.5D	285000.00			285000.00	917.00	941.62	942.30	0.001427	6.62	43059.46	3338.20	24.62	0.32	0.048	1.14
Reach-1	198.4	Alt3.5H	285000.00			285000.00	917.00	940.99	941.74	0.001693	6.96	40960.45	3338.20	23.99	0.35	0.048	1.28
Reach-1	198.49	existing	23500.00		219.16	23280.84	921.90	931.81	931.86	0.000258	1.81	13010.78	2562.61	9.91	0.14	0.042	0.08
Reach-1	198.49	Alt3.5B	23500.00		167.02	23332.98	917.20	930.79	930.84	0.000311	1.86	12643.08	2155.06	13.59	0.13	0.048	0.11
Reach-1	198.49	Alt3.5D	23500.00			23500.00	917.20	930.79	930.84	0.000316	1.87	12557.96	2130.65	13.59	0.14	0.048	0.11
Reach-1	198.49	Alt3.5H	23500.00			23500.00	917.20	930.79	930.84	0.000316	1.87	12557.96	2130.65	13.59	0.14	0.048	0.11
Reach-1	198.49	existing	57000.00		1119.15	55880.85	921.90	935.00	935.09	0.000339	2.50	23714.08	5245.68	13.10	0.17	0.041	0.14
Reach-1	198.49	Alt3.5B	57000.00		699.27	56300.73	917.20	934.38	934.48	0.000391	2.48	23258.21	3878.48	17.18	0.17	0.045	0.17
Reach-1	198.49	Alt3.5D	57000.00			57000.00	917.20	934.42	934.51	0.000395	2.50	22810.32	3278.66	17.22	0.17	0.045	0.17
Reach-1	198.49	Alt3.5H	57000.00			57000.00	917.20	934.42	934.51	0.000395	2.50	22810.32	3278.66	17.22	0.17	0.045	0.17
Reach-1	198.49	existing	92000.00		7504.56	84495.43	921.90	936.60	936.73	0.000389	3.06	34426.13	7904.50	14.70	0.19	0.040	0.20
Reach-1	198.49	Alt3.5B	92000.00		5703.01	86296.99	917.20	936.26	936.39	0.000416	2.99	34242.98	7158.59	19.06	0.18	0.044	0.23
Reach-1	198.49	Alt3.5D	92000.00			92000.00	917.20	936.33	936.49	0.000461	3.16	29092.77	3285.03	19.13	0.19	0.045	0.25
Reach-1	198.49	Alt3.5H	92000.00			92000.00	917.20	936.35	936.50	0.000458	3.16	29156.93	3285.09	19.15	0.19	0.045	0.25
Reach-1	198.49	existing	185000.00		37948.00	147052.00	921.90	939.08	939.31	0.000501	4.11	54179.90	7979.64	17.18	0.22	0.040	0.34
Reach-1	198.49	Alt3.5B	185000.00		36285.37	148714.63	917.20	938.97	939.17	0.000505	3.94	55588.72	7978.18	21.77	0.20	0.043	0.36
Reach-1	198.49	Alt3.5D	185000.00			185000.00	917.20	939.51	939.85	0.000669	4.68	39561.18	3295.61	22.31	0.24	0.044	0.50
Reach-1	198.49	Alt3.5H	185000.00			185000.00	917.20	939.43	939.78	0.000684	4.71	39296.08	3295.34	22.23	0.24	0.044	0.50
Reach-1	198.49	existing	227000.00		53563.97	173436.03	921.90	939.86	940.12	0.000555	4.52	60341.80	7989.44	17.96	0.23	0.040	0.40
Reach-1	198.49	Alt3.5B	227000.00		52193.30	174806.69	917.20	939.78	940.03	0.000554	4.32	62103.95	7988.54	22.58	0.22	0.043	0.42
Reach-1	198.49	Alt3.5D	227000.00			227000.00	917.20	940.75	941.17	0.000725	5.20	43632.75	3296.90	23.55	0.25	0.043	0.59
Reach-1	198.49	Alt3.5H	227000.00			227000.00	917.20	940.54	940.97	0.000765	5.29	42945.56	3296.90	23.34	0.26	0.043	0.62
Reach-1	198.49	existing	243000.00		59730.87	183269.14	921.90	940.13	940.41	0.000574	4.67	62514.36	7990.00	18.23	0.24	0.040	0.43
Reach-1	198.49	Alt3.5B	243000.00		58139.57	184860.42	917.20	940.03	940.29	0.000580	4.48	64085.27	7990.00	22.83	0.22	0.043	0.45
Reach-1	198.49	Alt3.5D	243000.00			243000.00	917.20	941.19	941.64	0.000743	5.39	45098.69	3296.90	23.99	0.26	0.043	0.63
Reach-1	198.49	Alt3.5H	243000.00			243000.00	917.20	940.91	941.38	0.000798	5.50	44157.95	3296.90	23.71	0.26	0.043	0.66
Reach-1	198.49	existing	285000.00		76383.10	208616.89	921.90	940.80	941.12	0.000620	5.03	67861.19	7990.00	18.90	0.25	0.040	0.48
Reach-1	198.49	Alt3.5B	285000.00		74350.29	210649.72	917.20	940.65	940.96	0.000639	4.86	69046.34	7990.00	23.45	0.24	0.043	0.52
Reach-1	198.49	Alt3.5D	285000.00			285000.00	917.20	942.30	942.83	0.000787	5.85	48750.96	3296.90	25.10	0.27	0.043	0.72
Reach-1	198.49	Alt3.5H	285000.00			285000.00	917.20	941.78	942.35	0.000887	6.06	47053.00	3296.90	24.58	0.28	0.043	0.78
Reach-1	198.59	existing	23500.00		196.93	23303.07	921.30	931.95	932.00	0.000259	1.81	12951.05	2384.76	10.65	0.14	0.044	0.09
Reach-1	198.59	Alt3.5B	23500.00		247.17	23252.83	918.00	931.04	931.09	0.000808	1.87	12501.79	2139.17	13.04	0.14	0.072	0.29
Reach-1	198.59	Alt3.5D	23500.00			23500.00	918.00	931.04	931.10	0.000823	1.89	12431.00	2116.65	13.04	0.14	0.073	0.30
Reach-1	198.59	Alt3.5H	23500.00			23500.00	918.00	931.04	931.10	0.000823	1.89	12431.00	2116.65	13.04	0.14	0.073	0.30
Reach-1	198.59	existing	57000.00		620.63	56379.37	921.30	935.17	935.28	0.000349	2.61	21962.82	3640.48	13.87	0.17	0.043	0.15
Reach-1	198.59	Alt3.5B	57000.00		800.70	56199.30	918.00	934.68	934.78	0.000873	2.57	22046.44	3074.25	16.68	0.17	0.064	0.40
Reach-1	198.59	Alt3.5D	57000.00			57000.00	918.00	934.71	934.82	0.000885	2.60	21957.29	2975.33	16.71	0.17	0.064	0.40
Reach-1	198.59	Alt3.5H	57000.00			57000.00	918.00	934.71	934.82	0.000885	2.60	21957.29	2975.33	16.71	0.17	0.064	0.40
Reach-1	198.59	existing	92000.00		5632.66	86367.34	921.30	936.81	936.96	0.000441	3.23	31621.68	7643.05	15.51	0.19	0.043	0.23

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.59	Alt3.5B	92000.00		6293.06	85706.94	918.00	936.58	936.72	0.000979	3.09	31630.79	6912.32	18.58	0.18	0.062	0.54
Reach-1	198.59	Alt3.5D	92000.00			92000.00	918.00	936.68	936.85	0.001086	3.28	28039.84	3124.26	18.68	0.19	0.064	0.60
Reach-1	198.59	Alt3.5H	92000.00			92000.00	918.00	936.70	936.87	0.001079	3.27	28093.04	3124.33	18.70	0.19	0.064	0.60
Reach-1	198.59	existing	185000.00		44023.79	140976.20	921.30	939.35	939.57	0.000522	4.07	51256.25	7740.40	18.05	0.22	0.040	0.36
Reach-1	198.59	Alt3.5B	185000.00		57195.39	127804.59	918.00	939.33	939.52	0.000898	3.52	52813.55	7740.24	21.33	0.18	0.054	0.64
Reach-1	198.59	Alt3.5D	185000.00			185000.00	918.00	940.02	940.38	0.001559	4.81	38487.85	3137.02	22.02	0.24	0.064	1.18
Reach-1	198.59	Alt3.5H	185000.00			185000.00	918.00	939.95	940.31	0.001588	4.83	38271.31	3136.75	21.95	0.24	0.064	1.20
Reach-1	198.59	existing	227000.00		63685.97	163314.02	921.30	940.15	940.41	0.000581	4.39	57467.48	7757.68	18.85	0.22	0.039	0.41
Reach-1	198.59	Alt3.5B	227000.00		82027.05	144972.95	918.00	940.17	940.40	0.000921	3.72	59300.02	7758.42	22.17	0.19	0.052	0.71
Reach-1	198.59	Alt3.5D	227000.00			227000.00	918.00	941.30	941.74	0.001693	5.34	42493.41	3137.70	23.30	0.26	0.064	1.41
Reach-1	198.59	Alt3.5H	227000.00			227000.00	918.00	941.12	941.57	0.001769	5.41	41933.44	3137.70	23.12	0.26	0.064	1.46
Reach-1	198.59	existing	243000.00		71458.40	171541.59	921.30	940.44	940.71	0.000574	4.51	59657.52	7760.00	19.14	0.23	0.039	0.43
Reach-1	198.59	Alt3.5B	243000.00		91263.35	151736.66	918.00	940.43	940.68	0.000941	3.82	61322.41	7760.00	22.43	0.19	0.052	0.74
Reach-1	198.59	Alt3.5D	243000.00			243000.00	918.00	941.76	942.23	0.001737	5.53	43931.07	3137.70	23.76	0.26	0.064	1.50
Reach-1	198.59	Alt3.5H	243000.00			243000.00	918.00	941.51	942.00	0.001841	5.63	43165.23	3137.70	23.51	0.27	0.064	1.56
Reach-1	198.59	existing	285000.00		92427.83	192572.16	921.30	941.13	941.44	0.000606	4.78	65040.35	7760.00	19.83	0.24	0.039	0.48
Reach-1	198.59	Alt3.5B	285000.00		116112.66	168887.33	918.00	941.08	941.37	0.000988	4.04	66350.02	7760.00	23.08	0.20	0.050	0.81
Reach-1	198.59	Alt3.5D	285000.00			285000.00	918.00	942.90	943.45	0.001844	6.00	47507.52	3137.70	24.90	0.27	0.065	1.72
Reach-1	198.59	Alt3.5H	285000.00			285000.00	918.00	942.46	943.05	0.002033	6.18	46126.45	3137.70	24.46	0.28	0.065	1.84
Reach-1	198.66	existing	23500.00		143.06	23356.94	921.50	932.04	932.08	0.000188	1.74	13549.16	2111.52	10.54	0.12	0.044	0.08
Reach-1	198.66	Alt3.5B	23500.00		111.26	23388.74	918.30	931.19	931.24	0.000223	1.75	13432.37	1940.79	12.89	0.12	0.046	0.10
Reach-1	198.66	Alt3.5D	23500.00			23500.00	918.30	931.20	931.25	0.000224	1.76	13371.47	1917.45	12.90	0.12	0.047	0.10
Reach-1	198.66	Alt3.5H	23500.00			23500.00	918.30	931.20	931.25	0.000224	1.76	13371.47	1917.45	12.90	0.12	0.047	0.10
Reach-1	198.66	existing	57000.00	0.37	533.08	56466.55	921.50	935.30	935.40	0.000314	2.60	21994.10	3150.20	13.80	0.17	0.044	0.15
Reach-1	198.66	Alt3.5B	57000.00	0.01	439.70	56560.29	918.30	934.87	934.97	0.000313	2.54	22491.00	2962.06	16.57	0.16	0.047	0.15
Reach-1	198.66	Alt3.5D	57000.00	0.02		56999.98	918.30	934.91	935.01	0.000314	2.54	22404.96	2820.42	16.61	0.16	0.047	0.15
Reach-1	198.66	Alt3.5H	57000.00	0.02		56999.98	918.30	934.91	935.01	0.000314	2.54	22404.96	2820.42	16.61	0.16	0.047	0.15
Reach-1	198.66	existing	92000.00	4.42	4796.64	87198.94	921.50	936.97	937.13	0.000428	3.27	30694.13	7041.52	15.47	0.19	0.043	0.24
Reach-1	198.66	Alt3.5B	92000.00	3.81	3654.49	88341.70	918.30	936.80	936.95	0.000399	3.16	31361.64	6823.59	18.50	0.18	0.046	0.23
Reach-1	198.66	Alt3.5D	92000.00	4.24		91995.76	918.30	936.93	937.09	0.000416	3.24	28375.22	2994.06	18.63	0.19	0.046	0.24
Reach-1	198.66	Alt3.5H	92000.00	4.28		91995.72	918.30	936.95	937.11	0.000414	3.24	28422.00	2994.12	18.65	0.19	0.046	0.24
Reach-1	198.66	existing	185000.00	14.06	41299.99	143685.94	921.50	939.55	939.78	0.000546	4.18	50206.65	7655.46	18.05	0.22	0.041	0.39
Reach-1	198.66	Alt3.5B	185000.00	13.41	39527.82	145458.98	918.30	939.56	939.78	0.000493	4.01	52141.81	7655.56	21.26	0.20	0.043	0.37
Reach-1	198.66	Alt3.5D	185000.00	18.75		184981.27	918.30	940.39	940.75	0.000648	4.77	38761.39	3006.08	22.09	0.23	0.046	0.52
Reach-1	198.66	Alt3.5H	185000.00	18.63		184981.38	918.30	940.33	940.69	0.000658	4.80	38574.05	3005.86	22.03	0.24	0.046	0.52
Reach-1	198.66	existing	227000.00	17.75	61286.66	165695.59	921.50	940.36	940.64	0.000588	4.50	56470.92	7670.30	18.86	0.23	0.041	0.45
Reach-1	198.66	Alt3.5B	227000.00	17.03	59314.88	167668.11	918.30	940.41	940.66	0.000530	4.32	58683.02	7672.36	22.11	0.21	0.042	0.42
Reach-1	198.66	Alt3.5D	227000.00	25.44		226974.55	918.30	941.70	942.14	0.000719	5.32	42706.81	3006.80	23.40	0.25	0.046	0.63
Reach-1	198.66	Alt3.5H	227000.00	25.19		226974.81	918.30	941.54	941.99	0.000745	5.38	42224.52	3006.80	23.24	0.25	0.046	0.65
Reach-1	198.66	existing	243000.00	19.10	69178.28	173804.63	921.50	940.65	940.94	0.000602	4.61	58678.07	7680.00	19.15	0.23	0.040	0.47
Reach-1	198.66	Alt3.5B	243000.00	18.34	66789.05	176192.59	918.30	940.68	940.95	0.000548	4.45	60754.19	7680.00	22.38	0.22	0.042	0.45
Reach-1	198.66	Alt3.5D	243000.00	27.96		242972.03	918.30	942.17	942.65	0.000743	5.51	44120.11	3006.80	23.87	0.25	0.046	0.67
Reach-1	198.66	Alt3.5H	243000.00	27.63		242972.36	918.30	941.95	942.44	0.000779	5.59	43461.27	3006.80	23.65	0.26	0.046	0.70
Reach-1	198.66	existing	285000.00	22.50	90647.93	194329.58	921.50	941.36	941.66	0.000635	4.88	64102.91	7680.00	19.86	0.24	0.040	0.52
Reach-1	198.66	Alt3.5B	285000.00	21.67	87262.42	197715.91	918.30	941.35	941.66	0.000590	4.75	65900.13	7680.00	23.05	0.22	0.041	0.51
Reach-1	198.66	Alt3.5D	285000.00	34.44		284965.56	918.30	943.34	943.90	0.000800	5.99	47631.41	3006.80	25.04	0.26	0.046	0.78
Reach-1	198.66	Alt3.5H	285000.00	33.95		284966.06	918.30	942.95	943.53	0.000867	6.14	46448.62	3006.80	24.65	0.28	0.046	0.83
Reach-1	198.75	existing	23500.00		133.32	23366.68	921.40	932.13	932.17	0.000153	1.56	15026.71	2214.84	10.73	0.11	0.043	0.06
Reach-1	198.75	Alt3.5B	23500.00		199.30	23300.70	919.00	931.37	931.41	0.000594	1.57	14926.03	2232.84	12.37	0.11	0.081	0.25
Reach-1	198.75	Alt3.5D	23500.00			23500.00	919.00	931.38	931.42	0.000602	1.58	14869.01	2211.38	12.38	0.11	0.082	0.25
Reach-1	198.75	Alt3.5H	23500.00			23500.00	919.00	931.38	931.42	0.000602	1.58	14869.01	2211.38	12.38	0.11	0.082	0.25
Reach-1	198.75	existing	57000.00		514.48	56485.52	921.40	935.48	935.57	0.000348	2.41	23665.79	3104.96	14.08	0.15	0.045	0.17
Reach-1	198.75	Alt3.5B	57000.00		710.94	56289.07	919.00	935.11	935.20	0.000813	2.33	24343.61	3050.87	16.11	0.14	0.072	0.41
Reach-1	198.75	Alt3.5D	57000.00			57000.00	919.00	935.16	935.24	0.000820	2.35	24289.34	2992.21	16.16	0.15	0.073	0.41
Reach-1	198.75	Alt3.5H	57000.00			57000.00	919.00	935.16	935.24	0.000820	2.35	24289.34	2992.21	16.16	0.15	0.073	0.41
Reach-1	198.75	existing	92000.00		2742.18	89257.82	921.40	937.19	937.34	0.000481	3.11	31068.81	6389.76	15.79	0.18	0.045	0.27
Reach-1	198.75	Alt3.5B	92000.00		3516.06	88483.95	919.00	937.11	937.24	0.000982	2.93	32321.80	6210.18	18.11	0.16	0.071	0.59
Reach-1	198.75	Alt3.5D	92000.00			92000.00	919.00	937.26	937.40	0.001011	3.00	30686.82	3086.88	18.26	0.17	0.072	0.62

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan L
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	106.75	Alt3.5H	92000.00			92000.00	919.00	937.27	937.41	0.001006	2.99	30730.15	3086.92	18.27	0.17	0.072	0.62
Reach-1	106.75	existing	185000.00		34410.23	150589.78	921.40	939.80	940.03	0.000574	4.10	50719.43	7745.41	18.40	0.21	0.042	0.42
Reach-1	106.76	Alt3.5B	185000.00		48461.16	136538.84	919.00	939.90	940.09	0.001026	3.51	53261.61	7745.94	20.90	0.17	0.061	0.79
Reach-1	106.75	Alt3.5D	185000.00			185000.00	919.00	940.90	941.21	0.001463	4.41	41969.58	3099.14	21.90	0.21	0.073	1.22
Reach-1	106.75	Alt3.5H	185000.00			185000.00	919.00	940.85	941.15	0.001483	4.43	41800.28	3098.96	21.85	0.21	0.073	1.23
Reach-1	106.75	existing	227000.00		53241.10	173758.92	921.40	940.64	940.90	0.000610	4.42	57166.60	7760.09	19.24	0.22	0.042	0.48
Reach-1	106.76	Alt3.5B	227000.00		73425.66	153574.33	919.00	940.78	940.98	0.001045	3.70	59922.04	7762.70	21.78	0.18	0.059	0.86
Reach-1	106.75	Alt3.5D	227000.00			227000.00	919.00	942.28	942.65	0.001601	4.91	46223.79	3099.80	23.28	0.22	0.073	1.47
Reach-1	106.75	Alt3.5H	227000.00			227000.00	919.00	942.14	942.52	0.001652	4.96	45790.71	3099.80	23.14	0.23	0.073	1.50
Reach-1	106.75	existing	243000.00		60747.14	182252.86	921.40	940.93	941.21	0.000622	4.53	59436.72	7766.33	19.53	0.22	0.041	0.50
Reach-1	106.76	Alt3.5B	243000.00		82826.73	160173.27	919.00	941.03	941.27	0.001063	3.78	62058.73	7768.58	22.03	0.18	0.058	0.90
Reach-1	106.75	Alt3.5D	243000.00			243000.00	919.00	942.77	943.17	0.001648	5.09	47745.88	3099.80	23.77	0.23	0.073	1.56
Reach-1	106.75	Alt3.5H	243000.00			243000.00	919.00	942.58	942.99	0.001717	5.15	47155.39	3099.80	23.58	0.23	0.073	1.61
Reach-1	106.75	existing	285000.00		81175.27	203824.72	921.40	941.65	941.96	0.000650	4.80	65011.60	7770.00	20.25	0.23	0.041	0.55
Reach-1	106.76	Alt3.5B	285000.00		108166.85	176833.13	919.00	941.71	942.00	0.001103	3.98	67332.27	7770.00	22.71	0.18	0.056	0.98
Reach-1	106.75	Alt3.5D	285000.00			285000.00	919.00	943.99	944.46	0.001762	5.53	51525.09	3099.80	24.99	0.24	0.073	1.80
Reach-1	106.75	Alt3.5H	285000.00			285000.00	919.00	943.65	944.14	0.001886	5.65	50470.50	3099.80	24.65	0.25	0.073	1.89
Reach-1	106.85	existing	23500.00		123.86	23376.14	922.30	932.22	932.28	0.000352	2.00	11776.44	2139.95	9.92	0.15	0.044	0.12
Reach-1	106.85	Alt3.5B	23500.00		187.32	23312.68	920.00	931.77	931.83	0.001284	1.90	12356.80	2239.97	11.77	0.14	0.087	0.44
Reach-1	106.85	Alt3.5D	23500.00			23500.00	920.00	931.78	931.84	0.001293	1.91	12331.99	2217.94	11.78	0.14	0.087	0.44
Reach-1	106.85	Alt3.5H	23500.00			23500.00	920.00	931.78	931.84	0.001293	1.91	12331.99	2217.94	11.78	0.14	0.087	0.44
Reach-1	106.85	existing	57000.00		533.26	56466.73	922.30	935.67	935.79	0.000572	2.76	20463.03	2933.69	13.37	0.19	0.047	0.25
Reach-1	106.85	Alt3.5B	57000.00		760.42	56239.58	920.00	935.58	935.69	0.001219	2.56	22104.99	2926.25	15.58	0.16	0.077	0.57
Reach-1	106.85	Alt3.5D	57000.00			57000.00	920.00	935.63	935.74	0.001227	2.58	22083.11	2896.75	15.63	0.16	0.078	0.58
Reach-1	106.85	Alt3.5H	57000.00			57000.00	920.00	935.63	935.74	0.001227	2.58	22083.11	2896.75	15.63	0.16	0.078	0.58
Reach-1	106.85	existing	92000.00		997.40	91002.60	922.30	937.44	937.63	0.000713	3.57	25969.35	3528.36	15.14	0.21	0.047	0.38
Reach-1	106.85	Alt3.5B	92000.00		1564.65	90435.34	920.00	937.66	937.82	0.001441	3.23	28690.01	3883.94	17.66	0.18	0.077	0.85
Reach-1	106.85	Alt3.5D	92000.00			92000.00	920.00	937.82	937.99	0.001410	3.23	28520.32	2949.97	17.82	0.18	0.078	0.84
Reach-1	106.85	Alt3.5H	92000.00			92000.00	920.00	937.84	938.00	0.001405	3.22	28554.35	2950.05	17.84	0.18	0.078	0.84
Reach-1	106.85	existing	185000.00		14422.20	170577.80	922.30	940.05	940.43	0.001049	5.14	41100.55	7535.09	17.75	0.27	0.046	0.73
Reach-1	106.85	Alt3.5B	185000.00		27127.93	157872.06	920.00	940.45	940.72	0.001880	4.35	46070.13	7656.86	20.45	0.22	0.072	1.42
Reach-1	106.85	Alt3.5D	185000.00			185000.00	920.00	941.70	942.03	0.001879	4.63	39995.13	2977.36	21.70	0.22	0.078	1.56
Reach-1	106.85	Alt3.5H	185000.00			185000.00	920.00	941.65	941.99	0.001900	4.64	39862.65	2977.17	21.65	0.22	0.078	1.57
Reach-1	106.85	existing	227000.00		28662.20	198337.80	922.30	940.89	941.32	0.001120	5.56	47495.98	7666.74	18.59	0.28	0.046	0.84
Reach-1	106.85	Alt3.5B	227000.00		48696.32	178303.67	920.00	941.31	941.61	0.001920	4.59	52642.15	7679.34	21.31	0.22	0.070	1.55
Reach-1	106.85	Alt3.5D	227000.00			227000.00	920.00	943.13	943.54	0.002020	5.13	44285.19	2983.33	23.13	0.23	0.078	1.85
Reach-1	106.85	Alt3.5H	227000.00			227000.00	920.00	943.02	943.44	0.002072	5.17	43945.99	2982.86	23.02	0.24	0.078	1.88
Reach-1	106.85	existing	243000.00		34607.05	208192.94	922.30	941.18	941.63	0.001140	5.69	49756.23	7672.94	18.88	0.29	0.046	0.87
Reach-1	106.85	Alt3.5B	243000.00		57125.93	185874.08	920.00	941.59	941.91	0.001946	4.68	54800.43	7689.03	21.59	0.23	0.069	1.60
Reach-1	106.85	Alt3.5D	243000.00			243000.00	920.00	943.65	944.09	0.002069	5.30	45819.10	2985.46	23.65	0.24	0.078	1.95
Reach-1	106.85	Alt3.5H	243000.00			243000.00	920.00	943.49	943.94	0.002139	5.36	45356.32	2984.82	23.49	0.24	0.078	2.00
Reach-1	106.85	existing	285000.00		52109.82	232890.17	922.30	941.91	942.39	0.001183	6.01	55315.49	7690.33	19.61	0.29	0.045	0.96
Reach-1	106.85	Alt3.5B	285000.00		80317.77	204682.23	920.00	942.28	942.63	0.001995	4.90	60102.65	7691.89	22.28	0.23	0.067	1.72
Reach-1	106.85	Alt3.5D	285000.00			285000.00	920.00	944.92	945.44	0.002186	5.74	49627.75	2991.12	24.92	0.25	0.078	2.23
Reach-1	106.85	Alt3.5H	285000.00			285000.00	920.00	944.65	945.18	0.002311	5.84	48801.17	2989.61	24.65	0.25	0.078	2.32
Reach-1	106.94	existing	23500.00		255.61	23244.39	923.20	932.45	932.54	0.000762	2.41	9721.61	2253.72	9.25	0.20	0.045	0.20
Reach-1	106.94	Alt3.5B	23500.00		218.59	23281.41	920.20	932.20	932.28	0.000665	2.25	10440.67	2214.46	12.00	0.18	0.049	0.19
Reach-1	106.94	Alt3.5D	23500.00			23500.00	920.20	932.22	932.30	0.000669	2.26	10402.92	2196.57	12.02	0.18	0.050	0.20
Reach-1	106.94	Alt3.5H	23500.00			23500.00	920.20	932.22	932.30	0.000669	2.26	10402.92	2196.57	12.02	0.18	0.050	0.20
Reach-1	106.94	existing	57000.00		710.88	56289.13	923.20	935.99	936.14	0.000846	3.13	18165.09	2736.04	12.79	0.21	0.048	0.35
Reach-1	106.94	Alt3.5B	57000.00		644.13	56355.87	920.20	936.01	936.14	0.000688	2.92	19495.27	2747.60	15.81	0.19	0.051	0.30
Reach-1	106.94	Alt3.5D	57000.00			57000.00	920.20	936.06	936.20	0.000695	2.93	19465.61	2739.51	15.86	0.19	0.051	0.30
Reach-1	106.94	Alt3.5H	57000.00			57000.00	920.20	936.06	936.20	0.000695	2.93	19465.61	2739.51	15.86	0.19	0.051	0.30
Reach-1	106.94	existing	92000.00		1874.96	90125.04	923.20	937.83	938.06	0.001003	3.89	24187.84	4608.48	14.63	0.24	0.049	0.51
Reach-1	106.94	Alt3.5B	92000.00		2430.46	89569.54	920.20	938.14	938.33	0.000745	3.54	27045.57	5611.35	17.94	0.21	0.050	0.41
Reach-1	106.94	Alt3.5D	92000.00			92000.00	920.20	938.30	938.49	0.000742	3.57	25780.36	2836.79	18.10	0.21	0.050	0.42
Reach-1	106.94	Alt3.5H	92000.00			92000.00	920.20	938.31	938.50	0.000739	3.56	25808.06	2836.82	18.11	0.21	0.050	0.41
Reach-1	106.94	existing	185000.00		37599.40	147400.61	923.20	940.63	940.93	0.001005	4.74	43571.20	7494.11	17.43	0.25	0.045	0.68

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	198.94	Alt3.5B	185000.00		40791.75	144208.23	920.20	941.01	941.26	0.000758	4.31	47716.70	7499.13	20.81	0.22	0.045	0.55
Reach-1	198.94	Alt3.5D	185000.00			185000.00	920.20	942.28	942.66	0.000885	4.99	37103.74	2849.01	22.08	0.24	0.049	0.71
Reach-1	198.94	Alt3.5H	185000.00			185000.00	920.20	942.24	942.63	0.000894	5.00	36995.23	2848.90	22.04	0.24	0.049	0.72
Reach-1	198.94	existing	227000.00		59835.71	167164.28	923.20	941.49	941.83	0.001003	4.98	50050.65	7505.44	18.29	0.26	0.044	0.73
Reach-1	198.94	Alt3.5B	227000.00		62421.63	164578.38	920.20	941.87	942.15	0.000780	4.58	54152.37	7510.38	21.67	0.23	0.044	0.61
Reach-1	198.94	Alt3.5D	227000.00			227000.00	920.20	943.75	944.22	0.000931	5.50	41299.95	2850.00	23.55	0.25	0.049	0.83
Reach-1	198.94	Alt3.5H	227000.00			227000.00	920.20	943.65	944.13	0.000952	5.53	41020.76	2850.00	23.45	0.26	0.049	0.84
Reach-1	198.94	existing	243000.00		68566.79	174433.20	923.20	941.79	942.14	0.001005	5.07	52304.16	7509.38	18.59	0.26	0.043	0.75
Reach-1	198.94	Alt3.5B	243000.00		70747.34	172252.66	920.20	942.15	942.45	0.000793	4.69	56296.36	7514.12	21.95	0.23	0.044	0.63
Reach-1	198.94	Alt3.5D	243000.00			243000.00	920.20	944.28	944.78	0.000947	5.68	42796.62	2850.00	24.08	0.26	0.049	0.88
Reach-1	198.94	Alt3.5H	243000.00			243000.00	920.20	944.14	944.65	0.000976	5.73	42415.67	2850.00	23.94	0.26	0.049	0.89
Reach-1	198.94	existing	285000.00		91992.38	193007.61	923.20	942.52	942.91	0.001012	5.28	57804.49	7518.97	19.32	0.26	0.043	0.80
Reach-1	198.94	Alt3.5B	285000.00		93216.41	191783.59	920.20	942.85	943.19	0.000824	4.95	61560.05	7520.00	22.65	0.24	0.043	0.69
Reach-1	198.94	Alt3.5D	285000.00			285000.00	920.20	945.58	946.16	0.000987	6.13	46506.28	2850.00	25.38	0.27	0.049	0.99
Reach-1	198.94	Alt3.5H	285000.00			285000.00	920.20	945.34	945.94	0.001036	6.22	45825.09	2850.00	25.14	0.27	0.049	1.02
Reach-1	199.07	existing	23500.00		1.91	23498.09	926.80	932.83	933.07	0.002187	3.97	5921.21	2064.01	6.03	0.41	0.036	0.39
Reach-1	199.07	Alt3.5B	23500.00		0.78	23499.22	921.00	932.54	932.75	0.002038	3.66	6415.06	2021.03	11.54	0.36	0.047	0.40
Reach-1	199.07	Alt3.5D	23500.00			23500.00	921.00	932.55	932.76	0.002012	3.65	6441.58	2019.88	11.55	0.36	0.046	0.40
Reach-1	199.07	Alt3.5H	23500.00			23500.00	921.00	932.55	932.76	0.002012	3.65	6441.58	2019.88	11.55	0.36	0.046	0.40
Reach-1	199.07	existing	57000.00		66.43	56933.57	926.80	936.28	936.56	0.001018	4.24	13481.39	2245.33	9.48	0.30	0.037	0.38
Reach-1	199.07	Alt3.5B	57000.00		64.93	56935.07	921.00	936.27	936.51	0.000987	3.93	14530.06	2245.24	15.27	0.27	0.043	0.40
Reach-1	199.07	Alt3.5D	57000.00			57000.00	921.00	936.31	936.55	0.000966	3.91	14589.68	2225.91	15.31	0.27	0.043	0.39
Reach-1	199.07	Alt3.5H	57000.00			57000.00	921.00	936.31	936.55	0.000966	3.91	14589.68	2225.91	15.31	0.27	0.043	0.39
Reach-1	199.07	existing	92000.00		174.50	91825.50	926.80	938.14	938.56	0.001103	5.22	17667.03	2259.09	11.34	0.33	0.037	0.54
Reach-1	199.07	Alt3.5B	92000.00		185.92	91814.08	921.00	938.39	938.75	0.001014	4.78	19320.67	2260.98	17.39	0.29	0.043	0.54
Reach-1	199.07	Alt3.5D	92000.00			92000.00	921.00	938.53	938.88	0.000965	4.71	19542.59	2232.87	17.53	0.28	0.043	0.52
Reach-1	199.07	Alt3.5H	92000.00			92000.00	921.00	938.54	938.89	0.000962	4.70	19562.21	2232.70	17.54	0.28	0.043	0.52
Reach-1	199.07	existing	185000.00		2587.14	182412.88	926.80	940.96	941.86	0.001595	7.63	26613.14	6002.36	14.16	0.41	0.038	1.06
Reach-1	199.07	Alt3.5B	185000.00		4439.76	180560.25	921.00	941.30	942.05	0.001497	7.02	29851.48	6783.20	20.30	0.36	0.042	1.06
Reach-1	199.07	Alt3.5D	185000.00			185000.00	921.00	942.51	943.17	0.001129	6.50	28446.20	2242.00	21.51	0.32	0.042	0.88
Reach-1	199.07	Alt3.5H	185000.00			185000.00	921.00	942.48	943.14	0.001139	6.52	28367.10	2242.00	21.48	0.32	0.042	0.89
Reach-1	199.07	existing	227000.00		10040.60	216959.39	926.80	941.87	942.91	0.001731	8.37	32939.40	7887.01	15.07	0.43	0.038	1.24
Reach-1	199.07	Alt3.5B	227000.00		14083.10	212916.91	921.00	942.21	943.07	0.001618	7.87	36822.63	8339.70	21.21	0.38	0.043	1.24
Reach-1	199.07	Alt3.5D	227000.00			227000.00	921.00	943.98	944.77	0.001183	7.15	31727.23	2242.00	22.98	0.34	0.042	1.03
Reach-1	199.07	Alt3.5H	227000.00			227000.00	921.00	943.88	944.69	0.001209	7.20	31522.51	2242.00	22.88	0.34	0.042	1.05
Reach-1	199.07	existing	243000.00		14314.70	228685.28	926.80	942.19	943.27	0.001758	8.58	35533.84	8306.24	15.39	0.44	0.038	1.30
Reach-1	199.07	Alt3.5B	243000.00		18675.60	224124.41	921.00	942.52	943.41	0.001652	7.87	39469.71	8745.11	21.52	0.39	0.043	1.30
Reach-1	199.07	Alt3.5D	243000.00			243000.00	921.00	944.50	945.34	0.001203	7.39	32895.71	2242.00	23.50	0.34	0.042	1.09
Reach-1	199.07	Alt3.5H	243000.00			243000.00	921.00	944.37	945.23	0.001237	7.45	32615.87	2242.00	23.37	0.34	0.042	1.11
Reach-1	199.07	existing	285000.00		28073.53	256926.47	926.80	942.98	944.13	0.001796	9.04	42514.08	9341.22	16.18	0.45	0.039	1.42
Reach-1	199.07	Alt3.5B	285000.00		33992.27	251007.73	921.00	943.29	944.24	0.001705	8.31	46577.13	9691.00	22.29	0.40	0.043	1.42
Reach-1	199.07	Alt3.5D	285000.00			285000.00	921.00	945.79	946.77	0.001251	7.96	35788.39	2242.00	24.79	0.35	0.042	1.23
Reach-1	199.07	Alt3.5H	285000.00			285000.00	921.00	945.58	946.58	0.001311	8.08	35285.91	2242.00	24.58	0.36	0.042	1.27
Reach-1	199.11	existing	23500.00		0.00	23500.00	926.80	933.42	933.61	0.001570	3.48	6762.36	2178.69	6.62	0.35	0.037	0.30
Reach-1	199.11	Alt3.5B	23500.00			23500.00	926.80	933.12	933.35	0.002114	3.85	6107.27	2125.95	6.32	0.40	0.037	0.38
Reach-1	199.11	Alt3.5D	23500.00			23500.00	926.80	933.12	933.35	0.002098	3.84	6123.37	2127.30	6.32	0.40	0.037	0.38
Reach-1	199.11	Alt3.5H	23500.00			23500.00	926.80	933.12	933.35	0.002098	3.84	6123.37	2127.30	6.32	0.40	0.037	0.38
Reach-1	199.11	existing	57000.00	19.89	38.49	56943.62	926.80	936.59	936.85	0.000997	4.04	14152.79	2470.59	9.79	0.29	0.038	0.36
Reach-1	199.11	Alt3.5B	57000.00	17.68	35.39	56946.93	926.80	936.54	936.80	0.001027	4.08	14018.94	2468.41	9.74	0.30	0.038	0.37
Reach-1	199.11	Alt3.5D	57000.00	19.34		56980.66	926.80	936.58	936.84	0.001005	4.05	14089.84	2451.43	9.78	0.30	0.038	0.37
Reach-1	199.11	Alt3.5H	57000.00	19.34		56980.66	926.80	936.58	936.84	0.001005	4.05	14089.84	2451.43	9.78	0.30	0.038	0.37
Reach-1	199.11	existing	92000.00	244.69	129.40	91625.91	926.80	938.50	938.88	0.001031	4.90	18941.53	2547.46	11.70	0.31	0.038	0.50
Reach-1	199.11	Alt3.5B	92000.00	276.30	136.09	91587.62	926.80	938.67	939.03	0.000961	4.80	19364.13	2549.28	11.87	0.30	0.038	0.47
Reach-1	199.11	Alt3.5D	92000.00	301.39		91698.61	926.80	938.80	939.14	0.000914	4.73	19606.94	2519.11	12.00	0.29	0.038	0.46
Reach-1	199.11	Alt3.5H	92000.00	302.92		91697.09	926.80	938.81	939.15	0.000911	4.72	19626.93	2519.15	12.01	0.29	0.038	0.46
Reach-1	199.11	existing	185000.00	1591.15	2839.49	180569.36	926.80	941.60	942.33	0.001331	6.90	29687.21	6584.06	14.80	0.37	0.039	0.90
Reach-1	199.11	Alt3.5B	185000.00	1631.83	3650.32	179717.84	926.80	941.78	942.45	0.001259	6.77	30714.34	6745.48	14.96	0.36	0.039	0.86
Reach-1	199.11	Alt3.5D	185000.00	1995.24		183004.77	926.80	942.87	943.48	0.000951	6.26	29912.18	2536.30	16.07	0.32	0.039	0.71

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.11	Alt3.5H	185000.00	1986.21		183013.78	926.80	942.84	943.45	0.000959	6.28	29830.60	2536.23	16.04	0.32	0.039	0.72
Reach-1	199.11	existing	227000.00	2234.16	11012.97	213752.84	926.80	942.59	943.41	0.001403	7.49	36654.49	7612.18	15.79	0.38	0.039	1.03
Reach-1	199.11	Alt3.5B	227000.00	2262.98	12078.97	212658.05	926.80	942.71	943.50	0.001343	7.38	37573.09	7737.55	15.91	0.38	0.039	1.00
Reach-1	199.11	Alt3.5D	227000.00	2945.98		224054.03	926.80	944.38	945.10	0.000968	6.82	33739.86	2537.00	17.58	0.33	0.039	0.82
Reach-1	199.11	Alt3.5H	227000.00	2920.46		224079.53	926.80	944.30	945.02	0.000988	6.86	33528.65	2537.00	17.50	0.33	0.039	0.83
Reach-1	199.11	existing	243000.00	2474.44	15017.54	225508.02	926.80	942.92	943.77	0.001425	7.69	39244.57	7960.60	16.12	0.39	0.039	1.08
Reach-1	199.11	Alt3.5B	243000.00	2498.46	16058.85	224442.69	926.80	943.02	943.85	0.001373	7.58	40077.18	8069.41	16.22	0.38	0.039	1.05
Reach-1	199.11	Alt3.5D	243000.00	3323.94		239676.05	926.80	944.92	945.68	0.000975	7.01	35106.22	2537.00	18.12	0.33	0.039	0.86
Reach-1	199.11	Alt3.5H	243000.00	3288.91		239711.09	926.80	944.81	945.57	0.001001	7.07	34817.90	2537.00	18.01	0.33	0.039	0.87
Reach-1	199.11	existing	285000.00	3109.48	26764.49	255126.02	926.80	943.71	944.65	0.001481	8.16	46057.89	9024.39	16.91	0.40	0.040	1.19
Reach-1	199.11	Alt3.5B	285000.00	3122.58	27629.01	254248.41	926.80	943.78	944.69	0.001447	8.09	46628.38	9072.20	16.98	0.40	0.040	1.17
Reach-1	199.11	Alt3.5D	285000.00	4342.31		280657.69	926.80	946.26	947.12	0.000993	7.50	38496.73	2537.00	19.46	0.34	0.039	0.95
Reach-1	199.11	Alt3.5H	285000.00	4279.09		280720.91	926.80	946.05	946.94	0.001038	7.60	37980.02	2537.00	19.25	0.34	0.039	0.98
Reach-1	100.12	existing	23500.00		0.00	23500.00	926.80	933.52	933.63	0.000613	2.71	8684.53	2094.69	6.72	0.23	0.035	0.16
Reach-1	100.12	Alt3.5B	23500.00			23500.00	926.80	933.25	933.38	0.000767	2.89	8119.83	2094.00	6.45	0.26	0.035	0.18
Reach-1	100.12	Alt3.5D	23500.00			23500.00	926.80	933.26	933.39	0.000763	2.89	8133.51	2094.00	6.46	0.26	0.035	0.18
Reach-1	100.12	Alt3.5H	23500.00			23500.00	926.80	933.26	933.39	0.000763	2.89	8133.51	2094.00	6.46	0.26	0.035	0.18
Reach-1	100.12	existing	57000.00		28.73	56971.28	926.80	936.64	936.86	0.000556	3.74	15259.93	2112.99	9.84	0.24	0.035	0.25
Reach-1	100.12	Alt3.5B	57000.00		27.85	56972.15	926.80	936.59	936.81	0.000570	3.77	15150.06	2112.68	9.79	0.25	0.035	0.26
Reach-1	100.12	Alt3.5D	57000.00			57000.00	926.80	936.63	936.85	0.000560	3.75	15202.42	2094.00	9.83	0.25	0.035	0.25
Reach-1	100.12	Alt3.5H	57000.00			57000.00	926.80	936.63	936.85	0.000560	3.75	15202.42	2094.00	9.83	0.25	0.035	0.25
Reach-1	100.12	existing	92000.00		107.07	91892.93	926.80	938.53	938.88	0.000674	4.79	19246.08	2124.00	11.73	0.28	0.035	0.38
Reach-1	100.12	Alt3.5B	92000.00		112.96	91887.05	926.80	938.69	939.03	0.000636	4.71	19588.53	2124.95	11.89	0.27	0.035	0.37
Reach-1	100.12	Alt3.5D	92000.00			92000.00	926.80	938.81	939.15	0.000610	4.65	19770.27	2094.00	12.01	0.27	0.035	0.36
Reach-1	100.12	Alt3.5H	92000.00			92000.00	926.80	938.82	939.16	0.000608	4.65	19786.63	2094.00	12.02	0.27	0.035	0.36
Reach-1	100.12	existing	185000.00		3227.07	181772.94	926.80	941.58	942.36	0.001012	7.11	28520.18	4689.84	14.78	0.36	0.035	0.76
Reach-1	100.12	Alt3.5B	185000.00		3034.84	181965.14	926.80	941.73	942.49	0.000975	7.03	29364.97	5915.33	14.93	0.35	0.035	0.74
Reach-1	100.12	Alt3.5D	185000.00			185000.00	926.80	942.84	943.51	0.000757	6.56	28211.19	2094.00	16.04	0.31	0.035	0.63
Reach-1	100.12	Alt3.5H	185000.00			185000.00	926.80	942.81	943.48	0.000763	6.57	28144.09	2094.00	16.01	0.32	0.035	0.63
Reach-1	100.12	existing	227000.00		8954.81	218045.19	926.80	942.53	943.47	0.001136	7.91	34462.99	6787.30	15.73	0.38	0.036	0.92
Reach-1	100.12	Alt3.5B	227000.00		9844.77	217155.23	926.80	942.65	943.56	0.001094	7.81	35279.34	6916.72	15.85	0.38	0.036	0.90
Reach-1	100.12	Alt3.5D	227000.00			227000.00	926.80	944.33	945.15	0.000805	7.25	31331.46	2094.00	17.53	0.33	0.035	0.74
Reach-1	100.12	Alt3.5H	227000.00			227000.00	926.80	944.25	945.07	0.000820	7.29	31157.15	2094.00	17.45	0.33	0.035	0.75
Reach-1	100.12	existing	243000.00		12224.48	230775.53	926.80	942.86	943.84	0.001175	8.17	36709.77	7137.85	16.06	0.39	0.036	0.98
Reach-1	100.12	Alt3.5B	243000.00		13109.77	229890.23	926.80	942.96	943.92	0.001136	8.08	37456.24	7250.56	16.16	0.39	0.036	0.95
Reach-1	100.12	Alt3.5D	243000.00			243000.00	926.80	944.87	945.74	0.000822	7.49	32444.44	2094.00	18.07	0.34	0.035	0.78
Reach-1	100.12	Alt3.5H	243000.00			243000.00	926.80	944.75	945.64	0.000842	7.55	32206.20	2094.00	17.95	0.34	0.035	0.80
Reach-1	100.12	existing	285000.00		22306.07	262693.94	926.80	943.63	944.74	0.001266	8.80	42634.95	8116.12	16.83	0.41	0.036	1.11
Reach-1	100.12	Alt3.5B	285000.00		23083.91	261916.08	926.80	943.69	944.78	0.001240	8.73	43151.98	8158.99	16.89	0.41	0.036	1.09
Reach-1	199.12	Alt3.5D	285000.00			285000.00	926.80	946.18	947.20	0.000863	8.10	35203.16	2094.00	19.38	0.35	0.035	0.89
Reach-1	100.12	Alt3.5H	285000.00			285000.00	926.80	945.98	947.02	0.000899	8.20	34775.51	2094.00	19.18	0.35	0.035	0.92
Reach-1	100.125		Bridge														
Reach-1	199.13	existing	23500.00		0.02	23499.98	926.80	933.59	933.70	0.000579	2.66	8836.81	2095.12	6.79	0.23	0.035	0.15
Reach-1	199.13	Alt3.5B	23500.00			23500.00	926.80	933.34	933.46	0.000711	2.83	8307.84	2094.00	6.54	0.25	0.035	0.18
Reach-1	199.13	Alt3.5D	23500.00			23500.00	926.80	933.34	933.47	0.000707	2.82	8320.37	2094.00	6.54	0.25	0.035	0.17
Reach-1	199.13	Alt3.5H	23500.00			23500.00	926.80	933.34	933.47	0.000707	2.82	8320.37	2094.00	6.54	0.25	0.035	0.17
Reach-1	199.13	existing	57000.00		30.22	56969.77	926.80	936.73	936.94	0.000535	3.70	15443.86	2113.50	9.93	0.24	0.035	0.24
Reach-1	199.13	Alt3.5B	57000.00		29.36	56970.64	926.80	936.68	936.90	0.000547	3.72	15338.22	2113.21	9.88	0.24	0.035	0.25
Reach-1	199.13	Alt3.5D	57000.00			57000.00	926.80	936.72	936.93	0.000538	3.70	15386.08	2094.00	9.92	0.24	0.035	0.25
Reach-1	199.13	Alt3.5H	57000.00			57000.00	926.80	936.72	936.93	0.000538	3.70	15386.08	2094.00	9.92	0.24	0.035	0.25
Reach-1	199.13	existing	92000.00		111.63	91888.38	926.80	938.65	939.00	0.000644	4.73	19511.75	2124.73	11.85	0.27	0.035	0.37
Reach-1	199.13	Alt3.5B	92000.00		117.34	91882.66	926.80	938.81	939.14	0.000610	4.65	19840.70	2125.64	12.01	0.27	0.035	0.36
Reach-1	199.13	Alt3.5D	92000.00			92000.00	926.80	938.93	939.26	0.000586	4.60	20010.03	2094.00	12.13	0.26	0.035	0.35
Reach-1	199.13	Alt3.5H	92000.00			92000.00	926.80	938.93	939.26	0.000584	4.59	20025.62	2094.00	12.13	0.26	0.035	0.35
Reach-1	199.13	existing	185000.00		3505.83	181494.17	926.80	941.83	942.57	0.000944	6.95	29973.55	6026.06	15.03	0.35	0.035	0.73
Reach-1	199.13	Alt3.5B	185000.00		4268.12	180731.89	926.80	941.99	942.70	0.000898	6.84	30923.85	6195.00	15.19	0.34	0.035	0.70
Reach-1	199.13	Alt3.5D	185000.00			185000.00	926.80	943.04	943.69	0.000722	6.46	28617.11	2094.00	16.24	0.31	0.035	0.61

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.13	Alt3.5H	185000.00			185000.00	926.80	943.01	943.66	0.000728	6.48	28553.07	2094.00	16.21	0.31	0.035	0.61
Reach-1	199.13	existing	227000.00		11448.98	215551.02	926.80	942.86	943.72	0.001024	7.63	36736.34	7141.89	16.06	0.37	0.036	0.85
Reach-1	199.13	Alt3.5B	227000.00		12256.40	214743.59	926.80	942.96	943.80	0.000991	7.55	37465.08	7251.89	16.16	0.36	0.036	0.83
Reach-1	199.13	Alt3.5D	227000.00			227000.00	926.80	944.56	945.35	0.000766	7.14	31811.28	2094.00	17.76	0.32	0.035	0.72
Reach-1	199.13	Alt3.5H	227000.00			227000.00	926.80	944.48	945.28	0.000779	7.17	31645.12	2094.00	17.68	0.33	0.035	0.72
Reach-1	199.13	existing	243000.00		15129.11	227870.89	926.80	943.19	944.10	0.001056	7.87	39153.37	7500.53	16.39	0.37	0.036	0.90
Reach-1	199.13	Alt3.5B	243000.00		15420.28	227579.72	926.80	943.28	944.17	0.001031	7.81	39840.15	7880.34	16.48	0.37	0.036	0.88
Reach-1	199.13	Alt3.5D	243000.00			243000.00	926.80	945.11	945.95	0.000781	7.37	32952.21	2094.00	18.31	0.33	0.035	0.76
Reach-1	199.13	Alt3.5H	243000.00			243000.00	926.80	945.00	945.86	0.000799	7.43	32725.81	2094.00	18.20	0.33	0.035	0.77
Reach-1	199.13	existing	285000.00		27066.30	257933.70	926.80	944.01	945.01	0.001117	8.41	45820.47	8376.78	17.21	0.39	0.036	1.01
Reach-1	199.13	Alt3.5B	285000.00		27662.88	257337.11	926.80	944.06	945.05	0.001100	8.36	46224.14	8409.23	17.26	0.38	0.036	0.99
Reach-1	199.13	Alt3.5D	285000.00			285000.00	926.80	946.46	947.45	0.000817	7.96	35785.08	2094.00	19.66	0.34	0.035	0.86
Reach-1	199.13	Alt3.5H	285000.00			285000.00	926.80	946.27	947.27	0.000849	8.06	35380.05	2094.00	19.47	0.35	0.035	0.88
Reach-1	199.14	existing	23500.00		0.01	23499.99	926.80	933.60	933.70	0.000580	2.56	9163.62	2304.96	6.80	0.23	0.035	0.14
Reach-1	199.14	Alt3.5B	23500.00			23500.00	926.80	933.35	933.47	0.000714	2.74	8584.83	2289.64	6.55	0.25	0.035	0.17
Reach-1	199.14	Alt3.5D	23500.00			23500.00	926.80	933.36	933.47	0.000711	2.73	8598.39	2289.98	6.56	0.25	0.035	0.17
Reach-1	199.14	Alt3.5H	23500.00			23500.00	926.80	933.36	933.47	0.000711	2.73	8598.39	2289.98	6.56	0.25	0.035	0.17
Reach-1	199.14	existing	57000.00	18.12	22.50	56959.37	926.80	936.77	936.95	0.000486	3.42	16710.84	2414.30	9.97	0.23	0.035	0.21
Reach-1	199.14	Alt3.5B	57000.00	17.43	21.89	56960.68	926.80	936.72	936.91	0.000498	3.44	16591.00	2413.93	9.92	0.23	0.035	0.22
Reach-1	199.14	Alt3.5D	57000.00	17.97		56982.04	926.80	936.76	936.94	0.000490	3.42	16656.17	2398.81	9.96	0.23	0.035	0.21
Reach-1	199.14	Alt3.5H	57000.00	17.97		56982.04	926.80	936.76	936.94	0.000490	3.42	16656.17	2398.81	9.96	0.23	0.035	0.21
Reach-1	199.14	existing	92000.00	67.41	81.54	91851.05	926.80	938.73	939.02	0.000556	4.30	21451.02	2428.80	11.93	0.25	0.035	0.31
Reach-1	199.14	Alt3.5B	92000.00	69.80	85.47	91844.73	926.80	938.88	939.16	0.000526	4.23	21821.41	2429.93	12.08	0.25	0.035	0.30
Reach-1	199.14	Alt3.5D	92000.00	71.70		91928.30	926.80	939.00	939.27	0.000504	4.18	22042.80	2405.15	12.20	0.24	0.035	0.29
Reach-1	199.14	Alt3.5H	92000.00	71.81		91928.19	926.80	939.01	939.28	0.000503	4.17	22060.21	2405.17	12.21	0.24	0.035	0.29
Reach-1	199.14	existing	185000.00	203.95	4532.81	180263.25	926.80	942.05	942.62	0.000748	6.15	34383.20	7028.11	15.25	0.31	0.035	0.57
Reach-1	199.14	Alt3.5B	185000.00	205.02	5340.78	179454.20	926.80	942.20	942.75	0.000713	6.05	35432.04	7173.73	15.40	0.30	0.035	0.55
Reach-1	199.14	Alt3.5D	185000.00	223.26		184776.73	926.80	943.22	943.73	0.000581	5.75	32198.66	2417.00	16.42	0.28	0.035	0.48
Reach-1	199.14	Alt3.5H	185000.00	222.95		184777.05	926.80	943.19	943.70	0.000586	5.77	32126.67	2416.98	16.39	0.28	0.035	0.49
Reach-1	199.14	existing	227000.00	256.36	13793.45	212950.19	926.80	943.14	943.79	0.000787	6.67	42605.48	8099.78	16.34	0.32	0.036	0.65
Reach-1	199.14	Alt3.5B	227000.00	258.10	13100.41	213641.48	926.80	943.21	943.86	0.000778	6.65	43219.93	8840.83	16.41	0.32	0.036	0.65
Reach-1	199.14	Alt3.5D	227000.00	290.06		226709.94	926.80	944.79	945.41	0.000604	6.31	36001.18	2417.00	17.99	0.29	0.035	0.56
Reach-1	199.14	Alt3.5H	227000.00	289.43		226710.58	926.80	944.71	945.34	0.000614	6.35	35815.45	2417.00	17.91	0.29	0.035	0.57
Reach-1	199.14	existing	243000.00	275.96	16929.80	225794.23	926.80	943.48	944.16	0.000814	6.90	45560.75	8894.18	16.68	0.33	0.036	0.69
Reach-1	199.14	Alt3.5B	243000.00	275.77	17959.14	224765.09	926.80	943.57	944.24	0.000788	6.82	46385.13	8912.90	16.77	0.32	0.036	0.67
Reach-1	199.14	Alt3.5D	243000.00	315.03		242684.98	926.80	945.35	946.01	0.000612	6.51	37362.66	2417.00	18.55	0.29	0.035	0.59
Reach-1	199.14	Alt3.5H	243000.00	314.25		242685.75	926.80	945.25	945.91	0.000626	6.56	37109.81	2417.00	18.45	0.29	0.035	0.60
Reach-1	199.14	existing	285000.00	319.75	31482.30	253197.94	926.80	944.37	945.10	0.000828	7.26	53557.30	9074.08	17.57	0.34	0.037	0.75
Reach-1	199.14	Alt3.5B	285000.00	319.49	32028.20	252652.31	926.80	944.41	945.13	0.000817	7.22	53940.74	9082.62	17.61	0.33	0.037	0.74
Reach-1	199.14	Alt3.5D	285000.00	379.34		284620.66	926.80	946.75	947.51	0.000631	7.00	40750.65	2417.00	19.95	0.30	0.035	0.66
Reach-1	199.14	Alt3.5H	285000.00	378.27		284621.72	926.80	946.57	947.35	0.000655	7.08	40301.01	2417.00	19.77	0.31	0.035	0.68
Reach-1	199.24	existing	23500.00		183.63	23316.37	927.10	933.84	934.08	0.003648	3.96	5937.48	1838.28	6.74	0.39	0.050	0.74
Reach-1	199.24	Alt3.5B	23500.00		183.47	23316.53	927.10	933.65	933.92	0.004377	4.21	5588.70	1792.31	6.55	0.42	0.051	0.85
Reach-1	199.24	Alt3.5D	23500.00			23500.00	927.10	933.65	933.93	0.004425	4.24	5546.05	1775.46	6.55	0.42	0.051	0.86
Reach-1	199.24	Alt3.5H	23500.00			23500.00	927.10	933.65	933.93	0.004425	4.24	5546.05	1775.46	6.55	0.42	0.051	0.86
Reach-1	199.24	existing	57000.00		413.39	56586.61	927.10	936.94	937.24	0.002049	4.45	12826.52	2405.99	9.84	0.34	0.046	0.68
Reach-1	199.24	Alt3.5B	57000.00		413.91	56586.09	927.10	936.89	937.20	0.002106	4.49	12717.88	2404.84	9.79	0.34	0.046	0.70
Reach-1	199.24	Alt3.5D	57000.00			57000.00	927.10	936.93	937.24	0.002093	4.50	12676.81	2380.51	9.83	0.34	0.046	0.70
Reach-1	199.24	Alt3.5H	57000.00			57000.00	927.10	936.93	937.24	0.002093	4.50	12676.81	2380.51	9.83	0.34	0.046	0.70
Reach-1	199.24	existing	92000.00		779.22	91220.78	927.10	938.91	939.33	0.001903	5.23	17756.98	2954.93	11.81	0.34	0.046	0.85
Reach-1	199.24	Alt3.5B	92000.00		864.04	91135.95	927.10	939.05	939.45	0.001783	5.13	18187.62	3097.19	11.95	0.33	0.046	0.81
Reach-1	199.24	Alt3.5D	92000.00			92000.00	927.10	939.16	939.56	0.001731	5.10	18047.60	2431.81	12.06	0.33	0.046	0.80
Reach-1	199.24	Alt3.5H	92000.00			92000.00	927.10	939.17	939.57	0.001725	5.09	18064.37	2431.96	12.07	0.33	0.046	0.80
Reach-1	199.24	existing	185000.00		28023.21	156976.80	927.10	942.40	942.89	0.001551	6.03	36456.08	6739.68	15.30	0.33	0.045	1.01
Reach-1	199.24	Alt3.5B	185000.00		29578.52	155421.48	927.10	942.54	943.01	0.001457	5.89	37395.93	6827.36	15.44	0.32	0.045	0.96
Reach-1	199.24	Alt3.5D	185000.00			185000.00	927.10	943.38	944.04	0.001613	6.49	28522.65	2528.26	16.28	0.34	0.046	1.13
Reach-1	199.24	Alt3.5H	185000.00			185000.00	927.10	943.35	944.01	0.001626	6.50	28450.60	2527.61	16.25	0.34	0.046	1.14
Reach-1	199.24	existing	227000.00		48134.13	178865.88	927.10	943.57	944.07	0.001431	6.17	44726.23	7385.68	16.47	0.32	0.045	1.02

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.24	Alt3.5B	227000.00		49307.71	177692.28	927.10	943.66	944.14	0.001378	6.08	45370.96	7388.02	16.56	0.32	0.045	0.99
Reach-1	199.24	Alt3.5D	227000.00			227000.00	927.10	944.96	945.72	0.001599	6.98	32544.75	2564.33	17.86	0.35	0.046	1.27
Reach-1	199.24	Alt3.5H	227000.00			227000.00	927.10	944.89	945.65	0.001629	7.02	32355.75	2562.64	17.79	0.35	0.046	1.28
Reach-1	199.24	existing	243000.00		56947.88	186052.13	927.10	943.96	944.45	0.001393	6.21	47583.51	7396.01	16.86	0.32	0.045	1.02
Reach-1	199.24	Alt3.5B	243000.00		57988.06	185011.95	927.10	944.04	944.52	0.001349	6.13	48155.54	7398.08	16.94	0.31	0.045	1.00
Reach-1	199.24	Alt3.5D	243000.00			243000.00	927.10	945.53	946.32	0.001597	7.15	33999.92	2577.25	18.43	0.35	0.046	1.31
Reach-1	199.24	Alt3.5H	243000.00			243000.00	927.10	945.43	946.23	0.001636	7.20	33740.80	2574.96	18.33	0.35	0.046	1.34
Reach-1	199.24	existing	285000.00		80219.36	204780.64	927.10	944.88	945.38	0.001329	6.33	54402.77	7424.73	17.78	0.31	0.045	1.05
Reach-1	199.24	Alt3.5B	285000.00		80675.67	204324.33	927.10	944.91	945.41	0.001312	6.30	54657.92	7426.16	17.81	0.31	0.045	1.03
Reach-1	199.24	Alt3.5D	285000.00			285000.00	927.10	946.94	947.83	0.001589	7.57	37637.63	2584.08	19.84	0.35	0.047	1.44
Reach-1	199.24	Alt3.5H	285000.00			285000.00	927.10	946.76	947.67	0.001653	7.67	37174.91	2583.66	19.66	0.36	0.047	1.48
Reach-1	199.3	existing	23500.00			23500.00	928.80	935.07	935.25	0.005082	3.41	6888.10	2478.28	6.27	0.36	0.065	0.88
Reach-1	199.3	Alt3.5B	23500.00			23500.00	928.80	935.04	935.22	0.005235	3.45	6819.75	2465.60	6.24	0.37	0.065	0.90
Reach-1	199.3	Alt3.5D	23500.00			23500.00	928.80	935.05	935.23	0.005175	3.43	6846.11	2470.50	6.25	0.36	0.065	0.90
Reach-1	199.3	Alt3.5H	23500.00			23500.00	928.80	935.05	935.23	0.005175	3.43	6846.11	2470.50	6.25	0.36	0.065	0.90
Reach-1	199.3	existing	57000.00			57000.00	928.80	937.63	937.91	0.002937	4.19	13606.16	2663.31	8.83	0.33	0.058	0.94
Reach-1	199.3	Alt3.5B	57000.00			57000.00	928.80	937.61	937.88	0.002991	4.21	13534.48	2662.45	8.81	0.33	0.058	0.95
Reach-1	199.3	Alt3.5D	57000.00			57000.00	928.80	937.64	937.91	0.002931	4.19	13615.26	2663.43	8.84	0.33	0.058	0.93
Reach-1	199.3	Alt3.5H	57000.00			57000.00	928.80	937.64	937.91	0.002931	4.19	13615.26	2663.43	8.84	0.33	0.058	0.93
Reach-1	199.3	existing	92000.00			92000.00	928.80	939.56	939.93	0.002594	4.87	18874.14	2797.52	10.76	0.33	0.056	1.09
Reach-1	199.3	Alt3.5B	92000.00			92000.00	928.80	939.66	940.02	0.002468	4.80	19157.25	2801.19	10.86	0.32	0.056	1.05
Reach-1	199.3	Alt3.5D	92000.00			92000.00	928.80	939.76	940.11	0.002353	4.73	19434.74	2804.78	10.96	0.32	0.056	1.02
Reach-1	199.3	Alt3.5H	92000.00			92000.00	928.80	939.77	940.12	0.002347	4.73	19449.46	2804.97	10.97	0.32	0.056	1.02
Reach-1	199.3	existing	185000.00		10946.80	174053.19	928.80	942.87	943.43	0.002379	6.16	33214.56	6283.55	14.07	0.34	0.054	1.47
Reach-1	199.3	Alt3.5B	185000.00		11976.17	173023.83	928.80	942.98	943.52	0.002267	6.06	33693.64	6330.92	14.18	0.34	0.054	1.42
Reach-1	199.3	Alt3.5D	185000.00			185000.00	928.80	943.98	944.52	0.001880	5.89	31414.51	2851.33	15.18	0.31	0.054	1.29
Reach-1	199.3	Alt3.5H	185000.00			185000.00	928.80	943.96	944.50	0.001894	5.90	31346.64	2851.26	15.16	0.31	0.054	1.30
Reach-1	199.3	existing	227000.00		26726.67	200273.33	928.80	944.00	944.57	0.002186	6.36	40529.02	6865.02	15.20	0.34	0.053	1.51
Reach-1	199.3	Alt3.5B	227000.00		27549.07	199450.92	928.80	944.07	944.63	0.002123	6.30	41010.04	6912.81	15.27	0.33	0.053	1.47
Reach-1	199.3	Alt3.5D	227000.00			227000.00	928.80	945.57	946.19	0.001794	6.31	35954.43	2855.88	16.77	0.31	0.054	1.41
Reach-1	199.3	Alt3.5H	227000.00			227000.00	928.80	945.51	946.13	0.001824	6.35	35775.42	2855.70	16.71	0.32	0.054	1.42
Reach-1	199.3	existing	243000.00		33240.26	209759.75	928.80	944.37	944.95	0.002144	6.45	43122.73	7122.63	15.57	0.34	0.052	1.53
Reach-1	199.3	Alt3.5B	243000.00		34025.11	208974.89	928.80	944.44	945.00	0.002089	6.39	43573.07	7162.88	15.64	0.33	0.052	1.49
Reach-1	199.3	Alt3.5D	243000.00			243000.00	928.80	946.14	946.79	0.001770	6.47	37585.73	2857.51	17.34	0.31	0.054	1.45
Reach-1	199.3	Alt3.5H	243000.00			243000.00	928.80	946.06	946.71	0.001809	6.51	37340.18	2857.27	17.26	0.32	0.054	1.47
Reach-1	199.3	existing	285000.00		52138.91	232861.09	928.80	945.27	945.86	0.002046	6.64	49733.66	7466.32	16.47	0.33	0.052	1.57
Reach-1	199.3	Alt3.5B	285000.00		52605.94	232394.06	928.80	945.30	945.89	0.002021	6.61	49950.58	7466.40	16.50	0.33	0.052	1.55
Reach-1	199.3	Alt3.5D	285000.00			285000.00	928.80	947.56	948.29	0.001722	6.84	41654.27	2861.58	18.76	0.32	0.054	1.56
Reach-1	199.3	Alt3.5H	285000.00			285000.00	928.80	947.41	948.15	0.001785	6.92	41212.07	2861.14	18.61	0.32	0.054	1.60
Reach-1	199.34	existing	23500.00			23500.00	929.50	936.29	936.44	0.004862	3.14	7472.63	2487.55	6.79	0.32	0.072	0.91
Reach-1	199.34	Alt3.5B	23500.00			23500.00	924.90	935.39	935.45	0.000336	2.04	11527.14	2472.24	10.49	0.17	0.045	0.10
Reach-1	199.34	Alt3.5D	23500.00			23500.00	924.90	935.40	935.46	0.000335	2.04	11547.05	2472.38	10.50	0.17	0.045	0.10
Reach-1	199.34	Alt3.5H	23500.00			23500.00	924.90	935.40	935.46	0.000335	2.04	11547.05	2472.38	10.50	0.17	0.045	0.10
Reach-1	199.34	existing	57000.00			57000.00	929.50	938.45	938.75	0.004215	4.42	12885.96	2524.28	8.95	0.35	0.066	1.34
Reach-1	199.34	Alt3.5B	57000.00			57000.00	924.90	938.03	938.19	0.000611	3.15	18120.05	2517.17	13.13	0.21	0.047	0.27
Reach-1	199.34	Alt3.5D	57000.00			57000.00	924.90	938.06	938.21	0.000605	3.14	18180.74	2517.58	13.16	0.21	0.047	0.27
Reach-1	199.34	Alt3.5H	57000.00			57000.00	924.90	938.06	938.21	0.000605	3.14	18180.74	2517.58	13.16	0.21	0.047	0.27
Reach-1	199.34	existing	92000.00		2808.41	89191.59	929.50	940.27	940.66	0.003573	5.09	19135.11	4243.08	10.77	0.34	0.063	1.53
Reach-1	199.34	Alt3.5B	92000.00		969.52	91030.48	924.90	940.11	940.35	0.000748	3.89	24746.33	4193.53	15.21	0.23	0.048	0.42
Reach-1	199.34	Alt3.5D	92000.00		2.61	91997.38	924.90	940.19	940.43	0.000745	3.90	23593.93	2561.87	15.29	0.23	0.048	0.42
Reach-1	199.34	Alt3.5H	92000.00		2.64	91997.36	924.90	940.19	940.43	0.000744	3.90	23605.03	2561.97	15.29	0.23	0.048	0.42
Reach-1	199.34	existing	185000.00		43001.98	141998.02	929.50	943.63	944.02	0.002314	5.43	39832.83	7200.32	14.13	0.30	0.059	1.45
Reach-1	199.34	Alt3.5B	185000.00		25355.79	159644.20	924.90	943.55	943.88	0.000879	4.95	45513.45	7186.68	18.65	0.25	0.049	0.67
Reach-1	199.34	Alt3.5D	185000.00		4084.57	180915.44	924.90	944.43	944.85	0.000914	5.24	36611.84	3245.77	19.53	0.25	0.049	0.74
Reach-1	199.34	Alt3.5H	185000.00		4051.96	180948.03	924.90	944.41	944.83	0.000919	5.25	36543.50	3245.22	19.51	0.25	0.049	0.75
Reach-1	199.34	existing	227000.00		66717.09	160282.92	929.50	944.71	945.11	0.002092	5.53	47720.97	7324.67	15.21	0.29	0.058	1.44
Reach-1	199.34	Alt3.5B	227000.00		42400.11	184599.89	924.90	944.62	944.99	0.000910	5.27	53333.89	7321.34	19.72	0.25	0.049	0.75
Reach-1	199.34	Alt3.5D	227000.00		8016.84	218983.16	924.90	946.04	946.52	0.000941	5.65	41873.90	3287.80	21.14	0.26	0.049	0.85

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.34	Alt3.5H	227000.00		7915.50	219084.50	924.90	945.98	946.47	0.000952	5.67	41689.93	3286.34	21.08	0.26	0.049	0.85
Reach-1	199.34	existing	243000.00		75840.30	167159.72	929.50	945.08	945.47	0.002045	5.58	50370.64	7337.74	15.58	0.29	0.057	1.45
Reach-1	199.34	Alt3.5B	243000.00		49258.06	193741.94	924.90	944.98	945.36	0.000924	5.38	55982.10	7334.40	20.08	0.26	0.049	0.78
Reach-1	199.34	Alt3.5D	243000.00		9686.34	233313.66	924.90	946.62	947.12	0.000948	5.78	43783.86	3302.92	21.72	0.26	0.049	0.88
Reach-1	199.34	Alt3.5H	243000.00		9541.75	233458.25	924.90	946.54	947.05	0.000964	5.82	43529.73	3300.91	21.64	0.26	0.049	0.89
Reach-1	199.34	existing	285000.00		99895.95	185104.05	929.50	945.94	946.37	0.001967	5.74	56756.30	7364.67	16.44	0.29	0.057	1.49
Reach-1	199.34	Alt3.5B	285000.00		67699.05	217300.94	924.90	945.84	946.25	0.000966	5.68	62257.67	7361.45	20.94	0.26	0.049	0.86
Reach-1	199.34	Alt3.5D	285000.00		14413.60	270586.41	924.90	948.07	948.63	0.000960	6.12	48570.91	3311.12	23.17	0.27	0.050	0.98
Reach-1	199.34	Alt3.5H	285000.00		14132.29	270867.72	924.90	947.93	948.50	0.000988	6.18	48109.73	3311.01	23.03	0.27	0.050	1.00
Reach-1	199.44	existing	23500.00			23500.00	931.70	938.29	938.39	0.003107	2.59	9062.98	3094.65	6.59	0.27	0.066	0.57
Reach-1	199.44	Alt3.5B	23500.00			23500.00	925.40	935.60	935.65	0.000430	1.74	13535.51	2289.06	10.20	0.13	0.057	0.16
Reach-1	199.44	Alt3.5D	23500.00			23500.00	925.40	935.61	935.66	0.000429	1.73	13552.43	2294.97	10.21	0.13	0.057	0.16
Reach-1	199.44	Alt3.5H	23500.00			23500.00	925.40	935.61	935.66	0.000429	1.73	13552.43	2294.97	10.21	0.13	0.057	0.16
Reach-1	199.44	existing	57000.00		14.93	56985.07	931.70	940.30	940.52	0.002876	3.69	15465.97	3867.06	8.60	0.30	0.062	0.87
Reach-1	199.44	Alt3.5B	57000.00			57000.00	925.40	938.43	938.54	0.000786	2.63	21643.58	3129.28	13.03	0.18	0.057	0.33
Reach-1	199.44	Alt3.5D	57000.00			57000.00	925.40	938.45	938.56	0.000781	2.63	21708.95	3134.26	13.05	0.18	0.057	0.33
Reach-1	199.44	Alt3.5H	57000.00			57000.00	925.40	938.45	938.56	0.000781	2.63	21708.95	3134.26	13.05	0.18	0.057	0.33
Reach-1	199.44	existing	92000.00		3280.38	88719.62	931.70	941.93	942.21	0.002583	4.31	22724.02	5512.39	10.23	0.30	0.060	1.04
Reach-1	199.44	Alt3.5B	92000.00		108.00	91892.00	925.40	940.59	940.78	0.000844	3.23	28729.96	4010.82	15.19	0.19	0.057	0.47
Reach-1	199.44	Alt3.5D	92000.00			92000.00	925.40	940.67	940.83	0.000823	3.20	28709.02	3171.25	15.27	0.19	0.057	0.46
Reach-1	199.44	Alt3.5H	92000.00			92000.00	925.40	940.67	940.83	0.000822	3.20	28720.84	3171.29	15.27	0.19	0.057	0.46
Reach-1	199.44	existing	185000.00		37125.71	147874.30	931.70	944.80	945.13	0.002056	4.97	42802.13	7626.24	13.10	0.29	0.058	1.18
Reach-1	199.44	Alt3.5B	185000.00		16790.17	168209.83	925.40	944.10	944.36	0.000965	4.24	49616.67	7542.39	18.70	0.21	0.057	0.73
Reach-1	199.44	Alt3.5D	185000.00		3228.87	181770.14	925.40	945.04	945.32	0.000888	4.26	44370.27	3753.29	19.64	0.21	0.057	0.72
Reach-1	199.44	Alt3.5H	185000.00		3207.32	181792.67	925.40	945.02	945.30	0.000892	4.27	44302.69	3753.00	19.62	0.21	0.057	0.72
Reach-1	199.44	existing	227000.00		57331.15	169668.86	931.70	945.78	946.13	0.001928	5.15	50303.97	7646.73	14.08	0.28	0.057	1.22
Reach-1	199.44	Alt3.5B	227000.00		31552.13	195447.88	925.40	945.19	945.48	0.000989	4.53	57942.31	7634.56	19.79	0.22	0.056	0.81
Reach-1	199.44	Alt3.5D	227000.00		6439.01	220560.98	925.40	946.68	947.00	0.000897	4.60	50550.59	3778.86	21.28	0.21	0.057	0.81
Reach-1	199.44	Alt3.5H	227000.00		6368.34	220631.66	925.40	946.63	946.96	0.000907	4.61	50368.17	3778.11	21.23	0.21	0.057	0.82
Reach-1	199.44	existing	243000.00		64669.63	178330.38	931.70	946.12	946.48	0.001907	5.24	52910.13	7652.14	14.42	0.28	0.057	1.25
Reach-1	199.44	Alt3.5B	243000.00		37641.49	205358.52	925.40	945.56	945.86	0.001000	4.63	60768.01	7642.23	20.18	0.22	0.056	0.84
Reach-1	199.44	Alt3.5D	243000.00		7801.15	235198.86	925.40	947.27	947.61	0.000899	4.71	52780.38	3788.05	21.87	0.21	0.058	0.85
Reach-1	199.44	Alt3.5H	243000.00		7700.08	235299.92	925.40	947.20	947.55	0.000913	4.74	52528.41	3787.01	21.80	0.21	0.057	0.86
Reach-1	199.44	existing	285000.00		85584.56	199415.44	931.70	946.95	947.34	0.001849	5.43	59273.93	7665.09	15.25	0.28	0.056	1.30
Reach-1	199.44	Alt3.5B	285000.00		53834.50	231165.50	925.40	946.44	946.77	0.001038	4.90	67497.83	7657.16	21.04	0.23	0.056	0.93
Reach-1	199.44	Alt3.5D	285000.00		11635.36	273364.66	925.40	948.74	949.12	0.000904	5.00	58360.00	3813.19	23.34	0.22	0.058	0.93
Reach-1	199.44	Alt3.5H	285000.00		11443.82	273556.19	925.40	948.62	949.00	0.000928	5.04	57898.89	3810.16	23.22	0.22	0.058	0.95
Reach-1	199.53	existing	23500.00			23500.00	932.70	939.56	939.64	0.002112	2.30	10236.09	3060.16	6.86	0.22	0.075	0.44
Reach-1	199.53	Alt3.5B	23500.00			23500.00	926.00	935.83	935.87	0.000459	1.52	15442.68	2846.90	9.83	0.12	0.064	0.15
Reach-1	199.53	Alt3.5D	23500.00			23500.00	926.00	935.84	935.88	0.000458	1.52	15462.32	2849.50	9.84	0.11	0.064	0.15
Reach-1	199.53	Alt3.5H	23500.00			23500.00	926.00	935.84	935.88	0.000458	1.52	15462.32	2849.50	9.84	0.11	0.064	0.15
Reach-1	199.53	existing	57000.00		2326.88	54673.12	932.70	941.69	941.85	0.002528	3.21	18194.81	4961.29	8.99	0.25	0.071	0.82
Reach-1	199.53	Alt3.5B	57000.00			57000.00	926.00	938.81	938.89	0.000647	2.29	24846.17	3317.06	12.81	0.15	0.062	0.30
Reach-1	199.53	Alt3.5D	57000.00			57000.00	926.00	938.83	938.91	0.000642	2.29	24908.31	3317.91	12.83	0.15	0.062	0.30
Reach-1	199.53	Alt3.5H	57000.00			57000.00	926.00	938.83	938.91	0.000642	2.29	24908.31	3317.91	12.83	0.15	0.062	0.30
Reach-1	199.53	existing	92000.00		14623.62	77376.38	932.70	943.21	943.40	0.002220	3.51	26218.46	5795.69	10.51	0.24	0.066	0.90
Reach-1	199.53	Alt3.5B	92000.00		219.60	91780.40	926.00	941.02	941.14	0.000725	2.85	32483.94	4022.24	15.02	0.16	0.063	0.43
Reach-1	199.53	Alt3.5D	92000.00			92000.00	926.00	941.09	941.21	0.000712	2.83	32464.09	3362.68	15.09	0.16	0.063	0.42
Reach-1	199.53	Alt3.5H	92000.00			92000.00	926.00	941.09	941.21	0.000711	2.83	32474.96	3362.69	15.09	0.16	0.063	0.42
Reach-1	199.53	existing	185000.00		62149.44	122850.55	932.70	945.79	946.09	0.001821	3.99	43040.13	7228.68	13.09	0.23	0.057	1.03
Reach-1	199.53	Alt3.5B	185000.00		22933.76	162066.23	926.00	944.60	944.79	0.000795	3.66	52335.11	6636.09	18.60	0.18	0.059	0.64
Reach-1	199.53	Alt3.5D	185000.00		2533.08	182466.92	926.00	945.51	945.74	0.000807	3.85	48509.01	3927.31	19.51	0.18	0.063	0.69
Reach-1	199.53	Alt3.5H	185000.00		2505.64	182494.36	926.00	945.50	945.73	0.000810	3.86	48446.45	3927.18	19.50	0.18	0.063	0.70
Reach-1	199.53	existing	227000.00		83229.05	143770.94	932.70	946.73	947.05	0.001795	4.24	50029.45	7540.16	14.03	0.24	0.055	1.12
Reach-1	199.53	Alt3.5B	227000.00		39872.61	187127.39	926.00	945.70	945.93	0.000812	3.90	59951.56	7146.68	19.70	0.18	0.057	0.71
Reach-1	199.53	Alt3.5D	227000.00		6800.97	220199.03	926.00	947.17	947.43	0.000819	4.16	55016.89	3949.48	21.17	0.19	0.062	0.78
Reach-1	199.53	Alt3.5H	227000.00		6702.38	220297.63	926.00	947.12	947.39	0.000827	4.17	54846.73	3948.56	21.12	0.19	0.062	0.79
Reach-1	199.53	existing	243000.00		93581.55	149418.45	932.70	947.04	947.39	0.001748	4.27	52411.66	7546.85	14.34	0.23	0.054	1.12

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.63	Alt3.5B	243000.00		44481.95	198518.05	926.00	946.08	946.32	0.000839	4.03	62713.04	7464.26	20.08	0.19	0.057	0.75
Reach-1	199.53	Alt3.5D	243000.00		8729.99	234270.02	926.00	947.76	948.04	0.000824	4.26	57365.61	3962.04	21.76	0.19	0.062	0.82
Reach-1	199.53	Alt3.5H	243000.00		8585.02	234414.98	926.00	947.70	947.98	0.000834	4.28	57129.39	3960.78	21.70	0.19	0.062	0.82
Reach-1	199.53	existing	285000.00		120827.05	164172.97	932.70	947.81	948.21	0.001660	4.36	58247.62	7563.19	15.11	0.23	0.053	1.14
Reach-1	199.53	Alt3.5B	285000.00		63855.30	221144.70	926.00	946.97	947.24	0.000859	4.22	69463.19	7545.43	20.97	0.19	0.056	0.81
Reach-1	199.53	Alt3.5D	285000.00		14347.56	270652.44	926.00	949.24	949.55	0.000832	4.51	63241.12	3990.40	23.24	0.19	0.062	0.89
Reach-1	199.53	Alt3.5H	285000.00		14054.06	270945.94	926.00	949.13	949.45	0.000851	4.54	62807.84	3990.40	23.13	0.19	0.062	0.91
Reach-1	199.63	existing	23500.00			23500.00	930.90	940.78	940.83	0.002528	2.03	11601.54	2975.32	9.86	0.18	0.093	0.61
Reach-1	199.63	Alt3.5B	23500.00			23500.00	926.20	936.05	936.11	0.000453	1.98	11844.59	1700.86	9.85	0.13	0.057	0.19
Reach-1	199.63	Alt3.5D	23500.00			23500.00	926.20	936.05	936.12	0.000452	1.98	11855.49	1701.93	9.85	0.13	0.057	0.19
Reach-1	199.63	Alt3.5H	23500.00			23500.00	926.20	936.05	936.12	0.000452	1.98	11855.49	1701.93	9.85	0.13	0.057	0.19
Reach-1	199.63	existing	57000.00		520.56	56479.44	930.90	943.16	943.29	0.003125	2.93	19563.75	3961.14	12.26	0.21	0.092	1.14
Reach-1	199.63	Alt3.5B	57000.00		1161.38	55838.63	926.20	939.34	939.44	0.002018	2.64	21826.10	3542.61	13.14	0.18	0.090	0.85
Reach-1	199.63	Alt3.5D	57000.00		1176.48	55823.51	926.20	939.35	939.46	0.002004	2.63	21876.49	3543.28	13.15	0.18	0.090	0.85
Reach-1	199.63	Alt3.5H	57000.00		1176.48	55823.51	926.20	939.35	939.46	0.002004	2.63	21876.49	3543.28	13.15	0.18	0.090	0.85
Reach-1	199.63	existing	92000.00		8812.68	83187.32	930.90	944.58	944.77	0.003270	3.47	26648.16	5994.65	13.68	0.23	0.086	1.48
Reach-1	199.63	Alt3.5B	92000.00		5468.24	86531.77	926.20	941.58	941.72	0.001967	3.05	30068.92	3749.88	15.36	0.18	0.087	1.04
Reach-1	199.63	Alt3.5D	92000.00		5543.08	86456.91	926.20	941.64	941.78	0.001922	3.03	30280.64	3746.18	15.44	0.18	0.087	1.03
Reach-1	199.63	Alt3.5H	92000.00		5546.57	86453.42	926.20	941.64	941.78	0.001920	3.03	30290.47	3746.19	15.44	0.18	0.087	1.03
Reach-1	199.63	existing	185000.00		61107.68	123892.31	930.90	946.93	947.24	0.002827	3.91	42912.55	7306.06	16.03	0.22	0.071	1.69
Reach-1	199.63	Alt3.5B	185000.00		30253.32	154746.69	926.20	945.18	945.41	0.001978	3.84	47881.68	6580.96	18.98	0.19	0.082	1.48
Reach-1	199.63	Alt3.5D	185000.00		19844.26	165155.73	926.20	946.09	946.34	0.001775	3.82	47102.07	3819.40	19.89	0.19	0.086	1.43
Reach-1	199.63	Alt3.5H	185000.00		19823.12	165176.88	926.20	946.08	946.32	0.001782	3.82	47050.55	3819.40	19.88	0.19	0.086	1.43
Reach-1	199.63	existing	227000.00		88456.41	138543.59	930.90	947.80	948.17	0.002640	4.01	49312.10	7358.40	16.90	0.22	0.067	1.72
Reach-1	199.63	Alt3.5B	227000.00		52469.75	174530.27	926.20	946.28	946.54	0.001888	3.98	55558.04	7205.03	20.08	0.19	0.078	1.54
Reach-1	199.63	Alt3.5D	227000.00		27267.96	199732.05	926.20	947.74	948.03	0.001751	4.10	53401.38	3819.40	21.54	0.19	0.085	1.58
Reach-1	199.63	Alt3.5H	227000.00		27207.30	199792.72	926.20	947.70	947.99	0.001767	4.11	53258.71	3819.40	21.50	0.19	0.085	1.59
Reach-1	199.63	existing	243000.00		99384.85	143615.16	930.90	948.08	948.48	0.002593	4.04	51401.41	7358.40	17.18	0.22	0.066	1.74
Reach-1	199.63	Alt3.5B	243000.00		61568.93	181431.06	926.20	946.67	946.94	0.001856	4.02	58362.20	7301.70	20.47	0.19	0.077	1.56
Reach-1	199.63	Alt3.5D	243000.00		30185.68	212814.31	926.20	948.33	948.64	0.001745	4.20	55663.32	3819.40	22.13	0.19	0.085	1.64
Reach-1	199.63	Alt3.5H	243000.00		30100.85	212899.16	926.20	948.28	948.59	0.001766	4.22	55464.93	3819.40	22.08	0.19	0.085	1.66
Reach-1	199.63	existing	285000.00		128383.24	156616.75	930.90	948.79	949.26	0.002491	4.14	56591.01	7358.40	17.89	0.22	0.064	1.78
Reach-1	199.63	Alt3.5B	285000.00		85548.66	199451.34	926.20	947.56	947.87	0.001818	4.15	64911.45	7358.40	21.36	0.19	0.074	1.62
Reach-1	199.63	Alt3.5D	285000.00		38006.73	246993.27	926.20	949.80	950.16	0.001734	4.45	61287.29	3819.40	23.60	0.19	0.084	1.79
Reach-1	199.63	Alt3.5H	285000.00		37850.32	247149.69	926.20	949.71	950.07	0.001769	4.48	60923.62	3819.40	23.51	0.19	0.084	1.81
Reach-1	199.72	existing	23500.00		1.25	23498.75	930.60	941.40	941.46	0.000772	2.02	11630.24	2905.57	10.80	0.18	0.052	0.19
Reach-1	199.72	Alt3.5B	23500.00			23500.00	926.20	936.18	936.27	0.000215	2.38	9857.85	1762.00	9.98	0.18	0.038	0.07
Reach-1	199.72	Alt3.5D	23500.00			23500.00	926.20	936.18	936.27	0.000215	2.38	9868.62	1767.24	9.98	0.18	0.038	0.07
Reach-1	199.72	Alt3.5H	23500.00			23500.00	926.20	936.18	936.27	0.000215	2.38	9868.62	1767.24	9.98	0.18	0.038	0.07
Reach-1	199.72	existing	57000.00		1296.84	55703.16	930.60	943.94	944.06	0.000937	2.87	20361.82	4575.63	13.34	0.20	0.053	0.36
Reach-1	199.72	Alt3.5B	57000.00		460.02	56539.98	926.20	939.65	939.79	0.000337	2.99	19529.43	3381.91	13.45	0.21	0.040	0.13
Reach-1	199.72	Alt3.5D	57000.00		465.55	56534.45	926.20	939.66	939.80	0.000336	2.99	19571.55	3383.08	13.46	0.21	0.040	0.13
Reach-1	199.72	Alt3.5H	57000.00		465.55	56534.45	926.20	939.66	939.80	0.000336	2.99	19571.55	3383.08	13.46	0.21	0.040	0.13
Reach-1	199.72	existing	92000.00		9179.81	82820.19	930.60	945.43	945.60	0.001024	3.44	28222.62	6458.50	14.83	0.22	0.051	0.49
Reach-1	199.72	Alt3.5B	92000.00		2387.27	89612.73	926.20	941.92	942.11	0.000395	3.48	27371.92	3532.49	15.72	0.21	0.041	0.20
Reach-1	199.72	Alt3.5D	92000.00		2417.90	89582.09	926.20	941.97	942.16	0.000389	3.46	27544.24	3529.32	15.77	0.21	0.041	0.20
Reach-1	199.72	Alt3.5H	92000.00		2418.85	89581.15	926.20	941.98	942.16	0.000388	3.46	27552.65	3529.52	15.78	0.21	0.041	0.20
Reach-1	199.72	existing	185000.00		48295.30	136704.70	930.60	947.81	948.09	0.001147	4.33	44294.42	7232.70	17.21	0.24	0.048	0.72
Reach-1	199.72	Alt3.5B	185000.00		15759.78	169240.23	926.20	945.58	945.88	0.000514	4.55	44748.62	6468.88	19.38	0.23	0.041	0.37
Reach-1	199.72	Alt3.5D	185000.00		9693.30	175306.70	926.20	946.45	946.74	0.000449	4.39	43696.11	3697.90	20.25	0.22	0.042	0.35
Reach-1	199.72	Alt3.5H	185000.00		9681.05	175318.95	926.20	946.44	946.73	0.000450	4.39	43650.51	3697.90	20.24	0.22	0.042	0.35
Reach-1	199.72	existing	227000.00		69131.19	157868.81	930.60	948.69	949.00	0.001163	4.60	50636.22	7243.90	18.09	0.25	0.047	0.79
Reach-1	199.72	Alt3.5B	227000.00		28140.69	198859.31	926.20	946.68	947.02	0.000547	4.89	51938.94	6534.33	20.48	0.24	0.041	0.43
Reach-1	199.72	Alt3.5D	227000.00		13834.65	213165.34	926.20	948.11	948.44	0.000462	4.72	49819.39	3697.90	21.91	0.22	0.042	0.41
Reach-1	199.72	Alt3.5H	227000.00		13796.35	213203.66	926.20	948.07	948.41	0.000465	4.74	49692.32	3697.90	21.87	0.22	0.042	0.41
Reach-1	199.72	existing	243000.00		77905.84	165094.17	930.60	948.98	949.31	0.001166	4.69	52752.70	7243.90	18.38	0.25	0.046	0.81
Reach-1	199.72	Alt3.5B	243000.00		33551.78	209448.22	926.20	947.07	947.42	0.000557	5.00	54556.18	6887.49	20.87	0.24	0.041	0.45
Reach-1	199.72	Alt3.5D	243000.00		15503.14	227496.86	926.20	948.70	949.05	0.000465	4.84	52017.96	3697.90	22.50	0.22	0.042	0.43

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.72	Alt3.5H	243000.00		15448.47	227551.53	926.20	948.65	949.01	0.000470	4.86	51841.00	3697.90	22.45	0.22	0.042	0.43
Reach-1	199.72	existing	285000.00		101506.00	183494.02	930.60	949.71	950.08	0.001171	4.89	58027.34	7243.90	19.11	0.25	0.046	0.87
Reach-1	199.72	Alt3.5B	285000.00		48324.77	236675.23	926.20	947.98	948.36	0.000585	5.29	61002.59	7242.47	21.78	0.25	0.041	0.51
Reach-1	199.72	Alt3.5D	285000.00		20047.99	264952.00	926.20	950.18	950.57	0.000474	5.13	57486.04	3697.90	23.98	0.22	0.043	0.48
Reach-1	199.72	Alt3.5H	285000.00		19942.97	265057.03	926.20	950.09	950.49	0.000482	5.16	57159.90	3697.90	23.89	0.22	0.043	0.48
Reach-1	199.82	existing	23500.00			23500.00	931.20	942.20	942.33	0.005906	2.80	8397.72	2687.29	11.00	0.28	0.087	1.15
Reach-1	199.82	Alt3.5B	23500.00			23500.00	926.20	936.33	936.43	0.000470	2.49	9425.79	1083.89	10.13	0.15	0.053	0.25
Reach-1	199.82	Alt3.5D	23500.00			23500.00	926.20	936.33	936.43	0.000469	2.49	9432.01	1083.89	10.13	0.15	0.053	0.25
Reach-1	199.82	Alt3.5H	23500.00			23500.00	926.20	936.33	936.43	0.000469	2.49	9432.01	1083.89	10.13	0.15	0.053	0.25
Reach-1	199.82	existing	57000.00		3774.39	53225.61	931.20	944.79	944.97	0.004313	3.42	16593.90	3816.83	13.59	0.26	0.085	1.47
Reach-1	199.82	Alt3.5B	57000.00		1555.95	55444.05	926.20	939.99	940.19	0.002727	3.65	15961.04	3096.23	13.79	0.26	0.069	1.00
Reach-1	199.82	Alt3.5D	57000.00		1571.17	55428.83	926.20	940.00	940.20	0.002710	3.64	15994.31	3096.63	13.80	0.26	0.069	1.00
Reach-1	199.82	Alt3.5H	57000.00		1571.17	55428.83	926.20	940.00	940.20	0.002710	3.64	15994.31	3096.63	13.80	0.26	0.069	1.00
Reach-1	199.82	existing	92000.00		15724.71	76275.29	931.20	946.30	946.53	0.003932	3.84	23641.66	6188.77	15.10	0.26	0.078	1.71
Reach-1	199.82	Alt3.5B	92000.00		7514.73	84485.27	926.20	942.30	942.54	0.002445	3.99	23269.93	3254.73	16.10	0.25	0.070	1.16
Reach-1	199.82	Alt3.5D	92000.00		7592.97	84407.03	926.20	942.34	942.58	0.002400	3.96	23412.54	3256.95	16.14	0.25	0.070	1.16
Reach-1	199.82	Alt3.5H	92000.00		7596.55	84403.45	926.20	942.34	942.58	0.002398	3.96	23419.11	3257.09	16.14	0.25	0.070	1.16
Reach-1	199.82	existing	185000.00		76043.74	108956.26	931.20	948.64	949.02	0.003066	4.10	39213.20	6875.37	17.44	0.24	0.064	1.78
Reach-1	199.82	Alt3.5B	185000.00		32241.03	152758.97	926.20	946.03	946.39	0.002301	4.83	38557.94	5644.78	19.63	0.26	0.067	1.57
Reach-1	199.82	Alt3.5D	185000.00		26008.88	158991.13	926.20	946.83	947.19	0.001978	4.68	38690.58	3471.10	20.63	0.24	0.069	1.44
Reach-1	199.82	Alt3.5H	185000.00		25990.51	159009.50	926.20	946.82	947.18	0.001984	4.69	38652.02	3471.10	20.62	0.24	0.069	1.45
Reach-1	199.82	existing	227000.00		105982.10	121017.89	931.20	949.47	949.93	0.002846	4.18	44968.26	6968.31	18.27	0.23	0.061	1.80
Reach-1	199.82	Alt3.5B	227000.00		51965.57	175034.44	926.20	947.15	947.54	0.002193	5.02	45714.28	6599.02	20.95	0.25	0.065	1.64
Reach-1	199.82	Alt3.5D	227000.00		34932.34	192067.66	926.20	948.48	948.89	0.001876	4.97	44422.01	3471.10	22.28	0.24	0.069	1.56
Reach-1	199.82	Alt3.5H	227000.00		34880.85	192119.16	926.20	948.45	948.86	0.001892	4.98	44313.54	3471.10	22.25	0.24	0.069	1.57
Reach-1	199.82	existing	243000.00		117020.39	125979.63	931.20	949.75	950.24	0.002816	4.24	46929.98	6985.58	18.55	0.23	0.060	1.83
Reach-1	199.82	Alt3.5B	243000.00		60774.35	182225.66	926.20	947.54	947.94	0.002142	5.06	48305.83	6684.98	21.34	0.25	0.064	1.66
Reach-1	199.82	Alt3.5D	243000.00		38400.30	204599.70	926.20	949.07	949.51	0.001848	5.07	46478.31	3471.10	22.87	0.24	0.069	1.60
Reach-1	199.82	Alt3.5H	243000.00		38328.67	204671.33	926.20	949.03	949.46	0.001868	5.09	46326.83	3471.10	22.83	0.24	0.069	1.61
Reach-1	199.82	existing	285000.00		147449.92	137550.08	931.20	950.44	951.02	0.002713	4.34	51764.87	7029.79	19.24	0.23	0.058	1.88
Reach-1	199.82	Alt3.5B	285000.00		85037.95	199962.05	926.20	948.46	948.88	0.002045	5.18	54508.80	6855.36	22.26	0.25	0.062	1.70
Reach-1	199.82	Alt3.5D	285000.00		47632.41	237367.59	926.20	950.55	951.03	0.001791	5.33	51591.75	3471.10	24.35	0.24	0.068	1.71
Reach-1	199.82	Alt3.5H	285000.00		47501.00	237499.02	926.20	950.47	950.96	0.001825	5.36	51310.60	3471.10	24.27	0.24	0.069	1.74
Reach-1	199.91	existing	23500.00		0.15	23499.85	932.10	942.76	942.83	0.000432	2.07	11352.57	2487.48	10.66	0.17	0.042	0.12
Reach-1	199.91	Alt3.5B	23500.00			23500.00	926.20	936.47	936.58	0.000231	2.57	9155.34	1648.63	10.27	0.19	0.037	0.08
Reach-1	199.91	Alt3.5D	23500.00			23500.00	926.20	936.48	936.58	0.000230	2.56	9164.29	1649.55	10.28	0.19	0.037	0.08
Reach-1	199.91	Alt3.5H	23500.00			23500.00	926.20	936.48	936.58	0.000230	2.56	9164.29	1649.55	10.28	0.19	0.037	0.08
Reach-1	199.91	existing	57000.00		753.71	56246.29	932.10	945.45	945.59	0.000636	3.03	19208.46	3605.47	13.35	0.21	0.044	0.27
Reach-1	199.91	Alt3.5B	57000.00		4571.64	52428.36	926.20	940.31	940.50	0.000286	3.14	17425.18	2754.87	14.11	0.20	0.035	0.13
Reach-1	199.91	Alt3.5D	57000.00		4610.06	52389.94	926.20	940.32	940.51	0.000285	3.14	17447.86	2755.45	14.12	0.20	0.035	0.13
Reach-1	199.91	Alt3.5H	57000.00		4610.06	52389.94	926.20	940.32	940.51	0.000285	3.14	17447.86	2755.45	14.12	0.20	0.035	0.13
Reach-1	199.91	existing	92000.00		5570.27	86429.73	932.10	947.02	947.23	0.000775	3.78	26010.35	5103.91	14.92	0.23	0.044	0.40
Reach-1	199.91	Alt3.5B	92000.00		21576.15	70423.84	926.20	942.37	942.97	0.000275	3.28	23370.38	3067.44	16.17	0.20	0.030	0.15
Reach-1	199.91	Alt3.5D	92000.00		21785.03	70214.97	926.20	942.41	943.01	0.000270	3.25	23482.08	3073.74	16.21	0.20	0.030	0.14
Reach-1	199.91	Alt3.5H	92000.00		21794.80	70205.20	926.20	942.41	943.01	0.000270	3.25	23487.33	3074.03	16.21	0.20	0.030	0.14
Reach-1	199.91	existing	185000.00		38591.04	146408.95	932.10	949.44	949.77	0.000983	4.95	41107.70	6528.69	17.34	0.27	0.042	0.65
Reach-1	199.91	Alt3.5B	185000.00		70132.00	114867.99	926.20	945.63	947.16	0.000302	3.80	34807.73	4327.86	19.43	0.20	0.025	0.20
Reach-1	199.91	Alt3.5D	185000.00		71940.95	113059.06	926.20	946.06	948.14	0.000263	3.60	35439.79	3360.80	19.86	0.19	0.025	0.19
Reach-1	199.91	Alt3.5H	185000.00		71884.72	113115.29	926.20	946.05	948.13	0.000264	3.60	35402.04	3360.80	19.85	0.19	0.025	0.19
Reach-1	199.91	existing	227000.00		58069.82	168930.17	932.10	950.30	950.68	0.001020	5.29	46767.04	6609.66	18.20	0.27	0.042	0.73
Reach-1	199.91	Alt3.5B	227000.00		94775.39	132224.61	926.20	946.89	948.20	0.000295	3.92	40795.42	5014.40	20.69	0.20	0.024	0.22
Reach-1	199.91	Alt3.5D	227000.00		95551.48	131448.53	926.20	947.40	950.04	0.000259	3.74	40019.84	3420.80	21.20	0.18	0.024	0.20
Reach-1	199.91	Alt3.5H	227000.00		95385.27	131614.73	926.20	947.37	950.02	0.000262	3.75	39901.67	3420.80	21.17	0.19	0.024	0.21
Reach-1	199.91	existing	243000.00		65919.30	177080.69	932.10	950.59	951.00	0.001033	5.41	48726.77	6619.92	18.49	0.28	0.042	0.76
Reach-1	199.91	Alt3.5B	243000.00		104376.58	138623.42	926.20	947.35	948.55	0.000292	3.96	43244.53	5924.13	21.15	0.20	0.024	0.23
Reach-1	199.91	Alt3.5D	243000.00		104639.58	138360.42	926.20	947.88	950.73	0.000258	3.79	41654.66	3420.80	21.68	0.18	0.024	0.21
Reach-1	199.91	Alt3.5H	243000.00		104406.91	138593.08	926.20	947.83	950.70	0.000262	3.81	41486.80	3420.80	21.63	0.19	0.024	0.21
Reach-1	199.91	existing	285000.00		86908.70	198091.28	932.10	951.33	951.78	0.001065	5.70	53582.96	6643.18	19.23	0.28	0.041	0.83

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Manin Wid Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	199.91	All3.5B	285000.00		130755.19	154244.81	926.20	948.40	949.39	0.000286	4.07	49916.23	6528.33	22.20	0.19	0.024	0.24
Reach-1	199.91	All3.5D	285000.00		128616.82	156383.19	926.20	949.05	952.45	0.000257	3.94	45668.01	3420.80	22.85	0.18	0.023	0.23
Reach-1	199.91	All3.5H	285000.00		128179.64	156820.36	926.20	948.96	952.39	0.000264	3.98	45341.88	3420.80	22.76	0.19	0.023	0.23
Reach-1	200	existing	23500.00		0.16	23499.84	933.40	942.94	943.01	0.000282	2.21	10627.90	2180.69	9.54	0.18	0.037	0.09
Reach-1	200	All3.5B	23500.00			23500.00	933.40	937.68	938.90	0.014834	8.86	2653.27	1105.24	4.28	1.01	0.037	2.22
Reach-1	200	All3.5D	23500.00			23500.00	933.40	937.69	938.90	0.014671	8.83	2662.85	1106.14	4.29	1.00	0.037	2.20
Reach-1	200	All3.5H	23500.00			23500.00	933.40	937.69	938.90	0.014671	8.83	2662.85	1106.14	4.29	1.00	0.037	2.20
Reach-1	200	existing	57000.00		1177.67	55822.33	933.40	945.72	945.89	0.000494	3.33	17665.32	2789.03	12.32	0.21	0.040	0.23
Reach-1	200	All3.5B	57000.00			57000.00	933.40	939.63	941.66	0.012467	11.44	4983.23	1253.03	6.23	1.01	0.036	3.09
Reach-1	200	All3.5D	57000.00			57000.00	933.40	939.66	941.66	0.012188	11.36	5018.65	1254.10	6.26	1.00	0.036	3.04
Reach-1	200	All3.5H	57000.00			57000.00	933.40	939.66	941.66	0.012188	11.36	5018.65	1254.10	6.26	1.00	0.036	3.04
Reach-1	200	existing	92000.00		5970.99	86029.01	933.40	947.38	947.62	0.000681	4.21	23803.02	4967.07	13.96	0.24	0.042	0.39
Reach-1	200	All3.5B	92000.00			92000.00	933.40	941.94	943.73	0.007308	10.76	8546.38	1922.49	8.54	0.90	0.036	2.02
Reach-1	200	All3.5D	92000.00			92000.00	933.40	942.00	943.75	0.007043	10.61	8674.68	1945.19	8.60	0.89	0.036	1.96
Reach-1	200	All3.5H	92000.00			92000.00	933.40	942.00	943.75	0.007031	10.60	8680.74	1946.25	8.60	0.88	0.036	1.95
Reach-1	200	existing	185000.00		39246.54	145753.47	933.40	949.89	950.31	0.000972	5.59	38209.91	6455.89	16.49	0.29	0.041	0.71
Reach-1	200	All3.5B	185000.00		4497.14	180502.86	933.40	945.94	947.60	0.004783	10.45	18283.97	2935.13	12.54	0.66	0.041	2.31
Reach-1	200	All3.5D	185000.00		8954.88	176045.13	933.40	947.47	948.56	0.002758	8.51	22494.32	2831.52	14.07	0.49	0.042	1.59
Reach-1	200	All3.5H	185000.00		8923.37	176076.63	933.40	947.46	948.55	0.002768	8.52	22464.08	2831.36	14.06	0.49	0.042	1.60
Reach-1	200	existing	227000.00		59133.24	167866.77	933.40	950.78	951.24	0.001040	5.99	43997.08	6544.62	17.38	0.30	0.041	0.81
Reach-1	200	All3.5B	227000.00		10863.71	216136.30	933.40	946.92	948.76	0.004941	11.11	21734.15	4178.07	13.52	0.66	0.041	2.68
Reach-1	200	All3.5D	227000.00		17773.17	209226.83	933.40	949.47	950.51	0.002226	8.32	28193.08	2860.81	16.07	0.44	0.043	1.56
Reach-1	200	All3.5H	227000.00		17696.13	209303.88	933.40	949.45	950.49	0.002242	8.34	28122.37	2860.45	16.05	0.44	0.043	1.57
Reach-1	200	existing	243000.00		67697.78	175302.22	933.40	951.08	951.57	0.001057	6.10	45995.16	6550.03	17.68	0.30	0.041	0.85
Reach-1	200	All3.5B	243000.00		14824.96	228175.03	933.40	947.28	949.15	0.004920	11.27	23378.94	4902.29	13.86	0.66	0.041	2.76
Reach-1	200	All3.5D	243000.00		21310.58	221689.41	933.40	950.18	951.21	0.002092	8.30	30224.68	2871.18	16.78	0.42	0.043	1.56
Reach-1	200	All3.5H	243000.00		21206.82	221793.17	933.40	950.15	951.18	0.002111	8.32	30129.18	2870.70	16.75	0.42	0.043	1.57
Reach-1	200	existing	285000.00		91045.36	193954.64	933.40	951.84	952.36	0.001093	6.38	50937.12	6563.41	18.44	0.30	0.041	0.93
Reach-1	200	All3.5B	285000.00		30625.56	254374.44	933.40	948.18	950.04	0.004669	11.42	28123.42	5536.40	14.78	0.64	0.042	2.90
Reach-1	200	All3.5D	285000.00		30906.85	254093.14	933.40	951.95	952.97	0.001832	8.29	35308.80	2896.97	18.55	0.39	0.044	1.56
Reach-1	200	All3.5H	285000.00		30731.54	254268.45	933.40	951.89	952.92	0.001857	8.33	35143.83	2896.14	18.49	0.40	0.044	1.58
Reach-1	200.1	existing	23500.00	147.82		23352.18	934.50	943.08	943.26	0.000776	3.44	7243.14	1854.53	8.58	0.29	0.038	0.22
Reach-1	200.1	All3.5B	23500.00		168.76	23331.24	934.50	940.74	941.05	0.001829	4.46	5449.54	1967.57	6.24	0.42	0.036	0.41
Reach-1	200.1	All3.5D	23500.00		166.47	23333.53	934.50	940.74	941.04	0.001835	4.47	5441.62	1967.28	6.24	0.42	0.035	0.41
Reach-1	200.1	All3.5H	23500.00		166.47	23333.53	934.50	940.74	941.04	0.001835	4.47	5441.62	1967.28	6.24	0.42	0.035	0.41
Reach-1	200.1	existing	57000.00	1382.61	34.80	55582.59	934.50	945.98	946.31	0.001254	4.68	13532.50	2458.87	11.48	0.33	0.043	0.49
Reach-1	200.1	All3.5B	57000.00	310.12	4215.19	52474.68	934.50	943.37	943.83	0.001791	5.60	11462.10	2558.57	8.87	0.42	0.038	0.62
Reach-1	200.1	All3.5D	57000.00	308.21	4205.91	52485.88	934.50	943.36	943.82	0.001800	5.61	11440.56	2557.43	8.86	0.42	0.038	0.62
Reach-1	200.1	All3.5H	57000.00	308.21	4205.91	52485.88	934.50	943.36	943.82	0.001800	5.61	11440.56	2557.43	8.86	0.42	0.038	0.62
Reach-1	200.1	existing	92000.00	2866.25	1698.26	87435.49	934.50	947.69	948.18	0.001579	5.79	18752.63	4222.14	13.19	0.36	0.045	0.79
Reach-1	200.1	All3.5B	92000.00	1098.15	9172.21	81729.63	934.50	945.04	945.67	0.002010	6.63	15923.64	2769.59	10.54	0.45	0.039	0.84
Reach-1	200.1	All3.5D	92000.00	1092.29	9154.40	81753.30	934.50	945.03	945.66	0.002025	6.65	15880.42	2763.63	10.53	0.45	0.039	0.84
Reach-1	200.1	All3.5H	92000.00	1092.03	9153.65	81754.32	934.50	945.03	945.66	0.002025	6.65	15878.57	2763.59	10.53	0.45	0.039	0.84
Reach-1	200.1	existing	185000.00	5912.56	35562.92	143524.52	934.50	950.37	951.02	0.001814	7.12	33618.01	6474.53	15.87	0.38	0.045	1.21
Reach-1	200.1	All3.5B	185000.00	3940.31	25337.78	155721.91	934.50	948.27	949.25	0.002139	8.46	26576.38	4844.96	13.77	0.48	0.041	1.29
Reach-1	200.1	All3.5D	185000.00	4172.67	24031.53	156795.78	934.50	948.78	949.69	0.001843	8.10	26833.57	3055.40	14.28	0.45	0.041	1.17
Reach-1	200.1	All3.5H	185000.00	4170.74	24023.81	156805.45	934.50	948.77	949.69	0.001846	8.11	26816.42	3055.40	14.27	0.45	0.041	1.17
Reach-1	200.1	existing	227000.00	7022.91	58059.82	161917.28	934.50	951.29	951.97	0.001795	7.39	39953.39	6933.94	16.79	0.38	0.045	1.30
Reach-1	200.1	All3.5B	227000.00	5096.94	40295.94	181607.11	934.50	949.39	950.42	0.002051	8.85	32676.88	6001.08	14.89	0.47	0.041	1.38
Reach-1	200.1	All3.5D	227000.00	5737.54	32157.38	189105.08	934.50	950.48	951.45	0.001633	8.38	32033.76	3055.40	15.98	0.43	0.042	1.21
Reach-1	200.1	All3.5H	227000.00	5732.39	32133.55	189134.06	934.50	950.46	951.44	0.001641	8.39	31983.22	3055.40	15.96	0.43	0.042	1.22
Reach-1	200.1	existing	243000.00	7383.32	68002.54	167614.14	934.50	951.61	952.29	0.001774	7.45	42145.77	6942.59	17.11	0.38	0.044	1.32
Reach-1	200.1	All3.5B	243000.00	5499.55	46983.51	190516.94	934.50	949.75	950.80	0.002030	8.99	34886.76	6143.32	15.25	0.47	0.041	1.41
Reach-1	200.1	All3.5D	243000.00	6341.45	35362.90	201295.66	934.50	951.11	952.10	0.001567	8.47	33961.10	3055.40	16.61	0.42	0.042	1.22
Reach-1	200.1	All3.5H	243000.00	6334.38	35329.09	201336.55	934.50	951.08	952.08	0.001577	8.49	33889.30	3055.40	16.58	0.42	0.042	1.23
Reach-1	200.1	existing	285000.00	8288.49	94886.70	181824.83	934.50	952.39	953.08	0.001723	7.58	47526.16	6947.31	17.89	0.38	0.044	1.36
Reach-1	200.1	All3.5B	285000.00	6484.19	65600.63	212915.19	934.50	950.54	951.64	0.002038	9.39	39861.64	6652.90	16.04	0.48	0.041	1.52
Reach-1	200.1	All3.5D	285000.00	7940.64	43968.10	233091.27	934.50	952.73	953.77	0.001419	8.69	38907.48	3055.40	18.23	0.41	0.042	1.25

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.1	Alt3.5H	285000.00	7928.08	43903.88	233168.05	934.50	952.68	953.73	0.001435	8.72	38767.98	3055.40	18.18	0.41	0.042	1.26
Reach-1	200.2	existing	23500.00			23500.00	937.00	943.82	944.09	0.004233	4.16	5655.62	2114.46	6.82	0.45	0.050	0.71
Reach-1	200.2	Alt3.5B	23500.00			23500.00	937.00	942.04	942.38	0.003650	4.66	5040.02	2010.50	5.04	0.52	0.041	0.57
Reach-1	200.2	Alt3.5D	23500.00			23500.00	937.00	942.04	942.38	0.003652	4.66	5038.68	2010.25	5.04	0.52	0.041	0.57
Reach-1	200.2	Alt3.5H	23500.00			23500.00	937.00	942.04	942.38	0.003652	4.66	5038.68	2010.25	5.04	0.52	0.041	0.57
Reach-1	200.2	existing	57000.00		0.53	56999.47	937.00	946.90	947.18	0.002251	4.24	13430.59	2685.07	9.90	0.33	0.051	0.70
Reach-1	200.2	Alt3.5B	57000.00			57000.00	937.00	944.56	944.97	0.002675	5.16	11043.39	2625.45	7.56	0.44	0.042	0.70
Reach-1	200.2	Alt3.5D	57000.00			57000.00	937.00	944.55	944.97	0.002681	5.17	11034.74	2624.91	7.55	0.44	0.042	0.70
Reach-1	200.2	Alt3.5H	57000.00			57000.00	937.00	944.55	944.97	0.002681	5.17	11034.74	2624.91	7.55	0.44	0.042	0.70
Reach-1	200.2	existing	92000.00		2071.71	89928.30	937.00	948.79	949.15	0.002118	4.85	19742.23	4396.29	11.79	0.33	0.051	0.89
Reach-1	200.2	Alt3.5B	92000.00			92000.00	937.00	946.32	946.85	0.002491	5.84	15745.26	2673.43	9.32	0.42	0.043	0.91
Reach-1	200.2	Alt3.5D	92000.00			92000.00	937.00	946.32	946.85	0.002500	5.85	15727.15	2673.38	9.32	0.43	0.043	0.91
Reach-1	200.2	Alt3.5H	92000.00			92000.00	937.00	946.32	946.85	0.002500	5.85	15728.50	2673.35	9.32	0.43	0.043	0.91
Reach-1	200.2	existing	185000.00		41815.89	143184.11	937.00	951.59	951.99	0.001824	5.45	37287.25	7029.24	14.59	0.31	0.048	1.07
Reach-1	200.2	Alt3.5B	185000.00		8353.30	176646.70	937.00	949.88	950.43	0.002291	7.11	28437.74	6216.49	12.68	0.42	0.044	1.27
Reach-1	200.2	Alt3.5D	185000.00		3723.55	181276.45	937.00	950.00	950.76	0.002167	7.04	26906.51	3281.44	13.00	0.41	0.044	1.25
Reach-1	200.2	Alt3.5H	185000.00		3717.40	181282.61	937.00	950.00	950.75	0.002169	7.05	26895.10	3281.34	13.00	0.41	0.044	1.25
Reach-1	200.2	existing	227000.00		66339.87	160660.13	937.00	952.48	952.91	0.001727	5.58	43596.01	7092.30	15.48	0.31	0.047	1.11
Reach-1	200.2	Alt3.5B	227000.00		25478.95	201521.06	937.00	950.79	951.53	0.002074	7.21	35622.93	6790.49	13.79	0.40	0.043	1.29
Reach-1	200.2	Alt3.5D	227000.00		7952.23	219047.77	937.00	951.60	952.40	0.001923	7.26	32199.93	3327.87	14.60	0.39	0.044	1.30
Reach-1	200.2	Alt3.5H	227000.00		7929.11	219070.89	937.00	951.59	952.39	0.001930	7.26	32161.95	3327.54	14.59	0.39	0.044	1.30
Reach-1	200.2	existing	243000.00		75639.33	167360.66	937.00	952.77	953.22	0.001714	5.85	45692.04	7113.12	15.77	0.31	0.046	1.14
Reach-1	200.2	Alt3.5B	243000.00		33165.69	209834.31	937.00	951.15	951.89	0.002012	7.25	38126.92	6978.74	14.15	0.40	0.043	1.30
Reach-1	200.2	Alt3.5D	243000.00		9787.28	233212.72	937.00	952.20	953.01	0.001840	7.32	34202.00	3345.26	15.20	0.38	0.045	1.31
Reach-1	200.2	Alt3.5H	243000.00		9752.47	233247.55	937.00	952.18	953.00	0.001850	7.33	34146.05	3344.78	15.18	0.38	0.045	1.31
Reach-1	200.2	existing	285000.00		100640.20	184359.78	937.00	953.50	953.99	0.001685	5.83	50892.50	7157.27	16.50	0.30	0.046	1.19
Reach-1	200.2	Alt3.5B	285000.00		54024.85	230975.16	937.00	951.97	952.72	0.001923	7.40	43877.69	7056.63	14.97	0.39	0.042	1.34
Reach-1	200.2	Alt3.5D	285000.00		15057.29	269942.72	937.00	953.75	954.59	0.001649	7.46	39433.51	3390.29	16.75	0.36	0.045	1.33
Reach-1	200.2	Alt3.5H	285000.00		14981.68	270018.31	937.00	953.72	954.56	0.001664	7.48	39315.58	3389.28	16.72	0.37	0.045	1.34
Reach-1	200.3	existing	23500.00			23500.00	937.70	945.21	945.35	0.001566	2.99	7861.93	2722.24	7.51	0.31	0.045	0.28
Reach-1	200.3	Alt3.5B	23500.00		556.16	22943.84	937.60	943.24	943.41	0.001231	3.32	7418.85	2708.63	5.64	0.33	0.039	0.24
Reach-1	200.3	Alt3.5D	23500.00		556.05	22943.95	937.60	943.24	943.41	0.001232	3.32	7418.35	2708.52	5.64	0.33	0.039	0.24
Reach-1	200.3	Alt3.5H	23500.00		556.05	22943.95	937.60	943.24	943.41	0.001232	3.32	7418.35	2708.52	5.64	0.33	0.039	0.24
Reach-1	200.3	existing	57000.00			57000.00	937.70	947.91	948.11	0.001472	3.62	15731.89	3040.44	10.21	0.28	0.049	0.47
Reach-1	200.3	Alt3.5B	57000.00		4084.18	52915.82	937.60	945.66	945.90	0.001236	3.99	14929.35	3427.01	8.06	0.33	0.041	0.35
Reach-1	200.3	Alt3.5D	57000.00		4083.10	52916.89	937.60	945.66	945.89	0.001237	3.99	14924.33	3426.94	8.06	0.33	0.041	0.35
Reach-1	200.3	Alt3.5H	57000.00		4083.10	52916.89	937.60	945.66	945.89	0.001237	3.99	14924.33	3426.94	8.06	0.33	0.041	0.35
Reach-1	200.3	existing	92000.00		34.54	91965.46	937.70	949.80	950.08	0.001525	4.27	21583.53	3438.64	12.10	0.29	0.051	0.66
Reach-1	200.3	Alt3.5B	92000.00		8174.31	83825.69	937.60	947.46	947.76	0.001238	4.49	21182.44	3501.42	9.86	0.32	0.042	0.48
Reach-1	200.3	Alt3.5D	92000.00		8171.95	83828.05	937.60	947.45	947.76	0.001240	4.49	21169.81	3501.33	9.85	0.32	0.042	0.48
Reach-1	200.3	Alt3.5H	92000.00		8171.87	83828.13	937.60	947.45	947.75	0.001240	4.49	21169.18	3501.33	9.85	0.32	0.042	0.48
Reach-1	200.3	existing	185000.00		11419.85	173580.16	937.70	952.51	953.01	0.001975	5.80	32976.83	4541.17	14.81	0.33	0.051	1.18
Reach-1	200.3	Alt3.5B	185000.00		20521.78	164478.22	937.60	950.87	951.34	0.001296	5.64	34232.21	4760.64	13.27	0.32	0.044	0.76
Reach-1	200.3	Alt3.5D	185000.00		19367.18	165632.81	937.60	951.15	951.61	0.001204	5.52	34308.94	3584.30	13.55	0.31	0.044	0.72
Reach-1	200.3	Alt3.5H	185000.00		19366.08	165633.92	937.60	951.15	951.60	0.001204	5.52	34300.84	3584.30	13.55	0.31	0.044	0.72
Reach-1	200.3	existing	227000.00		20168.57	206831.42	937.70	953.37	953.97	0.002146	6.34	36956.71	4713.39	15.67	0.35	0.050	1.40
Reach-1	200.3	Alt3.5B	227000.00		29226.85	197773.16	937.60	951.87	952.42	0.001378	6.13	39067.89	4906.00	14.27	0.34	0.044	0.89
Reach-1	200.3	Alt3.5D	227000.00		24507.44	202492.56	937.60	952.68	953.19	0.001150	5.83	39778.23	3586.99	15.08	0.31	0.044	0.80
Reach-1	200.3	Alt3.5H	227000.00		24503.64	202496.36	937.60	952.67	953.18	0.001153	5.83	39749.55	3586.97	15.07	0.31	0.044	0.80
Reach-1	200.3	existing	243000.00		23618.88	219381.11	937.70	953.66	954.30	0.002216	6.54	38343.00	4793.89	15.96	0.35	0.050	1.49
Reach-1	200.3	Alt3.5B	243000.00		32852.44	210147.56	937.60	952.20	952.78	0.001416	6.31	40676.09	4958.71	14.60	0.34	0.044	0.94
Reach-1	200.3	Alt3.5D	243000.00		26475.90	216524.09	937.60	953.25	953.77	0.001128	5.93	41826.41	3587.99	15.65	0.30	0.045	0.82
Reach-1	200.3	Alt3.5H	243000.00		26470.32	216529.69	937.60	953.23	953.76	0.001132	5.93	41783.05	3587.97	15.63	0.31	0.045	0.82
Reach-1	200.3	existing	285000.00		32160.45	252839.55	937.70	954.38	955.12	0.002402	7.07	41938.39	5211.76	16.68	0.37	0.050	1.72
Reach-1	200.3	Alt3.5B	285000.00		42876.14	242123.86	937.60	952.95	953.62	0.001525	6.60	44463.15	5106.24	15.35	0.35	0.044	1.09
Reach-1	200.3	Alt3.5D	285000.00		31660.45	253339.56	937.60	954.73	955.30	0.001069	6.16	47138.72	3590.60	17.13	0.30	0.045	0.88
Reach-1	200.3	Alt3.5H	285000.00		31649.00	253350.98	937.60	954.70	955.27	0.001076	6.17	47043.17	3590.55	17.10	0.30	0.045	0.88

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.39	existing	23500.00			23500.00	937.00	945.70	945.77	0.000492	2.00	11763.19	2721.93	8.70	0.17	0.045	0.13
Reach-1	200.39	Alt3.5B	23500.00		160.95	23339.05	937.00	943.75	943.83	0.000551	2.30	10464.26	3148.42	6.75	0.21	0.039	0.13
Reach-1	200.39	Alt3.5D	23500.00		160.91	23339.09	937.00	943.75	943.83	0.000551	2.30	10463.87	3148.41	6.75	0.21	0.039	0.13
Reach-1	200.39	Alt3.5H	23500.00		160.91	23339.09	937.00	943.75	943.83	0.000551	2.30	10463.87	3148.41	6.75	0.21	0.039	0.13
Reach-1	200.39	existing	57000.00			57000.00	937.00	948.49	948.62	0.000698	2.82	20217.30	3287.86	11.49	0.20	0.048	0.27
Reach-1	200.39	Alt3.5B	57000.00		2408.70	54591.30	937.00	946.20	946.36	0.000671	3.22	18381.33	3304.29	9.20	0.23	0.041	0.25
Reach-1	200.39	Alt3.5D	57000.00		2408.01	54591.99	937.00	946.20	946.36	0.000671	3.22	18377.91	3304.19	9.20	0.23	0.041	0.25
Reach-1	200.39	Alt3.5H	57000.00		2408.01	54591.99	937.00	946.20	946.36	0.000671	3.22	18377.91	3304.19	9.20	0.23	0.041	0.25
Reach-1	200.39	existing	92000.00		287.35	91712.65	937.00	950.45	950.63	0.000783	3.44	26982.11	3795.11	13.45	0.21	0.049	0.39
Reach-1	200.39	Alt3.5B	92000.00		5563.30	86436.70	937.00	948.04	948.26	0.000768	3.83	24849.71	3710.97	11.04	0.26	0.041	0.33
Reach-1	200.39	Alt3.5D	92000.00		5562.52	86437.48	937.00	948.04	948.26	0.000769	3.83	24839.51	3710.72	11.04	0.26	0.041	0.33
Reach-1	200.39	Alt3.5H	92000.00		5562.44	86437.56	937.00	948.04	948.26	0.000769	3.83	24839.06	3710.71	11.04	0.26	0.041	0.33
Reach-1	200.39	existing	185000.00		19676.67	165323.33	937.00	953.41	953.70	0.000947	4.51	44238.31	7076.40	16.41	0.24	0.048	0.64
Reach-1	200.39	Alt3.5B	185000.00		15113.98	169886.02	937.00	951.52	951.88	0.000853	4.98	38922.93	5311.69	14.52	0.27	0.042	0.54
Reach-1	200.39	Alt3.5D	185000.00		14424.62	170575.39	937.00	951.76	952.12	0.000799	4.88	38976.19	3856.34	14.76	0.27	0.042	0.52
Reach-1	200.39	Alt3.5H	185000.00		14423.42	170576.58	937.00	951.76	952.11	0.000800	4.88	38969.13	3856.33	14.76	0.27	0.042	0.52
Reach-1	200.39	existing	227000.00		36495.60	190504.41	937.00	954.36	954.69	0.000961	4.78	51052.27	7114.17	17.36	0.24	0.047	0.71
Reach-1	200.39	Alt3.5B	227000.00		23866.78	203133.22	937.00	952.58	953.00	0.000894	5.39	45565.79	6611.25	15.58	0.28	0.042	0.62
Reach-1	200.39	Alt3.5D	227000.00		18792.88	208207.11	937.00	953.27	953.68	0.000777	5.20	44818.34	3858.50	16.27	0.27	0.043	0.58
Reach-1	200.39	Alt3.5H	227000.00		18788.46	208211.55	937.00	953.27	953.67	0.000778	5.20	44792.20	3858.50	16.27	0.27	0.043	0.58
Reach-1	200.39	existing	243000.00		43371.12	199628.89	937.00	954.70	955.03	0.000967	4.87	53409.63	7122.09	17.70	0.25	0.047	0.73
Reach-1	200.39	Alt3.5B	243000.00		28153.42	214846.59	937.00	952.93	953.37	0.000907	5.53	47923.07	6731.88	15.93	0.29	0.042	0.65
Reach-1	200.39	Alt3.5D	243000.00		20497.63	222502.36	937.00	953.84	954.26	0.000766	5.31	46998.88	3858.50	16.84	0.26	0.043	0.59
Reach-1	200.39	Alt3.5H	243000.00		20490.98	222509.02	937.00	953.83	954.25	0.000768	5.31	46959.30	3858.50	16.83	0.26	0.043	0.60
Reach-1	200.39	existing	285000.00		62418.39	222581.61	937.00	955.52	955.88	0.000976	5.09	59250.85	7141.66	18.52	0.25	0.046	0.79
Reach-1	200.39	Alt3.5B	285000.00		40598.33	244401.66	937.00	953.76	954.25	0.000942	5.66	53726.89	7099.80	16.76	0.29	0.042	0.73
Reach-1	200.39	Alt3.5D	285000.00		25053.77	259946.22	937.00	955.30	955.76	0.000735	5.55	52642.26	3858.50	18.30	0.26	0.043	0.64
Reach-1	200.39	Alt3.5H	285000.00		25039.17	259960.83	937.00	955.28	955.74	0.000739	5.56	52553.00	3858.50	18.28	0.26	0.043	0.64
Reach-1	200.40	existing	23500.00			23500.00	936.90	945.98	946.06	0.000684	2.21	10616.61	2750.38	9.08	0.20	0.046	0.16
Reach-1	200.40	Alt3.5B	23500.00			23500.00	936.90	944.15	944.38	0.002528	3.87	6071.04	2090.58	7.25	0.40	0.042	0.46
Reach-1	200.40	Alt3.5D	23500.00			23500.00	936.90	944.15	944.38	0.002528	3.87	6070.78	2090.53	7.25	0.40	0.042	0.46
Reach-1	200.40	Alt3.5H	23500.00			23500.00	936.90	944.15	944.38	0.002528	3.87	6070.78	2090.53	7.25	0.40	0.042	0.46
Reach-1	200.40	existing	57000.00			57000.00	936.90	948.86	949.00	0.000841	2.98	19111.40	3095.09	11.96	0.21	0.050	0.32
Reach-1	200.40	Alt3.5B	57000.00			57000.00	936.90	946.68	947.00	0.002628	4.53	12579.24	2850.90	9.78	0.38	0.047	0.72
Reach-1	200.40	Alt3.5D	57000.00			57000.00	936.90	946.68	947.00	0.002629	4.53	12577.15	2850.81	9.78	0.38	0.047	0.72
Reach-1	200.40	Alt3.5H	57000.00			57000.00	936.90	946.68	947.00	0.002629	4.53	12577.15	2850.81	9.78	0.38	0.047	0.72
Reach-1	200.40	existing	92000.00		138.44	91861.55	936.90	950.86	951.06	0.000939	3.61	25644.21	3807.24	13.96	0.23	0.051	0.46
Reach-1	200.40	Alt3.5B	92000.00			92000.00	936.90	948.55	948.95	0.002552	5.07	18147.28	3076.49	11.65	0.37	0.050	0.94
Reach-1	200.40	Alt3.5D	92000.00			92000.00	936.90	948.55	948.95	0.002555	5.07	18140.89	3076.37	11.65	0.37	0.050	0.94
Reach-1	200.40	Alt3.5H	92000.00			92000.00	936.90	948.55	948.95	0.002555	5.07	18140.52	3076.36	11.65	0.37	0.050	0.94
Reach-1	200.40	existing	185000.00		14691.03	170308.97	936.90	953.90	954.23	0.001165	4.75	41206.23	6558.98	17.00	0.26	0.051	0.75
Reach-1	200.40	Alt3.5B	185000.00		3087.84	181912.16	936.90	952.03	952.62	0.002415	6.18	30448.36	4278.96	15.13	0.37	0.052	1.30
Reach-1	200.40	Alt3.5D	185000.00		3458.91	181541.08	936.90	952.24	952.80	0.002237	6.02	31193.12	4037.08	15.34	0.36	0.052	1.23
Reach-1	200.40	Alt3.5H	185000.00		3454.67	181545.33	936.90	952.24	952.80	0.002238	6.02	31186.96	4037.07	15.34	0.36	0.052	1.23
Reach-1	200.40	existing	227000.00		28416.46	198583.55	936.90	954.87	955.24	0.001203	5.07	47798.46	7068.52	17.97	0.27	0.050	0.85
Reach-1	200.40	Alt3.5B	227000.00		10187.61	216812.39	936.90	953.11	953.75	0.002406	6.55	36126.25	6021.67	16.21	0.37	0.051	1.44
Reach-1	200.40	Alt3.5D	227000.00		9402.39	217597.59	936.90	953.74	954.32	0.001997	6.17	37252.54	4071.70	16.84	0.34	0.052	1.27
Reach-1	200.40	Alt3.5H	227000.00		9382.48	217617.52	936.90	953.73	954.31	0.002001	6.17	37228.43	4071.70	16.83	0.34	0.052	1.27
Reach-1	200.40	existing	243000.00		34840.82	208159.17	936.90	955.20	955.58	0.001208	5.16	50160.62	7071.61	18.30	0.27	0.050	0.88
Reach-1	200.40	Alt3.5B	243000.00		14349.04	228650.95	936.90	953.47	954.13	0.002393	6.66	38389.78	6464.53	16.57	0.37	0.051	1.46
Reach-1	200.40	Alt3.5D	243000.00		12025.66	230974.33	936.90	954.29	954.88	0.001912	6.21	39515.78	4071.70	17.39	0.33	0.052	1.28
Reach-1	200.40	Alt3.5H	243000.00		11994.69	231005.31	936.90	954.28	954.88	0.001917	6.21	39479.25	4071.70	17.38	0.33	0.052	1.29
Reach-1	200.40	existing	285000.00		52998.41	232001.59	936.90	956.03	956.44	0.001212	5.37	55988.85	7079.22	19.13	0.27	0.049	0.94
Reach-1	200.40	Alt3.5B	285000.00		28447.39	256552.63	936.90	954.32	955.01	0.002338	6.88	44010.88	6738.79	17.42	0.37	0.050	1.57
Reach-1	200.40	Alt3.5D	285000.00		19537.36	265462.66	936.90	955.73	956.34	0.001711	6.30	45363.63	4071.70	18.83	0.32	0.051	1.30
Reach-1	200.40	Alt3.5H	285000.00		19464.81	265535.19	936.90	955.71	956.32	0.001721	6.31	45279.63	4071.70	18.81	0.32	0.051	1.31
Reach-1	200.58	existing	23500.00			23500.00	937.60	946.34	946.46	0.000984	2.86	8223.72	2243.13	8.74	0.26	0.043	0.23
Reach-1	200.58	Alt3.5B	23500.00			23500.00	937.60	944.78	944.88	0.000516	2.50	9408.18	2273.20	7.18	0.22	0.039	0.13

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.58	Alt3.5D	23500.00			23500.00	937.60	944.78	944.88	0.000516	2.50	9407.90	2273.16	7.18	0.22	0.039	0.13
Reach-1	200.58	Alt3.5H	23500.00			23500.00	937.60	944.78	944.88	0.000516	2.50	9407.90	2273.16	7.18	0.22	0.039	0.13
Reach-1	200.58	existing	57000.00			57000.00	937.60	949.31	949.50	0.001202	3.47	16416.80	3128.11	11.71	0.27	0.048	0.39
Reach-1	200.58	Alt3.5B	57000.00		887.12	56112.88	937.60	947.48	947.63	0.000737	3.37	17246.05	3308.53	9.86	0.25	0.041	0.25
Reach-1	200.58	Alt3.5D	57000.00		886.95	56113.05	937.60	947.48	947.63	0.000737	3.37	17244.63	3308.49	9.86	0.25	0.041	0.25
Reach-1	200.58	Alt3.5H	57000.00		886.95	56113.05	937.60	947.48	947.63	0.000737	3.37	17244.63	3308.49	9.86	0.25	0.041	0.25
Reach-1	200.58	existing	92000.00			92000.00	937.60	951.36	951.60	0.001308	3.95	23273.84	3544.46	13.76	0.27	0.051	0.54
Reach-1	200.58	Alt3.5B	92000.00		2458.63	89541.37	937.60	949.40	949.63	0.000833	3.93	23825.02	3506.60	11.80	0.26	0.043	0.36
Reach-1	200.58	Alt3.5D	92000.00		2458.00	89541.99	937.60	949.40	949.63	0.000833	3.93	23820.09	3506.37	11.80	0.26	0.043	0.36
Reach-1	200.58	Alt3.5H	92000.00		2457.98	89542.02	937.60	949.40	949.63	0.000833	3.93	23819.88	3506.36	11.80	0.26	0.043	0.36
Reach-1	200.58	existing	185000.00		6023.00	178977.00	937.60	954.51	954.91	0.001595	5.14	37211.41	5851.19	16.91	0.30	0.053	0.94
Reach-1	200.58	Alt3.5B	185000.00		7265.10	177734.91	937.60	952.98	953.36	0.000978	5.03	37430.17	4306.99	15.38	0.29	0.045	0.58
Reach-1	200.58	Alt3.5D	185000.00		7311.65	177688.34	937.60	953.13	953.50	0.000935	4.95	37985.63	4172.50	15.53	0.28	0.045	0.56
Reach-1	200.58	Alt3.5H	185000.00		7310.78	177689.22	937.60	953.13	953.50	0.000935	4.95	37981.05	4172.48	15.53	0.28	0.045	0.56
Reach-1	200.58	existing	227000.00		15150.76	211849.23	937.60	955.49	955.94	0.001663	5.51	43168.53	6356.80	17.89	0.30	0.053	1.08
Reach-1	200.58	Alt3.5B	227000.00		10984.30	216015.70	937.60	954.07	954.53	0.001054	5.48	42683.90	5265.05	16.47	0.30	0.045	0.70
Reach-1	200.58	Alt3.5D	227000.00		10538.86	216461.14	937.60	954.56	954.98	0.000926	5.25	43987.57	4176.00	16.96	0.28	0.045	0.64
Reach-1	200.58	Alt3.5H	227000.00		10533.78	216466.22	937.60	954.56	954.98	0.000928	5.26	43968.96	4176.00	16.96	0.28	0.045	0.64
Reach-1	200.58	existing	243000.00		19767.05	223232.95	937.60	955.83	956.30	0.001678	5.62	45315.52	6393.51	18.23	0.30	0.052	1.12
Reach-1	200.58	Alt3.5B	243000.00		12997.18	230002.81	937.60	954.43	954.91	0.001083	5.65	44666.91	5757.88	16.83	0.30	0.045	0.74
Reach-1	200.58	Alt3.5D	243000.00		11932.20	231067.80	937.60	955.10	955.53	0.000918	5.35	46216.01	4176.00	17.50	0.28	0.045	0.67
Reach-1	200.58	Alt3.5H	243000.00		11923.83	231076.17	937.60	955.09	955.53	0.000920	5.35	46187.21	4176.00	17.49	0.28	0.045	0.67
Reach-1	200.58	existing	285000.00		33614.78	251385.22	937.60	956.66	957.18	0.001701	5.88	50607.81	6406.81	19.06	0.30	0.052	1.23
Reach-1	200.58	Alt3.5B	285000.00		19833.81	265166.19	937.60	955.27	955.81	0.001157	6.05	49667.87	6151.08	17.67	0.31	0.045	0.85
Reach-1	200.58	Alt3.5D	285000.00		15905.39	269094.63	937.60	956.48	956.95	0.000889	5.57	51986.82	4176.00	18.88	0.27	0.045	0.72
Reach-1	200.58	Alt3.5H	285000.00		15883.29	269116.69	937.60	956.48	956.94	0.000892	5.58	51917.48	4176.00	18.86	0.27	0.045	0.72
Reach-1	200.67	existing	23500.00			23500.00	939.80	946.93	947.08	0.001458	2.90	8102.81	2324.39	7.13	0.27	0.048	0.32
Reach-1	200.67	Alt3.5B	23500.00			23500.00	938.10	945.09	945.21	0.000823	2.82	8339.52	2494.10	6.99	0.27	0.040	0.17
Reach-1	200.67	Alt3.5D	23500.00			23500.00	938.10	945.09	945.21	0.000823	2.82	8339.37	2494.08	6.99	0.27	0.040	0.17
Reach-1	200.67	Alt3.5H	23500.00			23500.00	938.10	945.09	945.21	0.000823	2.82	8339.37	2494.08	6.99	0.27	0.040	0.17
Reach-1	200.67	existing	57000.00			57000.00	939.80	949.96	950.14	0.001362	3.46	16489.82	3117.63	10.16	0.26	0.051	0.45
Reach-1	200.67	Alt3.5B	57000.00			57000.00	938.10	947.86	948.06	0.000945	3.51	16238.15	3201.88	9.76	0.27	0.043	0.30
Reach-1	200.67	Alt3.5D	57000.00			57000.00	938.10	947.86	948.06	0.000945	3.51	16236.99	3201.81	9.76	0.27	0.043	0.30
Reach-1	200.67	Alt3.5H	57000.00			57000.00	938.10	947.86	948.06	0.000945	3.51	16236.99	3201.81	9.76	0.27	0.043	0.30
Reach-1	200.67	existing	92000.00			92000.00	939.80	952.04	952.28	0.001382	3.91	23528.06	3659.69	12.24	0.27	0.051	0.55
Reach-1	200.67	Alt3.5B	92000.00			92000.00	938.10	949.85	950.10	0.001009	4.02	22913.94	3478.62	11.75	0.28	0.044	0.41
Reach-1	200.67	Alt3.5D	92000.00			92000.00	938.10	949.85	950.10	0.001009	4.02	22910.12	3478.54	11.75	0.28	0.044	0.41
Reach-1	200.67	Alt3.5H	92000.00			92000.00	938.10	949.85	950.10	0.001009	4.02	22909.91	3478.53	11.75	0.28	0.044	0.41
Reach-1	200.67	existing	185000.00		7520.87	177479.13	939.80	955.31	955.68	0.001464	4.97	38494.57	5505.37	15.51	0.28	0.052	0.87
Reach-1	200.67	Alt3.5B	185000.00		624.79	184375.20	938.10	953.49	953.90	0.001130	5.10	36839.36	4443.13	15.39	0.29	0.046	0.68
Reach-1	200.67	Alt3.5D	185000.00		799.22	184200.78	938.10	953.62	954.01	0.001085	5.03	37182.10	4380.21	15.52	0.28	0.046	0.66
Reach-1	200.67	Alt3.5H	185000.00		797.92	184202.08	938.10	953.62	954.01	0.001085	5.03	37178.09	4380.19	15.52	0.28	0.046	0.66
Reach-1	200.67	existing	227000.00		16794.14	210205.86	939.80	956.32	956.74	0.001502	5.33	44134.34	5601.55	16.52	0.29	0.051	0.99
Reach-1	200.67	Alt3.5B	227000.00		3582.37	223417.64	938.10	954.62	955.09	0.001187	5.53	42060.02	5214.71	16.52	0.30	0.046	0.80
Reach-1	200.67	Alt3.5D	227000.00		4084.45	222915.55	938.10	955.05	955.48	0.001049	5.31	43473.36	4409.70	16.95	0.28	0.046	0.73
Reach-1	200.67	Alt3.5H	227000.00		4074.96	222925.05	938.10	955.05	955.48	0.001050	5.31	43456.41	4409.70	16.95	0.28	0.046	0.73
Reach-1	200.67	existing	243000.00		20754.53	222245.47	939.80	956.66	957.10	0.001520	5.45	46046.80	5613.32	16.86	0.29	0.051	1.03
Reach-1	200.67	Alt3.5B	243000.00		5182.23	237817.78	938.10	955.00	955.49	0.001211	5.69	44044.88	5387.76	16.90	0.30	0.046	0.84
Reach-1	200.67	Alt3.5D	243000.00		5785.72	237214.28	938.10	955.58	956.02	0.001031	5.40	45806.05	4409.70	17.48	0.28	0.046	0.75
Reach-1	200.67	Alt3.6H	243000.00		5769.65	237230.36	938.10	955.57	956.02	0.001033	5.40	45779.68	4409.70	17.47	0.28	0.046	0.75
Reach-1	200.67	existing	285000.00		31751.43	253248.56	939.80	957.49	957.99	0.001569	5.78	50731.84	5704.69	17.69	0.30	0.051	1.15
Reach-1	200.67	Alt3.5B	285000.00		11320.08	273679.91	938.10	955.87	956.43	0.001272	6.08	48866.82	5586.40	17.77	0.31	0.046	0.95
Reach-1	200.67	Alt3.5D	285000.00		11039.69	273960.31	938.10	956.95	957.42	0.000977	5.59	51830.37	4409.70	18.85	0.27	0.046	0.80
Reach-1	200.67	Alt3.6H	285000.00		10995.05	274004.97	938.10	956.93	957.41	0.000981	5.59	51765.50	4409.70	18.83	0.27	0.046	0.80
Reach-1	200.77	existing	23500.00			23500.00	936.90	947.51	947.61	0.000869	2.62	8954.67	2438.60	10.61	0.24	0.044	0.20
Reach-1	200.77	Alt3.5B	23500.00			23500.00	936.90	945.45	945.55	0.000578	2.61	9013.95	2322.48	8.55	0.23	0.039	0.14
Reach-1	200.77	Alt3.5D	23500.00			23500.00	936.90	945.45	945.55	0.000578	2.61	9013.81	2322.47	8.55	0.23	0.039	0.14
Reach-1	200.77	Alt3.5H	23500.00			23500.00	936.90	945.45	945.55	0.000578	2.61	9013.81	2322.47	8.55	0.23	0.039	0.14

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.77	existing	57000.00			57000.00	936.90	950.53	950.70	0.000943	3.28	17360.83	3112.93	13.63	0.25	0.046	0.33
Reach-1	200.77	Alt3.5B	57000.00		767.67	56232.33	936.90	948.29	948.45	0.000680	3.27	17865.11	3620.64	11.39	0.25	0.041	0.22
Reach-1	200.77	Alt3.5D	57000.00		767.50	56232.51	936.90	948.29	948.45	0.000680	3.27	17864.00	3620.60	11.39	0.25	0.041	0.22
Reach-1	200.77	Alt3.5H	57000.00		767.50	56232.51	936.90	948.29	948.45	0.000680	3.27	17864.00	3620.60	11.39	0.25	0.041	0.22
Reach-1	200.77	existing	92000.00		76.08	91923.91	936.90	952.66	952.87	0.001026	3.63	25388.18	4283.86	15.76	0.26	0.047	0.40
Reach-1	200.77	Alt3.5B	92000.00		2906.22	89093.77	936.90	950.31	950.52	0.000717	3.71	25512.21	3886.75	13.41	0.25	0.042	0.31
Reach-1	200.77	Alt3.5D	92000.00		2905.51	89094.49	936.90	950.31	950.52	0.000717	3.71	25508.65	3886.58	13.41	0.25	0.042	0.31
Reach-1	200.77	Alt3.5H	92000.00		2905.46	89094.54	936.90	950.31	950.52	0.000717	3.71	25508.41	3886.57	13.41	0.25	0.042	0.31
Reach-1	200.77	existing	185000.00		10128.89	174871.11	936.90	955.99	956.30	0.001051	4.50	42618.84	5946.12	19.09	0.26	0.048	0.62
Reach-1	200.77	Alt3.5B	185000.00		10168.43	174831.56	936.90	954.06	954.37	0.000787	4.53	41980.21	4633.77	17.16	0.26	0.044	0.47
Reach-1	200.77	Alt3.5D	185000.00		9950.13	175049.88	936.90	954.16	954.47	0.000765	4.48	42167.39	4496.89	17.26	0.25	0.044	0.46
Reach-1	200.77	Alt3.5H	185000.00		9949.56	175050.44	936.90	954.16	954.47	0.000765	4.48	42164.09	4496.84	17.26	0.25	0.044	0.46
Reach-1	200.77	existing	227000.00		19749.77	207250.23	936.90	957.03	957.38	0.001074	4.81	48806.86	5967.73	20.13	0.26	0.048	0.70
Reach-1	200.77	Alt3.5B	227000.00		14671.27	212328.72	936.90	955.23	955.59	0.000824	4.89	48244.75	5888.01	18.33	0.27	0.044	0.54
Reach-1	200.77	Alt3.5D	227000.00		13449.93	213550.08	936.90	955.59	955.93	0.000755	4.76	48640.44	4582.20	18.69	0.25	0.044	0.51
Reach-1	200.77	Alt3.5H	227000.00		13447.43	213552.58	936.90	955.58	955.93	0.000756	4.76	48625.61	4582.20	18.68	0.25	0.044	0.51
Reach-1	200.77	existing	243000.00		23609.42	219390.58	936.90	957.39	957.75	0.001087	4.92	50914.20	5971.20	20.49	0.26	0.048	0.73
Reach-1	200.77	Alt3.5B	243000.00		17177.95	225822.05	936.90	955.63	956.00	0.000836	5.02	50562.31	5934.61	18.73	0.27	0.044	0.57
Reach-1	200.77	Alt3.5D	243000.00		14815.92	228184.08	936.90	956.11	956.47	0.000749	4.85	51036.41	4582.20	19.21	0.25	0.044	0.53
Reach-1	200.77	Alt3.5H	243000.00		14811.96	228188.05	936.90	956.11	956.46	0.000750	4.85	51012.92	4582.20	19.21	0.25	0.044	0.53
Reach-1	200.77	existing	285000.00		34720.14	250279.86	936.90	958.25	958.65	0.001118	5.20	56051.53	5971.20	21.35	0.27	0.048	0.81
Reach-1	200.77	Alt3.5B	285000.00		24616.12	260383.88	936.90	956.54	956.96	0.000871	5.34	56005.36	5957.54	19.64	0.27	0.044	0.64
Reach-1	200.77	Alt3.5D	285000.00		18491.59	266508.41	936.90	957.46	957.85	0.000727	5.07	57203.53	4582.20	20.56	0.25	0.045	0.58
Reach-1	200.77	Alt3.5H	285000.00		18481.88	266518.13	936.90	957.44	957.83	0.000730	5.07	57144.79	4582.20	20.54	0.25	0.045	0.58
Reach-1	200.86	existing	23500.00			23500.00	938.50	948.14	948.24	0.001755	2.55	9210.35	2678.20	9.64	0.24	0.056	0.38
Reach-1	200.86	Alt3.5B	23500.00			23500.00	938.10	945.74	945.88	0.000641	3.04	7734.81	1731.26	7.64	0.25	0.038	0.18
Reach-1	200.86	Alt3.5D	23500.00			23500.00	938.10	945.74	945.88	0.000641	3.04	7734.71	1731.25	7.64	0.25	0.038	0.18
Reach-1	200.86	Alt3.5H	23500.00			23500.00	938.10	945.74	945.88	0.000641	3.04	7734.71	1731.25	7.64	0.25	0.038	0.18
Reach-1	200.86	existing	57000.00			57000.00	938.50	951.19	951.34	0.001616	3.09	18463.29	3525.89	12.69	0.24	0.059	0.53
Reach-1	200.86	Alt3.5B	57000.00		604.30	56395.70	938.10	948.65	948.88	0.000889	3.88	15079.78	3351.15	10.55	0.31	0.040	0.27
Reach-1	200.86	Alt3.5D	57000.00		604.15	56395.85	938.10	948.65	948.88	0.000889	3.88	15078.96	3351.10	10.55	0.31	0.040	0.27
Reach-1	200.86	Alt3.5H	57000.00		604.15	56395.85	938.10	948.65	948.88	0.000889	3.88	15078.96	3351.10	10.55	0.31	0.040	0.27
Reach-1	200.86	existing	92000.00		45.49	91954.51	938.50	953.32	953.51	0.001461	3.49	26399.54	4100.72	14.82	0.24	0.060	0.62
Reach-1	200.86	Alt3.5B	92000.00		2915.44	89084.55	938.10	950.70	950.97	0.000961	4.25	22341.38	3770.43	12.60	0.30	0.042	0.37
Reach-1	200.86	Alt3.5D	92000.00		2914.81	89085.20	938.10	950.70	950.97	0.000961	4.25	22338.61	3770.25	12.60	0.30	0.042	0.37
Reach-1	200.86	Alt3.5H	92000.00		2914.76	89085.24	938.10	950.70	950.97	0.000961	4.25	22338.38	3770.24	12.60	0.30	0.042	0.37
Reach-1	200.86	existing	185000.00		11474.54	173525.47	938.50	956.64	956.93	0.001402	4.38	43091.26	5510.28	18.14	0.25	0.057	0.86
Reach-1	200.86	Alt3.5B	185000.00		10970.62	174029.38	938.10	954.48	954.85	0.000987	4.96	38475.38	4853.73	16.38	0.29	0.044	0.54
Reach-1	200.86	Alt3.5D	185000.00		10805.38	174194.61	938.10	954.57	954.93	0.000961	4.91	38698.78	4647.20	16.47	0.29	0.044	0.53
Reach-1	200.86	Alt3.5H	185000.00		10804.58	174195.42	938.10	954.57	954.93	0.000961	4.91	38693.94	4647.17	16.47	0.29	0.044	0.53
Reach-1	200.86	existing	227000.00		21144.23	205855.78	938.50	957.68	958.02	0.001414	4.70	48855.99	5550.02	19.18	0.25	0.058	0.95
Reach-1	200.86	Alt3.5B	227000.00		16027.38	210972.61	938.10	955.67	956.09	0.001014	5.29	44525.64	5275.94	17.57	0.30	0.044	0.62
Reach-1	200.86	Alt3.5D	227000.00		15492.35	211507.66	938.10	955.99	956.38	0.000929	5.14	45325.24	4694.00	17.89	0.28	0.045	0.59
Reach-1	200.86	Alt3.5H	227000.00		15488.17	211511.83	938.10	955.98	956.38	0.000930	5.14	45312.06	4693.99	17.88	0.28	0.045	0.59
Reach-1	200.86	existing	243000.00		25040.36	217959.64	938.50	958.04	958.40	0.001424	4.81	50838.72	5563.62	19.54	0.25	0.058	0.98
Reach-1	200.86	Alt3.5B	243000.00		18308.66	224691.33	938.10	956.07	956.50	0.001026	5.42	46642.81	5452.89	17.97	0.30	0.044	0.65
Reach-1	200.86	Alt3.5D	243000.00		17394.29	225605.70	938.10	956.51	956.91	0.000914	5.21	47760.38	4697.14	18.41	0.28	0.045	0.61
Reach-1	200.86	Alt3.5H	243000.00		17387.23	225612.77	938.10	956.50	956.91	0.000915	5.22	47738.88	4696.96	18.40	0.28	0.045	0.61
Reach-1	200.86	existing	285000.00		35671.66	249328.34	938.50	958.91	959.32	0.001450	5.10	55670.43	5565.90	20.41	0.26	0.055	1.08
Reach-1	200.86	Alt3.5B	285000.00		25161.52	259838.47	938.10	957.00	957.48	0.001063	5.74	51759.01	5523.82	18.90	0.30	0.044	0.74
Reach-1	200.86	Alt3.5D	285000.00		22664.19	262335.81	938.10	957.84	958.28	0.000872	5.39	54058.45	4747.97	19.74	0.28	0.045	0.65
Reach-1	200.86	Alt3.5H	285000.00		22645.90	262354.13	938.10	957.83	958.27	0.000875	5.39	54001.68	4747.53	19.73	0.28	0.045	0.65
Reach-1	200.95	existing	23500.00			23500.00	939.80	948.68	948.76	0.000740	2.30	10213.08	3122.39	8.88	0.22	0.044	0.15
Reach-1	200.95	Alt3.5B	23500.00			23500.00	938.10	946.04	946.20	0.000659	3.22	7307.59	1580.48	7.94	0.26	0.038	0.19
Reach-1	200.95	Alt3.5D	23500.00			23500.00	938.10	946.04	946.20	0.000659	3.22	7307.50	1580.47	7.94	0.26	0.038	0.19
Reach-1	200.95	Alt3.5H	23500.00			23500.00	938.10	946.04	946.20	0.000659	3.22	7307.50	1580.47	7.94	0.26	0.038	0.19
Reach-1	200.95	existing	57000.00			57000.00	939.80	951.68	951.80	0.000645	2.78	20495.83	3628.56	11.88	0.21	0.046	0.23
Reach-1	200.95	Alt3.5B	57000.00		601.73	56398.27	938.10	949.07	949.31	0.000906	3.94	14900.45	3783.94	10.97	0.33	0.039	0.25

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	200.95	Alt3.5D	57000.00		601.60	56398.40	938.10	949.07	949.31	0.000906	3.94	14899.75	3783.91	10.97	0.33	0.039	0.25
Reach-1	200.95	Alt3.5H	57000.00		601.60	56398.40	938.10	949.07	949.31	0.000906	3.94	14899.75	3783.91	10.97	0.33	0.039	0.25
Reach-1	200.95	existing	92000.00		20.78	91979.23	939.80	953.79	953.95	0.000648	3.25	28342.22	3900.87	13.99	0.21	0.047	0.30
Reach-1	200.95	Alt3.5B	92000.00		3227.55	88772.45	938.10	951.15	951.41	0.000872	4.14	23049.94	4061.22	13.05	0.30	0.041	0.33
Reach-1	200.95	Alt3.5D	92000.00		3226.96	88773.04	938.10	951.15	951.41	0.000872	4.14	23047.47	4061.13	13.05	0.30	0.041	0.33
Reach-1	200.95	Alt3.5H	92000.00		3226.91	88773.09	938.10	951.15	951.41	0.000872	4.14	23047.21	4061.12	13.05	0.30	0.041	0.33
Reach-1	200.95	existing	185000.00		7735.51	177264.48	939.80	957.14	957.41	0.000784	4.27	44470.11	5217.87	17.34	0.24	0.046	0.49
Reach-1	200.95	Alt3.5B	185000.00		12058.00	172942.00	938.10	954.93	955.29	0.000870	4.87	39349.66	4888.34	16.83	0.28	0.043	0.49
Reach-1	200.95	Alt3.5D	185000.00		12140.07	172859.94	938.10	955.02	955.36	0.000848	4.82	39638.63	4559.27	16.92	0.28	0.043	0.48
Reach-1	200.95	Alt3.5H	185000.00		12139.42	172860.58	938.10	955.01	955.36	0.000846	4.82	39636.40	4559.22	16.91	0.28	0.043	0.48
Reach-1	200.95	existing	227000.00		14081.06	212918.94	939.80	958.19	958.52	0.000811	4.65	50030.29	5282.90	18.39	0.25	0.046	0.56
Reach-1	200.95	Alt3.5B	227000.00		17476.16	209523.84	938.10	956.14	956.54	0.000900	5.20	45408.77	5147.12	18.04	0.29	0.043	0.56
Reach-1	200.95	Alt3.5D	227000.00		16984.01	210015.98	938.10	956.42	956.80	0.000835	5.07	46136.12	4670.55	18.32	0.28	0.043	0.54
Reach-1	200.95	Alt3.5H	227000.00		16980.82	210019.17	938.10	956.42	956.80	0.000836	5.07	46125.00	4670.37	18.32	0.28	0.043	0.54
Reach-1	200.95	existing	243000.00		16666.85	226333.14	939.80	958.56	958.90	0.000828	4.78	51953.02	5282.90	18.78	0.25	0.046	0.59
Reach-1	200.95	Alt3.5B	243000.00		19782.90	223217.09	938.10	956.54	956.96	0.000912	5.33	47480.85	5173.06	18.44	0.29	0.043	0.59
Reach-1	200.95	Alt3.5D	243000.00		18895.12	224104.88	938.10	956.93	957.33	0.000827	5.15	48538.29	4709.12	18.83	0.28	0.043	0.55
Reach-1	200.95	Alt3.5H	243000.00		18889.76	224110.25	938.10	956.93	957.32	0.000828	5.16	48519.60	4708.82	18.83	0.28	0.043	0.55
Reach-1	200.95	existing	285000.00		23836.23	261163.77	939.80	959.45	959.84	0.000872	5.12	56641.01	5282.90	19.65	0.26	0.046	0.67
Reach-1	200.95	Alt3.5B	285000.00		26230.79	258769.22	938.10	957.49	957.96	0.000951	5.66	52416.30	5244.41	19.39	0.30	0.043	0.66
Reach-1	200.95	Alt3.5D	285000.00		24071.33	260928.67	938.10	958.25	958.67	0.000798	5.34	54795.36	4789.60	20.15	0.27	0.044	0.59
Reach-1	200.95	Alt3.5H	285000.00		24057.97	260942.03	938.10	958.24	958.66	0.000800	5.34	54746.25	4789.60	20.14	0.27	0.044	0.59
Reach-1	201.05	existing	23500.00			23500.00	941.50	949.25	949.37	0.002145	2.73	8616.34	3012.31	7.75	0.28	0.053	0.38
Reach-1	201.05	Alt3.5B	23500.00			23500.00	938.10	946.36	946.54	0.000645	3.39	6935.67	1334.22	8.26	0.26	0.038	0.21
Reach-1	201.05	Alt3.5D	23500.00			23500.00	938.10	946.36	946.54	0.000645	3.39	6935.59	1334.21	8.26	0.26	0.038	0.21
Reach-1	201.05	Alt3.5H	23500.00			23500.00	938.10	946.36	946.54	0.000645	3.39	6935.59	1334.21	8.26	0.26	0.038	0.21
Reach-1	201.05	existing	57000.00			57000.00	941.50	952.11	952.26	0.001267	3.03	18835.03	3759.92	10.61	0.24	0.052	0.40
Reach-1	201.05	Alt3.5B	57000.00		415.43	56584.57	938.10	949.52	949.80	0.000956	4.27	13709.53	3711.60	11.42	0.37	0.039	0.24
Reach-1	201.05	Alt3.5D	57000.00		415.31	56584.69	938.10	949.52	949.80	0.000956	4.27	13708.85	3711.50	11.42	0.37	0.039	0.24
Reach-1	201.05	Alt3.5H	57000.00		415.31	56584.69	938.10	949.52	949.80	0.000956	4.27	13708.85	3711.50	11.42	0.37	0.039	0.24
Reach-1	201.05	existing	92000.00		95.93	91904.06	941.50	954.19	954.38	0.001053	3.44	26803.70	4033.85	12.69	0.23	0.052	0.46
Reach-1	201.05	Alt3.5B	92000.00		2918.11	89081.88	938.10	951.60	951.88	0.000931	4.30	22201.63	4247.89	13.50	0.32	0.040	0.32
Reach-1	201.05	Alt3.5D	92000.00		2917.65	89082.35	938.10	951.60	951.88	0.000931	4.30	22199.55	4247.88	13.50	0.32	0.040	0.32
Reach-1	201.05	Alt3.5H	92000.00		2917.59	89082.41	938.10	951.60	951.88	0.000931	4.30	22199.29	4247.88	13.50	0.32	0.040	0.32
Reach-1	201.05	existing	185000.00		7787.35	177212.64	941.50	957.58	957.87	0.001043	4.45	42491.78	4949.35	16.08	0.25	0.050	0.66
Reach-1	201.05	Alt3.5B	185000.00		11144.79	173855.22	938.10	955.38	955.74	0.000886	4.95	38594.98	4508.91	17.28	0.29	0.042	0.50
Reach-1	201.05	Alt3.5D	185000.00		11221.00	173779.00	938.10	955.45	955.81	0.000866	4.91	38911.02	4545.60	17.35	0.29	0.042	0.49
Reach-1	201.05	Alt3.5H	185000.00		11220.60	173779.41	938.10	955.45	955.81	0.000866	4.91	38909.36	4545.33	17.35	0.29	0.042	0.49
Reach-1	201.05	existing	227000.00		14274.72	212725.28	941.50	958.65	959.00	0.001074	4.83	47820.34	4956.02	17.15	0.25	0.050	0.78
Reach-1	201.05	Alt3.5B	227000.00		15789.26	211210.73	938.10	956.59	957.01	0.000905	5.30	44462.84	4921.07	18.49	0.29	0.043	0.57
Reach-1	201.05	Alt3.5D	227000.00		15872.48	211127.52	938.10	956.84	957.24	0.000843	5.17	45375.75	4644.30	18.74	0.28	0.043	0.55
Reach-1	201.05	Alt3.5H	227000.00		15869.24	211130.77	938.10	956.84	957.24	0.000843	5.18	45365.82	4644.30	18.74	0.28	0.043	0.55
Reach-1	201.05	existing	243000.00		16923.28	226076.72	941.50	959.02	959.40	0.001088	4.97	49659.59	4958.10	17.52	0.26	0.050	0.79
Reach-1	201.05	Alt3.5B	243000.00		17802.92	225197.08	938.10	957.00	957.44	0.000917	5.44	46468.11	4940.61	18.90	0.29	0.043	0.60
Reach-1	201.05	Alt3.5D	243000.00		17806.25	225193.75	938.10	957.35	957.78	0.000833	5.26	47730.49	4645.42	19.25	0.28	0.043	0.57
Reach-1	201.05	Alt3.5H	243000.00		17800.64	225199.38	938.10	957.34	957.78	0.000834	5.27	47714.05	4645.41	19.24	0.28	0.043	0.57
Reach-1	201.05	existing	285000.00		24294.72	260705.27	941.50	959.93	960.36	0.001126	5.32	54147.12	4958.10	18.43	0.26	0.049	0.88
Reach-1	201.05	Alt3.5B	285000.00		23509.71	261490.30	938.10	957.96	958.46	0.000954	5.79	51239.71	4951.93	19.86	0.30	0.043	0.69
Reach-1	201.05	Alt3.5D	285000.00		23179.08	261820.92	938.10	958.65	959.09	0.000804	5.47	53783.27	4646.20	20.55	0.28	0.043	0.61
Reach-1	201.05	Alt3.5H	285000.00		23163.77	261836.23	938.10	958.64	959.08	0.000806	5.48	53720.73	4646.20	20.54	0.28	0.043	0.61
Reach-1	201.14	existing	23500.00			23500.00	940.40	949.91	950.05	0.000977	3.05	7698.94	2399.23	9.51	0.30	0.038	0.20
Reach-1	201.14	Alt3.5B	23500.00			23500.00	940.40	946.56	947.75	0.015858	8.77	2678.38	1144.53	6.16	1.01	0.039	2.31
Reach-1	201.14	Alt3.5D	23500.00			23500.00	940.40	946.58	947.75	0.015445	8.70	2701.66	1146.19	6.18	1.00	0.039	2.27
Reach-1	201.14	Alt3.5H	23500.00			23500.00	940.40	946.58	947.75	0.015445	8.70	2701.66	1146.19	6.18	1.00	0.039	2.27
Reach-1	201.14	existing	57000.00			57000.00	940.40	952.61	952.81	0.000986	3.58	15917.39	3430.86	12.21	0.29	0.039	0.29
Reach-1	201.14	Alt3.5B	57000.00			57000.00	940.40	950.08	950.84	0.005102	7.02	8124.39	2533.86	9.68	0.69	0.038	1.02
Reach-1	201.14	Alt3.5D	57000.00			57000.00	940.40	950.08	950.84	0.005102	7.02	8123.92	2533.71	9.68	0.69	0.038	1.02
Reach-1	201.14	Alt3.5H	57000.00			57000.00	940.40	950.08	950.84	0.005102	7.02	8123.92	2533.71	9.68	0.69	0.038	1.02

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.14	existing	92000.00		14.70	91985.30	940.40	954.62	954.87	0.000919	4.02	22920.33	3576.01	14.22	0.26	0.041	0.37
Reach-1	201.14	Alt3.5B	92000.00			92000.00	940.40	952.12	952.77	0.003482	6.46	14249.35	3346.79	11.72	0.55	0.039	0.92
Reach-1	201.14	Alt3.5D	92000.00			92000.00	940.40	952.12	952.77	0.003483	6.46	14248.12	3346.69	11.72	0.55	0.039	0.92
Reach-1	201.14	Alt3.5H	92000.00			92000.00	940.40	952.12	952.77	0.003483	6.46	14248.12	3346.69	11.72	0.55	0.039	0.92
Reach-1	201.14	existing	185000.00		4435.62	180564.38	940.40	957.99	958.39	0.000976	5.12	37182.62	4743.40	17.59	0.29	0.041	0.58
Reach-1	201.14	Alt3.5B	185000.00		203.06	184796.94	940.40	955.78	956.50	0.002302	6.81	27257.13	3964.89	15.38	0.44	0.041	1.06
Reach-1	201.14	Alt3.5D	185000.00		233.90	184766.11	940.40	955.84	956.55	0.002247	6.76	27491.59	3986.99	15.44	0.44	0.041	1.04
Reach-1	201.14	Alt3.5H	185000.00		233.70	184766.30	940.40	955.84	956.55	0.002247	6.76	27490.13	3986.87	15.44	0.44	0.041	1.04
Reach-1	201.14	existing	227000.00		9685.40	217314.61	940.40	959.08	959.54	0.001008	5.54	42360.28	4797.93	18.88	0.30	0.041	0.67
Reach-1	201.14	Alt3.5B	227000.00		1835.48	225164.52	940.40	956.98	957.78	0.002151	7.14	32397.46	4688.77	16.58	0.43	0.041	1.15
Reach-1	201.14	Alt3.5D	227000.00		2681.89	224318.11	940.40	957.20	957.94	0.001974	6.94	33337.23	4441.32	16.80	0.41	0.041	1.08
Reach-1	201.14	Alt3.5H	227000.00		2676.66	224323.34	940.40	957.19	957.93	0.001975	6.94	33329.10	4441.31	16.79	0.41	0.041	1.08
Reach-1	201.14	existing	243000.00		12023.15	230976.84	940.40	959.45	959.94	0.001020	5.68	44163.20	4798.89	19.05	0.30	0.041	0.70
Reach-1	201.14	Alt3.5B	243000.00		3413.89	239586.11	940.40	957.38	958.19	0.002109	7.26	34307.00	4710.64	16.98	0.43	0.041	1.18
Reach-1	201.14	Alt3.5D	243000.00		4443.10	238556.91	940.40	957.69	958.44	0.001880	6.98	35543.84	4442.59	17.29	0.40	0.041	1.09
Reach-1	201.14	Alt3.5H	243000.00		4432.80	238567.20	940.40	957.69	958.44	0.001883	6.99	35529.73	4442.58	17.29	0.40	0.041	1.09
Reach-1	201.14	existing	285000.00		18647.93	266352.06	940.40	960.37	960.92	0.001053	6.05	48569.76	4800.80	19.97	0.31	0.041	0.78
Reach-1	201.14	Alt3.5B	285000.00		8587.04	276412.97	940.40	958.35	959.22	0.002035	7.56	38898.32	4762.84	17.95	0.42	0.041	1.26
Reach-1	201.14	Alt3.5D	285000.00		10093.47	274906.53	940.40	958.97	959.73	0.001667	7.08	41201.10	4445.84	18.57	0.38	0.042	1.09
Reach-1	201.14	Alt3.5H	285000.00		10062.39	274937.63	940.40	958.98	959.72	0.001671	7.08	41164.46	4445.82	18.56	0.38	0.042	1.10
Reach-1	201.24	existing	19500.00			19500.00	943.00	950.50	950.86	0.001689	3.20	6101.41	1686.31	7.50	0.30	0.046	0.38
Reach-1	201.24	Alt3.5B	19500.00			19500.00	940.90	948.96	949.11	0.000777	3.14	6213.00	1369.27	8.06	0.26	0.040	0.22
Reach-1	201.24	Alt3.5D	19500.00			19500.00	940.90	948.95	949.11	0.000780	3.14	6202.64	1368.13	8.05	0.26	0.040	0.22
Reach-1	201.24	Alt3.5H	19500.00			19500.00	940.90	948.95	949.11	0.000780	3.14	6202.64	1368.13	8.05	0.26	0.040	0.22
Reach-1	201.24	existing	49000.00			49000.00	943.00	953.21	953.46	0.001914	4.06	12057.80	2667.83	10.21	0.34	0.045	0.54
Reach-1	201.24	Alt3.5B	49000.00		1372.59	47627.41	940.90	951.75	952.02	0.001133	4.23	12161.57	2850.22	10.85	0.34	0.041	0.34
Reach-1	201.24	Alt3.5D	49000.00		1372.59	47627.41	940.90	951.75	952.02	0.001133	4.23	12161.57	2850.22	10.85	0.34	0.041	0.34
Reach-1	201.24	Alt3.5H	49000.00		1372.59	47627.41	940.90	951.75	952.02	0.001133	4.23	12161.57	2850.22	10.85	0.34	0.041	0.34
Reach-1	201.24	existing	82000.00			82000.00	943.00	955.15	955.48	0.001738	4.59	17852.49	3329.54	12.15	0.35	0.045	0.58
Reach-1	201.24	Alt3.5B	82000.00		4779.62	77220.38	940.90	953.50	953.86	0.001376	4.93	17480.15	3244.05	12.60	0.36	0.041	0.49
Reach-1	201.24	Alt3.5D	82000.00		4779.50	77220.51	940.90	953.50	953.86	0.001376	4.93	17479.76	3244.04	12.60	0.36	0.041	0.49
Reach-1	201.24	Alt3.5H	82000.00		4779.50	77220.51	940.90	953.50	953.86	0.001376	4.93	17479.76	3244.04	12.60	0.36	0.041	0.49
Reach-1	201.24	existing	130000.00		5679.93	124320.07	943.00	958.61	958.87	0.000938	4.18	31955.47	4496.19	15.61	0.25	0.046	0.50
Reach-1	201.24	Alt3.5B	130000.00		11603.62	118396.38	940.90	956.98	957.27	0.000809	4.41	30629.06	4272.24	16.08	0.28	0.042	0.39
Reach-1	201.24	Alt3.5D	130000.00		11583.77	118416.22	940.90	957.02	957.30	0.000799	4.39	30704.50	4097.77	16.12	0.28	0.042	0.38
Reach-1	201.24	Alt3.5H	130000.00		11583.59	118416.41	940.90	957.02	957.30	0.000800	4.39	30703.50	4097.76	16.12	0.28	0.042	0.38
Reach-1	201.24	existing	162000.00		10652.55	151347.45	943.00	959.73	960.03	0.000946	4.49	37069.46	4647.40	16.73	0.26	0.046	0.57
Reach-1	201.24	Alt3.5B	162000.00		15994.11	146005.89	940.90	958.19	958.52	0.000816	4.69	35919.93	4449.48	17.29	0.28	0.042	0.45
Reach-1	201.24	Alt3.5D	162000.00		15578.86	146421.14	940.90	958.32	958.64	0.000787	4.64	36084.77	4122.34	17.42	0.27	0.043	0.44
Reach-1	201.24	Alt3.5H	162000.00		15577.92	146422.08	940.90	958.32	958.64	0.000787	4.64	36079.98	4122.34	17.42	0.27	0.043	0.44
Reach-1	201.24	existing	198000.00		14163.52	183836.47	943.00	960.07	960.49	0.001251	5.27	38677.57	4723.61	17.07	0.29	0.046	0.78
Reach-1	201.24	Alt3.5B	198000.00		20172.75	177827.25	940.90	958.56	959.00	0.001077	5.49	37561.82	4490.62	17.66	0.32	0.043	0.62
Reach-1	201.24	Alt3.5D	198000.00		19451.35	178548.64	940.90	958.75	959.18	0.001023	5.40	37844.75	4123.47	17.85	0.31	0.043	0.60
Reach-1	201.24	Alt3.5H	198000.00		19449.47	178550.53	940.90	958.75	959.18	0.001024	5.40	37836.45	4123.46	17.85	0.31	0.043	0.60
Reach-1	201.24	existing	235000.00		20797.96	214202.05	943.00	961.02	961.49	0.001277	5.61	43265.75	4942.50	18.02	0.30	0.046	0.87
Reach-1	201.24	Alt3.5B	235000.00		25966.15	209033.84	940.90	959.53	960.03	0.001112	5.84	41968.36	4602.44	18.63	0.32	0.043	0.70
Reach-1	201.24	Alt3.5D	235000.00		24307.03	210692.98	940.90	959.94	960.42	0.001004	5.66	42761.62	4126.50	19.04	0.31	0.043	0.66
Reach-1	201.24	Alt3.5H	235000.00		24301.57	210698.44	940.90	959.94	960.41	0.001006	5.66	42737.69	4126.50	19.04	0.31	0.043	0.66
Reach-1	201.33	existing	19500.00			19500.00	943.00	951.39	951.56	0.001822	3.33	5854.54	1644.64	8.39	0.31	0.046	0.40
Reach-1	201.33	Alt3.5B	19500.00			19500.00	940.90	949.28	949.38	0.000346	2.50	7814.82	1497.94	8.38	0.19	0.038	0.11
Reach-1	201.33	Alt3.5D	19500.00			19500.00	940.90	949.27	949.37	0.000347	2.50	7805.32	1497.17	8.37	0.19	0.038	0.11
Reach-1	201.33	Alt3.5H	19500.00			19500.00	940.90	949.27	949.37	0.000347	2.50	7805.32	1497.17	8.37	0.19	0.038	0.11
Reach-1	201.33	existing	49000.00			49000.00	943.00	954.25	954.52	0.002179	4.13	11853.24	2578.79	11.25	0.34	0.049	0.62
Reach-1	201.33	Alt3.5B	49000.00			49000.00	940.90	952.23	952.46	0.000634	3.77	12997.88	1997.85	11.33	0.26	0.040	0.25
Reach-1	201.33	Alt3.5D	49000.00			49000.00	940.90	952.23	952.46	0.000634	3.77	12997.88	1997.85	11.33	0.26	0.040	0.25
Reach-1	201.33	Alt3.5H	49000.00			49000.00	940.90	952.23	952.46	0.000634	3.77	12997.88	1997.85	11.33	0.26	0.040	0.25
Reach-1	201.33	existing	82000.00			82000.00	943.00	956.17	956.50	0.002269	4.61	17799.74	3272.62	13.17	0.35	0.050	0.77
Reach-1	201.33	Alt3.5B	82000.00			82000.00	940.90	954.10	954.44	0.000931	4.68	17505.07	2697.61	13.20	0.32	0.040	0.37

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.33	Alt3.5D	82000.00			82000.00	940.90	954.10	954.44	0.000931	4.66	17504.75	2697.59	13.20	0.32	0.040	0.37
Reach-1	201.33	Alt3.5H	82000.00			82000.00	940.90	954.10	954.44	0.000931	4.66	17504.75	2697.59	13.20	0.32	0.040	0.37
Reach-1	201.33	existing	130000.00		4258.97	125741.03	943.00	959.18	959.49	0.001507	4.54	29374.50	4409.44	16.18	0.28	0.053	0.79
Reach-1	201.33	Alt3.5B	130000.00		107.49	129892.51	940.90	957.36	957.70	0.000801	4.65	28073.87	3729.44	16.46	0.28	0.043	0.42
Reach-1	201.33	Alt3.5D	130000.00		122.49	129877.52	940.90	957.39	957.73	0.000794	4.64	28186.83	3710.36	16.49	0.28	0.043	0.42
Reach-1	201.33	Alt3.5H	130000.00		122.40	129877.59	940.90	957.39	957.73	0.000794	4.64	28186.15	3710.31	16.49	0.28	0.043	0.42
Reach-1	201.33	existing	162000.00		10578.92	151421.08	943.00	960.30	960.65	0.001507	4.81	34440.81	4587.83	17.30	0.28	0.053	0.86
Reach-1	201.33	Alt3.5B	162000.00		1662.95	160337.06	940.90	958.58	958.97	0.000864	5.02	32969.82	4342.34	17.68	0.28	0.043	0.52
Reach-1	201.33	Alt3.5D	162000.00		1738.81	160261.19	940.90	958.70	959.08	0.000835	4.96	33307.08	4007.25	17.80	0.28	0.043	0.51
Reach-1	201.33	Alt3.5H	162000.00		1737.03	160262.97	940.90	958.70	959.08	0.000835	4.96	33303.16	4007.25	17.80	0.28	0.043	0.51
Reach-1	201.33	existing	198000.00		15851.74	182148.27	943.00	960.82	961.28	0.001854	5.48	36835.03	4625.59	17.82	0.31	0.052	1.12
Reach-1	201.33	Alt3.5B	198000.00		3274.24	194725.77	940.90	959.07	959.59	0.001114	5.60	35127.93	4398.89	18.17	0.32	0.044	0.70
Reach-1	201.33	Alt3.5D	198000.00		3393.19	194606.81	940.90	959.24	959.74	0.001064	5.70	35481.51	4008.47	18.34	0.31	0.044	0.68
Reach-1	201.33	Alt3.5H	198000.00		3389.05	194610.95	940.90	959.24	959.74	0.001065	5.70	35474.66	4008.47	18.34	0.31	0.044	0.68
Reach-1	201.33	existing	235000.00		24801.02	210198.98	943.00	961.78	962.28	0.001865	5.75	41279.92	4677.56	18.78	0.31	0.052	1.23
Reach-1	201.33	Alt3.5B	235000.00		7985.00	227015.00	940.90	960.07	960.64	0.001176	6.15	39571.45	4551.34	19.17	0.33	0.044	0.79
Reach-1	201.33	Alt3.5D	235000.00		7587.14	227412.84	940.90	960.43	960.97	0.001079	5.96	40328.94	4133.25	19.53	0.32	0.044	0.74
Reach-1	201.33	Alt3.5H	235000.00		7572.07	227427.94	940.90	960.43	960.97	0.001080	5.97	40308.25	4133.19	19.53	0.32	0.044	0.74
Reach-1	201.43	existing	19500.00			19500.00	941.30	952.17	952.28	0.001070	2.67	7298.70	1789.70	10.87	0.23	0.050	0.27
Reach-1	201.43	Alt3.5B	19500.00			19500.00	940.90	949.46	949.52	0.000224	2.03	9625.47	1822.75	8.56	0.16	0.038	0.07
Reach-1	201.43	Alt3.5D	19500.00			19500.00	940.90	949.45	949.52	0.000224	2.03	9614.79	1822.10	8.55	0.16	0.038	0.07
Reach-1	201.43	Alt3.5H	19500.00			19500.00	940.90	949.45	949.52	0.000224	2.03	9614.79	1822.10	8.55	0.16	0.038	0.07
Reach-1	201.43	existing	49000.00			49000.00	941.30	955.25	955.44	0.001457	3.48	14076.72	2766.67	13.95	0.27	0.053	0.46
Reach-1	201.43	Alt3.5B	49000.00		120.22	48879.78	940.90	952.57	952.72	0.000386	3.03	16401.16	2812.63	11.67	0.20	0.040	0.17
Reach-1	201.43	Alt3.5D	49000.00		120.22	48879.78	940.90	952.57	952.72	0.000386	3.03	16401.16	2812.63	11.67	0.20	0.040	0.17
Reach-1	201.43	Alt3.5H	49000.00		120.22	48879.78	940.90	952.57	952.72	0.000386	3.03	16401.16	2812.63	11.67	0.20	0.040	0.17
Reach-1	201.43	existing	82000.00			82000.00	941.30	957.20	957.47	0.001528	4.16	19734.30	3009.21	15.90	0.29	0.052	0.62
Reach-1	201.43	Alt3.5B	82000.00		1764.73	80235.27	940.90	954.60	954.82	0.000543	3.76	22621.81	3401.50	13.70	0.24	0.041	0.25
Reach-1	201.43	Alt3.5D	82000.00		1764.62	80235.38	940.90	954.60	954.82	0.000543	3.76	22621.20	3401.42	13.70	0.24	0.041	0.25
Reach-1	201.43	Alt3.5H	82000.00		1764.62	80235.38	940.90	954.60	954.82	0.000543	3.76	22621.20	3401.42	13.70	0.24	0.041	0.25
Reach-1	201.43	existing	130000.00		3487.91	126512.09	941.30	959.89	960.20	0.001227	4.47	29766.92	4214.16	18.59	0.27	0.050	0.65
Reach-1	201.43	Alt3.5B	130000.00		6327.66	123672.35	940.90	957.80	958.03	0.000486	3.91	34563.85	3927.59	16.90	0.22	0.043	0.29
Reach-1	201.43	Alt3.5D	130000.00		6353.86	123646.13	940.90	957.83	958.05	0.000482	3.90	34670.77	3927.88	16.93	0.22	0.043	0.29
Reach-1	201.43	Alt3.5H	130000.00		6353.74	123646.26	940.90	957.83	958.05	0.000482	3.90	34670.29	3927.87	16.92	0.22	0.043	0.29
Reach-1	201.43	existing	162000.00		8194.11	153805.91	941.30	961.02	961.36	0.001248	4.78	34683.77	4466.62	19.72	0.28	0.049	0.72
Reach-1	201.43	Alt3.5B	162000.00		9517.66	152482.34	940.90	959.05	959.32	0.000522	4.27	39598.00	4087.44	18.15	0.23	0.043	0.35
Reach-1	201.43	Alt3.5D	162000.00		9567.55	152432.44	940.90	959.16	959.42	0.000508	4.23	39916.04	3949.98	18.26	0.22	0.043	0.35
Reach-1	201.43	Alt3.5H	162000.00		9566.52	152433.48	940.90	959.15	959.42	0.000508	4.23	39912.86	3949.97	18.25	0.22	0.043	0.35
Reach-1	201.43	existing	198000.00		13086.30	184913.70	941.30	961.69	962.13	0.001457	5.35	37705.52	4468.29	20.39	0.30	0.049	0.90
Reach-1	201.43	Alt3.5B	198000.00		12705.50	185294.50	940.90	959.68	960.04	0.000656	4.90	42202.56	4165.72	18.78	0.26	0.043	0.47
Reach-1	201.43	Alt3.5D	198000.00		12666.81	185333.19	940.90	959.83	960.17	0.000634	4.84	42566.97	3986.56	18.93	0.25	0.043	0.45
Reach-1	201.43	Alt3.5H	198000.00		12664.73	185335.26	940.90	959.82	960.17	0.000634	4.84	42561.37	3986.37	18.92	0.25	0.043	0.45
Reach-1	201.43	existing	235000.00	1093.35	14840.41	219066.22	941.30	962.67	963.16	0.001537	5.78	44301.93	10597.00	21.37	0.31	0.050	1.04
Reach-1	201.43	Alt3.5B	235000.00		17295.68	217704.33	940.90	960.71	961.12	0.000710	5.27	46624.70	4448.28	19.81	0.27	0.043	0.52
Reach-1	201.43	Alt3.5D	235000.00		17037.38	217962.63	940.90	961.03	961.42	0.000660	5.14	47483.60	4154.34	20.13	0.26	0.043	0.50
Reach-1	201.43	Alt3.5H	235000.00		17030.97	217969.03	940.90	961.02	961.42	0.000661	5.14	47466.11	4154.33	20.12	0.26	0.043	0.50
Reach-1	201.52	existing	19500.00			19500.00	940.90	952.92	953.03	0.002344	2.75	7100.04	2110.59	12.02	0.26	0.060	0.49
Reach-1	201.52	Alt3.5B	19500.00			19500.00	940.90	949.57	949.66	0.000301	2.42	8041.48	1674.26	8.67	0.19	0.038	0.09
Reach-1	201.52	Alt3.5D	19500.00			19500.00	940.90	949.56	949.65	0.000302	2.43	8032.19	1672.63	8.66	0.20	0.038	0.09
Reach-1	201.52	Alt3.5H	19500.00			19500.00	940.90	949.56	949.65	0.000302	2.43	8032.19	1672.63	8.66	0.20	0.038	0.09
Reach-1	201.52	existing	49000.00			49000.00	940.90	956.07	956.24	0.001785	3.24	15137.53	2875.12	15.17	0.25	0.061	0.59
Reach-1	201.52	Alt3.5B	49000.00			49000.00	940.90	952.77	952.95	0.000526	3.33	14730.34	2493.40	11.87	0.24	0.041	0.19
Reach-1	201.52	Alt3.5D	49000.00			49000.00	940.90	952.77	952.95	0.000526	3.33	14730.34	2493.40	11.87	0.24	0.041	0.19
Reach-1	201.52	Alt3.5H	49000.00			49000.00	940.90	952.77	952.95	0.000526	3.33	14730.34	2493.40	11.87	0.24	0.041	0.19
Reach-1	201.52	existing	82000.00		0.57	81999.44	940.90	958.07	958.31	0.001913	3.88	21140.97	3200.79	17.17	0.26	0.060	0.80
Reach-1	201.52	Alt3.5B	82000.00		1045.89	80954.12	940.90	954.89	955.12	0.000686	3.93	21430.40	3433.70	13.99	0.26	0.043	0.29
Reach-1	201.52	Alt3.5D	82000.00		1045.80	80954.20	940.90	954.89	955.12	0.000686	3.93	21429.99	3433.68	13.99	0.26	0.043	0.29
Reach-1	201.52	Alt3.5H	82000.00		1045.80	80954.20	940.90	954.89	955.12	0.000686	3.93	21429.99	3433.68	13.99	0.26	0.043	0.29

PLATES

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.52	existing	130000.00		4949.87	125050.34	940.90	960.61	960.88	0.001586	4.24	31106.99	4201.26	19.71	0.25	0.058	0.86
Reach-1	201.52	Alt3.5B	130000.00		5142.06	124857.94	940.90	958.05	958.31	0.000634	4.10	32746.36	3758.75	17.15	0.24	0.045	0.37
Reach-1	201.52	Alt3.5D	130000.00		5165.85	124834.16	940.90	958.08	958.33	0.000630	4.09	32841.40	3782.25	17.18	0.24	0.045	0.36
Reach-1	201.52	Alt3.5H	130000.00		5165.73	124834.28	940.90	958.08	958.33	0.000630	4.09	32840.94	3782.13	17.18	0.24	0.045	0.36
Reach-1	201.52	existing	162000.00		10460.73	151539.27	940.90	961.74	962.06	0.001584	4.54	35911.16	4291.26	20.84	0.26	0.058	0.95
Reach-1	201.52	Alt3.5B	162000.00		8174.88	153825.13	940.90	959.33	959.62	0.000682	4.44	37826.14	4021.75	18.43	0.24	0.046	0.44
Reach-1	201.52	Alt3.5D	162000.00		8320.09	153679.91	940.90	959.42	959.71	0.000664	4.39	38215.76	4026.58	18.52	0.24	0.046	0.43
Reach-1	201.52	Alt3.5H	162000.00		8318.89	153681.11	940.90	959.42	959.71	0.000664	4.39	38212.57	4026.43	18.52	0.24	0.046	0.44
Reach-1	201.52	existing	198000.00		16244.90	181755.11	940.90	962.53	962.92	0.001782	5.03	39320.03	4343.03	21.63	0.28	0.057	1.14
Reach-1	201.52	Alt3.5B	198000.00		11322.31	186677.70	940.90	960.03	960.41	0.000839	5.05	40684.41	4110.87	19.13	0.27	0.046	0.58
Reach-1	201.52	Alt3.5D	198000.00		11584.29	186415.70	940.90	960.16	960.53	0.000811	4.98	41225.47	4135.54	19.26	0.26	0.046	0.56
Reach-1	201.52	Alt3.5H	198000.00		11581.73	186418.28	940.90	960.16	960.53	0.000811	4.98	41220.17	4135.29	19.26	0.26	0.046	0.56
Reach-1	201.52	existing	235000.00	1897.46	16235.03	216867.52	940.90	963.56	964.00	0.001876	5.45	46051.83	10583.40	22.66	0.29	0.057	1.31
Reach-1	201.52	Alt3.5B	235000.00		15916.07	219083.94	940.90	961.09	961.52	0.000898	5.40	45110.54	4248.00	20.19	0.28	0.046	0.66
Reach-1	201.52	Alt3.5D	235000.00		16601.48	218398.53	940.90	961.38	961.79	0.000834	5.25	46353.33	4267.56	20.48	0.27	0.046	0.62
Reach-1	201.52	Alt3.5H	235000.00		16592.63	218407.38	940.90	961.37	961.79	0.000835	5.25	46337.17	4267.32	20.47	0.27	0.046	0.62
Reach-1	201.62	existing	19500.00			19500.00	945.60	954.06	954.23	0.002520	3.32	5871.62	2656.59	8.46	0.39	0.043	0.35
Reach-1	201.62	Alt3.5B	19500.00			19500.00	940.90	949.70	949.85	0.000450	3.17	6142.68	1074.05	8.80	0.23	0.038	0.16
Reach-1	201.62	Alt3.5D	19500.00			19500.00	940.90	949.69	949.85	0.000451	3.18	6137.11	1073.49	8.79	0.23	0.038	0.16
Reach-1	201.62	Alt3.5H	19500.00			19500.00	940.90	949.69	949.85	0.000451	3.18	6137.11	1073.49	8.79	0.23	0.038	0.16
Reach-1	201.62	existing	49000.00			49000.00	945.60	956.84	957.03	0.001462	3.45	14195.94	3199.29	11.24	0.29	0.045	0.40
Reach-1	201.62	Alt3.5B	49000.00			49000.00	940.90	952.98	953.30	0.000795	4.58	10694.60	1991.81	12.08	0.35	0.038	0.26
Reach-1	201.62	Alt3.5D	49000.00			49000.00	940.90	952.98	953.30	0.000795	4.58	10694.60	1991.81	12.08	0.35	0.038	0.26
Reach-1	201.62	Alt3.5H	49000.00			49000.00	940.90	952.98	953.30	0.000795	4.58	10694.60	1991.81	12.08	0.35	0.038	0.26
Reach-1	201.62	existing	82000.00			82000.00	945.60	958.82	959.06	0.001273	3.99	20563.86	3230.87	13.22	0.28	0.046	0.51
Reach-1	201.62	Alt3.5B	82000.00		647.21	81352.79	940.90	955.20	955.56	0.000969	4.83	17441.43	3670.50	14.30	0.37	0.039	0.32
Reach-1	201.62	Alt3.5D	82000.00		647.16	81352.84	940.90	955.20	955.56	0.000969	4.83	17441.21	3670.48	14.30	0.37	0.039	0.32
Reach-1	201.62	Alt3.5H	82000.00		647.16	81352.84	940.90	955.20	955.56	0.000969	4.83	17441.21	3670.48	14.30	0.37	0.039	0.32
Reach-1	201.62	existing	130000.00		1290.91	128709.09	945.60	961.22	961.54	0.001117	4.54	29062.26	3854.69	15.62	0.27	0.046	0.61
Reach-1	201.62	Alt3.5B	130000.00		4712.45	125287.55	940.90	958.33	958.66	0.000717	4.65	29087.43	3727.39	17.43	0.28	0.040	0.37
Reach-1	201.62	Alt3.5D	130000.00		4734.41	125265.59	940.90	958.35	958.68	0.000711	4.64	29173.65	3727.54	17.45	0.28	0.040	0.37
Reach-1	201.62	Alt3.5H	130000.00		4734.29	125265.71	940.90	958.35	958.68	0.000711	4.64	29173.20	3727.54	17.45	0.28	0.040	0.37
Reach-1	201.62	existing	162000.00		3968.02	158031.97	945.60	962.35	962.72	0.001135	4.94	33493.37	3973.12	16.75	0.28	0.046	0.70
Reach-1	201.62	Alt3.5B	162000.00		7327.55	154672.45	940.90	959.62	959.99	0.000732	4.98	33903.25	3807.24	18.72	0.28	0.041	0.44
Reach-1	201.62	Alt3.5D	162000.00		7419.64	154580.36	940.90	959.71	960.07	0.000712	4.93	34241.50	3836.74	18.81	0.28	0.041	0.43
Reach-1	201.62	Alt3.5H	162000.00		7418.86	154581.14	940.90	959.71	960.07	0.000712	4.93	34238.69	3836.49	18.81	0.28	0.041	0.43
Reach-1	201.62	existing	198000.00		7447.03	190552.97	945.60	963.21	963.67	0.001257	5.47	36921.87	3992.35	17.61	0.29	0.046	0.84
Reach-1	201.62	Alt3.5B	198000.00		10097.40	187902.59	940.90	960.39	960.85	0.000866	5.60	37012.88	4179.62	19.49	0.31	0.041	0.56
Reach-1	201.62	Alt3.5D	198000.00		10312.85	187687.16	940.90	960.50	960.96	0.000836	5.53	37507.54	4179.88	19.60	0.30	0.041	0.54
Reach-1	201.62	Alt3.5H	198000.00		10310.71	187689.28	940.90	960.50	960.96	0.000837	5.53	37502.70	4179.88	19.60	0.30	0.041	0.54
Reach-1	201.62	existing	235000.00	1576.52	8633.99	224789.50	945.60	964.26	964.78	0.001291	5.88	43465.05	10594.80	18.66	0.30	0.046	0.95
Reach-1	201.62	Alt3.5B	235000.00		14439.07	220560.92	940.90	961.46	961.99	0.000894	5.95	41507.04	4181.97	20.56	0.31	0.041	0.63
Reach-1	201.62	Alt3.5D	235000.00		15060.71	219939.28	940.90	961.72	962.22	0.000831	5.80	42608.25	4182.55	20.82	0.30	0.041	0.60
Reach-1	201.62	Alt3.5H	235000.00		15052.56	219947.45	940.90	961.72	962.22	0.000831	5.80	42593.96	4182.54	20.82	0.30	0.041	0.60
Reach-1	201.71	existing	19500.00			19500.00	946.00	955.24	955.42	0.002333	3.39	5744.05	2096.85	9.24	0.36	0.044	0.40
Reach-1	201.71	Alt3.5B	19500.00			19500.00	940.90	949.65	950.76	0.005235	8.45	2307.37	466.83	8.75	0.67	0.043	1.56
Reach-1	201.71	Alt3.5D	19500.00			19500.00	940.90	949.65	950.76	0.005249	8.46	2304.97	466.23	8.75	0.67	0.043	1.56
Reach-1	201.71	Alt3.5H	19500.00			19500.00	940.90	949.65	950.76	0.005249	8.46	2304.97	466.23	8.75	0.67	0.043	1.56
Reach-1	201.71	existing	49000.00			49000.00	946.00	957.65	957.91	0.002137	4.06	12072.86	2957.10	11.65	0.35	0.044	0.54
Reach-1	201.71	Alt3.5B	49000.00			49000.00	940.90	953.19	954.53	0.005639	9.30	5268.71	1168.65	12.29	0.77	0.043	1.55
Reach-1	201.71	Alt3.5D	49000.00			49000.00	940.90	953.19	954.53	0.005639	9.30	5268.71	1168.65	12.29	0.77	0.043	1.55
Reach-1	201.71	Alt3.5H	49000.00			49000.00	940.90	953.19	954.53	0.005639	9.30	5268.71	1168.65	12.29	0.77	0.043	1.55
Reach-1	201.71	existing	82000.00			82000.00	946.00	959.51	959.84	0.001886	4.56	17972.47	3280.30	13.51	0.34	0.045	0.64
Reach-1	201.71	Alt3.5B	82000.00		583.07	81416.93	940.90	955.67	956.80	0.005359	8.54	9874.61	2852.53	14.77	0.75	0.043	1.34
Reach-1	201.71	Alt3.5D	82000.00		583.07	81416.93	940.90	955.67	956.80	0.005359	8.54	9874.61	2852.53	14.77	0.75	0.043	1.34
Reach-1	201.71	Alt3.5H	82000.00		583.07	81416.93	940.90	955.67	956.80	0.005359	8.54	9874.61	2852.53	14.77	0.75	0.043	1.34
Reach-1	201.71	existing	130000.00		2080.66	127919.34	946.00	961.82	962.20	0.001549	4.97	26474.46	3841.67	15.82	0.32	0.046	0.73
Reach-1	201.71	Alt3.5B	130000.00		7133.55	122866.45	940.90	958.73	959.41	0.002690	6.73	20131.20	3710.73	17.83	0.50	0.043	0.95

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan T
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.71	Alt3.5D	130000.00		7163.54	122836.45	940.90	958.75	959.42	0.002665	6.70	20205.05	3713.03	17.85	0.49	0.043	0.94
Reach-1	201.71	Alt3.5H	130000.00		7163.36	122836.63	940.90	958.75	959.42	0.002665	6.70	20204.60	3713.02	17.85	0.49	0.043	0.94
Reach-1	201.71	existing	162000.00		4451.49	157548.50	946.00	962.95	963.38	0.001516	5.32	30855.26	3934.26	16.95	0.32	0.046	0.82
Reach-1	201.71	Alt3.5B	162000.00		10960.16	151039.84	940.90	960.03	960.70	0.002354	6.71	25051.81	3973.28	19.13	0.45	0.044	0.98
Reach-1	201.71	Alt3.5D	162000.00		11072.98	150927.03	940.90	960.11	960.76	0.002281	6.63	25359.68	4014.15	19.21	0.45	0.044	0.96
Reach-1	201.71	Alt3.5H	162000.00		11071.96	150928.03	940.90	960.11	960.76	0.002281	6.63	25356.98	4013.80	19.21	0.45	0.044	0.96
Reach-1	201.71	existing	198000.00		7477.56	190522.44	946.00	963.86	964.38	0.001613	5.82	34496.05	3996.43	17.86	0.33	0.046	0.96
Reach-1	201.71	Alt3.5B	198000.00		15085.92	182914.08	940.90	960.87	961.65	0.002496	7.21	28518.66	4148.36	19.97	0.46	0.044	1.16
Reach-1	201.71	Alt3.5D	198000.00		15300.66	182699.34	940.90	960.97	961.73	0.002400	7.11	28935.20	4153.93	20.07	0.46	0.044	1.12
Reach-1	201.71	Alt3.5H	198000.00		15298.44	182701.56	940.90	960.97	961.73	0.002401	7.11	28930.89	4153.87	20.07	0.46	0.044	1.12
Reach-1	201.71	existing	235000.00	291.02	6479.93	228229.05	946.00	964.92	965.51	0.001660	6.28	39475.37	10586.80	18.92	0.34	0.046	1.10
Reach-1	201.71	Alt3.5B	235000.00		20574.68	214425.33	940.90	961.96	962.77	0.002334	7.38	33042.32	4175.70	21.06	0.45	0.044	1.23
Reach-1	201.71	Alt3.5D	235000.00		21098.04	213901.95	940.90	962.18	962.95	0.002154	7.17	33982.86	4176.97	21.28	0.43	0.044	1.16
Reach-1	201.71	Alt3.5H	235000.00		21091.21	213908.78	940.90	962.18	962.95	0.002156	7.17	33970.42	4176.95	21.28	0.43	0.044	1.16
Reach-1	201.61	existing	19500.00			19500.00	946.00	955.64	955.67	0.000195	1.59	12264.40	2459.17	9.64	0.13	0.042	0.06
Reach-1	201.61	Alt3.5B	19500.00			19500.00	946.00	952.12	952.27	0.001533	3.17	6156.72	1982.27	6.12	0.32	0.042	0.30
Reach-1	201.61	Alt3.5D	19500.00			19500.00	946.00	952.12	952.27	0.001534	3.17	6155.51	1982.17	6.12	0.32	0.042	0.30
Reach-1	201.61	Alt3.5H	19500.00			19500.00	946.00	952.12	952.27	0.001534	3.17	6155.51	1982.17	6.12	0.32	0.042	0.30
Reach-1	201.61	existing	49000.00			49000.00	946.00	958.19	958.29	0.000358	2.55	19221.20	3019.51	12.19	0.18	0.042	0.14
Reach-1	201.61	Alt3.5B	49000.00			49000.00	946.00	955.50	955.69	0.000880	3.49	14038.18	2575.50	9.50	0.26	0.041	0.30
Reach-1	201.61	Alt3.5D	49000.00			49000.00	946.00	955.50	955.69	0.000880	3.49	14038.18	2575.50	9.50	0.26	0.041	0.30
Reach-1	201.61	Alt3.5H	49000.00			49000.00	946.00	955.50	955.69	0.000880	3.49	14038.18	2575.50	9.50	0.26	0.041	0.30
Reach-1	201.61	existing	82000.00			82000.00	946.00	960.12	960.28	0.000466	3.24	25306.13	3328.85	14.12	0.21	0.042	0.22
Reach-1	201.61	Alt3.5B	82000.00			82000.00	946.00	957.62	957.88	0.000884	4.13	19854.10	2943.71	11.62	0.28	0.041	0.37
Reach-1	201.61	Alt3.5D	82000.00			82000.00	946.00	957.62	957.88	0.000884	4.13	19854.10	2943.71	11.62	0.28	0.041	0.37
Reach-1	201.61	Alt3.5H	82000.00			82000.00	946.00	957.62	957.88	0.000884	4.13	19854.10	2943.71	11.62	0.28	0.041	0.37
Reach-1	201.61	existing	130000.00			130000.00	946.00	962.42	962.65	0.000544	3.89	33457.89	3637.42	16.42	0.23	0.042	0.31
Reach-1	201.61	Alt3.5B	130000.00			130000.00	946.00	959.85	960.22	0.000914	4.85	26783.58	3264.97	13.85	0.30	0.041	0.46
Reach-1	201.61	Alt3.5D	130000.00			130000.00	946.00	959.86	960.23	0.000911	4.85	26818.27	3267.53	13.86	0.30	0.041	0.46
Reach-1	201.61	Alt3.5H	130000.00			130000.00	946.00	959.86	960.23	0.000911	4.85	26818.07	3267.51	13.86	0.30	0.041	0.46
Reach-1	201.61	existing	162000.00			162000.00	946.00	963.57	963.86	0.000602	4.30	37686.48	3706.27	17.57	0.24	0.043	0.38
Reach-1	201.61	Alt3.5B	162000.00			162000.00	946.00	961.05	961.48	0.000948	5.25	30872.13	3577.41	15.05	0.31	0.041	0.51
Reach-1	201.61	Alt3.5D	162000.00			162000.00	946.00	961.10	961.52	0.000933	5.22	31042.26	3579.50	15.10	0.31	0.041	0.50
Reach-1	201.61	Alt3.5H	162000.00			162000.00	946.00	961.10	961.52	0.000933	5.22	31040.96	3579.48	15.10	0.31	0.041	0.50
Reach-1	201.61	existing	198000.00			198000.00	946.00	964.56	964.91	0.000693	4.78	41427.25	3859.79	18.56	0.26	0.043	0.46
Reach-1	201.61	Alt3.5B	198000.00			198000.00	946.00	961.97	962.49	0.001060	5.79	34199.94	3617.96	15.97	0.33	0.041	0.62
Reach-1	201.61	Alt3.5D	198000.00			198000.00	946.00	962.03	962.55	0.001041	5.75	34419.07	3620.62	16.03	0.33	0.041	0.61
Reach-1	201.61	Alt3.5H	198000.00			198000.00	946.00	962.03	962.55	0.001041	5.75	34416.86	3620.59	16.03	0.33	0.041	0.61
Reach-1	201.61	existing	235000.00			235000.00	946.00	965.67	966.08	0.000736	5.14	45706.56	3872.11	19.67	0.26	0.043	0.54
Reach-1	201.61	Alt3.5B	235000.00			235000.00	946.00	963.01	963.60	0.001105	6.19	37971.50	3661.30	17.01	0.34	0.041	0.71
Reach-1	201.61	Alt3.5D	235000.00			235000.00	946.00	963.16	963.73	0.001061	6.10	38510.04	3667.00	17.16	0.33	0.041	0.69
Reach-1	201.61	Alt3.5H	235000.00			235000.00	946.00	963.15	963.73	0.001062	6.10	38503.09	3666.93	17.15	0.33	0.041	0.69
Reach-1	201.9	existing	19500.00			19500.00	947.20	955.75	955.82	0.000417	2.07	9426.95	2214.12	8.55	0.18	0.041	0.11
Reach-1	201.9	Alt3.5B	19500.00			19500.00	947.20	952.96	953.12	0.001897	3.23	6030.08	2052.69	5.76	0.33	0.041	0.35
Reach-1	201.9	Alt3.5D	19500.00			19500.00	947.20	952.96	953.12	0.001897	3.23	6029.58	2052.65	5.76	0.33	0.041	0.35
Reach-1	201.9	Alt3.5H	19500.00			19500.00	947.20	952.96	953.12	0.001897	3.23	6029.58	2052.65	5.76	0.33	0.041	0.35
Reach-1	201.9	existing	49000.00			49000.00	947.20	958.39	958.53	0.000604	2.96	16571.68	2939.87	11.19	0.22	0.041	0.21
Reach-1	201.9	Alt3.5B	49000.00			49000.00	947.20	955.99	956.22	0.001255	3.77	13006.03	2585.71	8.79	0.30	0.041	0.39
Reach-1	201.9	Alt3.5D	49000.00			49000.00	947.20	955.99	956.22	0.001255	3.77	13006.03	2585.71	8.79	0.30	0.041	0.39
Reach-1	201.9	Alt3.5H	49000.00			49000.00	947.20	955.99	956.22	0.001255	3.77	13006.03	2585.71	8.79	0.30	0.041	0.39
Reach-1	201.9	existing	82000.00			82000.00	947.20	960.36	960.57	0.000672	3.62	22668.89	3255.41	13.16	0.24	0.041	0.29
Reach-1	201.9	Alt3.5B	82000.00			82000.00	947.20	958.11	958.40	0.001214	4.29	19106.00	3051.08	10.91	0.30	0.041	0.47
Reach-1	201.9	Alt3.5D	82000.00			82000.00	947.20	958.11	958.40	0.001214	4.29	19106.00	3051.08	10.91	0.30	0.041	0.47
Reach-1	201.9	Alt3.5H	82000.00			82000.00	947.20	958.11	958.40	0.001214	4.29	19106.00	3051.08	10.91	0.30	0.041	0.47
Reach-1	201.9	existing	130000.00			130000.00	947.20	962.69	962.97	0.000701	4.20	30929.82	3819.05	15.49	0.26	0.041	0.35
Reach-1	201.9	Alt3.5B	130000.00			130000.00	947.20	960.37	960.75	0.001252	4.93	26346.58	3393.48	13.17	0.31	0.042	0.60
Reach-1	201.9	Alt3.5D	130000.00			130000.00	947.20	960.38	960.76	0.001248	4.93	26376.41	3394.77	13.18	0.31	0.042	0.60
Reach-1	201.9	Alt3.5H	130000.00			130000.00	947.20	960.38	960.76	0.001248	4.93	26376.20	3394.77	13.18	0.31	0.042	0.60

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	201.9	existing	162000.00			162000.00	947.20	963.87	964.20	0.000730	4.57	35468.82	3873.11	16.67	0.27	0.041	0.42
Reach-1	201.9	Alt3.5B	162000.00			162000.00	947.20	961.59	962.02	0.001296	5.29	30617.81	3585.79	14.39	0.32	0.042	0.69
Reach-1	201.9	Alt3.5D	162000.00			162000.00	947.20	961.63	962.06	0.001279	5.27	30758.86	3590.85	14.43	0.32	0.042	0.68
Reach-1	201.9	Alt3.5H	162000.00			162000.00	947.20	961.63	962.06	0.001279	5.27	30757.78	3590.81	14.43	0.32	0.042	0.68
Reach-1	201.9	existing	198000.00			198000.00	947.20	964.90	965.29	0.000793	5.02	39449.70	3882.73	17.70	0.28	0.041	0.50
Reach-1	201.9	Alt3.5B	198000.00			198000.00	947.20	962.59	963.11	0.001459	5.76	34390.46	3814.13	15.39	0.34	0.043	0.82
Reach-1	201.9	Alt3.5D	198000.00			198000.00	947.20	962.64	963.15	0.001435	5.73	34576.05	3816.48	15.44	0.34	0.043	0.81
Reach-1	201.9	Alt3.5H	198000.00			198000.00	947.20	962.64	963.15	0.001435	5.73	34574.42	3816.46	15.44	0.34	0.043	0.81
Reach-1	201.9	existing	235000.00			235000.00	947.20	966.02	966.47	0.000812	5.36	43814.26	3899.75	18.82	0.28	0.041	0.57
Reach-1	201.9	Alt3.5B	235000.00			235000.00	947.20	963.65	964.23	0.001449	6.11	38452.76	3865.20	16.45	0.34	0.043	0.89
Reach-1	201.9	Alt3.5D	235000.00			235000.00	947.20	963.77	964.34	0.001395	6.04	38916.20	3870.98	16.57	0.34	0.043	0.87
Reach-1	201.9	Alt3.5H	235000.00			235000.00	947.20	963.77	964.34	0.001396	6.04	38910.06	3870.90	16.57	0.34	0.043	0.87
Reach-1	201.99	existing	19500.00			19500.00	948.70	955.98	956.09	0.000714	2.71	7206.30	1627.21	7.28	0.23	0.041	0.20
Reach-1	201.99	Alt3.5B	19500.00			19500.00	948.60	953.72	953.89	0.001375	3.27	5966.37	1764.99	5.12	0.31	0.040	0.29
Reach-1	201.99	Alt3.5D	19500.00			19500.00	948.60	953.72	953.89	0.001376	3.27	5966.16	1764.98	5.12	0.31	0.040	0.29
Reach-1	201.99	Alt3.5H	19500.00			19500.00	948.60	953.72	953.89	0.001376	3.27	5966.16	1764.98	5.12	0.31	0.040	0.29
Reach-1	201.99	existing	49000.00			49000.00	948.70	958.71	958.92	0.001058	3.72	13164.54	2637.80	10.01	0.29	0.042	0.33
Reach-1	201.99	Alt3.5B	49000.00			49000.00	948.60	956.56	956.85	0.001288	4.30	11382.86	2164.05	7.96	0.33	0.040	0.42
Reach-1	201.99	Alt3.5D	49000.00			49000.00	948.60	956.56	956.85	0.001288	4.30	11382.86	2164.05	7.96	0.33	0.040	0.42
Reach-1	201.99	Alt3.5H	49000.00			49000.00	948.60	956.56	956.85	0.001288	4.30	11382.86	2164.05	7.96	0.33	0.040	0.42
Reach-1	201.99	existing	82000.00			82000.00	948.70	960.70	961.00	0.001110	4.39	18657.78	2924.43	12.00	0.31	0.042	0.44
Reach-1	201.99	Alt3.5B	82000.00			82000.00	948.60	958.67	959.06	0.001384	4.99	16445.68	2669.10	10.07	0.35	0.040	0.53
Reach-1	201.99	Alt3.5D	82000.00			82000.00	948.60	958.67	959.06	0.001384	4.99	16445.68	2669.10	10.07	0.35	0.040	0.53
Reach-1	201.99	Alt3.5H	82000.00			82000.00	948.60	958.67	959.06	0.001384	4.99	16445.68	2669.10	10.07	0.35	0.040	0.53
Reach-1	201.99	existing	130000.00			130000.00	948.70	963.04	963.42	0.001136	4.93	26353.92	3524.20	14.34	0.32	0.042	0.53
Reach-1	201.99	Alt3.5B	130000.00			130000.00	948.60	960.92	961.43	0.001386	5.73	22700.30	2995.00	12.32	0.37	0.040	0.65
Reach-1	201.99	Alt3.5D	130000.00			130000.00	948.60	960.93	961.43	0.001383	5.72	22721.33	2997.27	12.33	0.37	0.040	0.65
Reach-1	201.99	Alt3.5H	130000.00			130000.00	948.60	960.93	961.43	0.001383	5.72	22721.15	2997.24	12.33	0.37	0.040	0.65
Reach-1	201.99	existing	162000.00			162000.00	948.70	964.24	964.67	0.001215	5.28	30682.95	3714.88	15.54	0.32	0.042	0.62
Reach-1	201.99	Alt3.5B	162000.00			162000.00	948.60	962.15	962.73	0.001423	6.08	26662.08	3406.98	13.55	0.38	0.040	0.69
Reach-1	201.99	Alt3.5D	162000.00			162000.00	948.60	962.19	962.76	0.001409	6.05	26771.78	3413.99	13.59	0.38	0.040	0.68
Reach-1	201.99	Alt3.5H	162000.00			162000.00	948.60	962.19	962.76	0.001409	6.05	26770.95	3413.94	13.59	0.38	0.040	0.68
Reach-1	201.99	existing	198000.00			198000.00	948.70	965.30	965.80	0.001306	5.71	34687.96	3852.32	16.60	0.34	0.042	0.73
Reach-1	201.99	Alt3.5B	198000.00			198000.00	948.60	963.21	963.88	0.001514	6.52	30360.47	3541.20	14.61	0.39	0.040	0.80
Reach-1	201.99	Alt3.5D	198000.00			198000.00	948.60	963.25	963.91	0.001496	6.49	30497.80	3545.01	14.65	0.39	0.041	0.80
Reach-1	201.99	Alt3.5H	198000.00			198000.00	948.60	963.25	963.91	0.001496	6.49	30496.50	3544.98	14.65	0.39	0.041	0.80
Reach-1	201.99	existing	235000.00			235000.00	948.70	966.43	966.99	0.001303	6.01	39100.99	3956.20	17.73	0.34	0.042	0.80
Reach-1	201.99	Alt3.5B	235000.00			235000.00	948.60	964.29	965.02	0.001600	6.86	34249.71	3720.93	15.69	0.40	0.041	0.91
Reach-1	201.99	Alt3.5D	235000.00			235000.00	948.60	964.38	965.10	0.001557	6.79	34613.27	3733.81	15.78	0.39	0.041	0.89
Reach-1	201.99	Alt3.5H	235000.00			235000.00	948.60	964.38	965.10	0.001558	6.79	34608.48	3733.64	15.78	0.39	0.041	0.89
Reach-1	202.09	existing	19500.00			19500.00	950.00	956.32	957.27	0.011396	7.82	2492.84	821.12	6.32	0.79	0.043	2.15
Reach-1	202.09	Alt3.5B	19500.00			19500.00	950.00	955.75	957.16	0.018792	9.52	2049.17	729.35	5.75	1.00	0.043	3.29
Reach-1	202.09	Alt3.5D	19500.00			19500.00	950.00	955.74	957.16	0.018939	9.55	2042.85	727.93	5.74	1.00	0.043	3.31
Reach-1	202.09	Alt3.5H	19500.00			19500.00	950.00	955.74	957.16	0.018939	9.55	2042.85	727.93	5.74	1.00	0.043	3.31
Reach-1	202.09	existing	49000.00			49000.00	950.00	959.50	960.19	0.007101	6.68	7331.52	2099.13	9.50	0.63	0.044	1.54
Reach-1	202.09	Alt3.5B	49000.00			49000.00	950.00	958.31	959.77	0.018218	9.70	5050.68	1794.89	8.31	1.02	0.043	3.19
Reach-1	202.09	Alt3.5D	49000.00			49000.00	950.00	958.32	959.77	0.018005	9.66	5073.26	1797.20	8.32	1.01	0.043	3.17
Reach-1	202.09	Alt3.5H	49000.00			49000.00	950.00	958.32	959.77	0.018005	9.66	5073.26	1797.20	8.32	1.01	0.043	3.17
Reach-1	202.09	existing	82000.00	111.07		81888.93	950.00	961.51	962.20	0.005560	6.64	12416.05	3036.35	11.51	0.57	0.044	1.48
Reach-1	202.09	Alt3.5B	82000.00			82000.00	950.00	959.66	961.43	0.017890	10.68	7677.80	2164.34	9.66	1.00	0.044	3.95
Reach-1	202.09	Alt3.5D	82000.00			82000.00	950.00	959.61	961.43	0.018391	10.82	7578.82	2142.71	9.61	1.01	0.044	4.05
Reach-1	202.09	Alt3.5H	82000.00			82000.00	950.00	959.61	961.43	0.018391	10.82	7578.82	2142.71	9.61	1.01	0.044	4.05
Reach-1	202.09	existing	130000.00	1742.44		128257.55	950.00	963.83	964.46	0.003785	6.43	20560.50	3957.95	13.83	0.48	0.044	1.29
Reach-1	202.09	Alt3.5B	130000.00	320.09		129679.91	950.00	961.78	963.30	0.011746	9.88	13254.08	3132.28	11.78	0.83	0.044	3.24
Reach-1	202.09	Alt3.5D	130000.00	322.68		129677.33	950.00	961.79	963.30	0.011713	9.87	13268.24	3133.95	11.79	0.83	0.044	3.24
Reach-1	202.09	Alt3.5H	130000.00	322.64		129677.36	950.00	961.79	963.30	0.011713	9.87	13268.04	3133.93	11.79	0.83	0.044	3.24
Reach-1	202.09	existing	162000.00	3195.57		158804.44	950.00	965.02	965.67	0.003055	6.52	25475.77	4201.12	15.02	0.45	0.044	1.24
Reach-1	202.09	Alt3.5B	162000.00	1547.71		160452.30	950.00	963.11	964.42	0.008738	9.23	17787.34	3710.65	13.11	0.73	0.044	2.73

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.09	Alt3.5D	162000.00	1565.41		160434.58	950.00	963.13	964.43	0.008644	9.19	17858.75	3717.34	13.13	0.72	0.044	2.71
Reach-1	202.09	Alt3.5H	162000.00	1565.24		160434.77	950.00	963.13	964.43	0.008645	9.19	17858.07	3717.28	13.13	0.72	0.044	2.71
Reach-1	202.09	existing	198000.00	5565.39		192434.61	950.00	966.09	966.79	0.002716	6.79	29985.30	4223.51	16.09	0.43	0.044	1.29
Reach-1	202.09	Alt3.5B	198000.00	2711.25		195288.77	950.00	964.22	965.50	0.007022	9.12	22141.89	4096.40	14.22	0.67	0.044	2.54
Reach-1	202.09	Alt3.5D	198000.00	2723.39		195276.61	950.00	964.25	965.51	0.006925	9.09	22242.24	4103.77	14.25	0.66	0.044	2.51
Reach-1	202.09	Alt3.5H	198000.00	2723.26		195276.73	950.00	964.25	965.51	0.006926	9.09	22241.23	4103.69	14.25	0.66	0.044	2.52
Reach-1	202.09	existing	235000.00	8325.15		226674.86	950.00	967.19	967.92	0.002417	6.99	34628.27	4314.63	17.19	0.42	0.044	1.31
Reach-1	202.09	Alt3.5B	235000.00	5192.07		229807.92	950.00	965.31	966.55	0.005553	9.04	26679.74	4207.11	15.31	0.61	0.044	2.36
Reach-1	202.09	Alt3.5D	235000.00	5315.28		229684.72	950.00	965.37	966.59	0.005376	8.95	26953.00	4208.47	15.37	0.60	0.044	2.31
Reach-1	202.09	Alt3.5H	235000.00	5313.67		229686.33	950.00	965.37	966.59	0.005379	8.95	26949.40	4208.45	15.37	0.60	0.044	2.31
Reach-1	202.18	existing	19500.00			19500.00	950.00	958.86	959.00	0.001503	2.98	6536.44	1936.79	8.86	0.29	0.044	0.32
Reach-1	202.18	Alt3.5B	19500.00			19500.00	950.00	958.94	959.07	0.001418	2.92	6681.21	1957.13	8.94	0.28	0.044	0.30
Reach-1	202.18	Alt3.5D	19500.00			19500.00	950.00	958.94	959.07	0.001415	2.92	6685.03	1957.61	8.94	0.28	0.044	0.30
Reach-1	202.18	Alt3.5H	19500.00			19500.00	950.00	958.94	959.07	0.001415	2.92	6685.03	1957.61	8.94	0.28	0.044	0.30
Reach-1	202.18	existing	49000.00			49000.00	950.00	961.58	961.80	0.001681	3.76	13025.86	2938.39	11.58	0.31	0.044	0.46
Reach-1	202.18	Alt3.5B	49000.00			49000.00	950.00	961.65	961.86	0.001617	3.70	13238.89	2971.38	11.65	0.31	0.044	0.45
Reach-1	202.18	Alt3.5D	49000.00			49000.00	950.00	961.64	961.85	0.001624	3.71	13215.33	2967.92	11.64	0.31	0.044	0.45
Reach-1	202.18	Alt3.6H	49000.00			49000.00	950.00	961.64	961.85	0.001624	3.71	13215.33	2967.92	11.64	0.31	0.044	0.45
Reach-1	202.18	existing	82000.00	140.39		81859.62	950.00	963.40	963.69	0.001722	4.30	19191.78	3843.71	13.40	0.33	0.044	0.58
Reach-1	202.18	Alt3.5B	82000.00	130.72		81869.27	950.00	963.37	963.66	0.001754	4.33	19067.45	3830.54	13.37	0.33	0.044	0.58
Reach-1	202.18	Alt3.5D	82000.00	133.73		81866.27	950.00	963.38	963.67	0.001744	4.32	19106.75	3834.02	13.38	0.33	0.044	0.58
Reach-1	202.18	Alt3.5H	82000.00	133.73		81866.27	950.00	963.38	963.67	0.001744	4.32	19106.75	3834.02	13.38	0.33	0.044	0.58
Reach-1	202.18	existing	130000.00	1911.99		128088.02	950.00	965.31	965.68	0.001573	4.94	26973.78	4205.35	15.31	0.33	0.044	0.69
Reach-1	202.18	Alt3.5B	130000.00	1519.69		128480.31	950.00	964.95	965.37	0.001875	5.22	25460.77	4173.30	14.95	0.35	0.044	0.79
Reach-1	202.18	Alt3.5D	130000.00	1519.29		128480.70	950.00	964.95	965.36	0.001875	5.22	25459.24	4173.27	14.95	0.35	0.044	0.79
Reach-1	202.18	Alt3.5H	130000.00	1519.29		128480.70	950.00	964.95	965.36	0.001875	5.22	25459.24	4173.27	14.95	0.35	0.044	0.79
Reach-1	202.18	existing	162000.00	3776.69		158223.30	950.00	966.35	966.78	0.001559	5.31	31403.63	4359.40	16.35	0.33	0.044	0.76
Reach-1	202.18	Alt3.5B	162000.00	3083.67		158916.33	950.00	965.83	966.33	0.001921	5.70	29189.58	4251.14	15.83	0.37	0.044	0.90
Reach-1	202.18	Alt3.5D	162000.00	3084.95		158915.05	950.00	965.83	966.33	0.001920	5.70	29193.73	4251.23	15.83	0.37	0.044	0.90
Reach-1	202.18	Alt3.6H	162000.00	3084.95		158915.05	950.00	965.83	966.33	0.001920	5.70	29193.73	4251.23	15.83	0.37	0.044	0.90
Reach-1	202.18	existing	198000.00	6076.31		191923.70	950.00	967.35	967.84	0.001552	5.72	35798.08	4417.85	17.35	0.34	0.044	0.85
Reach-1	202.18	Alt3.5B	198000.00	5190.67		192809.33	950.00	966.73	967.31	0.001990	6.18	33062.96	4391.28	16.73	0.38	0.044	1.02
Reach-1	202.18	Alt3.5D	198000.00	5195.33		192804.66	950.00	966.73	967.31	0.001987	6.17	33076.91	4391.41	16.73	0.38	0.044	1.02
Reach-1	202.18	Alt3.5H	198000.00	5195.24		192804.77	950.00	966.73	967.31	0.001987	6.17	33076.64	4391.41	16.73	0.38	0.044	1.02
Reach-1	202.18	existing	235000.00	8656.94		226343.05	950.00	968.36	968.91	0.001512	6.05	40287.53	4480.46	18.36	0.34	0.044	0.93
Reach-1	202.18	Alt3.5B	235000.00	7553.24		227446.75	950.00	967.56	968.22	0.002017	6.62	36728.22	4426.86	17.56	0.39	0.044	1.14
Reach-1	202.18	Alt3.5D	235000.00	7576.86		227423.14	950.00	967.57	968.23	0.002006	6.60	36793.34	4427.48	17.57	0.39	0.044	1.13
Reach-1	202.18	Alt3.6H	235000.00	7576.56		227423.44	950.00	967.57	968.23	0.002006	6.60	36792.54	4427.48	17.57	0.39	0.044	1.13
Reach-1	202.29	existing	19500.00			19500.00	955.50	959.67	959.74	0.001076	2.22	8775.90	3210.80	4.17	0.24	0.044	0.18
Reach-1	202.29	Alt3.5B	19500.00			19500.00	955.50	959.70	959.78	0.001033	2.19	8888.30	3216.88	4.20	0.23	0.044	0.18
Reach-1	202.29	Alt3.6D	19500.00			19500.00	955.50	959.70	959.78	0.001032	2.19	8891.24	3217.04	4.20	0.23	0.044	0.18
Reach-1	202.29	Alt3.5H	19500.00			19500.00	955.50	959.70	959.78	0.001032	2.19	8891.24	3217.04	4.20	0.23	0.044	0.18
Reach-1	202.29	existing	49000.00	13.52		48986.48	955.50	962.31	962.43	0.000734	2.75	17872.01	3677.75	6.81	0.22	0.044	0.23
Reach-1	202.29	Alt3.5B	49000.00	15.58		48984.42	955.50	962.36	962.47	0.000712	2.72	18042.56	3684.97	6.86	0.21	0.044	0.22
Reach-1	202.29	Alt3.5D	49000.00	15.35		48984.65	955.50	962.35	962.47	0.000715	2.72	18023.66	3684.17	6.85	0.21	0.044	0.22
Reach-1	202.29	Alt3.5H	49000.00	15.35		48984.65	955.50	962.35	962.47	0.000715	2.72	18023.66	3684.17	6.85	0.21	0.044	0.22
Reach-1	202.29	existing	82000.00	413.14		81586.86	955.50	964.16	964.33	0.000735	3.33	24897.86	3861.50	8.66	0.23	0.044	0.31
Reach-1	202.29	Alt3.5B	82000.00	406.62		81593.39	955.50	964.14	964.31	0.000742	3.34	24815.85	3860.59	8.64	0.23	0.044	0.31
Reach-1	202.29	Alt3.5D	82000.00	408.66		81591.34	955.50	964.14	964.32	0.000740	3.34	24841.54	3860.88	8.64	0.23	0.044	0.31
Reach-1	202.29	Alt3.5H	82000.00	408.66		81591.34	955.50	964.14	964.32	0.000740	3.34	24841.54	3860.88	8.64	0.23	0.044	0.31
Reach-1	202.29	existing	130000.00	1544.48		128455.52	955.50	966.08	966.33	0.000811	4.09	32458.39	4041.72	10.58	0.24	0.044	0.44
Reach-1	202.29	Alt3.5B	130000.00	1451.56		128548.43	955.50	965.84	966.11	0.000890	4.21	31481.50	4027.31	10.34	0.25	0.044	0.47
Reach-1	202.29	Alt3.5D	130000.00	1451.43		128548.57	955.50	965.84	966.11	0.000890	4.21	31480.52	4027.27	10.34	0.25	0.044	0.47
Reach-1	202.29	Alt3.5H	130000.00	1451.43		128548.57	955.50	965.84	966.11	0.000890	4.21	31480.52	4027.27	10.34	0.25	0.044	0.47
Reach-1	202.29	existing	162000.00	2777.67		159222.33	955.50	967.14	967.45	0.000856	4.52	36764.31	4103.26	11.64	0.25	0.044	0.52
Reach-1	202.29	Alt3.5B	162000.00	2505.33		159494.67	955.50	966.78	967.12	0.000970	4.70	35307.55	4077.55	11.28	0.27	0.044	0.57
Reach-1	202.29	Alt3.5D	162000.00	2505.84		159494.16	955.50	966.78	967.12	0.000969	4.70	35310.30	4077.60	11.28	0.27	0.044	0.57
Reach-1	202.29	Alt3.5H	162000.00	2505.84		159494.16	955.50	966.78	967.12	0.000969	4.70	35310.30	4077.60	11.28	0.27	0.044	0.57

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.29	existing	198000.00	4211.40		193788.59	955.50	968.16	968.54	0.000914	4.98	41014.11	4219.43	12.66	0.27	0.044	0.62
Reach-1	202.29	Alt3.5B	198000.00	3911.76		194088.23	955.50	967.73	968.14	0.001047	5.19	39225.83	4157.80	12.23	0.28	0.044	0.68
Reach-1	202.29	Alt3.5D	198000.00	3913.23		194086.77	955.50	967.73	968.15	0.001046	5.19	39234.21	4158.06	12.23	0.28	0.044	0.68
Reach-1	202.29	Alt3.5H	198000.00	3913.23		194086.77	955.50	967.73	968.15	0.001046	5.19	39234.21	4158.06	12.23	0.28	0.044	0.68
Reach-1	202.29	existing	235000.00	6203.85		228796.14	955.50	969.17	969.61	0.000949	5.37	45358.18	4330.01	13.67	0.28	0.045	0.70
Reach-1	202.29	Alt3.5B	235000.00	5374.94		229625.06	955.50	968.61	969.10	0.001122	5.66	42932.29	4298.75	13.11	0.30	0.044	0.79
Reach-1	202.29	Alt3.5D	235000.00	5391.03		229608.97	955.50	968.62	969.11	0.001119	5.66	42974.00	4299.00	13.12	0.30	0.044	0.78
Reach-1	202.29	Alt3.5H	235000.00	5390.83		229609.17	955.50	968.62	969.11	0.001119	5.66	42973.48	4299.00	13.12	0.30	0.044	0.79
Reach-1	202.37	existing	19500.00	338.54		19161.46	954.60	960.18	960.34	0.001986	3.26	6070.13	2053.27	5.58	0.33	0.043	0.38
Reach-1	202.37	Alt3.5B	19500.00	342.40		19157.60	954.60	960.19	960.36	0.001955	3.25	6107.41	2059.94	5.59	0.33	0.043	0.37
Reach-1	202.37	Alt3.5D	19500.00	342.50		19157.50	954.60	960.19	960.36	0.001955	3.24	6108.41	2060.13	5.59	0.33	0.043	0.37
Reach-1	202.37	Alt3.5H	19500.00	342.50		19157.50	954.60	960.19	960.36	0.001955	3.24	6108.41	2060.13	5.59	0.33	0.043	0.37
Reach-1	202.37	existing	49000.00	1722.68		47277.32	954.60	962.66	962.89	0.001741	3.86	12943.64	3147.94	8.06	0.32	0.043	0.48
Reach-1	202.37	Alt3.5B	49000.00	1732.29		47267.71	954.60	962.70	962.92	0.001695	3.83	13054.81	3154.52	8.10	0.32	0.043	0.47
Reach-1	202.37	Alt3.5D	49000.00	1731.21		47268.79	954.60	962.69	962.92	0.001700	3.83	13042.49	3153.79	8.09	0.32	0.043	0.47
Reach-1	202.37	Alt3.5H	49000.00	1731.21		47268.79	954.60	962.69	962.92	0.001700	3.83	13042.49	3153.79	8.09	0.32	0.043	0.47
Reach-1	202.37	existing	82000.00	3402.83		78597.17	954.60	964.48	964.78	0.001561	4.52	19027.12	3595.09	9.88	0.32	0.043	0.58
Reach-1	202.37	Alt3.5B	82000.00	3384.32		78615.68	954.60	964.46	964.77	0.001577	4.53	18963.52	3591.73	9.86	0.33	0.043	0.59
Reach-1	202.37	Alt3.5D	82000.00	3390.07		78609.93	954.60	964.46	964.77	0.001572	4.53	18983.25	3592.77	9.86	0.33	0.043	0.59
Reach-1	202.37	Alt3.5H	82000.00	3390.07		78609.93	954.60	964.46	964.77	0.001572	4.53	18983.25	3592.77	9.86	0.33	0.043	0.59
Reach-1	202.37	existing	130000.00	8639.33		121360.67	954.60	966.40	966.81	0.001498	5.28	26211.87	3833.10	11.80	0.33	0.044	0.73
Reach-1	202.37	Alt3.5B	130000.00	8427.95		121572.05	954.60	966.19	966.63	0.001640	5.43	25417.80	3823.80	11.59	0.35	0.044	0.78
Reach-1	202.37	Alt3.5D	130000.00	8427.66		121572.34	954.60	966.19	966.63	0.001640	5.43	25417.10	3823.78	11.59	0.35	0.044	0.78
Reach-1	202.37	Alt3.5H	130000.00	8427.66		121572.34	954.60	966.19	966.63	0.001640	5.43	25417.10	3823.78	11.59	0.35	0.044	0.78
Reach-1	202.37	existing	162000.00	13160.30		148839.70	954.60	967.47	967.94	0.001489	5.69	30344.27	3998.52	12.87	0.34	0.044	0.82
Reach-1	202.37	Alt3.5B	162000.00	12512.36		149487.64	954.60	967.16	967.67	0.001686	5.93	29130.40	3887.43	12.56	0.36	0.044	0.90
Reach-1	202.37	Alt3.5D	162000.00	12513.69		149486.31	954.60	967.16	967.67	0.001685	5.92	29132.77	3887.65	12.56	0.36	0.044	0.90
Reach-1	202.37	Alt3.5H	162000.00	12513.69		149486.31	954.60	967.16	967.67	0.001685	5.92	29132.77	3887.65	12.56	0.36	0.044	0.90
Reach-1	202.37	existing	198000.00	17584.33		180415.66	954.60	968.50	969.05	0.001520	6.18	34537.94	4079.98	13.90	0.35	0.044	0.93
Reach-1	202.37	Alt3.5B	198000.00	16500.39		181499.61	954.60	968.13	968.74	0.001746	6.46	33018.00	4074.16	13.53	0.37	0.044	1.03
Reach-1	202.37	Alt3.5D	198000.00	16505.51		181494.50	954.60	968.13	968.74	0.001745	6.46	33024.96	4074.19	13.53	0.37	0.044	1.03
Reach-1	202.37	Alt3.5H	198000.00	16505.51		181494.50	954.60	968.13	968.74	0.001745	6.46	33024.96	4074.19	13.53	0.37	0.044	1.03
Reach-1	202.37	existing	235000.00	24007.44		210992.55	954.60	969.52	970.14	0.001504	6.54	38701.79	4101.24	14.92	0.35	0.044	1.01
Reach-1	202.37	Alt3.5B	235000.00	22557.58		212442.42	954.60	969.03	969.72	0.001776	6.90	36685.18	4088.20	14.43	0.38	0.044	1.14
Reach-1	202.37	Alt3.5D	235000.00	22583.25		212416.75	954.60	969.03	969.72	0.001770	6.90	36719.36	4088.33	14.43	0.38	0.044	1.14
Reach-1	202.37	Alt3.5H	235000.00	22582.90		212417.09	954.60	969.03	969.72	0.001771	6.90	36718.87	4088.32	14.43	0.38	0.044	1.14
Reach-1	202.46	existing	19500.00	194.57		19305.43	952.50	961.18	961.29	0.001369	2.75	7189.47	2294.04	8.68	0.27	0.045	0.28
Reach-1	202.46	Alt3.5B	19500.00	195.69		19304.31	952.50	961.18	961.30	0.001361	2.74	7204.88	2295.72	8.68	0.27	0.045	0.28
Reach-1	202.46	Alt3.5D	19500.00	195.72		19304.28	952.50	961.18	961.30	0.001361	2.74	7205.30	2295.76	8.68	0.27	0.045	0.28
Reach-1	202.46	Alt3.5H	19500.00	195.72		19304.28	952.50	961.18	961.30	0.001361	2.74	7205.30	2295.76	8.68	0.27	0.045	0.28
Reach-1	202.46	existing	49000.00	1500.45		47499.55	952.50	963.61	963.82	0.001450	3.71	13545.33	2955.74	11.11	0.29	0.045	0.44
Reach-1	202.46	Alt3.5B	49000.00	1506.27		47493.74	952.50	963.62	963.83	0.001435	3.70	13591.18	2958.66	11.12	0.29	0.045	0.44
Reach-1	202.46	Alt3.5D	49000.00	1505.62		47494.38	952.50	963.62	963.83	0.001436	3.70	13586.12	2958.34	11.12	0.29	0.045	0.44
Reach-1	202.46	Alt3.5H	49000.00	1505.62		47494.38	952.50	963.62	963.83	0.001436	3.70	13586.12	2958.34	11.12	0.29	0.045	0.44
Reach-1	202.46	existing	82000.00	3417.12		78582.88	952.50	965.37	965.67	0.001482	4.50	19058.50	3354.20	12.87	0.31	0.044	0.60
Reach-1	202.46	Alt3.5B	82000.00	3407.18		78592.83	952.50	965.36	965.66	0.001489	4.50	19024.73	3351.18	12.86	0.31	0.044	0.60
Reach-1	202.46	Alt3.5D	82000.00	3410.24		78589.76	952.50	965.36	965.67	0.001487	4.50	19035.16	3352.11	12.86	0.31	0.044	0.60
Reach-1	202.46	Alt3.5H	82000.00	3410.24		78589.76	952.50	965.36	965.67	0.001487	4.50	19035.16	3352.11	12.86	0.31	0.044	0.60
Reach-1	202.46	existing	130000.00	8244.16		121755.84	952.50	967.28	967.70	0.001531	5.35	25905.47	3755.01	14.78	0.33	0.045	0.78
Reach-1	202.46	Alt3.5B	130000.00	7996.40		122003.59	952.50	967.15	967.59	0.001621	5.45	25404.63	3735.44	14.65	0.34	0.045	0.81
Reach-1	202.46	Alt3.5D	130000.00	7996.16		122003.84	952.50	967.15	967.59	0.001621	5.45	25404.17	3735.41	14.65	0.34	0.045	0.81
Reach-1	202.46	Alt3.5H	130000.00	7996.16		122003.84	952.50	967.15	967.59	0.001621	5.45	25404.17	3735.41	14.65	0.34	0.045	0.81
Reach-1	202.46	existing	162000.00	12696.42		149303.58	952.50	968.35	968.84	0.001555	5.81	29990.69	3868.86	15.65	0.34	0.045	0.89
Reach-1	202.46	Alt3.5B	162000.00	12141.57		149858.42	952.50	968.14	968.66	0.001681	5.96	29201.53	3854.81	15.64	0.35	0.045	0.94
Reach-1	202.46	Alt3.5D	162000.00	12142.77		149857.23	952.50	968.14	968.66	0.001681	5.96	29203.18	3854.84	15.64	0.35	0.045	0.94
Reach-1	202.46	Alt3.5H	162000.00	12142.77		149857.23	952.50	968.14	968.66	0.001681	5.96	29203.18	3854.84	15.64	0.35	0.045	0.94
Reach-1	202.46	existing	198000.00	18313.00		179687.00	952.50	969.41	969.98	0.001595	6.25	34179.97	4007.16	16.91	0.35	0.045	1.00
Reach-1	202.46	Alt3.5B	198000.00	17592.80		180407.20	952.50	969.16	969.76	0.001738	6.44	33184.15	3984.81	16.66	0.36	0.045	1.06

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.48	Alt3.5D	198000.00	17595.82		180404.19	952.50	969.16	969.76	0.001738	6.44	33188.28	3984.90	16.66	0.36	0.045	1.06
Reach-1	202.48	Alt3.5H	198000.00	17595.82		180404.19	952.50	969.16	969.76	0.001738	6.44	33188.28	3984.90	16.66	0.36	0.045	1.06
Reach-1	202.48	existing	235000.00	25002.66		209997.34	952.50	970.42	971.06	0.001596	6.64	38276.12	4057.81	17.92	0.35	0.045	1.09
Reach-1	202.48	Alt3.5B	235000.00	23909.91		211090.09	952.50	970.08	970.77	0.001784	6.88	36902.43	4046.77	17.58	0.37	0.045	1.18
Reach-1	202.48	Alt3.5D	235000.00	23927.88		211072.33	952.50	970.09	970.77	0.001781	6.88	36924.17	4046.95	17.59	0.37	0.045	1.18
Reach-1	202.48	Alt3.5H	235000.00	23927.23		211072.78	952.50	970.09	970.77	0.001781	6.88	36923.68	4046.94	17.59	0.37	0.045	1.18
Reach-1	202.50	existing	19500.00	4.32		19495.68	953.70	962.08	962.21	0.001940	2.95	6623.86	2353.37	8.38	0.31	0.045	0.34
Reach-1	202.50	Alt3.5B	19500.00	4.38		19495.62	953.70	962.08	962.21	0.001935	2.94	6629.90	2354.57	8.38	0.31	0.045	0.34
Reach-1	202.50	Alt3.5D	19500.00	4.38		19495.62	953.70	962.08	962.21	0.001935	2.94	6630.04	2354.60	8.38	0.31	0.045	0.34
Reach-1	202.50	Alt3.5H	19500.00	4.38		19495.62	953.70	962.08	962.21	0.001935	2.94	6630.04	2354.60	8.38	0.31	0.045	0.34
Reach-1	202.50	existing	49000.00	622.57		48377.43	953.70	964.46	964.69	0.001629	3.87	12783.89	2751.34	10.76	0.31	0.045	0.49
Reach-1	202.50	Alt3.5B	49000.00	626.14		48373.86	953.70	964.47	964.69	0.001620	3.86	12806.40	2751.68	10.77	0.31	0.045	0.49
Reach-1	202.50	Alt3.5D	49000.00	625.74		48374.26	953.70	964.46	964.69	0.001621	3.86	12803.88	2751.64	10.76	0.31	0.045	0.49
Reach-1	202.50	Alt3.5H	49000.00	625.74		48374.26	953.70	964.46	964.69	0.001621	3.86	12803.88	2751.64	10.76	0.31	0.045	0.49
Reach-1	202.50	existing	82000.00	2308.22		79691.78	953.70	966.21	966.54	0.001605	4.68	17807.48	3045.46	12.51	0.32	0.044	0.66
Reach-1	202.50	Alt3.5B	82000.00	2302.31		79697.69	953.70	966.20	966.54	0.001610	4.69	17788.34	3043.67	12.50	0.32	0.044	0.66
Reach-1	202.50	Alt3.5D	82000.00	2304.14		79695.85	953.70	966.20	966.54	0.001608	4.68	17794.29	3044.23	12.50	0.32	0.044	0.66
Reach-1	202.50	Alt3.5H	82000.00	2304.14		79695.85	953.70	966.20	966.54	0.001608	4.68	17794.29	3044.23	12.50	0.32	0.044	0.66
Reach-1	202.50	existing	130000.00	7793.86		122206.14	953.70	968.14	968.60	0.001649	5.54	24333.79	3649.96	14.44	0.34	0.044	0.85
Reach-1	202.50	Alt3.5B	130000.00	7549.51		122450.50	953.70	968.05	968.52	0.001709	5.61	24013.55	3632.44	14.35	0.34	0.044	0.87
Reach-1	202.50	Alt3.5D	130000.00	7549.17		122450.83	953.70	968.05	968.52	0.001709	5.61	24013.11	3632.42	14.35	0.34	0.044	0.87
Reach-1	202.50	Alt3.5H	130000.00	7549.17		122450.83	953.70	968.05	968.52	0.001709	5.61	24013.11	3632.42	14.35	0.34	0.044	0.87
Reach-1	202.50	existing	162000.00	12759.56		149240.44	953.70	969.22	969.75	0.001696	5.97	28394.92	3821.26	15.52	0.35	0.044	0.96
Reach-1	202.50	Alt3.5B	162000.00	12208.31		149791.69	953.70	969.08	969.63	0.001787	6.09	27867.19	3800.39	15.38	0.36	0.044	1.00
Reach-1	202.50	Alt3.5D	162000.00	12209.27		149790.73	953.70	969.08	969.63	0.001787	6.09	27868.12	3800.42	15.38	0.36	0.044	1.00
Reach-1	202.50	Alt3.5H	162000.00	12209.27		149790.73	953.70	969.08	969.63	0.001787	6.09	27868.12	3800.42	15.38	0.36	0.044	1.00
Reach-1	202.50	existing	198000.00	21037.62		176962.39	953.70	970.31	970.90	0.001743	6.29	32707.36	4031.13	16.61	0.36	0.043	1.03
Reach-1	202.50	Alt3.5B	198000.00	20280.67		177719.34	953.70	970.14	970.75	0.001858	6.43	32020.85	4023.23	16.44	0.37	0.043	1.09
Reach-1	202.50	Alt3.5D	198000.00	20283.69		177716.30	953.70	970.14	970.75	0.001858	6.43	32023.54	4023.26	16.44	0.37	0.043	1.09
Reach-1	202.50	Alt3.5H	198000.00	20283.69		177716.30	953.70	970.14	970.75	0.001858	6.43	32023.54	4023.26	16.44	0.37	0.043	1.09
Reach-1	202.50	existing	235000.00	29722.80		205277.20	953.70	971.32	971.96	0.001707	6.60	36779.41	4063.73	17.62	0.36	0.043	1.11
Reach-1	202.50	Alt3.5B	235000.00	28694.17		206305.81	953.70	971.08	971.76	0.001855	6.78	35825.21	4058.33	17.38	0.37	0.043	1.18
Reach-1	202.50	Alt3.5D	235000.00	28709.95		206290.05	953.70	971.09	971.77	0.001852	6.78	35839.33	4058.45	17.39	0.37	0.043	1.18
Reach-1	202.50	Alt3.5H	235000.00	28709.67		206290.33	953.70	971.09	971.77	0.001852	6.78	35839.08	4058.45	17.39	0.37	0.043	1.18
Reach-1	202.69	existing	19500.00	38.56		19461.44	953.70	962.93	963.04	0.001157	2.72	7201.89	2253.07	9.23	0.26	0.047	0.24
Reach-1	202.69	Alt3.5B	19500.00	38.64		19461.36	953.70	962.93	963.05	0.001156	2.72	7204.37	2253.44	9.23	0.26	0.047	0.24
Reach-1	202.69	Alt3.5D	19500.00	38.64		19461.36	953.70	962.93	963.05	0.001156	2.72	7204.37	2253.44	9.23	0.26	0.047	0.24
Reach-1	202.69	Alt3.5H	19500.00	38.64		19461.36	953.70	962.93	963.05	0.001156	2.72	7204.37	2253.44	9.23	0.26	0.047	0.24
Reach-1	202.69	existing	49000.00	861.35		48138.65	953.70	965.30	965.52	0.001327	3.72	13466.19	2797.28	11.60	0.29	0.046	0.42
Reach-1	202.69	Alt3.5B	49000.00	862.97		48137.03	953.70	965.31	965.52	0.001324	3.71	13478.14	2797.45	11.61	0.29	0.046	0.42
Reach-1	202.69	Alt3.5D	49000.00	862.81		48137.19	953.70	965.31	965.52	0.001324	3.71	13476.95	2797.43	11.61	0.29	0.046	0.42
Reach-1	202.69	Alt3.5H	49000.00	862.81		48137.19	953.70	965.31	965.52	0.001324	3.71	13476.95	2797.43	11.61	0.29	0.046	0.42
Reach-1	202.69	existing	82000.00	2404.36		79595.64	953.70	967.07	967.39	0.001402	4.56	18507.82	2981.54	13.37	0.31	0.046	0.60
Reach-1	202.69	Alt3.5B	82000.00	2402.54		79597.47	953.70	967.07	967.39	0.001404	4.56	18496.54	2980.56	13.37	0.31	0.046	0.60
Reach-1	202.69	Alt3.5D	82000.00	2403.09		79596.91	953.70	967.07	967.39	0.001404	4.56	18500.00	2980.85	13.37	0.31	0.046	0.60
Reach-1	202.69	Alt3.5H	82000.00	2403.09		79596.91	953.70	967.07	967.39	0.001404	4.56	18500.00	2980.85	13.37	0.31	0.046	0.60
Reach-1	202.69	existing	130000.00	7607.88		122392.12	953.70	969.03	969.47	0.001464	5.45	25273.50	3689.69	15.33	0.32	0.045	0.80
Reach-1	202.69	Alt3.5B	130000.00	7429.60		122570.40	953.70	968.98	969.42	0.001499	5.50	25066.13	3688.28	15.28	0.33	0.045	0.82
Reach-1	202.69	Alt3.5D	130000.00	7429.40		122570.59	953.70	968.98	969.42	0.001499	5.50	25065.90	3688.28	15.28	0.33	0.045	0.82
Reach-1	202.69	Alt3.5H	130000.00	7429.40		122570.59	953.70	968.98	969.42	0.001499	5.50	25065.90	3688.28	15.28	0.33	0.045	0.82
Reach-1	202.69	existing	162000.00	13763.00		148237.00	953.70	970.13	970.64	0.001458	5.87	29353.78	3717.87	16.43	0.33	0.045	0.90
Reach-1	202.69	Alt3.5B	162000.00	13423.17		148576.83	953.70	970.04	970.56	0.001510	5.94	29018.48	3715.53	16.34	0.33	0.045	0.92
Reach-1	202.69	Alt3.5D	162000.00	13423.87		148576.13	953.70	970.04	970.56	0.001510	5.94	29019.16	3715.54	16.34	0.33	0.045	0.92
Reach-1	202.69	Alt3.5H	162000.00	13423.87		148576.13	953.70	970.04	970.56	0.001510	5.94	29019.16	3715.54	16.34	0.33	0.045	0.92
Reach-1	202.69	existing	198000.00	22049.14		175950.86	953.70	971.24	971.81	0.001508	6.26	33502.81	3805.74	17.54	0.34	0.045	1.01
Reach-1	202.69	Alt3.5B	198000.00	21356.64		176643.36	953.70	971.12	971.71	0.001546	6.36	33049.00	3773.59	17.42	0.34	0.045	1.03
Reach-1	202.69	Alt3.5D	198000.00	21359.14		176640.84	953.70	971.12	971.71	0.001546	6.36	33050.61	3773.70	17.42	0.34	0.045	1.03
Reach-1	202.69	Alt3.5H	198000.00	21359.14		176640.84	953.70	971.12	971.71	0.001546	6.36	33050.61	3773.70	17.42	0.34	0.045	1.03

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.69	existing	235000.00	31272.20		203727.80	953.70	972.25	972.88	0.001552	6.62	37393.14	3887.71	18.55	0.34	0.044	1.10
Reach-1	202.69	Alt3.5B	235000.00	30589.03		204410.97	953.70	972.09	972.75	0.001634	6.73	36786.61	3884.99	18.39	0.35	0.044	1.15
Reach-1	202.69	Alt3.5D	235000.00	30598.74		204401.25	953.70	972.09	972.75	0.001633	6.73	36795.14	3885.03	18.39	0.35	0.044	1.15
Reach-1	202.69	Alt3.5H	235000.00	30598.74		204401.25	953.70	972.09	972.75	0.001633	6.73	36795.14	3885.03	18.39	0.35	0.044	1.15
Reach-1	202.6	existing	19500.00	47.07		19452.93	956.40	963.61	963.70	0.001169	2.44	8030.14	2662.14	7.21	0.24	0.045	0.23
Reach-1	202.6	Alt3.5B	19500.00	47.13		19452.87	956.40	963.61	963.70	0.001168	2.44	8031.77	2662.50	7.21	0.24	0.045	0.23
Reach-1	202.6	Alt3.5D	19500.00	47.13		19452.87	956.40	963.61	963.70	0.001168	2.44	8031.77	2662.50	7.21	0.24	0.045	0.23
Reach-1	202.6	Alt3.5H	19500.00	47.13		19452.87	956.40	963.61	963.70	0.001168	2.44	8031.77	2662.50	7.21	0.24	0.045	0.23
Reach-1	202.6	existing	49000.00	1328.53		47671.47	956.40	966.02	966.19	0.001065	3.36	15091.99	3088.79	9.62	0.25	0.045	0.36
Reach-1	202.6	Alt3.5B	49000.00	1330.36		47669.64	956.40	966.02	966.19	0.001063	3.36	15099.91	3088.91	9.62	0.25	0.045	0.36
Reach-1	202.6	Alt3.5D	49000.00	1330.19		47669.81	956.40	966.02	966.19	0.001063	3.36	15099.15	3088.90	9.62	0.25	0.045	0.36
Reach-1	202.6	Alt3.5H	49000.00	1330.19		47669.81	956.40	966.02	966.19	0.001063	3.36	15099.15	3088.90	9.62	0.25	0.045	0.36
Reach-1	202.6	existing	82000.00	4110.99		77889.01	956.40	967.84	968.09	0.001099	4.12	20811.30	3184.36	11.44	0.27	0.045	0.50
Reach-1	202.6	Alt3.5B	82000.00	4108.82		77891.19	956.40	967.84	968.09	0.001101	4.12	20803.14	3184.20	11.44	0.27	0.045	0.50
Reach-1	202.6	Alt3.5D	82000.00	4109.48		77890.52	956.40	967.84	968.09	0.001100	4.12	20805.66	3184.25	11.44	0.27	0.045	0.50
Reach-1	202.6	Alt3.5H	82000.00	4109.48		77890.52	956.40	967.84	968.09	0.001100	4.12	20805.66	3184.25	11.44	0.27	0.045	0.50
Reach-1	202.6	existing	130000.00	9527.25		120472.75	956.40	969.85	970.22	0.001172	4.98	27420.72	3425.16	13.45	0.29	0.045	0.67
Reach-1	202.6	Alt3.5B	130000.00	9466.61		120533.39	956.40	969.81	970.18	0.001189	5.01	27291.11	3414.11	13.41	0.29	0.045	0.68
Reach-1	202.6	Alt3.5D	130000.00	9466.52		120533.48	956.40	969.81	970.18	0.001189	5.01	27290.90	3414.09	13.41	0.29	0.045	0.68
Reach-1	202.6	Alt3.5H	130000.00	9466.52		120533.48	956.40	969.81	970.18	0.001189	5.01	27290.90	3414.09	13.41	0.29	0.045	0.68
Reach-1	202.6	existing	162000.00	14197.73		147802.27	956.40	970.96	971.39	0.001212	5.46	31346.70	3637.56	14.56	0.30	0.045	0.78
Reach-1	202.6	Alt3.5B	162000.00	14061.35		147938.66	956.40	970.89	971.34	0.001239	5.50	31119.21	3627.74	14.49	0.30	0.045	0.79
Reach-1	202.6	Alt3.5D	162000.00	14061.61		147938.39	956.40	970.89	971.34	0.001239	5.50	31119.65	3627.76	14.49	0.30	0.045	0.79
Reach-1	202.6	Alt3.5H	162000.00	14061.61		147938.39	956.40	970.89	971.34	0.001239	5.50	31119.65	3627.76	14.49	0.30	0.045	0.79
Reach-1	202.6	existing	198000.00	20490.12		177509.89	956.40	972.08	972.59	0.001241	5.91	35536.16	3736.37	15.68	0.31	0.045	0.88
Reach-1	202.6	Alt3.5B	198000.00	20216.60		177783.39	956.40	971.99	972.51	0.001278	5.97	35199.56	3736.19	15.59	0.31	0.045	0.90
Reach-1	202.6	Alt3.5D	198000.00	20217.53		177782.47	956.40	971.99	972.51	0.001278	5.97	35200.70	3736.19	15.59	0.31	0.045	0.90
Reach-1	202.6	Alt3.5H	198000.00	20217.53		177782.47	956.40	971.99	972.51	0.001278	5.97	35200.70	3736.19	15.59	0.31	0.045	0.90
Reach-1	202.6	existing	235000.00	27875.86		207124.14	956.40	973.10	973.68	0.001273	6.33	39347.45	3738.41	16.70	0.32	0.045	0.99
Reach-1	202.6	Alt3.5B	235000.00	27498.36		207501.64	956.40	972.99	973.58	0.001317	6.40	38929.21	3738.18	16.59	0.32	0.045	1.01
Reach-1	202.6	Alt3.5D	235000.00	27503.53		207496.47	956.40	972.99	973.59	0.001316	6.40	38934.93	3738.19	16.59	0.32	0.045	1.01
Reach-1	202.6	Alt3.5H	235000.00	27503.53		207496.47	956.40	972.99	973.59	0.001316	6.40	38934.93	3738.19	16.59	0.32	0.045	1.01
Reach-1	202.0	existing	19500.00	0.91		19499.09	956.50	964.16	964.25	0.000889	2.48	7869.41	2092.64	7.66	0.22	0.044	0.21
Reach-1	202.0	Alt3.5B	19500.00	0.91		19499.09	956.50	964.16	964.25	0.000888	2.48	7870.17	2092.70	7.66	0.22	0.044	0.21
Reach-1	202.0	Alt3.5D	19500.00	0.91		19499.09	956.50	964.16	964.25	0.000888	2.48	7870.17	2092.70	7.66	0.22	0.044	0.21
Reach-1	202.0	Alt3.5H	19500.00	0.91		19499.09	956.50	964.16	964.25	0.000888	2.48	7870.17	2092.70	7.66	0.22	0.044	0.21
Reach-1	202.0	existing	49000.00	459.08		48540.92	956.50	966.60	966.80	0.001147	3.63	13755.68	2765.53	10.10	0.27	0.044	0.40
Reach-1	202.0	Alt3.5B	49000.00	459.81		48540.19	956.50	966.60	966.80	0.001145	3.63	13760.59	2766.88	10.10	0.27	0.044	0.40
Reach-1	202.0	Alt3.5D	49000.00	459.74		48540.26	956.50	966.60	966.80	0.001146	3.63	13760.08	2766.74	10.10	0.27	0.044	0.40
Reach-1	202.0	Alt3.5H	49000.00	459.74		48540.26	956.50	966.60	966.80	0.001146	3.63	13760.08	2766.74	10.10	0.27	0.044	0.40
Reach-1	202.0	existing	82000.00	2551.57		79448.43	956.50	968.44	968.74	0.001229	4.46	19264.55	3152.12	11.94	0.29	0.044	0.55
Reach-1	202.0	Alt3.5B	82000.00	2549.07		79450.93	956.50	968.44	968.74	0.001230	4.46	19258.79	3152.07	11.94	0.29	0.044	0.55
Reach-1	202.0	Alt3.5D	82000.00	2549.91		79450.09	956.50	968.44	968.74	0.001229	4.46	19260.71	3152.09	11.94	0.29	0.044	0.55
Reach-1	202.0	Alt3.5H	82000.00	2549.91		79450.09	956.50	968.44	968.74	0.001229	4.46	19260.71	3152.09	11.94	0.29	0.044	0.55
Reach-1	202.0	existing	130000.00	8082.67		121917.33	956.50	970.48	970.90	0.001286	5.33	25801.21	3254.50	13.98	0.31	0.044	0.73
Reach-1	202.0	Alt3.5B	130000.00	8029.88		121970.11	956.50	970.46	970.88	0.001300	5.35	25706.88	3252.86	13.96	0.31	0.044	0.74
Reach-1	202.0	Alt3.5D	130000.00	8029.88		121970.11	956.50	970.46	970.88	0.001300	5.35	25706.88	3252.86	13.96	0.31	0.044	0.74
Reach-1	202.0	Alt3.5H	130000.00	8029.88		121970.11	956.50	970.46	970.88	0.001300	5.35	25706.88	3252.86	13.96	0.31	0.044	0.74
Reach-1	202.0	existing	162000.00	12545.95		149454.05	956.50	971.61	972.11	0.001330	5.81	29492.12	3297.52	15.11	0.32	0.044	0.84
Reach-1	202.0	Alt3.5B	162000.00	12445.91		149554.09	956.50	971.56	972.06	0.001353	5.84	29332.35	3295.77	15.06	0.32	0.044	0.85
Reach-1	202.0	Alt3.5D	162000.00	12445.91		149554.09	956.50	971.56	972.06	0.001353	5.84	29332.35	3295.77	15.06	0.32	0.044	0.85
Reach-1	202.0	Alt3.5H	162000.00	12445.91		149554.09	956.50	971.56	972.06	0.001353	5.84	29332.35	3295.77	15.06	0.32	0.044	0.85
Reach-1	202.0	existing	198000.00	18024.14		179975.84	956.50	972.75	973.33	0.001368	6.29	33256.52	3322.89	16.25	0.33	0.044	0.96
Reach-1	202.0	Alt3.5B	198000.00	17865.61		180134.39	956.50	972.68	973.26	0.001399	6.34	33022.50	3322.01	16.18	0.33	0.044	0.98
Reach-1	202.0	Alt3.5D	198000.00	17866.16		180133.84	956.50	972.68	973.27	0.001399	6.34	33023.32	3322.01	16.18	0.33	0.044	0.98
Reach-1	202.0	Alt3.5H	198000.00	17866.16		180133.84	956.50	972.68	973.27	0.001399	6.34	33023.32	3322.01	16.18	0.33	0.044	0.98
Reach-1	202.0	existing	235000.00	23945.50	0.00	211054.50	956.50	973.78	974.45	0.001414	6.76	36689.67	3335.35	17.28	0.34	0.044	1.08
Reach-1	202.0	Alt3.5B	235000.00	23745.60		211254.39	956.50	973.69	974.37	0.001451	6.81	36394.92	3334.67	17.19	0.34	0.044	1.10

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	202.9	Alt3.5D	235000.00	23748.30		211251.70	956.50	973.69	974.37	0.001451	6.81	36398.80	3334.69	17.19	0.34	0.044	1.10
Reach-1	202.9	Alt3.5H	235000.00	23748.30		211251.70	956.50	973.69	974.37	0.001451	6.81	36398.80	3334.69	17.19	0.34	0.044	1.10
Reach-1	202.99	existing	19500.00	8.50		19491.50	959.20	964.69	964.85	0.001847	3.22	6075.29	1978.58	5.49	0.32	0.044	0.36
Reach-1	202.99	Alt3.5B	19500.00	8.51		19491.49	959.20	964.69	964.85	0.001846	3.21	6075.77	1978.65	5.49	0.32	0.044	0.36
Reach-1	202.99	Alt3.5D	19500.00	8.51		19491.49	959.20	964.69	964.85	0.001846	3.21	6075.77	1978.65	5.49	0.32	0.044	0.36
Reach-1	202.99	Alt3.5H	19500.00	8.51		19491.49	959.20	964.69	964.85	0.001846	3.21	6075.77	1978.65	5.49	0.32	0.044	0.36
Reach-1	202.99	existing	49000.00	462.68		48537.32	959.20	967.20	967.46	0.001730	4.16	11946.00	2518.29	8.00	0.33	0.044	0.55
Reach-1	202.99	Alt3.5B	49000.00	463.02		48536.98	959.20	967.20	967.46	0.001729	4.16	11949.07	2518.42	8.00	0.33	0.044	0.55
Reach-1	202.99	Alt3.5D	49000.00	462.98		48537.02	959.20	967.20	967.46	0.001729	4.16	11948.76	2518.41	8.00	0.33	0.044	0.55
Reach-1	202.99	Alt3.5H	49000.00	462.98		48537.02	959.20	967.20	967.46	0.001729	4.16	11948.76	2518.41	8.00	0.33	0.044	0.55
Reach-1	202.99	existing	82000.00	1757.85		80242.16	959.20	969.06	969.44	0.001737	5.00	16928.65	2889.60	9.86	0.34	0.044	0.71
Reach-1	202.99	Alt3.5B	82000.00	1756.95		80243.05	959.20	969.05	969.44	0.001738	5.00	16924.95	2889.40	9.85	0.34	0.044	0.71
Reach-1	202.99	Alt3.5D	82000.00	1757.25		80242.75	959.20	969.05	969.44	0.001738	5.00	16926.18	2889.47	9.85	0.34	0.044	0.71
Reach-1	202.99	Alt3.5H	82000.00	1757.25		80242.75	959.20	969.05	969.44	0.001738	5.00	16926.18	2889.47	9.85	0.34	0.044	0.71
Reach-1	202.99	existing	130000.00	5627.59	1.83	124370.59	959.20	971.10	971.62	0.001722	5.91	23320.00	3253.10	11.90	0.36	0.044	0.92
Reach-1	202.99	Alt3.5B	130000.00	5582.58	1.72	124415.70	959.20	971.08	971.60	0.001738	5.92	23248.33	3252.88	11.88	0.36	0.044	0.93
Reach-1	202.99	Alt3.5D	130000.00	5582.58	1.72	124415.70	959.20	971.08	971.60	0.001738	5.92	23248.33	3252.88	11.88	0.36	0.044	0.93
Reach-1	202.99	Alt3.5H	130000.00	5582.58	1.72	124415.70	959.20	971.08	971.60	0.001738	5.92	23248.33	3252.88	11.88	0.36	0.044	0.93
Reach-1	202.99	existing	162000.00	9714.18	16.11	152269.70	959.20	972.23	972.84	0.001715	6.39	27022.25	3274.49	13.03	0.36	0.044	1.04
Reach-1	202.99	Alt3.5B	162000.00	9630.33	15.43	152354.23	959.20	972.19	972.80	0.001739	6.42	26898.75	3273.78	12.99	0.36	0.044	1.05
Reach-1	202.99	Alt3.5D	162000.00	9630.33	15.43	152354.23	959.20	972.19	972.80	0.001739	6.42	26898.75	3273.78	12.99	0.36	0.044	1.05
Reach-1	202.99	Alt3.5H	162000.00	9630.33	15.43	152354.23	959.20	972.19	972.80	0.001739	6.42	26898.75	3273.78	12.99	0.36	0.044	1.05
Reach-1	202.99	existing	198000.00	14790.02	53.03	183156.95	959.20	973.38	974.07	0.001719	6.87	30832.20	3467.34	14.18	0.37	0.045	1.16
Reach-1	202.99	Alt3.5B	198000.00	14639.26	51.06	183309.69	959.20	973.32	974.02	0.001752	6.91	30638.71	3454.31	14.12	0.37	0.045	1.18
Reach-1	202.99	Alt3.5D	198000.00	14639.76	51.06	183309.17	959.20	973.32	974.02	0.001752	6.91	30639.35	3454.36	14.12	0.37	0.045	1.18
Reach-1	202.99	Alt3.5H	198000.00	14639.76	51.06	183309.17	959.20	973.32	974.02	0.001752	6.91	30639.35	3454.36	14.12	0.37	0.045	1.18
Reach-1	202.99	existing	235000.00	21355.26	113.64	213531.11	959.20	974.42	975.20	0.001723	7.31	34779.46	3874.59	15.22	0.37	0.045	1.28
Reach-1	202.99	Alt3.5B	235000.00	21072.85	109.82	213817.33	959.20	974.35	975.14	0.001762	7.36	34503.45	3867.82	15.15	0.38	0.045	1.30
Reach-1	202.99	Alt3.5D	235000.00	21076.71	109.87	213813.41	959.20	974.35	975.14	0.001762	7.36	34507.23	3867.93	15.15	0.38	0.045	1.30
Reach-1	202.99	Alt3.5H	235000.00	21076.71	109.87	213813.41	959.20	974.35	975.14	0.001762	7.36	34507.23	3867.93	15.15	0.38	0.045	1.30
Reach-1	203.09	existing	19500.00	1.06		19498.94	958.70	965.62	965.81	0.001820	3.45	5656.41	1558.96	6.92	0.32	0.044	0.41
Reach-1	203.09	Alt3.5B	19500.00	1.14		19498.86	955.80	965.64	965.78	0.001717	3.00	6507.13	1619.36	9.84	0.26	0.052	0.43
Reach-1	203.09	Alt3.5D	19500.00	1.14		19498.86	955.80	965.64	965.78	0.001717	3.00	6507.13	1619.36	9.84	0.26	0.052	0.43
Reach-1	203.09	Alt3.5H	19500.00	1.14		19498.86	955.80	965.64	965.78	0.001717	3.00	6507.13	1619.36	9.84	0.26	0.052	0.43
Reach-1	203.09	existing	49000.00	589.53		48410.47	958.70	968.13	968.47	0.002082	4.66	10765.30	2314.89	9.43	0.36	0.044	0.68
Reach-1	203.09	Alt3.5B	49000.00	616.82		48383.18	955.80	968.18	968.45	0.002077	4.23	11829.11	2376.07	12.38	0.32	0.050	0.71
Reach-1	203.09	Alt3.5D	49000.00	616.76		48383.24	955.80	968.18	968.45	0.002077	4.23	11828.82	2376.05	12.38	0.32	0.050	0.71
Reach-1	203.09	Alt3.5H	49000.00	616.76		48383.24	955.80	968.18	968.45	0.002077	4.23	11828.82	2376.05	12.38	0.32	0.050	0.71
Reach-1	203.09	existing	82000.00	2917.94		79082.06	958.70	970.03	970.47	0.002223	5.45	15837.28	2978.15	11.33	0.38	0.044	0.87
Reach-1	203.09	Alt3.5B	82000.00	3038.69		78961.30	955.80	970.08	970.46	0.002246	5.03	17033.21	3022.78	14.28	0.34	0.049	0.92
Reach-1	203.09	Alt3.5D	82000.00	3038.94		78961.06	955.80	970.08	970.46	0.002245	5.03	17033.77	3022.80	14.28	0.34	0.049	0.92
Reach-1	203.09	Alt3.5H	82000.00	3038.94		78961.06	955.80	970.08	970.46	0.002245	5.03	17033.77	3022.80	14.28	0.34	0.049	0.92
Reach-1	203.09	existing	130000.00	9017.27		120982.73	958.70	972.05	972.63	0.002109	6.27	22125.11	3188.09	13.35	0.39	0.044	1.06
Reach-1	203.09	Alt3.5B	130000.00	9410.12		120589.88	955.80	972.11	972.62	0.002187	5.88	23393.07	3192.15	16.31	0.35	0.049	1.15
Reach-1	203.09	Alt3.5D	130000.00	9410.12		120589.88	955.80	972.11	972.62	0.002187	5.88	23393.07	3192.15	16.31	0.35	0.049	1.15
Reach-1	203.09	Alt3.5H	130000.00	9410.12		120589.88	955.80	972.11	972.62	0.002187	5.88	23393.07	3192.15	16.31	0.35	0.049	1.15
Reach-1	203.09	existing	162000.00	13545.04		148454.95	958.70	973.17	973.83	0.002066	6.75	25736.70	3262.14	14.47	0.39	0.044	1.18
Reach-1	203.09	Alt3.5B	162000.00	14217.10		147782.89	955.80	973.22	973.82	0.002186	6.37	27006.86	3265.37	17.42	0.36	0.049	1.30
Reach-1	203.09	Alt3.5D	162000.00	14217.10		147782.89	955.80	973.22	973.82	0.002186	6.37	27006.86	3265.37	17.42	0.36	0.049	1.30
Reach-1	203.09	Alt3.5H	162000.00	14217.10		147782.89	955.80	973.22	973.82	0.002186	6.37	27006.86	3265.37	17.42	0.36	0.049	1.30
Reach-1	203.09	existing	198000.00	19173.23		178826.77	958.70	974.30	975.06	0.002038	7.24	29477.40	3324.40	15.60	0.40	0.044	1.30
Reach-1	203.09	Alt3.5B	198000.00	20203.50		177796.50	955.80	974.36	975.04	0.002191	6.86	30742.51	3327.15	18.56	0.37	0.049	1.45
Reach-1	203.09	Alt3.5D	198000.00	20203.78		177796.22	955.80	974.36	975.04	0.002191	6.86	30742.91	3327.15	18.56	0.37	0.049	1.45
Reach-1	203.09	Alt3.5H	198000.00	20203.78		177796.22	955.80	974.36	975.04	0.002191	6.86	30742.91	3327.15	18.56	0.37	0.049	1.45
Reach-1	203.09	existing	235000.00	25822.27		209177.72	958.70	975.34	976.19	0.002023	7.68	32939.55	3333.40	16.64	0.40	0.044	1.42
Reach-1	203.09	Alt3.5B	235000.00	27317.20		207682.81	955.80	975.39	976.16	0.002203	7.31	34186.36	3333.40	19.59	0.38	0.049	1.60
Reach-1	203.09	Alt3.5D	235000.00	27319.04		207680.97	955.80	975.39	976.16	0.002203	7.31	34188.39	3333.40	19.59	0.37	0.049	1.60
Reach-1	203.09	Alt3.5H	235000.00	27319.04		207680.97	955.80	975.39	976.16	0.002203	7.31	34188.39	3333.40	19.59	0.37	0.049	1.60

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.19	existing	19500.00	35.97		19464.04	956.70	966.66	966.84	0.002168	3.49	5604.85	1766.73	9.96	0.34	0.044	0.44
Reach-1	203.19	Alt3.5B	19500.00	27.50		19472.50	956.50	966.56	966.69	0.001760	2.87	6809.53	1904.22	10.06	0.26	0.051	0.40
Reach-1	203.19	Alt3.5D	19500.00	27.50		19472.50	956.50	966.56	966.69	0.001760	2.87	6809.53	1904.22	10.06	0.26	0.051	0.40
Reach-1	203.19	Alt3.5H	19500.00	27.50		19472.50	956.50	966.56	966.69	0.001760	2.87	6809.53	1904.22	10.06	0.26	0.051	0.40
Reach-1	203.19	existing	49000.00	1212.17		47787.83	956.70	969.26	969.56	0.002061	4.39	11451.28	2612.11	12.56	0.35	0.044	0.62
Reach-1	203.19	Alt3.5B	49000.00	1096.33		47903.67	956.50	969.24	969.46	0.001766	3.81	13139.03	2718.46	12.74	0.29	0.049	0.58
Reach-1	203.19	Alt3.5D	49000.00	1096.29		47903.71	956.50	969.24	969.46	0.001766	3.81	13138.87	2718.45	12.74	0.29	0.049	0.58
Reach-1	203.19	Alt3.5H	49000.00	1096.29		47903.71	956.50	969.24	969.46	0.001766	3.81	13138.87	2718.45	12.74	0.29	0.049	0.58
Reach-1	203.19	existing	82000.00	4141.78		77858.22	956.70	971.20	971.57	0.001944	4.96	17114.13	3153.75	14.50	0.36	0.044	0.73
Reach-1	203.19	Alt3.5B	82000.00	3906.21		78093.78	956.50	971.20	971.50	0.001732	4.44	19018.73	3209.86	14.70	0.30	0.049	0.71
Reach-1	203.19	Alt3.5D	82000.00	3906.37		78093.63	956.50	971.20	971.50	0.001732	4.44	19019.13	3209.87	14.70	0.30	0.049	0.71
Reach-1	203.19	Alt3.5H	82000.00	3906.37		78093.63	956.50	971.20	971.50	0.001732	4.44	19019.13	3209.87	14.70	0.30	0.049	0.71
Reach-1	203.19	existing	130000.00	9863.23		120136.77	956.70	973.18	973.66	0.001833	5.74	23743.63	3456.57	16.48	0.36	0.044	0.90
Reach-1	203.19	Alt3.5B	130000.00	9684.86		120315.14	956.50	973.22	973.63	0.001699	5.24	25841.86	3460.65	16.72	0.31	0.048	0.90
Reach-1	203.19	Alt3.5D	130000.00	9684.86		120315.14	956.50	973.22	973.63	0.001699	5.24	25841.86	3460.65	16.72	0.31	0.048	0.90
Reach-1	203.19	Alt3.5H	130000.00	9684.86		120315.14	956.50	973.22	973.63	0.001699	5.24	25841.86	3460.65	16.72	0.31	0.048	0.90
Reach-1	203.19	existing	162000.00	14787.75		147212.25	956.70	974.29	974.85	0.001781	6.16	27657.38	3645.06	17.59	0.36	0.044	0.99
Reach-1	203.19	Alt3.5B	162000.00	14768.64		147231.36	956.50	974.36	974.83	0.001689	5.66	29849.41	3674.55	17.86	0.32	0.048	1.01
Reach-1	203.19	Alt3.5D	162000.00	14768.64		147231.36	956.50	974.36	974.83	0.001689	5.66	29849.41	3674.55	17.86	0.32	0.048	1.01
Reach-1	203.19	Alt3.5H	162000.00	14768.64		147231.36	956.50	974.36	974.83	0.001689	5.66	29849.41	3674.55	17.86	0.32	0.048	1.01
Reach-1	203.19	existing	198000.00	20588.54		177411.45	956.70	975.43	976.06	0.001744	6.58	32091.73	4082.63	18.73	0.37	0.044	1.09
Reach-1	203.19	Alt3.5B	198000.00	20966.68		177033.31	956.50	975.52	976.06	0.001684	6.08	34383.00	4097.25	19.02	0.33	0.048	1.13
Reach-1	203.19	Alt3.5D	198000.00	20966.96		177033.03	956.50	975.52	976.06	0.001684	6.08	34383.26	4097.26	19.02	0.33	0.048	1.13
Reach-1	203.19	Alt3.5H	198000.00	20966.96		177033.03	956.50	975.52	976.06	0.001684	6.08	34383.26	4097.26	19.02	0.33	0.048	1.13
Reach-1	203.19	existing	235000.00	29925.18	283.63	204791.19	956.70	976.49	977.17	0.001672	6.87	36728.64	4634.06	19.79	0.36	0.044	1.15
Reach-1	203.19	Alt3.5B	235000.00	30602.02	356.90	204041.08	956.50	976.59	977.17	0.001642	6.38	39091.51	4663.88	20.09	0.33	0.048	1.20
Reach-1	203.19	Alt3.5D	235000.00	30603.88	357.20	204038.91	956.50	976.59	977.18	0.001642	6.38	39093.21	4663.99	20.09	0.33	0.048	1.20
Reach-1	203.19	Alt3.5H	235000.00	30603.88	357.20	204038.91	956.50	976.59	977.18	0.001642	6.38	39093.21	4663.99	20.09	0.33	0.048	1.20
Reach-1	203.20	existing	19500.00			19500.00	960.70	967.45	967.62	0.000981	3.26	5988.03	1620.77	6.75	0.30	0.035	0.23
Reach-1	203.20	Alt3.5B	19500.00			19500.00	957.30	967.24	967.36	0.000901	2.86	6820.42	1694.66	9.94	0.25	0.041	0.22
Reach-1	203.20	Alt3.5D	19500.00			19500.00	957.30	967.24	967.36	0.000901	2.86	6820.42	1694.66	9.94	0.25	0.041	0.22
Reach-1	203.20	Alt3.5H	19500.00			19500.00	957.30	967.24	967.36	0.000901	2.86	6820.42	1694.66	9.94	0.25	0.041	0.22
Reach-1	203.20	existing	49000.00	146.65		48853.35	960.70	970.13	970.43	0.001258	4.40	11223.21	2373.54	9.43	0.35	0.035	0.39
Reach-1	203.20	Alt3.5B	49000.00	113.39		48886.61	957.30	970.00	970.25	0.001161	4.01	12307.10	2382.84	12.70	0.30	0.040	0.39
Reach-1	203.20	Alt3.5D	49000.00	113.40		48886.60	957.30	970.00	970.25	0.001160	4.01	12307.25	2382.84	12.70	0.30	0.040	0.39
Reach-1	203.20	Alt3.5H	49000.00	113.40		48886.60	957.30	970.00	970.25	0.001160	4.01	12307.25	2382.84	12.70	0.30	0.040	0.39
Reach-1	203.20	existing	82000.00	1370.81		80629.19	960.70	972.07	972.47	0.001359	5.15	16437.48	3073.00	11.37	0.37	0.036	0.51
Reach-1	203.20	Alt3.5B	82000.00	1197.28		80802.73	957.30	971.97	972.32	0.001259	4.80	17575.56	3045.87	14.67	0.33	0.040	0.51
Reach-1	203.20	Alt3.5D	82000.00	1197.41		80802.59	957.30	971.97	972.32	0.001259	4.80	17575.94	3045.91	14.67	0.33	0.040	0.51
Reach-1	203.20	Alt3.5H	82000.00	1197.41		80802.59	957.30	971.97	972.32	0.001259	4.80	17575.94	3045.91	14.67	0.33	0.040	0.51
Reach-1	203.20	existing	130000.00	5169.23		124830.77	960.70	974.04	974.56	0.001414	5.90	22852.77	3365.87	13.34	0.38	0.036	0.64
Reach-1	203.20	Alt3.5B	130000.00	4970.88		125029.13	957.30	974.02	974.48	0.001336	5.55	24209.27	3361.81	16.72	0.35	0.039	0.65
Reach-1	203.20	Alt3.5D	130000.00	4970.88		125029.13	957.30	974.02	974.48	0.001336	5.55	24209.27	3361.81	16.72	0.35	0.039	0.65
Reach-1	203.20	Alt3.5H	130000.00	4970.88		125029.13	957.30	974.02	974.48	0.001336	5.55	24209.27	3361.81	16.72	0.35	0.039	0.65
Reach-1	203.20	existing	162000.00	8068.63		153931.38	960.70	975.14	975.74	0.001416	6.30	26657.98	3488.93	14.44	0.39	0.036	0.72
Reach-1	203.20	Alt3.5B	162000.00	7899.44		154100.56	957.30	975.15	975.69	0.001346	5.95	28133.42	3489.01	17.85	0.36	0.039	0.72
Reach-1	203.20	Alt3.5D	162000.00	7899.44		154100.56	957.30	975.15	975.69	0.001346	5.95	28133.42	3489.01	17.85	0.36	0.039	0.72
Reach-1	203.20	Alt3.5H	162000.00	7899.44		154100.56	957.30	975.15	975.69	0.001346	5.95	28133.42	3489.01	17.85	0.36	0.039	0.72
Reach-1	203.20	existing	198000.00	11266.15	19.38	186714.48	960.70	976.25	976.93	0.001364	6.72	30565.96	3575.44	15.55	0.39	0.036	0.78
Reach-1	203.20	Alt3.5B	198000.00	11142.41	22.15	186835.44	957.30	976.29	976.90	0.001305	6.37	32140.09	3580.47	18.99	0.36	0.039	0.78
Reach-1	203.20	Alt3.5D	198000.00	11142.48	22.16	186835.36	957.30	976.29	976.90	0.001305	6.37	32140.31	3580.48	18.99	0.36	0.039	0.78
Reach-1	203.20	Alt3.5H	198000.00	11142.48	22.16	186835.36	957.30	976.29	976.90	0.001305	6.37	32140.31	3580.48	18.99	0.36	0.039	0.78
Reach-1	203.20	existing	235000.00	14591.82	227.20	220180.98	960.70	977.27	978.03	0.001342	7.14	34258.79	3705.00	16.57	0.39	0.036	0.85
Reach-1	203.20	Alt3.5B	235000.00	14514.77	249.65	220235.58	957.30	977.33	978.01	0.001291	6.79	35902.85	3705.00	20.03	0.37	0.039	0.86
Reach-1	203.20	Alt3.5D	235000.00	14515.05	249.75	220235.19	957.30	977.33	978.01	0.001291	6.79	35903.76	3705.00	20.03	0.37	0.039	0.86
Reach-1	203.20	Alt3.5H	235000.00	14515.05	249.75	220235.19	957.30	977.33	978.01	0.001291	6.79	35903.76	3705.00	20.03	0.37	0.039	0.86
Reach-1	203.30	existing	19500.00			19500.00	959.90	967.96	968.12	0.000998	3.19	6117.00	1719.29	8.06	0.30	0.035	0.22

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.39	Alt3.5B	19500.00			19500.00	958.10	967.71	967.84	0.000976	2.89	6751.37	1830.75	9.61	0.27	0.040	0.22
Reach-1	203.39	Alt3.5D	19500.00			19500.00	958.10	967.71	967.84	0.000976	2.89	6751.37	1830.75	9.61	0.27	0.040	0.22
Reach-1	203.39	Alt3.5H	19500.00			19500.00	958.10	967.71	967.84	0.000976	2.89	6751.37	1830.75	9.61	0.27	0.040	0.22
Reach-1	203.39	existing	49000.00	76.40		48923.60	959.90	970.75	971.02	0.001075	4.21	11679.58	2298.10	10.85	0.33	0.038	0.35
Reach-1	203.39	Alt3.5B	49000.00	61.46		48938.54	958.10	970.56	970.80	0.001025	3.90	12587.79	2277.31	12.46	0.29	0.040	0.36
Reach-1	203.39	Alt3.5D	49000.00	61.46		48938.54	958.10	970.56	970.80	0.001025	3.90	12587.93	2277.32	12.46	0.29	0.040	0.36
Reach-1	203.39	Alt3.5H	49000.00	61.46		48938.54	958.10	970.56	970.80	0.001025	3.90	12587.93	2277.32	12.46	0.29	0.040	0.36
Reach-1	203.39	existing	82000.00	559.18		81440.83	959.90	972.73	973.11	0.001163	4.93	16896.46	2986.93	12.83	0.35	0.036	0.46
Reach-1	203.39	Alt3.5B	82000.00	480.60		81519.40	958.10	972.59	972.93	0.001136	4.66	17827.19	2938.05	14.49	0.32	0.039	0.47
Reach-1	203.39	Alt3.5D	82000.00	480.64		81519.36	958.10	972.59	972.93	0.001136	4.66	17827.55	2938.10	14.49	0.32	0.039	0.47
Reach-1	203.39	Alt3.5H	82000.00	480.64		81519.36	958.10	972.59	972.93	0.001136	4.66	17827.55	2938.10	14.49	0.32	0.039	0.47
Reach-1	203.39	existing	130000.00	3008.89		126991.10	959.90	974.72	975.23	0.001222	5.79	23197.15	3246.24	14.82	0.36	0.036	0.60
Reach-1	203.39	Alt3.5B	130000.00	2850.47		127149.52	958.10	974.65	975.11	0.001183	5.50	24339.75	3241.48	16.55	0.34	0.039	0.61
Reach-1	203.39	Alt3.5D	130000.00	2850.47		127149.52	958.10	974.65	975.11	0.001183	5.50	24339.75	3241.48	16.55	0.34	0.039	0.61
Reach-1	203.39	Alt3.5H	130000.00	2850.47		127149.52	958.10	974.65	975.11	0.001183	5.50	24339.75	3241.48	16.55	0.34	0.039	0.61
Reach-1	203.39	existing	162000.00	5432.97	6.21	156560.83	959.90	975.84	976.42	0.001303	6.23	26929.80	3470.87	15.94	0.38	0.036	0.69
Reach-1	203.39	Alt3.5B	162000.00	5289.81	5.01	156705.38	958.10	975.81	976.34	0.001263	5.93	28186.47	3465.62	17.71	0.35	0.039	0.70
Reach-1	203.39	Alt3.5D	162000.00	5289.81	5.01	156705.38	958.10	975.81	976.34	0.001263	5.93	28186.47	3465.62	17.71	0.35	0.039	0.70
Reach-1	203.39	Alt3.5H	162000.00	5289.81	5.01	156705.38	958.10	975.81	976.34	0.001263	5.93	28186.47	3465.62	17.71	0.35	0.039	0.70
Reach-1	203.39	existing	198000.00	8156.60	116.82	189726.58	959.90	976.93	977.60	0.001299	6.68	30760.28	3549.51	17.03	0.38	0.036	0.77
Reach-1	203.39	Alt3.5B	198000.00	8065.20	116.50	189818.30	958.10	976.94	977.55	0.001263	6.37	32135.71	3550.33	18.84	0.36	0.039	0.78
Reach-1	203.39	Alt3.5D	198000.00	8065.28	116.51	189818.20	958.10	976.94	977.55	0.001263	6.37	32135.92	3550.34	18.84	0.36	0.039	0.78
Reach-1	203.39	Alt3.5H	198000.00	8065.28	116.51	189818.20	958.10	976.94	977.55	0.001263	6.37	32135.92	3550.34	18.84	0.36	0.039	0.78
Reach-1	203.39	existing	235000.00	11060.92	428.99	223510.08	959.90	977.94	978.70	0.001301	7.11	34385.99	3635.88	18.04	0.39	0.036	0.85
Reach-1	203.39	Alt3.5B	235000.00	11017.66	437.47	223544.88	958.10	977.97	978.66	0.001270	6.80	35842.45	3637.92	19.87	0.36	0.039	0.86
Reach-1	203.39	Alt3.5D	235000.00	11017.90	437.54	223544.56	958.10	977.97	978.66	0.001270	6.80	35843.11	3637.94	19.87	0.36	0.039	0.86
Reach-1	203.39	Alt3.5H	235000.00	11017.90	437.54	223544.56	958.10	977.97	978.66	0.001270	6.80	35843.11	3637.94	19.87	0.36	0.039	0.86
Reach-1	203.48	existing	19500.00			19500.00	962.20	968.44	968.61	0.000943	3.32	5865.02	1462.95	6.24	0.29	0.035	0.24
Reach-1	203.48	Alt3.5B	19500.00			19500.00	958.80	968.18	968.31	0.000897	2.89	6747.64	1653.04	9.38	0.25	0.040	0.23
Reach-1	203.48	Alt3.5D	19500.00			19500.00	958.80	968.18	968.31	0.000897	2.89	6747.64	1653.04	9.38	0.25	0.040	0.23
Reach-1	203.48	Alt3.5H	19500.00			19500.00	958.80	968.18	968.31	0.000897	2.89	6747.64	1653.04	9.38	0.25	0.040	0.23
Reach-1	203.48	existing	49000.00	126.23		48873.77	962.20	971.31	971.61	0.001243	4.41	11229.99	2466.65	9.11	0.35	0.035	0.38
Reach-1	203.48	Alt3.5B	49000.00	107.32		48892.68	958.80	971.10	971.34	0.001135	3.94	12516.17	2504.75	12.30	0.30	0.040	0.37
Reach-1	203.48	Alt3.5D	49000.00	107.33		48892.67	958.80	971.10	971.34	0.001135	3.94	12516.32	2504.78	12.30	0.30	0.040	0.37
Reach-1	203.48	Alt3.5H	49000.00	107.33		48892.67	958.80	971.10	971.34	0.001135	3.94	12516.32	2504.78	12.30	0.30	0.040	0.37
Reach-1	203.48	existing	82000.00	1252.07		80747.93	962.20	973.33	973.72	0.001240	4.99	16866.44	3153.21	11.13	0.36	0.036	0.45
Reach-1	203.48	Alt3.5B	82000.00	1083.38		80916.62	958.80	973.19	973.50	0.001135	4.56	18377.23	3121.50	14.39	0.32	0.039	0.45
Reach-1	203.48	Alt3.5D	82000.00	1083.43		80916.57	958.80	973.19	973.51	0.001135	4.56	18377.61	3121.54	14.39	0.32	0.039	0.45
Reach-1	203.48	Alt3.5H	82000.00	1083.43		80916.57	958.80	973.19	973.51	0.001135	4.56	18377.61	3121.54	14.39	0.32	0.039	0.45
Reach-1	203.48	existing	130000.00	4408.48		125591.52	962.20	975.35	975.84	0.001211	5.72	23660.03	3442.77	13.15	0.37	0.036	0.57
Reach-1	203.48	Alt3.5B	130000.00	4081.06		125918.95	958.80	975.28	975.70	0.001119	5.31	25392.37	3441.23	16.48	0.33	0.039	0.56
Reach-1	203.48	Alt3.5D	130000.00	4081.06		125918.95	958.80	975.28	975.70	0.001119	5.31	25392.37	3441.23	16.48	0.33	0.039	0.56
Reach-1	203.48	Alt3.5H	130000.00	4081.06		125918.95	958.80	975.28	975.70	0.001119	5.31	25392.37	3441.23	16.48	0.33	0.039	0.56
Reach-1	203.48	existing	162000.00	7212.43		154787.56	962.20	976.49	977.05	0.001181	6.12	27598.22	3467.00	14.29	0.37	0.036	0.64
Reach-1	203.48	Alt3.5B	162000.00	6861.85		155138.14	958.80	976.45	976.95	0.001097	5.71	29460.61	3466.28	17.65	0.33	0.039	0.63
Reach-1	203.48	Alt3.5D	162000.00	6861.85		155138.14	958.80	976.45	976.95	0.001097	5.71	29460.61	3466.28	17.65	0.33	0.039	0.63
Reach-1	203.48	Alt3.5H	162000.00	6861.85		155138.14	958.80	976.45	976.95	0.001097	5.71	29460.61	3466.28	17.65	0.33	0.039	0.63
Reach-1	203.48	existing	198000.00	10516.85		187483.14	962.20	977.58	978.23	0.001188	6.58	31403.40	3490.26	15.38	0.37	0.036	0.72
Reach-1	203.48	Alt3.5B	198000.00	10165.97		187834.03	958.80	977.59	978.16	0.001108	6.17	33393.86	3490.31	18.79	0.34	0.039	0.71
Reach-1	203.48	Alt3.5D	198000.00	10166.06		187833.95	958.80	977.59	978.16	0.001108	6.17	33394.07	3490.32	18.79	0.34	0.039	0.71
Reach-1	203.48	Alt3.5H	198000.00	10166.06		187833.95	958.80	977.59	978.16	0.001108	6.17	33394.07	3490.32	18.79	0.34	0.039	0.71
Reach-1	203.48	existing	235000.00	14119.07	0.02	220880.92	962.20	978.59	979.33	0.001202	7.02	34941.96	3509.29	16.39	0.38	0.036	0.80
Reach-1	203.48	Alt3.5B	235000.00	13777.85	0.04	221222.31	958.80	978.62	979.27	0.001127	6.60	37025.23	3510.78	19.82	0.34	0.039	0.79
Reach-1	203.48	Alt3.5D	235000.00	13777.84	0.04	221222.13	958.80	978.62	979.27	0.001127	6.60	37025.66	3510.79	19.82	0.34	0.039	0.79
Reach-1	203.48	Alt3.5H	235000.00	13777.84	0.04	221222.13	958.80	978.62	979.27	0.001127	6.60	37025.66	3510.79	19.82	0.34	0.039	0.79
Reach-1	203.58	existing	19500.00			19500.00	962.10	968.88	968.99	0.000567	2.70	7218.80	1719.53	6.78	0.23	0.035	0.15
Reach-1	203.58	Alt3.5B	19500.00			19500.00	962.10	968.59	968.72	0.000701	2.90	6725.23	1679.66	6.49	0.26	0.035	0.17
Reach-1	203.58	Alt3.5D	19500.00			19500.00	962.10	968.59	968.72	0.000701	2.90	6725.23	1679.66	6.49	0.26	0.035	0.17

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.58	Alt3.5H	19500.00			19500.00	962.10	968.59	968.72	0.000701	2.90	6725.23	1679.66	6.49	0.26	0.035	0.17
Reach-1	203.58	existing	49000.00			49000.00	962.10	971.88	972.09	0.000689	3.67	13343.98	2347.37	9.78	0.27	0.035	0.24
Reach-1	203.58	Alt3.5B	49000.00			49000.00	962.10	971.61	971.84	0.000804	3.86	12695.93	2337.19	9.51	0.29	0.035	0.27
Reach-1	203.58	Alt3.5D	49000.00			49000.00	962.10	971.61	971.84	0.000804	3.86	12696.07	2337.19	9.51	0.29	0.035	0.27
Reach-1	203.58	Alt3.5H	49000.00			49000.00	962.10	971.61	971.84	0.000804	3.86	12696.07	2337.19	9.51	0.29	0.035	0.27
Reach-1	203.58	existing	82000.00	48.19		81951.80	962.10	973.90	974.21	0.000739	4.52	18207.82	2504.64	11.80	0.29	0.035	0.35
Reach-1	203.58	Alt3.5B	82000.00	32.66		81967.34	962.10	973.67	974.01	0.000814	4.66	17643.19	2483.73	11.57	0.30	0.035	0.37
Reach-1	203.58	Alt3.5D	82000.00	32.66		81967.34	962.10	973.67	974.01	0.000814	4.66	17643.49	2483.74	11.57	0.30	0.035	0.37
Reach-1	203.58	Alt3.5H	82000.00	32.66		81967.34	962.10	973.67	974.01	0.000814	4.66	17643.49	2483.74	11.57	0.30	0.035	0.37
Reach-1	203.58	existing	130000.00	648.58		129351.41	962.10	975.89	976.38	0.000874	5.61	23619.60	2989.09	13.79	0.33	0.035	0.50
Reach-1	203.58	Alt3.5B	130000.00	561.55		129438.45	962.10	975.75	976.25	0.000918	5.70	23203.94	2956.16	13.65	0.33	0.035	0.52
Reach-1	203.58	Alt3.5D	130000.00	561.55		129438.45	962.10	975.75	976.25	0.000918	5.70	23203.94	2956.16	13.65	0.33	0.035	0.52
Reach-1	203.58	Alt3.5H	130000.00	561.55		129438.45	962.10	975.75	976.25	0.000918	5.70	23203.94	2956.16	13.65	0.33	0.035	0.52
Reach-1	203.58	existing	162000.00	2064.30		159935.70	962.10	977.02	977.60	0.000928	6.19	26990.80	2995.74	14.92	0.34	0.036	0.60
Reach-1	203.58	Alt3.5B	162000.00	1943.57		160056.42	962.10	976.91	977.51	0.000960	6.25	26681.45	2995.34	14.81	0.34	0.036	0.61
Reach-1	203.58	Alt3.5D	162000.00	1943.57		160056.42	962.10	976.91	977.51	0.000960	6.25	26681.45	2995.34	14.81	0.34	0.036	0.61
Reach-1	203.58	Alt3.5H	162000.00	1943.57		160056.42	962.10	976.91	977.51	0.000960	6.25	26681.45	2995.34	14.81	0.34	0.036	0.61
Reach-1	203.58	existing	198000.00	4104.33		193895.67	962.10	978.11	978.81	0.000996	6.78	30279.97	3012.43	16.01	0.35	0.036	0.71
Reach-1	203.58	Alt3.5B	198000.00	3999.64		194000.36	962.10	978.04	978.75	0.001016	6.83	30062.37	3009.97	15.94	0.36	0.036	0.72
Reach-1	203.58	Alt3.5D	198000.00	3999.73		194000.27	962.10	978.04	978.75	0.001016	6.83	30062.55	3009.98	15.94	0.36	0.036	0.72
Reach-1	203.58	Alt3.5H	198000.00	3999.73		194000.27	962.10	978.04	978.75	0.001016	6.83	30062.55	3009.98	15.94	0.36	0.036	0.72
Reach-1	203.58	existing	235000.00	6577.91		228422.09	962.10	979.13	979.94	0.001068	7.33	33362.03	3047.02	17.03	0.37	0.036	0.81
Reach-1	203.58	Alt3.5B	235000.00	6496.60		228503.41	962.10	979.08	979.90	0.001081	7.36	33210.32	3045.33	16.98	0.37	0.036	0.82
Reach-1	203.58	Alt3.5D	235000.00	6496.70		228503.31	962.10	979.08	979.90	0.001081	7.36	33210.50	3045.33	16.98	0.37	0.036	0.82
Reach-1	203.58	Alt3.5H	235000.00	6496.70		228503.31	962.10	979.08	979.90	0.001081	7.36	33210.50	3045.33	16.98	0.37	0.036	0.82
Reach-1	203.67	existing	19500.00			19500.00	962.30	969.14	969.25	0.000479	2.63	7428.22	1623.09	6.84	0.22	0.035	0.14
Reach-1	203.67	Alt3.5B	19500.00			19500.00	962.30	968.91	969.03	0.000563	2.76	7053.33	1598.62	6.61	0.23	0.035	0.15
Reach-1	203.67	Alt3.5D	19500.00			19500.00	962.30	968.91	969.03	0.000563	2.76	7053.33	1598.62	6.61	0.23	0.035	0.15
Reach-1	203.67	Alt3.5H	19500.00			19500.00	962.30	968.91	969.03	0.000563	2.76	7053.33	1598.62	6.61	0.23	0.035	0.15
Reach-1	203.67	existing	49000.00			49000.00	962.30	972.18	972.40	0.000569	3.74	13110.38	2036.20	9.88	0.26	0.035	0.23
Reach-1	203.67	Alt3.5B	49000.00			49000.00	962.30	971.95	972.18	0.000633	3.88	12641.05	2026.87	9.65	0.27	0.035	0.25
Reach-1	203.67	Alt3.5D	49000.00			49000.00	962.30	971.95	972.18	0.000633	3.88	12641.17	2026.88	9.65	0.27	0.035	0.25
Reach-1	203.67	Alt3.5H	49000.00			49000.00	962.30	971.95	972.18	0.000633	3.88	12641.17	2026.88	9.65	0.27	0.035	0.25
Reach-1	203.67	existing	82000.00	418.44		81581.56	962.30	974.25	974.59	0.000783	4.64	18016.89	2812.08	11.95	0.30	0.036	0.37
Reach-1	203.67	Alt3.5B	82000.00	304.22		81695.78	962.30	974.06	974.41	0.000841	4.77	17473.98	2772.18	11.76	0.31	0.036	0.39
Reach-1	203.67	Alt3.5D	82000.00	304.27		81695.73	962.30	974.06	974.41	0.000841	4.77	17474.32	2772.28	11.76	0.31	0.036	0.39
Reach-1	203.67	Alt3.5H	82000.00	304.27		81695.73	962.30	974.06	974.41	0.000841	4.77	17474.32	2772.28	11.76	0.31	0.036	0.39
Reach-1	203.67	existing	130000.00	3138.89		126861.12	962.30	976.32	976.81	0.000889	5.67	23883.08	2858.91	14.02	0.32	0.036	0.53
Reach-1	203.67	Alt3.5B	130000.00	2993.00		127006.99	962.30	976.20	976.70	0.000927	5.74	23545.44	2858.65	13.90	0.33	0.036	0.54
Reach-1	203.67	Alt3.5D	130000.00	2993.00		127006.99	962.30	976.20	976.70	0.000927	5.74	23545.44	2858.65	13.90	0.33	0.036	0.54
Reach-1	203.67	Alt3.5H	130000.00	2993.00		127006.99	962.30	976.20	976.70	0.000927	5.74	23545.44	2858.65	13.90	0.33	0.036	0.54
Reach-1	203.67	existing	162000.00	5602.80	0.08	156397.11	962.30	977.47	978.06	0.000937	6.23	27180.89	2862.91	15.17	0.34	0.036	0.62
Reach-1	203.67	Alt3.5B	162000.00	5481.53	0.03	156518.44	962.30	977.38	977.98	0.000964	6.29	26932.62	2862.23	15.08	0.34	0.036	0.64
Reach-1	203.67	Alt3.5D	162000.00	5481.53	0.03	156518.44	962.30	977.38	977.98	0.000964	6.29	26932.62	2862.23	15.08	0.34	0.036	0.64
Reach-1	203.67	Alt3.5H	162000.00	5481.53	0.03	156518.44	962.30	977.38	977.98	0.000964	6.29	26932.62	2862.23	15.08	0.34	0.036	0.64
Reach-1	203.67	existing	198000.00	8658.46	6.53	189335.02	962.30	978.60	979.30	0.000994	6.82	30414.31	2871.71	16.30	0.35	0.036	0.73
Reach-1	203.67	Alt3.5B	198000.00	8566.01	5.85	189428.14	962.30	978.54	979.24	0.001012	6.86	30239.05	2871.23	16.24	0.35	0.036	0.74
Reach-1	203.67	Alt3.5D	198000.00	8566.10	5.85	189428.06	962.30	978.54	979.24	0.001012	6.86	30239.23	2871.23	16.24	0.35	0.036	0.74
Reach-1	203.67	Alt3.5H	198000.00	8566.10	5.85	189428.06	962.30	978.54	979.24	0.001012	6.86	30239.23	2871.23	16.24	0.35	0.036	0.74
Reach-1	203.67	existing	235000.00	12043.42	29.73	222926.84	962.30	979.64	980.46	0.001048	7.38	33420.88	2879.88	17.34	0.36	0.036	0.84
Reach-1	203.67	Alt3.5B	235000.00	11976.43	28.54	222995.02	962.30	979.60	980.42	0.001060	7.41	33299.95	2879.55	17.30	0.36	0.036	0.84
Reach-1	203.67	Alt3.5D	235000.00	11976.53	28.55	222994.92	962.30	979.60	980.42	0.001060	7.41	33300.12	2879.55	17.30	0.36	0.036	0.84
Reach-1	203.67	Alt3.5H	235000.00	11976.53	28.55	222994.92	962.30	979.60	980.42	0.001060	7.41	33300.12	2879.55	17.30	0.36	0.036	0.84
Reach-1	203.77	existing	19500.00			19500.00	963.30	969.40	969.50	0.000527	2.56	7605.12	1965.07	6.10	0.23	0.035	0.13
Reach-1	203.77	Alt3.5B	19500.00			19500.00	963.30	969.21	969.32	0.000609	2.69	7236.34	1915.57	5.91	0.24	0.035	0.14
Reach-1	203.77	Alt3.5D	19500.00			19500.00	963.30	969.21	969.32	0.000609	2.69	7236.34	1915.57	5.91	0.24	0.035	0.14
Reach-1	203.77	Alt3.5H	19500.00			19500.00	963.30	969.21	969.32	0.000609	2.69	7236.34	1915.57	5.91	0.24	0.035	0.14
Reach-1	203.77	existing	49000.00			49000.00	963.30	972.49	972.68	0.000539	3.47	14111.56	2175.58	9.19	0.24	0.036	0.22

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.77	Alt3.5B	49000.00			49000.00	963.30	972.29	972.49	0.000590	3.58	13682.33	2166.99	8.99	0.25	0.036	0.23
Reach-1	203.77	Alt3.5D	49000.00			49000.00	963.30	972.29	972.49	0.000590	3.58	13682.46	2167.00	8.99	0.25	0.036	0.23
Reach-1	203.77	Alt3.5H	49000.00			49000.00	963.30	972.29	972.49	0.000590	3.58	13682.46	2167.00	8.99	0.25	0.036	0.23
Reach-1	203.77	existing	82000.00			82000.00	963.30	974.65	974.94	0.000645	4.33	18940.18	2346.35	11.35	0.27	0.036	0.32
Reach-1	203.77	Alt3.5B	82000.00			82000.00	963.30	974.49	974.79	0.000679	4.42	18559.31	2302.70	11.19	0.27	0.036	0.34
Reach-1	203.77	Alt3.5D	82000.00			82000.00	963.30	974.49	974.79	0.000679	4.42	18559.59	2302.74	11.19	0.27	0.036	0.34
Reach-1	203.77	Alt3.5H	82000.00			82000.00	963.30	974.49	974.79	0.000679	4.42	18559.59	2302.74	11.19	0.27	0.036	0.34
Reach-1	203.77	existing	130000.00			130000.00	963.30	976.78	977.23	0.000815	5.39	24117.72	2498.41	13.48	0.31	0.036	0.49
Reach-1	203.77	Alt3.5B	130000.00			130000.00	963.30	976.68	977.14	0.000842	5.44	23875.35	2496.49	13.38	0.31	0.036	0.50
Reach-1	203.77	Alt3.5D	130000.00			130000.00	963.30	976.68	977.14	0.000842	5.44	23875.35	2496.49	13.38	0.31	0.036	0.50
Reach-1	203.77	Alt3.5H	130000.00			130000.00	963.30	976.68	977.14	0.000842	5.44	23875.35	2496.49	13.38	0.31	0.036	0.50
Reach-1	203.77	existing	162000.00			162000.00	963.30	977.95	978.51	0.000880	5.99	27062.09	2519.46	14.65	0.32	0.036	0.59
Reach-1	203.77	Alt3.5B	162000.00			162000.00	963.30	977.88	978.45	0.000899	6.03	26880.97	2518.65	14.58	0.33	0.036	0.60
Reach-1	203.77	Alt3.5D	162000.00			162000.00	963.30	977.88	978.45	0.000899	6.03	26880.97	2518.65	14.58	0.33	0.036	0.60
Reach-1	203.77	Alt3.5H	162000.00			162000.00	963.30	977.88	978.45	0.000899	6.03	26880.97	2518.65	14.58	0.33	0.036	0.60
Reach-1	203.77	existing	198000.00			198000.00	963.30	979.11	979.78	0.000957	6.61	29972.92	2543.50	15.81	0.34	0.036	0.70
Reach-1	203.77	Alt3.5B	198000.00			198000.00	963.30	979.05	979.74	0.000969	6.63	29843.03	2541.53	15.75	0.34	0.036	0.71
Reach-1	203.77	Alt3.5D	198000.00			198000.00	963.30	979.05	979.74	0.000969	6.63	29843.18	2541.53	15.75	0.34	0.036	0.71
Reach-1	203.77	Alt3.5H	198000.00			198000.00	963.30	979.05	979.74	0.000969	6.63	29843.18	2541.53	15.75	0.34	0.036	0.71
Reach-1	203.77	existing	235000.00			235000.00	963.30	980.17	980.98	0.001038	7.18	32715.18	2584.82	16.87	0.36	0.037	0.82
Reach-1	203.77	Alt3.5B	235000.00			235000.00	963.30	980.14	980.95	0.001047	7.20	32624.17	2583.46	16.84	0.36	0.037	0.82
Reach-1	203.77	Alt3.5D	235000.00			235000.00	963.30	980.14	980.95	0.001047	7.20	32624.33	2583.46	16.84	0.36	0.037	0.82
Reach-1	203.77	Alt3.5H	235000.00			235000.00	963.30	980.14	980.95	0.001047	7.20	32624.33	2583.46	16.84	0.36	0.037	0.82
Reach-1	203.86	existing	19500.00			19500.00	962.30	969.62	969.72	0.000379	2.49	7845.80	1567.96	7.32	0.20	0.035	0.12
Reach-1	203.86	Alt3.5B	19500.00			19500.00	962.30	969.47	969.57	0.000418	2.57	7600.68	1552.55	7.17	0.20	0.035	0.13
Reach-1	203.86	Alt3.5D	19500.00			19500.00	962.30	969.47	969.57	0.000418	2.57	7600.68	1552.55	7.17	0.20	0.035	0.13
Reach-1	203.86	Alt3.5H	19500.00			19500.00	962.30	969.47	969.57	0.000418	2.57	7600.68	1552.55	7.17	0.20	0.035	0.13
Reach-1	203.86	existing	49000.00			49000.00	962.30	972.74	972.95	0.000517	3.65	13412.76	1944.30	10.44	0.25	0.035	0.22
Reach-1	203.86	Alt3.5B	49000.00			49000.00	962.30	972.56	972.78	0.000556	3.75	13073.83	1936.18	10.26	0.25	0.035	0.23
Reach-1	203.86	Alt3.5D	49000.00			49000.00	962.30	972.56	972.78	0.000556	3.75	13073.83	1936.18	10.26	0.25	0.035	0.23
Reach-1	203.86	Alt3.5H	49000.00			49000.00	962.30	972.56	972.78	0.000556	3.75	13073.83	1936.18	10.26	0.25	0.035	0.23
Reach-1	203.86	existing	82000.00			82000.00	962.30	974.95	975.28	0.000657	4.59	17861.55	2086.11	12.65	0.28	0.036	0.35
Reach-1	203.86	Alt3.5B	82000.00			82000.00	962.30	974.81	975.15	0.000689	4.67	17556.75	2075.52	12.51	0.28	0.036	0.36
Reach-1	203.86	Alt3.5D	82000.00			82000.00	962.30	974.81	975.15	0.000689	4.67	17556.87	2075.52	12.51	0.28	0.036	0.36
Reach-1	203.86	Alt3.5H	82000.00			82000.00	962.30	974.81	975.15	0.000689	4.67	17556.87	2075.52	12.51	0.28	0.036	0.36
Reach-1	203.86	existing	130000.00			130000.00	962.30	977.15	977.66	0.000833	5.76	22587.73	2188.39	14.85	0.32	0.036	0.54
Reach-1	203.86	Alt3.5B	130000.00			130000.00	962.30	977.06	977.59	0.000856	5.80	22402.89	2187.96	14.76	0.32	0.036	0.55
Reach-1	203.86	Alt3.5D	130000.00			130000.00	962.30	977.06	977.59	0.000856	5.80	22402.89	2187.96	14.76	0.32	0.036	0.55
Reach-1	203.86	Alt3.5H	130000.00			130000.00	962.30	977.06	977.59	0.000856	5.80	22402.89	2187.96	14.76	0.32	0.036	0.55
Reach-1	203.86	existing	162000.00			162000.00	962.30	978.34	978.98	0.000915	6.43	25206.77	2220.30	16.04	0.34	0.036	0.65
Reach-1	203.86	Alt3.5B	162000.00			162000.00	962.30	978.28	978.93	0.000929	6.46	25066.61	2208.49	15.98	0.34	0.036	0.66
Reach-1	203.86	Alt3.5D	162000.00			162000.00	962.30	978.28	978.93	0.000929	6.46	25066.61	2208.49	15.98	0.34	0.036	0.66
Reach-1	203.86	Alt3.5H	162000.00			162000.00	962.30	978.28	978.93	0.000929	6.46	25066.61	2208.49	15.98	0.34	0.036	0.66
Reach-1	203.86	existing	198000.00			198000.00	962.30	979.52	980.30	0.001000	7.11	27856.86	2259.53	17.22	0.36	0.036	0.77
Reach-1	203.86	Alt3.5B	198000.00			198000.00	962.30	979.47	980.26	0.001012	7.13	27755.23	2259.10	17.17	0.36	0.036	0.77
Reach-1	203.86	Alt3.5D	198000.00			198000.00	962.30	979.47	980.26	0.001012	7.13	27755.38	2259.10	17.17	0.36	0.036	0.77
Reach-1	203.86	Alt3.5H	198000.00			198000.00	962.30	979.47	980.26	0.001012	7.13	27755.38	2259.10	17.17	0.36	0.036	0.77
Reach-1	203.86	existing	235000.00			235000.00	962.30	980.61	981.54	0.001076	7.75	30329.35	2269.94	18.31	0.37	0.036	0.90
Reach-1	203.86	Alt3.5B	235000.00			235000.00	962.30	980.58	981.52	0.001084	7.77	30258.98	2269.64	18.28	0.37	0.036	0.90
Reach-1	203.86	Alt3.5D	235000.00			235000.00	962.30	980.58	981.52	0.001084	7.77	30259.12	2269.65	18.28	0.37	0.036	0.90
Reach-1	203.86	Alt3.5H	235000.00			235000.00	962.30	980.58	981.52	0.001084	7.77	30259.12	2269.65	18.28	0.37	0.036	0.90
Reach-1	203.96	existing	19500.00			19500.00	964.10	969.85	971.39	0.011912	9.98	1953.63	638.41	5.75	1.01	0.035	2.27
Reach-1	203.96	Alt3.5B	19500.00			19500.00	964.10	969.85	971.39	0.011860	9.97	1956.64	638.70	5.75	1.00	0.035	2.26
Reach-1	203.96	Alt3.5D	19500.00			19500.00	964.10	969.85	971.39	0.011860	9.97	1956.64	638.70	5.75	1.00	0.035	2.26
Reach-1	203.96	Alt3.5H	19500.00			19500.00	964.10	969.85	971.39	0.011860	9.97	1956.64	638.70	5.75	1.00	0.035	2.26
Reach-1	203.96	existing	49000.00			49000.00	964.10	972.63	974.28	0.012692	10.34	4740.96	1442.58	8.53	1.00	0.036	2.60
Reach-1	203.96	Alt3.5B	49000.00			49000.00	964.10	972.63	974.28	0.012632	10.31	4750.48	1444.58	8.53	1.00	0.036	2.59
Reach-1	203.96	Alt3.5D	49000.00			49000.00	964.10	972.63	974.28	0.012641	10.32	4748.98	1444.26	8.53	1.00	0.036	2.59

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	203.96	Alt3.5H	49000.00			49000.00	964.10	972.63	974.28	0.012641	10.32	4748.98	1444.26	8.53	1.00	0.036	2.59
Reach-1	203.96	existing	82000.00			82000.00	964.10	974.96	976.35	0.006335	9.46	8669.01	1779.35	10.86	0.76	0.036	1.92
Reach-1	203.96	Alt3.5B	82000.00			82000.00	964.10	974.81	976.29	0.007027	9.77	8392.23	1773.15	10.71	0.79	0.036	2.07
Reach-1	203.96	Alt3.5D	82000.00			82000.00	964.10	974.81	976.29	0.007027	9.77	8392.34	1773.15	10.71	0.79	0.036	2.07
Reach-1	203.96	Alt3.5H	82000.00			82000.00	964.10	974.81	976.29	0.007027	9.77	8392.34	1773.15	10.71	0.79	0.036	2.07
Reach-1	203.96	existing	130000.00			130000.00	964.10	977.29	978.81	0.005004	9.88	13154.65	2156.41	13.19	0.71	0.036	1.90
Reach-1	203.96	Alt3.5B	130000.00			130000.00	964.10	977.21	978.77	0.005220	10.01	12981.22	2151.90	13.11	0.72	0.036	1.96
Reach-1	203.96	Alt3.5D	130000.00			130000.00	964.10	977.21	978.77	0.005220	10.01	12981.22	2151.90	13.11	0.72	0.036	1.96
Reach-1	203.96	Alt3.5H	130000.00			130000.00	964.10	977.21	978.77	0.005220	10.01	12981.22	2151.90	13.11	0.72	0.036	1.96
Reach-1	203.96	existing	162000.00			162000.00	964.10	978.52	980.14	0.004331	10.22	15848.95	2247.21	14.42	0.68	0.036	1.90
Reach-1	203.96	Alt3.5B	162000.00			162000.00	964.10	978.45	980.11	0.004450	10.31	15710.72	2241.65	14.35	0.69	0.036	1.94
Reach-1	203.96	Alt3.5D	162000.00			162000.00	964.10	978.45	980.11	0.004450	10.31	15710.72	2241.65	14.35	0.69	0.036	1.94
Reach-1	203.96	Alt3.5H	162000.00			162000.00	964.10	978.45	980.11	0.004450	10.31	15710.72	2241.65	14.35	0.69	0.036	1.94
Reach-1	203.96	existing	198000.00	0.31		197999.69	964.10	979.72	981.48	0.003917	10.64	18605.57	2320.25	15.62	0.66	0.036	1.97
Reach-1	203.96	Alt3.5B	198000.00	0.10		197999.91	964.10	979.68	981.46	0.003983	10.70	18508.14	2313.58	15.58	0.66	0.036	1.99
Reach-1	203.96	Alt3.5D	198000.00	0.10		197999.91	964.10	979.68	981.46	0.003983	10.70	18508.28	2313.59	15.58	0.66	0.036	1.99
Reach-1	203.96	Alt3.5H	198000.00	0.10		197999.91	964.10	979.68	981.46	0.003983	10.70	18508.28	2313.59	15.58	0.66	0.036	1.99
Reach-1	203.96	existing	235000.00	145.18		234854.83	964.10	980.83	982.74	0.003656	11.09	21287.91	2535.78	16.73	0.65	0.036	2.06
Reach-1	203.96	Alt3.5B	235000.00	136.72		234863.28	964.10	980.80	982.73	0.003693	11.13	21214.56	2524.26	16.70	0.65	0.036	2.10
Reach-1	203.96	Alt3.5D	235000.00	136.74		234863.27	964.10	980.80	982.73	0.003693	11.13	21214.71	2524.29	16.70	0.65	0.036	2.10
Reach-1	203.96	Alt3.5H	235000.00	136.74		234863.27	964.10	980.80	982.73	0.003693	11.13	21214.71	2524.29	16.70	0.65	0.036	2.10
Reach-1	204.05	existing	19500.00			19500.00	965.00	972.96	973.19	0.001532	3.88	5031.83	1409.44	7.96	0.36	0.035	0.34
Reach-1	204.05	Alt3.5B	19500.00			19500.00	965.00	972.96	973.19	0.001533	3.88	5029.85	1409.16	7.96	0.36	0.035	0.34
Reach-1	204.05	Alt3.5D	19500.00			19500.00	965.00	972.96	973.19	0.001533	3.88	5029.85	1409.16	7.96	0.36	0.035	0.34
Reach-1	204.05	Alt3.5H	19500.00			19500.00	965.00	972.96	973.19	0.001533	3.88	5029.85	1409.16	7.96	0.36	0.035	0.34
Reach-1	204.05	existing	49000.00			49000.00	965.00	975.81	976.18	0.001623	4.93	9936.98	2025.63	10.81	0.39	0.035	0.50
Reach-1	204.05	Alt3.5B	49000.00			49000.00	965.00	975.80	976.18	0.001625	4.93	9933.14	2025.18	10.80	0.39	0.035	0.50
Reach-1	204.05	Alt3.5D	49000.00			49000.00	965.00	975.81	976.18	0.001625	4.93	9933.76	2025.26	10.81	0.39	0.035	0.50
Reach-1	204.05	Alt3.5H	49000.00			49000.00	965.00	975.81	976.18	0.001625	4.93	9933.76	2025.26	10.81	0.39	0.035	0.50
Reach-1	204.05	existing	82000.00			82000.00	965.00	977.40	977.99	0.001826	6.18	13259.04	2100.83	12.40	0.43	0.035	0.72
Reach-1	204.05	Alt3.5B	82000.00			82000.00	965.00	977.40	977.99	0.001824	6.18	13262.63	2100.83	12.40	0.43	0.035	0.72
Reach-1	204.05	Alt3.5D	82000.00			82000.00	965.00	977.40	977.99	0.001824	6.18	13262.75	2100.83	12.40	0.43	0.035	0.72
Reach-1	204.05	Alt3.5H	82000.00			82000.00	965.00	977.40	977.99	0.001824	6.18	13262.75	2100.83	12.40	0.43	0.035	0.72
Reach-1	204.05	existing	130000.00			130000.00	965.00	979.44	980.29	0.001809	7.40	17570.52	2112.10	14.44	0.45	0.035	0.94
Reach-1	204.05	Alt3.5B	130000.00			130000.00	965.00	979.43	980.28	0.001817	7.41	17546.41	2112.04	14.43	0.45	0.035	0.94
Reach-1	204.05	Alt3.5D	130000.00			130000.00	965.00	979.43	980.28	0.001817	7.41	17546.41	2112.04	14.43	0.45	0.035	0.94
Reach-1	204.05	Alt3.5H	130000.00			130000.00	965.00	979.43	980.28	0.001817	7.41	17546.41	2112.04	14.43	0.45	0.035	0.94
Reach-1	204.05	existing	162000.00			162000.00	965.00	980.54	981.57	0.001867	8.15	19883.74	2118.26	15.54	0.47	0.035	1.09
Reach-1	204.05	Alt3.5B	162000.00			162000.00	965.00	980.52	981.56	0.001877	8.16	19852.96	2118.18	15.52	0.47	0.035	1.09
Reach-1	204.05	Alt3.5D	162000.00			162000.00	965.00	980.52	981.56	0.001877	8.16	19852.96	2118.18	15.52	0.47	0.035	1.09
Reach-1	204.05	Alt3.5H	162000.00			162000.00	965.00	980.52	981.56	0.001877	8.16	19852.96	2118.18	15.52	0.47	0.035	1.09
Reach-1	204.05	existing	198000.00			198000.00	965.00	981.64	982.88	0.001931	8.91	22231.84	2124.50	16.64	0.49	0.035	1.26
Reach-1	204.05	Alt3.5B	198000.00			198000.00	965.00	981.63	982.87	0.001939	8.92	22204.99	2124.43	16.63	0.49	0.035	1.26
Reach-1	204.05	Alt3.5D	198000.00			198000.00	965.00	981.63	982.87	0.001939	8.92	22204.99	2124.43	16.63	0.49	0.035	1.26
Reach-1	204.05	Alt3.5H	198000.00			198000.00	965.00	981.63	982.87	0.001939	8.92	22204.99	2124.43	16.63	0.49	0.035	1.26
Reach-1	204.05	existing	235000.00			235000.00	965.00	982.68	984.12	0.001991	9.61	24441.19	2130.35	17.68	0.50	0.035	1.42
Reach-1	204.05	Alt3.5B	235000.00			235000.00	965.00	982.67	984.11	0.001997	9.62	24419.48	2130.29	17.67	0.50	0.035	1.42
Reach-1	204.05	Alt3.5D	235000.00			235000.00	965.00	982.67	984.11	0.001997	9.62	24419.61	2130.29	17.67	0.50	0.035	1.42
Reach-1	204.05	Alt3.5H	235000.00			235000.00	965.00	982.67	984.11	0.001997	9.62	24419.61	2130.29	17.67	0.50	0.035	1.42
Reach-1	204.15	existing	19500.00			19500.00	966.00	973.53	973.63	0.000513	2.52	7745.62	1822.30	7.53	0.22	0.035	0.14
Reach-1	204.15	Alt3.5B	19500.00			19500.00	966.00	973.53	973.63	0.000513	2.52	7744.06	1822.23	7.53	0.22	0.035	0.14
Reach-1	204.15	Alt3.5D	19500.00			19500.00	966.00	973.53	973.63	0.000513	2.52	7744.06	1822.23	7.53	0.22	0.035	0.14
Reach-1	204.15	Alt3.5H	19500.00			19500.00	966.00	973.53	973.63	0.000513	2.52	7744.06	1822.23	7.53	0.22	0.035	0.14
Reach-1	204.15	existing	49000.00			49000.00	966.00	976.45	976.66	0.000577	3.68	13324.54	1939.82	10.45	0.25	0.035	0.25
Reach-1	204.15	Alt3.5B	49000.00			49000.00	966.00	976.45	976.66	0.000577	3.68	13322.06	1939.81	10.45	0.25	0.035	0.25
Reach-1	204.15	Alt3.5D	49000.00			49000.00	966.00	976.45	976.66	0.000577	3.68	13322.41	1939.81	10.45	0.25	0.035	0.25
Reach-1	204.15	Alt3.5H	49000.00			49000.00	966.00	976.45	976.66	0.000577	3.68	13322.41	1939.81	10.45	0.25	0.035	0.25
Reach-1	204.15	existing	82000.00			82000.00	966.00	978.21	978.58	0.000760	4.90	16746.97	1951.28	12.21	0.29	0.035	0.41

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	204.15	Alt3.5B	82000.00			82000.00	966.00	978.21	978.58	0.000760	4.90	16749.12	1951.28	12.21	0.29	0.035	0.41
Reach-1	204.15	Alt3.5D	82000.00			82000.00	966.00	978.21	978.58	0.000760	4.90	16749.23	1951.28	12.21	0.29	0.035	0.41
Reach-1	204.15	Alt3.5H	82000.00			82000.00	966.00	978.21	978.58	0.000760	4.90	16749.23	1951.28	12.21	0.29	0.035	0.41
Reach-1	204.15	existing	130000.00			130000.00	966.00	980.39	980.98	0.000974	6.17	21076.05	2090.91	14.39	0.34	0.035	0.61
Reach-1	204.15	Alt3.5B	130000.00			130000.00	966.00	980.38	980.97	0.000976	6.17	21059.97	2090.55	14.38	0.34	0.035	0.61
Reach-1	204.15	Alt3.5D	130000.00			130000.00	966.00	980.38	980.97	0.000976	6.17	21059.97	2090.55	14.38	0.34	0.035	0.61
Reach-1	204.15	Alt3.5H	130000.00			130000.00	966.00	980.38	980.97	0.000976	6.17	21059.97	2090.55	14.38	0.34	0.035	0.61
Reach-1	204.15	existing	162000.00			162000.00	966.00	981.57	982.30	0.001079	6.86	23605.22	2155.15	15.57	0.37	0.035	0.74
Reach-1	204.15	Alt3.5B	162000.00			162000.00	966.00	981.56	982.30	0.001082	6.87	23584.30	2155.01	15.56	0.37	0.035	0.74
Reach-1	204.15	Alt3.5D	162000.00			162000.00	966.00	981.56	982.30	0.001082	6.87	23584.30	2155.01	15.56	0.37	0.035	0.74
Reach-1	204.15	Alt3.5H	162000.00			162000.00	966.00	981.56	982.30	0.001082	6.87	23584.30	2155.01	15.56	0.37	0.035	0.74
Reach-1	204.15	existing	198000.00			198000.00	966.00	982.77	983.65	0.001152	7.56	26187.27	2171.77	16.77	0.38	0.035	0.86
Reach-1	204.15	Alt3.5B	198000.00			198000.00	966.00	982.76	983.65	0.001155	7.57	26168.85	2171.65	16.76	0.38	0.035	0.87
Reach-1	204.15	Alt3.5D	198000.00			198000.00	966.00	982.76	983.65	0.001155	7.57	26168.85	2171.65	16.76	0.38	0.035	0.87
Reach-1	204.15	Alt3.5H	198000.00			198000.00	966.00	982.76	983.65	0.001155	7.57	26168.85	2171.65	16.76	0.38	0.035	0.87
Reach-1	204.15	existing	235000.00			235000.00	966.00	983.89	984.94	0.001220	8.21	28639.23	2192.93	17.89	0.40	0.035	0.99
Reach-1	204.15	Alt3.5B	235000.00			235000.00	966.00	983.88	984.93	0.001222	8.21	28624.12	2192.79	17.88	0.40	0.035	0.99
Reach-1	204.15	Alt3.5D	235000.00			235000.00	966.00	983.88	984.93	0.001222	8.21	28624.25	2192.79	17.88	0.40	0.035	0.99
Reach-1	204.15	Alt3.5H	235000.00			235000.00	966.00	983.88	984.93	0.001222	8.21	28624.25	2192.79	17.88	0.40	0.035	0.99
Reach-1	204.25	existing	19500.00			19500.00	968.00	973.80	974.01	0.000976	3.63	5369.06	1179.69	5.80	0.30	0.035	0.28
Reach-1	204.25	Alt3.5B	19500.00			19500.00	968.00	973.80	974.01	0.000976	3.63	5368.27	1179.68	5.80	0.30	0.035	0.28
Reach-1	204.25	Alt3.5D	19500.00			19500.00	968.00	973.80	974.01	0.000976	3.63	5368.27	1179.68	5.80	0.30	0.035	0.28
Reach-1	204.25	Alt3.5H	19500.00			19500.00	968.00	973.80	974.01	0.000976	3.63	5368.27	1179.68	5.80	0.30	0.035	0.28
Reach-1	204.25	existing	49000.00	6.53		48993.47	968.00	976.67	977.16	0.001228	5.57	8804.12	1220.26	8.67	0.36	0.035	0.56
Reach-1	204.25	Alt3.5B	49000.00	6.51		48993.49	968.00	976.67	977.16	0.001229	5.57	8802.78	1220.24	8.67	0.36	0.035	0.56
Reach-1	204.25	Alt3.5D	49000.00	6.51		48993.49	968.00	976.67	977.16	0.001229	5.57	8802.93	1220.24	8.67	0.36	0.035	0.56
Reach-1	204.25	Alt3.5H	49000.00	6.51		48993.49	968.00	976.67	977.16	0.001229	5.57	8802.93	1220.24	8.67	0.36	0.035	0.56
Reach-1	204.25	existing	82000.00	118.15		81881.85	968.00	978.42	979.29	0.001704	7.50	10962.04	1259.08	10.42	0.44	0.035	0.94
Reach-1	204.25	Alt3.5B	82000.00	118.24		81881.76	968.00	978.42	979.29	0.001703	7.50	10963.20	1259.10	10.42	0.44	0.035	0.94
Reach-1	204.25	Alt3.5D	82000.00	118.25		81881.76	968.00	978.42	979.29	0.001703	7.50	10963.27	1259.10	10.42	0.44	0.035	0.94
Reach-1	204.25	Alt3.5H	82000.00	118.25		81881.76	968.00	978.42	979.29	0.001703	7.50	10963.27	1259.10	10.42	0.44	0.035	0.94
Reach-1	204.25	existing	130000.00	751.23		129248.77	968.00	980.70	981.94	0.002667	8.99	14555.99	1791.20	12.70	0.55	0.035	1.38
Reach-1	204.25	Alt3.5B	130000.00	749.21		129250.79	968.00	980.69	981.94	0.002672	8.99	14543.74	1790.01	12.69	0.55	0.035	1.38
Reach-1	204.25	Alt3.5D	130000.00	749.21		129250.79	968.00	980.69	981.94	0.002672	8.99	14543.74	1790.01	12.69	0.55	0.035	1.38
Reach-1	204.25	Alt3.5H	130000.00	749.21		129250.79	968.00	980.69	981.94	0.002672	8.99	14543.74	1790.01	12.69	0.55	0.035	1.38
Reach-1	204.25	existing	162000.00	1290.52		160709.48	968.00	981.96	983.37	0.003005	9.55	17109.19	2133.78	13.96	0.58	0.035	1.56
Reach-1	204.25	Alt3.5B	162000.00	1288.30		160711.70	968.00	981.95	983.36	0.003013	9.56	17091.36	2132.34	13.95	0.58	0.035	1.56
Reach-1	204.25	Alt3.5D	162000.00	1288.30		160711.70	968.00	981.95	983.36	0.003013	9.56	17091.36	2132.34	13.95	0.58	0.035	1.56
Reach-1	204.25	Alt3.5H	162000.00	1288.30		160711.70	968.00	981.95	983.36	0.003013	9.56	17091.36	2132.34	13.95	0.58	0.035	1.56
Reach-1	204.25	existing	198000.00	2331.47		195668.53	968.00	983.16	984.75	0.002906	10.14	19763.31	2230.00	15.16	0.58	0.035	1.69
Reach-1	204.25	Alt3.5B	198000.00	2325.38		195674.61	968.00	983.16	984.74	0.002914	10.15	19746.98	2229.94	15.16	0.58	0.035	1.70
Reach-1	204.25	Alt3.5D	198000.00	2325.38		195674.61	968.00	983.16	984.74	0.002914	10.15	19746.98	2229.94	15.16	0.58	0.035	1.70
Reach-1	204.25	Alt3.5H	198000.00	2325.38		195674.61	968.00	983.16	984.74	0.002914	10.15	19746.98	2229.94	15.16	0.58	0.035	1.70
Reach-1	204.25	existing	235000.00	3733.56		231266.44	968.00	984.29	986.05	0.002786	10.70	22297.15	2282.14	16.29	0.58	0.035	1.82
Reach-1	204.25	Alt3.5B	235000.00	3728.16		231271.83	968.00	984.29	986.04	0.002791	10.71	22283.50	2281.10	16.29	0.58	0.035	1.82
Reach-1	204.25	Alt3.5D	235000.00	3728.16		231271.83	968.00	984.29	986.04	0.002791	10.71	22283.50	2281.10	16.29	0.58	0.035	1.82
Reach-1	204.25	Alt3.5H	235000.00	3728.16		231271.83	968.00	984.29	986.04	0.002791	10.71	22283.50	2281.10	16.29	0.58	0.035	1.82
Reach-1	204.34	existing	19500.00			19500.00	969.30	974.55	975.20	0.008273	6.49	3004.51	1010.39	5.25	0.66	0.043	1.53
Reach-1	204.34	Alt3.5B	19500.00			19500.00	969.30	974.55	975.20	0.008275	6.49	3004.27	1010.39	5.25	0.66	0.043	1.53
Reach-1	204.34	Alt3.5D	19500.00			19500.00	969.30	974.55	975.20	0.008275	6.49	3004.27	1010.39	5.25	0.66	0.043	1.53
Reach-1	204.34	Alt3.5H	19500.00			19500.00	969.30	974.55	975.20	0.008275	6.49	3004.27	1010.39	5.25	0.66	0.043	1.53
Reach-1	204.34	existing	49000.00			49000.00	969.30	977.38	978.45	0.005708	8.30	5902.95	1036.83	8.08	0.61	0.043	2.02
Reach-1	204.34	Alt3.5B	49000.00			49000.00	969.30	977.38	978.45	0.005708	8.30	5902.25	1036.83	8.08	0.61	0.043	2.02
Reach-1	204.34	Alt3.5D	49000.00			49000.00	969.30	977.38	978.45	0.005708	8.30	5902.31	1036.83	8.08	0.61	0.043	2.02
Reach-1	204.34	Alt3.5H	49000.00			49000.00	969.30	977.38	978.45	0.005708	8.30	5902.31	1036.83	8.08	0.61	0.043	2.02
Reach-1	204.34	existing	82000.00			82000.00	969.30	979.45	981.00	0.007186	9.99	8211.19	1298.64	10.15	0.70	0.043	2.82
Reach-1	204.34	Alt3.5B	82000.00			82000.00	969.30	979.45	981.00	0.007185	9.99	8211.83	1298.75	10.15	0.70	0.043	2.82
Reach-1	204.34	Alt3.5D	82000.00			82000.00	969.30	979.45	981.00	0.007185	9.99	8211.99	1298.78	10.15	0.70	0.043	2.82

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Ch Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	204.34	Alt3.5H	82000.00			82000.00	969.30	979.45	981.00	0.007185	9.99	8211.99	1298.78	10.15	0.70	0.043	2.82
Reach-1	204.34	existing	130000.00			130000.00	969.30	982.43	983.99	0.006643	10.04	12952.62	1915.17	13.13	0.68	0.043	2.79
Reach-1	204.34	Alt3.5B	130000.00			130000.00	969.30	982.43	983.99	0.006652	10.04	12946.89	1915.09	13.13	0.68	0.043	2.79
Reach-1	204.34	Alt3.5D	130000.00			130000.00	969.30	982.43	983.99	0.006652	10.04	12946.89	1915.09	13.13	0.68	0.043	2.79
Reach-1	204.34	Alt3.5H	130000.00			130000.00	969.30	982.43	983.99	0.006652	10.04	12946.89	1915.09	13.13	0.68	0.043	2.79
Reach-1	204.34	existing	162000.00			162000.00	969.30	983.77	985.45	0.005915	10.39	15588.85	2004.24	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt3.5B	162000.00			162000.00	969.30	983.77	985.45	0.005922	10.40	15582.85	2004.17	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt3.5D	162000.00			162000.00	969.30	983.77	985.45	0.005922	10.40	15582.85	2004.17	14.47	0.66	0.043	2.86
Reach-1	204.34	Alt3.5H	162000.00			162000.00	969.30	983.77	985.45	0.005922	10.40	15582.85	2004.17	14.47	0.66	0.043	2.86
Reach-1	204.34	existing	198000.00			198000.00	969.30	984.87	986.79	0.005761	11.12	17799.60	2025.12	15.57	0.66	0.043	3.14
Reach-1	204.34	Alt3.5B	198000.00			198000.00	969.30	984.87	986.79	0.005767	11.13	17794.73	2025.11	15.57	0.66	0.043	3.14
Reach-1	204.34	Alt3.5D	198000.00			198000.00	969.30	984.87	986.79	0.005767	11.13	17794.73	2025.11	15.57	0.66	0.043	3.14
Reach-1	204.34	Alt3.5H	198000.00			198000.00	969.30	984.87	986.79	0.005767	11.13	17794.73	2025.11	15.57	0.66	0.043	3.14
Reach-1	204.34	existing	235000.00		0.01	235000.00	969.30	985.88	988.06	0.005669	11.84	19852.09	2031.37	16.58	0.67	0.043	3.43
Reach-1	204.34	Alt3.5B	235000.00		0.01	235000.00	969.30	985.88	988.06	0.005674	11.84	19847.13	2031.34	16.58	0.67	0.043	3.44
Reach-1	204.34	Alt3.5D	235000.00		0.01	235000.00	969.30	985.88	988.06	0.005674	11.84	19847.13	2031.34	16.58	0.67	0.043	3.44
Reach-1	204.34	Alt3.5H	235000.00		0.01	235000.00	969.30	985.88	988.06	0.005674	11.84	19847.13	2031.34	16.58	0.67	0.043	3.44
Reach-1	204.42	existing	19500.00			19500.00	971.40	976.84	977.17	0.002659	4.64	4201.30	997.04	5.44	0.40	0.043	0.70
Reach-1	204.42	Alt3.5B	19500.00			19500.00	971.40	976.84	977.17	0.002659	4.64	4201.30	997.04	5.44	0.40	0.043	0.70
Reach-1	204.42	Alt3.5D	19500.00			19500.00	971.40	976.84	977.17	0.002659	4.64	4201.30	997.04	5.44	0.40	0.043	0.70
Reach-1	204.42	Alt3.5H	19500.00			19500.00	971.40	976.84	977.17	0.002659	4.64	4201.30	997.04	5.44	0.40	0.043	0.70
Reach-1	204.42	existing	49000.00			49000.00	971.40	979.64	980.39	0.003294	6.95	7054.62	1073.01	8.24	0.48	0.043	1.35
Reach-1	204.42	Alt3.5B	49000.00			49000.00	971.40	979.64	980.39	0.003294	6.95	7054.56	1073.01	8.24	0.48	0.043	1.35
Reach-1	204.42	Alt3.5D	49000.00			49000.00	971.40	979.64	980.39	0.003294	6.95	7054.56	1073.01	8.24	0.48	0.043	1.35
Reach-1	204.42	Alt3.5H	49000.00			49000.00	971.40	979.64	980.39	0.003294	6.95	7054.56	1073.01	8.24	0.48	0.043	1.35
Reach-1	204.42	existing	82000.00	19.99		81980.02	971.40	982.50	983.41	0.003981	7.63	10758.82	1702.68	11.10	0.52	0.043	1.63
Reach-1	204.42	Alt3.5B	82000.00	19.99		81980.02	971.40	982.50	983.41	0.003981	7.63	10758.82	1702.68	11.10	0.52	0.043	1.63
Reach-1	204.42	Alt3.5D	82000.00	19.99		81980.01	971.40	982.50	983.41	0.003981	7.63	10758.92	1702.69	11.10	0.52	0.043	1.63
Reach-1	204.42	Alt3.5H	82000.00	19.99		81980.01	971.40	982.50	983.41	0.003981	7.63	10758.92	1702.69	11.10	0.52	0.043	1.63
Reach-1	204.42	existing	130000.00	1116.30		128883.70	971.40	984.95	986.12	0.003457	8.73	15084.56	1801.38	13.55	0.51	0.043	1.92
Reach-1	204.42	Alt3.5B	130000.00	1116.14		128883.85	971.40	984.94	986.12	0.003457	8.74	15084.12	1801.38	13.54	0.51	0.043	1.92
Reach-1	204.42	Alt3.5D	130000.00	1116.14		128883.85	971.40	984.94	986.12	0.003457	8.74	15084.12	1801.38	13.54	0.51	0.043	1.92
Reach-1	204.42	Alt3.5H	130000.00	1116.14		128883.85	971.40	984.94	986.12	0.003457	8.74	15084.12	1801.38	13.54	0.51	0.043	1.92
Reach-1	204.42	existing	162000.00	2274.98		159725.02	971.40	986.08	987.50	0.003567	9.60	17138.64	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt3.5B	162000.00	2274.66		159725.34	971.40	986.08	987.50	0.003567	9.60	17137.87	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt3.5D	162000.00	2274.66		159725.34	971.40	986.08	987.50	0.003567	9.60	17137.87	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	Alt3.5H	162000.00	2274.66		159725.34	971.40	986.08	987.50	0.003567	9.60	17137.87	1804.15	14.68	0.53	0.043	2.23
Reach-1	204.42	existing	198000.00	3726.24		194273.77	971.40	987.17	988.87	0.003757	10.54	19100.15	1806.79	15.77	0.56	0.043	2.60
Reach-1	204.42	Alt3.5B	198000.00	3725.84		194274.16	971.40	987.17	988.87	0.003758	10.54	19099.27	1806.79	15.77	0.56	0.043	2.60
Reach-1	204.42	Alt3.5D	198000.00	3725.84		194274.16	971.40	987.17	988.87	0.003758	10.54	19099.27	1806.79	15.77	0.56	0.043	2.60
Reach-1	204.42	Alt3.5H	198000.00	3725.84		194274.16	971.40	987.17	988.87	0.003758	10.54	19099.27	1806.79	15.77	0.56	0.043	2.60
Reach-1	204.42	existing	235000.00	5356.64		229643.36	971.40	988.18	990.17	0.003940	11.42	20922.29	1809.24	16.78	0.58	0.043	2.97
Reach-1	204.42	Alt3.5B	235000.00	5356.21		229643.78	971.40	988.18	990.17	0.003941	11.42	20921.41	1809.23	16.78	0.58	0.043	2.97
Reach-1	204.42	Alt3.5D	235000.00	5356.21		229643.78	971.40	988.18	990.17	0.003941	11.42	20921.41	1809.23	16.78	0.58	0.043	2.97
Reach-1	204.42	Alt3.5H	235000.00	5356.21		229643.78	971.40	988.18	990.17	0.003941	11.42	20921.41	1809.23	16.78	0.58	0.043	2.97
Reach-1	204.53	existing	19500.00			19500.00	972.70	978.28	978.55	0.002284	4.17	4677.85	1164.73	5.58	0.37	0.043	0.57
Reach-1	204.53	Alt3.5B	19500.00			19500.00	972.70	978.28	978.55	0.002284	4.17	4677.85	1164.73	5.58	0.37	0.043	0.57
Reach-1	204.53	Alt3.5D	19500.00			19500.00	972.70	978.28	978.55	0.002284	4.17	4677.85	1164.73	5.58	0.37	0.043	0.57
Reach-1	204.53	Alt3.5H	19500.00			19500.00	972.70	978.28	978.55	0.002284	4.17	4677.85	1164.73	5.58	0.37	0.043	0.57
Reach-1	204.53	existing	49000.00	41.81		48958.19	972.70	981.37	981.90	0.002200	5.84	8433.61	1319.98	8.67	0.39	0.043	0.94
Reach-1	204.53	Alt3.5B	49000.00	41.81		48958.19	972.70	981.37	981.90	0.002200	5.84	8433.61	1319.98	8.67	0.39	0.043	0.94
Reach-1	204.53	Alt3.5D	49000.00	41.81		48958.19	972.70	981.37	981.90	0.002200	5.84	8433.61	1319.98	8.67	0.39	0.043	0.94
Reach-1	204.53	Alt3.5H	49000.00	41.81		48958.19	972.70	981.37	981.90	0.002200	5.84	8433.61	1319.98	8.67	0.39	0.043	0.94
Reach-1	204.53	existing	82000.00	1797.93		80202.07	972.70	984.23	984.91	0.001903	6.69	12733.92	1647.79	11.53	0.39	0.043	1.11
Reach-1	204.53	Alt3.5B	82000.00	1797.93		80202.07	972.70	984.23	984.91	0.001903	6.69	12733.92	1647.79	11.53	0.39	0.043	1.11
Reach-1	204.53	Alt3.5D	82000.00	1797.93		80202.07	972.70	984.23	984.91	0.001903	6.69	12733.92	1647.79	11.53	0.39	0.043	1.11
Reach-1	204.53	Alt3.5H	82000.00	1797.93		80202.07	972.70	984.23	984.91	0.001903	6.69	12733.92	1647.79	11.53	0.39	0.043	1.11
Reach-1	204.53	existing	130000.00	7011.44		122988.57	972.70	986.64	987.63	0.002132	8.15	16728.17	1672.73	13.94	0.42	0.043	1.54

Table 4
Alternative 3.5 Hydraulic Pertinent Data

HEC-RAS River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Plan	Q Total	Q Left	Q Right	Q Channel	Min Ch El	W.S. Elev	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Max Chl Dpth	Froude # Chl	Mann Wtd Total	Shear Chan
			(cfs)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	(ft)			(lb/sq ft)
Reach-1	204.53	Alt3.5B	130000.00	7011.24		122988.77	972.70	986.64	987.63	0.002132	8.15	16727.96	1672.72	13.94	0.42	0.043	1.54
Reach-1	204.53	Alt3.5D	130000.00	7011.24		122988.77	972.70	986.64	987.63	0.002132	8.15	16727.96	1672.72	13.94	0.42	0.043	1.54
Reach-1	204.53	Alt3.5H	130000.00	7011.24		122988.77	972.70	986.64	987.63	0.002132	8.15	16727.96	1672.72	13.94	0.42	0.043	1.54
Reach-1	204.53	existing	162000.00	10990.28		151009.73	972.70	987.89	989.10	0.002299	9.03	18826.61	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3.5B	162000.00	10989.97		151010.03	972.70	987.89	989.10	0.002299	9.03	18826.30	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3.5D	162000.00	10989.97		151010.03	972.70	987.89	989.10	0.002299	9.03	18826.30	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	Alt3.5H	162000.00	10989.97		151010.03	972.70	987.89	989.10	0.002299	9.03	18826.30	1680.00	15.19	0.45	0.043	1.83
Reach-1	204.53	existing	198000.00	15742.76		182257.23	972.70	989.12	990.58	0.002469	9.94	20888.97	1680.00	16.42	0.47	0.043	2.15
Reach-1	204.53	Alt3.5B	198000.00	15742.44		182257.55	972.70	989.12	990.58	0.002469	9.94	20888.67	1680.00	16.42	0.47	0.043	2.15
Reach-1	204.53	Alt3.5D	198000.00	15742.44		182257.55	972.70	989.12	990.58	0.002469	9.94	20888.67	1680.00	16.42	0.47	0.043	2.15
Reach-1	204.53	Alt3.5H	198000.00	15742.44		182257.55	972.70	989.12	990.58	0.002469	9.94	20888.67	1680.00	16.42	0.47	0.043	2.15
Reach-1	204.53	existing	235000.00	20909.10		214090.91	972.70	990.26	991.98	0.002625	10.79	22810.66	1680.00	17.56	0.49	0.043	2.47
Reach-1	204.53	Alt3.5B	235000.00	20908.77		214091.23	972.70	990.26	991.98	0.002625	10.79	22810.35	1680.00	17.56	0.49	0.043	2.47
Reach-1	204.53	Alt3.5D	235000.00	20908.77		214091.23	972.70	990.26	991.98	0.002625	10.79	22810.35	1680.00	17.56	0.49	0.043	2.47
Reach-1	204.53	Alt3.5H	235000.00	20908.77		214091.23	972.70	990.26	991.98	0.002625	10.79	22810.35	1680.00	17.56	0.49	0.043	2.47

Table 5
Alternative 3 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (3B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 3B WSEL (ft)	Alternative 3D WSEL (ft)	Alternative 3F WSEL (ft)	Alternative 3G WSEL (ft)	Alternative 3H WSEL (ft)	Alternative 3I WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 3B w/o Levee WSEL (ft)	Alt. 3D w/ Levee WSEL (ft)	Alt. 3F w/o Levee w/o Lfill. WSEL (ft)	Alt. 3G w/ Levee w/o Lfill. WSEL (ft)	Alt. 3H Same as 3D diff. Levee alignmnt. WSEL (ft)	Alt. 3I Same as 3G diff. Levee alignmnt WSEL (ft)
195.16	900.6	900.6	915.58	915.58	915.58	915.58	915.58	915.58	915.58	915.58	915.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.19	900.7	900.7	915.85	915.85	915.85	915.85	915.85	915.85	915.85	915.85	915.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.28	901.3	901.3	916.97	916.97	916.97	916.97	916.97	916.97	916.97	916.97	916.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.38	902.1	902.1	917.55	917.55	917.55	917.55	917.55	917.55	917.55	917.55	917.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.47	902.1	902.1	918.01	918.01	918.01	918.01	918.01	918.01	918.01	918.01	918.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.56	901.4	901.4	918.52	918.52	918.52	918.52	918.52	918.52	918.52	918.52	918.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.66	903.1	903.1	919.13	919.13	919.13	919.13	919.13	919.13	919.13	919.13	919.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.75	903.4	903.4	919.52	919.52	919.52	919.52	919.52	919.52	919.52	919.52	919.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.85	904.5	904.5	920.12	920.12	920.12	920.12	920.12	920.12	920.12	920.12	920.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.94	904.5	904.5	921.27	921.27	921.27	921.27	921.27	921.27	921.27	921.27	921.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.04	904.5	904.5	922.6	922.6	922.6	922.6	922.6	922.6	922.6	922.6	922.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.13	904.9	904.9	922.96	922.96	922.96	922.96	922.96	922.96	922.96	922.96	922.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.23	906	906	923.2	923.2	923.2	923.2	923.2	923.2	923.2	923.2	923.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.32	906.2	906.2	923.55	923.55	923.55	923.55	923.55	923.55	923.55	923.55	923.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.42	907.3	907.3	923.84	923.84	923.84	923.87	923.87	923.87	923.87	923.87	923.87	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03
196.51	908.2	908.2	924.19	924.19	924.19	924.31	924.31	924.31	924.31	924.31	924.31	0.00	0.00	0.12	0.12	0.12	0.12	0.12	0.12
196.61	908.5	908.5	924.58	924.58	924.58	924.83	924.83	924.83	924.83	924.83	924.83	0.00	0.00	0.25	0.25	0.25	0.25	0.25	0.25
196.7	909.3	909.3	925.05	925.05	925.05	925.45	925.45	925.45	925.45	925.45	925.45	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40
196.79	910.7	910.2	925.48	925.48	925.48	926.07	926.07	926.07	926.07	926.07	926.07	0.00	0.00	0.59	0.59	0.59	0.59	0.59	0.59
196.88	910.8	910.2	926.21	926.21	926.21	926.88	926.88	926.88	926.88	926.88	926.88	0.00	0.00	0.67	0.67	0.67	0.67	0.67	0.67
196.98	911	911	927.07	927.07	927.07	927.5	927.5	927.5	927.5	927.5	927.5	0.00	0.00	0.43	0.43	0.43	0.43	0.43	0.43
197.07	913.2	913.2	927.65	927.65	927.65	927.98	927.98	927.98	927.98	927.98	927.98	0.00	0.00	0.33	0.33	0.33	0.33	0.33	0.33
197.16	913.4	912.2	928.1	928.06	928.08	928.55	928.53	928.55	928.53	928.54	928.54	-0.04	-0.02	0.45	0.43	0.45	0.43	0.44	0.44
197.26	913	912.2	928.69	928.82	928.74	929.3	929.66	929.3	929.66	929.44	929.44	0.13	0.05	0.61	0.97	0.61	0.97	0.75	0.75
197.35	914.2	912.5	929.57	930.1	929.72	929.95	930.64	929.95	930.64	930.18	930.18	0.53	0.15	0.38	1.07	0.38	1.07	0.61	0.61
197.45	915.6	912.5	930.4	931.33	930.72	930.28	931.1	930.28	931.1	930.57	930.57	0.93	0.32	-0.12	0.70	-0.12	0.70	0.17	0.17
197.54	916.1	912.5	931.06	932.1	931.5	930.59	931.41	930.59	931.41	930.89	930.89	1.04	0.44	-0.47	0.35	-0.47	0.35	-0.17	-0.17
197.64	918.2	918.2	931.72	932.93	932.34	931.25	932.21	931.25	932.21	931.71	931.71	1.21	0.62	-0.47	0.49	-0.47	0.49	-0.01	-0.01
197.74	919.1	918.8	932.48	933.75	933.23	932.08	933.11	932.08	933.11	932.68	932.68	1.27	0.75	-0.40	0.63	-0.40	0.63	0.20	0.20
197.83	919.6	918.8	933.27	934.47	934.01	932.95	933.91	932.95	933.91	933.55	933.55	1.20	0.74	-0.32	0.64	-0.32	0.64	0.28	0.28
197.92	920.6	920.6	933.98	935.1	934.69	933.74	934.63	933.74	934.63	934.32	934.32	1.12	0.71	-0.24	0.65	-0.24	0.65	0.34	0.34
198.02	922.8	916.4	934.7	935.73	935.36	934.56	935.41	934.51	935.39	935.13	935.1	1.03	0.66	-0.14	0.71	-0.19	0.69	0.43	0.40
198.11	922.4	916.4	935.74	936.7	936.28	935.73	936.58	935.29	936.13	936.21	935.8	0.96	0.54	-0.01	0.84	-0.45	0.39	0.47	0.06
198.2	918.8	916.4	936.99	938.16	937.56	937.13	938.48	936.23	937.14	937.69	936.73	1.17	0.57	0.14	1.49	-0.76	0.15	0.70	-0.26
198.26	918.7	918.7	937.5	938.84	938.06	937.62	939.14	936.4	937.35	938.2	936.9	1.34	0.56	0.12	1.64	-1.10	-0.15	0.70	-0.60
198.3	921.7	921.7	937.71	939.18	938.18	937.81	939.44	936.29	937.34	938.31	936.82	1.47	0.47	0.10	1.73	-1.42	-0.37	0.60	-0.89
198.34	922.7	915	938.84	940.15	939.3	938.99	940.47	936.83	937.7	939.54	937.27	1.31	0.46	0.15	1.63	-2.01	-1.14	0.70	-1.57
198.4	921.5	915.1	939.31	940.68	940	939.51	941.07	937.26	938.09	940.32	937.65	1.37	0.69	0.20	1.76	-2.05	-1.22	1.01	-1.66
198.49	921.9	915.3	939.86	941.26	940.7	940.04	941.66	937.81	938.56	941.03	938.18	1.40	0.84	0.18	1.80	-2.05	-1.30	1.17	-1.68
198.59	921.3	915.4	940.15	941.61	941.11	940.4	942.15	938.39	939.18	941.6	938.86	1.46	0.96	0.25	2.00	-1.76	-0.97	1.45	-1.29
198.66	921.5	915.6	940.36	941.89	941.43	940.74	942.74	939.14	940.19	942.26	939.97	1.53	1.07	0.38	2.38	-1.22	-0.17	1.90	-0.39
198.75	921.4	915.8	940.64	942.32	941.9	941.14	943.5	939.97	941.5	943.1	941.34	1.68	1.26	0.50	2.86	-0.67	0.86	2.46	0.70
198.85	922.3	916	940.89	942.66	942.28	941.61	944.15	940.75	942.5	943.81	942.37	1.77	1.39	0.72	3.26	-0.14	1.61	2.92	1.48
198.94	923.2	916.2	941.49	943.13	942.8	942.28	945	941.74	943.69	944.72	943.59	1.64	1.31	0.79	3.51	0.25	2.20	3.23	2.10
199.07	926.8	926.8	941.87	943.4	943.1	942.84	945.27	942.39	944.07	945.01	943.98	1.53	1.23	0.97	3.40	0.52	2.20	3.14	2.11
199.11	926.8	926.8	942.59	943.94	943.68	943.27	945.64	942.95	944.53	945.39	944.46	1.35	1.09	0.68	3.05	0.36	1.94	2.80	1.87
199.12	926.8	926.8	942.53	943.89	943.63	943.22	945.59	942.9	944.48	945.35	944.41	1.36	1.10	0.69	3.06	0.37	1.95	2.82	1.88
199.13	926.8	926.8	942.86	944.14	943.9	943.45	945.77	943.17	944.71	945.54	944.64	1.28	1.04	0.59	2.91	0.31	1.85	2.68	1.78
199.14	926.8	926.8	943.14	944.38	944.15	943.68	945.96	943.41	944.93	945.73	944.86	1.24	1.01	0.54	2.82	0.27	1.79	2.59	1.72
199.24	927.1	927.1	943.57	944.57	944.35	944.06	946.1	943.83	945.1	945.87	945.03	1.00	0.78	0.49	2.53	0.26	1.53	2.30	1.46
199.3	928.8	928.8	944	945.24	945.06	944.4	946.56	944.21	945.68	946.37	945.63	1.24	1.06	0.40	2.56	0.21	1.68	2.37	1.63
199.34	929.5	924	944.71	945.73	945.57	945.15	947.03	945.02	946.28	946.86	946.23	1.02	0.86	0.44	2.32	0.31	1.57	2.15	1.52
199.44	931.7	925	945.78	947.3	947.21	946.11	948.4	946.02	947.86	948.27	947.83	1.52	1.43	0.33	2.62	0.24	2.08	2.49	2.05

Table 5
Alternative 3 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (3B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 3B WSEL (ft)	Alternative 3D WSEL (ft)	Alternative 3F WSEL (ft)	Alternative 3G WSEL (ft)	Alternative 3H WSEL (ft)	Alternative 3I WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 3B w/o Levee WSEL (ft)	Alt. 3D w/ Levee WSEL (ft)	Alt. 3F w/o Levee w/o Lfill. WSEL (ft)	Alt. 3G w/ Levee w/o Lfill. WSEL (ft)	Alt 3H Same as 3D diff. Levee alignmnt. WSEL (ft)	Alt 3I Same as 3G diff. Levee alignmnt WSEL (ft)
199.53	932.7	926	946.73	948.53	948.47	946.8	949.17	946.73	948.73	949.07	948.71	1.80	1.74	0.07	2.44	0.00	2.00	2.34	1.98
199.63	930.9	927	947.8	950.11	950.07	947.78	950.53	947.75	950.24	950.46	950.22	2.31	2.27	-0.02	2.73	-0.05	2.44	2.66	2.42
199.72	930.6	928	948.69	951.06	951.03	948.94	951.79	948.93	951.57	951.73	951.55	2.37	2.34	0.25	3.10	0.24	2.88	3.04	2.86
199.82	931.2	929	949.47	951.93	951.9	949.67	952.51	949.65	952.33	952.47	952.32	2.46	2.43	0.20	3.04	0.18	2.86	3.00	2.85
199.91	932.1	932.1	950.3	952.86	952.84	950.39	953.21	950.38	953.06	953.17	953.05	2.56	2.54	0.09	2.91	0.08	2.76	2.87	2.75
200	933.4	933.4	950.78	953.23	953.21	950.82	953.53	950.81	953.38	953.49	953.37	2.45	2.43	0.04	2.75	0.03	2.60	2.71	2.59
200.1	934.5	934.5	951.29	953.62	953.6	951.35	953.89	951.35	953.75	953.85	953.75	2.33	2.31	0.06	2.60	0.06	2.46	2.56	2.46
200.2	937	937	952.48	954.47	954.45	952.17	954.43	952.17	954.31	954.4	954.31	1.99	1.97	-0.31	1.95	-0.31	1.83	1.92	1.83
200.3	937.7	937.4	953.37	955.18	955.17	953.19	955.18	953.19	955.09	955.15	955.08	1.81	1.80	-0.18	1.81	-0.18	1.72	1.78	1.71
200.39	937	937	954.36	955.96	955.95	953.91	955.68	953.91	955.6	955.66	955.6	1.60	1.59	-0.45	1.32	-0.45	1.24	1.30	1.24
200.49	936.9	936.9	954.87	956.35	956.34	954.56	956.13	954.55	956.06	956.12	956.06	1.48	1.47	-0.31	1.26	-0.32	1.19	1.25	1.19
200.58	937.6	937	955.49	956.84	956.83	955.74	957.02	955.74	956.97	957.01	956.97	1.35	1.34	0.25	1.53	0.25	1.48	1.52	1.48
200.67	939.8	937	956.32	957.47	957.46	956.68	957.85	956.68	957.81	957.84	957.81	1.15	1.14	0.36	1.53	0.36	1.49	1.52	1.49
200.77	936.9	936.9	957.03	958.08	958.07	957.2	958.29	957.2	958.25	958.28	958.25	1.05	1.04	0.17	1.26	0.17	1.22	1.25	1.22
200.86	938.5	937	957.68	958.63	958.63	957.86	958.9	957.86	958.87	958.89	958.87	0.95	0.95	0.18	1.22	0.18	1.19	1.21	1.19
200.95	939.8	937	958.19	959.11	959.11	958.4	959.38	958.4	959.35	959.38	959.35	0.92	0.92	0.21	1.19	0.21	1.16	1.19	1.16
201.05	941.5	937	958.65	959.51	959.51	958.88	959.79	958.88	959.76	959.78	959.76	0.86	0.86	0.23	1.14	0.23	1.11	1.13	1.11
201.14	940.4	940.4	959.08	959.88	959.87	959.25	960.09	959.25	960.07	960.08	960.07	0.80	0.79	0.17	1.01	0.17	0.99	1.00	0.99
201.24	943	939.6	959.73	960.44	960.44	959.9	960.63	959.9	960.6	960.62	960.6	0.71	0.71	0.17	0.90	0.17	0.87	0.89	0.87
201.33	943	939.6	960.3	960.92	960.92	960.37	961.01	960.37	961	961.01	960.99	0.62	0.62	0.07	0.71	0.07	0.70	0.71	0.69
201.43	941.3	939.6	961.02	961.53	961.53	960.83	961.41	960.83	961.39	961.41	961.39	0.51	0.51	-0.19	0.39	-0.19	0.37	0.39	0.37
201.52	940.9	939.6	961.74	962.14	962.14	961.38	961.88	961.38	961.86	961.87	961.86	0.40	0.40	-0.36	0.14	-0.36	0.12	0.13	0.12
201.62	945.6	939.6	962.35	962.68	962.68	961.86	962.29	961.86	962.28	962.29	962.28	0.33	0.33	-0.49	-0.06	-0.49	-0.07	-0.06	-0.07
201.71	946	946	962.95	963.21	963.21	962.24	962.63	962.24	962.61	962.62	962.61	0.26	0.26	-0.71	-0.32	-0.71	-0.34	-0.33	-0.34
201.81	946	946	963.57	963.78	963.78	963.12	963.4	963.12	963.39	963.39	963.39	0.21	0.21	-0.45	-0.17	-0.45	-0.18	-0.18	-0.18
201.9	947.2	947.2	963.87	964.06	964.06	963.62	963.85	963.62	963.85	963.85	963.85	0.19	0.19	-0.25	-0.02	-0.25	-0.02	-0.02	-0.02
201.99	948.7	948.7	964.24	964.42	964.42	964.11	964.31	964.11	964.3	964.31	964.3	0.18	0.18	-0.13	0.07	-0.13	0.06	0.07	0.06
202.09	950	950	965.02	965.15	965.15	965.06	965.19	965.06	965.18	965.19	965.18	0.13	0.13	0.04	0.17	0.04	0.16	0.17	0.16
202.18	950	950	966.35	966.5	966.5	966.36	966.43	966.36	966.43	966.43	966.43	0.15	0.15	0.01	0.08	0.01	0.08	0.08	0.08
202.29	955.5	955.5	967.14	967.25	967.25	967.15	967.2	967.15	967.19	967.2	967.19	0.11	0.11	0.01	0.06	0.01	0.05	0.06	0.05
202.37	954.6	949.5	967.47	967.57	967.57	967.53	967.57	967.53	967.57	967.57	967.57	0.10	0.10	0.06	0.10	0.06	0.10	0.10	0.10
202.48	952.5	949.8	968.35	968.43	968.43	968.49	968.52	968.49	968.51	968.51	968.51	0.08	0.08	0.14	0.17	0.14	0.16	0.16	0.16
202.59	953.7	950.2	969.22	969.28	969.28	969.36	969.38	969.36	969.38	969.38	969.38	0.06	0.06	0.14	0.16	0.14	0.16	0.16	0.16
202.69	953.7	950.6	970.13	970.17	970.17	970.25	970.27	970.25	970.27	970.27	970.27	0.04	0.04	0.12	0.14	0.12	0.14	0.14	0.14
202.8	956.4	951	970.96	970.98	970.98	971.04	971.05	971.04	971.05	971.05	971.05	0.02	0.02	0.08	0.09	0.08	0.09	0.09	0.09
202.9	956.5	951.4	971.61	971.63	971.63	971.72	971.73	971.72	971.73	971.73	971.73	0.02	0.02	0.11	0.12	0.11	0.12	0.12	0.12
202.99	959.2	951.8	972.23	972.25	972.25	972.43	972.44	972.43	972.44	972.44	972.44	0.02	0.02	0.20	0.21	0.20	0.21	0.21	0.21
203.09	958.7	952.2	973.17	973.18	973.18	973.43	973.44	973.43	973.44	973.44	973.44	0.01	0.01	0.26	0.27	0.26	0.27	0.27	0.27
203.19	956.7	956.7	974.29	974.29	974.29	974.46	974.46	974.46	974.46	974.46	974.46	0.00	0.00	0.17	0.17	0.17	0.17	0.17	0.17
203.29	960.7	960.7	975.14	975.15	975.15	975.26	975.26	975.26	975.26	975.26	975.26	0.01	0.01	0.12	0.12	0.12	0.12	0.12	0.12
203.39	959.9	954.4	975.84	975.84	975.84	976.05	976.05	976.05	976.05	976.05	976.05	0.00	0.00	0.21	0.21	0.21	0.21	0.21	0.21
203.48	962.2	957.9	976.49	976.49	976.49	976.79	976.79	976.79	976.79	976.79	976.79	0.00	0.00	0.30	0.30	0.30	0.30	0.30	0.30
203.58	962.1	962.1	977.02	977.02	977.02	977.31	977.31	977.31	977.31	977.31	977.31	0.00	0.00	0.29	0.29	0.29	0.29	0.29	0.29
203.67	962.3	962.3	977.47	977.47	977.47	977.73	977.73	977.73	977.73	977.73	977.73	0.00	0.00	0.26	0.26	0.26	0.26	0.26	0.26
203.77	963.3	963.3	977.95	977.95	977.95	978.17	978.17	978.17	978.17	978.17	978.17	0.00	0.00	0.22	0.22	0.22	0.22	0.22	0.22
203.86	962.3	962.3	978.34	978.34	978.34	978.53	978.53	978.53	978.53	978.53	978.53	0.00	0.00	0.19	0.19	0.19	0.19	0.19	0.19
203.96	964.1	964.1	978.52	978.52	978.52	978.7	978.7	978.7	978.7	978.7	978.7	0.00	0.00	0.18	0.18	0.18	0.18	0.18	0.18
204.05	965	965	980.54	980.54	980.54	980.59	980.59	980.59	980.59	980.59	980.59	0.00	0.00	0.05	0.05	0.05	0.05	0.05	0.05
204.15	966	966	981.57	981.57	981.57	981.61	981.61	981.61	981.61	981.61	981.61	0.00	0.00	0.04	0.04	0.04	0.04	0.04	0.04
204.25	968	968	981.96	981.96	981.96	981.99	981.99	981.99	981.99	981.99	981.99	0.00	0.00	0.03	0.03	0.03	0.03	0.03	0.03
204.34	969.3	969.3	983.77	983.77	983.77	983.78	983.78	983.78	983.78	983.78	983.78	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
204.42	971.4	971.4	986.08	986.08	986.08	986.09	986.09	986.09	986.09	986.09	986.09	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
204.53	972.7	972.7	987.89	987.89	987.89	987.89	987.89	987.89	987.89	987.89	987.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 6
Alternative 4 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (4B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 4B WSEL (ft)	Alternative 4D WSEL (ft)	Alternative 4F WSEL (ft)	Alternative 4G WSEL (ft)	Alternative 4H WSEL (ft)	Alternative 4I WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 4B w/o Levee WSEL (ft)	Alt. 4D w/ Levee WSEL (ft)	Alt. 4F w/o Levee w/o Lfill. WSEL (ft)	Alt. 4G w/ Levee w/o Lfill. WSEL (ft)	Alt. 4H Same as 3D diff. Levee alignmnt. WSEL (ft)	Alt. 4I Same as 3G diff. Levee alignmnt WSEL (ft)
195.16	900.6	900.6	915.58	915.58	915.58	915.58	915.58	915.58	915.58	915.58	915.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.19	900.7	900.7	915.85	915.85	915.85	915.85	915.85	915.85	915.85	915.85	915.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.28	901.3	901.3	916.97	916.97	916.97	916.97	916.97	916.97	916.97	916.97	916.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.38	902.1	902.1	917.55	917.55	917.55	917.55	917.55	917.55	917.55	917.55	917.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.47	902.1	902.1	918.01	918.01	918.01	918.01	918.01	918.01	918.01	918.01	918.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.56	901.4	901.4	918.52	918.52	918.52	918.52	918.52	918.52	918.52	918.52	918.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.66	903.1	903.1	919.13	919.13	919.13	919.13	919.13	919.13	919.13	919.13	919.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.75	903.4	903.4	919.52	919.52	919.52	919.52	919.52	919.52	919.52	919.52	919.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.85	904.5	904.5	920.12	920.12	920.12	920.12	920.12	920.12	920.12	920.12	920.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
195.94	904.5	904.5	921.27	921.27	921.27	921.27	921.27	921.27	921.27	921.27	921.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.04	904.5	904.5	922.6	922.6	922.6	922.6	922.6	922.6	922.6	922.6	922.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.13	904.9	904.9	922.96	922.96	922.96	922.96	922.96	922.96	922.96	922.96	922.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.23	906	906	923.2	923.2	923.2	923.2	923.2	923.2	923.2	923.2	923.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.32	906.2	906.2	923.55	923.55	923.55	923.55	923.55	923.55	923.55	923.55	923.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.42	907.3	906.3	923.84	923.84	923.84	923.84	923.84	923.84	923.84	923.84	923.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
196.51	908.2	907.6	924.19	924.19	924.19	924.18	924.18	924.18	924.18	924.18	924.18	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
196.61	908.5	905	924.58	924.58	924.58	924.67	924.67	924.67	924.67	924.67	924.67	0.00	0.00	0.09	0.09	0.09	0.09	0.09	0.09
196.7	909.3	906	925.05	925.05	925.05	925.29	925.29	925.29	925.29	925.29	925.29	0.00	0.00	0.24	0.24	0.24	0.24	0.24	0.24
196.79	910.7	909	925.48	925.48	925.48	925.88	925.88	925.88	925.88	925.88	925.88	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40
196.88	910.8	910.8	926.21	926.21	926.21	926.83	926.83	926.83	926.83	926.83	926.83	0.00	0.00	0.62	0.62	0.62	0.62	0.62	0.62
196.98	911	905	927.07	927.07	927.07	927.43	927.43	927.43	927.43	927.43	927.43	0.00	0.00	0.36	0.36	0.36	0.36	0.36	0.36
197.07	913.2	905.4	927.65	927.65	927.65	927.86	927.86	927.86	927.86	927.86	927.86	0.00	0.00	0.21	0.21	0.21	0.21	0.21	0.21
197.16	913.4	906	928.1	928.06	928.08	928.18	928.13	928.18	928.13	928.16	928.16	-0.04	-0.02	0.08	0.03	0.08	0.03	0.06	0.06
197.26	913	906.5	928.69	928.82	928.74	928.66	928.74	928.66	928.74	928.69	928.69	0.13	0.05	-0.03	0.05	-0.03	0.05	0.00	0.00
197.35	914.2	907	929.57	930.1	929.72	929.42	929.8	929.42	929.8	929.53	929.53	0.53	0.15	-0.15	0.23	-0.15	0.23	-0.04	-0.04
197.45	915.6	907.5	930.4	931.33	930.72	930.12	930.82	930.12	930.82	930.35	930.35	0.93	0.32	-0.28	0.42	-0.28	0.42	-0.05	-0.05
197.54	916.1	907.9	931.06	932.1	931.5	930.8	931.66	930.8	931.66	931.17	931.17	1.04	0.44	-0.26	0.60	-0.26	0.60	0.11	0.11
197.64	918.2	911.5	931.72	932.93	932.34	931.49	932.53	931.49	932.53	932.04	932.04	1.21	0.62	-0.23	0.81	-0.23	0.81	0.32	0.32
197.74	919.1	912.5	932.48	933.75	933.23	932.2	933.31	932.2	933.31	932.86	932.86	1.27	0.75	-0.28	0.83	-0.28	0.83	0.38	0.38
197.83	919.6	913.5	933.27	934.47	934.01	932.95	933.99	932.95	933.99	933.6	933.6	1.20	0.74	-0.32	0.72	-0.32	0.72	0.33	0.33
197.92	920.6	914.2	933.98	935.1	934.69	933.65	934.61	933.65	934.61	934.26	934.26	1.12	0.71	-0.33	0.63	-0.33	0.63	0.28	0.28
198.02	922.8	916.4	934.7	935.73	935.36	934.41	935.28	934.22	935.14	934.98	934.81	1.03	0.66	-0.29	0.58	-0.48	0.44	0.28	0.11
198.11	922.4	916.9	935.74	936.7	936.28	935.53	936.33	934.69	935.56	935.98	935.23	0.96	0.54	-0.21	0.59	-1.05	-0.18	0.24	-0.51
198.2	918.8	917.4	936.99	938.16	937.56	936.78	937.76	935.22	936.03	937.28	935.72	1.17	0.57	-0.21	0.77	-1.77	-0.96	0.29	-1.27
198.26	918.7	918	937.5	938.84	938.06	937.29	938.43	935.4	936.2	937.78	935.89	1.34	0.56	-0.21	0.93	-2.10	-1.30	0.28	-1.61
198.3	921.7	921.7	937.71	939.18	938.18	937.49	938.78	935.29	936.17	937.89	935.8	1.47	0.47	-0.22	1.07	-2.42	-1.54	0.18	-1.91
198.34	922.7	916.3	938.84	940.15	939.3	938.89	940.07	936	936.67	939.39	936.36	1.31	0.46	0.05	1.23	-2.84	-2.17	0.55	-2.48
198.4	921.5	916.8	939.31	940.68	940	939.46	940.76	936.61	937.2	940.23	936.93	1.37	0.69	0.15	1.45	-2.70	-2.11	0.92	-2.38
198.49	921.9	917.4	939.86	941.26	940.7	939.99	941.4	937.29	937.81	940.96	937.59	1.40	0.84	0.13	1.54	-2.57	-2.05	1.10	-2.27
198.59	921.3	918	940.15	941.61	941.11	940.35	941.9	937.98	938.5	941.52	938.33	1.46	0.96	0.20	1.75	-2.17	-1.65	1.37	-1.82
198.66	921.5	918.5	940.36	941.89	941.43	940.57	942.25	938.52	939.17	941.89	939.03	1.53	1.07	0.21	1.89	-1.84	-1.19	1.53	-1.33
198.75	921.4	919	940.64	942.32	941.9	940.8	942.6	939.11	939.91	942.27	939.79	1.68	1.26	0.16	1.96	-1.53	-0.73	1.63	-0.85
198.85	922.3	919.5	940.89	942.66	942.28	941.02	942.89	939.6	940.49	942.59	940.39	1.77	1.39	0.13	2.00	-1.29	-0.40	1.70	-0.50
198.94	923.2	920	941.49	943.13	942.8	941.71	943.53	940.88	941.65	943.28	941.58	1.64	1.31	0.22	2.04	-0.61	0.16	1.79	0.09
199.07	926.8	926.8	941.87	943.4	943.1	942.41	943.95	941.77	942.35	943.73	942.29	1.53	1.23	0.54	2.08	-0.10	0.48	1.86	0.42
199.11	926.8	926.8	942.59	943.94	943.68	942.96	944.43	942.52	943.05	944.23	943.01	1.35	1.09	0.37	1.84	-0.07	0.46	1.64	0.42
199.12	926.8	926.8	942.53	943.89	943.63	942.9	944.38	942.47	943	944.18	942.96	1.36	1.10	0.37	1.85	-0.06	0.47	1.65	0.43
199.13	926.8	926.8	942.86	944.14	943.9	943.18	944.61	942.81	943.31	944.42	943.27	1.28	1.04	0.32	1.75	-0.05	0.45	1.56	0.41
199.14	926.8	926.8	943.14	944.38	944.15	943.41	944.83	943.09	943.58	944.65	943.54	1.24	1.01	0.27	1.69	-0.05	0.44	1.51	0.40
199.24	927.1	927.1	943.57	944.57	944.35	943.83	945	943.53	943.81	944.83	943.78	1.00	0.78	0.26	1.43	-0.04	0.24	1.26	0.21
199.3	928.8	928.8	944	945.24	945.06	944.21	945.61	943.97	944.63	945.46	944.6	1.24	1.06	0.21	1.61	-0.03	0.63	1.46	0.60
199.34	929.5	923.8	944.71	945.73	945.57	944.83	946.12	944.64	945.28	945.99	945.26	1.02	0.86	0.12	1.41	-0.07	0.57	1.28	0.55
199.44	931.7	925.6	945.78	947.3	947.21	945.78	947.28	945.66	946.69	947.18	946.67	1.52	1.43	0.00	1.50	-0.12	0.91	1.40	0.89
199.53	932.7	927.5	946.73	948.53	948.47	946.47	948.07	946.38	947.61	947.99	947.59	1.80	1.74	-0.26	1.34	-0.35	0.88	1.26	0.86
199.63	930.9	928.6	947.8	950.11	950.07	946.99	948.63	946.93	948.23	948.57	948.22	2.31	2.27	-0.81	0.83	-0.87	0.43	0.77	0.42

Table 6
Alternative 4 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (4B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 4B WSEL (ft)	Alternative 4D WSEL (ft)	Alternative 4F WSEL (ft)	Alternative 4G WSEL (ft)	Alternative 4H WSEL (ft)	Alternative 4I WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 4B w/o Levee WSEL (ft)	Alt. 4D w/ Levee WSEL (ft)	Alt. 4F w/o Levee w/o Lfill. WSEL (ft)	Alt. 4G w/ Levee w/o Lfill. WSEL (ft)	Alt. 4H Same as 3D diff. Levee alignmnt. WSEL (ft)	Alt. 4I Same as 3G diff. Levee alignmnt WSEL (ft)
199.72	930.6	930.4	948.69	951.06	951.03	947.75	949.38	947.7	949.05	949.32	949.05	2.37	2.34	-0.94	0.69	-0.99	0.36	0.63	0.36
199.82	931.2	930.4	949.47	951.93	951.9	948.61	950.28	948.57	950.03	950.23	950.02	2.46	2.43	-0.86	0.81	-0.90	0.56	0.76	0.55
199.91	932.1	930.4	950.3	952.86	952.84	949.08	950.79	949.06	950.56	950.75	950.56	2.56	2.54	-1.22	0.49	-1.24	0.26	0.45	0.26
200	933.4	930.4	950.78	953.23	953.21	949.38	951.03	949.36	950.82	950.99	950.81	2.45	2.43	-1.40	0.25	-1.42	0.04	0.21	0.03
200.1	934.5	930.4	951.29	953.62	953.6	949.84	951.4	949.82	951.21	951.37	951.21	2.33	2.31	-1.45	0.11	-1.47	-0.08	0.08	-0.08
200.2	937	932	952.48	954.47	954.45	950.67	952.08	950.66	951.92	952.05	951.91	1.99	1.97	-1.81	-0.40	-1.82	-0.56	-0.43	-0.57
200.3	937.7	932	953.37	955.18	955.17	951.48	952.78	951.47	952.65	952.76	952.65	1.81	1.80	-1.89	-0.59	-1.90	-0.72	-0.61	-0.72
200.39	937	932	954.36	955.96	955.95	952.11	953.26	952.1	953.14	953.24	953.14	1.60	1.59	-2.25	-1.10	-2.26	-1.22	-1.12	-1.22
200.49	936.9	932	954.87	956.35	956.34	952.53	953.59	952.52	953.49	953.58	953.48	1.48	1.47	-2.34	-1.28	-2.35	-1.38	-1.29	-1.39
200.58	937.6	932	955.49	956.84	956.83	953.09	954.03	953.08	953.93	954.01	953.93	1.35	1.34	-2.40	-1.46	-2.41	-1.56	-1.48	-1.56
200.67	939.8	932	956.32	957.47	957.46	953.92	954.69	953.91	954.6	954.67	954.6	1.15	1.14	-2.40	-1.63	-2.41	-1.72	-1.65	-1.72
200.77	936.9	934.7	957.03	958.08	958.07	955.23	955.74	955.23	955.68	955.73	955.68	1.05	1.04	-1.80	-1.29	-1.80	-1.35	-1.30	-1.35
200.86	938.5	934.9	957.68	958.63	958.63	956.36	956.74	956.36	956.7	956.73	956.7	0.95	0.95	-1.32	-0.94	-1.32	-0.98	-0.95	-0.98
200.95	939.8	935.2	958.19	959.11	959.11	956.74	957.1	956.74	957.07	957.1	957.07	0.92	0.92	-1.45	-1.09	-1.45	-1.12	-1.09	-1.12
201.05	941.5	935.4	958.65	959.51	959.51	957.08	957.42	957.08	957.38	957.41	957.38	0.86	0.86	-1.57	-1.23	-1.57	-1.27	-1.24	-1.27
201.14	940.4	936.4	959.08	959.88	959.87	957.45	957.76	957.45	957.73	957.76	957.73	0.80	0.79	-1.63	-1.32	-1.63	-1.35	-1.32	-1.35
201.24	943	937.8	959.73	960.44	960.44	957.95	958.22	957.95	958.19	958.21	958.19	0.71	0.71	-1.78	-1.51	-1.78	-1.54	-1.52	-1.54
201.33	943	938	960.3	960.92	960.92	958.43	958.67	958.43	958.64	958.66	958.64	0.62	0.62	-1.87	-1.63	-1.87	-1.66	-1.64	-1.66
201.43	941.3	938	961.02	961.53	961.53	958.76	958.98	958.76	958.95	958.97	958.95	0.51	0.51	-2.26	-2.04	-2.26	-2.07	-2.05	-2.07
201.52	940.9	938	961.74	962.14	962.14	959.1	959.29	959.1	959.27	959.29	959.27	0.40	0.40	-2.64	-2.45	-2.64	-2.47	-2.45	-2.47
201.62	945.6	938	962.35	962.68	962.68	959.42	959.6	959.42	959.58	959.6	959.58	0.33	0.33	-2.93	-2.75	-2.93	-2.77	-2.75	-2.77
201.71	946	943.6	962.95	963.21	963.21	959.74	959.91	959.74	959.89	959.9	959.89	0.26	0.26	-3.21	-3.04	-3.21	-3.06	-3.05	-3.06
201.81	946	944.8	963.57	963.78	963.78	961.16	961.24	961.16	961.23	961.24	961.23	0.21	0.21	-2.41	-2.33	-2.41	-2.34	-2.33	-2.34
201.9	947.2	946	963.87	964.06	964.06	961.75	961.81	961.75	961.81	961.81	961.81	0.19	0.19	-2.12	-2.06	-2.12	-2.06	-2.06	-2.06
201.99	948.7	948.7	964.24	964.42	964.42	962.45	962.5	962.45	962.5	962.5	962.5	0.18	0.18	-1.79	-1.74	-1.79	-1.74	-1.74	-1.74
202.09	950	950	965.02	965.15	965.15	963.96	963.98	963.96	963.98	963.98	963.98	0.13	0.13	-1.06	-1.04	-1.06	-1.04	-1.04	-1.04
202.18	950	950	966.35	966.5	966.5	965.96	965.97	965.96	965.97	965.97	965.97	0.15	0.15	-0.39	-0.38	-0.39	-0.38	-0.38	-0.38
202.29	955.5	955.5	967.14	967.25	967.25	966.87	966.87	966.87	966.87	966.87	966.87	0.11	0.11	-0.27	-0.27	-0.27	-0.27	-0.27	-0.27
202.37	954.6	954.6	967.47	967.57	967.57	967.23	967.23	967.23	967.23	967.23	967.23	0.10	0.10	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24
202.48	952.5	952.5	968.35	968.43	968.43	968.19	968.19	968.19	968.19	968.19	968.19	0.08	0.08	-0.16	-0.16	-0.16	-0.16	-0.16	-0.16
202.59	953.7	953.7	969.22	969.28	969.28	969.11	969.12	969.11	969.12	969.12	969.12	0.06	0.06	-0.11	-0.10	-0.11	-0.10	-0.10	-0.10
202.69	953.7	953.7	970.13	970.17	970.17	970.06	970.06	970.06	970.06	970.06	970.06	0.04	0.04	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
202.8	956.4	956.4	970.96	970.98	970.98	970.91	970.91	970.91	970.91	970.91	970.91	0.02	0.02	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
202.9	956.5	956.5	971.61	971.63	971.63	971.57	971.57	971.57	971.57	971.57	971.57	0.02	0.02	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
202.99	959.2	959.2	972.23	972.25	972.25	972.2	972.2	972.2	972.2	972.2	972.2	0.02	0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
203.09	958.7	958.7	973.17	973.18	973.18	973.15	973.15	973.15	973.15	973.15	973.15	0.01	0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
203.19	956.7	956.7	974.29	974.29	974.29	974.28	974.28	974.28	974.28	974.28	974.28	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
203.29	960.7	960.7	975.14	975.15	975.15	975.13	975.13	975.13	975.13	975.13	975.13	0.01	0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
203.39	959.9	959.9	975.84	975.84	975.84	975.83	975.83	975.83	975.83	975.83	975.83	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
203.48	962.2	962.2	976.49	976.49	976.49	976.48	976.48	976.48	976.48	976.48	976.48	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
203.58	962.1	962.1	977.02	977.02	977.02	977.01	977.01	977.01	977.01	977.01	977.01	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
203.67	962.3	962.3	977.47	977.47	977.47	977.47	977.47	977.47	977.47	977.47	977.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
203.77	963.3	963.3	977.95	977.95	977.95	977.95	977.95	977.95	977.95	977.95	977.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
203.86	962.3	962.3	978.34	978.34	978.34	978.34	978.34	978.34	978.34	978.34	978.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
203.96	964.1	964.1	978.52	978.52	978.52	978.51	978.51	978.51	978.51	978.51	978.51	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
204.05	965	965	980.54	980.54	980.54	980.54	980.54	980.54	980.54	980.54	980.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204.15	966	966	981.57	981.57	981.57	981.57	981.57	981.57	981.57	981.57	981.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204.25	968	968	981.96	981.96	981.96	981.96	981.96	981.96	981.96	981.96	981.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204.34	969.3	969.3	983.77	983.77	983.77	983.77	983.77	983.77	983.77	983.77	983.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204.42	971.4	971.4	986.08	986.08	986.08	986.08	986.08	986.08	986.08	986.08	986.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
204.53	972.7	972.7	987.89	987.89	987.89	987.89	987.89	987.89	987.89	987.89	987.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7
Alternative 3.5 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (3.5B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 3.5B WSEL (ft)	Alternative 3.5D WSEL (ft)	Alternative 3.5H WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 3.5B w/o Levee WSEL (ft)	Alt. 3.5D w/ Levee WSEL (ft)	Alt. 3.5H w/ Levee WSEL (ft)
195.16	900.6	900.6	915.58	915.58	915.58	915.58	915.58	915.58	0.00	0.00	0.00	0.00	0.00
195.19	900.7	900.7	915.85	915.85	915.85	915.85	915.85	915.85	0.00	0.00	0.00	0.00	0.00
195.28	901.3	901.3	916.97	916.97	916.97	916.97	916.97	916.97	0.00	0.00	0.00	0.00	0.00
195.38	902.1	902.1	917.55	917.55	917.55	917.55	917.55	917.55	0.00	0.00	0.00	0.00	0.00
195.47	902.1	902.1	918.01	918.01	918.01	918.01	918.01	918.01	0.00	0.00	0.00	0.00	0.00
195.56	901.4	901.4	918.52	918.52	918.52	918.52	918.52	918.52	0.00	0.00	0.00	0.00	0.00
195.66	903.1	903.1	919.13	919.13	919.13	919.13	919.13	919.13	0.00	0.00	0.00	0.00	0.00
195.75	903.4	903.4	919.52	919.52	919.52	919.52	919.52	919.52	0.00	0.00	0.00	0.00	0.00
195.85	904.5	904.5	920.12	920.12	920.12	920.12	920.12	920.12	0.00	0.00	0.00	0.00	0.00
195.94	904.5	904.5	921.27	921.27	921.27	921.27	921.27	921.27	0.00	0.00	0.00	0.00	0.00
196.04	904.5	904.5	922.6	922.6	922.6	922.6	922.6	922.6	0.00	0.00	0.00	0.00	0.00
196.13	904.9	904.9	922.96	922.96	922.96	922.96	922.96	922.96	0.00	0.00	0.00	0.00	0.00
196.23	906	906	923.2	923.2	923.2	923.2	923.2	923.2	0.00	0.00	0.00	0.00	0.00
196.32	906.2	906.2	923.55	923.55	923.55	923.55	923.55	923.55	0.00	0.00	0.00	0.00	0.00
196.42	907.3	907.3	923.84	923.84	923.84	923.79	923.79	923.79	0.00	0.00	-0.05	-0.05	-0.05
196.51	908.2	908.2	924.19	924.19	924.19	924.11	924.11	924.11	0.00	0.00	-0.08	-0.08	-0.08
196.61	908.5	908.5	924.58	924.58	924.58	924.44	924.44	924.44	0.00	0.00	-0.14	-0.14	-0.14
196.7	909.3	909.3	925.05	925.05	925.05	924.72	924.72	924.72	0.00	0.00	-0.33	-0.33	-0.33
196.79	910.7	909.4	925.48	925.48	925.48	925	925	925	0.00	0.00	-0.48	-0.48	-0.48
196.88	910.8	909.2	926.21	926.21	926.21	925.39	925.39	925.39	0.00	0.00	-0.82	-0.82	-0.82
196.98	911	909.4	927.07	927.07	927.07	925.86	925.86	925.86	0.00	0.00	-1.21	-1.21	-1.21
197.07	913.2	913.2	927.65	927.65	927.65	926.28	926.28	926.28	0.00	0.00	-1.37	-1.37	-1.37
197.16	913.4	909.7	928.1	928.06	928.08	926.98	926.94	926.97	-0.04	-0.02	-1.12	-1.16	-1.13
197.26	913	909.7	928.69	928.82	928.74	927.46	927.47	927.46	0.13	0.05	-1.23	-1.22	-1.23
197.35	914.2	909.7	929.57	930.1	929.72	927.99	928.06	928.02	0.53	0.15	-1.58	-1.51	-1.55
197.45	915.6	909.7	930.4	931.33	930.72	928.38	928.58	928.43	0.93	0.32	-2.02	-1.82	-1.97
197.54	916.1	914.4	931.06	932.1	931.5	928.82	928.99	928.85	1.04	0.44	-2.24	-2.07	-2.21
197.64	918.2	914.4	931.72	932.93	932.34	929.63	929.93	929.79	1.21	0.62	-2.09	-1.79	-1.93
197.74	919.1	914.4	932.48	933.75	933.23	930.31	930.02	930.54	1.27	0.75	-2.17	-2.46	-1.94
197.83	919.6	914.4	933.27	934.47	934.01	931.06	934.27	931.26	1.20	0.74	-2.21	1.00	-2.01
197.92	920.6	917	933.98	935.1	934.69	932	934.6	932.16	1.12	0.71	-1.98	0.62	-1.82
198.02	922.8	915.8	934.7	935.73	935.36	933.48	935.25	933.67	1.03	0.66	-1.22	0.55	-1.03
198.11	922.4	915.8	935.74	936.7	936.28	934.59	935.92	934.77	0.96	0.54	-1.15	0.18	-0.97
198.2	918.8	915.8	936.99	938.16	937.56	935.83	936.87	936.07	1.17	0.57	-1.16	-0.12	-0.92
198.26	918.7	915.8	937.5	938.84	938.06	936.31	937.35	936.56	1.34	0.56	-1.19	-0.15	-0.94
198.3	921.7	918	937.71	939.18	938.18	936.28	937.49	936.51	1.47	0.47	-1.43	-0.22	-1.20
198.34	922.7	916.2	938.84	940.15	939.3	938.77	939.43	939.1	1.31	0.46	-0.07	0.59	0.26
198.4	921.5	917	939.31	940.68	940	939.25	940.12	939.86	1.37	0.69	-0.06	0.81	0.55
198.49	921.9	917.2	939.86	941.26	940.7	939.78	940.75	940.54	1.40	0.84	-0.08	0.89	0.68
198.59	921.3	918	940.15	941.61	941.11	940.17	941.3	941.12	1.46	0.96	0.02	1.15	0.97
198.66	921.5	918.3	940.36	941.89	941.43	940.41	941.7	941.54	1.53	1.07	0.05	1.34	1.18
198.75	921.4	919	940.64	942.32	941.9	940.76	942.28	942.14	1.68	1.26	0.12	1.64	1.50
198.85	922.3	920	940.89	942.66	942.28	941.31	943.13	943.02	1.77	1.39	0.42	2.24	2.13
198.94	923.2	920.2	941.49	943.13	942.8	941.87	943.75	943.65	1.64	1.31	0.38	2.26	2.16
199.07	926.8	921	941.87	943.4	943.1	942.21	943.98	943.88	1.53	1.23	0.34	2.11	2.01
199.11	926.8	926.8	942.59	943.94	943.68	942.71	944.38	944.3	1.35	1.09	0.12	1.79	1.71
199.12	926.8	926.8	942.53	943.89	943.63	942.65	944.33	944.25	1.36	1.10	0.12	1.80	1.72
199.13	926.8	926.8	942.86	944.14	943.9	942.96	944.56	944.48	1.28	1.04	0.10	1.70	1.62
199.14	926.8	926.8	943.14	944.38	944.15	943.21	944.79	944.71	1.24	1.01	0.07	1.65	1.57
199.24	927.1	927.1	943.57	944.57	944.35	943.66	944.96	944.89	1.00	0.78	0.09	1.39	1.32
199.3	928.8	928.8	944	945.24	945.06	944.07	945.57	945.51	1.24	1.06	0.07	1.57	1.51
199.34	929.5	924.9	944.71	945.73	945.57	944.62	946.04	945.98	1.02	0.86	-0.09	1.33	1.27
199.44	931.7	925.4	945.78	947.3	947.21	945.19	946.68	946.63	1.52	1.43	-0.59	0.90	0.85
199.53	932.7	926	946.73	948.53	948.47	945.7	947.17	947.12	1.80	1.74	-1.03	0.44	0.39
199.63	930.9	926.2	947.8	950.11	950.07	946.28	947.74	947.7	2.31	2.27	-1.52	-0.06	-0.10

Table 7
Alternative 3.5 100-Year Event Water Surface Comparison

Station (miles)	Existing Minimum Elevation (ft)	With Proj (3.5B) Minimum Elevation (ft)	Existing WSEL (ft)	Levee 1 w/o Proj WSEL (ft)	Levee 2 w/o Proj WSEL (ft)	Alternative 3.5B WSEL (ft)	Alternative 3.5D WSEL (ft)	Alternative 3.5H WSEL (ft)	Levee 1 w/o Proj w/ Levee WSEL (ft)	Levee 2 w/o Proj w/ Levee WSEL (ft)	Alt. 3.5B w/o Levee WSEL (ft)	Alt. 3.5D w/ Levee WSEL (ft)	Alt. 3.5H w/ Levee WSEL (ft)
199.72	930.6	926.2	948.69	951.06	951.03	946.68	948.11	948.07	2.37	2.34	-2.01	-0.58	-0.62
199.82	931.2	926.2	949.47	951.93	951.9	947.15	948.48	948.45	2.46	2.43	-2.32	-0.99	-1.02
199.91	932.1	926.2	950.3	952.86	952.84	946.89	947.4	947.37	2.56	2.54	-3.41	-2.90	-2.93
200	933.4	933.4	950.78	953.23	953.21	946.92	949.47	949.45	2.45	2.43	-3.86	-1.31	-1.33
200.1	934.5	934.5	951.29	953.62	953.6	949.39	950.48	950.46	2.33	2.31	-1.90	-0.81	-0.83
200.2	937	937	952.48	954.47	954.45	950.79	951.6	951.59	1.99	1.97	-1.69	-0.88	-0.89
200.3	937.7	937.6	953.37	955.18	955.17	951.87	952.68	952.67	1.81	1.80	-1.50	-0.69	-0.70
200.39	937	937	954.36	955.96	955.95	952.58	953.27	953.27	1.60	1.59	-1.78	-1.09	-1.09
200.49	936.9	936.9	954.87	956.35	956.34	953.11	953.74	953.73	1.48	1.47	-1.76	-1.13	-1.14
200.58	937.6	937.6	955.49	956.84	956.83	954.07	954.56	954.56	1.35	1.34	-1.42	-0.93	-0.93
200.67	939.8	938.1	956.32	957.47	957.46	954.62	955.05	955.05	1.15	1.14	-1.70	-1.27	-1.27
200.77	936.9	936.9	957.03	958.08	958.07	955.23	955.59	955.58	1.05	1.04	-1.80	-1.44	-1.45
200.86	938.5	938.1	957.68	958.63	958.63	955.67	955.99	955.98	0.95	0.95	-2.01	-1.69	-1.70
200.95	939.8	938.1	958.19	959.11	959.11	956.14	956.42	956.42	0.92	0.92	-2.05	-1.77	-1.77
201.05	941.5	938.1	958.65	959.51	959.51	956.59	956.84	956.84	0.86	0.86	-2.06	-1.81	-1.81
201.14	940.4	940.4	959.08	959.88	959.87	956.98	957.2	957.19	0.80	0.79	-2.10	-1.88	-1.89
201.24	943	940.9	959.73	960.44	960.44	958.19	958.32	958.32	0.71	0.71	-1.54	-1.41	-1.41
201.33	943	940.9	960.3	960.92	960.92	958.58	958.7	958.7	0.62	0.62	-1.72	-1.60	-1.60
201.43	941.3	940.9	961.02	961.53	961.53	959.05	959.16	959.15	0.51	0.51	-1.97	-1.86	-1.87
201.52	940.9	940.9	961.74	962.14	962.14	959.33	959.42	959.42	0.40	0.40	-2.41	-2.32	-2.32
201.62	945.6	940.9	962.35	962.68	962.68	959.62	959.71	959.71	0.33	0.33	-2.73	-2.64	-2.64
201.71	946	940.9	962.95	963.21	963.21	960.03	960.11	960.11	0.26	0.26	-2.92	-2.84	-2.84
201.81	946	946	963.57	963.78	963.78	961.05	961.1	961.1	0.21	0.21	-2.52	-2.47	-2.47
201.9	947.2	947.2	963.87	964.06	964.06	961.59	961.63	961.63	0.19	0.19	-2.28	-2.24	-2.24
201.99	948.7	948.6	964.24	964.42	964.42	962.15	962.19	962.19	0.18	0.18	-2.09	-2.05	-2.05
202.09	950	950	965.02	965.15	965.15	963.11	963.13	963.13	0.13	0.13	-1.91	-1.89	-1.89
202.18	950	950	966.35	966.5	966.5	965.83	965.83	965.83	0.15	0.15	-0.52	-0.52	-0.52
202.29	955.5	955.5	967.14	967.25	967.25	966.78	966.78	966.78	0.11	0.11	-0.36	-0.36	-0.36
202.37	954.6	954.6	967.47	967.57	967.57	967.16	967.16	967.16	0.10	0.10	-0.31	-0.31	-0.31
202.48	952.5	952.5	968.35	968.43	968.43	968.14	968.14	968.14	0.08	0.08	-0.21	-0.21	-0.21
202.59	953.7	953.7	969.22	969.28	969.28	969.08	969.08	969.08	0.06	0.06	-0.14	-0.14	-0.14
202.69	953.7	953.7	970.13	970.17	970.17	970.04	970.04	970.04	0.04	0.04	-0.09	-0.09	-0.09
202.8	956.4	956.4	970.96	970.98	970.98	970.89	970.89	970.89	0.02	0.02	-0.07	-0.07	-0.07
202.9	956.5	956.5	971.61	971.63	971.63	971.56	971.56	971.56	0.02	0.02	-0.05	-0.05	-0.05
202.99	959.2	959.2	972.23	972.25	972.25	972.19	972.19	972.19	0.02	0.02	-0.04	-0.04	-0.04
203.09	958.7	955.8	973.17	973.18	973.18	973.22	973.22	973.22	0.01	0.01	0.05	0.05	0.05
203.19	956.7	956.5	974.29	974.29	974.29	974.36	974.36	974.36	0.00	0.00	0.07	0.07	0.07
203.29	960.7	957.3	975.14	975.15	975.15	975.15	975.15	975.15	0.01	0.01	0.01	0.01	0.01
203.39	959.9	958.1	975.84	975.84	975.84	975.81	975.81	975.81	0.00	0.00	-0.03	-0.03	-0.03
203.48	962.2	958.8	976.49	976.49	976.49	976.45	976.45	976.45	0.00	0.00	-0.04	-0.04	-0.04
203.58	962.1	962.1	977.02	977.02	977.02	976.91	976.91	976.91	0.00	0.00	-0.11	-0.11	-0.11
203.67	962.3	962.3	977.47	977.47	977.47	977.38	977.38	977.38	0.00	0.00	-0.09	-0.09	-0.09
203.77	963.3	963.3	977.95	977.95	977.95	977.88	977.88	977.88	0.00	0.00	-0.07	-0.07	-0.07
203.86	962.3	962.3	978.34	978.34	978.34	978.28	978.28	978.28	0.00	0.00	-0.06	-0.06	-0.06
203.96	964.1	964.1	978.52	978.52	978.52	978.45	978.45	978.45	0.00	0.00	-0.07	-0.07	-0.07
204.05	965	965	980.54	980.54	980.54	980.52	980.52	980.52	0.00	0.00	-0.02	-0.02	-0.02
204.15	966	966	981.57	981.57	981.57	981.56	981.56	981.56	0.00	0.00	-0.01	-0.01	-0.01
204.25	968	968	981.96	981.96	981.96	981.95	981.95	981.95	0.00	0.00	-0.01	-0.01	-0.01
204.34	969.3	969.3	983.77	983.77	983.77	983.77	983.77	983.77	0.00	0.00	0.00	0.00	0.00
204.42	971.4	971.4	986.08	986.08	986.08	986.08	986.08	986.08	0.00	0.00	0.00	0.00	0.00
204.53	972.7	972.7	987.89	987.89	987.89	987.89	987.89	987.89	0.00	0.00	0.00	0.00	0.00

Table 8
Stage-Uncertainty Values for 100-Year Discharge

HEC Reference Cross-Section	Alternative	Ibed	Abasin (sq mi)	Q100 (cfs)	Hrange (ft)	Snatural (ft)	Smodel (ft)	Stotal (ft)
203.48	3B	3	13000	162000	18.89	0.53	0.90	1.0
	3D	3	13000	162000	18.89	0.53	0.90	1.0
Transition Reach	3F	3	13000	162000	18.89	0.53	0.90	1.0
75th Avenue to 83rd Avenue	3G	3	13000	162000	18.89	0.53	0.90	1.0
	3H	3	13000	162000	18.89	0.53	0.90	1.0
	3I	3	13000	162000	18.89	0.53	0.90	1.0
	4B	3	13000	162000	14.28	0.45	0.90	1.0
	4D	3	13000	162000	14.28	0.45	0.90	1.0
	4F	3	13000	162000	14.28	0.45	0.90	1.0
	4G	3	13000	162000	14.28	0.45	0.90	1.0
	4H	3	13000	162000	14.28	0.45	0.90	1.0
	4I	3	13000	162000	14.28	0.45	0.90	1.0
	3.5B	3	13000	162000	17.65	0.51	0.90	1.0
	3.5D	3	13000	162000	17.65	0.51	0.90	1.0
	3.5H	3	13000	162000	17.65	0.51	0.90	1.0
202.69	3B	3	13000	162000	19.65	0.54	0.90	1.1
	3D	3	13000	162000	19.67	0.54	0.90	1.1
Reach 1	3F	3	13000	162000	19.65	0.54	0.90	1.1
83rd Avenue to 91st Avenue	3G	3	13000	162000	19.67	0.54	0.90	1.1
	3H	3	13000	162000	19.67	0.54	0.90	1.1
	3I	3	13000	162000	19.67	0.54	0.90	1.1
	4B	3	13000	162000	16.36	0.49	0.90	1.0
	4D	3	13000	162000	16.36	0.49	0.90	1.0
	4F	3	13000	162000	16.36	0.49	0.90	1.0
	4G	3	13000	162000	16.36	0.49	0.90	1.0
	4H	3	13000	162000	16.36	0.49	0.90	1.0
	4I	3	13000	162000	16.36	0.49	0.90	1.0
	3.5B	3	13000	162000	16.34	0.49	0.90	1.0
	3.5D	3	13000	162000	16.34	0.49	0.90	1.0
	3.5H	3	13000	162000	16.34	0.49	0.90	1.0
201.81	3B	3	13000	162000	17.12	0.50	0.90	1.0
	3D	3	13000	162000	17.40	0.51	0.90	1.0
Reach 2	3F	3	13000	162000	17.12	0.50	0.90	1.0
91st Avenue to 99th Avenue	3G	3	13000	162000	17.39	0.51	0.90	1.0
	3H	3	13000	162000	17.39	0.51	0.90	1.0
	3I	3	13000	162000	17.39	0.51	0.90	1.0
	4B	3	13000	162000	16.36	0.49	0.90	1.0
	4D	3	13000	162000	16.44	0.49	0.90	1.0
	4F	3	13000	162000	16.36	0.49	0.90	1.0
	4G	3	13000	162000	16.43	0.49	0.90	1.0
	4H	3	13000	162000	16.44	0.49	0.90	1.0
	4I	3	13000	162000	16.43	0.49	0.90	1.0
	3.5B	3	13000	162000	15.12	0.47	0.90	1.0
	3.5D	3	13000	162000	15.10	0.47	0.90	1.0
	3.5H	3	13000	162000	15.10	0.47	0.90	1.0
200.77	3B	3	39700	227000	20.30	0.58	0.90	1.1
	3D	3	39700	227000	21.39	0.60	0.90	1.1
Reach 3	3F	3	39700	227000	20.30	0.58	0.90	1.1
99th Avenue to 107th Avenue	3G	3	39700	227000	21.35	0.60	0.90	1.1
	3H	3	39700	227000	21.38	0.60	0.90	1.1
	3I	3	39700	227000	21.35	0.60	0.90	1.1
	4B	3	39700	227000	20.53	0.59	0.90	1.1
	4D	3	39700	227000	21.04	0.60	0.90	1.1
	4F	3	39700	227000	20.53	0.59	0.90	1.1
	4G	3	39700	227000	20.98	0.60	0.90	1.1
	4H	3	39700	227000	21.03	0.60	0.90	1.1
	4I	3	39700	227000	20.98	0.60	0.90	1.1
	3.5B	3	39700	227000	18.33	0.55	0.90	1.1
	3.5D	3	39700	227000	18.69	0.56	0.90	1.1
	3.5H	3	39700	227000	18.68	0.56	0.90	1.1

Table 8
Stage-Uncertainty Values for 100-Year Discharge

HEC Reference Cross-Section	Alternative	Ibed	Abasin (sq mi)	Q100 (cfs)	Hrange (ft)	Snatural (ft)	Smodel (ft)	Stotal (ft)
199.82	3B	3	39700	227000	20.67	0.59	0.90	1.1
	3D	3	39700	227000	23.51	0.64	0.90	1.1
Reach 4	3F	3	39700	227000	20.65	0.59	0.90	1.1
107th Avenue to 115th Avenue	3G	3	39700	227000	23.33	0.64	0.90	1.1
	3H	3	39700	227000	23.47	0.64	0.90	1.1
	3I	3	39700	227000	23.32	0.64	0.90	1.1
	4B	3	39700	227000	18.21	0.55	0.90	1.1
	4D	3	39700	227000	19.88	0.58	0.90	1.1
	4F	3	39700	227000	18.17	0.55	0.90	1.1
	4G	3	39700	227000	19.63	0.57	0.90	1.1
	4H	3	39700	227000	19.83	0.58	0.90	1.1
	4I	3	39700	227000	19.62	0.57	0.90	1.1
	3.5B	3	39700	227000	20.95	0.60	0.90	1.1
	3.5D	3	39700	227000	22.28	0.62	0.90	1.1
	3.5H	3	39700	227000	22.25	0.62	0.90	1.1
198.75	3B	3	39700	227000	25.34	0.68	0.90	1.1
	3D	3	39700	227000	27.70	0.73	0.90	1.2
Reach 5	3F	3	39700	227000	24.17	0.66	0.90	1.1
115th Avenue to El Mirage Rd.	3G	3	39700	227000	25.70	0.69	0.90	1.1
	3H	3	39700	227000	27.30	0.72	0.90	1.2
	3I	3	39700	227000	25.54	0.68	0.90	1.1
	4B	3	39700	227000	21.80	0.61	0.90	1.1
	4D	3	39700	227000	23.60	0.65	0.90	1.1
	4F	3	39700	227000	20.11	0.58	0.90	1.1
	4G	3	39700	227000	20.91	0.60	0.90	1.1
	4H	3	39700	227000	23.27	0.64	0.90	1.1
	4I	3	39700	227000	20.79	0.59	0.90	1.1
	3.5B	3	39700	227000	21.76	0.61	0.90	1.1
	3.5D	3	39700	227000	23.28	0.64	0.90	1.1
	3.5H	3	39700	227000	23.14	0.64	0.90	1.1
197.74	3B	3	39700	227000	13.28	0.46	0.90	1.0
	3D	3	39700	227000	14.31	0.48	0.90	1.0
Reach 6	3F	3	39700	227000	13.28	0.46	0.90	1.0
El Mirage Rd. to Dysart Rd.	3G	3	39700	227000	14.31	0.48	0.90	1.0
	3H	3	39700	227000	13.88	0.47	0.90	1.0
	3I	3	39700	227000	13.88	0.47	0.90	1.0
	4B	3	39700	227000	19.70	0.57	0.90	1.1
	4D	3	39700	227000	20.81	0.59	0.90	1.1
	4F	3	39700	227000	19.70	0.57	0.90	1.1
	4G	3	39700	227000	20.81	0.59	0.90	1.1
	4H	3	39700	227000	20.36	0.59	0.90	1.1
	4I	3	39700	227000	20.36	0.59	0.90	1.1
	3.5B	3	39700	227000	15.91	0.51	0.90	1.0
	3.5D	3	39700	227000	15.62	0.50	0.90	1.0
	3.5H	3	39700	227000	16.14	0.51	0.90	1.0
196.88	3B	3	39700	227000	16.68	0.52	0.90	1.0
	3D	3	39700	227000	16.68	0.52	0.90	1.0
Reach 7	3F	3	39700	227000	16.68	0.52	0.90	1.0
Dysart Rd. to Bullard Avenue	3G	3	39700	227000	16.68	0.52	0.90	1.0
	3H	3	39700	227000	16.68	0.52	0.90	1.0
	3I	3	39700	227000	16.68	0.52	0.90	1.0
	4B	3	39700	227000	16.03	0.51	0.90	1.0
	4D	3	39700	227000	16.03	0.51	0.90	1.0
	4F	3	39700	227000	16.03	0.51	0.90	1.0
	4G	3	39700	227000	16.03	0.51	0.90	1.0
	4H	3	39700	227000	16.03	0.51	0.90	1.0
	4H	3	39700	227000	16.03	0.51	0.90	1.0
	3.5B	3	39700	227000	16.19	0.51	0.90	1.0
	3.5D	3	39700	227000	16.19	0.51	0.90	1.0
	3.5H	3	39700	227000	16.19	0.51	0.90	1.0

Table 9
Minimum Levee Elevations for Alternatives 3 and 4

HEC-RAS Reference Cross-Section	W/O Project, W/ Levee 100-Year Computed WS Elevation (ft)	W/O Project, W/ Levee Minimum Levee Elevation (ft)	Alternative 3D 100-Year Computed WS Elevation (ft)	Alternative 3D Minimum Levee Elevation (ft)	Alternative 4D 100-Year Computed WS Elevation (ft)	Alternative 4D Minimum Levee Elevation (ft)
203.48	976.49	no levee	976.79	no levee	976.48	no levee
202.69	970.17	no levee	970.27	no levee	970.06	no levee
201.81	963.78	967.28	963.40	966.90	961.24	964.74
200.77	958.08	961.47	958.29	961.68	955.74	959.13
199.82	951.92	955.20	952.51	955.79	950.28	953.56
198.75	942.23	945.39	943.50	946.66	942.60	945.76
197.74	933.76	936.81	933.11	936.16	933.31	936.36
196.88	926.23	no levee	926.88	no levee	926.83	no levee

Notes:

1. The proposed levee extends from Station 197.26 to 201.81. Per FEMA criteria, the freeboard at Station 201.81 is 3.5 ft and tapers down to 3.0 ft at Station 197.26. The minimum levee elevation in the table is based on this criteria.
2. Per FEMA criteria, 4 ft of freeboard is needed 100 ft upstream and downstream of bridges. This is not shown in this table but is included in the cost calculations.

Table 10
Minimum Levee Elevations for Alternative 3.5

HEC-RAS Reference Cross-Section	Alternative 3.5D 50-Year Computed WS Elevation (ft)	Alternative 3.5D Minimum Levee Elevation (ft) (2)	Alternative 3.5D 100-Year Computed WS Elevation (ft)	Alternative 3.5D Minimum Levee Elevation (ft) (3)	Alternative 3.5D 500-Year Computed WS Elevation (ft)	Alternative 3.5D Minimum Levee Elevation (ft) (4)	Alternative 3.5H 50-Year Computed WS Elevation (ft)	Alternative 3.5H Minimum Levee Elevation (ft) (2)	Alternative 3.5H 100-Year Computed WS Elevation (ft)	Alternative 3.5H Minimum Levee Elevation (ft) (3)	Alternative 3.5H 500-Year Computed WS Elevation (ft)	Alternative 3.5H Minimum Levee Elevation (ft) (4)
203.48	975.28	no levee	976.45	no levee	978.62	no levee	975.28	no levee	976.45	no levee	978.62	no levee
202.69	968.98	no levee	970.04	no levee	972.09	no levee	968.98	no levee	970.04	no levee	972.09	no levee
201.81	959.86	959.86	961.10	963.10	963.16	963.16	959.86	959.86	961.10	963.10	963.15	963.15
200.77	954.16	954.16	955.59	957.79	957.46	957.46	954.16	954.16	955.58	957.78	957.44	957.44
199.82	946.83	946.83	948.48	950.68	950.55	950.55	946.82	946.82	948.45	950.65	950.47	950.47
198.75	940.90	940.90	942.28	944.48	943.99	943.99	940.85	940.85	942.14	944.34	943.65	943.65
197.74	928.82	928.82	930.02	932.02	931.15	931.15	929.37	929.37	930.54	932.54	931.95	931.95
196.88	924.03	no levee	925.39	no levee	927.13	no levee	924.03	no levee	925.39	no levee	927.13	no levee

Notes:

1. The proposed levee extends from Station 197.26 to 201.81.
2. The minimum levee elevation for the 50-year levee is based on a 50% confidence levee height. This elevation corresponds to the computed water surface elevation.
3. The minimum levee elevation for the 100-year levee is based on a 95% confidence levee height. This elevation corresponds to the computed water surface elevation plus two standard deviations of error.
4. The minimum levee elevation for the 500-year levee is based on a 50% confidence levee height. This elevation corresponds to the computed water surface elevation.

Table 11

INTERIOR DRAINAGE: HYDROLOGIC ESTIMATES FOR TRES RIOS LEVEES. NNA/14July1999

LOCATION

	99th Avenue	107th Avenue	115th Avenue	El Mirage Road	Dysart Road
Drainage Area, sq mi	1.5	1	0.25	0.35	0.25
100-yr Peak Discharge, cfs	1000	700	200	280	200
100-yr Volume, ac-ft	100	60	15	20	15

Notes: data (peak and volume estimates) based upon Figures 3-1, 3-3 from Appendix A, Rio Salado Feasibility Report, April 1998.
Suggestion: to size detention basin/impoundment area consider reducing the 100-yr volume by the capacity of the selected drain in cfs. E.G., the impoundment area for the interior drainage to 99th Avenue could be 50 ac-ft if a 50 cfs pipe were selected. As the pipe capacity approaches the peak flow rate less impounded area would be necessary, of course. However, this total will be a non-zero number in order to provide sufficient head to drive the water. For the above data the tailwater is considered to be non-existent or negligible.

Table 12
Operation and Maintenance Requirements
Frequency of Excavation

(1) Alternative	(2) Average Annual Sediment Accumulation In Study Area (cy)	(3) Volume of Excavation for Open Water/ Marsh (cy)	(4) Volume of Excavation for Cottonwood Willow Corridor (cy)	(5) Sum of (3) and (4) (cy)	(6) Frequency of Excavation (5) / (2) (years)
3	50,041	782,000	281,700	1,063,700	21.3
4	50,041	1,261,000	161,813	1,422,813	28.4
3.5	50,041	2,920,000	588,300	3,508,300	70.1

Notes:
1. Average annual sediment accumulation in study area estimate based on existing conditions HEC-6 model from Without Project Hydraulic and Sedimentation Analysis, WEST Consultants, Inc., 1998, San Diego, California.
2. Volume of excavation for environmental features based on Design/Cost Appendix, Tres Rios Feasibility Study, 1999.

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
204.53	162000	987.89	1.25	2.2	991.34	991.8	0.46
204.42	130000	984.94					
204.42	162000	986.08	1.14	2.2	989.42	989.53	0.11
204.34	130000	982.43					
204.34	162000	983.77	1.34	2.2	987.31	987.3	-0.01
204.25	130000	980.69					
204.25	162000	981.95	1.26	2.2	985.41	985.86	0.45
204.15	130000	980.38					
204.15	162000	981.56	1.18	2.2	984.94	985.42	0.48
204.05	130000	979.43					
204.05	162000	980.52	1.09	2.2	983.81	984.06	0.25
203.96	130000	977.21					
203.96	162000	978.45	1.24	2.2	981.89	982.33	0.44
203.86	130000	977.06					
203.86	162000	978.28	1.22	2.2	981.7	982.05	0.35
203.77	130000	976.68					
203.77	162000	977.88	1.2	2.2	981.28	981.57	0.29
203.67	130000	976.2					
203.67	162000	977.38	1.18	2.2	980.76	981.01	0.25
203.58	130000	975.75					
203.58	162000	976.91	1.16	2.2	980.27	980.46	0.19
203.48	**130000**	**975.28**					
203.48	**162000**	**976.45**	**1.17**	**2.2**	**979.82**	**980.01**	**0.19**
203.39	130000	974.65					
203.39	162000	975.81	1.16	2.2	979.17	979.34	0.17
203.29	130000	974.02					
203.29	162000	975.15	1.13	2.2	978.48	978.69	0.21
203.19	130000	973.22					
203.19	162000	974.36	1.14	2.2	977.7	977.99	0.29
203.09	130000	972.11					
203.09	162000	973.22	1.11	2.2	976.53	976.77	0.24
202.99	130000	971.08					
202.99	162000	972.19	1.11	2.2	975.5	975.72	0.22
202.9	130000	970.46					
202.9	162000	971.56	1.1	2.2	974.86	975.01	0.15
202.8	130000	969.81					
202.8	162000	970.89	1.08	2.2	974.17	974.29	0.12
202.69	**130000**	**968.98**					
202.69	**162000**	**970.04**	**1.06**	**2.2**	**973.3**	**973.37**	**0.07**
202.59	130000	968.05					
202.59	162000	969.08	1.03	2.2	972.31	972.37	0.06

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
202.48	130000	967.15					
202.48	162000	968.14	0.99	2.2	971.33	971.37	0.04
202.37	130000	966.19					
202.37	162000	967.16	0.97	2.2	970.33	970.29	-0.04
202.29	130000	965.84					
202.29	162000	966.78	0.94	2.2	969.92	969.86	-0.06
202.18	130000	964.95					
202.18	162000	965.83	0.88	2.2	968.91	968.77	-0.14
202.09	130000	961.79					
202.09	162000	963.13	1.34	2.2	966.67	966.82	0.15
201.99	130000	960.93					
201.99	162000	962.19	1.26	2.2	965.65	965.88	0.23
201.9	130000	960.38					
201.9	162000	961.63	1.25	2.2	965.08	965.27	0.19
201.81	**130000**	**959.86**					
201.81	**162000**	**961.1**	**1.24**	**2.2**	**964.54**	**964.65**	**0.11**
201.71	130000	958.75					
201.71	162000	960.11	1.36	2.2	963.67	963.75	0.08
201.62	130000	958.35					
201.62	162000	959.71	1.36	2.2	963.27	963.3	0.03
201.52	130000	958.08					
201.52	162000	959.42	1.34	2.2	962.96	962.94	-0.02
201.43	130000	957.83					
201.43	162000	959.16	1.33	2.2	962.69	962.57	-0.12
201.33	130000	957.39					
201.33	162000	958.7	1.31	2.2	962.21	961.96	-0.25
201.24	130000	957.02					
201.24	162000	958.32	1.3	2.2	961.82	961.45	-0.37
201.14	185000	955.84					
201.14	227000	957.2	1.36	2.2	960.76	960.59	-0.17
201.05	185000	955.45					
201.05	227000	956.84	1.39	2.2	960.43	960.3	-0.13
200.95	185000	955.02					
200.95	227000	956.42	1.4	2.2	960.02	959.92	-0.1
200.86	185000	954.57					
200.86	227000	955.99	1.42	2.2	959.61	959.54	-0.07
200.77	**185000**	**954.16**					
200.77	**227000**	**955.59**	**1.43**	**2.2**	**959.22**	**959.18**	**-0.04**
200.67	185000	953.62					
200.67	227000	955.05	1.43	2.2	958.68	958.7	0.02

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
200.58	185000	953.13					
200.58	227000	954.56	1.43	2.2	958.19	958.26	0.07
200.49	185000	952.24					
200.49	227000	953.74	1.5	2.2	957.44	957.57	0.13
200.39	185000	951.76					
200.39	227000	953.27	1.51	2.2	956.98	957.17	0.19
200.3	185000	951.15					
200.3	227000	952.68	1.53	2.2	956.41	956.62	0.21
200.2	185000	950					
200.2	227000	951.6	1.6	2.2	955.4	955.73	0.33
200.1	185000	948.78					
200.1	227000	950.48	1.7	2.2	954.38	954.76	0.38
200	185000	947.47					
200	227000	949.47	2	2.2	953.67	954.09	0.42
199.91	185000	946.06					
199.91	227000	947.4	1.34	2.2	950.94	950.45	-0.49
199.82	185000	946.83					
199.82	227000	948.48	1.65	2.2	952.33	952.33	0
199.72	185000	946.45					
199.72	227000	948.11	1.66	2.2	951.97	951.97	0
199.63	185000	946.09					
199.63	227000	947.74	1.65	2.2	951.59	951.59	0
199.53	185000	945.51					
199.53	227000	947.17	1.66	2.2	951.03	951.03	0
199.44	185000	945.04					
199.44	227000	946.68	1.64	2.2	950.52	950.53	0.01
199.34	185000	944.43					
199.34	227000	946.04	1.61	2.2	949.85	949.83	-0.02
199.3	185000	943.98					
199.3	227000	945.57	1.59	2.2	949.36	949.3	-0.06
199.24	185000	943.38					
199.24	227000	944.96	1.58	2.2	948.74	948.65	-0.09
199.14	185000	943.22					
199.14	227000	944.79	1.57	2.2	948.56	948.46	-0.1
199.13	185000	943.04					
199.13	227000	944.56	1.52	2.2	948.28	948.1	-0.18
199.125 Bridge							
199.12	185000	942.84					
199.12	227000	944.33	1.49	2.2	948.02	947.78	-0.24
199.11	185000	942.87					
199.11	227000	944.38	1.51	2.2	948.09	947.88	-0.21

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
199.07	185000	942.51					
199.07	227000	943.98	1.47	2.2	947.65	947.35	-0.3
198.94	185000	942.28					
198.94	227000	943.75	1.47	2.2	947.42	947.16	-0.26
198.85	185000	941.7					
198.85	227000	943.13	1.43	2.2	946.76	946.47	-0.29
198.75	**185000**	**940.9**					
198.75	**227000**	**942.28**	**1.38**	**2.2**	**945.86**	**945.48**	**-0.38**
198.66	185000	940.39					
198.66	227000	941.7	1.31	2.2	945.21	944.77	-0.44
198.59	185000	940.02					
198.59	227000	941.3	1.28	2.2	944.78	944.3	-0.48
198.49	185000	939.51					
198.49	227000	940.75	1.24	2.2	944.19	943.67	-0.52
198.4	185000	938.93					
198.4	227000	940.12	1.19	2.2	943.51	942.96	-0.55
198.34	185000	938.26					
198.34	227000	939.43	1.17	2.2	942.8	942.23	-0.57
198.3	185000	936.19					
198.3	227000	937.49	1.3	2.2	940.99	940.45	-0.54
198.26	185000	936.07					
198.26	227000	937.35	1.28	2.2	940.83	940.28	-0.55
198.2	185000	935.61					
198.2	227000	936.87	1.26	2.2	940.33	939.76	-0.57
198.11	185000	934.67					
198.11	227000	935.92	1.25	2.2	939.37	938.81	-0.56
198.02	185000	933.99					
198.02	227000	935.25	1.26	2.2	938.71	938.17	-0.54
197.92	185000	933.32					
197.92	227000	934.6	1.28	2.2	938.08	937.57	-0.51
197.83	185000	932.98					
197.83	227000	934.27	1.29	2.2	937.76	937.22	-0.54
197.74	**185000**	**928.82**					
197.74	**227000**	**930.02**	**1.2**	**2.2**	**933.42**	**932.24**	**-1.18**
197.64	185000	928.68					
197.64	227000	929.93	1.25	2.2	933.38	932.94	-0.44
197.54	185000	927.71					
197.54	227000	928.99	1.28	2.2	932.47	932.06	-0.41
197.45	185000	927.32					
197.45	227000	928.58	1.26	2.2	932.04	931.65	-0.39

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
197.35	185000	926.85					
197.35	227000	928.06	1.21	2.2	931.47	931.06	-0.41
197.26	185000	926.31					
197.26	227000	927.47	1.16	2.2	930.83	930.41	-0.42
197.16	185000	925.82					
197.16	227000	926.94	1.12	2.2	930.26	929.86	-0.4
197.07	185000	925					
197.07	227000	926.28	1.28	2.2	929.76	929.47	-0.29
196.98	185000	924.55					
196.98	227000	925.86	1.31	2.2	929.37	929.17	-0.2
196.88	185000	924.03					
196.88	227000	925.39	1.36	2.2	928.95	928.87	-0.08
196.79	185000	923.6					
196.79	227000	925	1.4	2.2	928.6	928.59	-0.01
196.7	185000	923.28					
196.7	227000	924.72	1.44	2.2	928.36	928.38	0.02
196.61	185000	922.97					
196.61	227000	924.44	1.47	2.2	928.11	928.16	0.05
196.51	185000	922.61					
196.51	227000	924.11	1.5	2.2	927.81	927.88	0.07
196.42	185000	922.24					
196.42	227000	923.79	1.55	2.2	927.54	927.65	0.11
196.32	185000	921.97					
196.32	227000	923.55	1.58	2.2	927.33	927.44	0.11
196.23	185000	921.59					
196.23	227000	923.2	1.61	2.2	927.01	927.16	0.15
196.13	185000	921.34					
196.13	227000	922.96	1.62	2.2	926.78	926.94	0.16
196.04	185000	920.98					
196.04	227000	922.6	1.62	2.2	926.42	926.55	0.13
195.94	185000	919.76					
195.94	227000	921.27	1.51	2.2	924.98	924.99	0.01
195.85	185000	918.65					
195.85	227000	920.12	1.47	2.2	923.79	923.81	0.02
195.75	185000	917.99					
195.75	227000	919.52	1.53	2.2	923.25	923.35	0.1
195.66	185000	917.59					
195.66	227000	919.13	1.54	2.2	922.87	923.03	0.16
195.56	185000	917					
195.56	227000	918.52	1.52	2.2	922.24	922.4	0.16

Table 13. Alternative 3.5D Levee Elevations for Greater than 500-Year Flood Event

HEC-RAS Plan: Alt3.5D River: RIVER-1 Reach: Reach-1

River Sta	Q Total (cfs)	W.S. Elev (ft)	Difference (ft)	Free Board (ft)	Target El.	(290,000 and 340,000 cfs) W.S. El. (ft)	Difference (ft)
195.47	185000	916.47					
195.47	227000	918.01	1.54	2.2	921.75	921.96	0.21
195.38	185000	916					
195.38	227000	917.55	1.55	2.2	921.3	921.55	0.25
195.28	185000	915.44					
195.28	227000	916.97	1.53	2.2	920.7	920.94	0.24
195.19	185000	914.45					
195.19	227000	915.85	1.4	2.2	919.45	919.64	0.19
195.16	185000	914.2					
195.16	227000	915.58	1.38	2.2	919.16	919.34	0.18

Table 14. Alternative 3.5D Flood Inundation Durations

1	2	3	4	5	6	7	8
Flood Event	Q's used in Alt 3.5D Model to Match Existing Conditions WSEL (cfs)	Peak Q of Gila River Below Salt River (cfs)	Ratio (column 2 / column 3)	Peak Q of Salt River above Gila River (cfs)	Target Q for Duration Calculation (cfs)	Duration from Plates 7-10 (hrs)	Estimated Duration (0.75 * column 7) (hrs)
100-year	175,000	227,000	0.7709	164,000	126,000	13	9.75
50-year	155,000	185,000	0.8378	164,000	137,000	11	8.25
20-year	88,000	92,000	0.9565	164,000	157,000	5.5	4.13

Tres Rios Feasibility Study - Alternative 3
100-YR Water Surface Profiles

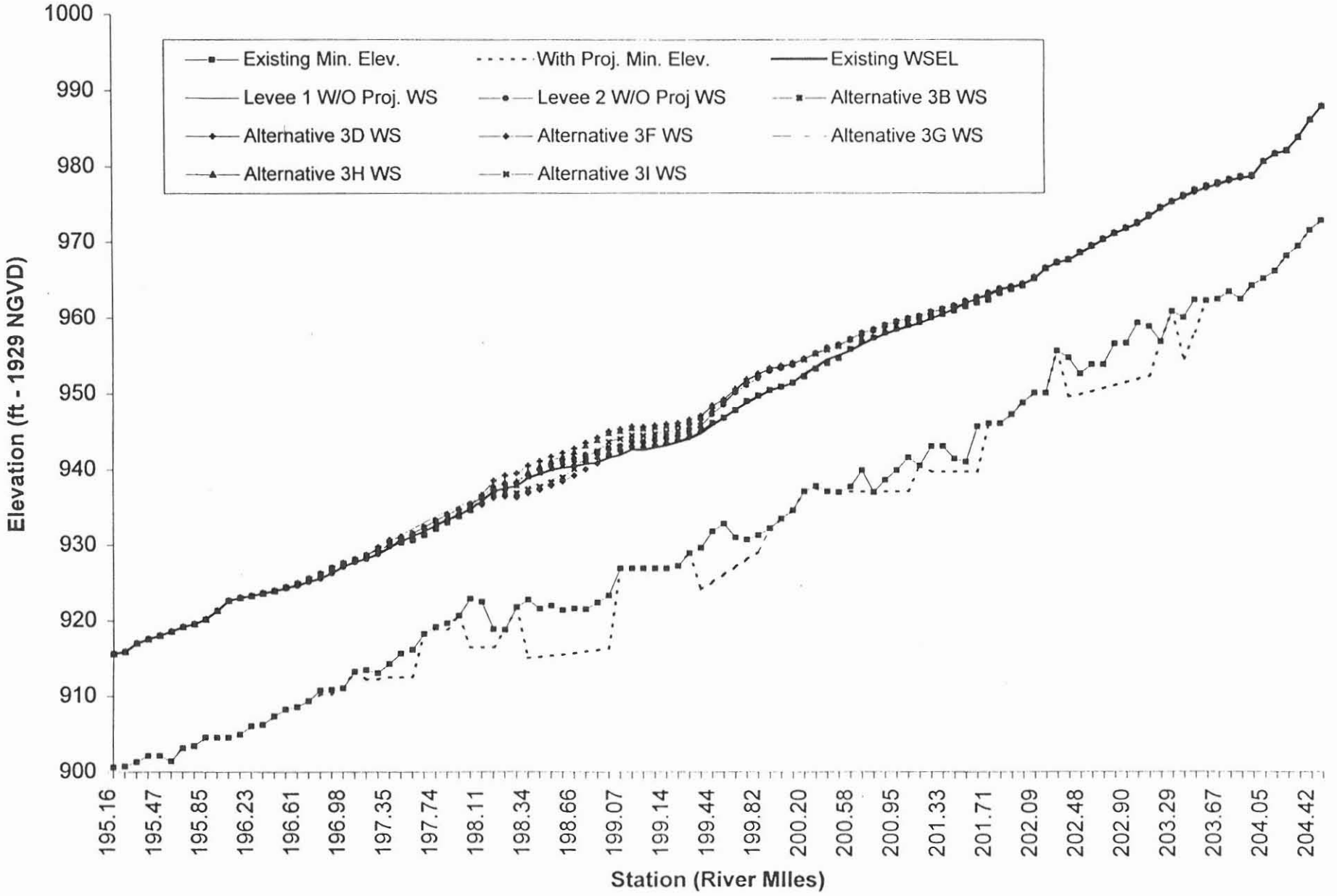

PLATE 1

7/29/99
Prfiles3.xls; Chart2

Tres Rios Feasibility Study - Alternative 4
100-YR Water Surface Profiles

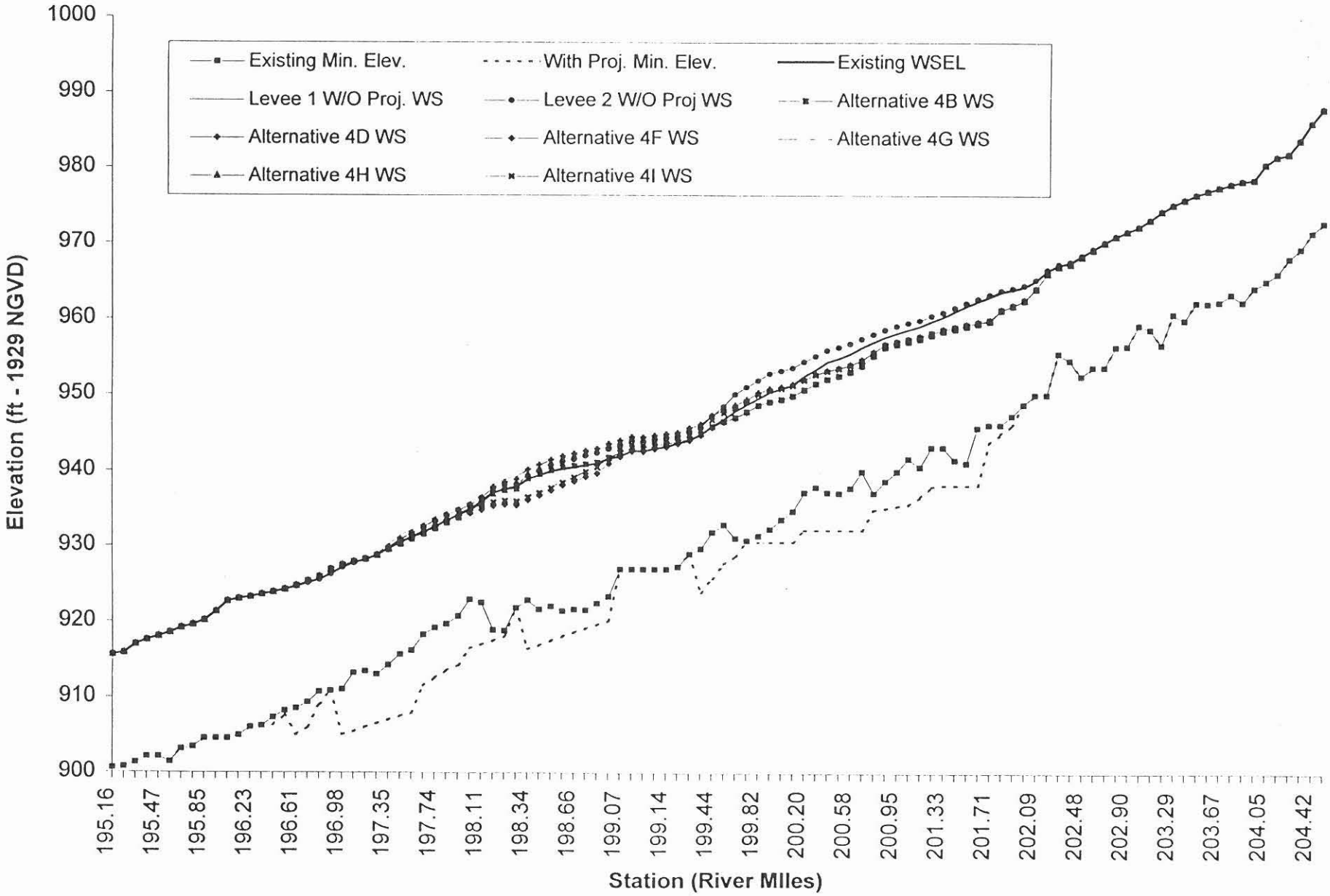

PLATE 2

7/29/99
Prfiles4.xls; Chart2

Tres Rios Feasibility Study - Alternative 3.5
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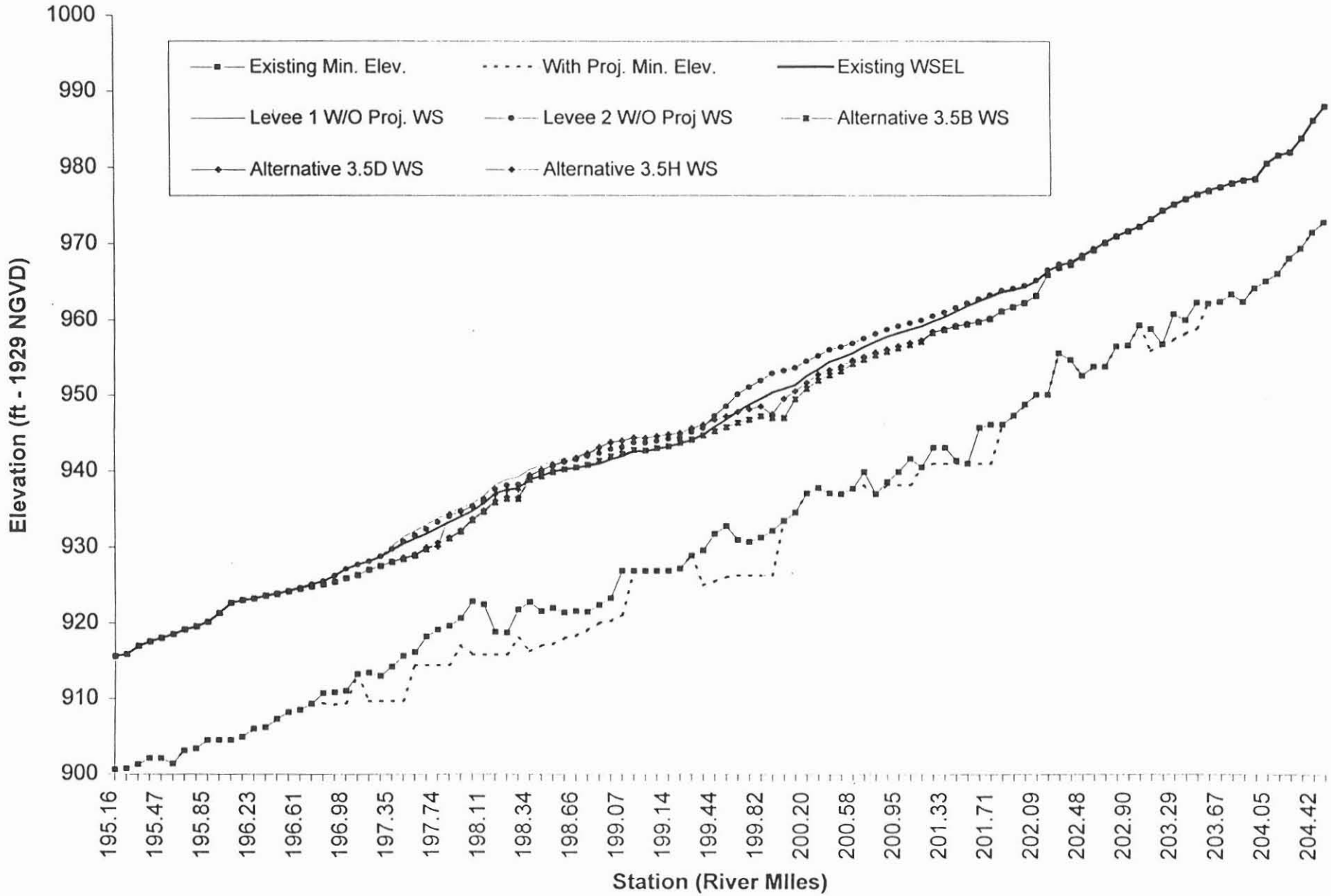

PLATE 3

7/29/99
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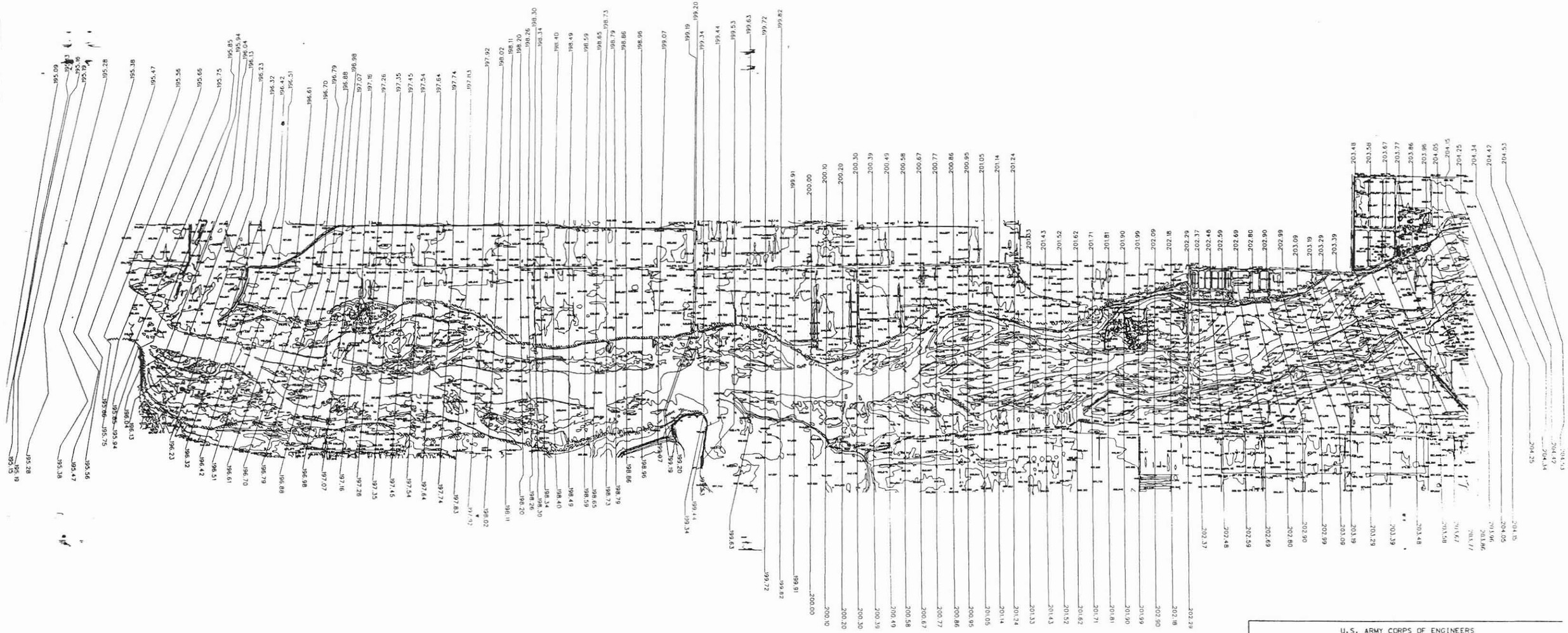


SCALE: 1"=3000'

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

TRES RIOS FEASIBILITY STUDY

HEC-RAS Cross-Section Locations

FILE = XS.DGN 7/29/99

PLATE 4

Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

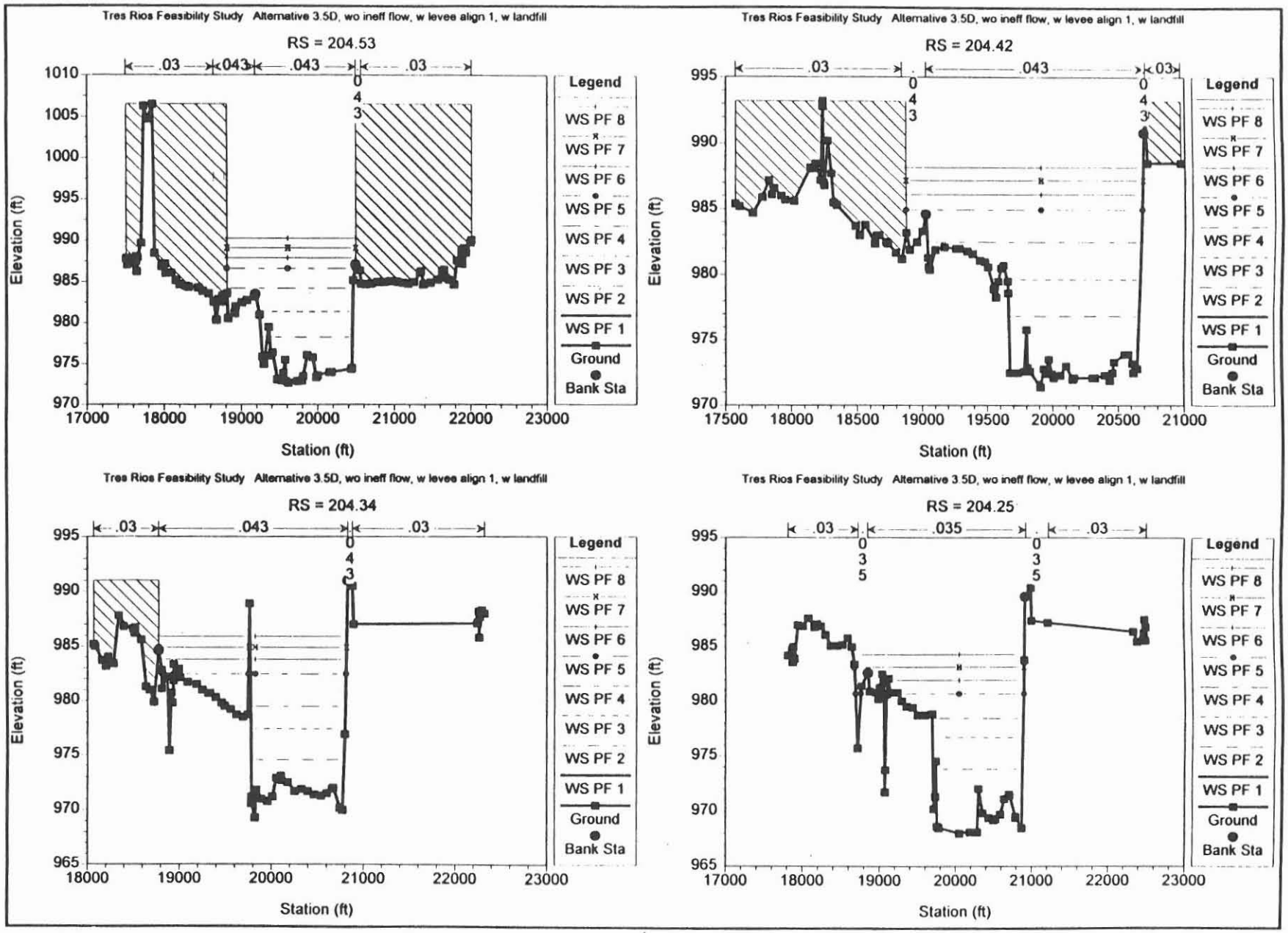


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

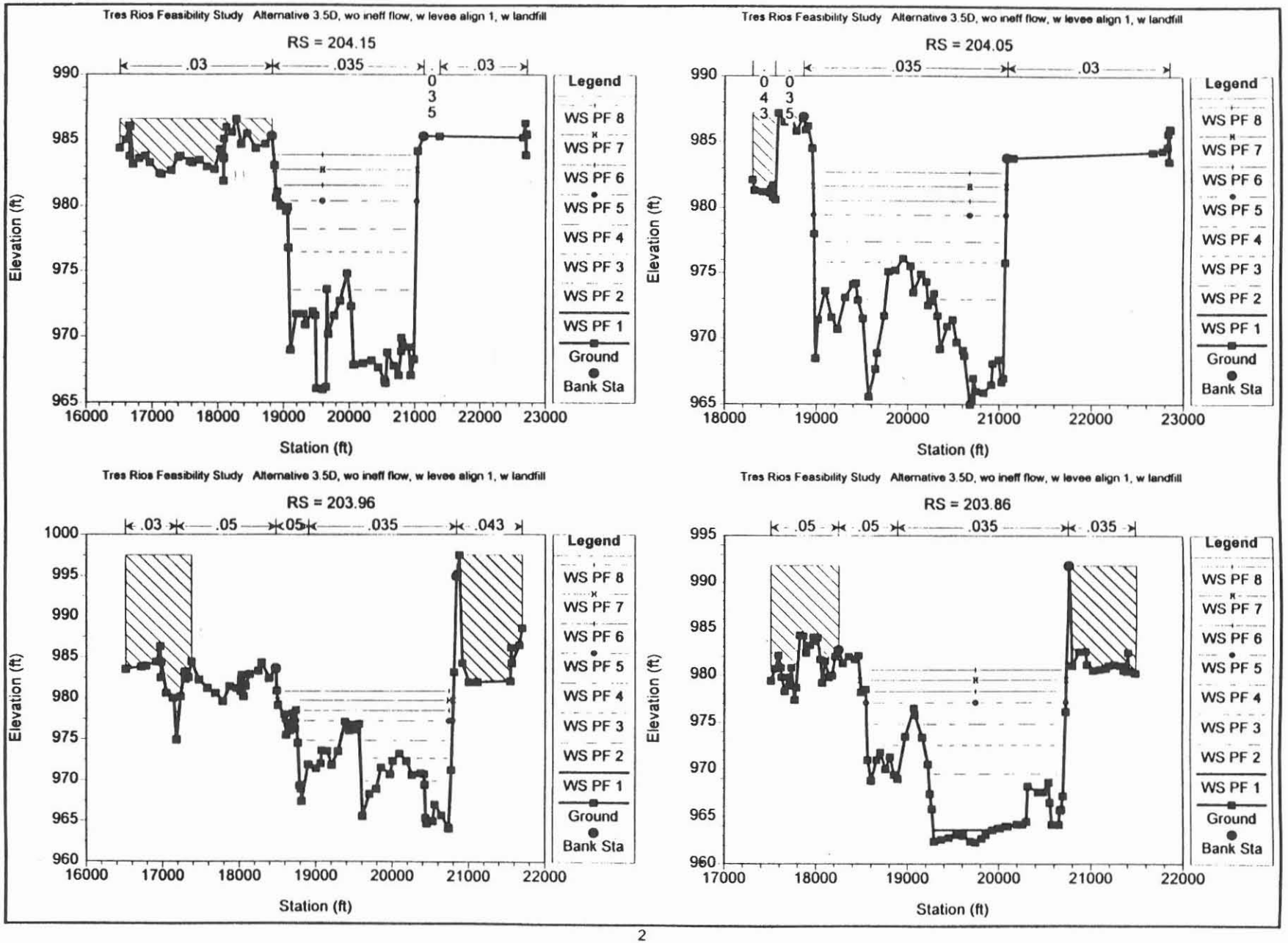


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

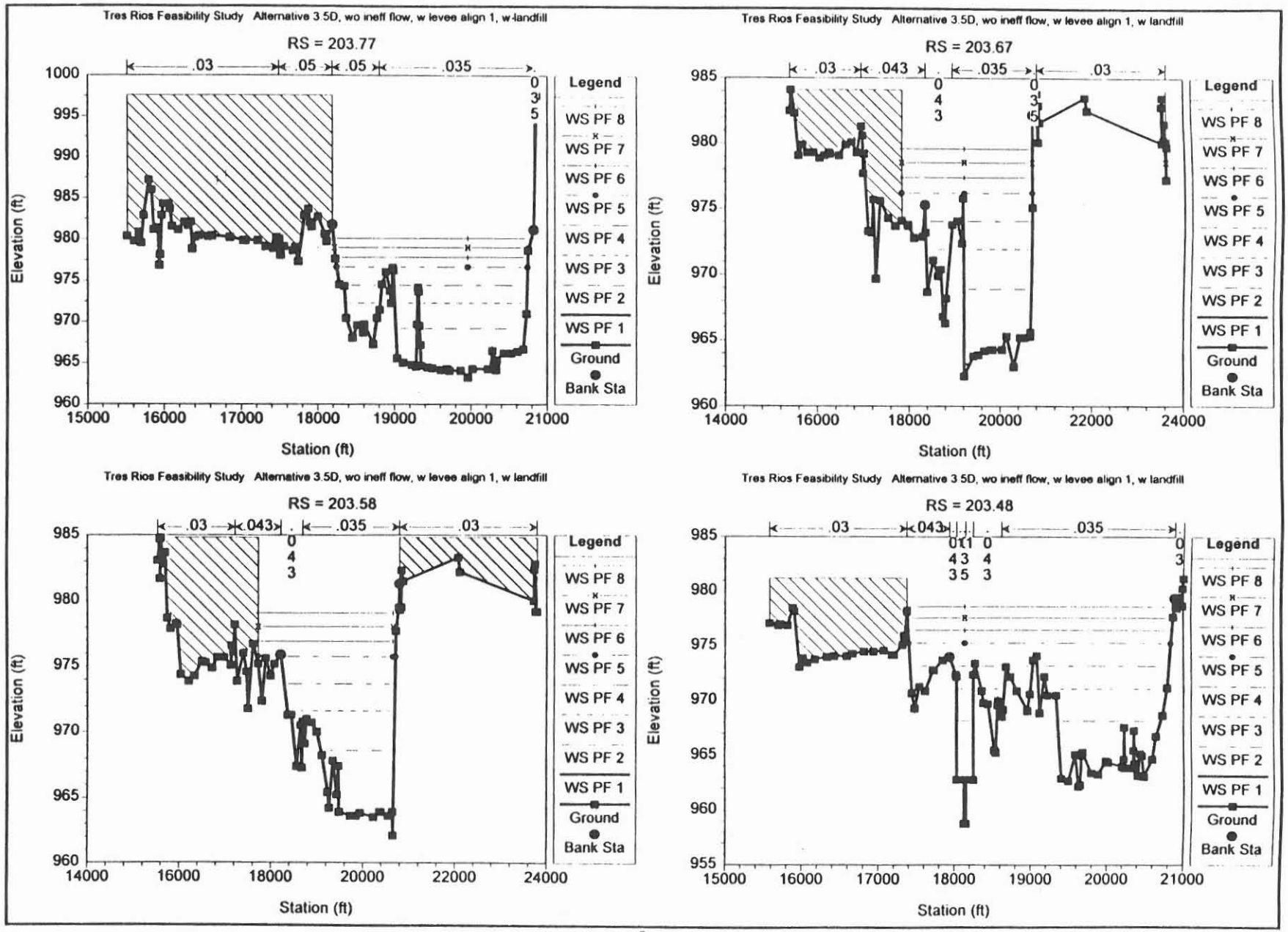


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

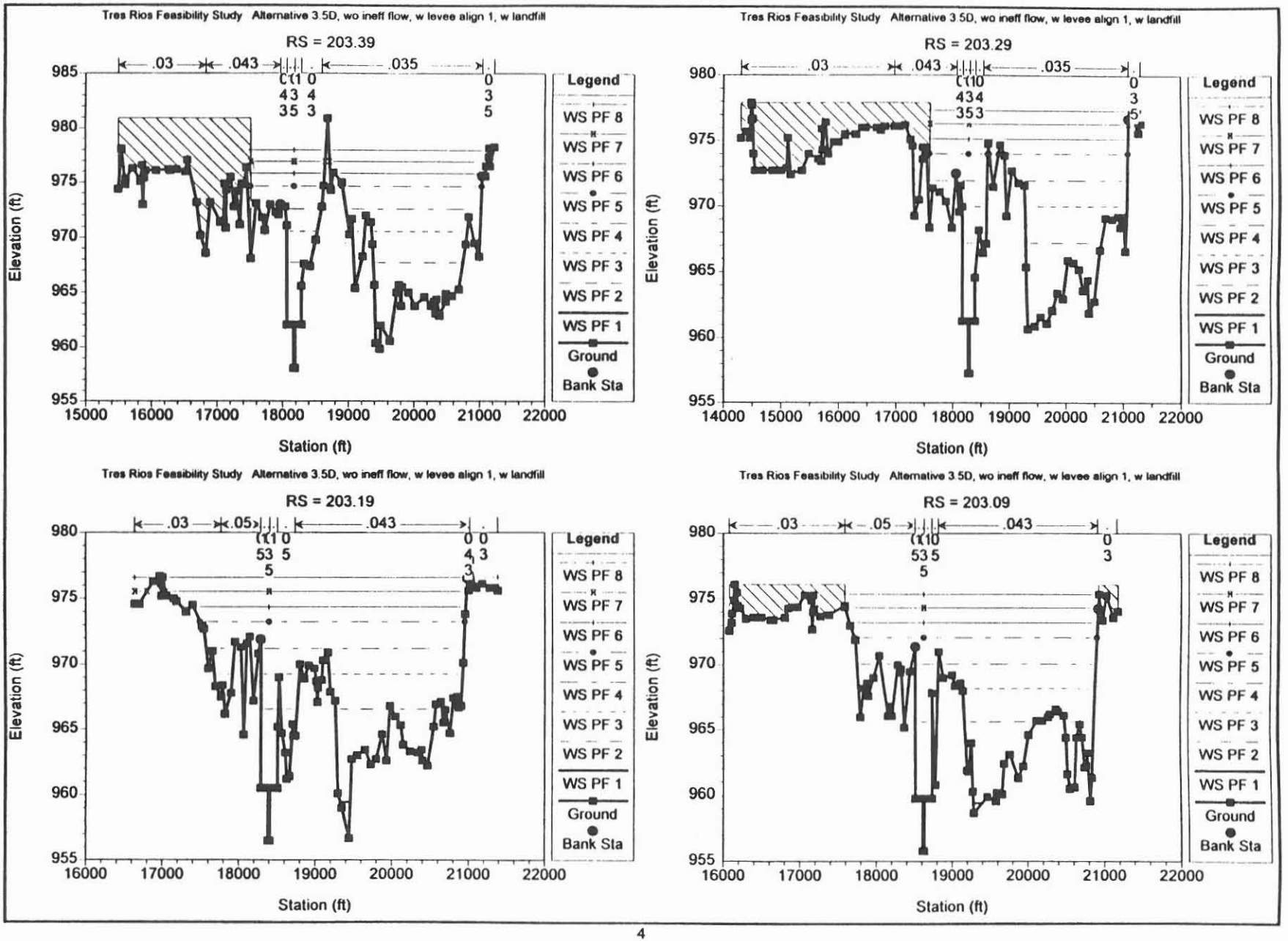


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

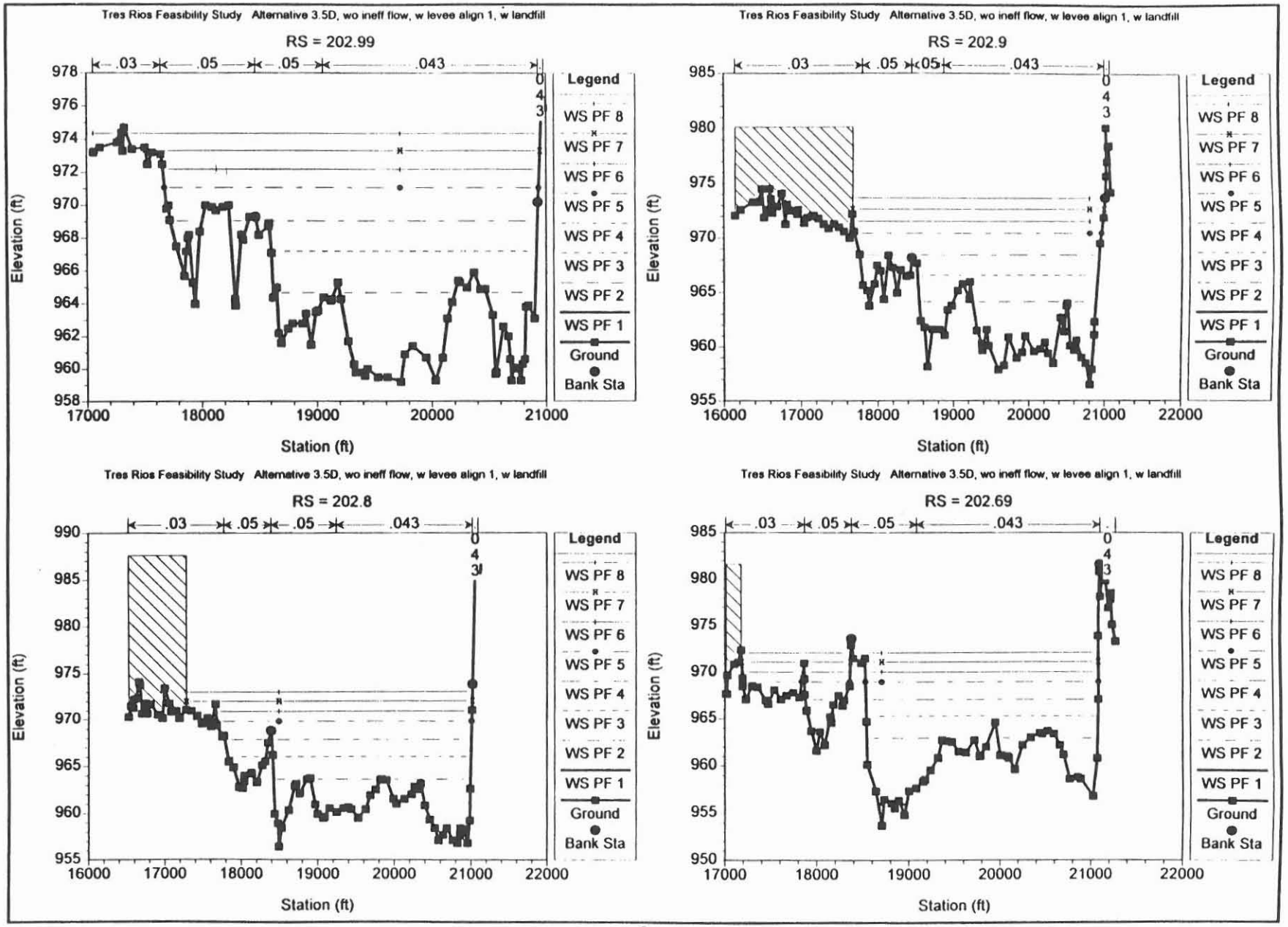


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

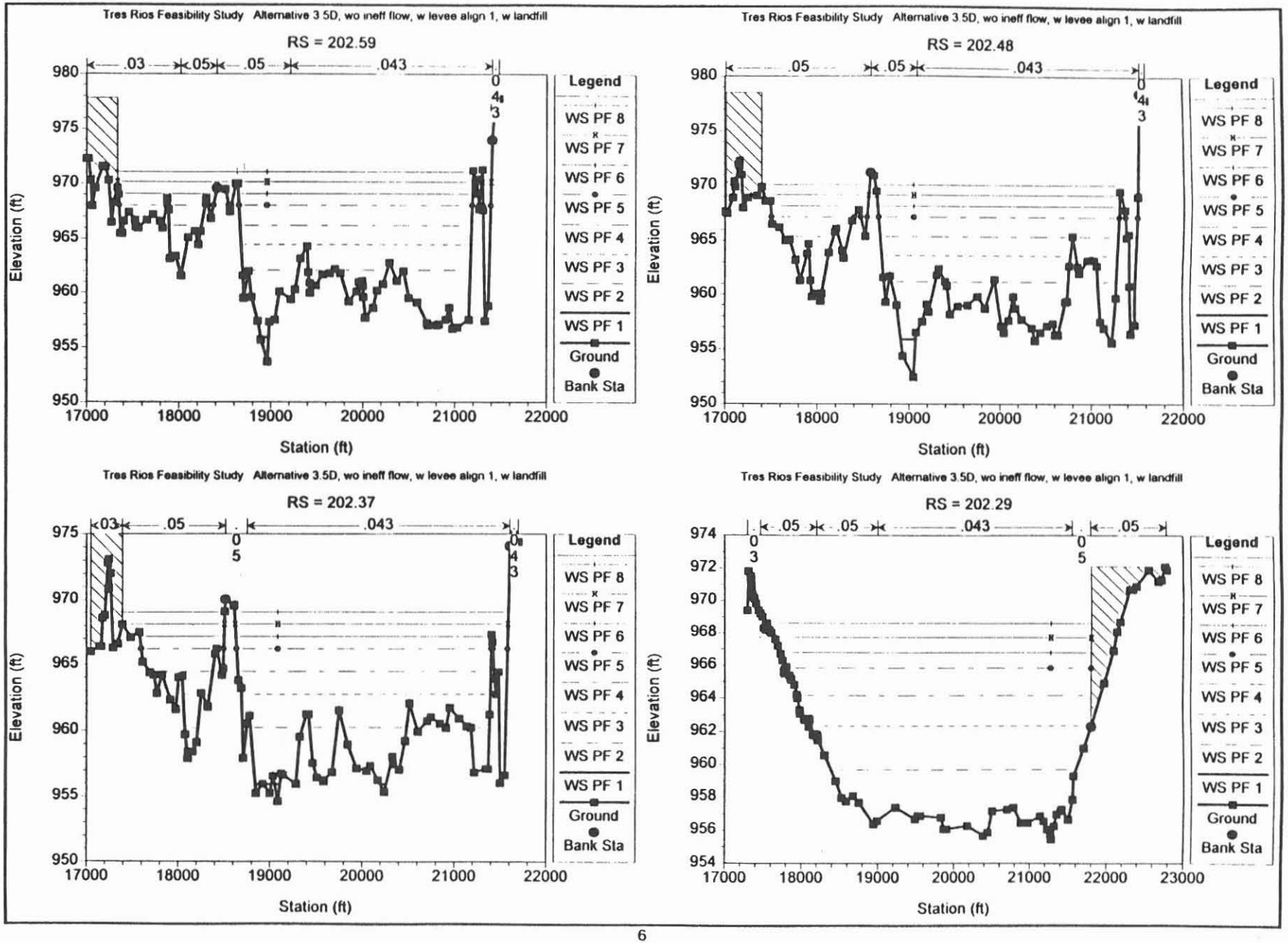


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

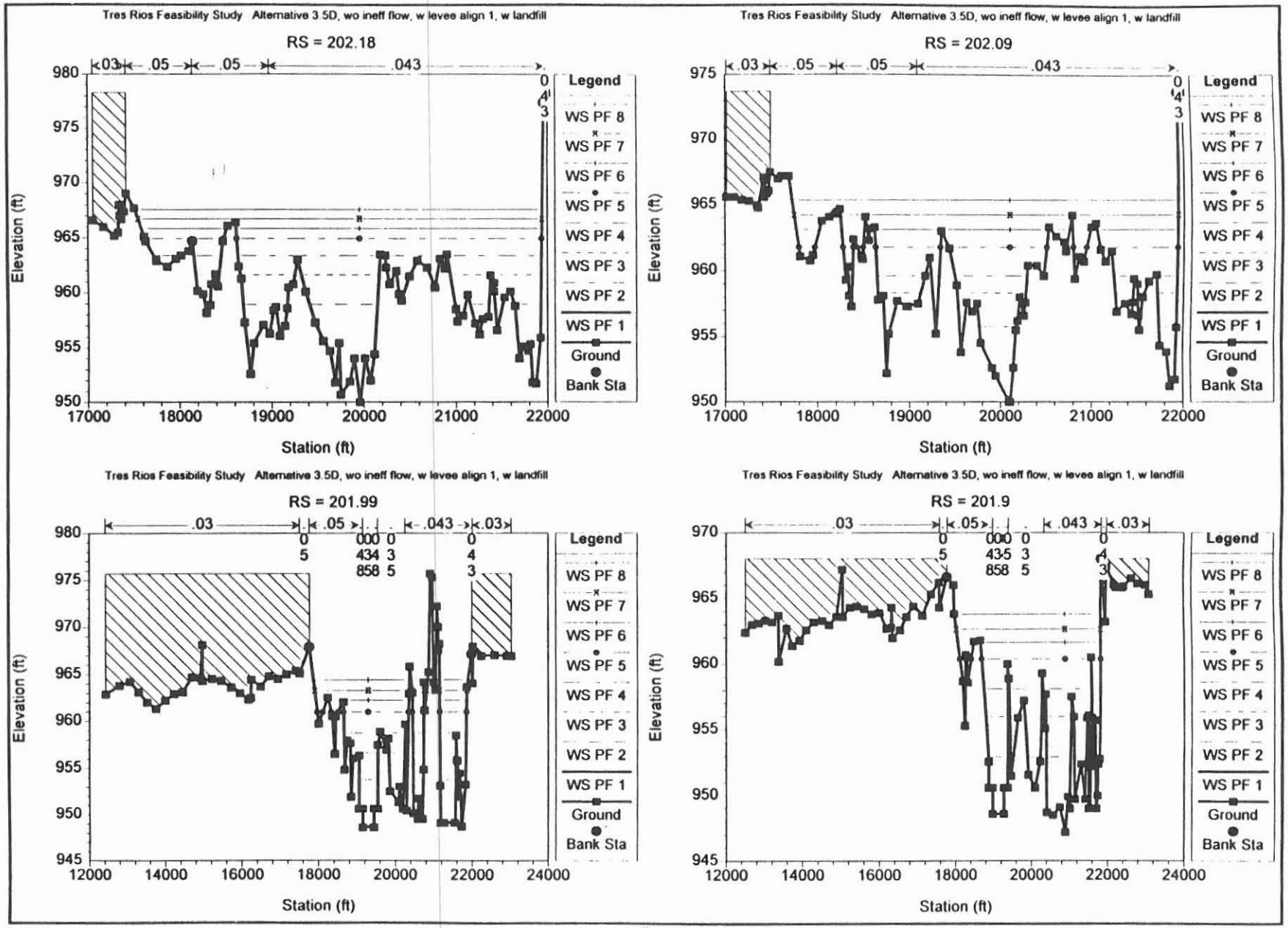


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

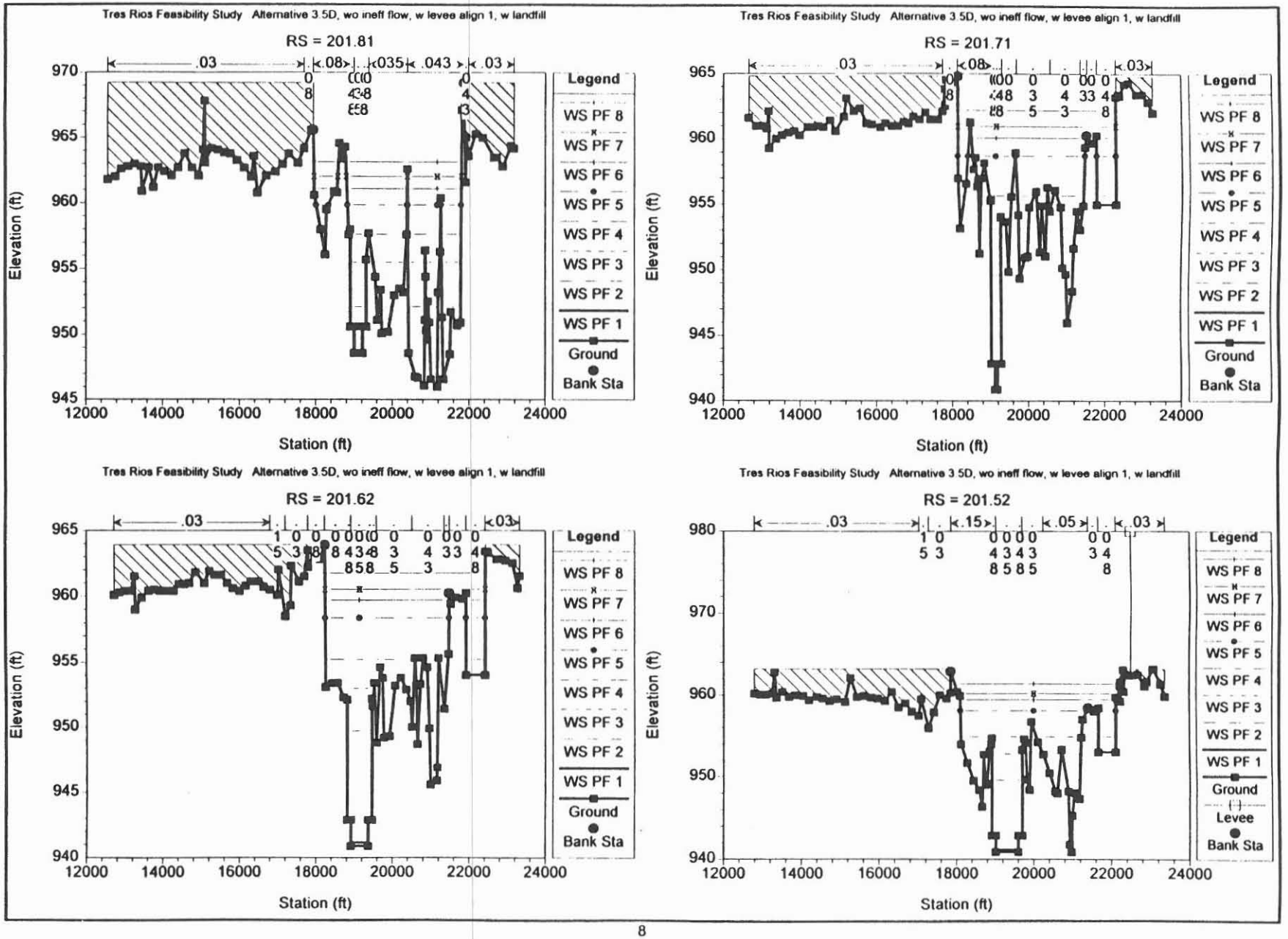
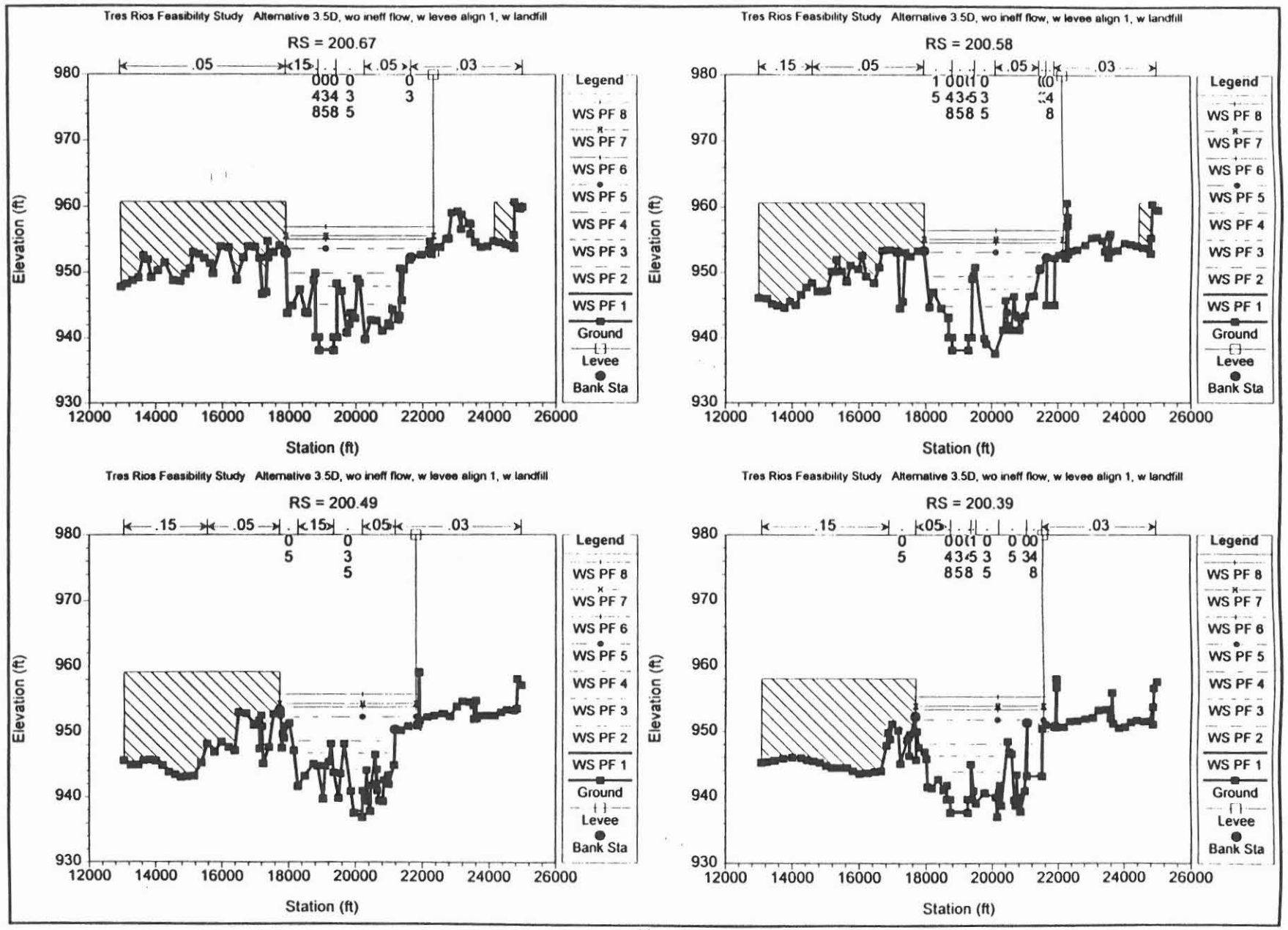


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

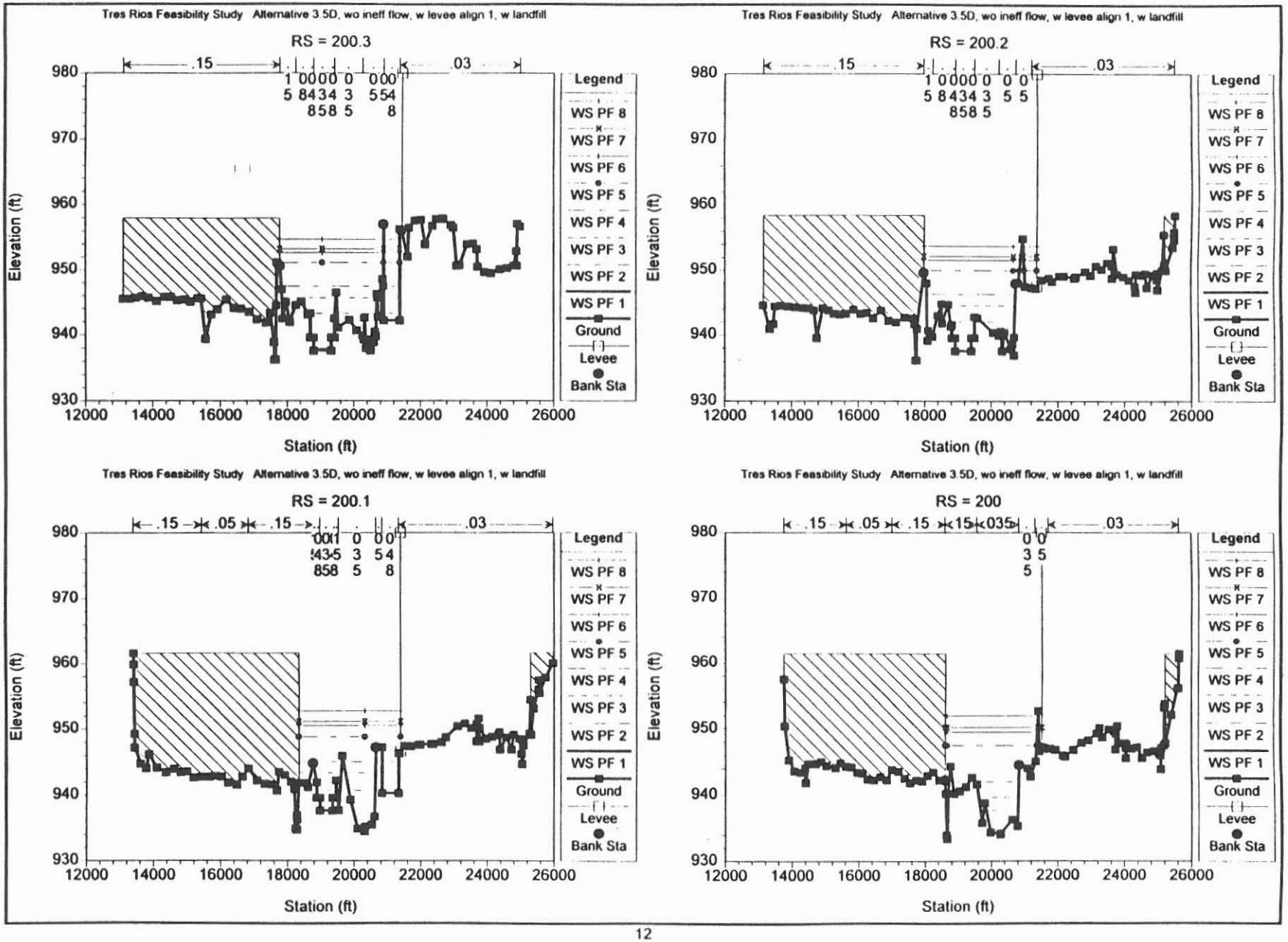


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

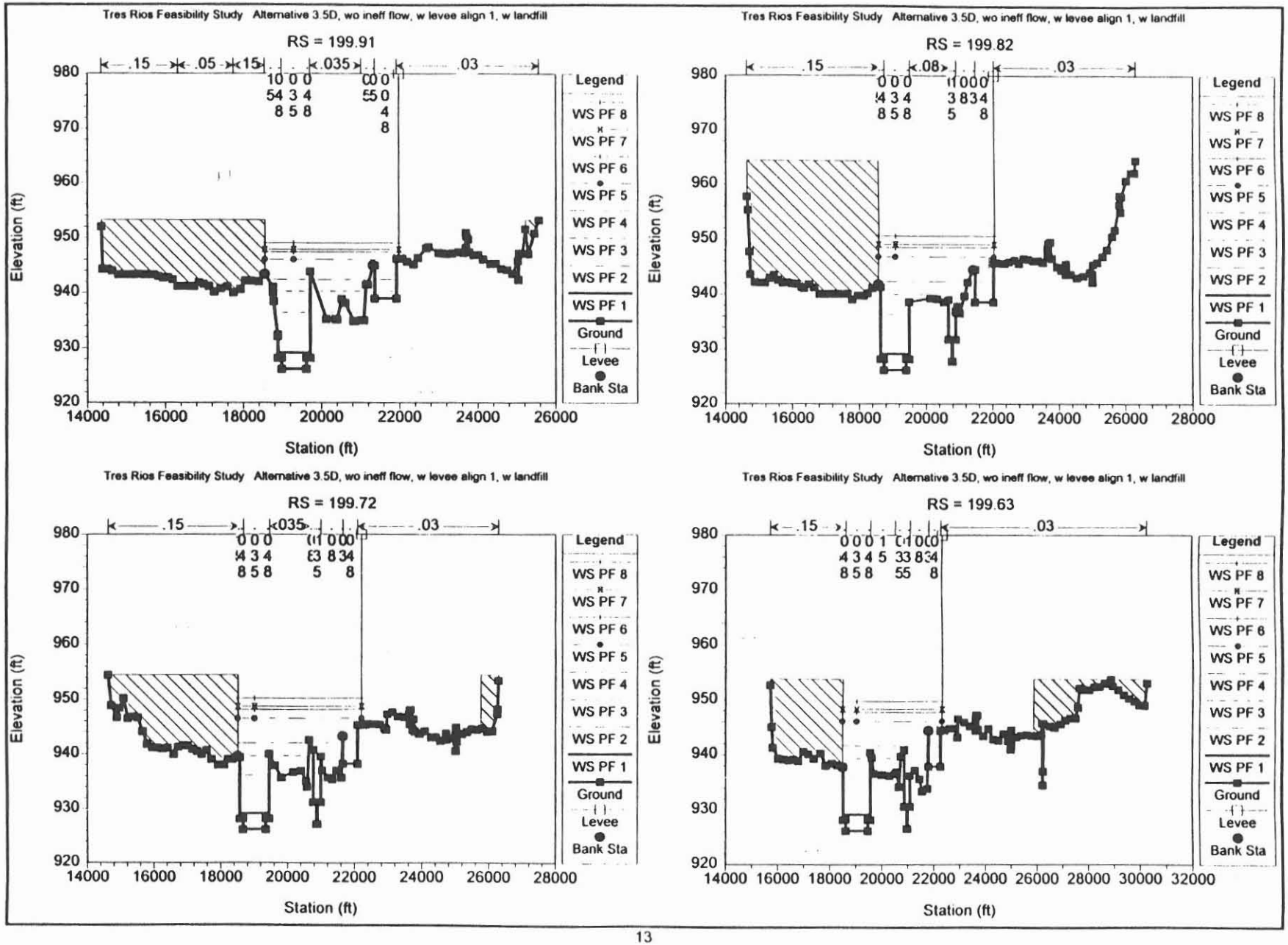


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

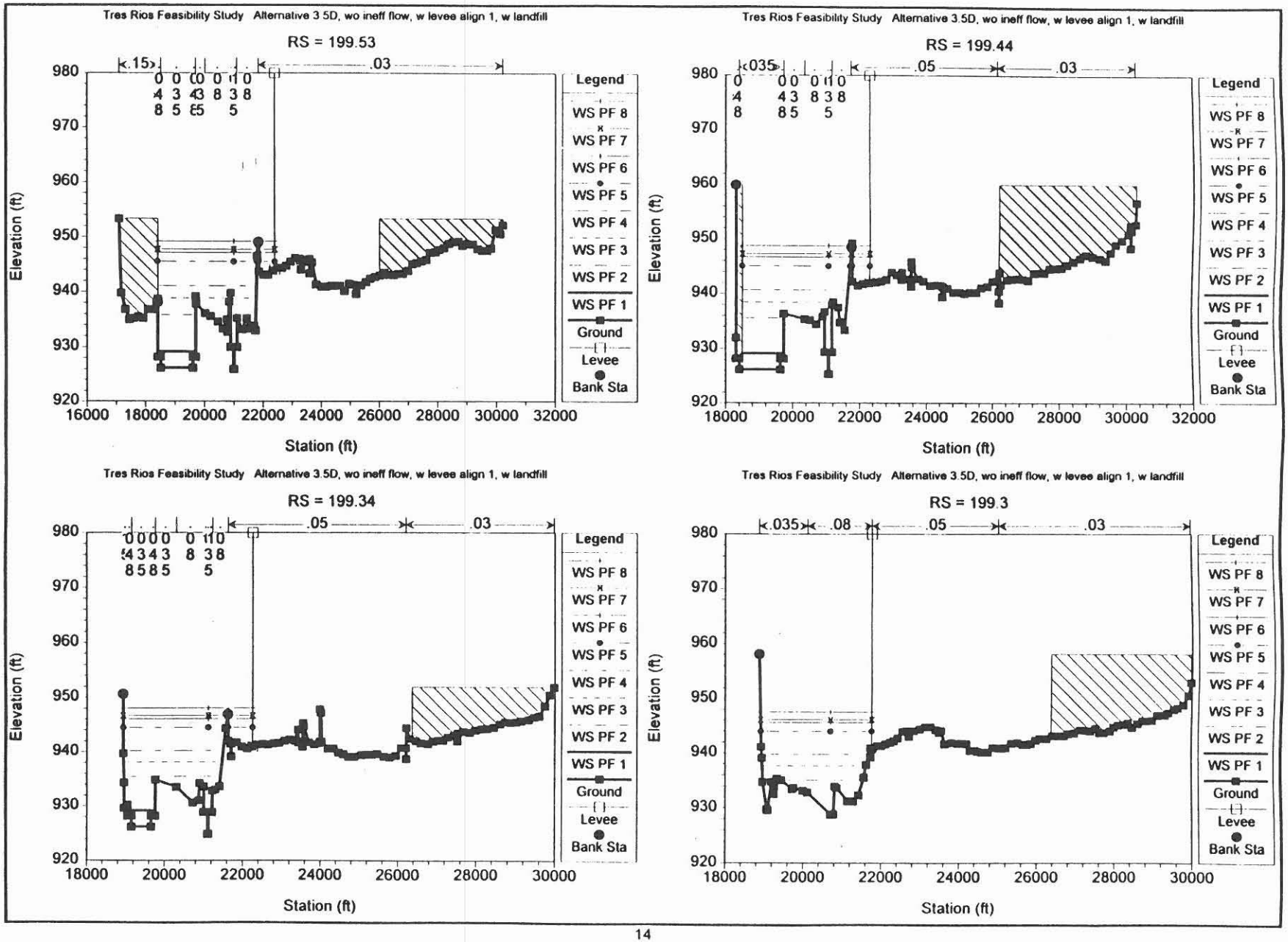
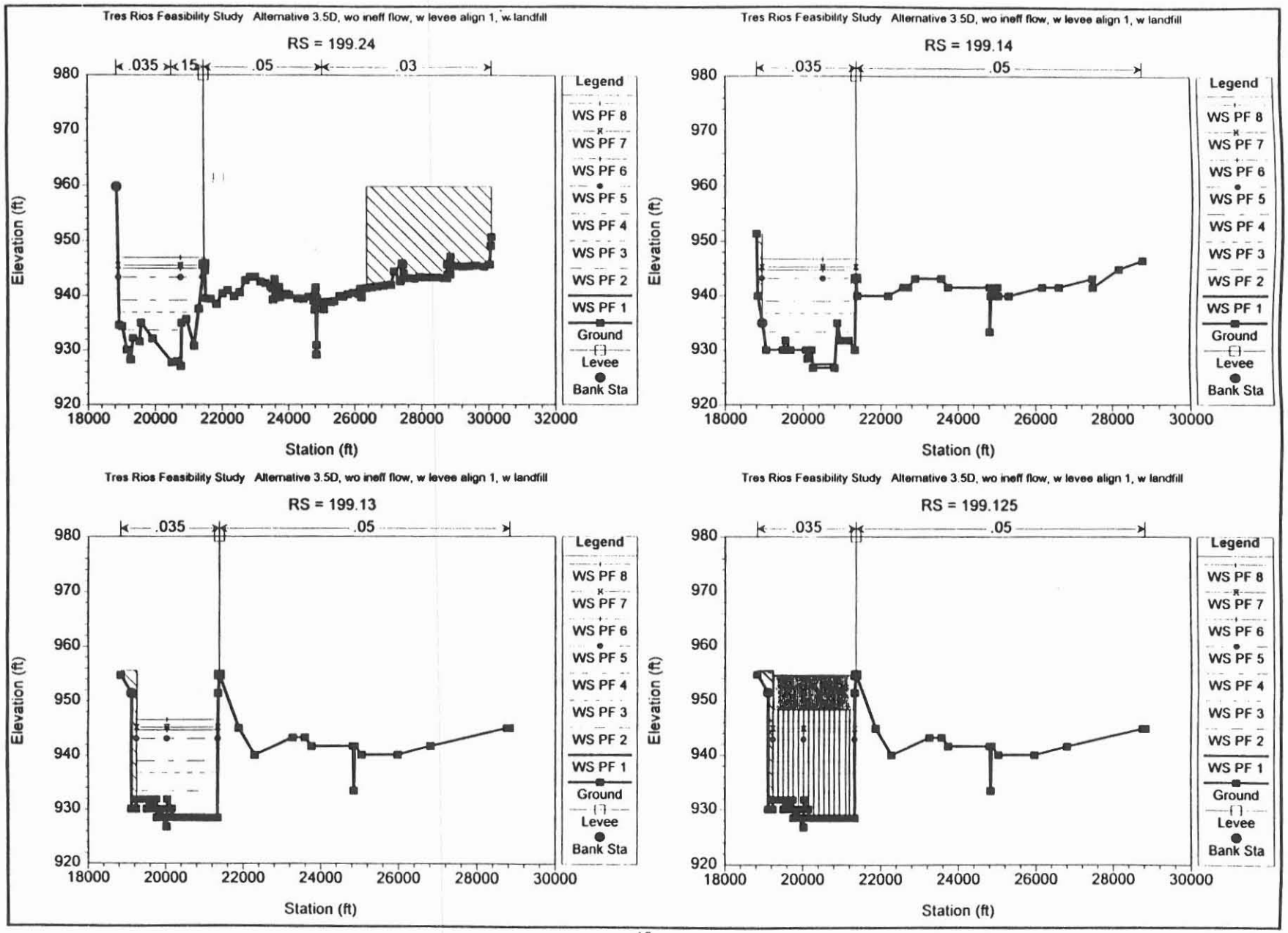


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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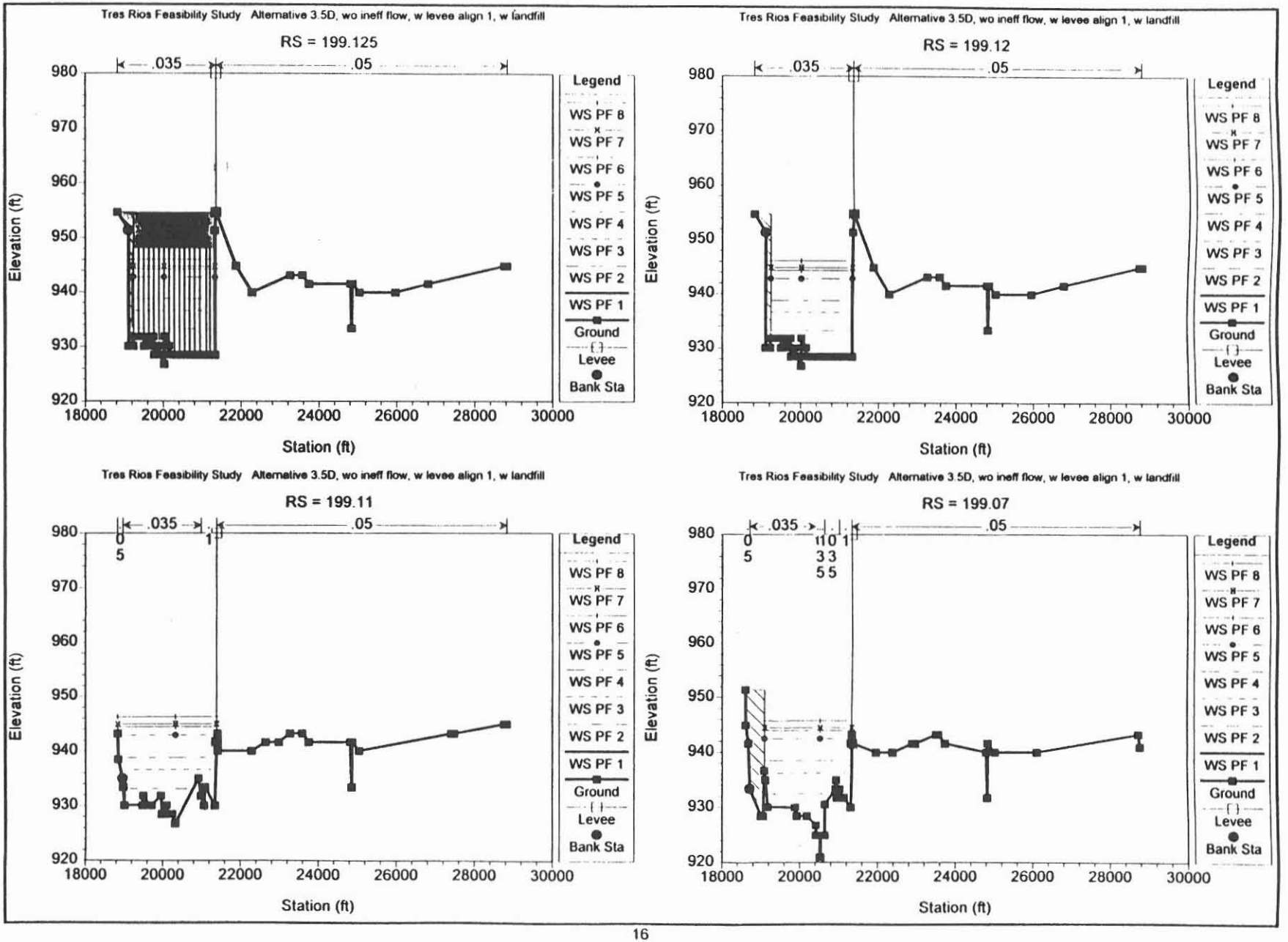
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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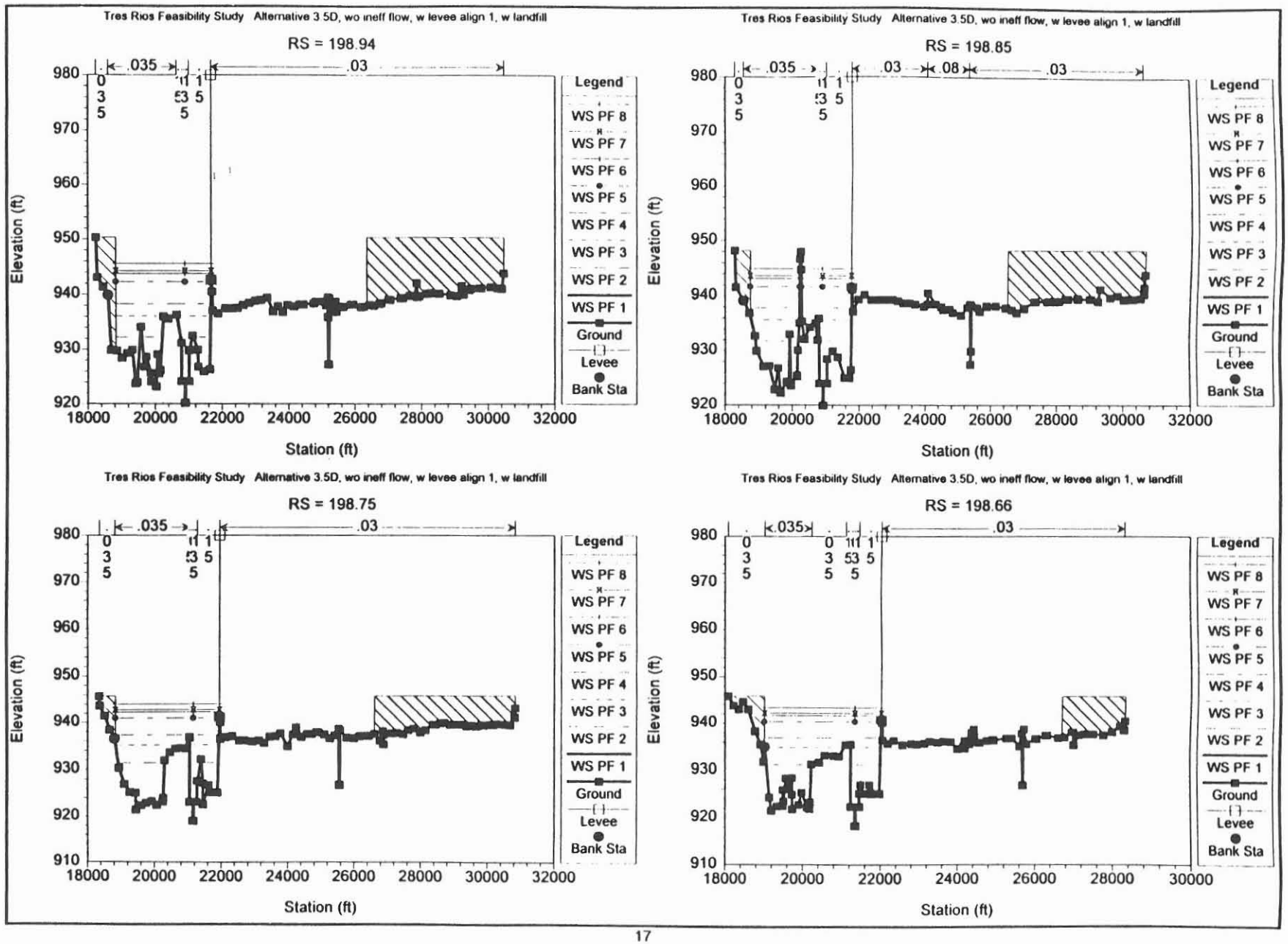
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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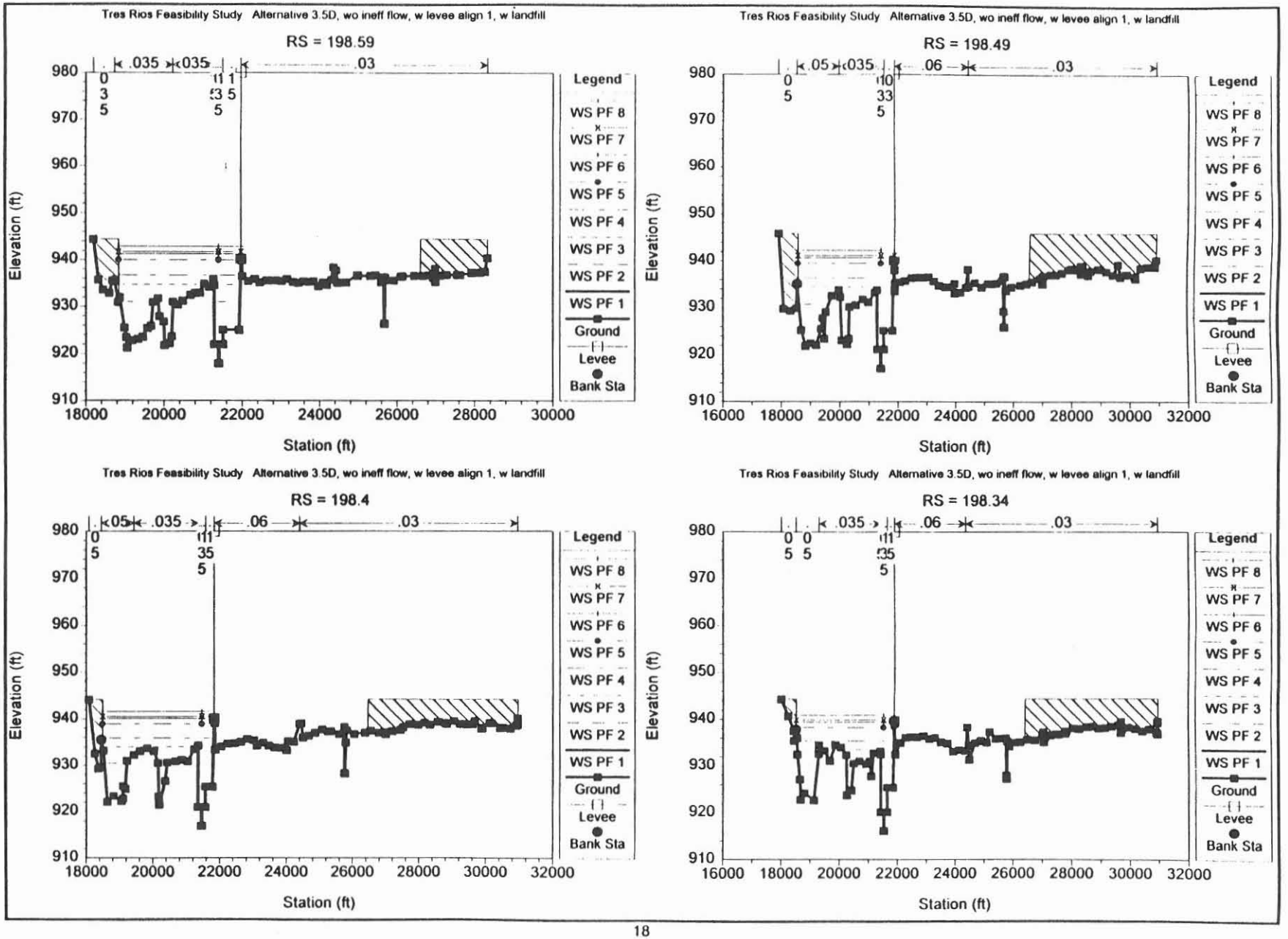

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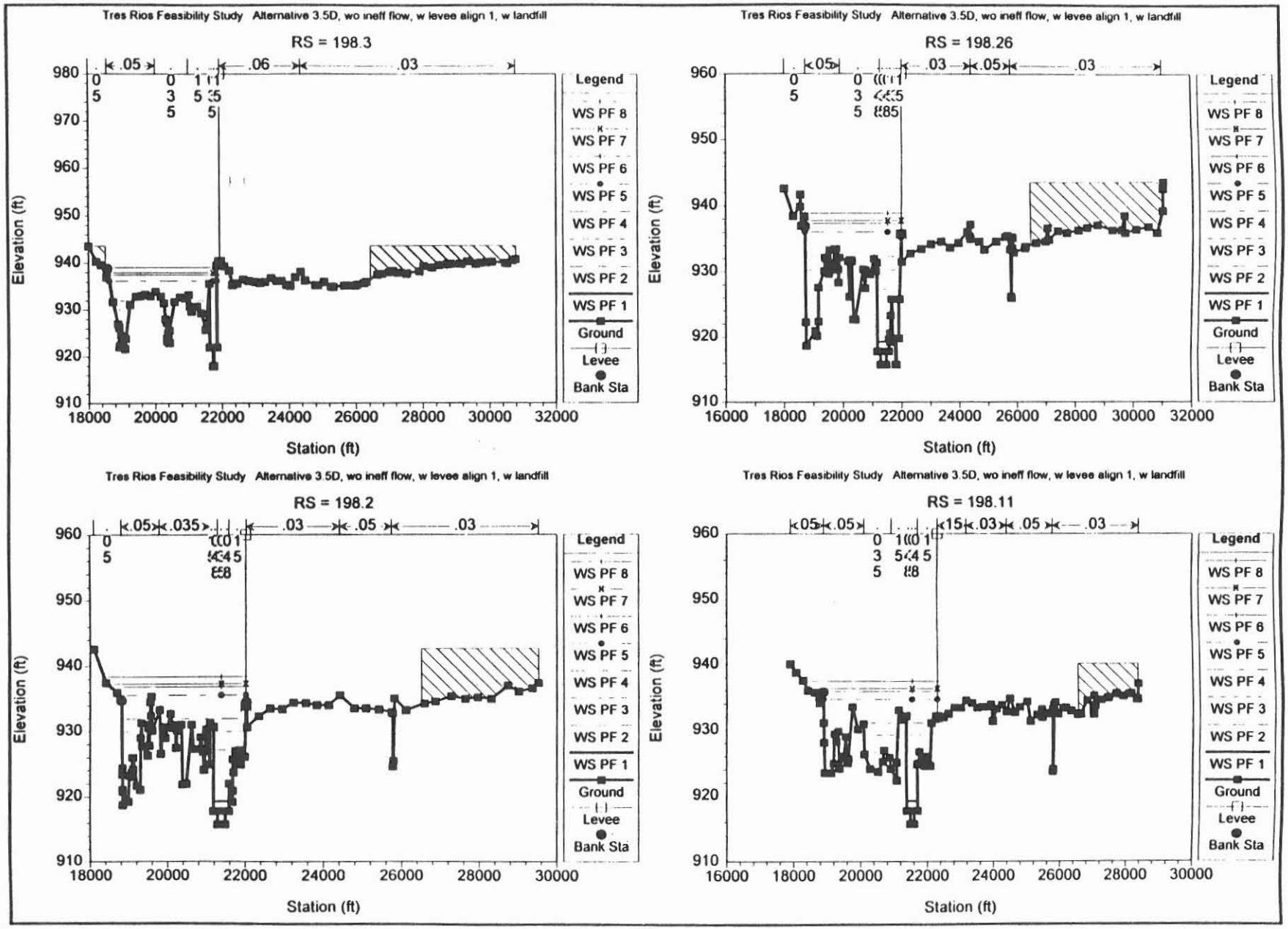
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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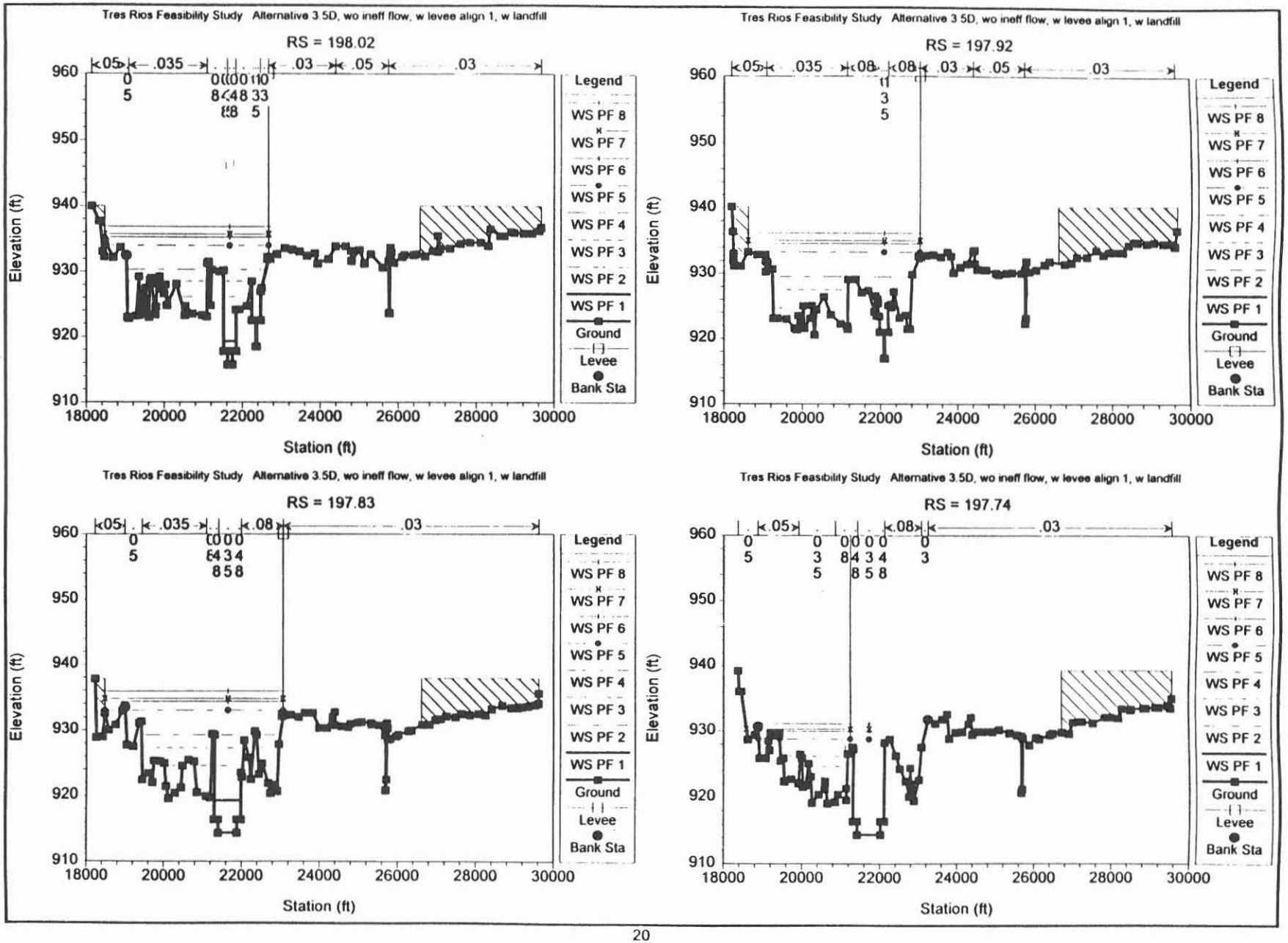
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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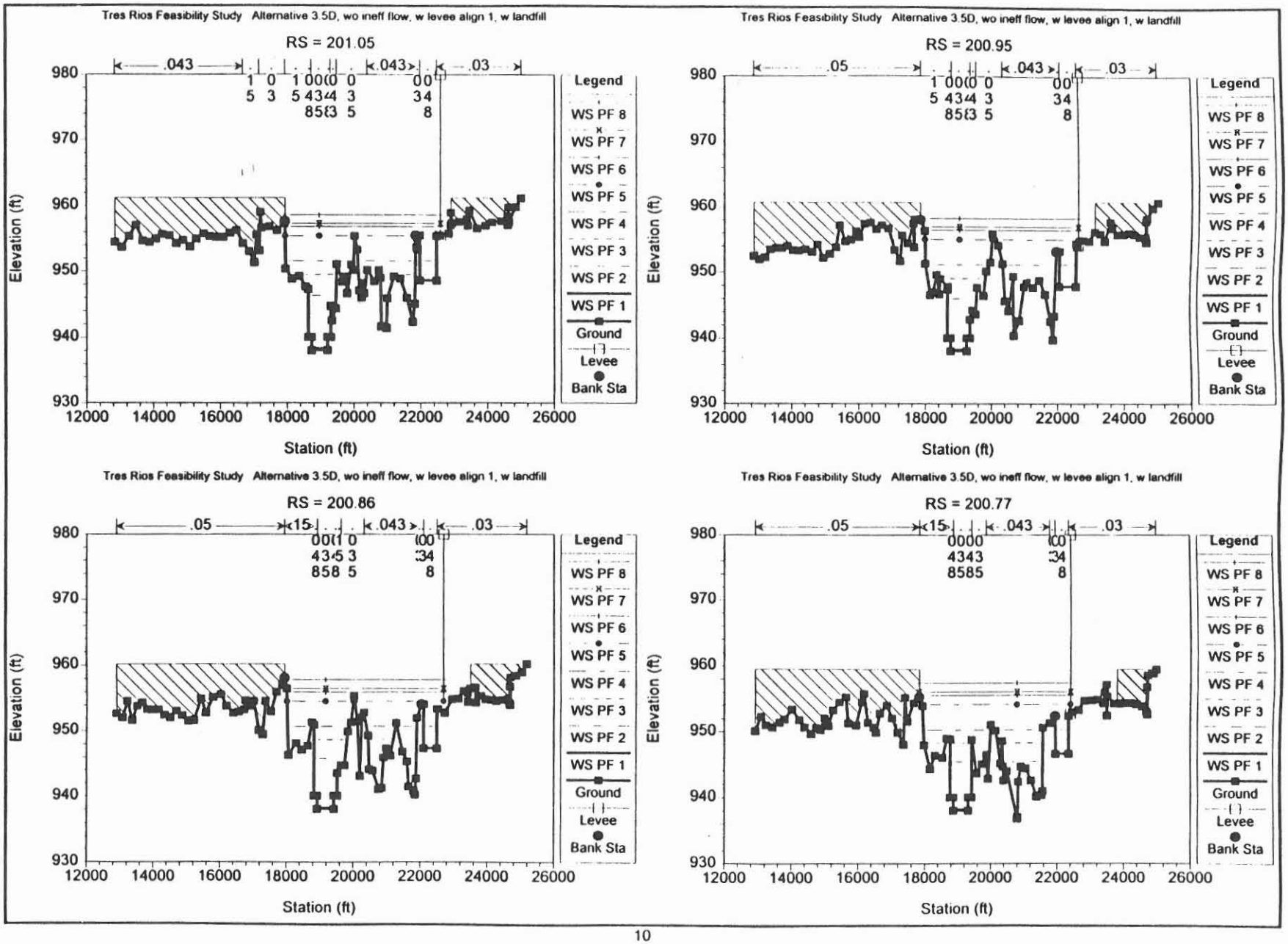
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

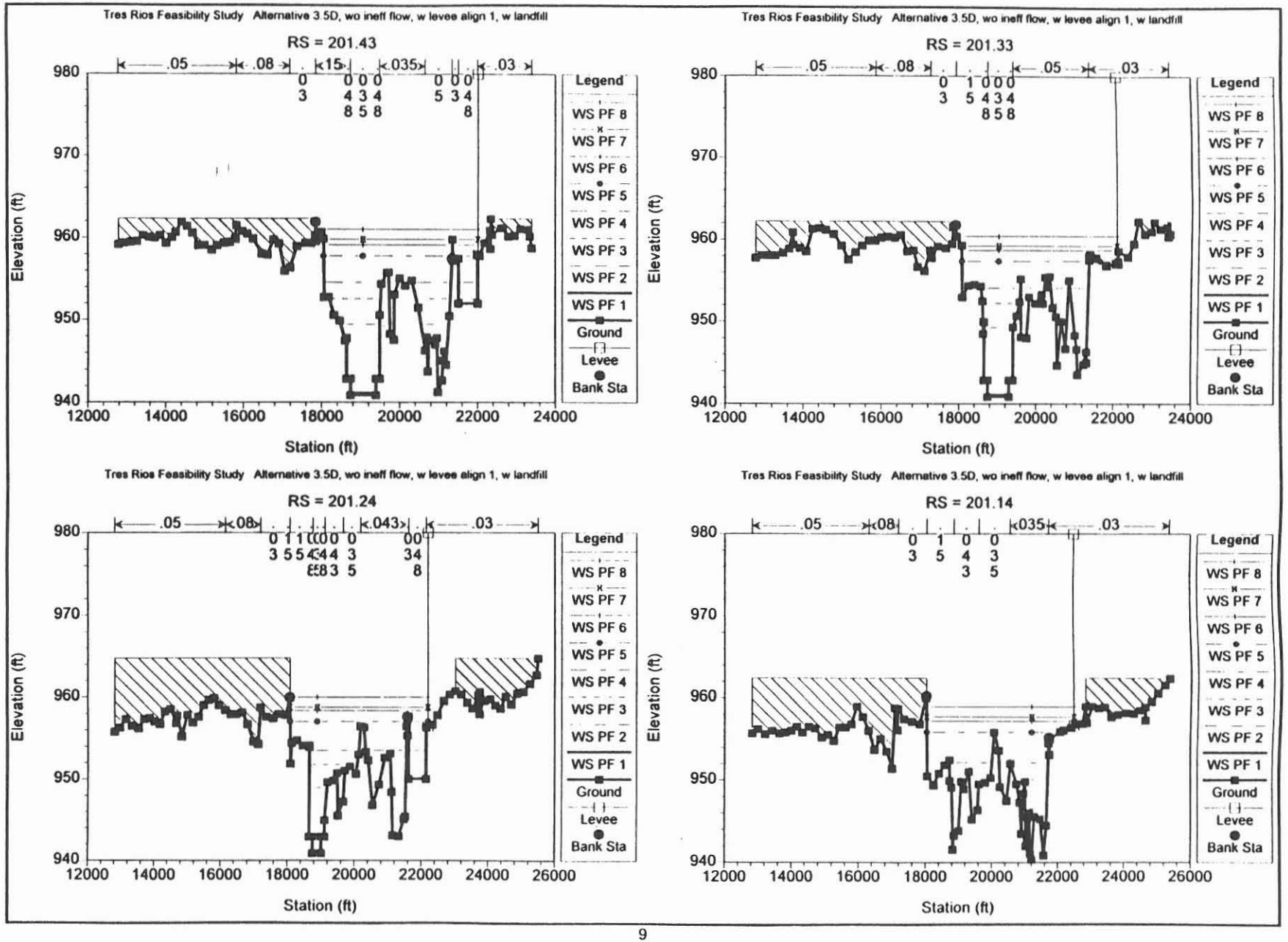
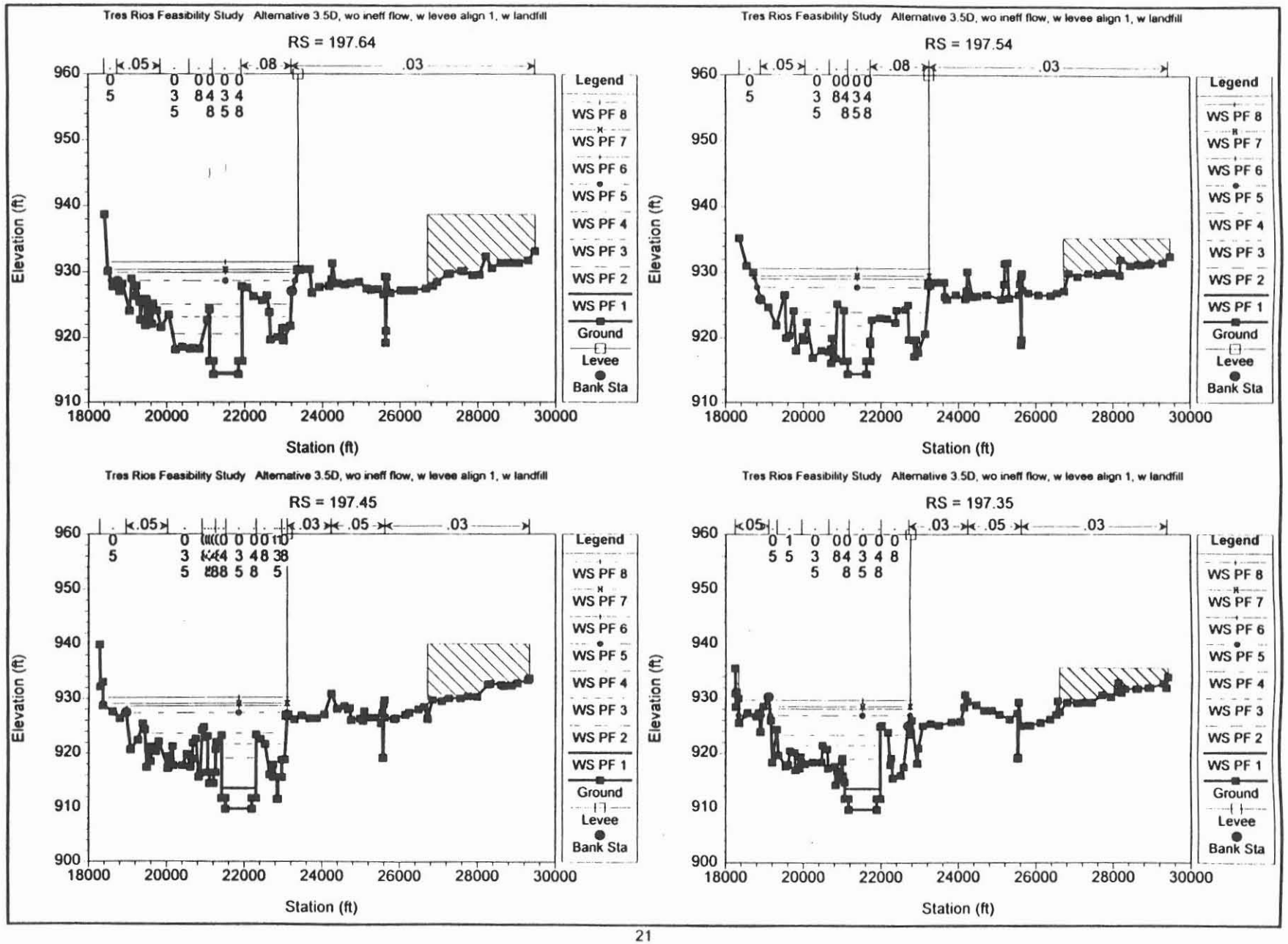


Plate 5

HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



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HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

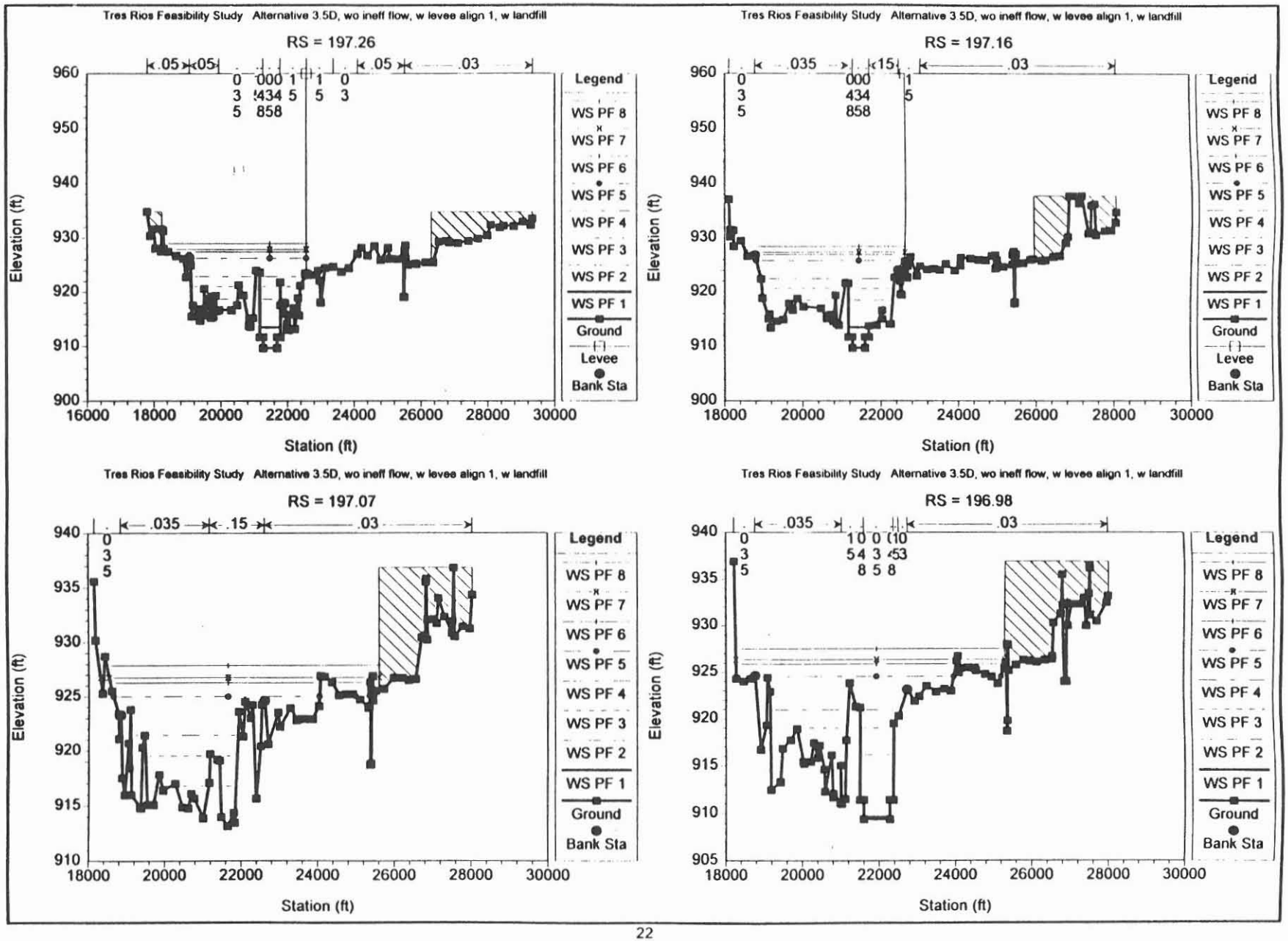


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

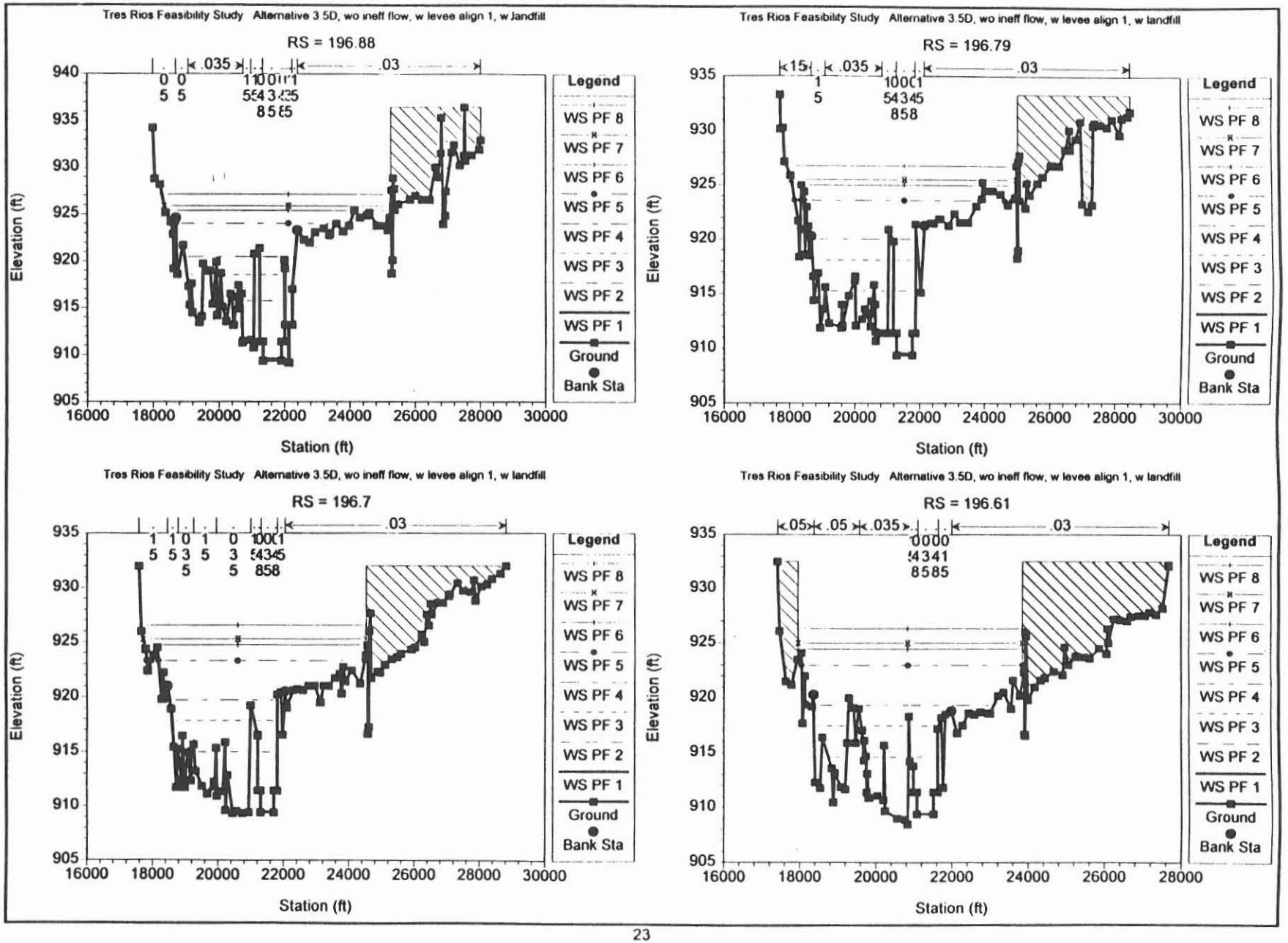


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

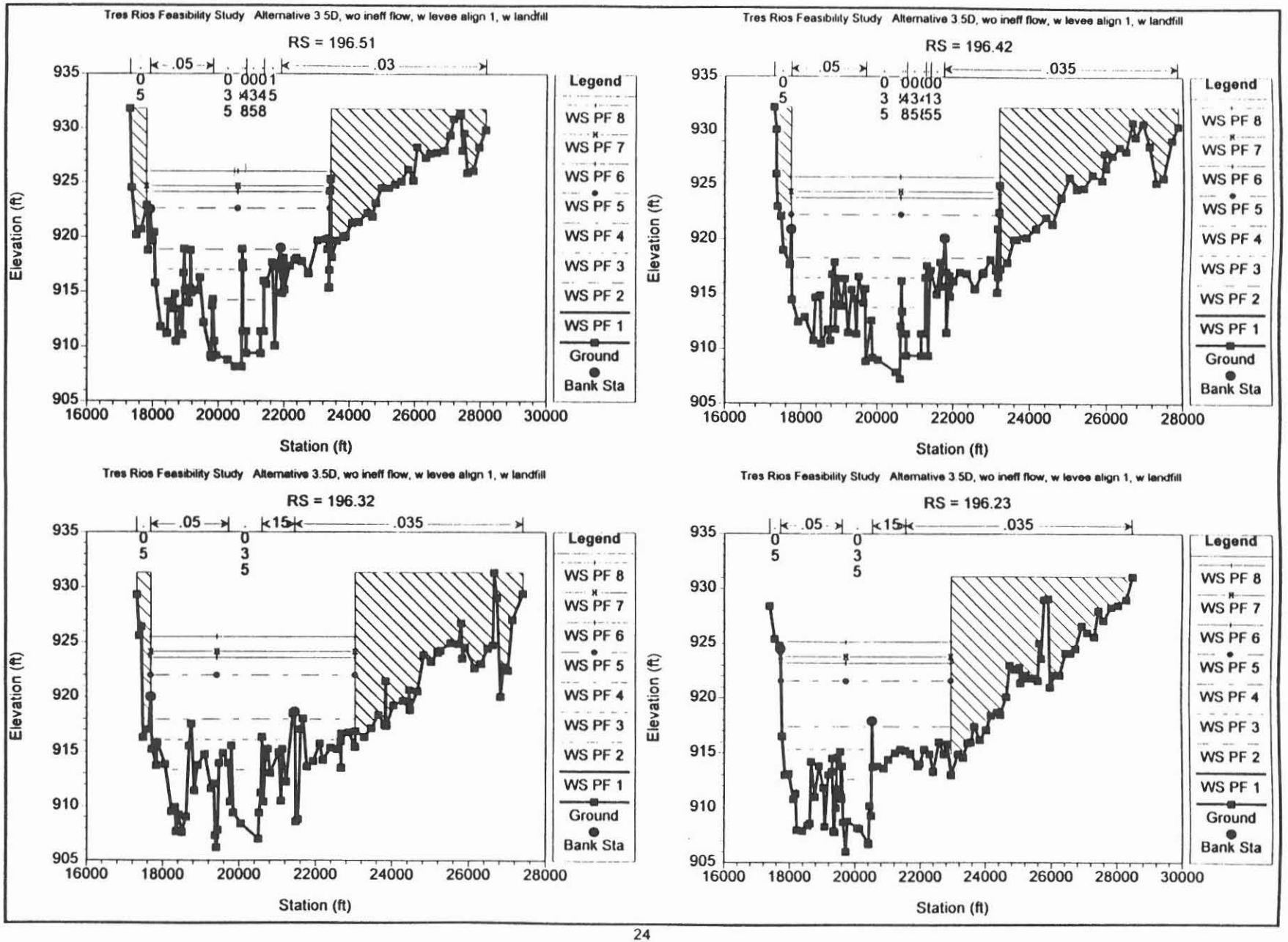


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

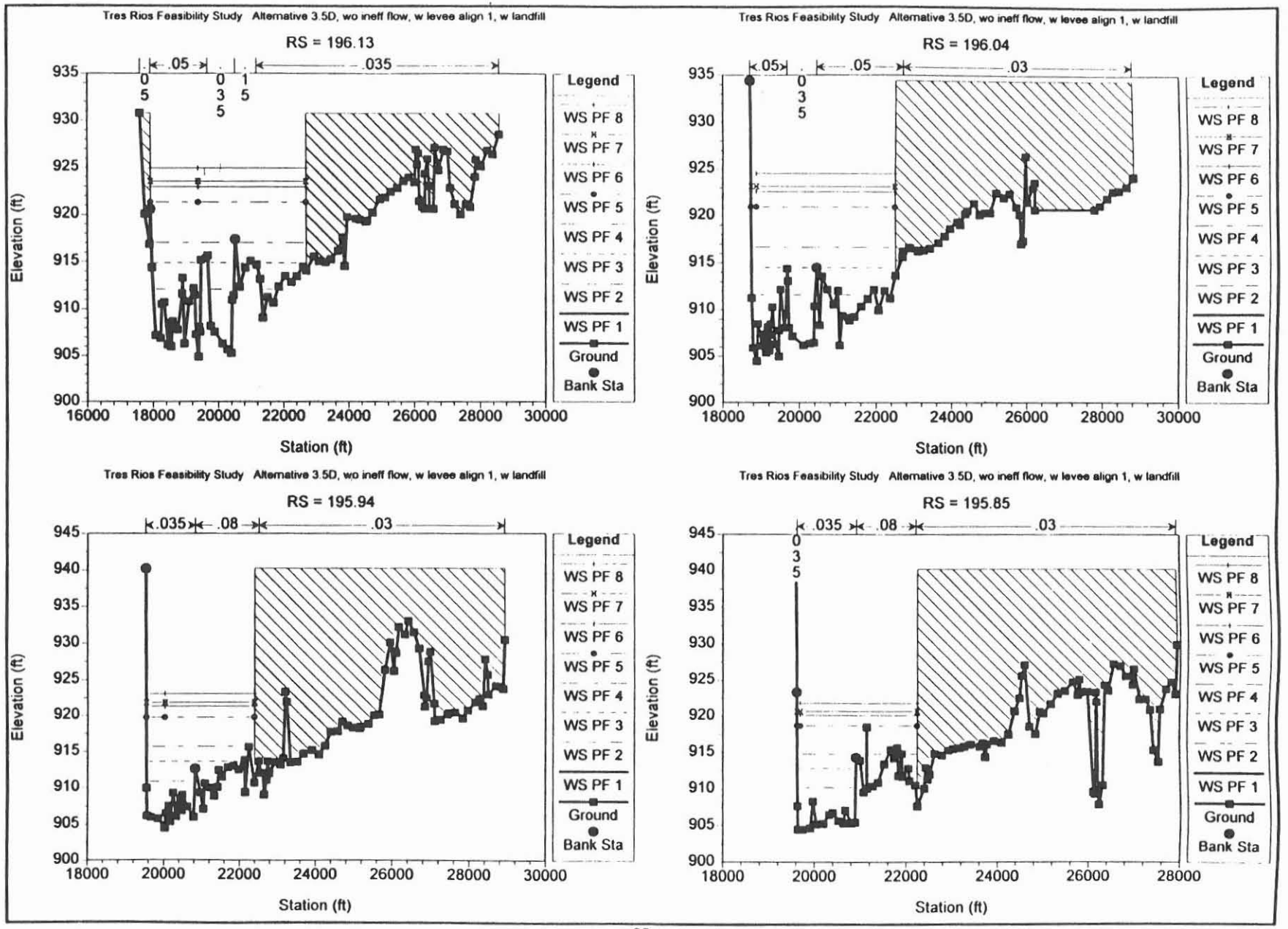


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1

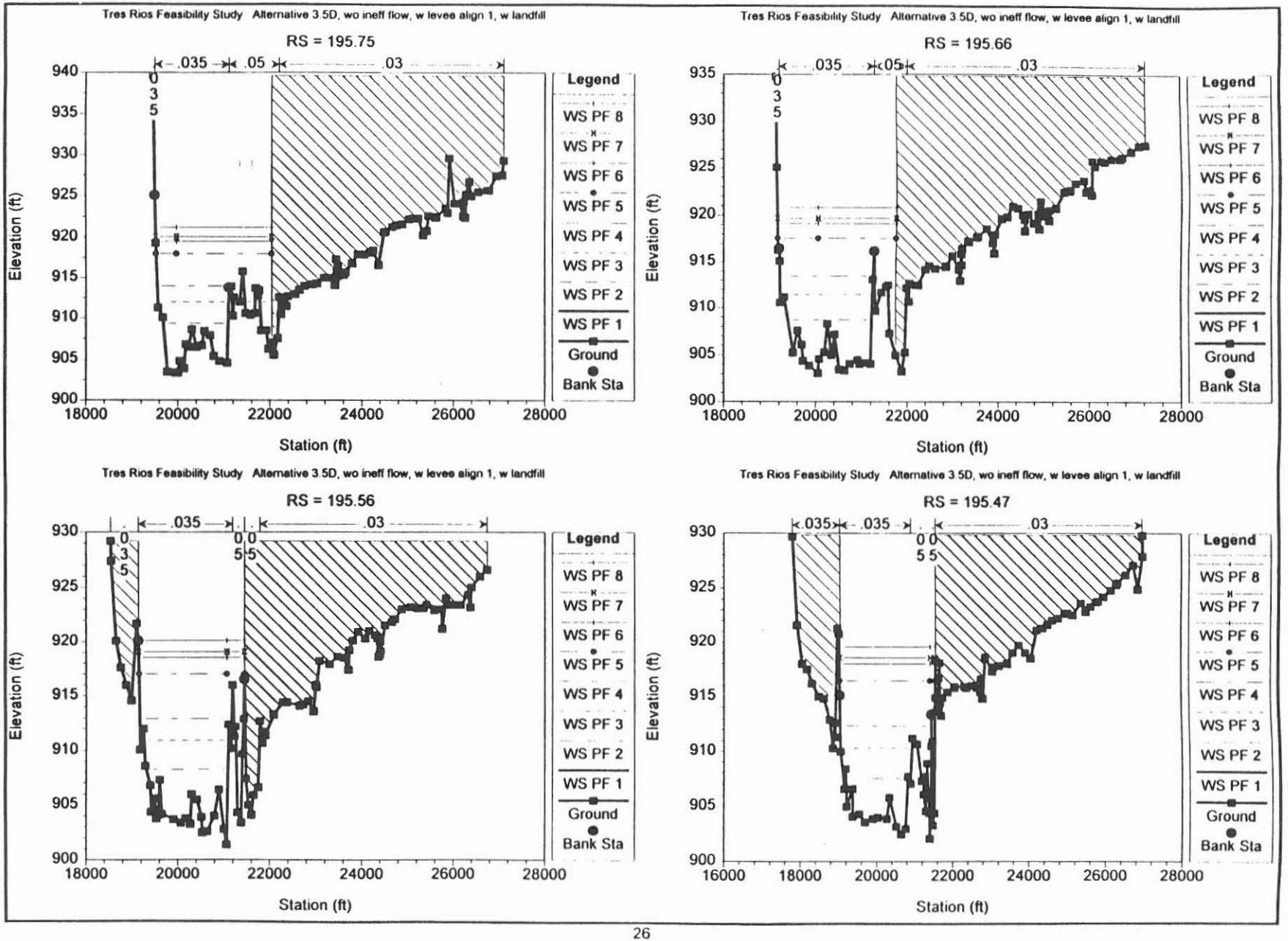
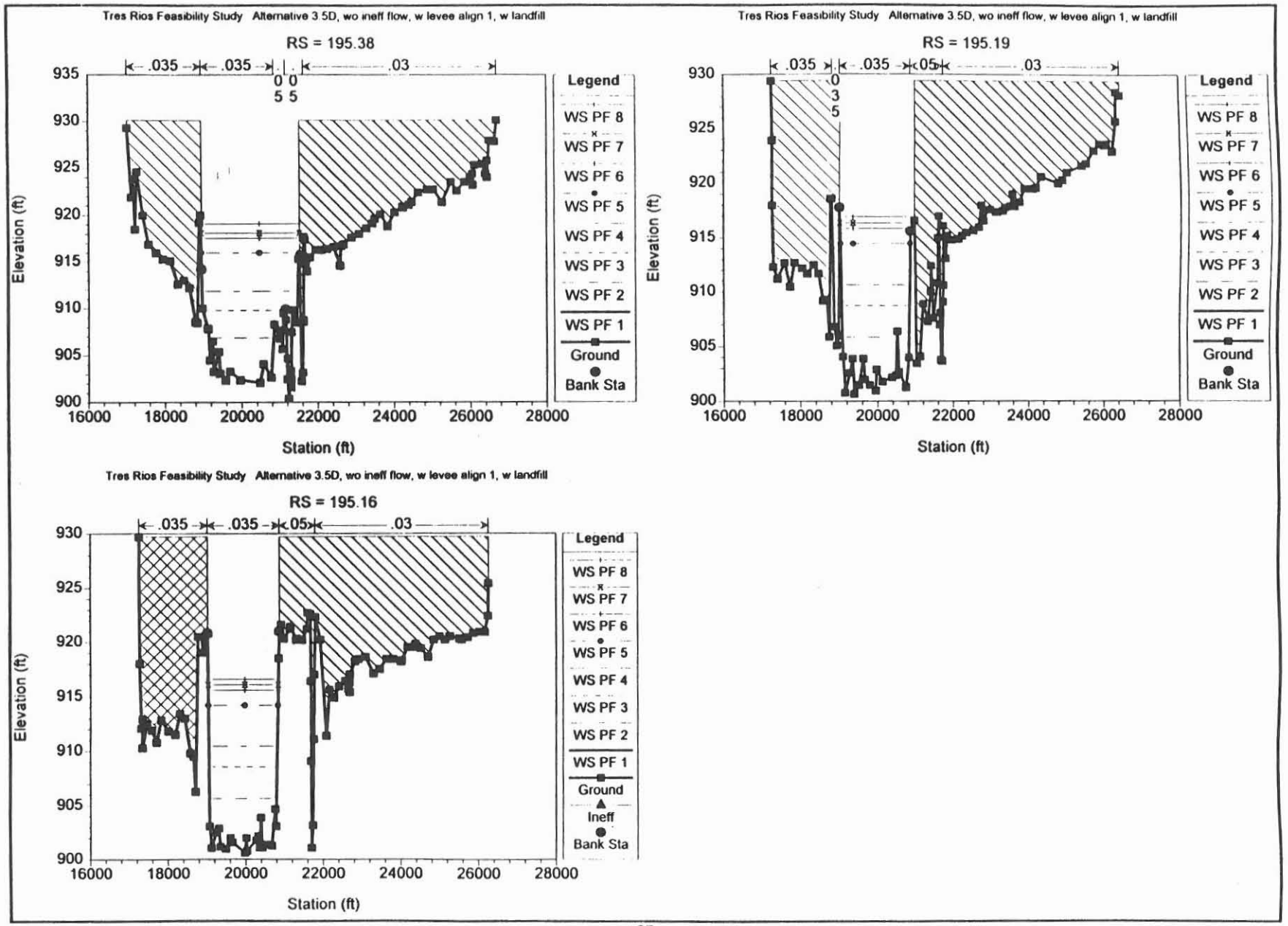


Plate 5
HEC-RAS Cross-Sections for Alternative 3.5, With Levee Alignment 1



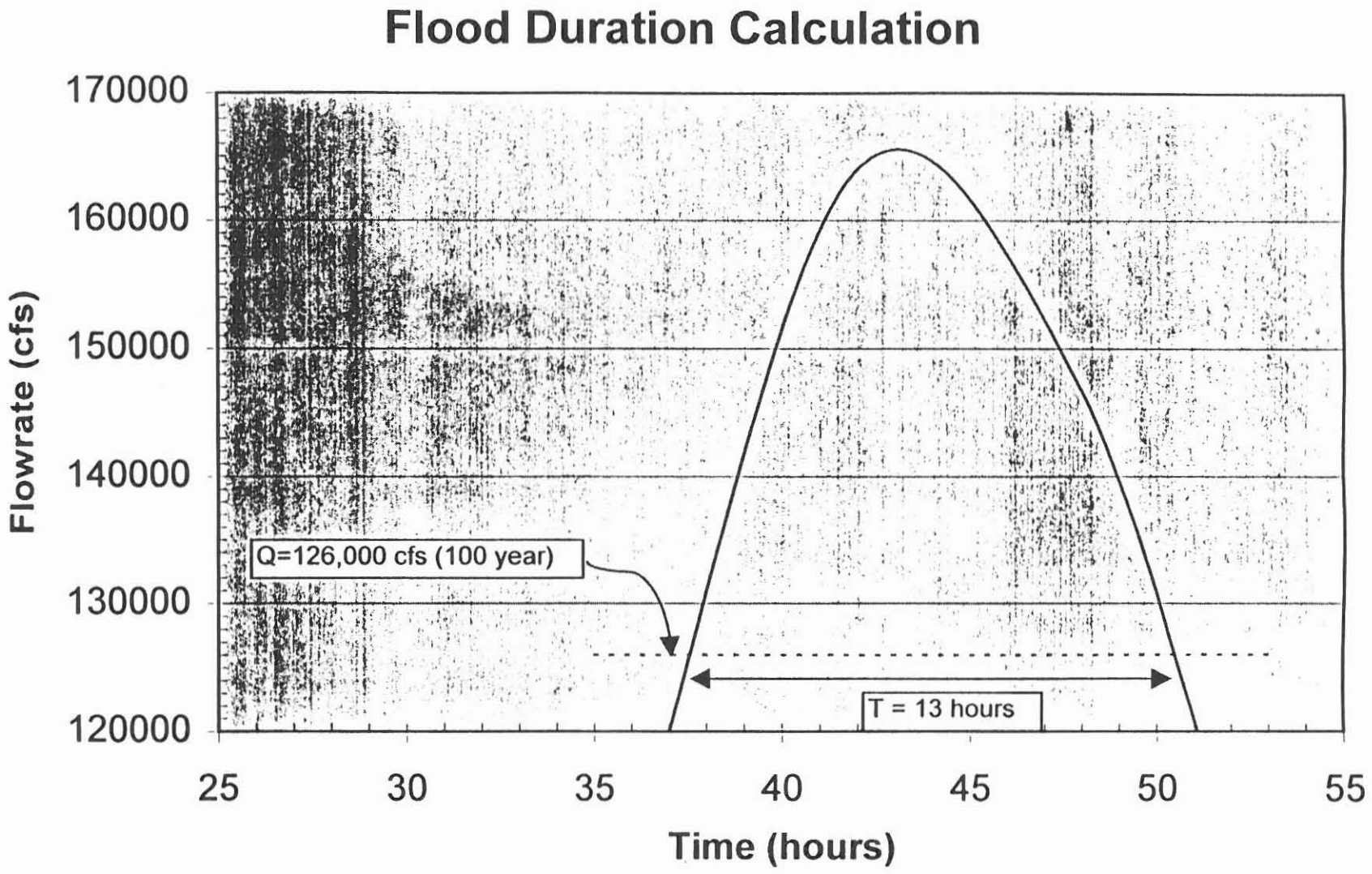


Plate 6. Alternative 3.5D 100-Year Event Flood Inundation Duration

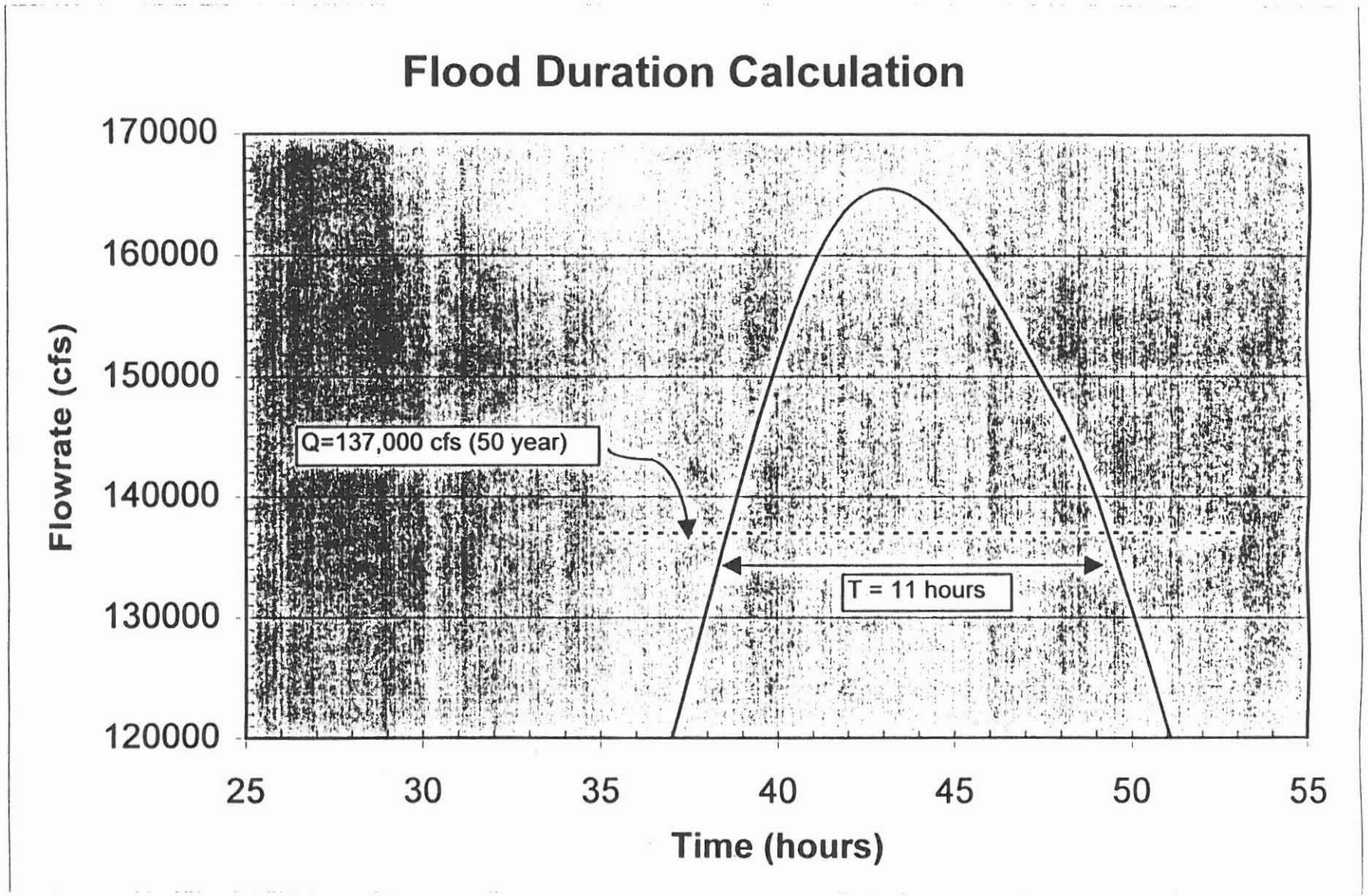


Plate 7. Alternative 3.5D 50-Year Event Flood Inundation Duration

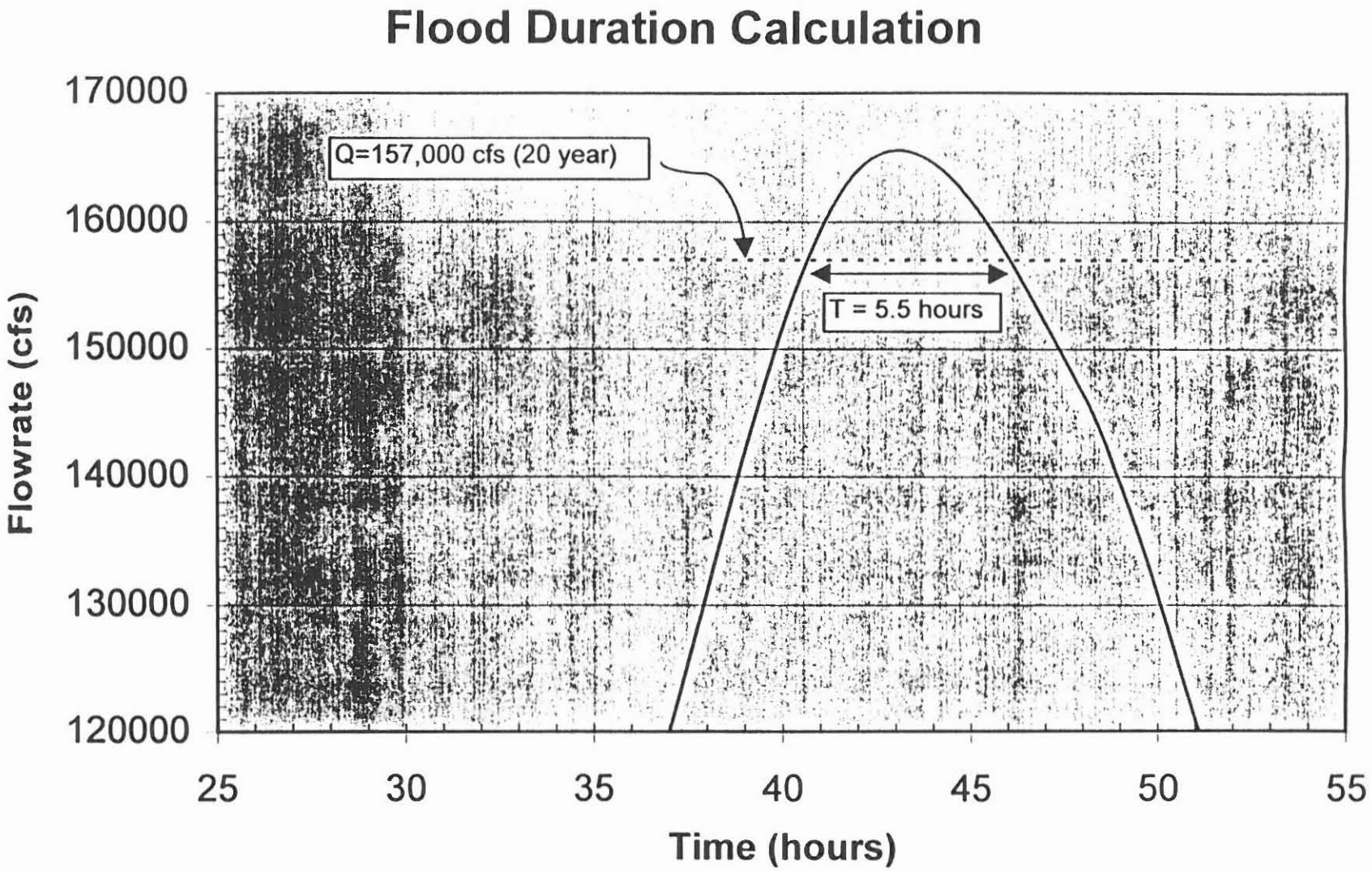
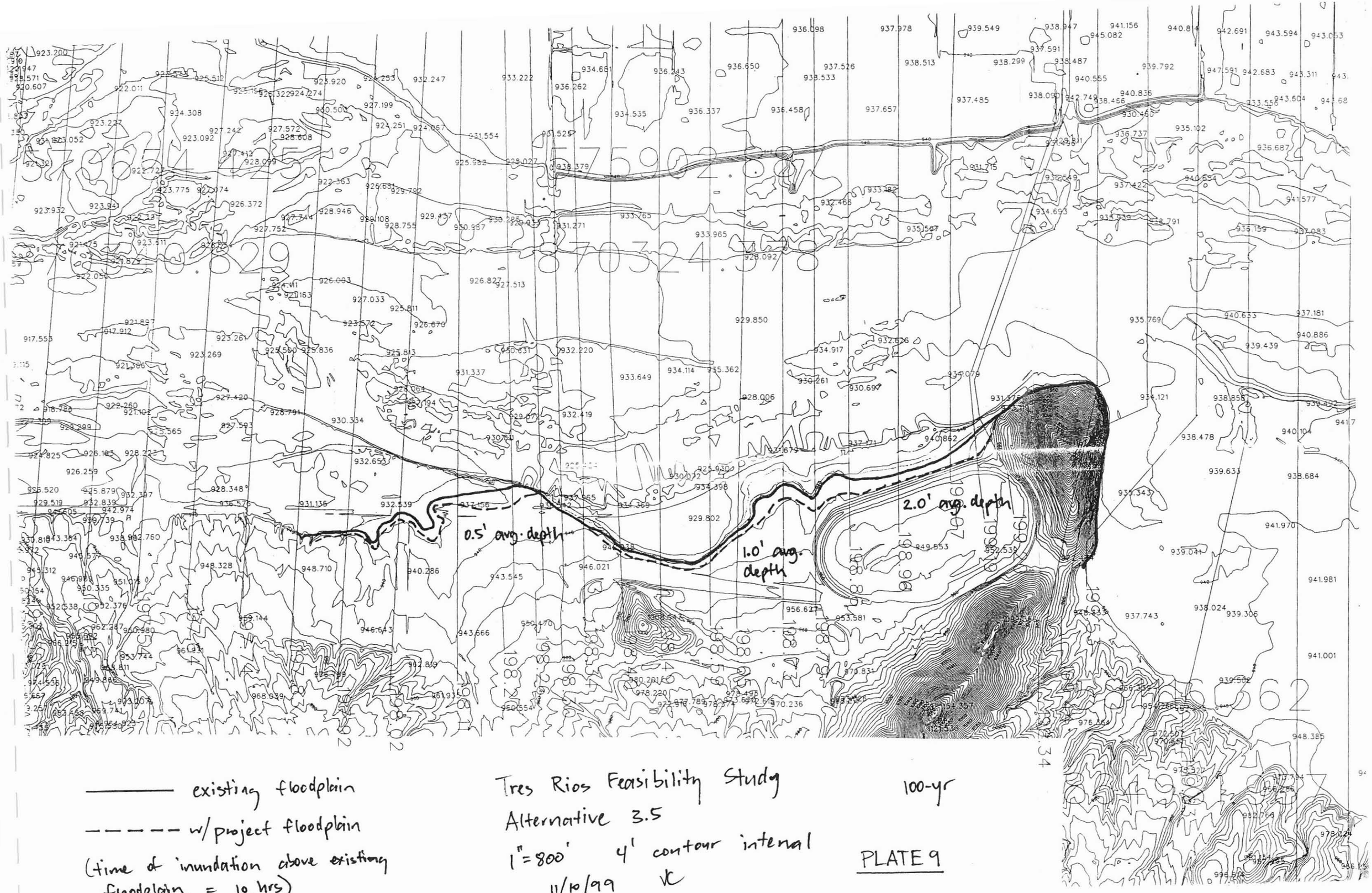


Plate 8. Alternative 3.5D 20-Year Event Flood Inundation Duration



——— existing floodplain

– – – – – w/project floodplain

(time of inundation above existing floodplain = 10 hrs)

Tres Rios Feasibility Study

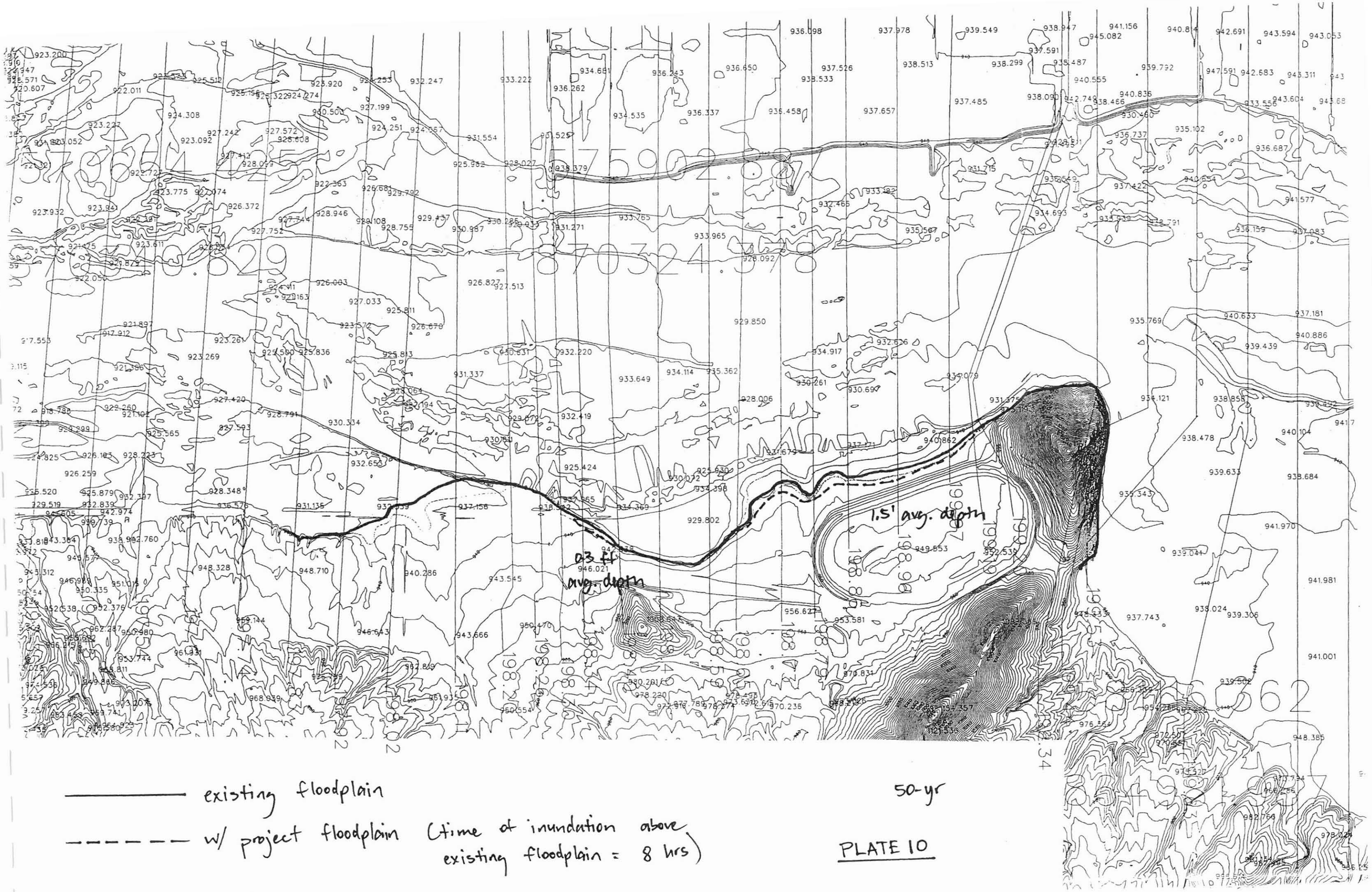
Alternative 3.5

1" = 800' 4' contour interval

11/10/99 VC

100-yr

PLATE 9

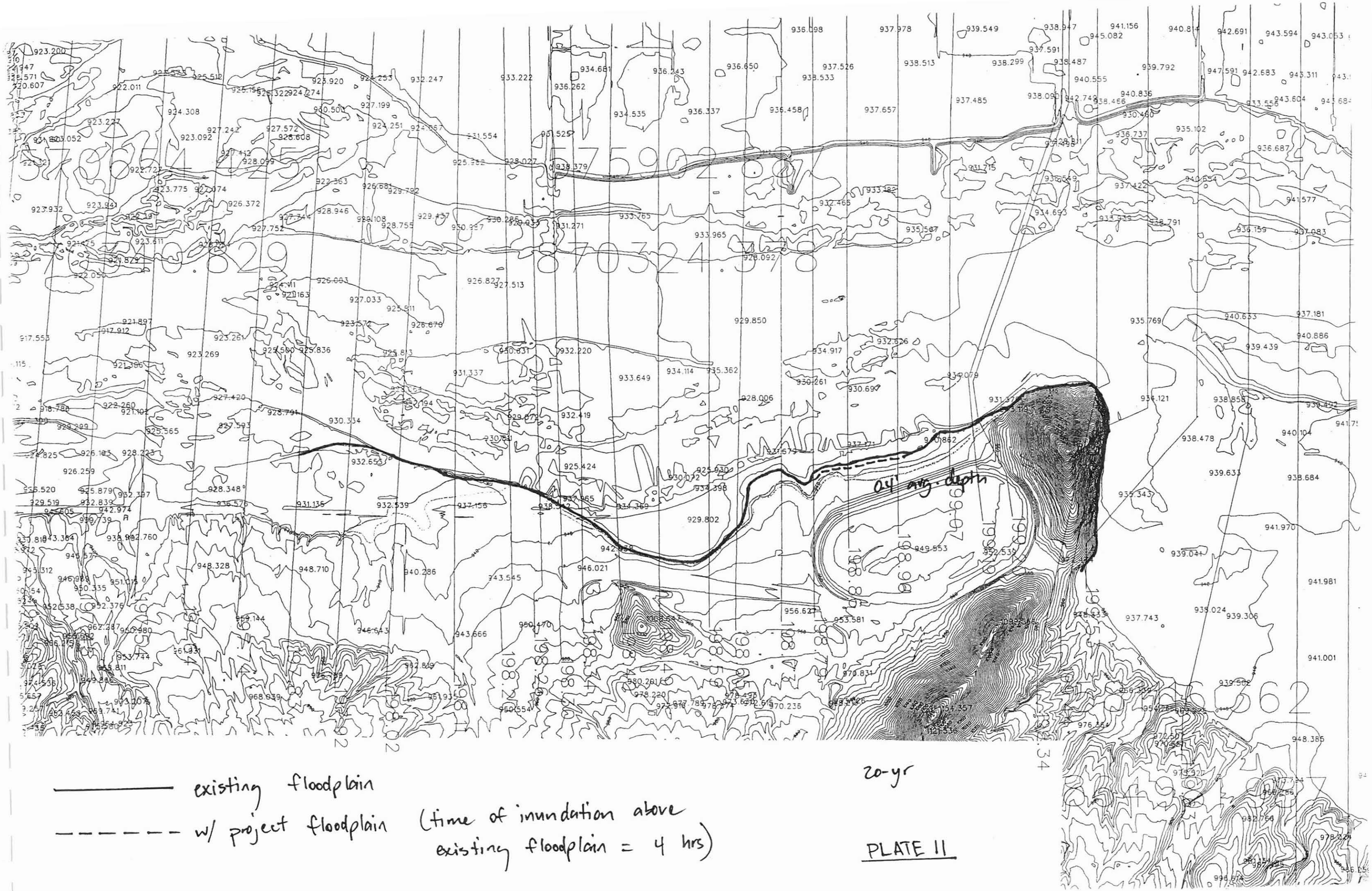


——— existing floodplain

- - - - - - w/ project floodplain (time of inundation above existing floodplain = 8 hrs)

50-yr

PLATE 10

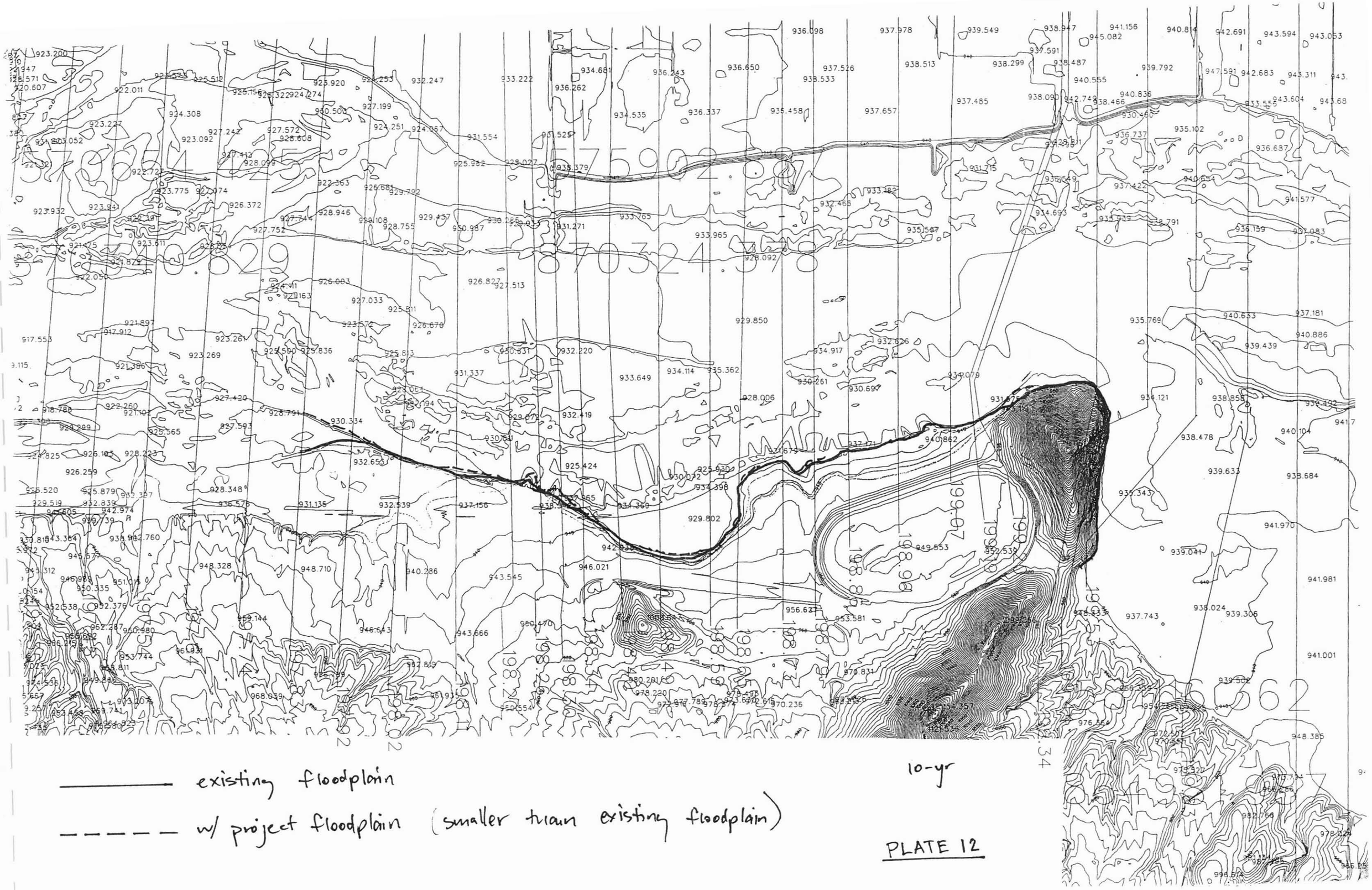


20-yr

existing floodplain

w/ project floodplain (time of inundation above existing floodplain = 4 hrs)

PLATE 11



10-yr

——— existing floodplain

– – – – – w/ project floodplain (smaller than existing floodplain)

PLATE 12

Appendix C: Water Budget

MARICOPA COUNTY, ARIZONA
GILA RIVER BASIN

APPENDIX C

WATER BUDGET ANALYSIS
TRES RIOS, FEASIBILITY STUDY

U.S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT
July 1999

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1.0 INTRODUCTION

The wetland water budget analysis begins with a review of the Tres Rios demonstration constructed wetlands. Then, the transpiration rates (plant consumption rates) for some riparian habitat are discussed. Finally, the project alternatives and the associated water budget analysis are presented.

2.0 TRES RIOS DEMONSTRATION CONSTRUCTED WETLANDS

In 1994 the local sponsor constructed the Tres Rios Wetlands Demonstration Project. The Tres Rios Demonstration Constructed Wetland Project consists of approximately 11 acres of emergent marsh, free-water surface wetlands, and is adjacent to and within the confines of the City of Phoenix/SROG 91st Avenue Wastewater Treatment Plant (WWTP). There are three operational wetland sites: Cobble (4 acres), Hayfield (6 acres), and the Research Cells (1 acre).

The demonstration project objective was to: 1) determine if wetland systems can polish pre-treated wastewater to a level that will meet perceived future discharge requirements, 2) develop scale-up parameters for an approximately 800-acre system, and 3) determine the net environmental benefit such a system and associated riparian habitats would have in the Salt/Gila, and Agua Fria River area.

The 91st Avenue Wastewater Treatment Plant is a conventional activated sludge plant currently treating approximately 154 mgd of municipal wastewater. Approximately 2 mgd (3.1 cfs) of highly treated wastewater from the WWTP has been polished by the Tres Rios wetland.

The hydrologic balance at the Tres Rios sites was evaluated using the following equation.

$$Q_{in} + Q_{rain} = Q_{out} + Q_{eto} + Q_{inf}$$

In the equation, **Qin** and **Qout** were measured from the V-Notch Weirs; **Qrain** was obtained from an on-site rain-gage and from the AZMET weather station in Litchfield Park; **Qeto** (evapotranspiration) was obtained from the Arizona Meteorological Network Weather Station located 1 mile North of McDowell Road on Cotton Lane in Litchfield Park; **Qinf** (infiltration) was calculated from the water balance equation. Since the **Qeto** was obtained from the weather station, it actually only includes the evaporation not the plant consumption. Therefore, for the Tres Rios data, the infiltration rate includes infiltration and plant consumption (transpiration).

Infiltration losses are solved for from the water balance. At the Hayfield Site Basins, infiltration losses have been extremely stable since startup. This site is characterized by fine sediments deposited during flood events of the Salt River. Long-Term average infiltration loss from Basin H1 equals 0.06 ft/d, while Basin H2 equals 0.09 ft/d. These rates are very similar to that experienced by the lined Cobble Basin C2, 0.06 ft/d. The other Cobble Basin (C1), located within the Salt River Floodway and constructed on well-draining sand, gravel, and cobble has behaved differently. In the long-term, C1 has lost an average of 0.74 ft/d to subsurface flow. At times, this represents almost

75% of the incoming wastewater. Interestingly, this basin (C1) has an unsaturated zone directly beneath it. This was substantiated in April 1997 when subsurface sampling devices were installed by USGS and Tres Rios staff. At that time, the subsurface was saturated to approximately 3 feet below the sediment surface, and then unsaturated to the local groundwater table (approximately 13 feet below ground surface). Table 1 summarized the water budget for the demonstration wetlands.

In this design analysis, the long term average value of 22.0 ft/yr (0.06 ft/d) is used to approximate the infiltration value for the wetland with soil liner. The selected evaporation value is 4.4 ft/yr.

3.0 TRANSPIRATION - PLANT CONSUMPTION RATES

The State of Arizona Game and Fish Department provided plant consumption values for riparian vegetation. The original data sources are listed below.

(a) Bill Wiesenborne, US Bureau of Reclamation, Lower Colorado (from draft DRI report)

(b) Johns, E.L. 1990, Vegetation Management Study Lower Colorado River. Bureau of Reclamation, Denver, Colorado.

(c) Norman, R., L. Finger, D. Titus, and R. Gearhart, 1993, Review of wetland evapotranspiration literature. Prepared for US Bureau of Reclamation, Lower Colorado Region. Contract No. 1-05-30-12790.

(d) US Bureau of Reclamation, 1992 Vegetation Management Study - Lower Colorado River - Phase I Report, Boulder City, Neveda.

(e) Dr. Julie Stromberg (Center for Environmental Studies, Arizona State University). Dr. Stromberg is working with the City of Tempe on their mesquite restorations (mitigation areas for channelization of Salt River). Dr. Stromberg□s report is listed in (f).

(f) Swenson, B., J. Stromberg, and D. Patten, 1993, Rio Salado Wildlife Habitat Restoration - 13 Acre Site - Revegetation Monitoring Report. Center for Environemntal Studies, Arizona State University, Tempe, Arizona.

(g) Graf, W. L., D. T. Patten, and E. Turner, 1984, Issues Concerning Pheatophyte Clearing, Revegetation, and Water Saving Along the Gila River, Arizona, US Army Corps of Engineers Contract No. DACW09-83-M-2623.

Table 2 summarizes the different riparian vegetations and the associated transpiration values based on the above data sources.

4.0 PROJECT DEVELOPMENT

4.1 Project Water Supply.

The water supply for the project will come from the 91st Avenue Wastewater Treatment Plant. The treatment plant is operated by the multi-city Subregional Operating Group (SROG) consisting of the cities of Glendale, Mesa, Phoenix, Scottsdale, and Tempe who own capacity in the plant. SROG discharges highly treated effluent from the WWTP to the Salt River at the east end of the Tres Rios Area. The project will require commitments to provide an adequate water supply for at least 50 years.

4.2 Typical Project Features

a. Pumping Station

A pump station will be designed to pump treated effluent from the WWTP to the Diurnal flow wetlands. The estimated pump capacity will be between 200 and 300 mgd. A 36-inch diameter steel pipe will connect the pump station to the diurnal flow wetlands.

b. Diurnal Flow Regulating Basins.

Diurnal flow regulating basin wetlands will be constructed on the north bank west of the WWTP. The purpose of the diurnal flow wetlands will be to buffer diurnal flowrate fluctuations from the wastewater plant. These wetland basins will have a depth of five feet. The basins are designed in a parallel arangement so that several basins can be removed from service for maintenaces while the rest are left functioning. Each basin will have gate valves to control the flow in and out of the basin through a steel pipe. The outflow gate valves will be designed so as to inhibit beavers from piling debris around them and plugging them. The bottom of the basins will be designed to facilitate draining and pumping of the basin for maintenance cleaning.

c. General Basins.

The general basins will be constructed along the north bank. Regulated flow from the diurnal flow regulating basins will maintian the basins at a constant water depth of four to five feet. The basins will be aranged in series with inlet and outlet gate valves to control the flow in and out of each basin. Basins will be connected either by pipe or by a drainage channel. The basins will be planted with various species of bulrush, cattails, water lilies and other aquatic and terrestrial plants to create a riparian habitat attractive to wildlife of the area. Viewing obsevation areas will be constructed to allow easy public without disturbing the wildlife. Maintenance roads will be constucted around each basin for access the control gates. Stubout pipes will provide a river exit.

d. C/W Stringers (Riparian Corridors)

The cottonwood/willow (C/W) stringers are riparian corridors that consist of a 20-foot wide, 4 feet deep low flow channel with a 75-foot wide, 3-foot deep bench. They will be planted with predomenantly Fremont Cottonwood and Goodding Willow trees to provide riparian habitat. Water supply for C/W stringers are either from a pipeline from the general basins or from diverting the natural stream channel in the river.

e. Open Water Marsh

Each open water/marsh (OW/M) consists of a 300 feet to 500 feet wide, 5-foot deep pond. Ponds will be clay lined to prevent loss of water caused by infiltration. Ponds will be connected in series by riprap lined connecting riffles. Control gates at the pond outlet will be used to control the flow to each pond. A 100-foot wide, 2-foot deep bench will be constructed at the bank of each pond. The bench will be planted with marsh habitat type plants while the deeper middle section of the pond will be left as open water habitat. Nesting islands for waterfowl will be constructed in the center of the ponds.

f. North Bank Levee

The levee will extend along the north bank from 91st Avenue to Dysart Road. The levee height will range from 4 feet to 10 feet high. The riverside will have an 8-inch thick riprap armor with 1 vertical on 2 horizontal sideslopes.

4.3 Project Alternatives.

Three alternatives were investigated for design and cost estimating purposes. All the alternatives contain similar project features listed above and vary only by the location and number of each project feature. For the cost estimate the alternatives were subdivided into three independent groups based on the three sources of project water supply. Water supply for the features along the north bank will come from treated effluent pumped from the WWTP. Water supply to features along the south side of the river channel will come from ground water pumped from a dewatering pump located at the WWTP. Other features will have an "independent" water source by diverting the natural base flow in the river through these features.

a. Alternative 3.

Alternative 3 is shown on Plate 2 of the Engineering Design Appendix. The feature unique to this alternative is the construction of a ground water discharge pipe from a ground water pump station at the WWTP to an existing gravel pit located at 83rd Avenue. The water from this gravel pit will then flow from a conveyance channel through C/W stringers and OW/M ponds on the south side of the river. Alternative 3 contains the largest area of OW/M ponds.

b. Alternative 4.

Alternative 4 is shown of Plate 3 of the Engineering Design Appendix. The main feature unique to this alternative is the addition of a pipeline downstream from the general basins to El Mirage Road where the water will be diverted into a series of C/W stringers. The general basins will be arranged in a series along the north bank. The ground water discharge pipeline will be placed under the river bed south to a C/W stringer.

c. Alternative 3.5.

Alternative 3.5 is shown of Plate 4 of the Engineering Design Appendix. This alternative is a combination of Alternatives 3 and 4, and therefore its main feature is similar to Alternatives 3 and 4. As shown in Plate 4, the layout of the Riparian Corridor, Open Water Marsh, Regulating Basin, and General Basin is slightly adjusted from the other alternatives.

5.0 WATER BUDGET ANALYSIS FOR THE PROJECT ALTERNATIVES

Water budget for the project alternatives 3, 4, and 3.5 was calculated based on the water losses through the diurnal flow regulating basins, general basins, cottonwood willow riparian corridors, and open water marsh.

For the regulating basins, general basins, and open water marsh, water losses include infiltration and evapotranspiration. For the cottonwood willow riparian corridors, because of no standing water, only evapotranspiration loss was calculated. In the analysis, the infiltration rate for a wetland with soil liner was assumed to be 22 ft/yr and the evaporation rate was assumed to be 4.4 ft/yr. The evapotranspiration rate for cottonwood willow was assumed to be 8.5 ft/yr and the evapotranspiration rate for the open water marsh was assumed to be 10 ft/yr. Detailed water loss calculations are presented in Tables 3, 4, and 5.

5.1 Alternative 3

(a) Cottonwood Willow Riparian Corridor
Infiltration Loss = 4,464,749 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.013 mgd
Evapotranspiration Loss = 4,464,749 ft^2 x 8.5 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 0.777 mgd

(b) Open Water Marsh
Infiltration Loss = 11,274,735 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 5.083 mgd
Evapotranspiration Loss = 11,274,735 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.31 mgd

(c) Regulating Basin
Infiltration Loss = 7,717,041 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 3.479 mgd

Evapotranspiration Loss = 7,717,041 ft^2 x 4.4 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 0.695 mgd

(d) General Basin
Infiltration Loss = 4,699,850 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.119 mgd
Evapotranspiration Loss = 4,699,850 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 0.963 mgd

Total Loss = 17.44 mgd

5.2 Alternative 4

(a) Cottonwood Willow Riparian Corridor
Infiltration Loss = 11,810,234 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 5.324 mgd
Evapotranspiration Loss = 11,810,234 ft^2 x 8.5 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.057 mgd

(b) Open Water Marsh
Infiltration Loss = 8,509,016 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 3.836 mgd
Evapotranspiration Loss = 8,509,016 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 1.743 mgd

(c) Regulating Basin
Infiltration Loss = 7,005,944 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 3.158 mgd
Evapotranspiration Loss = 7,005,944 ft^2 x 4.4 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 0.632 mgd

(d) General Basin
Infiltration Loss = 5,799,466 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.614 mgd
Evapotranspiration Loss = 5,799,466 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 1.188 mgd

Total Loss = 20.55 mgd

5.3 Alternative 3.5

(a) Cottonwood Willow Riparian Corridor
Infiltration Loss = 6,151,665 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.773 mgd
Evapotranspiration Loss = 6,151,665 ft^2 x 8.5 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 1.072 mgd

(b) Open Water Marsh
Infiltration Loss = 15,786,521 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 7.117 mgd
Evapotranspiration Loss = 15,786,521 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 3.235 mgd

(c) Regulating Basin
Infiltration Loss = 7,005,944 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 3.158 mgd
Evapotranspiration Loss = 7,005,944 ft^2 x 4.4 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 0.632 mgd

(d) General Basin
Infiltration Loss = 5,799,466 ft^2 x 22 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 2.614 mgd
Evapotranspiration Loss = 5,799,466 ft^2 x 10 ft/yr x 7.48 gal/ft^3 / 365 day/yr = 1.188 mgd

Total Loss = 21.7 mgd

6.0 Recommendation

There are some concerns regarding the water budget analysis. First, the water budget analysis was based on the long term steady-state condition. However, during the start-up stage, the project requires more water. Another concern is the evapotranspiration calculation. Although the major water losses are from the groundwater infiltration through the perennial stream and wetlands, water losses through evapotranspiration take about 27 percent of the total water budget. Evaporation data in the study area show that during warm weather, the evaporation rate can be double the average annual rate. This implies that during the start-up stage during extremely warm weather, the water loss will be much more than the steady-state value. Therefore, it is recommended that the water supply system be designed with a capacity two times larger than that calculated under the steady-state condition.

TABLE 1
WATER BUDGET
FOR TRES RIOS DEMONSTRATION WETLANDS

	Cobble Site		Hayfield Site	
Cell	C1	C2	H1	H2
Lining	unlined	lined	lined	lined
Size(acre)	2.2	2.2	3.0	3.0
Surface Flow	19%	87%	80%	71%
Evapotranspiration	3%	4%	4%	4%
Infiltration	72%	8%	16%	19%
Evaporation(ft/yr)	4.4	4.4	4.4	4.4
Infiltration(ft/d)	0.74	0.06	0.06	0.09
Infiltration(ft/yr)	270	22	22	33

Note:

(1) Hydraulic losses (% of Influent) from the Cobble and Hayfield Site Basins are measured from 10/1995 through 7/1997.

(2) Data are based on the following two reports.

a. Tres Rios Demonstration Constructed Wetland Operation & Research, May 1996, by Michael G

b. Tres Rios Demonstration Constructed Wetland Project, 1996/1997 Operation & Water Quality Re

(3) H1 is the only basin where the water losses add to 100%. This could be the result of measurement error (see Report b).

TABLE 2
TRANSPIRATION RATE FOR RIPARIAN HABITAT

Habitat	ft/yr
Arrowweed	1.2
Screwbean Mesquite and Tamarisk Mix	1.2
Honey Mesquite	1.6
Salt Cedar and Honey Mesquite Mix	3.3
Cottonwood willow (low density)	3.6
Willow	2.5-4.4
Cottonwood and Mesquite	3.1
Cottonwood	7-8.5
Cattail	7.5-16.5
Scirpus	3.2-22.7
Carex	3.8-6.4
Salt Cedar	3-9.2
Quailbush	3-4
Saltgrass	0.8-4.0
Saltbush	3.2
Sacaton Grass	4
Bermuda Grass	2.3-6.0

TABLE 5 WATER BUDGET ANALYSIS FOR ALTERNATIVE 3.5			
	Size	Infiltration	Evapotranspiration
	ft^2	mgd	mgd
Cottonwood Willow Riparian Corridor No. 1	1,367,919	0.61672	0.23828
Cottonwood Willow Riparian Corridor No. 2	1,841,928	0.83042	0.32085
Cottonwood Willow Riparian Corridor No. 3	1,226,488	0.55296	0.21364
Cottonwood Willow Riparian Corridor No. 4	243,150	0.10962	0.04235
Cottonwood Willow Riparian Corridor No. 5	635,348	0.28644	0.11067
Cottonwood Willow Riparian Corridor No. 6	535,270	0.24132	0.09324
Cottonwood Willow Riparian Corridor No. 7	301,562	0.13596	0.05253
Sub-total Cottonwood Willow	6,151,665	2.77345	1.07156
Open Water Marsh Pond No. 1	690,460	0.31129	0.14150
Open Water Marsh Pond No. 2	1,811,694	0.81679	0.37127
Open Water Marsh Pond No. 3	2,076,685	0.93626	0.42557
Open Water Marsh Pond No. 4	1,529,897	0.68975	0.31352
Open Water Marsh Pond No. 5	3,635,444	1.63902	0.74501
Open Water Marsh Pond No. 6	656,192	0.29584	0.13447
Open Water Marsh Pond No. 7	1,598,979	0.72089	0.32768
Open Water Marsh Pond No. 8	1,549,089	0.69840	0.31745
Open Water Marsh Pond No. 9	2,238,081	1.00903	0.45865
Sub-total Open Water Marsh	15,786,521	7.11727	3.23512
Regulating Basin No. 1	1,030,905	0.46478	0.09296
Regulating Basin No. 2	1,030,905	0.46478	0.09296
Regulating Basin No. 3	1,030,905	0.46478	0.09296
Regulating Basin No. 4	1,089,723	0.49130	0.09826
Regulating Basin No. 5	1,317,647	0.59405	0.11881
Regulating Basin No. 6	475,286	0.21428	0.04286
Regulating Basin No. 7	519,585	0.23425	0.04685
Regulating Basin No. 8	510,988	0.23038	0.04608
Sub-total Regulating Basin	7,005,944	3.15860	0.63172
General Basin No. 1	738,452	0.33293	0.15133
General Basin No. 2	572,982	0.25833	0.11742
General Basin No. 3	578,853	0.26097	0.11862
General Basin No. 4	566,535	0.25542	0.11610
General Basin No. 5	565,618	0.25501	0.11591
General Basin No. 6	661,636	0.29830	0.13559
General Basin No. 7	541,855	0.24429	0.11104
General Basin No. 8	598,208	0.26970	0.12259
General Basin No. 9	548,806	0.24743	0.11247
General Basin No. 10	426,521	0.19229	0.08741
Sub-total General Basin	5,799,466	2.61466	1.18848
Grand Total	34,743,596	15.664	6.127
Total Water Loss		***21.79 mgd***	

Appendix D: Design and Costs

APPENDIX D

F5 ENGINEERING DESIGN APPENDIX
TRES RIOS, ARIZONA, FEASIBILITY STUDY

MARICOPA COUNTY, ARIZONA

February, 2000
APPENDIX D
ENGINEERING DESIGN
F-5 FEASIBILITY REPORT FOR
TRES RIOS, ARIZONA, FEASIBILITY STUDY
MARICOPA COUNTY, ARIZONA

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1.0 OBJECTIVE

The purpose of this appendix is to provide results of the civil and structural design effort. Design data and calculations were developed sufficient to determine the technical and economic feasibility of each alternative and in the event the project is authorized, to provide a base design leading to the development of the construction plans and specifications. The objective of the Tres Rios project is to implement environmental restoration by creating wetland and riparian habitat in the vicinity of the confluence of the Salt River and Gila River.

2.0 STUDY AREA

The Tres Rios Project is located in central Maricopa County, Arizona. The study area generally includes a one-mile wide corridor along the Salt River and Gila River extending from 83rd Avenue on the east, downstream past the confluence with the Agua Fria River to the diversion structure of the Buckeye Irrigation Company on the west. The proximity of the study area to these three rivers led to the name "Tres Rios". The total project reach is seven miles. A project location map is shown on Plate 1.

3.0 SITE SELECTION AND PROJECT DEVELOPMENT

3.1 Demonstration Project.

In 1994 the local sponsor constructed the Tres Rios Wetlands Demonstration Project. The Tres Rios Demonstration Constructed Wetland Project consists of approximately 11 acres of emergent marsh, free-water surface wetlands, and is located adjacent to and within the confines of the City of Phoenix/SROG 91st Avenue Wastewater Treatment Plant. There are three operational wetland sites: Cobble (4 acres), Hayfield (6 acres), and the Research Cells (1 acre).

The demonstration project objective was to: 1) To determine if wetland systems can polish pre-treated wastewater to a level which will meet perceived future discharge requirements, 2) Develop scale-up parameters for an approximately 800 acre system, and 3) Determine the net environmental benefit such a system and associated riparian habitat would have in the Salt/Gila, and Agua Fria River area. The plans and specifications for this project will be based on the research results from the demonstration project.

3.2 Project Water Supply.

The water supply for the project will come from the 91st Avenue Wastewater Treatment Plant (WWTP). The treatment plant is operated by the multi-city Subregional Operating Group (SROG) consisting of the cities of Glendale, Mesa, Phoenix, Scottsdale, and Tempe who own capacity in the plant. SROG discharges highly treated effluent from the 91st Avenue WWTP to the Salt River at the east end of the Tres Rios Area. The project will require commitments to provide an adequate water supply for at least 50 years.

3.3 Typical Project Features

a. Pumping Station

A pump station will be designed to pump treated effluent from the 91st Avenue Wastewater Treatment Plant (WWTP) to the Diurnal flow wetlands. The estimated pump capacity will be between 200 and 300 mgd. A 36-inch diameter steel pipe will connect the pump station to the diurnal flow wetlands.

b. Diurnal Flow Regulating Basins.

Diurnal flow regulating basin wetlands will be constructed on the north bank west of the WWTP. The purpose of the diurnal flow wetlands will be to buffer diurnal flowrate fluctuations from the wastewater plant. These wetland basins will have a depth of five feet. The basins are designed in a parallel arrangement so that several basins can be removed from service for maintenance while the rest are left functioning. Each basin will have gate valves to control the flow in and out of the basin through a steel pipe. The outflow gate valves will be designed so as to inhibit beavers from piling debris around them and plugging them. The bottom of the basins will be designed to facilitate draining and pumping of the basin for maintenance cleaning.

c. General Basins.

The general basins will be constructed along the north bank. Regulated flow from the diurnal flow regulating basins will maintain the basins at a constant water depth of four to five feet. The basins will be arranged in series with inlet and outlet gate valves to control the flow in and out of each basin. Basins will be connected either by pipe or by a drainage channel. The basins will be planted with various species of bulrush, cattails, water lilies and other aquatic and terrestrial plants to create a riparian habitat attractive to wildlife of the area. Viewing observation areas will be constructed to allow easy public without disturbing the wildlife. Maintenance roads will be constructed around each basin for access to the control gates. Stubout pipes will provide a river exit.

d. C/W Stringers (Riparian Corridors)

The cottonwood/willow (C/W) stringers are riparian corridors that consist of a 20-foot wide, 4-foot deep low flow channel with a 75-foot wide, 3-foot deep bench. They will be planted with predominantly Fremont Cottonwood and Goodding Willow trees to provide riparian habitat. Water supply for C/W stringers will be either from a pipeline from the general basins or from diverting the natural stream channel in the river.

e. Open Water Marsh

Each open water/marsh (OW/M) consists of a 300 feet to 500 feet wide, 5-foot deep pond. Ponds will be clay lined to prevent loss of water caused by infiltration. Ponds will

be connected in series by riprap lined connecting riffles. Control gates at the pond outlet will be used to control the flow to each pond. A 100-foot wide, 2 foot deep bench will be constructed at the bank of each pond. The bench will be planted with marsh habitat type plants while the deeper middle section of the pond will be left as open water habitat. Nesting islands for waterfowl will be constructed in the center of the ponds.

f. North Bank Levee

The levee will extend along the north bank from 91st Avenue to Dysart Road. Three levee alternatives were considered. The recommended levee selected was the 100-year levee alternative. The levee height will range from 4 feet to 10 feet high. The riverside will have 15-inch thick riprap armor with 1 vertical on 2 horizontal sideslopes. The typical levee cross section is shown on Sheet 8.

3.4 Project Alternatives.

Two alternatives, Alternative 3 and Alternative 4, were initially investigated for design and cost estimating purposes for the F4 feasibility report. A third alternative, Alternative 3.5, was added for the AFB report. All alternatives contain similar project features listed above and vary only by the location and number of each project feature. For the cost estimate the alternatives were subdivided into three independent groups based on the three sources of project water supply. Water supply for the restoration features along the north bank will come from treated effluent pumped from the 91st Avenue WWTP. Water supply to the restoration features along the south side of the river channel will come from ground water pumped from a dewatering pump located at the WWTP. Other restoration features will have an "independent" water source by diverting the normal base stream flow in the river to them.

a. Alternative 3.

Alternative 3 is shown on Plate 2. The feature unique to this alternative is the construction of a ground water discharge pipe from a ground water pump station at the 91st Avenue WWTP to an existing gravel pit located at 83rd Avenue. The water from this gravel pit will then flow from a conveyance channel through C/W stringers and OW/M ponds on the south side of the river. Alternative 3 contains the largest area of OW/M ponds.

b. Alternative 4.

Alternative 4 is shown on Plate 3. The main feature unique to this alternative is the addition of a pipeline downstream from the general basins to El Mirage Road where the water will be diverted into a series of C/W stringers. The general basins will be arranged in a series along the north bank. The ground water discharge pipeline will be placed under the riverbed to a C/W stringer on the south side.

c. Alternative 3.5

Alternative 3.5 is shown on Plate 4. Alternative 3.5 is the recommended plan. This alternative is a combination of features in Alternative 3 and Alternative 4 that optimizes the planning objectives. This alternative utilizes ground water discharge pipe feature similar to Alternative 3. A ground water discharge pipe will be constructed from a ground water pump station at the 91st Avenue WWTP to an existing gravel pit located at 83rd Avenue. The water from this gravel pit will then flow from a conveyance channel through C/W stringers and OW/M ponds on the south side of the river. A series of general basins will be constructed along the north bank similar to Alternative 4. Also similar to alternative 4, a pipeline will be constructed downstream from the general basins to El Mirage Road where the water will be diverted into a series of C/W stringers. The C/W stringers will flow into four open water/marsh (OW/M) areas.

The design of the open water/marsh (OW/M) areas in this alternative has been refined for greater habitat benefits. The side adjacent to the riverbank will be planted with a 100-foot to 200-foot wide area of cottonwood and willow trees. The open water section will be maintained at a depth greater than 3 feet. The riverside will have a 100-foot to 200-foot wide marsh area. This design will require more excavation and earthwork thus a higher initial construction cost than the design used in the other alternatives, but will provide a more natural riverine environment. Also, the deeper depths will result in less frequent sediment removal and thus lower long term maintenance costs than the design used in the other alternatives.

A reduced version of Alternative 3.5 is shown on Plate 4a. The open water/marsh (OW/M) areas on the south side have been omitted. The full Alternative 3.5 will depend on sponsorship by the Gila River Indian Community, the landowner on the south side.

3.5. Design Plates.

The attached sheets 1 through 10 show the plan view for the various alternatives and details of the project features.

4.0 CONSTRUCTION CONSIDERATIONS

Most of the construction will consist of earthwork. Excavated material can be disposed of at the sand and gravel mining companies in the area. Some of the selected excavated material will be used for the construction of the north bank levee. The material to be used for the levee will likely come from the excavation of the diurnal flow regulating basins. Dewatering will be necessary for excavation of some of the OW/M ponds in the vicinity of the Gila River confluence. The Geotechnical Appendix will provide more detail of areas where dewatering will be needed.

5.0 OPERATION AND MAINTENANCE

5.1 Operations.

Daily operations will include monitoring and adjustment of water levels in the diurnal and general basins and a daily patrol of these overbank wetland areas to visually confirm water levels and outflow. It is assumed a biweekly patrol of the OW/M ponds and stringer channels will be sufficient to check their operation.

5.2 Maintenance.

The wetland areas are designed as close as possible to a natural riparian ecosystem and should be self-sustaining as long as sufficient amounts of water are provided. However, as in any manmade, controlled system, maintenance will be required. The assumed maintenance schedule for the various features is shown in the table below.

Item	Schedule
Regulating and general basins drained to kill overgrowth of bulrush	3 years
Debris removal from outlet control gates	4 months
Saltcedar control	Annual
Sediment removal from OW/M ponds*	20 years
Control gate valve major repair/replacement	50 years
Pump maintenance	2 years
Pump replacement	25 years
Minor regrading of access roads after a minor flood	5 years
Regrading, reconstruction, and replanting of OW/M ponds and access roads after a major flood event	Once every 50 years

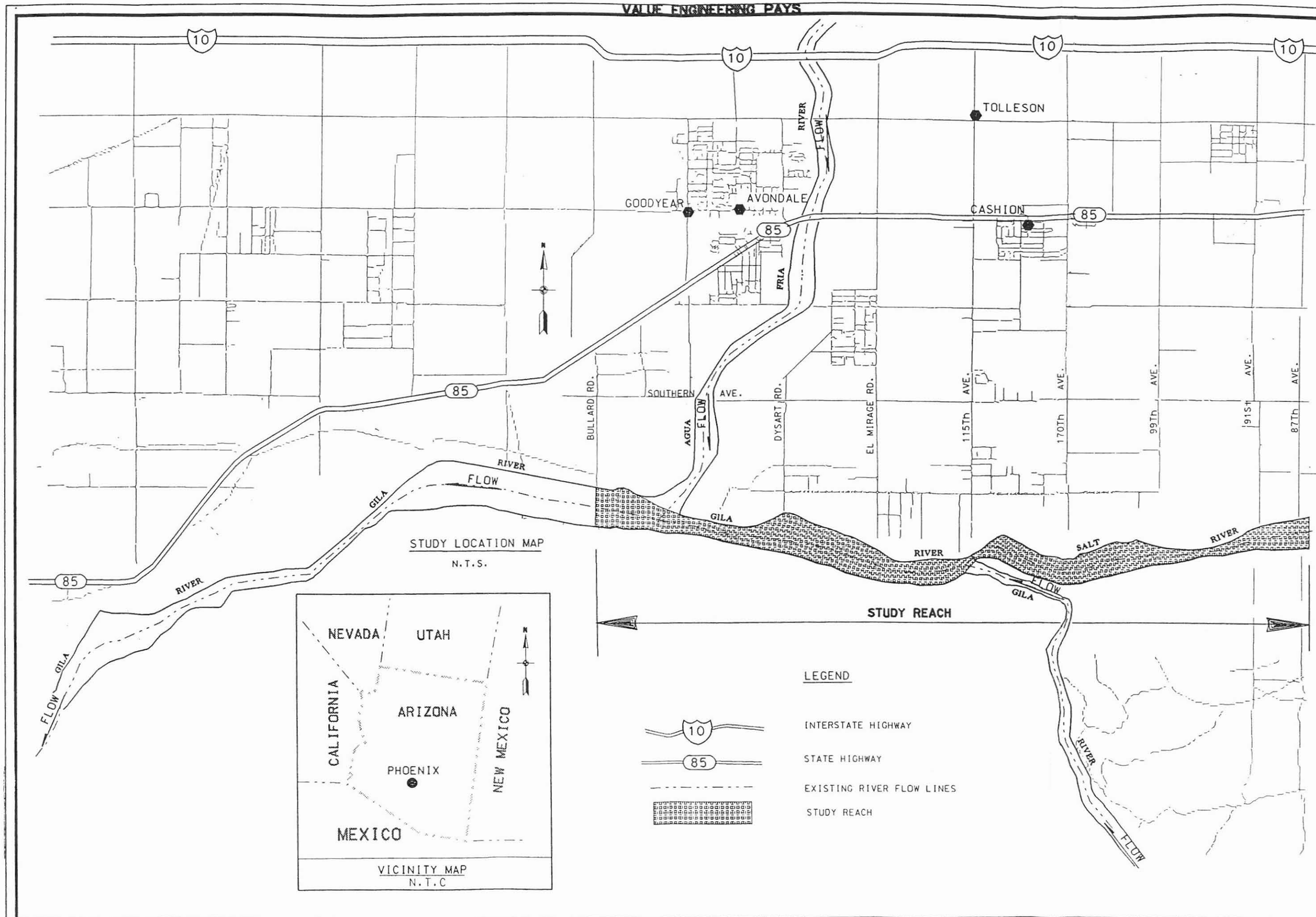
*The average annual sediment accumulation in the study area has been estimated to be 50,041 CY. A 20 year sediment removal frequency is an average for all the OW/M ponds in the study area and assumes that sediment removal for the OW/M ponds for Alternative 3.5 would be needed when the ponds are 1/3 full. It is likely that the actual rate of infilling of individual ponds will vary so that some ponds will require more frequent sediment removal.

5.3 Repairs After A Major Flooding Event.

Flooding is an important and natural part of a natural riparian ecosystem. Once established, the cottonwood/willow areas should be able to withstand a major flooding event. However, because much of the project is constructed in a fluvial bed river channel some reconstruction will be needed after a major flood. The wetland OW/M ponds and

connecting rivelets will likely require dredging and reconstruction after a major flood event and the marsh areas will require replanting. Also, regrading and reconstruction of

the access roads, trails, and viewing areas in the river bottom will be needed after a major flooding event. It is assumed that such an event will occur once during the 50-year life of the project.



SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER, MARICOPA COUNTY, ARIZONA
FEASIBILITY STUDY

VICINITY AND PROJECT LOCATION MAPS

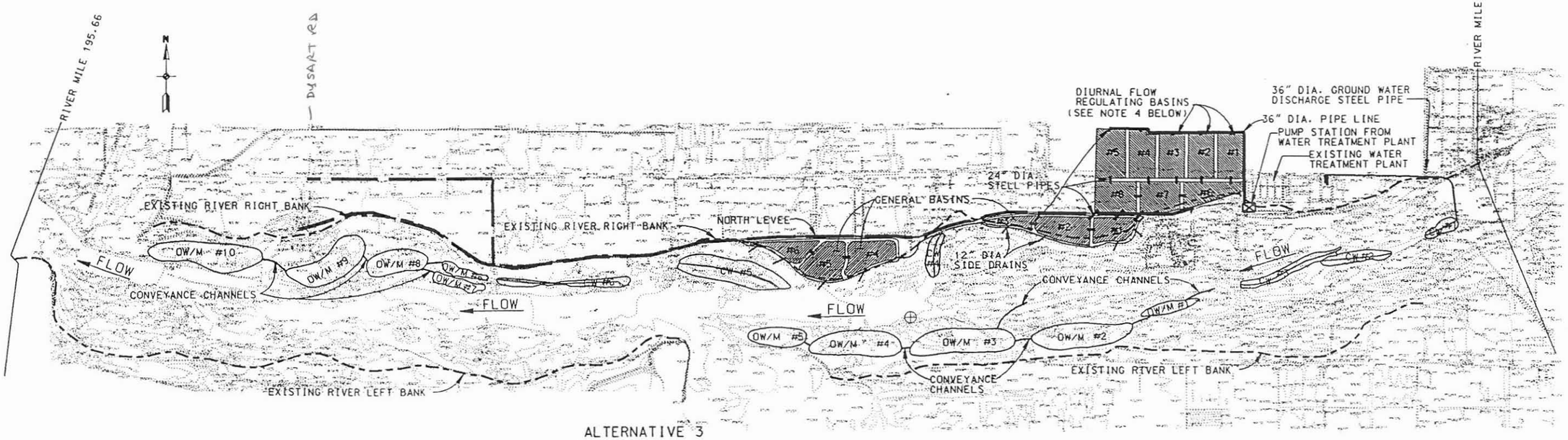
U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: LOCMAP.DGN

DISTRICT FILE NO. 2407

SHEET 1 OF 10



ALTERNATIVE 3
PROJECT AREA PLAN

1500 750 0 1500 3000FT

SCALE: 1" = 1500'

NOTES:

1. VIEWING AREAS ARE NOT SHOWN ON THE PLAN.
2. ACCESS RAMPS AND MAITENANCE ROADS SHALL BE INCLUDED IN THE PLAN AND SPECIFICATION .
3. SEE SUBSEQUENT PLATES FOR ENLARGED OW/M POND'S, CW RIARIAN CORRIDOR'S PLANS AND PROFILES, MISCELANEOUS DETAILS, TYPICAL LEVEE AND CONVEYANCE CHANNEL CROSS SECTIONS ARE ALSO PROVIDED.
4. SEE SHEET 6 FOR SCHEMATIC PROFILE OF REGULATING AND GENERAL BASINS

LEGEND

- REGULATING BASIN
- GENERAL BASIN
- OW/M — OPEN-WATER/MARSH POND
- CW — COTTONWOOD/WILLOW RIPARIAN CORRIDOR

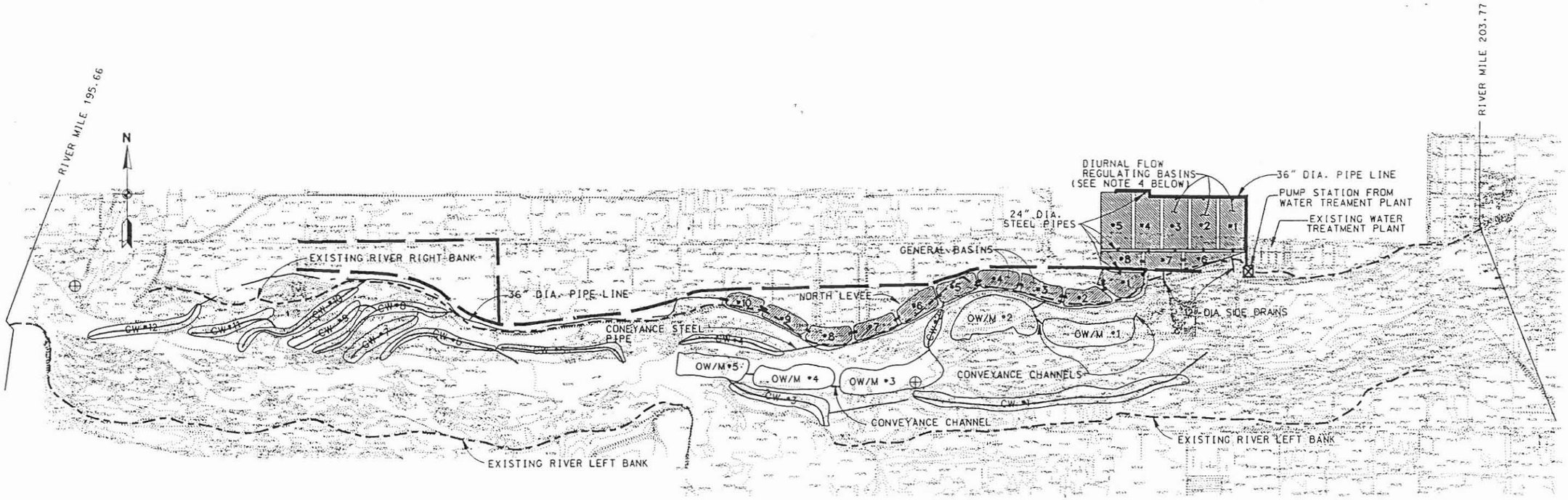
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER, MARACOPA COUNTY, ARIZONA
FEASIBILITY STUDY
GENERAL PROPOSED PROJECT AREA
ALTERNATIVE 3
RIVER MILE 195.66 TO 203.77

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH
CADD FILE NAME: ALT3.DGN
DISTRICT FILE NO. 2607

SHEET
2 OF 10



ALTERNATIVE 4
PROJECT AREA PLAN

1500 750 0 1500 3000FT

SCALE: 1"= 1500'

NOTES:

1. VIEWING AREAS ARE NOT SHOWN ON THE PLAN.
2. ACCESS RAMPS AND MAITENACE ROADS SHALL BE INCLUDED IN THE PLAN AND SPECIFICATIONS.
3. SEE SUBSEQUENT PLATES FOR ENLARGED OW/M POND'S. CW RIPARIAN CORRIDOR'S PLANS AND PROFILES. MISCELLANEOUS DETAILS. TYPICAL LEVEE AND CONVEYANCE CHANNEL CROSS SECTIONS ARE ALSO PROVIDED.
4. SEE SHEET 6 FOR SCHEMATIC PROFILE OF REGULATING AND GENERAL BASINS.

LEGEND:

- REGULATING BASIN
- GENERAL BASIN
- OM/M — OPEN-WATER/MARSH POND
- CW — COTTONWOOD/WILLOW RIPARIAN CORRIDOR

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER, MARACOPA COUNTY, ARIZONA
FEASIBILITY STUDY
GENERAL PROPOSED PROJECT AREA
ALTERNATIVE 4
RIVER MILE 195.66 TO 203.77

U.S. ARMY ENGINEER DISTRCT
LOS ANGELES
CORPS OF ENGINEERS

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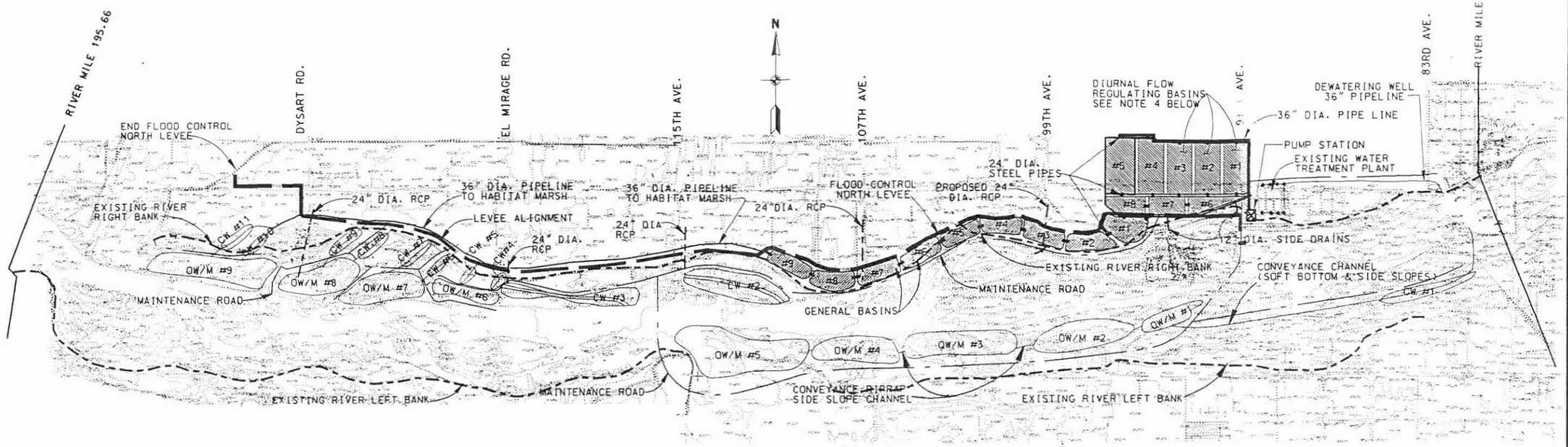
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: AL14.DGN

DISTRICT FILE NO. 2607

SHEET
3 OF 10



ALT. 3.5
PROJECT AREA PLAN

1500 750 0 1500 3000FT

SCALE: 1" = 1500'

NOTES:

1. VIEWING AREAS ARE NOT SHOWN ON THE PLAN
2. ACCESS RAMPS AND MAINTENANCE ROAD DETAILS SHALL BE INCLUDED IN THE PLAN AND SPECIFICATIONS.
3. SEE SUBSEQUENT PLATES FOR ENLARGED OW/M POND'S AND COTTON-WOOD CORRIDOR'S PLAN AND PROFILES. MISCELLANEOUS DETAILS, TYPICAL LEVEE AND CONVEYANCE CHANNEL SECTIONS ARE ALSO PROVIDED.
4. SEE SHEET 6 FOR SCHEMATIC PROFILE OF REGULATING AND GENERAL BASINS.

LEGEND:

- REGULATING BASIN
- GENERAL BASIN
- OW/M — OPEN WATER/MARSH
- CW — COTTONWOOD-WILLOW CORRIDOR
- PROPOSED 24" DIA. RCP INTERIOR DRAINAGE.
- PROPOSED MAINTENANCE ROADS

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER, MARACOPA COUNTY, ARIZONA
FEASIBILITY STUDY
GENERAL PROPOSED PROJECT AREA
ALTERNATIVE 3.5
RIVER MILE 195.66 TO 203.77

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
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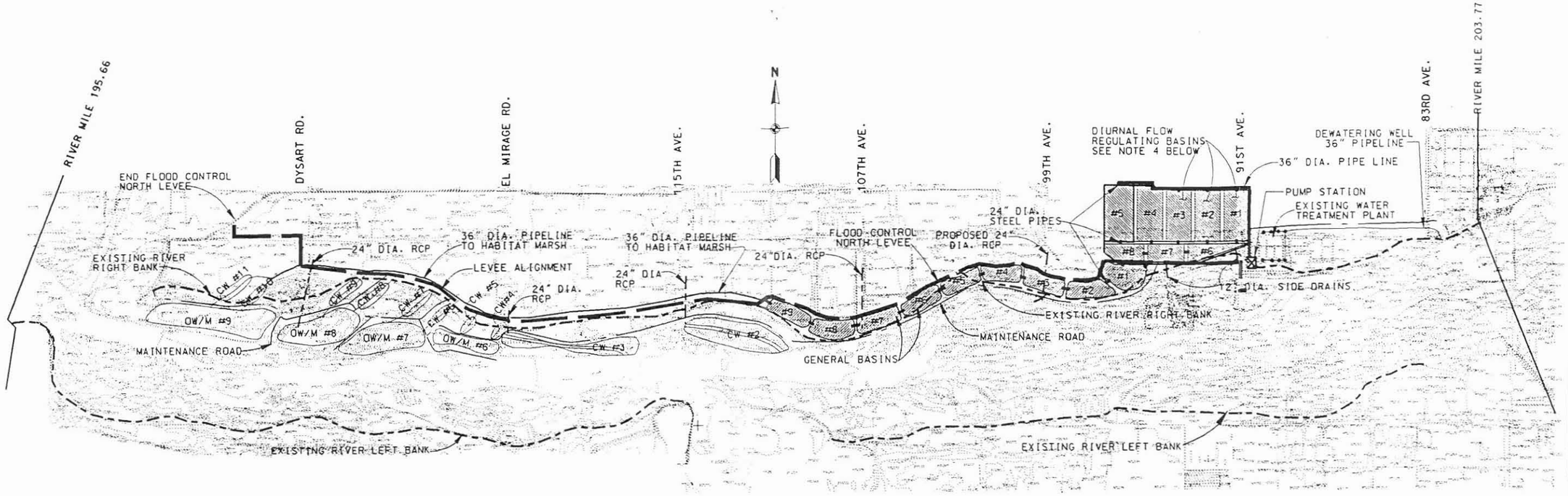
CHECKED BY:

SUBMITTED BY:
THOMAS H. SAGE, P.E.
CHIEF (CESPL) BRANCH

CADD FILE NAME:

DISTRICT FILE NO. 2607

SHEET
4 OF 10



ALT. 3.5
PROJECT AREA PLAN

1500 750 0 1500 3000FT

SCALE: 1" = 1500'

NOTES:

1. VIEWING AREAS ARE NOT SHOWN ON THE PLAN
2. ACCESS RAMPS AND MAINTENANCE ROAD DETAILS SHALL BE INCLUDED IN THE PLAN AND SPECIFICATIONS.
3. SEE SUBSEQUENT PLATES FOR ENLARGED OW/M POND'S AND COTTON-WOOD CORRIDOR'S PLAN AND PROFILES. MISCELLANEOUS DETAILS, TYPICAL LEVEE AND CONVEYANCE CHANNEL SECTIONS ARE ALSO PROVIDED.
4. SEE SHEET 10 FOR SCHEMATIC PROFILE OF REGULATING AND GENERAL BASINS.

LEGEND:

- REGULATING BASIN
- GENERAL BASIN
- OW/M — OPEN WATER/MARSH
- CW — COTTONWOOD-WILLOW CORRIDOR
- PROPOSED 24" DIA. RCP INTERIOR DRAINAGE.
- PROPOSED MAINTENANCE ROADS

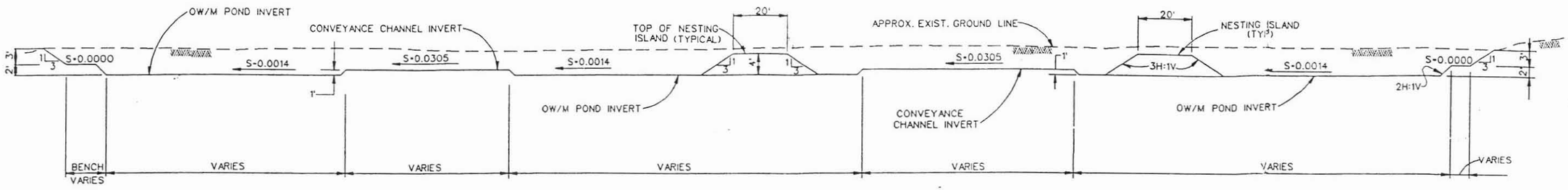
SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER, MARACOPA COUNTY, ARIZONA
FEASIBILITY STUDY
GENERAL PROPOSED PROJECT AREA
ALTERNATIVE 3.5 WITHOUT
SOUTH SIDE DESIGNED FEATURES
RIVER MILE 195.66 TO 203.77

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

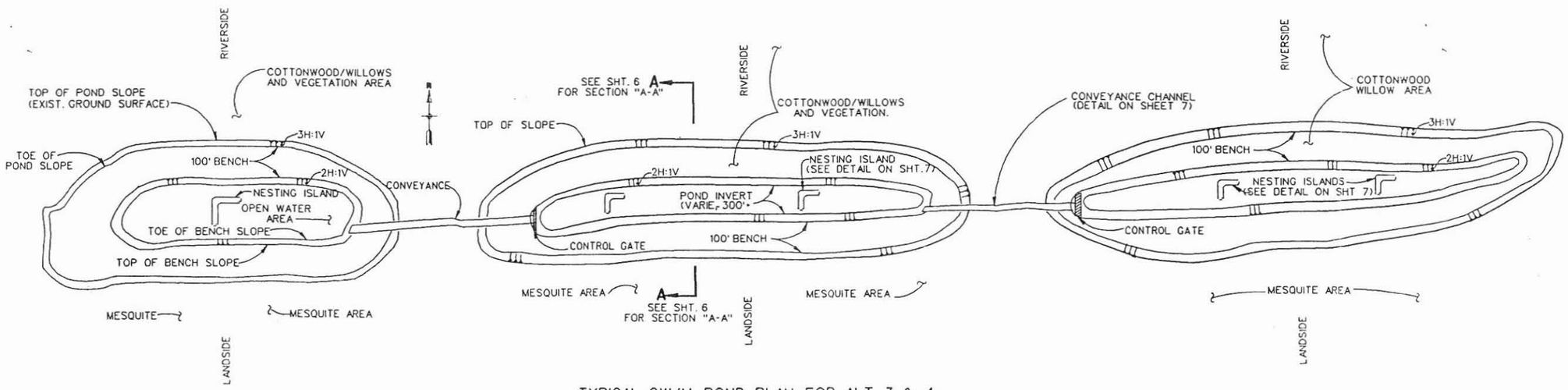
DESIGNED BY:
DRAWN BY:
CHECKED BY:
SUBMITTED BY: THOMAS H. SAGE, P.E.
CHIEF, DESIGN BRANCH
CADD FILE NAME:
DISTRICT FILE NO. 2601

SHEET 4A OF 10



TYPICAL OW/M POND C ℄ PROFILE FOR ALT. 3 & 4

HORIZ. SCALE: 1 IN = 20 FT.
VERT. SCALE: 1 IN = 10 FT.



TYPICAL OW/M POND PLAN FOR ALT. 3 & 4

NOT TO SCALE:

NOTES:

1. SOME OF THE NESTING ISLANDS ARE NOT SHOWN ON THE PROFILE.
2. VIEWING AREAS AT EACH OW/M POND WILL BE INCLUDED IN THE F-5 OR PLAN AND SPECIFICATION PHASE.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

TYPICAL OW/M POND PLAN AND PROFILE FOR ALT. 3 AND 4

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

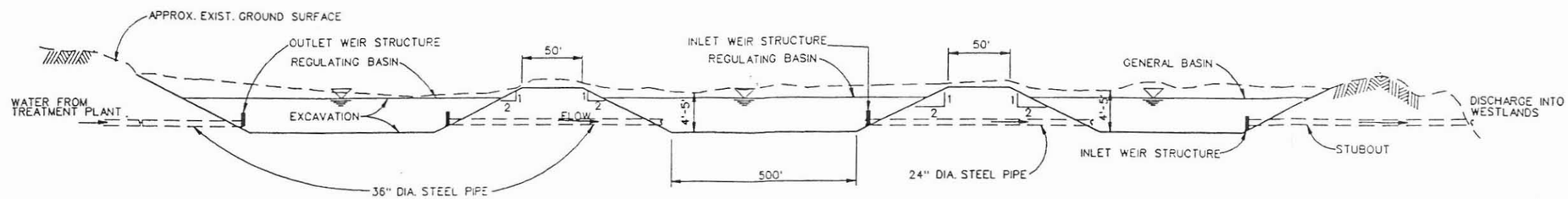
SUBMITTED BY: JAMES M. CRUM, P.E.
CHIEF, DESIGN BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

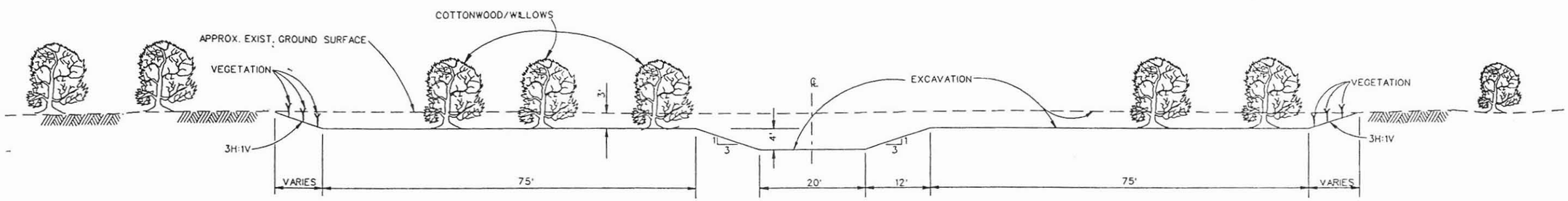
CADD FILE NAME: ONOPL AN3&4.DGN

DISTRICT FILE NO. 2607

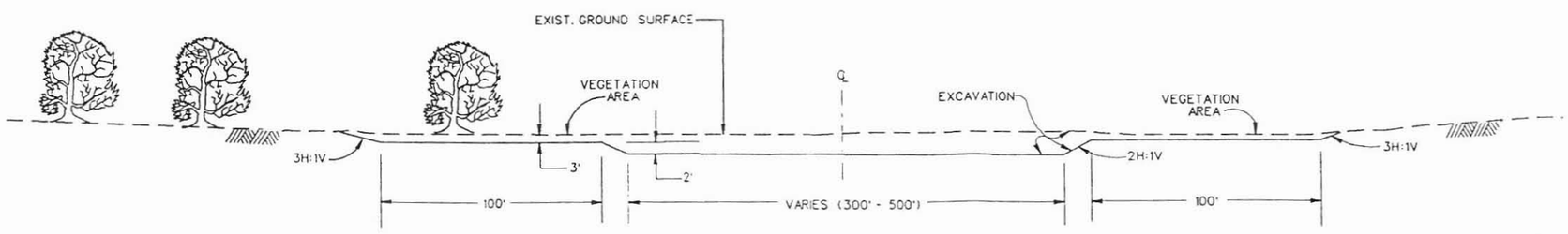
SHEET 5 OF 10



SCHEMATIC PROFILE OF
REGULATING AND GENERAL BASINS FOR ALT. 3 & 4
NOT TO SCALE



SECTION "B-B"
RIPARIAN CORRIDOR CROSS SECTION FOR ALT. 3 & 4
SCALE: 1 IN = 10 FT.



SECTION "A-A"
OPEN-WATER/MARSH POND CROSS SECTION FOR ALT.3 & 4
NOT TO SCALE

NOTE:

1. NESTING ISLANDS ARE NOT SHOWN ON THE PROFILE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

REGULATING, GENERAL BASIN PROFILE AND
RIPARIAN CORRIDOR AND OPEN-WATER/MARSH
POND CROSS SECTIONS FOR ALT. 3 AND 4

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

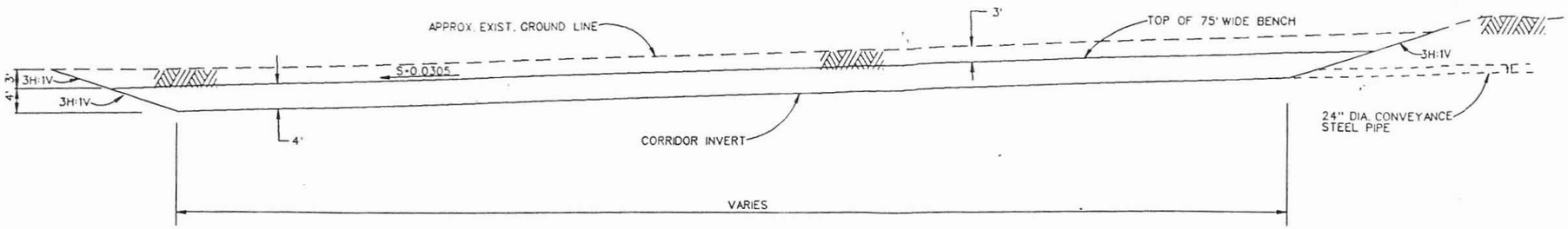
DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
JAMES M. CRUM, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: (BASIN3&4..DGN)

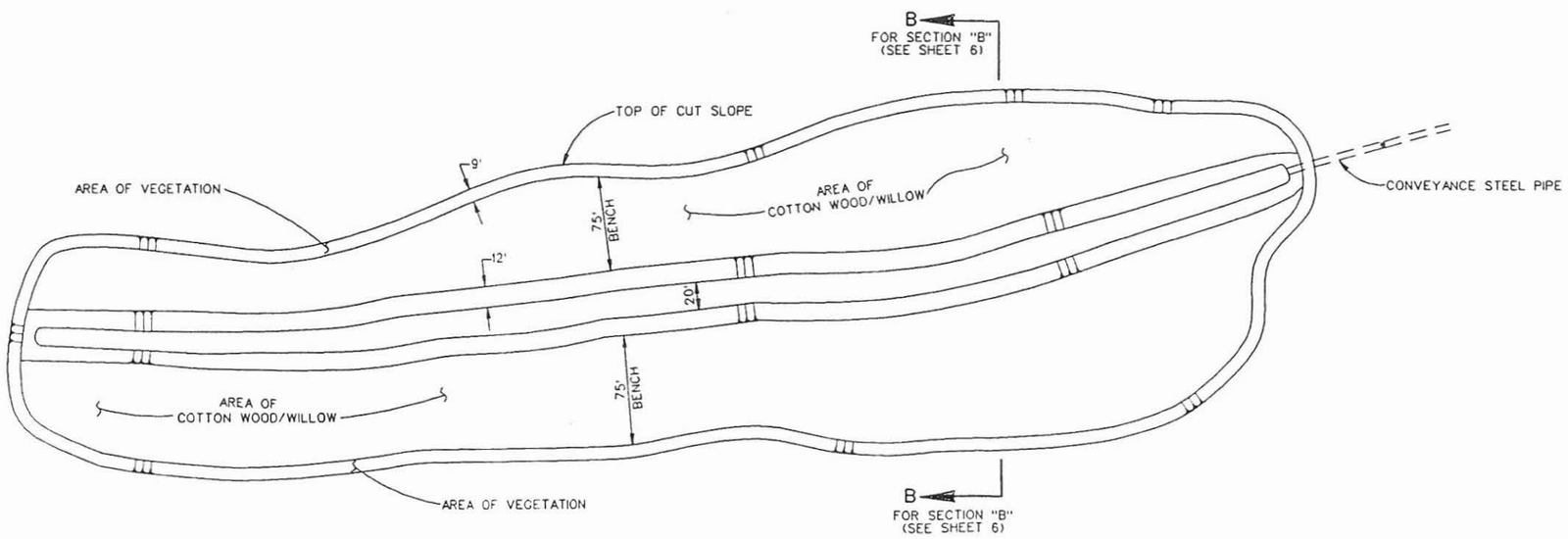
DISTRICT FILE NO. 2607

SHEET
8 OF 10



TYPICAL RIPARIAN CORRIDOR PROFILE FOR ALT. 3, 4 AND 3.5

SCALE: 1 IN = 10 FT.



RIPARIAN CORRIDOR TYPICAL PLAN

NOT TO SCALE:

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

TYPICAL RIPARIAN CORRIDOR PLAN AND PROFILE, FOR ALT. 3, 4 AND 3.5

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

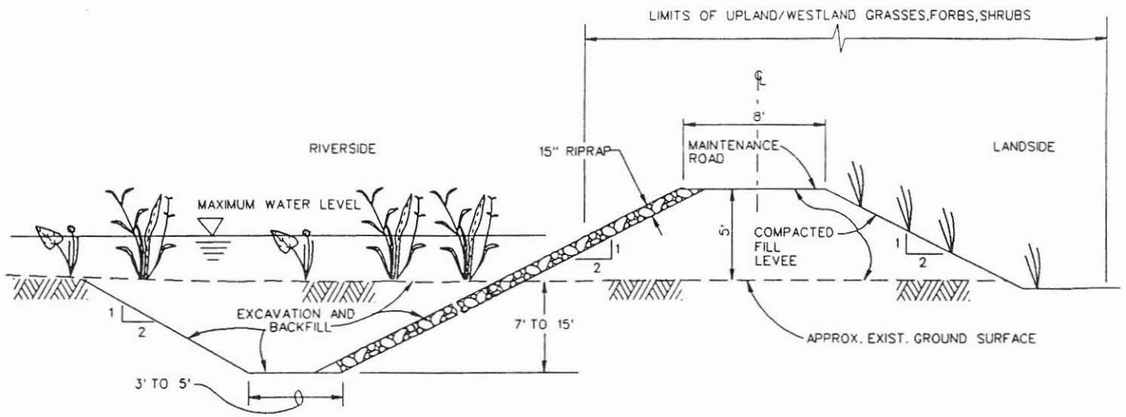
SUBMITTED BY: JAMES N. CRUM, P.E.
CHIEF, DESIGN BRANCH

DESIGNED BY:
DRAWN BY:
CHECKED BY:

CADD FILE NAME: CORRIDOR DGN

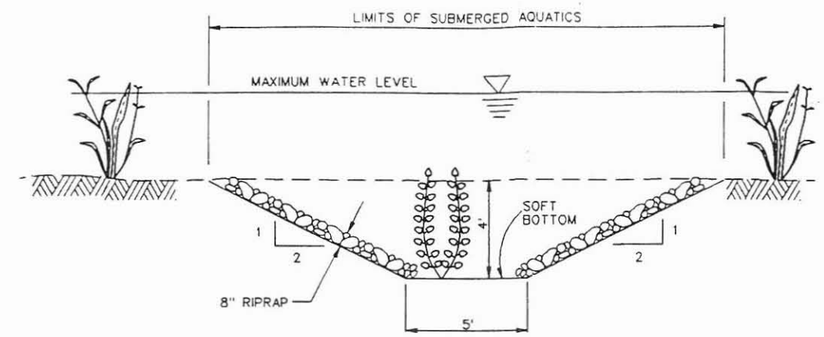
DISTRICT FILE NO. 2607

SHEET 7 OF 10



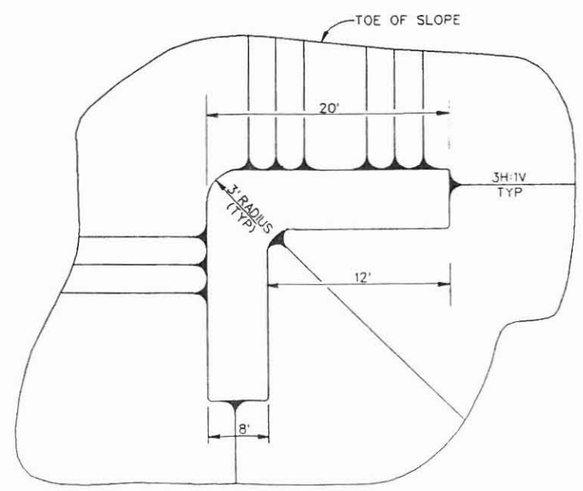
TYPICAL LEVEE SECTION

SCALE: 1 IN = 4 FT.



TYPICAL RIPRAP SIDE SLOPES
CONVEYANCE CHANNEL SECTION

SCALE: 1 IN = 3 FT.



NESTING ISLAND DETAIL

NOT TO SCALE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

TYPICAL LEVEE, SIDE SLOPE CONVEYANCE CHANNEL SECTIONS AND NESTING ISLAND DETAIL FOR ALT. 3.5

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

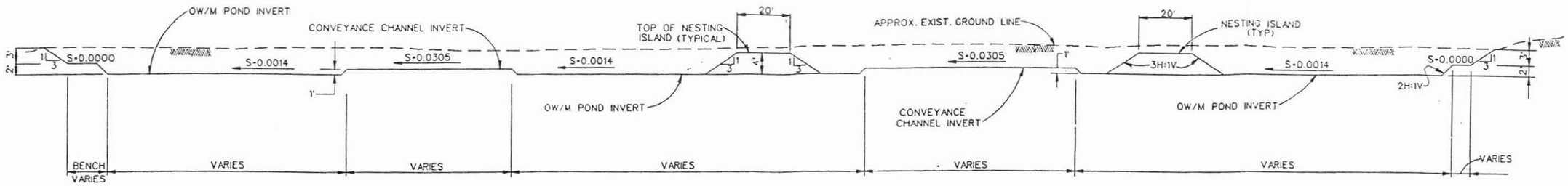
DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
JAMES M. CRUM, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: tresrec.dgn

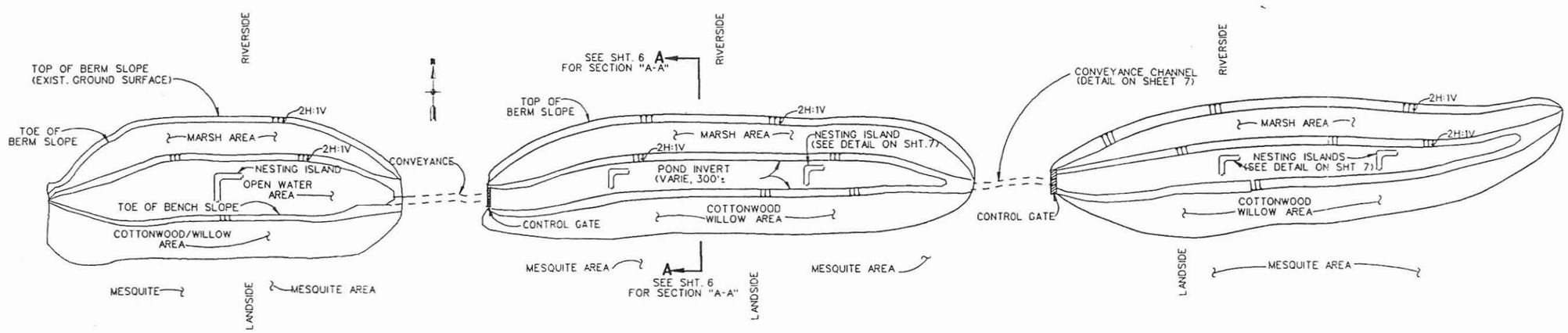
DISTRICT FILE NO. 2407

SHEET
8 OF 10



TYPICAL OW/M POND ℄ PROFILE FOR ALT. 3.5

HORIZ. SCALE: 1 IN = 20 FT.
VERT. SCALE: 1 IN = 10 FT.



TYPICAL OW/M POND PLAN FOR ALT. 3.5

NOT TO SCALE:

NOTES:

1. SOME OF THE NESTING ISLANDS ARE NOT SHOWN ON THE PROFILE.
2. VIEWING AREAS AT EACH OW/M POND WILL BE INCLUDED IN THE F-5 OR PLAN AND SPECIFICATION PHASE.

SYMBOL	DESCRIPTIONS	DATE	APPROVAL
	REVISIONS		

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

TYPICAL OW/M POND PLAN AND PROFILE FOR ALT. 3.5

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

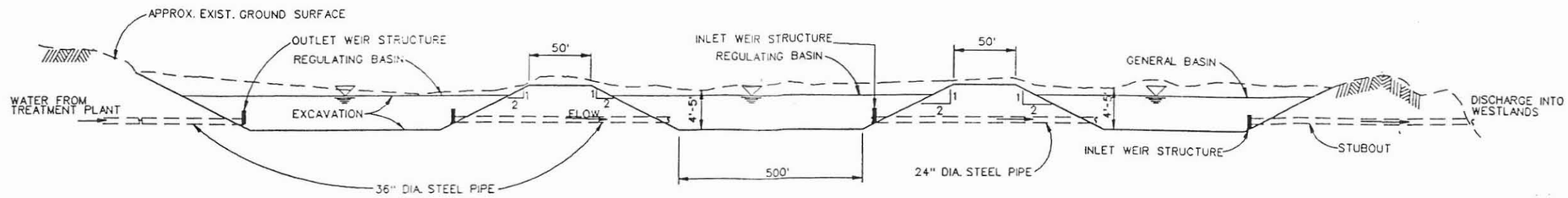
DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
JAMES M. CRUM, P.E.
CHIEF, ESPA BRANCH

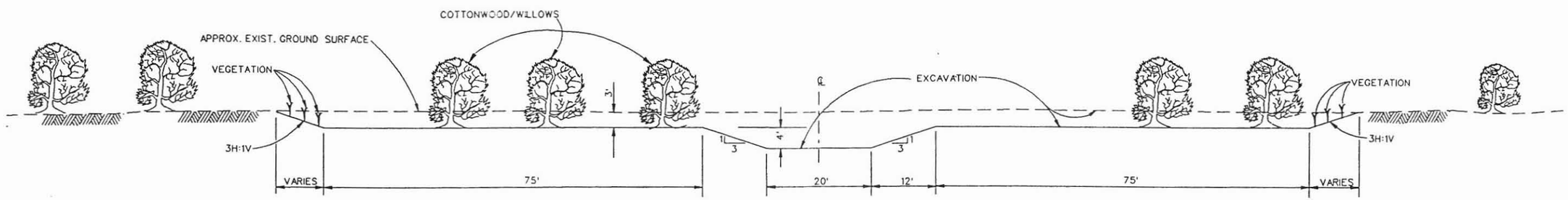
CADD FILE NAME: PONDPLANLOGN

DISTRICT FILE NO. 2607

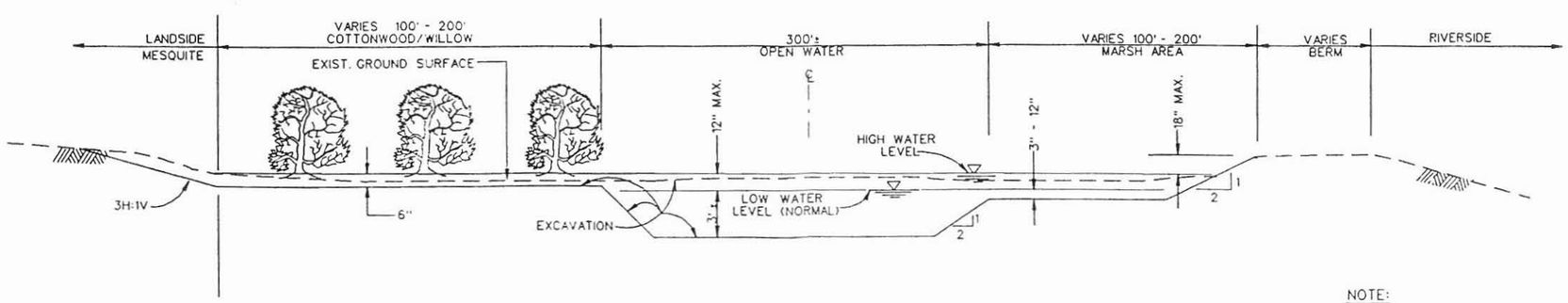
SHEET 9 OF 10



SCHEMATIC PROFILE OF
REGULATING AND GENERAL BASINS FOR ALT. 3.5
NOT TO SCALE



SECTION "B-B"
RIPARIAN CORRIDOR CROSS SECTION FOR ALT. 3.5
SCALE: 1 IN = 10 FT.



NOTE:

1. NESTING ISLANDS ARE NOT SHOWN ON THE PROFILE

SECTION "A-A"
OPEN-WATER/MARSH POND CROSS SECTION FOR ALT. 3.5
NOT TO SCALE

SYMBOL	DESCRIPTIONS	DATE	APPROVAL

REVISIONS

TRES RIOS RIVER MARACOPA COUNTY, ARIZONA
FEASIBILITY REPORT

REGULATING, GENERAL BASIN PROFILE AND
RIPARIAN CORRIDOR AND OPEN-WATER/MARSH
POND CROSS SECTIONS FOR ALT. 3.5

U.S. ARMY ENGINEER DISTRICT
LOS ANGELES
CORPS OF ENGINEERS

DESIGNED BY:
DRAWN BY:
CHECKED BY:

SUBMITTED BY:
JAMES M. CRUM, P.E.
CHIEF, DESIGN BRANCH

CADD FILE NAME: BASINPRO.DGN

DISTRICT FILE NO. 2607

SHEET
10 OF 10

Cost Summary and
MCACES Cost Estimate

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST SUMMARY FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

	Estimated Cost
A. ENVIRONMENTAL RESTORATION	
- Item No. 1: PUMP STATION AND PIPES TO DIURNAL WETLANDS:	$16,843,460.00
- Item No. 2: REGULATING WETLANDS	$9,064,270.00
- Item No. 3: OVERBANK WETLANDS	$9,630,528.00
- Item No. 4: PIPELINE TO CONVEY WATER FROM WETLANDS TO RIPARIAN CORRIDORS	$4,413,966.00
- Item No. 5: DEPENDENT RIPARIAN CORRIDORS FROM 36" DIA. PIPELINE	$4,813,791.00
- Item No. 6: INDEPENDENT OPEN WATER MARSH (OW/M) NORTH SIDE OF RIVER	$10,457,967.00
- Item No. 7: INDEPENDENT RIPARIAN CORRIDORS IN RIVER	$5,924,662.00
- Item No. 8: DEWATERING WELL COLLECTION SYSTEM AND ITS PIPELINE	$2,625,378.00
- Item No. 9: 36" DIA. PIPE FROM THE EXISTING LAKE TO RIPARIAN CORRIDOR AT 83rd AVE.	$518,445.00
- Item No. 10: CONVEYANCE TRAPEZOIDAL CHANNEL	$1,875,726.00
- Item No. 11: DEPENDANT OPEN WATER MARSH (OW/M) SOUTHSIDE OF RIVER	$14,463,036.00
- Item No. 12: MONITORING	$806,312.00
- Item No. 13: ADAPTIVE MANAGEMENT	$806,312.00
- Item No. 14: CULTURAL RESOURCES MITIGATION	$500,000.00
Total for Environmental Restoration	**$82,743,853.00**
B. FLOOD CONTROL	
- Item 12a1: LOW LEVEE (50 year)	$4,890,835.00
- Item 12a2: MID-HIGH LEVEE (100 year)	$5,380,173.00
- Item 12a3: HIGH LEVEE (500 year)	$6,109,648.00
Recommended Total for Flood Control (mid levee)	**$5,380,173.00**
C. REC IMPROVEMENTS & ENVR EDUCATION FACILITIES	
- Item No. 1: RECREATIONAL IMPROVEMENTS	$2,360,000.00
- Item No. 2: ENVIRONMENTAL EDUCATION FACILITIES	$2,500,000.00
Total for Rec Improvements & Envr Education Facilities	**$4,860,000.00**

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
A		**ENVIRONMENTAL RESTORATION**				
1		**PUMP STATION AND PIPES TO DIURNAL WETLANDS:**				
	a.	Pump Stations:				
		a1 -Capacity 300 MGD	1	LS	$8,000,000.00	$8,000,000.00
		a2 -Electrical Control Panels and SCADA	1	LS	$200,000.00	$200,000.00
	b.	Pipe Line fron Pump Station to Diurnal Wetlands:				
		b1 -Pipe (84" Dia. Steel Pipe)	3,900	LF	$492.00	$1,918,800.00
		b2 -Pipe Trench Excavation	22,300	CY	$5.00	$111,500.00
		b3 -Pipe Trench Backfill	20,700	CY	$3.00	$62,100.00
		b4 -Inlet Structure W/Gate	1	EA	$5,000.00	$5,000.00
		Subtotal				$10,297,400.00
		Contingencies			15.00%	$1,544,610.00
		Planning, Survey, Engineering and Design			10.00%	$1,029,740.00
		Engineering During Construction			1.00%	$102,974.00
		Supervision and Administration			6.30%	$648,736.00
		Real Estate				$3,220,000.00
		Subtotal Item No. 1				**$16,843,460.00**
2		**REGULATING WETLANDS**				
	a	Regulating Basins				
		a1 -Clear and Grubbing	1	LS	$50,000.00	$50,000.00
		a2 -Excavation and Stockpile	1,168,000	CY	$5.00	$5,840,000.00
		a3 -Grading	150	AC	$2,000.00	$300,000.00
		a4 -Vegetation Planting	75	AC	$3,500.00	$262,500.00
	b	Pipe line between Basins to Basins including Side Drains				
		b1 -Pipe (24" Dia. Steel Pipe)	1,600	LF	$130.00	$208,000.00
		b2 -Pipe Trench Excavation	5,700	CY	$5.00	$28,500.00
		b3 -Pipe Trench Backfill	5,500	CY	$3.00	$16,500.00
		b4 -Level Sensor	8	EA	$600.00	$4,800.00
		b5 -Meter	8	EA	$7,000.00	$56,000.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
		b6 -Inlet Structure with Gate	10	EA	$5,000.00	$50,000.00
		b7 -Outlet Weir Structure w/Gate	7	EA	$5,000.00	$35,000.00
		Subtotal				$6,851,300.00
		Contingencies			15.00%	$1,027,695.00
		Planning, Survey, Engineering and Design			10.00%	$685,130.00
		Engineering During Construction			1.00%	$68,513.00
		Supervision and Administration			6.30%	$431,632.00
		Real Estate				(incl in Diurnal Wt)
		Subtotal Item No. 2				**$9,064,270.00**
3		**OVERBANK WETLANDS**				
	a	General Basins				
		a1 -Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
		a2 -Excavation and Stockpile	966,600	CY	$5.00	$4,833,000.00
		a3 -Grading	150	AC	$2,000.00	$300,000.00
		a4 -Vegetation Planting	75	AC	$3,500.00	$262,500.00
	b	Pipe Connecting between Basins including Side Drains				
		b1 -Pipe (24" Dia. Steel)	1,500	LF	$130.00	$195,000.00
		b2 -Pipe Trench Excavation	5,300	CY	$5.00	$26,500.00
		b3 -Pipe Trench Backfill	5,100	CY	$3.00	$15,300.00
		b4 -Outlet Weirstructure w/Gate	3	EA	$5,000.00	$15,000.00
		Subtotal				$5,697,300.00
		Contingencies			15.00%	$854,595.00
		Planning, Survey, Engineering and Design			10.00%	$569,730.00
		Engineering During Construction			1.00%	$56,973.00
		Supervision and Administration			6.30%	$358,930.00
		Real Estate				$2,093,000.00
		Subtotal Item No. 3				**$9,630,528.00**

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
4		**PIPELINE TO CONVEY WATER FROM WETLANDS TO RIPARIAN CORRIDORS**				
	a	36" Dia. Steel Pipe				
		a1 -Pipe (36" Dia. Steel)	14,000	LF	$200.00	$2,800,000.00
		a2 -Pipe Trench Excavation	52,900	CY	$5.00	$264,500.00
		a3 -Pipe Trench backfill	49,200	CY	$3.00	$147,600.00
		a4 -Inlet Structure w/Gate	1	EA	$5,000.00	$5,000.00
		a5 -Outlet Structure w/Gate	4	EA	$5,000.00	$20,000.00
	b	12" dia. Concrete Pipe				
		b1 -Pipe	400	LF	$40.00	$16,000.00
		b2 -Pipe trench excavation	700	CY	$5.00	$3,500.00
		b3 -Pipe Trench Backfill	500	CY	$3.00	$1,500.00
		Subtotal				$3,258,100.00
		Contingencies			15.00%	$488,715.00
		Planning, Survey, Engineering and Design			10.00%	$325,810.00
		Engineering During Construction			1.00%	$32,581.00
		Supervision and Administration			6.30%	$205,260.00
		Real Estate				$103,500.00
		Subtotal Item No. 4				**$4,413,966.00**
5		**DEPENDENT RIPARIAN CORRIDORS FROM 36" DIA. PIPELINE**				
		-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
		-Exacavtion and Stockpile	342,600	CY	$5.00	$1,713,000.00
		-Grading	66	AC	$2,000.00	$132,000.00
		-Topsoil Lining	53,200	CY	$10.00	$532,000.00
		-Vegetation Removal (Salt Sedar)	66	AC	$2,500.00	$165,000.00
		-Revegetation of Natives	35	AC	$15,000.00	$525,000.00
		Subtotal				$3,117,000.00
		Contingencies			15.00%	$467,550.00
		Planning, Survey, Engineering and Design			10.00%	$311,700.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.	Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
	Engineering During Construction			1.00%	$31,170.00
	Supervision and Administration			6.30%	$196,371.00
	Real Estate				$690,000.00
	Subtotal Item No. 5				**$4,813,791.00**
6	**INDEPENDENT OPEN WATER MARSH (OW/M) NORTH SIDE OF RIVER**				
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Exacavtion and Stockpile	1,120,000	CY	$5.00	$5,600,000.00
	-Grading	139	AC	$2,000.00	$278,000.00
	-Topsoil Lining	57,000	CY	$10.00	$570,000.00
	-Vegetation Removal (Salt Sedar)	95	AC	$2,500.00	$237,500.00
	-Revegetation of Natives	20	AC	$15,000.00	$300,000.00
	Subtotal				$7,035,500.00
	Contingencies			15.00%	$1,055,325.00
	Planning, Survey, Engineering and Design			10.00%	$703,550.00
	Engineering During Construction			1.00%	$70,355.00
	Supervision and Administration			6.30%	$443,237.00
	Real Estate				$1,150,000.00
	Subtotal Item No. 6				**$10,457,967.00**
7	**INDEPENDENT RIPARIAN CORRIDORS IN RIVER**				
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Exacavtion and Stockpile	341,000	CY	$5.00	$1,705,000.00
	-Grading	70	AC	$2,000.00	$140,000.00
	-Topsoil Lining	56,800	CY	$10.00	$568,000.00
	-Vegetation Removal (Salt Sedar)	35	AC	$2,500.00	$87,500.00
	-Revegetation of Natives	30	AC	$15,000.00	$450,000.00
	Subtotal				$3,000,500.00
	Contingencies			15.00%	$450,075.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
		Planning, Survey, Engineering and Design			10.00%	$300,050.00
		Engineering During Construction			1.00%	$30,005.00
		Supervision and Administration			6.30%	$189,032.00
		Real Estate				$1,955,000.00
		Subtotal Item No. 7				**$5,924,662.00**
8		**DEWATERING WELL COLLECTION SYSTEM AND ITS PIPELINE**				
	a	Dewatering Well System				
		a1 -Deep Well Submersible Pumps	2	EA	$1,600.00	$3,200.00
		a2 -Water T-Valves	2	EA	$500.00	$1,000.00
		a3 -Inlet Diffusers	2	EA	$500.00	$1,000.00
		a4 -Pump Metering	2	EA	$2,000.00	$4,000.00
	b	Pipeline from well to the Existing Lake at 83rd. Ave.				
		b1 -36" Dia. Steel pipe	5,200	LF	$200.00	$1,040,000.00
		b2 -Pipe Trench Excavation	19,600	CY	$5.00	$98,000.00
		b3 -Pipe Trench Backfill	18,300	CY	$3.00	$54,900.00
		Subtotal				$1,202,100.00
		Contingencies			15.00%	$180,315.00
		Planning, Survey, Engineering and Design			10.00%	$120,210.00
		Engineering During Construction			1.00%	$12,021.00
		Supervision and Administration			6.30%	$75,732.00
		Real Estate				$1,035,000.00
		Subtotal Item No. 8				**$2,625,378.00**
9		**36" DIA. PIPE FROM THE EXISTING LAKE TO RIPARIAN CORRIDOR AT 83rd AVE.**				
		-36" Dia. Concrete Pipe	1,200	LF	$80.00	$96,000.00
		-Pipe Trench Excavation	4,500	CY	$5.00	$22,500.00
		-Pipe Trench Backfill	4,200	CY	$3.00	$12,600.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
		Subtotal				$131,100.00
		Contingencies			15.00%	$19,665.00
		Planning, Survey, Engineering and Design			10.00%	$13,110.00
		Engineering During Construction			1.00%	$1,311.00
		Supervision and Administration			6.30%	$8,259.00
		Real Estate				$345,000.00
		Subtotal Item No. 9				**$518,445.00**
10		**CONVEYANCE TRAPEZOIDAL CHANNEL**				
	a	Riprap Side-Slope Soft Bottom Trapezoidal Channel				
		a1 -Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
		a2 -Grading and Shaping	0.65	AC	$2,500.00	$1,625.00
		a3 -Excavation and Stockpile	2,300	CY	$5.00	$11,500.00
		a4 -Riprap Side Slopes	500	TONS	$35.00	$17,500.00
		a5 -Vegetation Planting	0.35	AC	$3,500.00	$1,225.00
	b	Earth Side Slope Soft Bottom Trapezoidal Channel				
		b1 -Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
		b2 -Grading and Shaping	3	AC	$2,500.00	$7,500.00
		b3 -Excavation and Stockpile	11,600	CY	$5.00	$58,000.00
		b4 -Vegetation Planting	1	AC	$3,500.00	$3,500.00
		Subtotal				$200,850.00
		Contingencies			15.00%	$30,128.00
		Planning, Survey, Engineering and Design			10.00%	$20,085.00
		Engineering During Construction			1.00%	$2,009.00
		Supervision and Administration			6.30%	$12,654.00
		Real Estate				$1,610,000.00
		Subtotal Item No. 10				**$1,875,726.00**
11		**DEPENDANT OPEN WATER MARSH (OW/M) SOUTHSIDE OF RIVER**				

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.	Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Excavation and Stockpile	1,800,000	CY	$5.00	$9,000,000.00
	-Grading	223	AC	$2,000.00	$446,000.00
	-Topsoil Lining	60,100	CY	$10.00	$601,000.00
	-Vegetation Removal (Salt Sedar)	112	AC	$2,500.00	$280,000.00
	-Revegetation of Natives	37	AC	$15,000.00	$555,000.00
	Subtotal				$10,932,000.00
	Contingencies			15.00%	$1,639,800.00
	Planning, Survey, Engineering and Design			10.00%	$1,093,200.00
	Engineering During Construction			1.00%	$109,320.00
	Supervision and Administration			6.30%	$688,716.00
	Real Estate				(incl in Trap Chan)
	Subtotal Item No. 11				**$14,463,036.00**
12	**MONITORING (1% of ecosystem restoration)**	1	LS	$806,312.00	$806,312.00
	Subtotal Item No. 12				**$806,312.00**
13	**ADAPTIVE MANAGEMENT (1% of ecosystem restoration)**	1	LS	$806,312.00	$806,312.00
	Subtotal Item No. 13				**$806,312.00**
14	**CULTURAL RESOURCES MITIGATION**	1	LS	$1,000,000.00	$1,000,000.00
	Subtotal Item No. 14				**$1,000,000.00**
B	**FLOOD CONTROL**				
1	**NORTH LEVEE**				
	a1 - For Low Levee:				
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Compacted Fill Levee	83,000	CY	$3.00	$249,000.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.	Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
	-Toe Excavation and Backfill	358,000	CY	$5.00	$1,790,000.00
	-Riprap Slope Protection	72,400	TONS	$12.00	$868,800.00
	-Interior Drainage (24" Dia. RCP)	1,550	LF	$40.00	$62,000.00
	-Inlet Structures	5	EA	$5,000.00	$25,000.00
	-Outlet Weir Structures	5	EA	$5,000.00	$25,000.00
	Subtotal				$3,069,800.00
	Contingencies			20.00%	$613,960.00
	Planning, Survey, Engineering and Design			10.00%	$306,980.00
	Engineering During Construction			1.00%	$30,698.00
	Supervision and Administration			6.30%	$193,397.00
	Real Estate				$676,000.00
	Subtotal Item 1a1				**$4,890,835.00**
	a2 - For Mid-high Levee:				
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Compacted Fill Levee	141,000	CY	$3.00	$423,000.00
	-Toe Excavation and Backfill	358,000	CY	$5.00	$1,790,000.00
	-Riprap Slope Protection	87,600	TONS	$12.00	$1,051,200.00
	-Interior Drainage (24" Dia. RCP)	1,550	LF	$40.00	$62,000.00
	-Inlet Structures	5	EA	$5,000.00	$25,000.00
	-Outlet Weir Structures	5	EA	$5,000.00	$25,000.00
	Subtotal				$3,426,200.00
	Contingencies			20.00%	$685,240.00
	Planning, Survey, Engineering and Design			10.00%	$342,620.00
	Engineering During Construction			1.00%	$34,262.00
	Supervision and Administration			6.30%	$215,851.00
	Real Estate				$676,000.00
	Subtotal Item 1a2				**$5,380,173.00**
	a3 - For High Levee:				
	-Clearing and Grubbing	1	LS	$50,000.00	$50,000.00
	-Compacted Fill Levee	175,000	CY	$3.00	$525,000.00
	-Toe Excavation and Backfill	358,000	CY	$5.00	$1,790,000.00
	-Riprap Slope Protection	98,700	TONS	$15.00	$1,480,500.00
	-Interior Drainage (24" Dia. RCP)	1,550	LF	$40.00	$62,000.00
	-Inlet Structures	5	EA	$5,000.00	$25,000.00

FEASIBILITY STUDY OF TRES RIOS AT PHOENIX, ARIZONA
COST COMPONENTS FOR ALTERNATIVE 3.5

Prepared by: Don D. Nguyen
Revised: 29-Feb-00

Item No.		Description	Estimated Quantity	UOM	Unit Cost	Estimated Cost
		-Outlet Weir Structures	5	EA	$5,000.00	$25,000.00
		Subtotal				$3,957,500.00
		Contingencies			20.00%	$791,500.00
		Planning, Survey, Engineering and Design			10.00%	$395,750.00
		Engineering During Construction			1.00%	$39,575.00
		Supervision and Administration			6.30%	$249,323.00
		Real Estate				$676,000.00
		Subtotal Item 1a3				**$6,109,648.00**
C		**RECREATIONAL IMPROVEMENTS & EDUCATION FACILITIES**				
1		**RECREATIONAL IMPROVEMENTS**	1	LS	$2,360,000.00	$2,360,000.00
		Subtotal Item No. 1				**$2,360,000.00**
2		**EDUCATION FACILITIES**	1	LS	$2,500,000.00	$2,500,000.00
		Subtotal Item No. 2				**$2,500,000.00**

COST SUMMARY APPENDIX

(Detailed sheets by line item are included as a separate MCACES Appendix, not distributed as part of this overall report.)

Tres Rios
Maricopa County, Arizona

Designed By: Corps of Engineers
Estimated By: Don D. Nguyen

Prepared By: Los Angeles District

Preparation Date 03/06/00
Effective Date of Pricing: 03/06/00

Sales Tax: 0.00%

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The following assumptions were made to prepare this estimate:

1. Field Office Overhead = 10%
2. Home Office Overhead = 6%
3. Profit = 10%
4. Arizona Business Privilege Tax = 4.55%

For Environmental Restoration, the following owner costs apply:

1. Contingency = 15%
2. PED = 10%
3. EDC = 1%
4. S&A = 6.3%

For Flood Control, the following owner costs apply:

1. Contingency = 20%
2. PED = 10%
3. EDC = 1%
4. S&A = 6.3%

Note: A contingency of 15% is included in the Real Estate

** CONTRACTOR SETTINGS **

	AMOUNT	PCT	PCT S	RISK	DIFF	SIZE	PERIOD	INVEST	ASSIST	SUBCON
AA Prime Contractor										
OVERHEAD		P	10.00							
HOME OFC		P	6.00							
PROFIT		P	10.00							
BOND		C		(Class: A)						
ARIZONA PRIV		P	4.55							

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	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
01 Environmental Restoration	1.00	EA	64,615,700	9,299,852	5,168,901	516,890	82,857,751	82857751
02 Flood Control	1.00	EA	12,089,067	2,329,613	1,032,507	103,251	16,204,917	16204917
03 Rec Impr & Envr Education Fac	1.00	EA	4,917,423	0	0	0	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	81,622,190	11,629,465	6,201,408	620,141	103,980,091	103980091

	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
01 Environmental Restoration								
01.01 Pump Sta & Pipes to Diurnal Wtld	1.00	EA	13,202,383	1,980,357	1,040,238	104,024	16,982,353	16982353
01.02 Regulating Wetlands	1.00	EA	6,779,786	1,016,968	677,979	67,798	8,969,657	8969657
01.03 Overbank Wetlands	1.00	EA	7,459,174	1,118,876	563,917	56,392	9,553,627	9553627
01.04 Pipeline to Convey Wtr Wtld-Corr	1.00	EA	3,432,734	514,910	334,273	33,427	4,525,937	4525937
01.05 Dependent Riparian Corridors	1.00	EA	3,423,631	513,545	312,363	31,236	4,477,564	4477564
01.06 Independent Open Water Marsh	1.00	EA	7,983,814	1,197,572	698,381	69,838	10,389,585	10389585
01.07 Independent Riparian Corridors	1.00	EA	4,703,695	705,554	300,369	30,037	5,928,888	5928888
01.08 Dewatering Well Collection Syst	1.00	EA	2,133,208	319,981	123,321	12,332	2,666,534	2666534
01.09 Pipe from Ext Lake to Rip Corr	1.00	EA	432,001	64,800	13,200	1,320	519,637	519637.48
01.10 Conveyance Trapezoidal Channel	1.00	EA	1,601,034	240,155	20,103	2,010	1,875,968	1875968
01.11 Dependent Open Water Marsh	1.00	EA	10,847,554	1,627,133	1,084,755	108,476	14,151,314	14351314
01.12 Monitoring	1.00	EA	808,344	0	0	0	808,344	808343.51
01.13 Adaptive Management	1.00	EA	808,344	0	0	0	808,344	808343.51
01.14 Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	64,615,700	9,299,852	5,168,901	516,890	82,857,751	82857751
02 Flood Control								
02.01 Low Levee (50 year)	1.00	EA	3,707,514	712,103	311,951	31,195	4,959,293	4959293
02.02 Mid-high Levee (100 year)	1.00	EA	4,068,742	784,348	348,074	34,807	5,455,258	5455258
02.03 High Levee (500 year)	1.00	EA	4,312,811	833,162	372,481	37,248	5,790,365	5790365
TOTAL Flood Control	1.00	EA	12,089,067	2,329,613	1,032,507	103,251	16,204,917	16204917
03 Rec Impr & Envr Education Fac								
03.01 Recreational Improvements	1.00	EA	2,384,613	0	0	0	2,384,613	2384613
03.02 Environmental Education Fac	1.00	EA	2,532,810	0	0	0	2,532,810	2532810
TOTAL Rec Impr & Envr Education Fac	1.00	EA	4,917,423	0	0	0	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	81,622,190	11,629,465	6,201,408	620,141	103,980,091	103980091

	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
01 Environmental Restoration								
01.01 Pump Sta & Pipes to Diurnal Wtld								
01.01. 01 Pump Stations	1.00	EA	8,286,195	1,242,929	828,619	82,862	10,962,635	10962635
01.01. 02 Pipeline fr Pump Sta to D Wtld	1.00	EA	2,116,189	317,428	211,619	21,162	2,799,718	2799718
01.01. 03 Real Estate	1.00	EA	2,800,000	420,000	0	0	3,220,000	3220000
TOTAL Pump Sta & Pipes to Diurnal Wtld	1.00	EA	13,202,383	1,980,357	1,040,238	104,024	16,982,353	16982353
01.02 Regulating Wetlands								
01.02. 01 Regulating Basins	1.00	EA	6,378,180	956,727	617,818	63,782	8,438,332	8438332
01.02. 02 Pipeline btw Basins to Basins	1.00	EA	401,606	60,241	40,161	4,016	531,325	531325.39
TOTAL Regulating Wetlands	1.00	EA	6,779,786	1,016,968	677,979	67,798	8,969,657	8969657
01.03 Overbank Wetlands								
01.03. 01 General Basins	1.00	EA	5,384,636	807,695	538,464	53,846	7,123,874	7123874
01.03. 02 Pipe Connecting between Basins	1.00	EA	254,538	38,181	25,454	2,545	336,754	336753.59
01.03. 03 Real Estate	1.00	EA	1,820,000	273,000	0	0	2,093,000	2093000
TOTAL Overbank Wetlands	1.00	EA	7,459,174	1,118,876	563,917	56,392	9,553,627	9553627
01.04 Pipeline to Convey Wtr Wtld-Corr								
01.04. 01 36" Dia. Steel Pipe	1.00	EA	3,320,403	498,060	332,040	33,204	4,392,893	4392893
01.04. 02 12" Dia. Concrete Pipe	1.00	EA	22,331	3,350	2,233	223	29,544	29543.97
01.04. 03 Real Estate	1.00	EA	90,000	13,500	0	0	103,500	103500.00
TOTAL Pipeline to Convey Wtr Wtld-Corr	1.00	EA	3,432,734	514,910	334,273	33,427	4,525,937	4525937
01.05 Dependent Riparian Corridors								
01.05. 01 Clearing and Grubbing	1.00	EA	50,521	7,578	5,052	505	66,840	66839.90
01.05. 02 Excavation and Stockpile	342600.00	CY	1,690,109	253,516	169,011	16,901	2,236,015	6.53
01.05. 03 Grading	66.00	ACR	133,339	20,001	13,334	1,333	176,407	2672.84
01.05. 04 Topsoil Lining	53200.00	CY	536,696	80,504	53,670	5,367	710,048	13.35
01.05. 05 Vegetation Removal (Salt Cedar)	66.00	ACR	166,943	25,041	16,694	1,669	220,865	3346.44
01.05. 06 Revegetation of Natives	35.00	ACR	546,023	81,904	54,602	5,460	722,389	20639.68
01.05. 07 Real Estate	1.00	EA	300,000	45,000	0	0	345,000	345000.00
TOTAL Dependent Riparian Corridors	1.00	EA	3,423,631	513,545	342,363	34,236	4,477,564	4477564

	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
01.06 Independent Open Water Marsh								
01.06. 01 Clearing and Grubbing	1.00	EA	50,521	7,578	5,052	505	66,840	66839.90
01.06. 02 Excavation and Stockpile	1120000	CY	5,525,168	828,775	552,517	55,252	7,309,797	6.53
01.06. 03 Grading	139.00	ACR	280,783	42,118	28,078	2,808	371,476	2672.49
01.06. 04 Topsoil Lining	57000.00	CY	575,031	86,255	57,503	5,750	760,766	13.35
01.06. 05 Vegetation Removal (Salt Cedar)	95.00	ACR	240,296	36,044	24,030	2,403	317,912	3346.44
01.06. 06 Revegetation of Natives	20.00	ACR	312,013	46,802	31,201	3,120	412,794	20639.68
01.06. 07 Real Estate	1.00	EA	1,000,000	150,000	0	0	1,150,000	1150000
TOTAL Independent Open Water Marsh	1.00	EA	7,983,814	1,197,572	698,381	69,838	10,389,585	10389585
01.07 Independent Riparian Corridors								
01.07. 01 Clearing and Grubbing	1.00	EA	50,521	7,578	5,052	505	66,840	66839.90
01.07. 02 Excavation and Stockpile	341000.00	CY	1,682,216	252,332	168,222	16,822	2,225,572	6.53
01.07. 03 Grading	70.00	ACR	141,393	21,209	14,139	1,414	187,063	2672.33
01.07. 04 Topsoil Lining	56800.00	CY	573,013	85,952	57,301	5,730	758,097	13.35
01.07. 05 Vegetation Removal (Salt Cedar)	35.00	ACR	88,530	13,280	8,853	885	117,126	3346.44
01.07. 06 Revegetation of Natives	30.00	ACR	468,020	70,203	46,802	4,680	619,190	20639.68
01.07. 07 Real Estate	1.00	EA	1,700,000	255,000	0	0	1,955,000	1955000
TOTAL Independent Riparian Corridors	1.00	EA	4,703,695	705,554	300,369	30,037	5,928,888	5928888
01.08 Dewatering Well Collection Syst								
01.08. 01 Dewatering Well System	1.00	EA	9,338	1,401	934	93	12,354	12354.22
01.08. 02 Pipeline from Well to Ext Lake	1.00	EA	1,223,870	183,580	122,387	12,239	1,619,179	1619179
01.08. 03 Real Estate	1.00	EA	900,000	135,000	0	0	1,035,000	1035000
TOTAL Dewatering Well Collection Syst	1.00	EA	2,133,208	319,981	123,321	12,332	2,666,534	2666534
01.09 Pipe from Ext Lake to Rip Corr								
01.09. 01 Pipe (36" Dia. Concrete)	1200.00	LF	96,840	14,526	9,684	968	128,119	106.77
01.09. 02 Pipe Trench Excavation	4500.00	CY	22,504	3,376	2,250	225	29,773	6.62
01.09. 03 Pipe Trench Backfill	4200.00	CY	12,657	1,899	1,266	127	16,746	3.99
01.09. 04 Real Estate	1.00	EA	300,000	45,000	0	0	345,000	345000.00
TOTAL Pipe from Ext Lake to Rip Corr	1.00	EA	432,001	64,800	13,200	1,320	519,637	519637.48
01.10 Conveyance Trapezoidal Channel								
01.10. 01 Riprap Sideslope Soft-Bot Chan	1.00	EA	82,187	12,328	8,219	822	108,734	108733.93
01.10. 02 Earth Sideslope Soft-Bot Chan	1.00	EA	118,847	17,827	11,885	1,188	157,234	157234.27
01.10. 03 Real Estate	1.00	EA	1,400,000	210,000	0	0	1,610,000	1610000

	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
TOTAL Conveyance Trapezoidal Channel	1.00	EA	1,601,034	240,155	20,103	2,010	1,875,968	1875968
01.11 Dependent Open Water Marsh								
01.11. 01 Clearing and Grubbing	1.00	EA	50,521	7,578	5,052	505	66,840	66839.90
01.11. 02 Excavation and Stockpile	1800000	CY	8,879,734	1,331,960	887,973	88,797	11,747,889	6.53
01.11. 03 Grading	223.00	ACR	450,472	67,571	45,047	4,505	595,975	2672.53
01.11. 04 Topsoil Lining	60100.00	CY	606,305	90,946	60,630	6,063	802,141	13.35
01.11. 05 Vegetation Removal (Salt Cedar)	112.00	ACR	283,297	42,495	28,330	2,833	374,802	3346.44
01.11. 06 Revegetation of Natives	37.00	ACR	577,225	86,584	57,722	5,772	763,668	20639.68
TOTAL Dependent Open Water Marsh	1.00	EA	10,847,554	1,627,133	1,084,755	108,476	14,351,314	14351314
01.12 Monitoring								
01.12.001 Monitoring	1.00	EA	808,344	0	0	0	808,344	808343.51
TOTAL Monitoring	1.00	EA	808,344	0	0	0	808,344	808343.51
01.13 Adaptive Management								
01.13.001 Adaptive Management	1.00	EA	808,344	0	0	0	808,344	808343.51
TOTAL Adaptive Management	1.00	EA	808,344	0	0	0	808,344	808343.51
01.14 Cultural Resources Mitigation								
01.14.001 Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	1,000,000	1000000
TOTAL Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	64,615,700	9,299,852	5,168,901	516,890	82,857,751	82857751
02 Flood Control								
02.01 Low Levee (50 year)								
02.01.001 Clearing and Grubbing	1.00	EA	50,521	10,104	5,052	505	69,366	69365.98
02.01.002 Compacted Fill Levee	83000.00	CY	255,589	51,118	25,559	2,556	350,924	4.23
02.01.003 Toe Excavation and Backfill	358000.00	CY	1,826,900	365,380	182,690	18,269	2,508,334	7.01
02.01.004 Riprap Slope Protection	72400.00	TON	869,863	173,973	86,986	8,699	1,194,322	16.50
02.01.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	66,793	13,359	6,679	668	91,707	59.17
02.01.006 Inlet Structures	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.01.007 Outlet Weir Stucture	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.01.008 Real Estate	1.00	EA	588,000	88,200	0	0	676,200	676200.00

	QUANTITY	UOM	CONTRACT	CONTINGN	PED	EDC	TOTAL COST	UNIT COST
TOTAL Low Levee (50 year)	1.00	EA	3,707,514	712,103	311,951	31,195	4,959,293	4959293
02.02 Mid-high Levee (100 year)								
02.02.001 Clearing and Grubbing	1.00	EA	50,521	10,104	5,052	505	69,366	69365.98
02.02.002 Compacted Fill Levee	141000.00	CY	414,193	86,839	43,419	4,342	596,147	4.23
02.02.003 Toe Excavation and Backfill	358000.00	CY	1,826,900	365,380	182,690	18,269	2,508,334	7.01
02.02.004 Riprap Slope Protection	87600.00	TON	1,052,486	210,497	105,249	10,525	1,445,063	16.50
02.02.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	66,793	13,359	6,679	668	91,707	59.17
02.02.006 Inlet Structures	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.02.007 Outlet Weir Structure	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.02.008 Real Estate	1.00	EA	588,000	88,200	0	0	676,200	676200.00
TOTAL Mid-high Levee (100 year)	1.00	EA	4,068,742	784,348	348,074	34,807	5,455,258	5455258
02.03 High Levee (500 year)								
02.03.001 Clearing and Grubbing	1.00	EA	50,521	10,104	5,052	505	69,366	69365.98
02.03.002 Compacted Fill Levee	175000.00	CY	538,892	107,778	53,889	5,389	739,899	4.23
02.03.003 Toe Excavation and Backfill	358000.00	CY	1,826,900	365,380	182,690	18,269	2,508,334	7.01
02.03.004 Riprap Slope Protection	98700.00	TON	1,191,856	238,371	119,186	11,919	1,636,419	16.58
02.03.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	66,793	13,359	6,679	668	91,707	59.17
02.03.006 Inlet Structures	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.03.007 Outlet Weir Structure	5.00	EA	24,924	4,985	2,492	249	34,221	6844.11
02.03.008 Real Estate	1.00	EA	588,000	88,200	0	0	676,200	676200.00
TOTAL High Levee (500 year)	1.00	EA	4,312,811	833,162	372,481	37,248	5,790,365	5790365
TOTAL Flood Control	1.00	EA	12,089,067	2,329,613	1,012,507	103,251	16,204,917	16204917
03 Rec Impr & Envr Education Fac								
03.01 Recreational Improvements								
03.01.001 Recreational Improvements	1.00	EA	2,384,613	0	0	0	2,384,613	2384613
TOTAL Recreational Improvements	1.00	EA	2,384,613	0	0	0	2,384,613	2384613
03.02 Environmental Education Fac								
03.02.001 Environmental Education Fac	1.00	EA	2,532,810	0	0	0	2,532,810	2532810
TOTAL Environmental Education Fac	1.00	EA	2,532,810	0	0	0	2,532,810	2532810
TOTAL Rec Impr & Envr Education Fac	1.00	EA	4,917,423	0	0	0	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	81,622,190	11,629,465	6,201,408	620,141	103,980,091	103980091

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
01 Environmental Restoration	1.00	EA	50,876,619	3,956,662	2,611,397	4,613,468	237,698	2,319,856	64,615,700	64615700
02 Flood Control	1.00	EA	9,427,871	766,387	505,815	893,607	46,041	449,345	12,089,067	12089067
03 Rec Impr & Envr Education Fac	1.00	EA	3,650,000	365,000	240,900	425,590	21,928	214,005	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	63,954,490	5,088,049	3,358,112	5,932,665	305,667	2,983,207	81,622,190	81622190
CONTINGENCY									11,629,465	
SUBTOTAL									93,251,655	
PLANNING, SURVEY, ENGR & DESIGN									6,201,408	
SUBTOTAL									99,453,063	
ENGINEERING DURING CONSTRUCTION									620,141	
SUBTOTAL									100,073,204	
SUPERVISION AND ADMINISTRATION									3,906,887	
TOTAL INCL OWNER COSTS									103,980,091	

FEASIBILITY ESTIMATE

** PROJECT INDIRECT SUMMARY - Facility **

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
01 Environmental Restoration										
01.01 Pump Sta & Pipes to Diurnal Wtld	1.00	EA	10,521,259	772,126	509,603	900,299	46,386	452,710	13,202,383	13202383
01.02 Regulating Wetlands	1.00	EA	5,032,355	503,236	332,135	586,773	30,232	295,055	6,779,786	6779786
01.03 Overbank Wetlands	1.00	EA	6,005,726	418,573	276,258	488,056	25,146	245,416	7,459,174	7459174
01.04 Pipeline to Convey Wtr Wtld-Corr	1.00	EA	2,571,173	248,117	163,757	289,305	14,906	145,475	3,432,734	3432734
01.05 Dependent Riparian Corridors	1.00	EA	2,618,542	231,854	153,024	270,342	13,929	135,940	3,423,631	3423631
01.06 Independent Open Water Marsh	1.00	EA	6,183,796	518,380	342,131	604,431	31,142	303,934	7,983,814	7983814
01.07 Independent Riparian Corridors	1.00	EA	3,929,518	222,952	147,148	259,962	13,394	130,720	4,703,695	4703695
01.08 Dewatering Well Collection Syst	1.00	EA	1,815,359	91,536	60,414	106,731	5,499	53,669	2,133,208	2133208
01.09 Pipe from Ext Lake to Rip Corr	1.00	EA	397,979	9,798	6,467	11,424	589	5,745	432,001	432001.12
01.10 Conveyance Trapezoidal Channel	1.00	EA	1,549,219	14,922	9,848	17,399	896	8,749	1,601,034	1601034
01.11 Dependent Open Water Marsh	1.00	EA	8,051,691	805,169	531,412	938,827	48,371	472,084	10,847,554	10847554
01.12 Monitoring	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
01.13 Adaptive Management	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
01.14 Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	0	0	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	50,876,619	3,956,662	2,611,397	4,613,468	237,698	2,319,856	64,615,700	64615700
02 Flood Control										
02.01 Low Levee (50 year)	1.00	EA	2,903,487	231,549	152,822	269,986	13,910	135,761	3,707,514	3707514
02.02 Mid-high Levee (100 year)	1.00	EA	3,171,611	258,361	170,518	301,249	15,521	151,481	4,068,742	4068742
02.03 High Levee (500 year)	1.00	EA	3,352,773	276,477	182,475	322,373	16,610	162,103	4,312,811	4312811
TOTAL Flood Control	1.00	EA	9,427,871	766,387	505,815	893,607	46,041	449,345	12,089,067	12089067
03 Rec Impr & Envr Education Fac										
03.01 Recreational Improvements	1.00	EA	1,770,000	177,000	116,820	206,382	10,633	103,778	2,384,613	2384613
03.02 Environmental Education Fac	1.00	EA	1,880,000	188,000	124,080	219,208	11,294	110,227	2,532,810	2532810
TOTAL Rec Impr & Envr Education Fac	1.00	EA	3,650,000	365,000	240,900	425,590	21,928	214,005	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	63,954,490	5,088,049	3,358,112	5,932,665	305,667	2,983,207	81,622,190	81622190
CONTINGENCY									11,629,465	
SUBTOTAL									93,251,655	
PLANNING, SURVEY, ENGR & DESIGN									6,201,408	
SUBTOTAL									99,453,063	
ENGINEERING DURING CONSTRUCTION									620,141	
SUBTOTAL									100,073,204	
SUPERVISION AND ADMINISTRATION									3,906,887	
TOTAL INCL OWNER COSTS									103,980,091	

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
01 Environmental Restoration										
01.01 Pump Sta & Pipes to Diurnal Wtld										
01.01. 01 Pump Stations	1.00	EA	6,150,500	615,050	405,933	717,148	36,949	360,614	8,286,195	8286195
01.01. 02 Pipeline fr Pump Sta to D Wtld	1.00	EA	1,570,759	157,076	103,670	183,151	9,436	92,096	2,116,189	2116189
01.01. 03 Real Estate	1.00	EA	2,800,000	0	0	0	0	0	2,800,000	2800000
TOTAL Pump Sta & Pipes to Diurnal Wtld	1.00	EA	10,521,259	772,126	509,603	900,299	46,386	452,710	13,202,383	13202383
01.02 Regulating Wetlands										
01.02. 01 Regulating Basins	1.00	EA	4,734,259	473,426	312,461	552,015	28,441	277,577	6,378,180	6378180
01.02. 02 Pipeline btw Basins to Basins	1.00	EA	298,096	29,810	19,674	34,758	1,791	17,478	401,606	401606.49
TOTAL Regulating Wetlands	1.00	EA	5,032,355	503,236	332,135	586,773	30,232	295,055	6,779,786	6779786
01.03 Overbank Wetlands										
01.03. 01 General Basins	1.00	EA	3,996,793	399,679	263,788	466,026	24,011	234,339	5,384,636	5384636
01.03. 02 Pipe Connecting between Basins	1.00	EA	188,933	18,893	12,470	22,030	1,135	11,077	254,538	254537.86
01.03. 03 Real Estate	1.00	EA	1,820,000	0	0	0	0	0	1,820,000	1820000
TOTAL Overbank Wetlands	1.00	EA	6,005,726	418,573	276,258	488,056	25,146	245,416	7,459,174	7459174
01.04 Pipeline to Convey Wtr Wtld-Corr										
01.04. 01 36" Dia. Steel Pipe	1.00	EA	2,464,598	246,460	162,663	287,372	14,806	144,503	3,120,403	3120403
01.04. 02 12" Dia. Concrete Pipe	1.00	EA	16,575	1,658	1,094	1,933	100	972	22,331	22331.04
01.04. 03 Real Estate	1.00	EA	90,000	0	0	0	0	0	90,000	90000.00
TOTAL Pipeline to Convey Wtr Wtld-Corr	1.00	EA	2,571,173	248,117	163,757	289,305	14,906	145,475	3,432,734	3432734
01.05 Dependent Riparian Corridors										
01.05. 01 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
01.05. 02 Excavation and Stockpile	342600.00	CY	1,254,498	125,450	82,797	146,275	7,536	73,553	1,690,109	4.93
01.05. 03 Grading	66.00	ACR	98,972	9,897	6,532	11,540	595	5,803	133,339	2020.28
01.05. 04 Topsoil Lining	53200.00	CY	398,367	39,837	26,292	46,450	2,393	23,357	536,696	10.09
01.05. 05 Vegetation Removal (Salt Cedar)	66.00	ACR	123,915	12,391	8,178	14,448	744	7,265	166,943	2529.44
01.05. 06 Revegetation of Natives	35.00	ACR	405,291	40,529	26,749	47,257	2,435	23,763	546,023	15600.67
01.05. 07 Real Estate	1.00	EA	300,000	0	0	0	0	0	300,000	300000.00
TOTAL Dependent Riparian Corridors	1.00	EA	2,618,542	231,854	153,024	270,342	13,929	135,940	3,423,631	3423631

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
01.06 Independent Open Water Marsh										
01.06. 01 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
01.06. 02 Excavation and Stockpile	1120000	CY	4,101,104	410,110	270,673	478,189	24,638	240,454	5,525,168	4.93
01.06. 03 Grading	139.00	ACR	208,414	20,841	13,755	24,301	1,252	12,220	280,783	2020.02
01.06. 04 Topsoil Lining	57000.00	CY	426,822	42,682	28,170	49,767	2,564	25,025	575,031	10.09
01.06. 05 Vegetation Removal (Salt Cedar)	95.00	ACR	178,162	17,836	11,772	20,797	1,072	10,458	240,296	2529.44
01.06. 06 Revegetation of Natives	20.00	ACR	231,595	23,159	15,285	27,004	1,391	13,579	312,013	15600.67
01.06. 07 Real Estate	1.00	EA	1,000,000	0	0	0	0	0	1,000,000	1000000
TOTAL Independent Open Water Marsh	1.00	EA	6,183,796	518,380	342,131	604,431	31,142	303,934	7,983,814	7983814
01.07 Independent Riparian Corridors										
01.07. 01 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
01.07. 02 Excavation and Stockpile	341000.00	CY	1,248,640	124,864	82,410	145,591	7,501	73,210	1,682,216	4.93
01.07. 03 Grading	70.00	ACR	104,950	10,495	6,927	12,237	630	6,153	141,393	2019.90
01.07. 04 Topsoil Lining	56800.00	CY	425,324	42,532	28,071	49,593	2,555	24,937	573,013	10.09
01.07. 05 Vegetation Removal (Salt Cedar)	35.00	ACR	65,712	6,571	4,337	7,662	395	3,853	88,530	2529.44
01.07. 06 Revegetation of Natives	30.00	ACR	347,392	34,739	22,928	40,506	2,087	20,368	468,020	15600.67
01.07. 07 Real Estate	1.00	EA	1,700,000	0	0	0	0	0	1,700,000	1700000
TOTAL Independent Riparian Corridors	1.00	EA	3,929,518	222,952	147,148	259,962	13,394	130,720	4,703,695	4703695
01.08 Dewatering Well Collection Syst										
01.08. 01 Dewatering Well System	1.00	EA	6,931	693	457	808	42	406	9,338	9338.03
01.08. 02 Pipeline from Well to Ext Lake	1.00	EA	908,428	90,843	59,956	105,923	5,457	53,263	1,224,870	1223870
01.08. 03 Real Estate	1.00	EA	900,000	0	0	0	0	0	900,000	900000.00
TOTAL Dewatering Well Collection Syst	1.00	EA	1,815,359	91,536	60,414	106,731	5,499	53,669	2,133,208	2133208
01.09 Pipe from Ext Lake to Rip Corr										
01.09. 01 Pipe (36" Dia. Concrete)	1200.00	LF	71,880	7,188	4,744	8,381	432	4,214	96,840	80.70
01.09. 02 Pipe Trench Excavation	4500.00	CY	16,704	1,670	1,102	1,948	100	979	22,504	5.00
01.09. 03 Pipe Trench Backfill	4200.00	CY	9,395	939	620	1,095	56	551	12,657	3.01
01.09. 04 Real Estate	1.00	EA	300,000	0	0	0	0	0	300,000	300000.00
TOTAL Pipe from Ext Lake to Rip Corr	1.00	EA	397,979	9,798	6,467	11,424	589	5,745	432,001	432001.12
01.10 Conveyance Trapezoidal Channel										
01.10. 01 Riprap Sideslope Soft-Bot Chan	1.00	EA	61,004	6,100	4,026	7,113	366	3,577	82,187	82187.40
01.10. 02 Earth Sideslope Soft-Bot Chan	1.00	EA	88,215	8,822	5,822	10,286	530	5,172	118,847	118846.77
01.10. 03 Real Estate	1.00	EA	1,400,000	0	0	0	0	0	1,400,000	1400000

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
TOTAL Conveyance Trapezoidal Channel	1.00	EA	1,549,219	14,922	9,848	17,399	896	8,749	1,601,034	1601034
01.11 Dependent Open Water Marsh										
01.11 01 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
01.11. 02 Excavation and Stockpile	1800000	CY	6,591,060	659,106	435,010	768,518	39,596	386,445	8,879,734	4.93
01.11. 03 Grading	223.00	ACR	334,367	33,437	22,068	38,987	2,009	19,604	450,472	2020.05
01.11. 04 Topsoil Lining	60100.00	CY	450,035	45,003	29,702	52,474	2,704	26,386	606,305	10.09
01.11. 05 Vegetation Removal (Salt Cedar)	112.00	ACR	210,279	21,028	13,878	24,519	1,263	12,329	283,297	2529.44
01.11. 06 Revegetation of Natives	37.00	ACR	428,450	42,845	28,278	49,957	2,574	25,121	577,225	15600.67
TOTAL Dependent Open Water Marsh	1.00	EA	8,051,691	805,169	531,412	938,827	48,371	472,084	10,847,554	10847554
01.12 Monitoring										
01.12.001 Monitoring	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
TOTAL Monitoring	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
01.13 Adaptive Management										
01.13.001 Adaptive Management	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
TOTAL Adaptive Management	1.00	EA	600,000	60,000	39,600	69,960	3,605	35,179	808,344	808343.51
01.14 Cultural Resources Mitigation										
01.14.001 Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	0	0	1,000,000	1000000
TOTAL Cultural Resources Mitigation	1.00	EA	1,000,000	0	0	0	0	0	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	50,876,619	3,956,662	2,611,397	4,613,468	237,698	2,319,856	64,615,700	64615700
02 Flood Control										
02.01 Low Levee (50 year)										
02.01.001 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
02.01.002 Compacted Fill Levee	83000.00	CY	189,713	18,971	12,521	22,121	1,140	11,123	255,589	3.08
02.01.003 Toe Excavation and Backfill	358000.00	CY	1,356,032	135,603	89,498	158,113	8,146	79,506	1,826,900	5.10
02.01.004 Riprap Slope Protection	72400.00	TON	645,663	64,566	42,614	75,284	3,879	37,856	869,863	12.01
02.01.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	49,578	4,958	3,272	5,781	298	2,907	66,793	43.09
02.01.006 Inlet Structures	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.01.007 Outlet Weir Structure	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.01.008 Real Estate	1.00	EA	588,000	0	0	0	0	0	588,000	588000.00

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
TOTAL Low Levee (50 year)	1.00	EA	2,903,487	231,549	152,822	269,986	13,910	135,761	3,707,514	3707514
02.02 Mid-high Levee (100 year)										
02.02.001 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
02.02.002 Compacted Fill Levee	141000.00	CY	322,284	32,228	21,271	37,578	1,936	18,896	434,193	3.08
02.02.003 Toe Excavation and Backfill	358000.00	CY	1,356,032	135,603	89,498	158,113	8,146	79,506	1,826,900	5.10
02.02.004 Riprap Slope Protection	87600.00	TON	781,217	78,122	51,560	91,090	4,693	45,804	1,052,486	12.01
02.02.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	49,578	4,958	3,272	5,781	298	2,907	66,793	43.09
02.02.006 Inlet Structures	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.02.007 Outlet Weir Structure	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.02.008 Real Estate	1.00	EA	588,000	0	0	0	0	0	588,000	588000.00
TOTAL Mid-high Levee (100 year)	1.00	EA	3,171,611	258,361	170,518	301,249	15,521	151,481	4,068,742	4068742
02.03 High Levee (500 year)										
02.03.001 Clearing and Grubbing	1.00	EA	37,500	3,750	2,475	4,373	225	2,199	50,521	50521.47
02.03.002 Compacted Fill Levee	175000.00	CY	399,998	40,000	26,400	46,640	2,403	23,453	538,892	3.08
02.03.003 Toe Excavation and Backfill	358000.00	CY	1,356,032	135,603	89,498	158,113	8,146	79,506	1,826,900	5.10
02.03.004 Riprap Slope Protection	98700.00	TON	884,666	88,467	58,388	103,152	5,315	51,869	1,191,856	12.08
02.03.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	49,578	4,958	3,272	5,781	298	2,907	66,793	43.09
02.03.006 Inlet Structures	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.03.007 Outlet Weir Structure	5.00	EA	18,500	1,850	1,221	2,157	111	1,085	24,924	4984.78
02.03.008 Real Estate	1.00	EA	588,000	0	0	0	0	0	588,000	588000.00
TOTAL High Levee (500 year)	1.00	EA	3,352,773	276,477	182,475	322,373	16,610	162,103	4,312,811	4312811
TOTAL Flood Control	1.00	EA	9,427,871	766,387	505,815	893,607	46,041	449,345	12,089,067	12089067
03 Rec Impr & Envr Education Fac										
03.01 Recreational Improvements										
03.01.001 Recreational Improvements	1.00	EA	1,770,000	177,000	116,820	206,382	10,633	103,778	2,384,613	2384613
TOTAL Recreational Improvements	1.00	EA	1,770,000	177,000	116,820	206,382	10,633	103,778	2,384,613	2384613
03.02 Environmental Education Fac										
03.02.001 Environmental Education Fac	1.00	EA	1,880,000	188,000	124,080	219,208	11,294	110,227	2,532,810	2532810
TOTAL Environmental Education Fac	1.00	EA	1,880,000	188,000	124,080	219,208	11,294	110,227	2,532,810	2532810
TOTAL Rec Impr & Envr Education Fac	1.00	EA	3,650,000	365,000	240,900	425,590	21,928	214,005	4,917,423	4917423
TOTAL Tres Rios	1.00	EA	63,954,490	5,088,049	3,358,112	5,932,665	305,067	2,983,207	81,622,190	81622190

	QUANTITY	UOM	DIRECT	OVERHEAD	HOME OFC	PROFIT	BOND	AZ PRIV	TOTAL COST	UNIT COST
CONTINGENCY									11,629,465	
SUBTOTAL									93,251,655	
PLANNING, SURVEY, ENGR & DESIGN									6,201,408	
SUBTOTAL									99,453,063	
ENGINEERING DURING CONSTRUCTION									620,141	
SUBTOTAL									100,073,204	
SUPERVISION AND ADMINISTRATION									3,906,887	
TOTAL INCL OWNER COSTS									103,980,091	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
01 Environmental Restoration	1.00	EA	427,430	12511755	14919174	395028119495410		50,876,619	50876619
02 Flood Control	1.00	EA	88,819	2602506	2916648	1921217	1987500	9,427,871	9427871
03 Rec Impr & Envr Education Fac	1.00	EA	0	0	0	0	3650000	3,650,000	3650000
TOTAL Tres Rios	1.00	EA	516,248	15114261	17835821	587149825132910		63,954,490	63954490
OVERHEAD								5,088,049	
SUBTOTAL								69,042,539	
HOME OFC								3,358,112	
SUBTOTAL								72,400,651	
PROFIT								5,932,665	
SUBTOTAL								78,333,316	
BOND								305,667	
SUBTOTAL								78,638,983	
ARIZONA PRIV								2,983,207	
TOTAL INCL INDIRECTS								81,622,190	
CONTINGENCY								11,629,465	
SUBTOTAL								93,251,655	
PLANNING, SURVEY, ENGR & DESIGN								6,201,408	
SUBTOTAL								99,453,063	
ENGINEERING DURING CONSTRUCTION								620,141	
SUBTOTAL								100,073,204	
SUPERVISION AND ADMINISTRATION								3,906,887	
TOTAL INCL OWNER COSTS								103,980,091	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
01 Environmental Restoration									
01.01 Pump Sta & Pipes to Diurnal Wtld	1.00	EA	3,952	126,536	69,521	1371003	8954200	10,521,259	10521259
01.02 Regulating Wetlands	1.00	EA	56,041	1721726	2865149	104,880	340,600	5,032,355	5032355
01.03 Overbank Wetlands	1.00	EA	47,046	1445947	2397862	98,316	2063600	6,005,726	6005726
01.04 Pipeline to Convey Wtr Wtld-Corr	1.00	EA	18,470	629,812	137,309	1695552	108,500	2,571,173	2571173
01.05 Dependent Riparian Corridors	1.00	EA	48,588	1309888	971,155	0	337,500	2,618,542	2618542
01.06 Independent Open Water Marsh	1.00	EA	78,672	2271161	2875135	0	1037500	6,183,796	6183796
01.07 Independent Riparian Corridors	1.00	EA	46,307	1249350	942,668	0	1737500	3,929,518	3929518
01.08 Dewatering Well Collection Syst	1.00	EA	6,805	232,652	50,189	632,518	900,000	1,815,359	1815359
01.09 Pipe from Ext Lake to Rip Corr	1.00	EA	1,385	39,244	22,063	36,672	300,000	397,979	397978.98
01.10 Conveyance Trapezoidal Channel	1.00	EA	743	22,729	36,640	11,340	1478510	1,549,219	1549219
01.11 Dependent Open Water Marsh	1.00	EA	119,422	3462709	4551482	0	37,500	8,051,691	8051691
01.12 Monitoring	1.00	EA	0	0	0	0	600,000	600,000	600000.00
01.13 Adaptive Management	1.00	EA	0	0	0	0	600,000	600,000	600000.00
01.14 Cultural Resources Mitigation	1.00	EA	0	0	0	0	1000000	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	427,430	12511755	14919174	395028	119495410	50,876,619	50876619
02 Flood Control									
02.01 Low Levee (50 year)	1.00	EA	26,146	775,502	929,329	536,156	662,500	2,903,487	2903487
02.02 Mid-high Levee (100 year)	1.00	EA	30,108	880,788	978,387	649,936	662,500	3,171,611	3171611
02.03 High Levee (500 year)	1.00	EA	32,565	946,216	1008931	735,126	662,500	3,352,773	3352773
TOTAL Flood Control	1.00	EA	88,819	2602506	2916648	1921217	1987500	9,427,871	9427871
03 Rec Impr & Envr Education Fac									
03.01 Recreational Improvements	1.00	EA	0	0	0	0	1770000	1,770,000	1770000
03.02 Environmental Education Fac	1.00	EA	0	0	0	0	1880000	1,880,000	1880000
TOTAL Rec Impr & Envr Education Fac	1.00	EA	0	0	0	0	3650000	3,650,000	3650000
TOTAL Tres Rios	1.00	EA	516,248	15114261	17835821	587149	825132910	63,954,490	63954490
OVERHEAD								5,088,049	
SUBTOTAL								69,042,539	
HOME OFC								3,358,112	
SUBTOTAL								72,400,651	
PROFIT								5,932,665	
SUBTOTAL								78,333,316	
BOND								305,667	
SUBTOTAL								78,638,983	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
ARIZONA PRIV								2,983,207	
TOTAL INCL INDIRECTS								81,622,190	
CONTINGENCY								11,629,465	
SUBTOTAL								93,251,655	
PLANNING, SURVEY, ENGR & DESIGN								6,201,408	
SUBTOTAL								99,453,063	
ENGINEERING DURING CONSTRUCTION								620,141	
SUBTOTAL								100,073,204	
SUPERVISION AND ADMINISTRATION								3,906,887	
TOTAL INCL OWNER COSTS								103,980,091	

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
01 Environmental Restoration									
01.01 Pump Sta & Pipes to Diurnal Wtld									
01.01. 01 Pump Stations	1.00	EA	0	0	0	0	6150500	6,150,500	6150500
01.01. 02 Pipeline fr Pump Sta to D Wtld	1.00	EA	3,952	126,536	69,521	1371003	3,700	1,570,759	1570759
01.01. 03 Real Estate	1.00	EA	0	0	0	0	2800000	2,800,000	2800000
TOTAL Pump Sta & Pipes to Diurnal Wtld	1.00	EA	3,952	126,536	69,521	1371003	8954200	10,521,259	10521259
01.02 Regulating Wetlands									
01.02. 01 Regulating Basins	1.00	EA	53,985	1651349	2850411	0	232,500	4,734,259	4734259
01.02. 02 Pipeline btw Basins to Basins	1.00	EA	2,056	70,378	14,738	104,880	108,100	298,096	298095.91
TOTAL Regulating Wetlands	1.00	EA	56,041	1721726	2865149	104,880	340,600	5,032,355	5032355
01.03 Overbank Wetlands									
01.03. 01 General Basins	1.00	EA	45,123	1380123	2384170	0	232,500	3,996,793	3996793
01.03. 02 Pipe Connecting between Basins	1.00	EA	1,923	65,824	13,693	98,316	11,100	188,933	188932.94
01.03. 03 Real Estate	1.00	EA	0	0	0	0	1820000	1,820,000	1820000
TOTAL Overbank Wetlands	1.00	EA	47,046	1445947	2397862	98,316	2063600	6,005,726	6005726
01.04 Pipeline to Convey Wtr Wtld-Corr									
01.04. 01 36" Dia. Steel Pipe	1.00	EA	18,220	622,920	135,305	1687872	18,500	2,464,598	2464598
01.04. 02 12" Dia. Concrete Pipe	1.00	EA	250	6,892	2,004	7,680	0	16,575	16575.41
01.04. 03 Real Estate	1.00	EA	0	0	0	0	90,000	90,000	90000.00
TOTAL Pipeline to Convey Wtr Wtld-Corr	1.00	EA	18,470	629,812	137,309	1695552	108,500	2,571,173	2571173
01.05 Dependent Riparian Corridors									
01.05. 01 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
01.05. 02 Excavation and Stockpile	342600.00	CY	15,074	461,379	793,119	0	0	1,254,498	3.66
01.05. 03 Grading	66.00	ACR	1,141	34,504	64,468	0	0	98,972	1499.57
01.05. 04 Topsoil Lining	53200.00	CY	13,896	352,466	45,901	0	0	398,367	7.49
01.05. 05 Vegetation Removal (Salt Cedar)	66.00	ACR	1,777	56,248	67,667	0	0	123,915	1877.50
01.05. 06 Revegetation of Natives	35.00	ACR	16,700	405,291	0	0	0	405,291	11579.73
01.05. 07 Real Estate	1.00	EA	0	0	0	0	300,000	300,000	300000.00
TOTAL Dependent Riparian Corridors	1.00	EA	48,588	1309888	971,155	0	337,500	2,618,542	2618542

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
01.06 Independent Open Water Marsh									
01.06. 01 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
01.06. 02 Excavation and Stockpile	1120000	CY	49,280	1508304	2592800	0	0	4,101,104	3.66
01.06. 03 Grading	139.00	ACR	2,403	72,658	135,756	0	0	208,414	1499.38
01.06. 04 Topsoil Lining	57000.00	CY	14,888	377,642	49,180	0	0	426,822	7.49
01.06. 05 Vegetation Removal (Salt Cedar)	95.00	ACR	2,558	80,963	97,399	0	0	178,362	1877.50
01.06. 06 Revegetation of Natives	20.00	ACR	9,543	231,595	0	0	0	231,595	11579.73
01.06. 07 Real Estate	1.00	EA	0	0	0	0	1000000	1,000,000	1000000
TOTAL Independent Open Water Marsh	1.00	EA	78,672	2271161	2875135	0	1037500	6,183,796	6183796
01.07 Independent Riparian Corridors									
01.07. 01 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
01.07. 02 Excavation and Stockpile	341000.00	CY	15,004	459,225	789,415	0	0	1,248,640	3.66
01.07. 03 Grading	70.00	ACR	1,210	36,588	68,362	0	0	104,950	1499.29
01.07. 04 Topsoil Lining	56800.00	CY	14,836	376,317	49,007	0	0	425,324	7.49
01.07. 05 Vegetation Removal (Salt Cedar)	35.00	ACR	942	29,828	35,884	0	0	65,712	1877.50
01.07. 06 Revegetation of Natives	30.00	ACR	14,314	347,392	0	0	0	347,392	11579.73
01.07. 07 Real Estate	1.00	EA	0	0	0	0	1700000	1,700,000	1700000
TOTAL Independent Riparian Corridors	1.00	EA	46,307	1249350	942,668	0	1737500	3,929,518	3929518
01.08 Dewatering Well Collection Syst									
01.08. 01 Dewatering Well System	1.00	EA	40	1,341	0	5,590	0	6,931	6931.24
01.08. 02 Pipeline from Well to Ext Lake	1.00	EA	6,766	231,311	50,189	626,928	0	908,428	908427.79
01.08. 03 Real Estate	1.00	EA	0	0	0	0	900,000	900,000	900000.00
TOTAL Dewatering Well Collection Syst	1.00	EA	6,805	232,652	50,189	632,518	900,000	1,815,359	1815359
01.09 Pipe from Ext Lake to Rip Corr									
01.09. 01 Pipe (36" Dia. Concrete)	1200.00	LF	933	25,338	10,542	36,000	0	71,880	59.90
01.09. 02 Pipe Trench Excavation	4500.00	CY	273	8,541	8,163	0	0	16,704	3.71
01.09. 03 Pipe Trench Backfill	4200.00	CY	179	5,364	3,359	672	0	9,395	2.24
01.09. 04 Real Estate	1.00	EA	0	0	0	0	300,000	300,000	300000.00
TOTAL Pipe from Ext Lake to Rip Corr	1.00	EA	1,185	39,244	22,063	36,672	300,000	397,979	397978.98
01.10 Conveyance Trapezoidal Channel									
01.10. 01 Riprap Sideslope Soft-Bot Chan	1.00	EA	157	4,705	6,550	11,340	38,410	61,004	61004.31
01.10. 02 Earth Sideslope Soft-Bot Chan	1.00	EA	586	18,025	30,090	0	40,100	88,215	88215.05
01.10. 03 Real Estate	1.00	EA	0	0	0	0	1400000	1,400,000	1400000

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL Conveyance Trapezoidal Channel	1.00	EA	743	22,729	36,640	11,340	1478510	1,549,219	1549219
01.11 Dependent Open Water Marsh									
01.11.01 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
01.11.02 Excavation and Stockpile	1800000	CY	79,200	2424060	4167000	0	0	6,591,060	3.66
01.11.03 Grading	223.00	ACR	3,855	116,568	217,799	0	0	334,367	1499.40
01.11.04 Topsoil Lining	60100.00	CY	15,698	398,181	51,854	0	0	450,035	7.49
01.11.05 Vegetation Removal (Salt Cedar)	112.00	ACR	3,015	95,451	114,829	0	0	210,279	1877.50
01.11.06 Revegetation of Natives	37.00	ACR	17,654	428,450	0	0	0	428,450	11579.73
TOTAL Dependent Open Water Marsh	1.00	EA	119,422	3462709	4551482	0	37,500	8,051,691	8051691
01.12 Monitoring									
01.12.001 Monitoring	1.00	EA	0	0	0	0	600,000	600,000	600000.00
TOTAL Monitoring	1.00	EA	0	0	0	0	600,000	600,000	600000.00
01.13 Adaptive Management									
01.13.001 Adaptive Management	1.00	EA	0	0	0	0	600,000	600,000	600000.00
TOTAL Adaptive Management	1.00	EA	0	0	0	0	600,000	600,000	600000.00
01.14 Cultural Resources Mitigation									
01.14.001 Cultural Resources Mitigation	1.00	EA	0	0	0	0	1000000	1,000,000	1000000
TOTAL Cultural Resources Mitigation	1.00	EA	0	0	0	0	1000000	1,000,000	1000000
TOTAL Environmental Restoration	1.00	EA	427,430	12511755	14919174	395028	11949541	0	50,876,619	50876619
02 Flood Control									
02.01 Low Levee (50 year)									
02.01.001 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
02.01.002 Compacted Fill Levee	83000.00	CY	4,582	120,674	55,759	13,280	0	189,713	2.29
02.01.003 Toe Excavation and Backfill	358000.00	CY	17,077	532,095	823,937	0	0	1,356,032	3.79
02.01.004 Riprap Slope Protection	72400.00	TON	3,620	99,835	48,078	497,750	0	645,663	8.92
02.01.005 Interior Drainage (24" Dia RCP)	1550.00	LF	868	22,898	1,554	25,126	0	49,578	31.99
02.01.006 Inlet Structures	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.01.007 Outlet Weir Structure	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.01.008 Real Estate	1.00	EA	0	0	0	0	588,000	588,000	588000.00

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
TOTAL Low Levee (50 year)	1.00	EA	26,146	775,502	929,329	536,156	662,500	2,903,487	2903487
02.02 Mid-high Levee (100 year)									
02.02.001 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
02.02.002 Compacted Fill Levee	141000.00	CY	7,783	205,000	94,724	22,560	0	322,284	2.29
02.02.003 Toe Excavation and Backfill	358000.00	CY	17,077	532,095	823,937	0	0	1,356,032	3.79
02.02.004 Riprap Slope Protection	87600.00	TON	4,380	120,795	58,172	602,250	0	781,217	8.92
02.02.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	868	22,898	1,554	25,126	0	49,578	31.99
02.02.006 Inlet Structures	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.02.007 Outlet Weir Structure	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.02.008 Real Estate	1.00	EA	0	0	0	0	588,000	588,000	588000.00
TOTAL Mid-high Levee (100 year)	1.00	EA	30,108	880,788	978,387	649,936	662,500	3,171,611	3171611
02.03 High Levee (500 year)									
02.03.001 Clearing and Grubbing	1.00	EA	0	0	0	0	37,500	37,500	37500.00
02.03.002 Compacted Fill Levee	175000.00	CY	9,660	254,433	117,565	28,000	0	399,998	2.29
02.03.003 Toe Excavation and Backfill	358000.00	CY	17,077	532,095	823,937	0	0	1,356,032	3.79
02.03.004 Riprap Slope Protection	98700.00	TON	4,960	136,791	65,875	682,000	0	884,666	8.96
02.03.005 Interior Drainage (24" Dia. RCP)	1550.00	LF	868	22,898	1,554	25,126	0	49,578	31.99
02.03.006 Inlet Structures	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.03.007 Outlet Weir Structure	5.00	EA	0	0	0	0	18,500	18,500	3700.00
02.03.008 Real Estate	1.00	EA	0	0	0	0	588,000	588,000	588000.00
TOTAL High Levee (500 year)	1.00	EA	32,565	946,216	1008931	735,126	662,500	3,352,773	3352773
TOTAL Flood Control	1.00	EA	88,819	2602506	2916648	1921217	1987500	9,427,871	9427871
03 Rec Impr & Envr Education Fac									
03.01 Recreational Improvements									
03.01.001 Recreational Improvements	1.00	EA	0	0	0	0	1770000	1,770,000	1770000
TOTAL Recreational Improvements	1.00	EA	0	0	0	0	1770000	1,770,000	1770000
03.02 Environmental Education Fac									
03.02.001 Environmental Education Fac	1.00	EA	0	0	0	0	1880000	1,880,000	1880000
TOTAL Environmental Education Fac	1.00	EA	0	0	0	0	1880000	1,880,000	1880000
TOTAL Rec Impr & Envr Education Fac	1.00	EA	0	0	0	0	3650000	3,650,000	3650000
TOTAL Tres Rios	1.00	EA	516,248	15114261	17835821	587149	825132910	63,954,490	63954490

	QUANTITY	UOM	MANHRS	LABOR	EQUIPMNT	MATERIAL	OTHER	TOTAL COST	UNIT COST
OVERHEAD								5,088,049	
SUBTOTAL								69,042,539	
HOME OFC								3,358,112	
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ARIZONA PRIV								2,983,207	
TOTAL INCL INDIRECTS								81,622,190	
CONTINGENCY								11,629,465	
SUBTOTAL								93,251,655	
PLANNING, SURVEY, ENGR & DESIGN								6,201,408	
SUBTOTAL								99,453,063	
ENGINEERING DURING CONSTRUCTION								620,141	
SUBTOTAL								100,073,204	
SUPERVISION AND ADMINISTRATION								3,906,887	
TOTAL INCL OWNER COSTS								103,980,091	

Appendix E: Economics

US Army Corps
of Engineers

Los Angeles District

TRES RIOS, ARIZONA
ECONOMIC ASSESSMENT

Prepared by

U.S. Army Corps of Engineers
Los Angeles District
911 Wilshire Boulevard
Los Angeles, CA 90017-3401

April 2000

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1. THE STUDY

A. Study Area Location

The study area is located at the confluence of the Salt, Gila, and Agua Fria Rivers, immediately west of the City of Phoenix, Arizona. Because of the confluence of the three rivers within this close proximity, the study area has been identified as "Tres Rios." In the Spanish language, Tres Rios means "three rivers."

Tres Rios is approximately nine miles west of downtown Phoenix. The upstream boundary of the study area is located at 87th Avenue, just upstream from the 91st Avenue Wastewater Treatment Plant operated by the City of Phoenix. The study area extends west from the treatment plant for approximately seven miles through the confluence of both the Gila and Agua Fria Rivers, and ends near Bullard Avenue. The Buckeye Irrigation Company diversion canal is situated at the western extent of the end of the study area.

Elevations at the confluence of the Agua Fria and the Gila Rivers are approximately 990 feet above sea level. The South Mountains and Sierra Estrella Mountains, lie south and southwest of the study area, respectively.

B. Authority

This study is being conducted under the authority of Section 6 of Public Law 761, Seventy-fifth Congress, June 28, 1938, which reads in part as follows:

> ***"The Secretary of War (now Secretary of the Army) is hereby given authorized and directed to cause preliminary examinations and surveys for flood control . . . at the following named localities--Gila River and tributaries, Arizona and New Mexico."***

In addition to the above authority, Tres Rios was included in Section 321 of WRDA 92, which reads as follows:

> ***"The Secretary may participate in the study and construction of a water resources project in the vicinity of Phoenix, Arizona, for the purpose of providing flood control and improving water quality in the Tres Rios wetlands, Arizona, at a total cost of $6,500,000."***

This was again modified in Section 301(b)(2) of WRDA 96. It reads, in part as follows:

> ***"Modifies the Tres Rios wetlands project to add ecosystem restoration as a project purpose to increase the authorized project cost from $6,500,000 to $17,500,000."***

C. Study Purpose and Scope

The purpose of this assessment is to present the economic analysis used to measure the beneficial contributions to National Economic Development (NED) from flood damage reduction. Economic analysis is also used to measure the beneficial contributions to National Ecosystem Restoration (NER) from net improvements in national environmental health in connection with the process of formulating and evaluating the array of alternate plans identified by the planning process. In addition, this study presents the NED plan, (the plan that maximizes the Federal interest in controlling the flooding problems), and the Optimum Tradeoff plan, (a plan that reasonably maximizes the sum of net national economic development and net national ecosystem restoration benefits). All are identified and defined throughout the planning process.

2. EXISTING CONDITIONS

A. Flood Control

Flows in the Salt River are controlled by a series of upstream dams built by the Bureau of Reclamation (BOR) and operated by the Salt River Project (SRP). The SRP system comprises six reservoirs and seven dams on the Salt and Verde Rivers. The dams include Roosevelt Dam (modified in 1996 to increase capacity – see Table below), Horse Mesa Dam, Mormon Flat Dam, Stewart Mountain Dam, and Granite Reef Dam on the Salt River. Horseshoe and Bartlett Dams are located on the Verde River. The study area has been subjected to five floods in excess of 100,000 cubic feet per second (CFS) since 1978. This discharge would correspond to an event of approximately 25-30 years return period. Two floods occurred in 1978, and one flood occurred during each year in 1980, 1983, and 1993. These floods resulted in damages to residences and agricultural areas in and around the study area. As a result of the threat of continued flooding, the Flood Control District of Maricopa County (FCDMC) constructed bank stabilization and a levee on the north bank of the Salt River in the study reach. The levee was designed to protect the Holly Acres subdivision from the 100 year event based on the assumption that Cliff Dam (a proposed BOR water project) would be completed upstream of the study area. However, due to the fact that Cliff Dam was never constructed, it is now doubtful that the levee provides protection from a 100-year event. Although little data is available regarding structural inundation damage costs for these events, the photos presented in Attachment A provide graphic examples of the extent of historical damages and the potential for future damages without project.

B. 91st Avenue Wastewater Treatment Plant

The 91st Avenue Wastewater Treatment Plant discharges nutrient-rich effluent to the Salt River. Vegetation has established itself within the floodway of the river, and has, to some degree, been found to impede river flood flows. This impeded flow is believed to result in more frequent flooding events within the study area due to the constriction of the river from the uncontrolled vegetation.

To mitigate the impact of the uncontrolled vegetation within the floodway, FCDMC conducted a second flood control project in the study area. This effort involved the mechanical removal of vegetation. The removal was 1,000 feet wide and primarily removed phreatophytes such as salt cedar (tamarisk). After the flood of 1993, additional vegetation established itself in the river. FCDMC applied to the EPA for a section 404 Permit (regulating placement of dredge or fill materials into waters of the U.S.) to resume channel clearing. The permit was denied due to concerns of the Arizona Game & Fish Department (AZGF). In addition to the vegetation that had sprung up after the 1993 flood, AZGF noticed an increase in wildlife activity in the area. Therefore, AZGF objected to continuing the channel clearing. The uncontrolled growth affects flood protection provided by the existing levee and as growth continues, the effect becomes worse.

As mentioned previously, BOR's 1996 modification to the Salt River Project system included an increase in flood control space behind Roosevelt Dam. The flood control space has reduced the discharges in the study area. The following changes have occurred in the frequency-discharge function:

	5-year	10-year	20-year	50-year	100-year
Former Q's	40,000 cfs	95,000 cfs	135,000 cfs	200,000 cfs	250,000 cfs
Present Q's	23,500 cfs	57,000 cfs	92,000 cfs	185,000 cfs	227,000 cfs

note: 1 cfs = .6463 mgd

C. Wildlife Habitat

The study area provides a wetland and riparian habitat for numerous species of fish and wildlife including waterfowl and Federal and State listed threatened and endangered species (T&E). Both wetland and riparian habitats are disappearing rapidly in Arizona and the southwest. These habitats are used by a high percentage of Federal and state T&E species. Continued degradation is expected to continue downstream of the 91st Avenue treatment plant since outflows from the plant are irregular, resulting in a somewhat disrupted growth pattern of the riparian vegetation. In "managed" locations such as the area downstream of the treatment plant, natural flood events have been drastically curtailed and/or base flows have been minimized during critical periods, which may provide favorable conditions for exotic species such as salt cedar (Tamarisk chinensis). Salt cedar is more tolerant of extreme conditions, particularly of low soil moisture and higher soil salinities. It exudes salt crystals from its leaves in the course of transpiration, "poisoning" the surrounding soils. Native riparian species, such as cottonwood and willow, are unable to tolerate the high salinity levels in the surrounding soils. Moreover, due to salt cedar's broad seed dispersal window, prolific seed production, effective seed dissemination, rapid growth, and early maturation, it has an advantage over native vegetation, often disrupting reproduction of the desirable native flora.

Compared with native riparian trees and shrubs, salt cedar has inferior values as wildlife habitat. The seed of salt cedar is generally too small to be consumed by rodents and birds, and its thin, scaley leaf is unpalatable to native browsing animals and to leaf-eating insects. In contrast, cottonwood and willow harbor a greater abundance of insect life than does salt cedar, so are more beneficial to many bird species. Consequently, as exotic species increase within a cotton-willow ecosystem, wildlife values tend to decline. Tantamount to diminishing wildlife values, salt cedar poses a threat to native vegetation by its highly flammable and combustible characteristics. Therefore, by virtue of its properties as a fuel source, its presence within a native system increases the probability and intensity of catastrophic wildfires. In effect, a catastrophic wildfire can result in high mortality rates of native vegetation, particularly cottonwood (Populus fremontii), and ultimately stimulate succession growth towards monotypic stands of salt cedar.

The Yuma Clapper Rail (Rallus longirostris yumanensis), a Federally listed endangered species, is found in the study area. A survey conducted by the U.S. Fish and Wildlife Service (USFWS) in May 1991 found three pair of Yuma Clapper Rail nesting in the study area. According to the USFWS, if the proper habitat was provided and managed for the Yuma Clapper Rail, a significant increase in population would be expected in the study area.

The razorback sucker (Xyrauchen texanus), also an endangered species, was reintroduced in 1982. The USFWS estimates that the razorback sucker could possibly still inhabit the study area.

Since construction of the Tres Rios demonstration project two years ago, representatives of BOR and the Phoenix Audubon Society have been recording the types of fish and wildlife that have utilized the constructed wetlands. Over 50 types of birds have been observed using the wetlands. Additionally, 5 types of fish, 14 types of mammals, and numerous amphibians have been observed. The most notable are the bobcat, beaver, and javelina. To date, no T&E species have been observed utilizing the wetlands.

D. Water Quality/Supply

The U.S. Environmental Protection Agency (EPA) sets water quality standards for discharge of effluent into the Salt River, including the discharge from the 91st Avenue treatment plant. Arizona Department of Environmental Quality (ADEQ) monitors and enforces the water quality standards. As of 1997, effluent discharges from the plant were meeting EPA standards. However, the effluent does not meet safe drinking water standards. Since flow in the river below the treatment plant consists almost entirely of effluent flows, the fish caught from the river are not safe for human consumption.

The current capacity of the treatment plant is 153 million gallons per day (MGD), or about 470 acre feet per day (1 MGD = approx 3.069 AF/day, and 1 cfs = .6463 mgd). Contractual agreements for this effluent require the Multi-city Sub-regional Operating Group (SROG) to provide a maximum of approximately 120 MGD to the Palo Verde Nuclear Generating Power Plant. The effluent water is delivered to the power plant through an underground pipeline where it is utilized as cooling water. At present, the power plant does not utilize the entire 120 MGD. Actual use rates range between 0 MGD, on a frequent basis, to a peak of 90 MGD, which is very rare.

SROG also has an obligation for an additional 31.5 MGD with the Buckeye Irrigation (BID). The effluent flows are utilized for agricultural water. Deliveries of the flows to BID utilize the Salt and Gila River beds. BID operates a diversion structure downstream of the 91st Avenue plant to capture the river flows and divert them into agricultural canals.

E. Recreation

Approximately 20 percent of the Tres Rios study area, on its western border, lies within Estrella Mountain Regional Park. The park is owned and managed by Maricopa County Parks and Recreation Department. The rugged and scenic Sierra Estrella Mountains are the most dominant feature of Estrella Mountain Regional Park. The terrain of these mountains is characterized by very steep slopes, numerous rock out-crop, shallow soils, and sparse desert vegetation.

The County has developed a master plan for the 19,200 acres of park, located approximately 20 miles southwest of downtown Phoenix. The master plan envisions the preservation of scenic desert wilderness areas while incorporating sensitive development of recreational facilities and activities. The Plan accommodates the expected annual demand of 1,000,000 visitors while ensuring that the existing Sonoran desert environment remains in its pristine condition. In fact, 90 percent of the park will remain essentially untouched. The remaining 10 percent will be sensitively utilized for educational, camping, picnicking, and sporting activities.

While water is a highly attractive feature for recreation, park trails and facilities have presently been planned away from the Gila River. Once the County completes its Sun Circle Trail System through this reach of the Gila and Salt Rivers, recreation use patterns are expected to expand throughout the study area. The Sun Circle Trail System, a component of the National Recreation Trail System, comprises a 110-mile loop encompassing the Phoenix metropolitan area. The trail offers a unique opportunity for hiking, horseback riding and bicycling throughout the urban area. The 110 miles of primary trail and the 580 miles of secondary trails are designed to link valley urban areas with county regional parks. Approximately 70 percent of the Sun Circle trail system is already in place. However, due to severe degradation of the habitat in the study area and a lack of recreational facilities, the study area currently has negligible recreation value. Appendix H of this report details the increase in recreation value and visitation with a restoration project implemented.

3. METHODOLOGY OVERVIEW

A. Guidance and Regulation

This economic assessment is formulated to be in accordance with ER 1105-2-100 and the Risk & Uncertainty guidance of ER 1105-2-205. Further, benefits and costs expressed as annual values are calculated utilizing the FY2000 discount rate of 6 – 5/8 percent with a project life of 50 years. All benefits and costs are expressed at an October 1999 price level. The base operational year is 2006.

B. Computer Based Models and Reference Sources

The following items were utilized for the economic assessment of Tres Rios:

Models:
(1) HEC-FDA Flood Damage Reduction Model, Version 1.1
(2) EAD –Expected Annual Damages – Corps DOS program

Software:
(1) Microsoft Excel, Version 8
(2) Paradise @RISK, Version 3.05.0006

References:
(1) Marshall & Swift Evaluation Services
(2) FEMA's 1999 depth/damage relationships
(3) CH2M Hill Commercial Content Survey
(4) TRW Redi Real Estate data base

C. Database Field Survey

The Tres Rios' floodplain was subject to a survey of 100% of the structures by hand level. The 500-year floodplain limits were estimated by oversampling the floodplain based on where the 500-year water surface elevation intersected the topography. Recorded items included: first floor elevation (FFE) above ground, structure type, structure condition, structure use, and agricultural use.

D. Topographic Mapping

The Tres Rios floodplain was topographically mapped at a 4-foot contour interval. The mapping and field survey FFEs were combined to estimate absolute FFE.

E. Reach Delineation

Economics, Hydrology, and Hydraulics study members participated in the segmenting of the Tres Rios study area into 8 distinct reaches of homogenous characteristics. Critical factors to be differentiated include discharge/frequency characteristics, overflow spatial characteristics, and economic activity.

1. Reach Definition

Reach delineation of the Tres Rios study area is as follows:

Table 1
REACH LOCATION

Reach	Location	Cross-Sections
Reach 1	GRIC Land	202.99 - 203.96
Reach 2	91st Ave. Waste Water Plant	202.29 - 202.99
Reach 3	91st Ave. to 99th Ave.	201.24 - 202.29
Reach 4	99th Ave. to 107th Ave.	200.30 - 201.24
Reach 5	107th Ave. to 115th Ave.	199.24 - 200.30
Reach 6	115th Ave. to El Mirage	198.30 - 199.24
Reach 7	El Mirage to Dysart	197.16 - 198.30
Reach 8	Dysart to study limit	196.61 - 197.16

2. Reach Reference Cross-section

Following are the reference cross-sections for the study's reaches:

Table 2
REACH REFERENCE CROSS-SECTION

Reach	Reference Cross-Section
Reach 1	203.48

Table 2
REACH REFERENCE CROSS-SECTION

Reach 2	202.69
Reach 3	201.81
Reach 4	200.77
Reach 5	199.82
Reach 6	198.75
Reach 7	197.74
Reach 8	196.88

3. Minimally Significant Damage Frequency

The minimally significant damage (total damage in the reach in excess of $1,000) frequency for each of the eight reaches based on the HEC-FDA simulation process is as follows:

Table 3
MINIMALLY SIGNIFICANT DAMAGE FREQUENCY

Reach	Frequency
Reach 1	.125
Reach 2	.075
Reach 3	.125
Reach 4	.150
Reach 5	.250
Reach 6	.200
Reach 7	.200
Reach 8	.075

4. RISK & UNCERTAINTY MODELING

A. General Methodological Approach

The basic floodplain inventory database is constructed in such a manner as to mimic the familiar SID to EAD interface used previously in Corps economic studies. The basic tenet of SID and the current R&U approach is to theoretically shift structures within a reach to a reference point (i.e., a cross-section) while maintaining the original flood dynamics of the structure.

The two variables subject to R&U variations for the economic determination of stage/damage functions are:

(1) First Floor Elevation plus the base Topographical Elevation (FFE)
(2) Depreciated Replacement Cost (DRC)

The functions employed to model their uncertainty are:

Table 4
STAGE/DAMAGE R&U MODEL PARAMETERS

Variable	HEC-FDA Function	Mean	Standard Deviation
FFE	@NORMAL	0.00	1.25 feet
DRC	@NORMAL	0.00	10% of Base Value

The hydrologic engineering variables allowed by the HEC-FDA model to fluctuate are:

Discharge - a graphical exceedance probability curve was generated using an equivalent record length of 105 and confidence limits of +/- one and two standard deviations.

Water Surface elevation – A normal distribution with a maximum standard deviation of 1 foot at the 100-year event was used.

5. CONTENT VALUE

A. Residential Home Content Value

Chapter 6, Section 6-45, (2) a. of ER 1105-2-100 requires that for feasibility studies, all content-to-structure ratios must be based on either site-specific surveys or surveys of comparable floodplains. Due to the availability and applicability/similarity of recent content survey data for the Tucson metro area, and the time, effort and money required to do a new survey in the Tres Rios area, a waiver has been requested for the content survey. The Tres Rios analysis will use the results of the content survey for the Tucson Area Drainage Feasibility Study, Arizona to validate a regional value of approximately 50% for residential content to structure ratios, and 100% for commercial properties, consistent with the type of development occurring and demographics nearly identical to the Tucson Study.

6. FLOODPLAIN INVENTORY

A. Inventory of Floodplain Structures

Table 5 presents the number of structures by category within the study area. It should be noted that there is not a one-to-one correlation between a structure and business unit for the category of commercial because property delineation in the assessors data is by structure ownership and not by units. It should also be noted that floodplain delineations for events rarer than the 100 year event were not provided, but the 500 year flood damages were estimated by oversampling the flood plain based on local topography. Thus, the 500-year flood damages (structural and agricultural) are computed based on the 500-year WSE, and include several additional structures.

Table 5
FLOODPLAIN INVENTORY BY USE

USE	# of Units	Square Feet	Value ($1000s)	Average Size	Average Value ($1000s)
Single-Family	404	584,523	$28,867.12	1,446.84	$71.45
Manufactured Housing	179	152,090	$5,819.83	849.67	$32.51
Public	3	3,650	$227.87	1,216.67	$75.96
Commercial	25	211,065	$5,900.86	8,442.60	$236.04
TOTAL	611	951,328	$40,815.68		

The estimated depreciated value of structures in the study area is $40,815,680. Content values were estimated at 50 percent of the structural depreciated replacement cost for single-family, manufactured housing and public and 100 percent for commercial. Total study area content value is $23,358,270.

B. Stage Damage Functions

Stage damage functions by structural category are the results of iterative HEC-FDA model process of allowing variability in first floor elevation and structure value while maintaining a constant water surface.

7. WITHOUT-PROJECT DAMAGES

A. Structural Damages

Aside from clean-up and utility repair costs incurred by local governments and utilities, no data were available for historical structural inundation damages in the study area. However, Attachment "A", at the end of this appendix, contains photo documentation of historic flooding in the study area to demonstrate the potential for serious and extensive flood damages. Future structural damages, i.e., damages to buildings and contents, are calculated with the HEC-FDA's Flood Damage Reduction Analysis Model (version 1.1, June 1998) using the graphical exceedance probability method. The resulting estimate of without-project expected annual damage is shown in Table 6.

Table 6
WITHOUT-PROJECT EXPECTED ANNUAL DAMAGE
(in $1000s, October 1999)

Reach	Structural Damage
Reach 1 (75th –83rd)	54.34
Reach 2 (Waste Water Plant)	5.72
Reach 3 (91st to 99th)	18.5
Reach 4 (99th to 107th)	74.72
Reach 5(107th to 115th)	531.07
Reach 6 (115th to El Mirage)	241.34
Reach 7 (El Mirage to Dysart)	164.91
Reach 8 (Dysart to End)	13.35
TOTAL	1103.94

B. Agricultural Damages

In the study area, there are 4 basic crops grown: cotton, alfalfa, wheat, and barley. Agricultural acreage within the 100-year floodplain totals 2005 acres. Damages for the 500-year event were assumed same as the 100-year event due to nearly identical acreages, but different flood depths. Agricultural damages are based on farm crop budgets as prepared by the Arizona Cooperative Extension, Department of Agriculture & Resource Economics, University of

Arizona. The damage assessment assumes that one complete crop cycle is lost when agricultural land is flooded for the crops of cotton, wheat, and barley. For these crops it is assumed that a flood event has an equal chance of occurring both pre- and post-harvest. In the event that a flood occurs pre-harvest the loss equals the sum of net income plus the value of direct production investment (DPI=variable costs less harvest costs) with the next year's crop cycle unaffected. In a post-harvest flood, it is assumed that no DPI expenses are incurred for the following crop cycle where the land is not suitable for planting. Therefore, the loss is restricted to the value of net income for post-harvest floods.

The treatment of alfalfa is quite different from the other three. The reason for this change is that alfalfa, unlike the others, is not an annual crop. Alfalfa production is on a four-year cycle. In its first year, alfalfa is established without any yield. Over the following three years it is repeatedly shorn for harvest. Assuming equal proportions in the alfalfa production cycle, a net present value (NPV) evaluation process was conducted over a fifty-year horizon to calculate the damage to alfalfa from flooding. The NPV approach is employed to account for the pro-rata share of establishment cost included in the harvest years and the time shift in net income when flood damage occurs in the harvest years.

Based on flood overflow boundaries, Table 7 shows crop acreage by flood event.

Table 7
Agricultural Crop Acreage by Flood Event

	Flood Event			
Crop	10-Year	20-Year	50-Year	100-Year
Cotton	115	290	330	330
Alfalfa	95	703	1013	1073
Wheat	68	135	491	527
Barley	0	75	75	75
Total	278	1203	1909	2005

The relevant economic data for the analysis of agricultural losses are listed in Table 8 below.

Table 8
Agricultural Economic Data

Crop	Costs				Yields	Normalized crop Prices (1997)
	DPI	Harvest	Overhead	Total		
Wheat	$247.11	$51.31	$52.87	$351.29	90 bu/ac	$3.50 bu
Cotton	$578.26	$233.98	$140.21	$952.45	117 lbs/ac lint	$0.627 lb
Barley	$238.68	$49.06	$52.53	$340.27	1.03 tons/ac seed	$2.21bu
Alfalfa	$407.84	$101.31	$101.15	$610.30	102.083 bu/ac	$2.75 bu
Alfalfa establish.	$239.36	$0.00	$79.95	$319.31	7.7 tons/ac	$85 ton

Using Federal normalized 1998 crop prices (the most recent available) and the crop budgets from the Arizona Cooperative Extension, the per acre market value and expected annual flood damage for each crop are shown in Table 9.

Table 9
Agricultural Crop Market Value & Expected Annual Damage Per Acre

Crop	Market Value	Expected Damage
Cotton	$854.32	$331.21
Alfalfa	$654.50	$326.13
Wheat	$314.80	$178.84
Barley	$224.60	$112.33

The market values of these crops by floodplain are shown in Table 10.

Table 10
Agricultural Crop Market Value by Flood Event - Floodplain

	Flood Event – Floodplain			
Crop	10-Year	20-Year	50-Year	100-Year
Cotton	$98,200	$247,800	$281,900	$281,900
Alfalfa	$62,200	$460,100	$663,000	$702,300
Wheat	$21,500	$42,500	$154,600	$165,900
Barley	$0	$17,000	$17,000	$17,000
Total	$181,900.00	$767,400	$1,116,500	$1,167,100

Crop damage by flood event is as follows:

Table 11
Agri. Crop Damage by Flood Event

	Flood Event			
Crop	10-Year	20-Year	50-Year	100-Year
Cotton	$38,100	$96,100	$109,300	$109,300
Alfalfa	$31,000	$229,300	$330,400	$349,900
Wheat	$10,900	$21,400	$78,100	$83,800
Barley	$0	$6,700	$6,700	$6,700
Total	$80,000	$353,500	$524,500	$549,700

Using HEC's EAD model with a five-year non-damaging frequency (most agricultural lands are in those reaches with a 4 to 5 year non-damaging flood frequency) the equivalent annual agricultural damage is $37,700.

C. 91st Avenue Waste Water Treatment Plant

The 91st Avenue Wastewater Treatment Plant is currently designed to provide 100-year protection. Analysis of the plant has not been conducted for the without-project condition, and there is no current plan at this time to provide any additional protection for the plant.

D. Emergency Clean-Up/Utility Repair Costs

Only damages incurred after 1987 were deemed relevant because the Holly Acres levee was completed in 1987, and any damages before that would not reflect the without project condition, which includes the levee. Data between 1987 and 1992 were not available, so emergency clean-up costs in the study area were only analyzed over the period 1992-1998, and were annualized based on the frequency of the event. Results are shown in the table below, and indicate that a 50-year event caused about $100,000 in cleanup and utility repair costs, and a 20-year event caused about $10,000 in cleanup and utility repair costs. A frequency – damage relationship was developed, and these costs were amortized to give average equivalent annual cleanup costs of about $6,500 under without project conditions.

Table 12

Tres Rios - Hist.
Cleanup Costs

storm season	93-94	94-95	96-97
frequency of event	50 yr	20 yr	20 yr
cleanup and utility repair cost	106,880.6	10,486.16	10,055.11

E. Environmental Conditions

Under without project conditions, habitat values are expected to decline significantly over the study period, as the chart below indicates.

Proj. Year	W/out Proj. HU's
0	1768
20	1579
30	1478
50	1275

F. Summary of Without-Project Damages

Equivalent annual damages for the Tres Rios floodplain are shown in Table 13. None of the damage types are either time or interest rate sensitive. The values in Table 13 are applicable to all future years due primarily to the long-term stability of the demographics and other relevant conditions in the study area.

Table 13
WITHOUT-PROJECT TOTAL DAMAGE
(in $1000s, October 1999)

Type		Damage
Structural Inundation		1103.94
Agricultural		37.7
Emergency/Clean-up		6.5
Waste Water Plant		N/A
	TOTAL	1148.14

8. WITH PROJECT –ENVIRONMENTAL RESTORATION PLANS

A. First Stage Analysis - Environmental Restoration Features

Numerous environmental restoration alternatives encompassing the entire range of feasible projects were assessed in Plan Formulation, including both structural and non-structural measures. For a more detailed discussion of this initial screening process, see the Main Report.

Two different environmental restoration plans were found to satisfy all the criteria of the initial screening and were carried forward for analysis along with the "Without Project condition". These plans, alternatives 3 and 4, were designed to bracket the range of potential plans by representing the minimum and maximum amount of wetlands creation to satisfy the criteria, respectively. The first stage of the analysis provides an estimate of the total costs vs. the environmental benefits of Alternatives 3 and 4 and also of the incidental flood control benefits of each plan.

B. Environmental Restoration Alternative Descriptions

Alternative 3 - No Land Constraints, Minimized Wetlands

This alternative is characterized by:

- no land constraints,
- a regulating wetland for treatment plant discharge,
- minimum overbank wetland area and minimum pipeline costs,
- riparian corridors from overbank wetland discharge
- southside distribution of dewatering well water into open water/marsh areas with some riparian corridors, and
- eradication of portions of salt cedar and conversion to open water/marsh in select locations.

This alternative mainly consists of constructed wetlands, open water/marsh areas, the rerouting of some of the water from the dewatering well near the wastewater treatment plant into the main channel for primarily open water/marsh areas, and the creation of some cottonwood-willow riparian corridors. The alternative includes a pump station to convey wastewater treatment plant discharge to a regulating wetland between 91st and 99th Avenue, from where water would be conveyed into two separate overbank wetlands that have discharge outlets into the main channel. The alternative also consists of 5 open water/marsh areas in the north side of the channel between El Mirage Road and the Agua Fria. Open water/marsh areas are located adjacent to existing, open water within the channel. Water within the marsh areas would come from conveyance of surface water within the main river channel and from proximity to groundwater. Finally, dewatering well water would be conveyed into the main channel and would flow

southward through restored cottonwood-willow, initially, and then to six open water/marsh areas.

Alternative 4 - No Land Constraints, Linear Wetlands

This alternative is characterized by:

- no land constraints,
- a regulating wetland for treatment plant discharge,
- the creation of linear, constructed wetlands along north overbank,
- riparian corridors from overbank wetland discharge
- southside distribution of dewatering well water into cottonwood-willow riparian corridors, and
- eradication of portions of salt cedar and conversion to open water/marsh downstream on the north side of the channel and cottonwood-willow habitat upstream on the south side of the channel. This alternative mainly consists of constructed wetlands, the rerouting of water from the dewatering well near the wastewater treatment plant southward into the main channel, and the creation of cottonwood-willow riparian corridors and open water/marsh areas.

The alternative includes a pump station to convey wastewater treatment plant discharge to a regulating wetland between 91st and 99th Avenue, from where water would be conveyed into one linear overbank wetland between 99th and 115th Avenues. Discharge from the wetland would flow into a pipeline conveying water into six open water/marsh areas along the northern banks of the river between El Mirage Road and the Agua Fria. Water discharged from the wetland would also combine with water from the channel to supply three cottonwood-willow corridors between 107th and Dysart Avenue through minor regrading of the channel. Alternative 4 also contains 5 open water/marsh areas located adjacent to existing, open water within the channel, east of 115th Avenue. Water within these marsh areas would come from conveyance of surface water within the main river channel and from proximity to groundwater. Finally, dewatering well water would be conveyed into the main channel south of 83rd Avenue. This water would help create cottonwood-willow riparian corridors within eradicated salt cedar habitat along the southern bank of the river.

C. Environmental Restoration Costs

Water Costs

The treatment plant produces about 171,000 acre-feet of water per year. As discussed previously, a portion of this water is already committed by contract to the Buckeye Irrigation Company and the Arizona Nuclear Power Plant, but the remainder of about 50-60,000 acre-feet per year is uncommitted. An in-depth study was prepared in 1995 for the City of Phoenix by Greeley and Hansen consultants to assess the feasibility and marketability (the opportunity cost) of recovered wastewater from the treatment plant. The study concluded that the resource cost of

the recovered water (no treatment) is about $50 per acre-foot . (1 Acre Foot = approx 325,829 Gal.). Local water brokers have expressed interest in purchasing all available recovered water . Alternatives 3 and 4 require about 19,535 and 23,019 acre-feet per year , respectively, to attain the project benefits. Therefore, an additional project cost is the lost opportunity cost of directing this water to other manufacturing, agricultural, or industrial uses. This annual cost is included below . Table 14, below, shows the total first cost of construction, contingencies, interest during construction, gross investment, avg. annual operations and maintenance, and annualized gross investment for the environmental restoration alternatives.

Table 14
Total Costs, Alts. 3 and 4

	Alt. 3	Alt. 4
First cost construction	$94,093,967	$116,631,759
IDC (3 year const. Period)	$9,870,457	$12,234,672
Gross investment	$103,964,424	$128,866,431
Annualized Gross Invest.	$7,414,406	$9,190,336
Operation & Maintenance	$589,000	$589,000
Annual Water Costs	$976,750	$1,150,900
Total annual cost	$8,980,151	$10,930,600
Total Present Value	$125,919,200	$153,268,300

D. Environmental Restoration Benefits

To assess environmental restoration benefits, different habitats are assigned different values according to their diversity and a number of other factors. The net change (from the future without project condition) in habitat values resulting from plan implementation is then the net environmental benefit of that plan, and is measured in "habitat units" or "hu's". Each plan is therefore associated with a net increase in habitat units in the study area. For alternatives 3 and 4, only the PY 30-50 year constant maximum HUs were determined. Therefore, the incremental costs and environmental benefits of Alternatives 3 and 4 were evaluated only at this final maximum value for this phase of the analysis. Due to the complexity of the analysis procedure, the IWR PLAN Decision Support System was used. Developed by the Institute of Water Resources, IWR-PLAN is used to identify the most cost-effective combinations of components and the best buys for the whole possible range of outputs of habitat units and associated costs. A more complete explanation of the analysis is provided in Appendix G, but the results, indicating the net increase in habitat units over the without project condition are presented below.

TABLE 15
IWR-PLAN ANALYSIS RESULTS (NET HABITAT UNITS)

	Alternative		
	w/out	3	4
total study area habitat units	1275	2089.26	2249.16
net gain in habitat units (PY 30)		814.26	974.16
Project cost (TOTAL PV)		$125,919,200	$153,268,300
Cost per unit		$154,642.50	$157,333.81
Annualized Cost per HU at PY 50 (maxvalue)		$11,029	$11,221

- Note, habitat unit totals for Alts 3 & 4 denote maximum – and not an average over the
- Project Life.

9. WITH PROJECT INCIDENTAL FLOOD CONTROL BENEFITS

In addition to environmental benefits, the restoration alternatives also impact the flood capacity of the channel. These impacts were calculated by analyzing the with vs. without project inundation damages using HEC-FDA, discussed previously. Reductions in clean-up costs and agricultural damages were not calculated for this phase of the analysis because they are insignificant and do not affect the environmental plan selection. The results are shown in Table 16, below, and indicate that both Alternatives produce incidental flood damage reduction benefits. This is due to a large amount of thick, flow impeding vegetation in the riverbed being removed and replaced by less restricting vegetation. Alternative 4 involves much more clearing of this vegetation and as a result, produces much more incidental flood reduction benefits.

Table 16 – Incidental Flood Control Benefits of Env. Restoration Alternatives

	Equivalent Annual Incidental Flood Damage Reduction Benefits of Environmental Restoration Features		
		W/project	
	Without Project	Alt. 3	Alt. 4
Damages	$1,104,000	$1,079,300	$823,520
With project benefits (damages reduced)		$24,700	$280,480

10. INCREMENTAL ANALYSIS

A. Optimum Trade-Off Plan

A detailed incremental analysis of these plans is presented in Appendix G of this report. This analysis considered each separable element or feature that makes up the alternatives and compared the incremental cost of the feature to its incremental benefit (net habitat units gained) at Project Years 1, 20, and 30-50 (habitat value was flat-lined after PY 30). Those features which gave the greatest habitat value for the lowest cost *at PY 50* were then combined to form the optimum environmental restoration alternative, called Alternative 3.5.

- Cost Revisions

Quantities, costs, and benefits of Alternative 3.5 (the sum of the optimal features) were then refined based on information received shortly before completion of the F4 package, to come up with a total cost and total net habitat units gained for Alternative 3.5. It should be noted here that no refinements or revision of the cost estimates or habitat outputs for Alternatives 3 and 4 were performed, so project cost estimates and habitat outputs of Alternatives 3 and 4 cannot be directly compared to those of Alternative 3.5. It should also be noted that had these revisions been applied to Alternatives 3 and 4 prior to the incremental analysis, the outcome would not change, due to the fact that the costs and habitat outputs of Alts. 3 and 4 would change by identical amounts, having no effect on the relative rankings of project components selected for carrying forward into Alternative 3.5.

These costs and benefits, by feature, are given in Table 17, below, for Target Year 50. For the purpose of this incremental analysis, costs included only the first cost of construction, and did not include interest during construction, operations and maintenance, or water costs. These costs were not available at the time this analysis was performed, and do not affect the *relative ranking of the features*, which is the primary purpose of the incremental analysis. In addition, "Degradation Prevention Benefits", a category of habitat value gained, were not broken down by feature like the other benefits, but were added to the sum total of all features to compute an "average cost per habitat unit". It should also be noted that this average cost is shown at a specific point in time, and not over the project life. For this reason, average costs per habitat unit presented in the table below will not match those computed in the final analysis of NER costs and benefits presented in the final sections, which do include these additional costs, and which are averaged over the project life.

TABLE 17 – Alternative 3.5; Incremental Cost Per H.U., Target Year 50

Feature	Increased Habitat Values	Total Cost $	Average Cost Per Habitat Unit
Pump Diurnal Wetlands	79.94	$ 25,907,730	$ 324,090
Overbank Wetlands	77.02	$ 9,630,528	$ 125,039
Pipeline & North Riparian Corridors	24.64	$ 9,227,757	$ 374,503
Independent Riparian Corridors	47.06	$ 5,924,662	$ 125,896
North Open Water Marsh	50.14	$ 10,457,967	$ 208,575
Dewatering System & South O/W Marsh	77.00	$ 19,482,585	$ 253,021
Subtotal	**355.80**	**$ 80,631,229**	**$ 226,620**
Degradation Prevention Benefits	493.15		
Total	**848.95**	**$ 80,631,229**	**$ 94,978**

B. Plan Features

Alternative 3.5 - No Land Constraints, Combination Plan

This alternative is characterized by:

- no land constraints,
- a regulating wetland for treatment plant discharge,
- the creation of linear, constructed wetlands along north overbank,
- a pipeline from the overbank wetland leading to riparian corridors west of El Mirage Road
- open water/marsh areas within the channel west of El Mirage Road,
- southside distribution of dewatering well water

The alternative includes a pump station to convey wastewater treatment plant discharge to a regulating wetland between 91st and 99th Avenue, from where water would be conveyed into one linear overbank wetland between 99th and 113th Avenues. Discharge from the wetland would flow into a pipeline conveying water into four riparian corridors west of El Mirage Road and then into four open water/marsh areas between El Mirage Road and the Agua Fria. These open/water marsh areas would be supplied with water from the riparian corridors immediately upslope along the banks, natural water flow from the river, and groundwater. Also, the channel would also be graded to convey surface water to supply two cottonwood-willow corridors between 111th Avenue and El Mirage Road. Further, dewatering well water would be conveyed into an existing impoundment of water just east of 83rd Avenue and would outlet into the main channel into a distribution system of pipes and canals. This water would help create cottonwood-willow riparian corridors and open water/marsh within eradicated salt cedar habitat between 91st

and 115th Avenues.

C. Environmental Restoration Costs

Water Costs

The treatment plant produces about 171,000 acre-feet of water per year. A portion of this water is already committed by contract to the Buckeye Irrigation Company and the Arizona Nuclear Power Plant, but the remainder of about 92,000 acre-feet per year is uncommitted (1 Acre Foot = approx 325,829 Gal.).

An in-depth study was prepared in 1995 for the City of Phoenix by Greeley and Hansen consultants to assess the feasibility and marketability (the opportunity cost) of recovered wastewater from the treatment plant. The study concluded that recovered (untreated) water would be valued at about $50 per acre-foot. Alternative 3.5 is expected to require about 24,423 acre feet per year to realize project benefits. Therefore, an additional project cost is the lost opportunity cost of directing this water to other manufacturing, agricultural, or industrial uses. This cost is included in total gross investment for the optimum environmental restoration alternative, shown in Table 18, below.

Alternative	Alt. 3.5
First cost construction	$82,743,853
IDC (2 year const. Period)	$5,303,881
Gross investment	$88,047,734.0
Annualized Gross Invest.	$6,079,136.66
Operation & Maintenance	$589,000
Annual Water Cost	$1,221,150
Total annual cost	$7,889,287
Total Present Value	$114,265,207.72

D. Environmental Restoration Benefits

Table 19, below, shows the net environmental habitat units gained by implementation of the environmental restoration features optimized in Alternative 3.5. These habitat values are increasing over time up to Target Year 50. The net habitat values at four points over the project life are given and average annual habitat units output over the project life are computed, and the average annual and present value total costs per habitat unit are also presented. It should be noted that credit is taken for the prevention of degradation as well as increases over present valuations. In other words, the without project condition is a continued loss of HUs, while the with project condition increases HUs, and the total difference makes up the benefits.

Table 19 – Costs per Habitat Unit

Proj. Year	W/out Proj.	W/Proj.	Difference	Midpoint	# Yrs	Wgtd. Value
0	1768	1768	0		0	
1	1759	1993	235	117	1	117
10	1674	2087	413	324	9	2917
20	1579	2115	536	475	10	4749
30	1478	2124	646	591	10	5912
50	1275	2124	849	748	20	14950
				Total		28645

Avg. Annual Hab. Units	571
Avg. Annual Cost of Restor.	$7,889,287
Avg Annual Cost per HU	$13,817
Net HUs created	849
Total Present Value of Project	$114,265,208
Total Pcost per HU	$134,588

E. Incidental Flood Control Benefits

Alternative 3.5 also provides significant incidental flood control benefits due to the removal of a large amount of thick, flow obstructing vegetation in the channel bottom. Table 20, below, shows the structural inundation benefits resulting from the restoration features. These benefits were computed using HEC-FDA. Incidental benefits from Agricultural damage reduction and cleanup cost reduction are computed in the following sections.

Appendix F: Habitat Evaluation

Table 20
Alt. 3.5; Avg. Annual Incidental Flood Benefits
(Structural Inundation Only)

	Table 20 Total Incidental Flood Damage Reduction Benefits of Environmental Restoration Features	
	Without project	Alternative 3.5
Inundation Damages	$1,103,940	$718,350
With project benefits (structural damages reduced)		$385,590

11. WITH PROJECT - FLOOD DAMAGE REDUCTION (LEVEE) ANALYSIS

A. Flood Control (Levee) Alternative Descriptions

The second stage of the analysis provides an assessment of the costs and benefits of an added feature providing flood control benefits. Three new alternatives were developed by adding three different levees to the selected environmental restoration plan (Alternative 3.5). The levees are designed for three different levels of protection in order to find the optimum NED plan which provides the greatest net flood control benefits. The levee alignment is the same for all three, and is roughly along the north bank of the river from reaches two through seven. The levee heights were determined by the design section and were designed to provide three different levels of protection, *independent of the restoration features*. This means that the designated levee heights would provide the indicated levels of protection to existing conditions, and are not dependent on channel clearing associated with the restoration project. The first levee was designed with a 50% confidence level for a 50 year event, the second levee has a 95% confidence level for a 100 year event (in order to ensure that this alternative would meet minimum FEMA criteria for flood plain removal), and the third levee has an unspecified confidence level for a 500 year event (in order to bracket the range with a levee that would show very little residual damages). Levee heights are given in the Design Appendix. Damages were estimated using HEC-FDA, as discussed previously. It should be noted that these confidence levels apply to the existing channel with a levee, but no restoration features. These features actually improve the confidence level of the levee, as shall be shown below. It should also be noted that even though the flood control benefits of the restoration features and the levee are cumulative, the levee is a truly separable increment from the environmental restoration features, because the costs and benefits of the levee are fundamentally independent of the environmental restoration costs and benefits, and vice versa.

B. With Project Inundation Damages

Table 21 , below, shows the Equivalent Annual <u>*structural inundation*</u> damages (the main damage category) for each levee alternative, with totals given. It also shows the expected incremental reductions in structural inundation damages achieved by adding the three levees.

Table 21
Tres Rios
Equivalent Annual Structural Damage by Plan

(Damage in $1,000's)
Discount Rate: 6.625
Analysis Period: 50 Years

Plan Name	Without	Alt. 3.5/no levee	Alt 3.5/50	Alt 3.5/100	Alt 3.5/500
Total Damage	$1,104,000	$718,000	$148,000	0	0
Damage Reduced (structural only)		$386,000	$956,000	$1,104,000	$1,104,000

As the table shows, the implementation of Alternative 3.5 with the 50 year levee significantly reduces inundation damages, and the environmental restoration with the "100 yr" levee practically eliminates inundation damages (statistically speaking, the mean avg. annual damage approaches zero).

C. With Project Agricultural Damages and Clean-up/Utility Repair costs

As shown previously under Without Project Conditions, Agricultural damages amount to about 3% of the total without project damages. This proportion is not expected to change under with project conditions with or without the levee because the structures and the agricultural lands in the floodplain are reasonably interspersed and the ground is relatively flat outside the riverbanks. For these reasons, agricultural damages under with project conditions were assumed to be reduced by the same factor as the inundation damages for each alternative. Cleanup and Utility Repair costs are also a small fraction of the total, and so were also assumed to be reduced by the same factor as the structural inundation damages for each alternative. Table 22, below, shows the total expected equivalent annual costs for all three damage categories. The last line of the table computes total incidental benefits ($402,000) of the restoration features alone. It can be seen that the restoration features of Alternative 3.5 combined with the "100 year, 95% confidence levee" can be expected to reduce average annual inundation damages to near zero. This seems to contradict the definition of a 95% confidence level, which would allow some residual damages, however the explanation lies in the fact that when incidental flood reduction benefits are considered (resulting from the restoration features), the "confidence level" of the levee is effectively raised above 100%. For the smallest levee, the combination of damage reduction from the levee ($523,000) plus damage reduction from the restoration features ($386,000) leaves remaining damages of $196,000 annually out of $1,104,000 without project. For the mid-size levee (100 yr), the sum of the two additive damage reductions ($883,000 plus $386,000) exceeds the avg. annual w/out proj. damage by about $165,000, so we can say that this levee (and the largest levee) when combined with the restoration features, effectively eliminates damages for all but the largest conceivable events. Failure Analysis was not deemed necessary for this study

based on discussions with H&H personnel due to the fact that the levees are bypassed upstream prior to failure.

Table 22 – Total With Project Damages and Incidental Benefits – Alt. 3.5

	Without	Alt. 3.5	Alt 3.5/50	Alt 3.5/100	Alt 3.5/500
	Without Project Condition	Alternative 3.5 w/ no levee	Alternative 3.5 w/ 50 yr. levee	Alternative 3.5 w/100 yr. levee	Alternative 3.5 w/500 yr. levee
struc. inund	$1,104,000	$718,000	$196,000	0	0
agri. dmgs	$37,700	$23,820	$11,520	0	0
cleanup/util	$6,500	$4,060	$1,960	0	0
Total Dmg	$1,148,000	$746,000	$210,000	0	0
Total Incidental Benefits		$402,000			

D. With Project Benefits

Table 23, below, shows the flood control benefits, including inundation reduction, clean-up and utility cost reduction, and agricultural damage reduction achieved incrementally by the addition of a levee to Alternative 3.5.

Table 23 Tres Rios Equivalent Annual Damage by Plan					
Discount Rate: 6.625 Analysis Period: 50 Years					
Plan Name	Without	Alt. 3.5/no levee	Alt 3.5/50	Alt 3.5/100	Alt 3.5/500
Total Damage	$1,148,000	$746,000	$210,000	0	0
Damage Reduced (incl. ag. and cleanup)		$402,000	$536,000	$746,000	$746,000

E. Flood Control (Levee) Construction Costs

Table 24, below, shows the total first cost of construction (including contingencies), average annual operations and maintenance, interest during construction, gross investment, and annualized gross investment for the levees only. A one-year period of construction was assumed and the current discount rate of 6-5/8% was used to compute interest during construction. The Table also shows the average annual flood control benefits of the levee alone, and presents net NED benefits for each alternative.

Table 24– Levee only - Construction costs/Benefits

Flood Control (levee) Costs

LEVEE CONSTRUCTION COSTS - SEPARABLE ELEMENT

	Levee Design Flood		
	50yr.	100yr.	500yr.
First cost construction	$4,890,835	$5,380,173	$6,109,648
Interest during construction	$313,659	$345,041	$391,824
Gross investment	$5,204,494	$5,725,214	$6,501,472
Annualized Gross Investment	$359,337	$395,290	$448,885
Operation & Maintenance	$4,000	$4,000	$4,000
Total annual cost	$363,337	$399,290	$452,885
Average annual Benefits (damages reduced incrementally by adding levee)	$536,000	$746,000	$746,000
Net NED Benefits	$172,663	$346,710	$293,115
B/C Ratio (Flood Control only)	1.48	1.87	1.65

It can be seen from the table above that the "100 year levee" is the NED plan, with net avg. annual benefits of $346,710, independent of incidental benefits from environmental restoration.

12. RECREATION ANALYSIS

Appendix H of this study contains a complete analysis of existing and future recreation opportunities in the study area. The costs for construction of the proposed recreation features are shown in Table 25, below. The value of the recreation experience is assessed and quantified in a point system according to Corps regulations (chapter 6, section VIII of ER-1105-2-100). A "unit day value" is then assigned according to the same regulations. The assessment was performed by qualified personnel from Phoenix Parks and Recreation Dept. Estimates of annual visitation over the project life are also provided in Appendix H along with an analysis of how the numbers were developed. Table 26 below shows the estimated point valuation and unit day value for recreation upon completion of construction (PY 1). This value does not change over time. Average annual visitation is derived from the estimates given at PY 1 and PY 20-50, and is then multiplied by the unit day value to produce an average annual recreation value estimate for the project. This is then compared with the estimated average annualized cost of construction and maintenance to produce net benefits and a B/C ratio of the recreation features. It can be seen from Table 26 that projected annual net benefits for the recreation features approaches $1 million, due to the high value of the recreation and the large number of visitors. It should be noted that these costs are not included in any other part of the economic analysis, as they are not associated with either flood control or environmental restoration. Average Annual O&M costs are $600,000/yr. Capital Expenditures (First Costs) for O&M are in the amount of $300,000 . Total annualized costs for recreation improvements are therefore $789,703, leaving annual net benefits of $596,297 and a B/C ratio for recreation of 1.76.

Table 25 – RECREATION IMPROVEMENTS/COSTS

DESCRIPTION	QUANTITY	UNIT COST	TOTAL
Stabilized Outdoor Recreation Access Routes	11 miles	$92,700	$1,020,000
Interpretive Signage	200	$1,000	$200,000
Trailheads	5	$228,000	$1,140,00
first costs, O&M			$300,000
Subtotal			$2,660,000
			$189,703
Annual O&M			$600,000
Total Annual Cost			$789,703

TABLE 26 – RECREATION COST-BENEFIT ANALYSIS

	POINT VALUE	U.D. VALU	ANN. VISIT.	ANN. REC. VALUE
PY 1	91	$7.70	180000	$1,386,000
PY 20-50	91	$7.70	180000	$1,386,000
AVG. ANNU	91	$7.70	180000	$1,386,000
ANN. COST				$789,703
ANN. NET BEN.				$596,297
B/C RATIO				1.76

13. EDUCATIONAL COST-BENEFIT ANALYSIS

The project also includes some environmental educational facilities whose costs are not included in any other part of the economic analysis, as they are not associated with flood control and are separate from the environmental restoration costs. As shown in Table 27, below this cost is estimated at about $2,500,000 total. This translates to an average annualized cost over the project life of about $178,300. Guidance is currently being drafted for assessing benefits of educational features, but at this time has not been formalized, and so no cost/benefit analysis was performed.

Table 27 -Environmental Education Facilities Costs

DESCRIPTION	QUANTITY	UNIT COST	TOTAL
Environmental Education Center	1	$2,500,000	$2,500,000
Total			$2,500,000

14. COST – BENEFIT ANALYSIS, NER AND NED PLAN

Cost – Benefit Allocation

When computing *incidental* flood control benefits produced by the restoration features only, no cost benefit ratio is provided, as there is no flood control feature. However, these incidental benefits are considered an offset to the restoration costs. Costs per HU are given with and without these incidental benefits included. When computing flood control benefits of a levee, only the cost of the flood control features is considered in the net benefits and B/C ratio computations. Tables 28, and 29, below, summarize the costs and benefits of Alternative 3.5 with and without the three different levee designs. Costs are broken down between environmental restoration features and flood control features, and benefits are broken down between incidental flood control benefits produced by the restoration features, levee-induced flood control benefits, and environmental restoration (Habitat Units) benefits.

NER Benefits/Costs per Habitat Unit

When computing costs per Habitat Unit, total avg. annualized costs of the environmental restoration features were divided by the average annual number of Habitat Units created compared to without project. The first column of Table 28, below, shows this analysis, considering only the costs of the restoration features. The second and third column show total project costs including the levees, but this is for demonstration purposes only. The correct cost per Habitat Unit comes out of the first column, as levee costs do not count against Habitat benefits. However, in Table 29, costs per HU were also computed when the cost of the restoration features are offset (reduced) by the incidental flood control benefits achieved by these features. This shows a slightly lower cost per HU, and reflects the holistic (environmental and flood control) benefits of the restoration features.
Although total project costs (sum of flood control features and environmental restoration features costs) are presented in Table 28, they are not used in computing any net benefits or B/C ratios. This is all per guidance outlined in ER-1105-200 and provided by SPD.

As can be seen in Table 28, Alternative 3.5 produces 571 avg. annual habitat units at an average annual cost of $13,817 per habitat unit. As seen in Table 29, When the restoration costs are offset by the incidental flood control benefits, this number drops to $13,113 per HU.

Table 28 Costs and Benefits Summary - Alternative 3.5 including Flood Control

Project Cost/Benefit Summary
For All Alternatives

	(No Levee)	Levee Only (50yr)	Levee Only (100yr)	Levee Only (500yr)
FLOOD CONTROL				
Total First Cost		$4,890,835	$5,380,173	$6,109,648
IDC		$313,659	$345,041	$391,824
Gross Investment		$5,204,494	$5,725,214	$6,501,472
Annual Gross Investment		$359,337	$395,290	$448,885
O&M		$4,000	$4,000	$4,000
Total Annual Cost		$363,337	$399,290	$452,885
ENVIRON. RESTOR.	Alt 3.5	Alt 3.5	Alt 3.5	Alt 3.5
Total First Cost	$82,743,853	$82,743,853	$82,743,853	$82,743,853
IDC	$5,303,881	$5,303,881	$5,303,881	$5,303,881
Gross Investment	$88,047,734	$88,047,734	$88,047,734	$88,047,734
Annual Gross Investment	$6,079,137	$6,079,137	$6,079,137	$6,079,137
O&M	$589,000	$589,000	$589,000	$589,000
Annual Cost of Water	$1,221,150	$1,221,150	$1,221,150	$1,221,150
Total Annual Cost	$7,889,287	$7,889,287	$7,889,287	$7,889,287
COMBINED FLOOD CONTROL AND ENVIRON. RESTORATION				
Combined First Cost	$82,743,853	$87,634,688	$88,124,026	$88,853,501
Combined Gross Investment	$88,047,734	$93,252,228	$93,772,948	$94,549,206
Combined Annual Cost	$7,889,287	$8,252,624	$8,288,576	$8,342,172
PROJECT BENEFITS				
Incidental F.C.	$402,000	$402,000	$402,000	$402,000
Levee F.C.	$0	$536,000	$746,000	$746,000
Net Benefits	$402,000	$938,000	$1,148,000	$1,148,000
BC Ratio	n/a	n/a	n/a	n/a
Avg. HU over proj. life	571	571	571	571
Avg. annual $/HU*	$13,817	$13,817	$13,817	$13,817

[1] A B/C ratio doesn't apply to the combined incidental and levee flood control benefits due to the difficulty of comparing incidental flood control benefits to specific portions of the overall project feature costs. A comparison of the B/C ratio just for levee construction as a separable element is shown in Table 31.

[2] Cost per HU is the total annual cost of environmental restoration features only, divided by the average HU over project life.

TABLE 29 -. COST PER HABITAT UNIT IF OFFSET BY INCIDENTAL FLOOD CONTROL BENEFITS.

TABLE 29 - COSTS OFFSET BY INCIDENTAL BENES

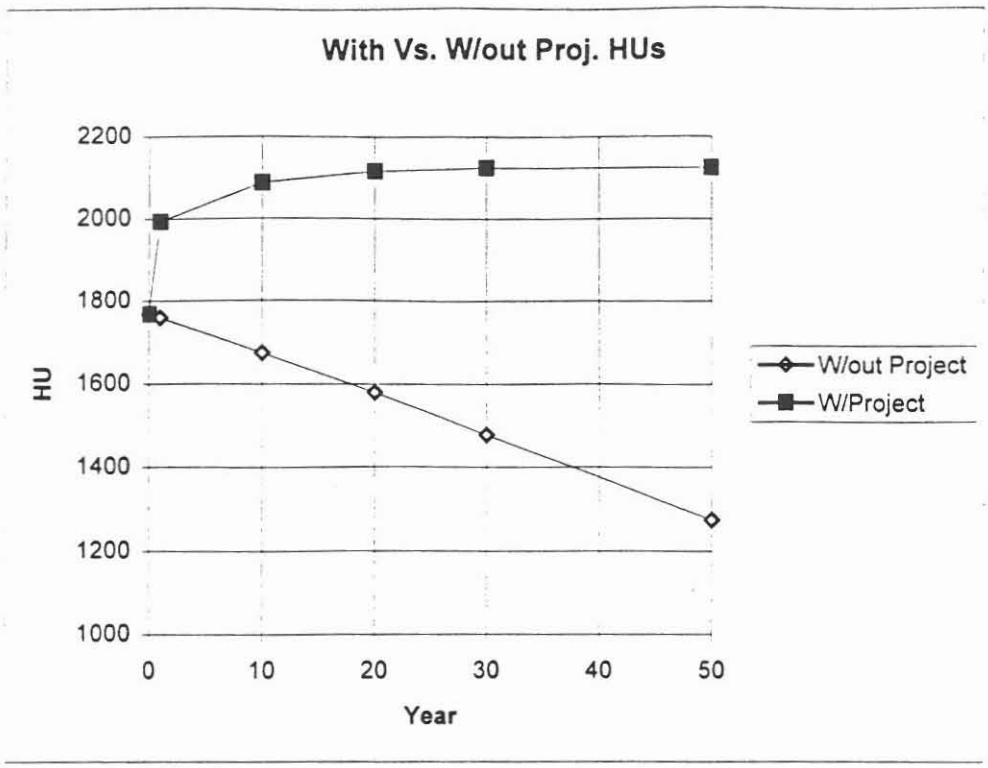
COMBINED COST	Rest. Only	w/50 yr levee	w/ 100 yr levee	w/500 yr levee
Total Annual Cost	$7,889,287	$8,252,624	$8,288,576	$8,342,172
PROJECT BENEFITS				
Incidental F.C.	$402,000	$402,000	$402,000	$402,000
Reduced Annual Cost	$7,487,287	$7,850,624	$7,886,576	$7,940,172
Cost per HU	$13,113	$13,749	$13,812	$13,906

Table 30, below, shows the projected value of the habitat over the project life for with and without project conditions. The graph immediately following Table 30 shows the total (gross) Habitat Units in the study area projected over the project life under both with and without project conditions.

TABLE 30 - HABITAT VALUATION OVER PROJECT LIFE

HABITAT VALUATION OVER PROJECT LIFE

Proj. Year	W/out Pro	W/Proj.	Difference	Midpoint
0	1768	1768	0	
1	1759	1993	235	117
10	1674	2087	413	324
20	1579	2115	536	475
30	1478	2124	646	591
50	1275	2124	849	748



NED Benefits/Levee Optimization

As can be seen in Table 31, all three levee designs are economically justified, and the "100 year " levee provides the greatest average annual net benefits of approximately $346,710 and a B/C ratio of 1.87.

Table 31 - Levee Feature Analysis (NED Analysis)

	Levee Only (50yr)	Levee Only (100yr)	Levee Only (500yr)
FLOOD CONTROL			
Total First Cost	$4,890,835	$5,380,173	$6,109,648
IDC	$313,659	$345,041	$391,824
Gross Investment	$5,204,494	$5,725,214	$6,501,472
Annual	$359,337	$395,290	$448,885
O&M	$4,000	$4,000	$4,000
Total Annual Cost	$363,337	$399,290	$452,885
PROJECT BENEFITS			
Levee F.C.	$536,000	$746,000	$746,000
Net Benefits	$172,663	$346,710	$293,115
BC Ratio	1.48	1.87	1.65

*Costs include only flood control features and benefits include only those produced by the flood control features

15. RISK AND UNCERTAINTY RESULTS

There are three critical variables involved in this analysis where a degree of uncertainty is involved; the construction costs, the flood depths, and the damages/benefits. Uncertainties in Project Construction costs are handled by adding contingencies, and are well within the bounds of these contingencies (see Cost Estimating Appendix).

The tables included below were output by HEC-FDA (discussed previously) and give three levels of probability that damage will be reduced by the indicated values or more. A table is also provided which indicates the computed annual exceedance probability of target stages at each of the 8 main cross sections corresponding to the eight study reaches. It also indicates the Median and Expected target stage annual exceedance probability, by reach and by alternative, and finally, the conditional non-exceedance probability is given by event. This statistical information can be used by planners to assess the risk and uncertainty of projections of flood damages and benefits.

A. EAD & EAD Reduced

Table 32 shows the results of the risk and uncertainty analysis. Note that the probability that *the expected annual damage reduced for Alternative 3.5 with any of the levees* exceeds the mean values is less than fifty percent. This is because of the nature of the damage distribution. There is the potential for very high damages when taking into consideration the uncertainty of engineering and economic variables, whereas the lower limit of damages is obviously zero. Therefore, the resulting damage and damage reduced distributions are not normally distributed, but reflect a range of positive values only.

B. Project Reliability Estimates

Tables 33 through 38, which follow, summarize project reliability estimates generated by the HEC-FDA program. Rather than showing the performance statistics for every single economic damage reach, data is displayed for larger areas. It should be noted that the values given on these tables for "Levee x" apply to the levee-only (no restoration features) condition, and the values for "W/PROJ, NO LEVEE" are also given so that they may be assessed both independently and cumulatively.

Under without-project conditions, the expected annual exceedance probabilities for the reaches with the lowest level of protection (reaches 5, 6, and 7) is approximately thirteen to fifteen percent for most of these areas. However, for some of these reaches (reaches 2, 3, and 4), damages do not become significant until less frequent events.
Under With Project Conditions (levee only), the expected annual exceedance probabilities for the reaches with the lowest level of protection (reaches 1, 2, and 8) is approximately six to eight percent for most of these areas.

When assessing the Long Term Risk, a review of the tables indicates that for the restoration features alone, reaches 3, 4, and 5 have a relatively low exceedance probability, while reaches 1, 2, and 6 through eight involve a little more risk. However, when the levee features are added, the result will be significant drops in exceedance probability in reaches 6 and 7, but reaches 1, 2, and 8 still show slightly higher risk. This makes sense due to the fact they are near both ends of the levee.

Tres Rios Env. Restoration
Expected Annual Damage Reduced and Distributed
by All Plans for Analysis Year 2005
(Damage in $1,000's)

Plan Name	Plan Description	Expected Annual Damage			Probability Damage Reduced Exceeds Indicated Values		
		Total Without Project	Total With Project	Damage Reduced	.75	.50	.25
Without	Without project condition	1103.94	1103.94	0.00	0.00	0.00	0.00
Levee 1	smallest (50 yr) levee	1103.94	581.14	522.80	350.05	508.61	624.54
Levee 2	medium (100 yr) levee	1103.94	220.64	883.30	550.04	786.12	1100.39
Levee 3	Highest (500 yr) levee	1103.94	182.88	921.06	561.60	819.01	1158.44
W/PROJ,NO LEVEE		1103.94	718.35	385.59	247.14	335.56	468.28

Tres Rios Env. Restoration Project Performance
by Plans and Damage Reaches by Analysis Year 2005
(Stages in ft.)

Without Project Base Year Performance Target Criteria:
Event Exceedance Probablility = 0.01
Residual Damage = 5.00 %

Plan Name	Stream Name	Damage Reach Name	Damage Reach Description	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)		
					Median	Expected	10	25	50
Without	Gila River	eight	Dysart to study limit	921.40	0.0460	0.0570	0.4440	0.7695	0.9469
		seven	El Mirage to Dysart	927.09	0.1100	0.1170	0.7130	0.9559	0.9981
		six	115th ave to El Mirage	934.26	0.1230	0.1350	0.7646	0.9731	0.9993
		five	107th ave to 115th ave	943.32	0.1400	0.1530	0.8104	0.9844	0.9998
		four	99th to 107th ave	951.95	0.0530	0.0640	0.4836	0.8084	0.9633
		three	91st to 99th Ave	959.18	0.0600	0.0710	0.5194	0.8399	0.9744
		two	91st ave Plant	967.05	0.0400	0.0490	0.3946	0.7149	0.9187
		one	GRIC land	972.09	0.0680	0.0770	0.5527	0.8662	0.9821
Levee 1	Gila River	eight	Dysart to study limit	921.40	0.0460	0.0570	0.4440	0.7695	0.9469
		seven	El Mirage to Dysart	levee	0.0490	0.0610	0.4663	0.7919	0.9567
		six	115th ave to El Mirage	levee	0.0040	0.0100	0.0959	0.2228	0.3960
		five	107th ave to 115th ave	levee	0.0390	0.0470	0.3848	0.7032	0.9119
		four	99th to 107th ave	levee	0.0280	0.0310	0.2725	0.5485	0.7962
		three	91st to 99th Ave	levee	0.0450	0.0540	0.4258	0.7501	0.9376
		two	91st ave Plant	967.05	0.0400	0.0490	0.3946	0.7148	0.9186
		one	GRIC land	972.09	0.0680	0.0770	0.5528	0.8662	0.9821
Levee 2	Gila River	eight	Dysart to study limit	921.40	0.0460	0.0570	0.4440	0.7695	0.9469
		seven	El Mirage to Dysart	levee	0.0210	0.0180	0.1659	0.3646	0.5962
		six	115th ave to El Mirage	levee	0.0010	0.0040	0.0383	0.0931	0.1774
		five	107th ave to 115th ave	levee	0.0010	0.0050	0.0465	0.1122	0.2118
		four	99th to 107th ave	levee	0.0030	0.0070	0.0723	0.1710	0.3127
		three	91st to 99th Ave	levee	0.0130	0.0160	0.1472	0.3283	0.5488
		two	91st ave Plant	967.05	0.0400	0.0490	0.3946	0.7148	0.9186

Tres Rios Env. Restoration Project Performance
by Plans and Damage Reaches by Analysis Year 2005
(Stages in ft.)

Without Project Base Year Performance Target Criteria:
Event Exceedance Probablility = 0.01
Residual Damage = 5.00 %

Plan Name	Stream Name	Damage Reach Name	Damage Reach Description	Target Stage	Target Stage Annual Exceedance Probability		Long-Term Risk (years)		
					Median	Expected	10	25	50
		one	GRIC land	972.09	0.0680	0.0770	0.5528	0.8662	0.9821
Levee 3	Gila River	eight	Dysart to study limit	921.40	0.0460	0.0570	0.4440	0.7695	0.9469
		seven	El Mirage to Dysart	levee	0.0140	0.0140	0.1358	0.3056	0.5178
		six	115th ave to El Mirage	levee	0.0010	0.0020	0.0149	0.0369	0.0724
		five	107th ave to 115th ave	levee	0.0010	0.0050	0.0445	0.1075	0.2035
		four	99th to 107th ave	levee	0.0010	0.0020	0.0223	0.0548	0.1066
		three	91st to 99th Ave	levee	0.0040	0.0070	0.0702	0.1665	0.3052
		two	91st ave Plant	967.05	0.0400	0.0490	0.3946	0.7148	0.9186
		one	GRIC land	972.09	0.0680	0.0770	0.5528	0.8662	0.9821
W/PROJ,NO LEVEE	Gila River	eight	Dysart to study limit	921.40	0.0320	0.0370	0.3129	0.6087	0.8469
		seven	El Mirage to Dysart	927.09	0.0300	0.0350	0.3027	0.5940	0.8352
		six	115th ave to El Mirage	934.26	0.1140	0.1240	0.7327	0.9631	0.9986
		five	107th ave to 115th ave	943.32	0.0330	0.0390	0.3261	0.6272	0.8610
		four	99th to 107th ave	951.95	0.0280	0.0310	0.2702	0.5449	0.7929
		three	91st to 99th Ave	959.18	0.0240	0.0270	0.2356	0.4892	0.7390
		two	91st ave Plant	967.05	0.0400	0.0490	0.3943	0.7145	0.9185
		one	GRIC land	972.09	0.0630	0.0730	0.5294	0.8481	0.9769

Tres Rios Env. Restoration Project Performance
by Plans and Damage Reaches by Analysis Year 2005
(Stages in ft.)

Without Project Base Year Performance Target Criteria:
Event Exceedance Probablility = 0.01
Residual Damage = 5.00 %

Conditional Non-Exceedance Probability by Events					
10%	4%	2%	1%	.4%	.2%
0.9185	0.4356	0.0287	0.0086	0.0056	0.0019
0.3580	0.0606	0.0010	0.0005	0.0003	0.0000
0.1964	0.0251	0.0004	0.0000	0.0000	0.0000
0.1008	0.0127	0.0002	0.0000	0.0000	0.0000
0.8798	0.3578	0.0178	0.0051	0.0032	0.0011
0.8192	0.2520	0.0232	0.0047	0.0009	0.0003
0.9421	0.5090	0.0997	0.0299	0.0076	0.0022
0.7719	0.1895	0.0138	0.0024	0.0006	0.0002
0.9185	0.4356	0.0287	0.0086	0.0056	0.0019
0.8829	0.4118	0.0330	0.0117	0.0081	0.0030
0.9991	0.9923	0.7516	0.5955	0.5431	0.4341
0.9455	0.5818	0.0991	0.0443	0.0331	0.0159
0.9895	0.8288	0.1985	0.0902	0.0663	0.0308
0.9275	0.4358	0.0642	0.0166	0.0034	0.0009
0.9422	0.5092	0.0998	0.0299	0.0077	0.0022
0.7719	0.1895	0.0138	0.0024	0.0006	0.0002
0.9185	0.4356	0.0287	0.0086	0.0056	0.0019
0.9971	0.9579	0.5098	0.3440	0.2977	0.2067
0.9995	0.9995	0.9162	0.8112	0.7669	0.6516
0.9996	0.9955	0.8821	0.8069	0.7807	0.7212
0.9994	0.9953	0.8122	0.6805	0.6338	0.5316
0.9975	0.9674	0.6587	0.4041	0.2081	0.0989
0.9422	0.5092	0.0998	0.0299	0.0077	0.0022

Tres Rios Env. Restoration Project Performance
by Plans and Damage Reaches by Analysis Year 2005
(Stages in ft.)

Without Project Base Year Performance Target Criteria:
Event Exceedance Probablility = 0.01
Residual Damage = 5.00 %

Conditional Non-Exceedance Probability by Events					
10%	4%	2%	1%	.4%	.2%
0.7719	0.1895	0.0138	0.0024	0.0006	0.0002
0.9185	0.4356	0.0287	0.0086	0.0056	0.0019
0.9982	0.9763	0.6103	0.4373	0.3844	0.2775
0.9995	0.9999	0.9715	0.9299	0.9112	0.8608
0.9996	0.9979	0.8856	0.8073	0.7811	0.7275
0.9998	0.9990	0.9444	0.9065	0.8939	0.8675
0.9993	0.9964	0.8922	0.7279	0.5273	0.3700
0.9422	0.5092	0.0998	0.0299	0.0077	0.0022
0.7719	0.1895	0.0138	0.0024	0.0006	0.0002
0.9841	0.7348	0.1171	0.0453	0.0318	0.0128
0.9816	0.7578	0.1615	0.0721	0.0527	0.0248
0.2878	0.0395	0.0005	0.0001	0.0000	0.0000
0.9823	0.7047	0.0936	0.0334	0.0231	0.0089
0.9904	0.8328	0.1839	0.0787	0.0567	0.0252
0.9923	0.8595	0.3616	0.1565	0.0562	0.0194
0.9423	0.5114	0.1020	0.0313	0.0082	0.0024
0.8090	0.2299	0.0194	0.0039	0.0008	0.0003

Tres Rios Env. Restoration
Expected Annual Damage Reduced and Distributed
for the Levee 2 (medium (100 yr) levee) Plan and
Analysis Year 2005
(Damage in $1,000's)
Plan was calculated with Uncertainty

Damage Reach Name	Expected Annual Da ge			Probability Damage Reduced Exceeds Indicated Values		
	Total Without Project	Total With Project	Damage Reduced	.75	.50	.25
eight	13.35	13.35	0.00	0.00	0.00	0.00
seven	164.91	58.31	106.59	82.03	85.54	117.30
six	241.34	19.79	221.55	135.23	199.78	278.42
five	531.07	39.86	491.21	302.18	443.21	629.57
four	74.72	19.70	55.01	25.11	50.02	65.15
three	18.50	9.57	8.93	5.50	7.58	9.93
two	5.72	5.72	0.00	0.00	0.00	0.00
one	54.34	54.34	0.00	0.00	0.00	0.00
	1103.94	220.64	883.30	550.04	786.12	1100.39

Tres Rios Env. Restoration
Expected Annual Damage Reduced and Distributed
for the Levee 1 (smallest (50 yr) levee) Plan and
Analysis Year 2005
(Damage in $1,000's)
Plan was calculated with Uncertainty

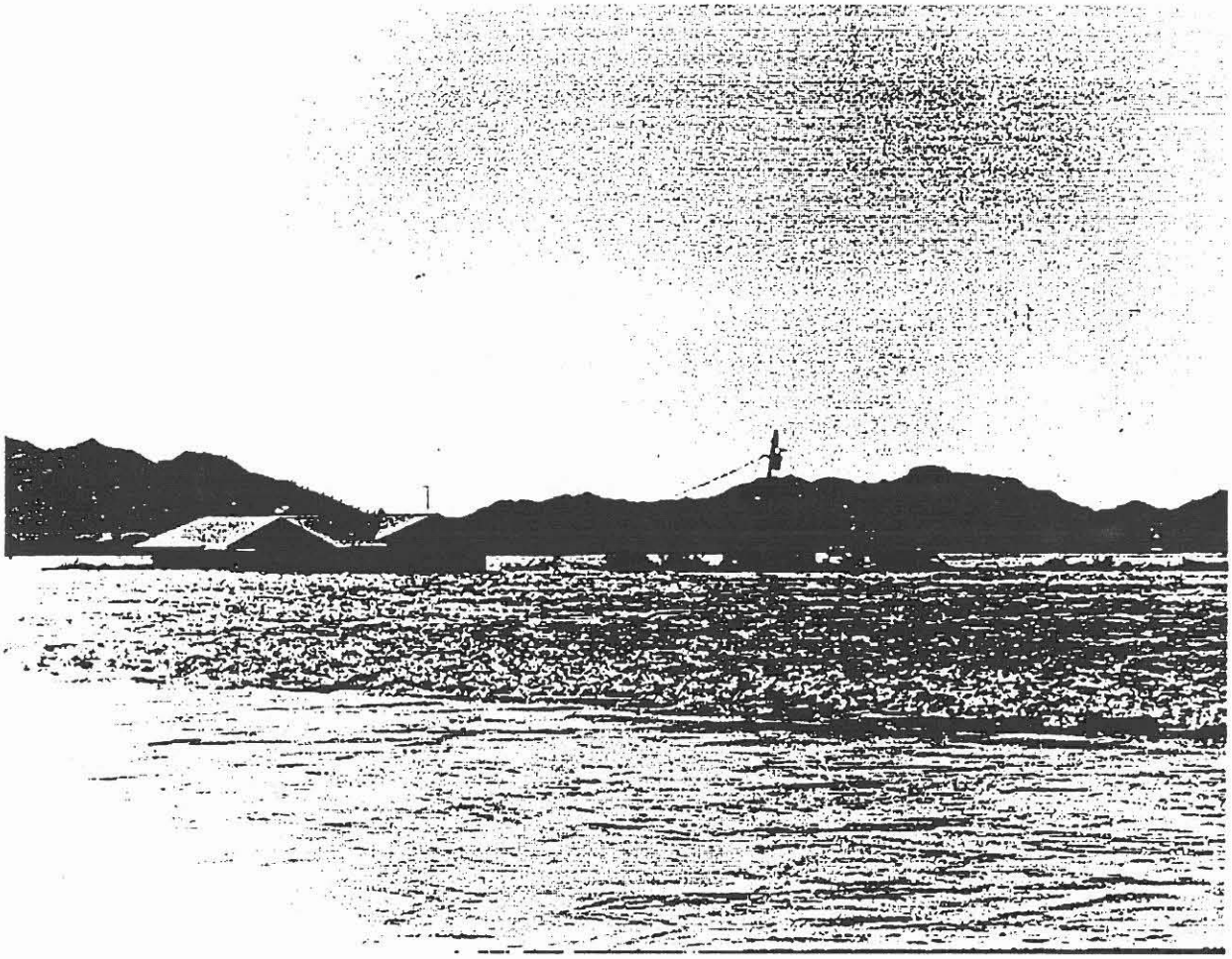
Damage Reach Name	Expected Annual Da		ge	Probability Damage Reduced Exceeds Indicated Values		
	Total Without Project	Total With Project	Damage Reduced	.75	.50	.25
ight	13.35	13.35	0.00	0.00	0.00	0.00
even	164.91	121.00	43.91	31.67	44.20	54.00
six	241.34	39.29	202.05	132.92	196.96	223.02
ive	531.07	283.75	247.32	172.59	245.08	307.99
our	74.72	47.25	27.47	11.94	20.71	36.87
three	18.50	16.45	2.05	0.93	1.67	2.65
vo	5.72	5.72	0.00	0.00	0.00	0.00
one	54.34	54.34	0.00	0.00	0.00	0.00
	1103.94	581.14	522.80	350.05	508.61	624.54

Tres Rios Env. Restoration
Expected Annual Damage Reduced and Distributed
for the Levee 3 (Highest (500 yr) levee) Plan and
Analysis Year 2005
(Damage in $1,000's)
Plan was calculated with Uncertainty

Damage Reach Name	Expected Annual Da		ge	Probability Damage Reduced Exceeds Indicated Values		
	Total Without Project	Total With Project	Damage Reduced	.75	.50	.25
eight	13.35	13.35	0.00	0.00	0.00	0.00
seven	164.91	48.10	116.80	82.99	101.95	126.35
six	241.34	7.40	233.94	142.54	208.71	295.38
five	531.07	41.93	489.13	302.71	443.85	630.33
four	74.72	6.96	67.75	26.88	52.18	89.98
three	18.50	5.07	13.43	6.48	12.32	16.40
two	5.72	5.72	0.00	0.00	0.00	0.00
one	54.34	54.34	0.00	0.00	0.00	0.00
	1103.94	182.88	921.06	561.60	819.01	1158.44

ATTACHMENT "A" – HISTORICAL DAMAGES IN TRES RIOS STUDY AREA

TRES RIOS



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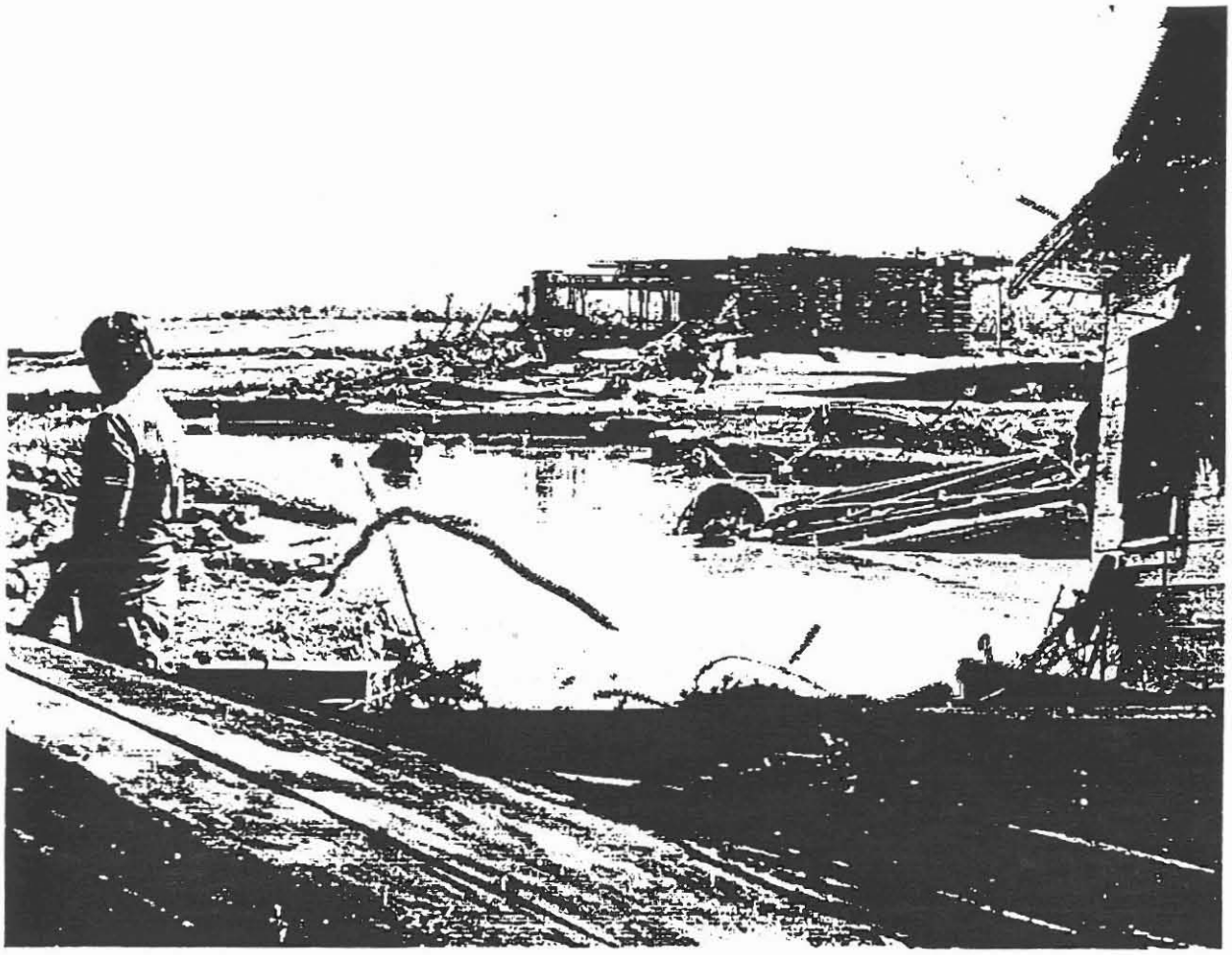

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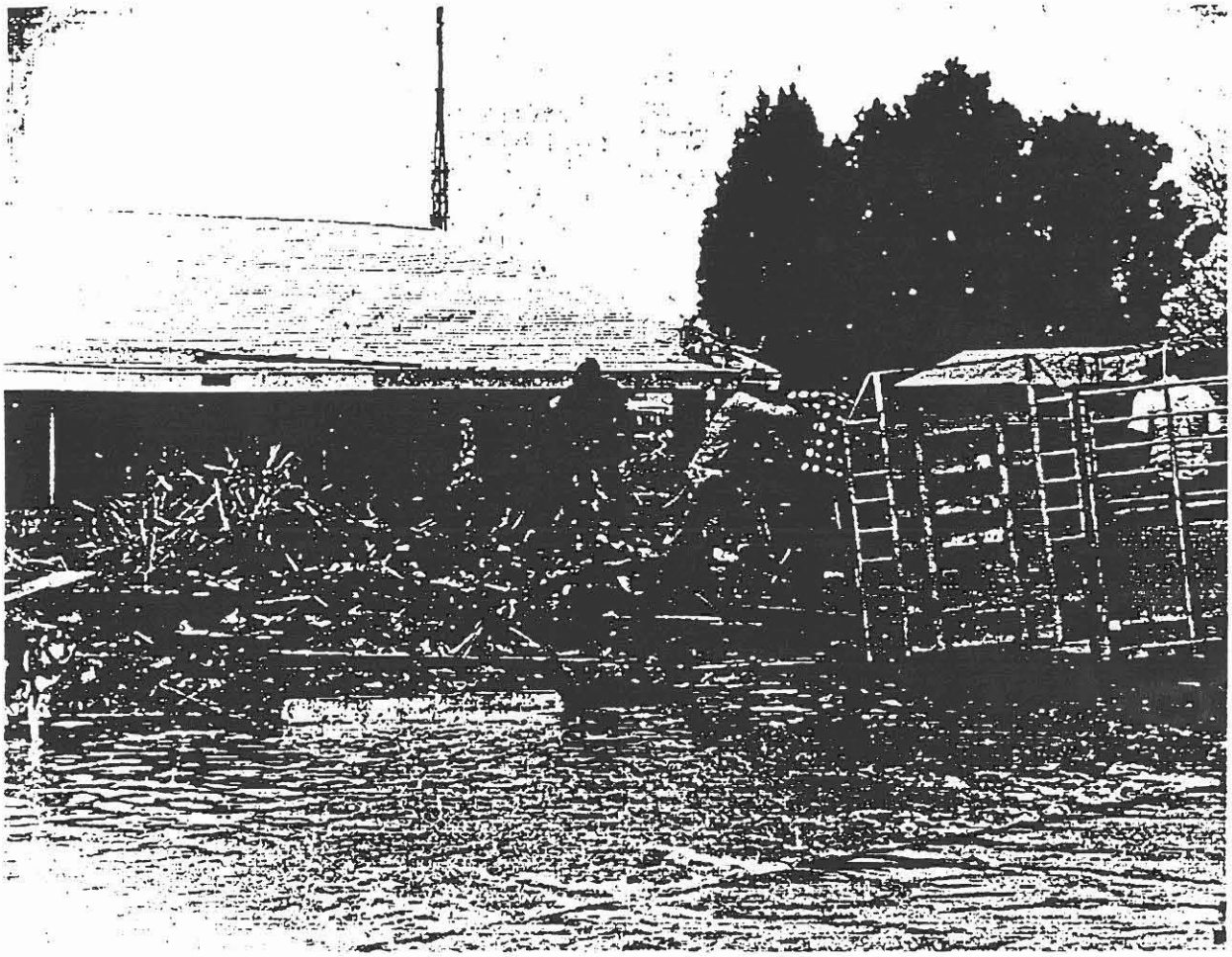

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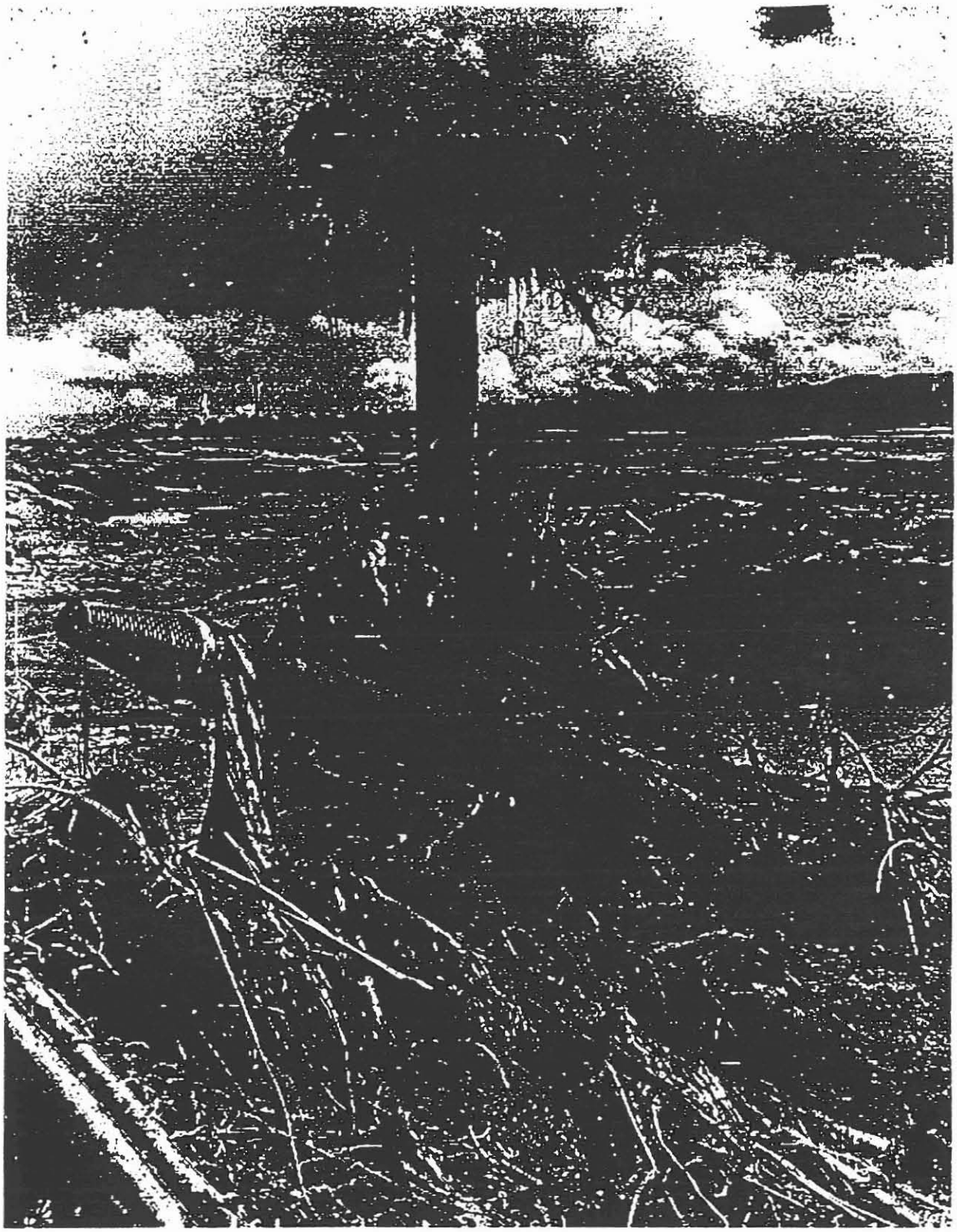

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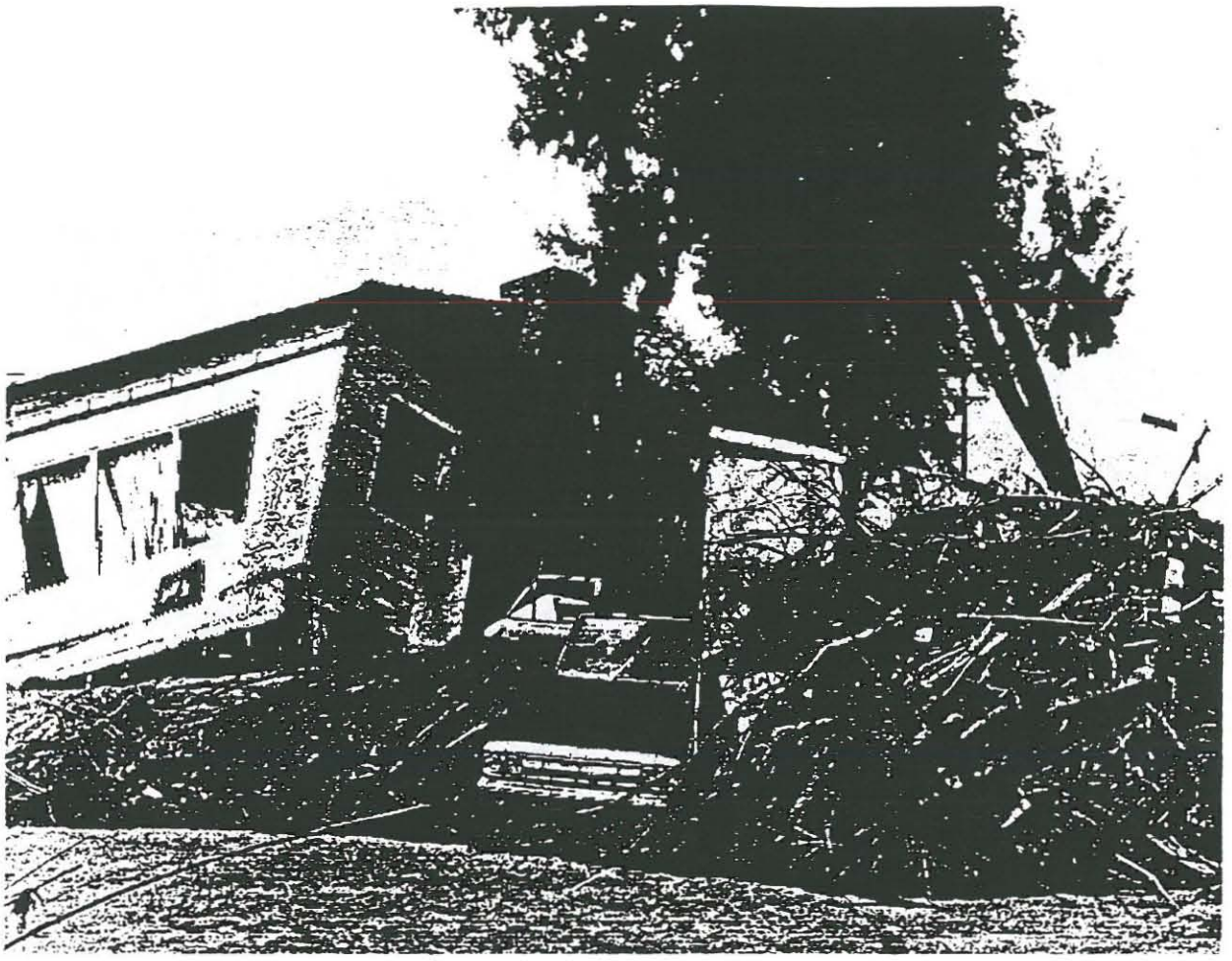

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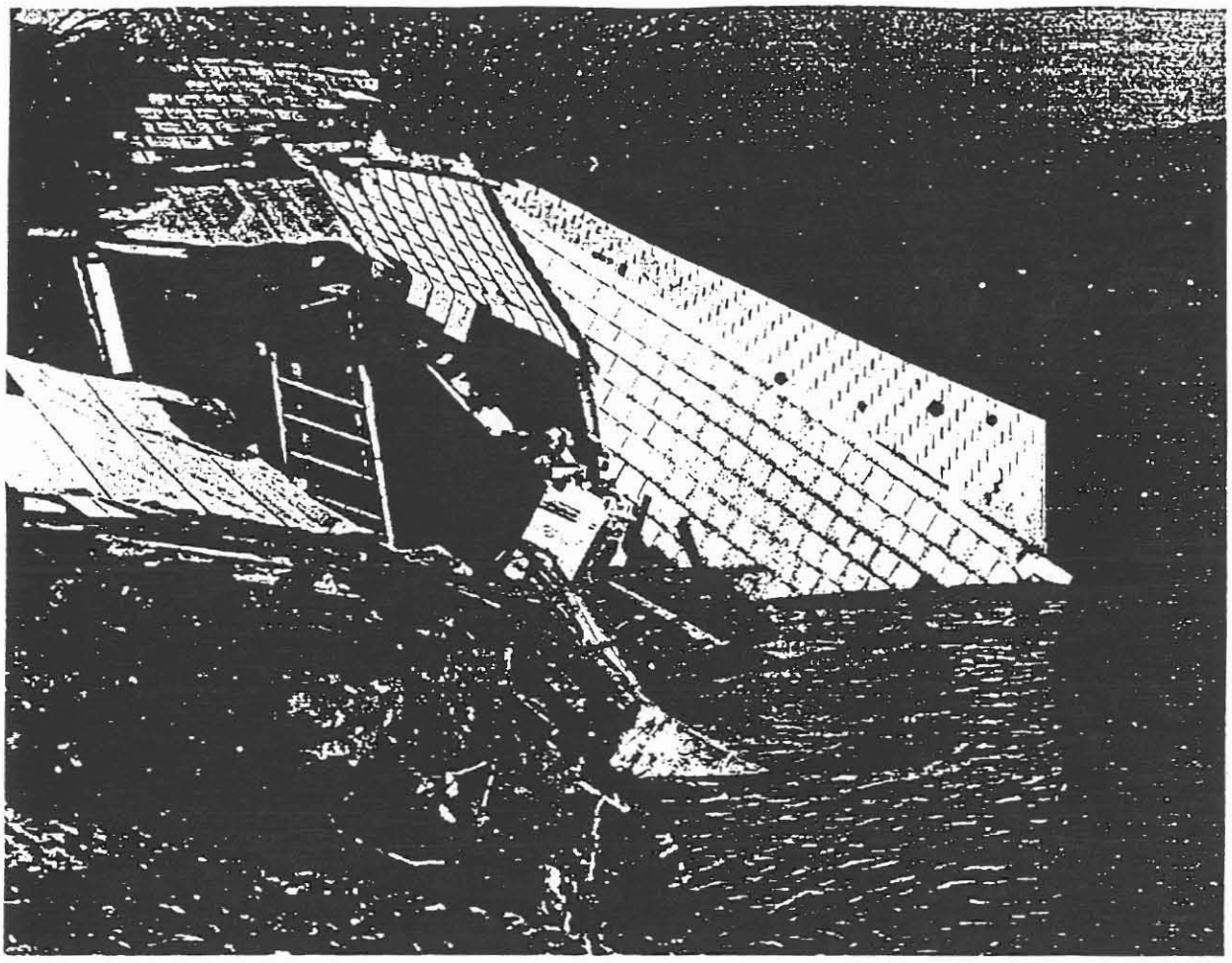


Habitat Valuation Analysis
For Environmental Restoration
Tres Rios Project

I. INTRODUCTION AND PURPOSE

The purpose of this Appendix is to provide information supporting the plan recommended in the Main Report and the Environmental Impact Statement for the Tres Rios Feasibility Study. The Corps' guidance for ecosystem restoration in the Civil Works Program is provided in Engineer Circular (EC) 1005-2-210. The purpose of the guidance is to assure that civil work investments in ecosystem restoration have the intended beneficial effects, are consistent with Administration policy, and will be conducted in the most cost effective manner.

This guidance (EC 1105-2-210:13.b.(1) and (20)) requires that the ecosystem outputs of proposed alternatives of a feasibility study be subjected to a detailed cost effectiveness and incremental cost analysis. The primary purpose being to allow explicit comparison of the additional cost and additional outputs associated with the alternatives. To perform this type of analysis, it is necessary that the environmental outputs be based on some quantifiable unit (e.g., Habitat Units, fisherman-days, visitor use days). This allows determination of the most cost-effective restoration option or combination of options that best meet the restoration goals. The following analysis uses a habitat-based method to quantitatively characterize biological values of fish and wildlife habitat in the study area.

II. EXISTING ENVIRONMENTAL DEGRADATION AND RESTORATION OPPORTUNITIES

A. Habitat degradation.

Destruction of riparian habitat in the southwest has been widely reported (see Bahre 1991; Busch and Smith 1995; Rea 1983). A historical perspective of the Salt River appears in Haughley (1994) and Ohmart (1979). These reports and studies are incorporated by reference as per 40 CFR 1502.21.

Dam construction throughout the Salt River's upper watershed in the early 1900's changed the original character of the river and by the 1940's most of the Salt River ceased to flow.

The Salt River in the study area is supported largely by effluent from the 91st Avenue Wastewater Treatment Plant and a rising groundwater table. Some portions of the study area which receive a fairly continuous supply of water have high quality Sonoran desert riparian habitat, open water habitat, and marsh habitat. Much of the area, however, experiences erratic flows and discharges; these conditions are more favorable to the exotic salt cedar which dominate most of the study areas' riparian corridor.

Without the project, discharges from the 91st Avenue plant are expected to diminish and

eventually cease. The current high quality riparian and marsh habitat is expected to deteriorate significantly as a result.

B. Restoration goals.

As stated in the "Planning Objectives" of the Plan Formulation of this Study, one objective is to retain existing high quality riparian habitat by maintaining a continuous, non-fluctuating supply of water to the channel, remove significant stands of the exotic salt cedar from the study area, and revegetating with native plant species. As such, the HEP team (see Section III, below) reached a consensus that the goal of this restoration effort should be to retain existing high quality aquatic habitat, riparian vegetation (habitat), and native upper floodplain habitat where it currently existed, replicate those high quality habitat conditions in areas where lesser quality (i.e., exotic vegetation, barren cobble beds, or agricultural areas) wildlife/aquatic habitat existed, and provide non-fluctuating flows to the channel as much as possible. **All** components of the Sonoran riparian ecosystem (i.e., the aquatic, riparian, and upper floodplain/terrace) were considered essential to restoring and maintaining a healthy and diverse system.

As was identified in the Rio Salado project, it was agreed that natural Sonoran desert riparian habitat would consist of a channel that would meander and naturally be dominated with freshwater aquatic vegetation (see Minckley and Brown [1982:265]). The first terrace or bench (i.e., the immediate floodplain) would naturally be dominated by willows and cottonwoods; the upper terraces or "secondary" floodplain is, under natural conditions, dominated by the mesquite "*bosque*" (or woodland) (see Minckley and Brown [1982:249 and 269]).

III. EVALUATION METHOD USED

A modified Habitat Evaluation Procedure (HEP) was used to evaluate the quality of the existing habitat and the quality of habitat from the proposed restoration alternatives. Biologist from U.S. Fish & Wildlife Service (USFWS), Arizona Game and Fish Department (AG&FD), Gila River Indian Community (GRIC), U.S. Bureau of Reclamation, and City of Phoenix's Wastewater Treatment Plant made up the HEP team and provided the input used in the modified HEP analysis for this Feasibility Study.

(Note that HEP is a habitat-based evaluation procedure; it is used to give a quantitative, numerical value to biological resources of concern. HEP, developed by the USFWS [USFWS 1980], is a formal process whereby tested habitat suitability models for certain species are used which directs the measurement of certain habitat variables for the selected species (e.g., percent of canopy cover, number of snag trees, stream temperature, percent ground cover, etc . . .) to obtain a Habitat Suitability Index (HSI). This is then used to obtain a numerical rating of habitat units for the selected species. A modified-HEP tailors the HEP process to a particular application and/or to a certain level of effort desired by the user [Wakeley and O'Neil 1988].)

A numerical rating or value between 0.0 and 1.0 (lowest to highest value) was assigned by

consensus of HEP team members to the habitat as its value (i.e., Habitat Value [HV]). The HV was then multiplied by the area of the habitat to obtain the Habitat Units (HUs) for each habitat type.

A. Riparian Habitat-Types

The HEP team agreed to use the values that Anderson and Ohmart (1993) assigned to the following vegetation/habitat types: Cottonwood/Willow, Salt Cedar, Salt Cedar/ Cottonwood/ Willow Mixes, Desert wash, and Quailbush/saltbush. Note that the Anderson-Ohmart values are given in a range of -3.0 to +3.0 (lowest to highest value); these were converted to the 0 to 1.0 values used by HEP.

(Note that the clarification of the habitat types used in the report are based on the report by Ch2M Hill et al. [1997] which utilized methods developed by Anderson and Ohmart [1993] to classify the vegetation communities in the study area. The Anderson-Ohmart system is a structural classification based on densities of tree species and the foliage profile or layering of the understory and midstory vegetation. The species that make up the various vegetation communities and a description of the vegetation structure types are detailed in Anderson and Ohmart [1993: 29 and Table 2]).

B. Open Water Marsh and other Habitat-types

The Habitat Values for Open Water, wetland marshes, cobble, and agricultural areas were determined by a consensus of the best professional judgement of HEP team members. The team's collective background knowledge of existing riparian habitat in the Study Area allowed for an objective projection of the potential habitat value of restoration alternatives.

IV. NO ACTION AND RESTORATION ALTERNATIVES

A. No Action Alternative

The No Action alternative (i.e., without project conditions scenario) makes the following assumptions for the various Target Years (TYs) throughout the life of the project:

- the channel does not change significantly in configuration
- in general, the net overall acreage does not change
- the ground water level rises during the life of the project
- the total acreage of marsh remains the same throughout the life of the project (marsh converted to agricultural land is replaced by marsh created by the increased ground water level)
- discharge from 91st Ave. Treatment Plant diminishes every year, until it completely ceases by TY 20.
- Cottonwood/Willow habitat declines in acreage and/or value for the remaining project life.

- Salt cedar increases in acreage after TY 20 due to the lack of discharge of 91st Ave Plant and the increase in salty ground water.

The HEP team assigned habitat values for TY 0, TY 20 and TY 50 (see Appendix 1). Based on the above assumptions, obviously, the value of much of the existing habitat is expected to decline throughout the life of the project.

The total habitat values for the various TYs are summarized below.

Table 1. Total Habitat Units: Without Project .

Target Year (TY)	Habitat Units (HUs)[1]
TY - 0	1768
TY - 20	1579
TY - 50	1275
AAHUs[2]	1531

[1]Total of all Habitat Units per given TY. See Appendix 1 for details of HUs for various habitat-types.
[2]Average Annual Habitat Units (AAHUs) over 50 years.

B. Restoration Alternatives

Section 2 of the preliminary Draft EIS provides a detailed description of the proposed restoration alternatives being considered.

The HEP team assigned habitat values for Alternatives 3, 3.5, and 4 for TY 1, TY 10, TY 20 and TY 30 (see Appendices 2 and 3). All restoration alternatives yield more Habitat Units than those that exist under existing and future Without Project Conditions. Also, all alternatives satisfy the restoration goals identified in Section II.B, above.

The total habitat value of the restoration alternatives in the various TYs are summarized below.

Table 2. Total Habitat Units generated for Restoration Alternatives - by Target Year.

	Total Habitat Units (HUs)[1]		
Target Year (TY)	Alternative 3	Alternative 3.5	Alternative 4
TY - 1	1959	1993	1960
TY - 10	2037	2087	2152
TY - 20	2060	2115	2201
TY - 30	2067	2124	2221
TY - 50	2067	2124	2221
AAHUs[2]	2049	2102	2178

[1]Total of all Habitat Units per given TY. See Appendices 2 & 3 for details of HUs for various habitat-types.
[2]Average Annual Habitat Units (AAHUs) over 50 years.

V. HABITAT VALUE COMPARISON OF RESTORATION ALTERNATIVES

The net Total Annual Average Habitat Units (AAHUs) expected from the restoration alternatives are similar (see Table 3), with Alternative 4 providing the most net total AAHUs. As mentioned in Section 2 of the Draft EIS, the restoration alternatives differ in the placement of the features. All alternatives meet the restoration goals and provide significant habitat units when compared to expected without-project conditions.

TABLE 3. Summary of Total Annual Average Habitat Units (AAHUs) by Alternative with & without project

	FUTURE AAHUs WITH	FUTURE AAHUs WITHOUT	CHANGE IN AAHUs
Alternative 3	2049	1531	+518
Alternative 3.5	2102	1531	+571
Alternative 4	2178	1531	+647

VI. RECOMMENDED RESTORATION PLAN

Alternative 3.5 provides significant habitat units in a cost-effective manner, meets the restoration goals and objectives, and can be implemented within the constraints identified for the Study.

VII. LITERATURE CITED

Anderson, B. and R. Ohmart. 1993. The development of an Arizona riparian habitat evaluation model with wildlife values. Prepared for Arizona Game and Fish Department. Contract # G30025-B.

Bahre, C.J. 1991. A legacy of change: historic human impact on vegetation in the Arizona borderlands. Univ. of Arizona Press. Tucson.

CH2M Hill; Logan, Simpson, and Dye; and ecoplan Associates, Inc. 1997. Salt-Gila River baseline ecological characterization. Prepared for the City of Phoenix. June 1997.

Haughey, R.A. 1994. History of the Salt and Gila: an historical perspective. Internal report of the Arizona Game and Fish Department. Mesa, AZ.

Minckley, W.L. and D.E. Brown. 1982. Part 6. Wetlands. *In.* Brown, D.E. (ed.) Biotic Communities of the American Southwest - United States and Mexico. Special Issue of Desert Plants. Volume 4. Published by the Univ. of Arizona for the Boyce Thompson Southwestern Arboretum.

Ohmart, R.D. 1979. Past and present biotic communities of the lower Colorado River mainstem and selected tributaries. Vol.IV. Report for the Bureau of Reclamation. Contract # 7-07-30-V0009.

Rea, A.M. 1983. Once a river: bird life and habitat change along the Middle Gila. univ. of Arizona Press. Tucson, AZ.

Stiehl, R.B. (ed.) 1993. Habitat evaluation procedures workbook. National Ecology Research Center. Fort Collins, CO. USFWS.

U.S. Fish & Wildlife Service. (USFWS). 1980. Habitat Evaluation Procedures (HEP). ESM (Ecological Service Manual) 102. Div. of Ecological Services, USFWS, Wash., D.C. March 31, 1980.

APPENDIX 1

CALCULATIONS OF AVERAGE ANNUAL HABITAT UNITS FOR HABITAT TYPES IN THE TRES RIOS FEASIBILITY STUDY AREA - WITHOUT PROJECT.

The following Tables show how Habitat Units (HUs) were calculated for this Analysis. As mentioned in Section III, a HEP-like approach was used to make the habitat-based evaluation of impacts.

As mentioned in Section III.A and III.B, the values assigned to Cottonwood/Willow (C/W), Salt Cedar (SC), Salt Cedar/Cottonwood-Willow Mixes, Desert wash, and Quailbush/saltbush by Anderson and Ohmart (1993) were used. The Habitat Values for Open Water, wetland marshes, cobble, agricultural areas were determined by a consensus of the best professional judgement of HEP team members.

Habitat values for **TY 0** were determined as follows:

- The Cottonwood/Willow - Salt Cedar (C/W - SC) Mixtures have high values (.95-.97) because these are primarily C/W habitats with SC as a minor component. (C/W makes up as much as 90% of many of the mixtures.)

- The HEP team decided to consider the large pool/lake in the Gravel Pit of the Transition Reach as a lake-like feature (and <u>not</u> a riverine-type). It was assigned a 0.6 HV because it has deep, cool, high D.O. water.

- For Existing Open Water habitats:

  Shallow pool, low velocity, constantly flowing waters (like behind the 115th Ave. "dike") were given a Habitat Value of 0.7 because of the overhanging vegetation and emergent and submergent vegetation. Note that this area (Reach 4) is also augmented by ground water.

  Intermittent flows which completely dry up were given a 0.3 HV.

  Constantly flowing waters with good velocity/flushing and riparian and submergent/emergent vegetation were assigned a 0.9 HV.

  Channels with erratic, fluctuating flows (especially those affected by discharges and/or drawdowns) but had aquatic/riparian vegetation were assigned a HV of 0.7.

Habitat Values for **TY 20** were determined as follows:

- The without project condition assumption is that by TY 20, discharges from the 91st Avenue Treatment Plant has finally been reduced to zero.

- The Cottonwood/Willow habitat-type does not change in total acreage. However, the stress to this habitat-type (from the expected increases in the Total Dissolved Solids [TDSs] of ground water and the reduced dilution of these TDSs from Treatment Plant discharges) is assumed to hinder recruitment of young C/W. The Habitat Value is predicted to drop from 1.0 to 0.8.

- The C/W - SC Mixes also do not change in total acreage. The HV of this type upstream of 115th Avenue, however, drops by 0.2 points; below 115th Avenue the HV drops only 0.1 points (because below 115th is considered a gaining Reach due to the continued increase in ground water levels during this time period).

- The HEP team felt that the increasing ground water levels and decreasing surface area of Open Water above 115th Avenue would result in the creation of an additional 14 acres of Marsh habitat (7 acres in Reaches 2 and 3, near the Gila River confluence). (Note that the 14 acres projected to be formed above 115th Avenue is based on the fact that there is a total of 13 acres of marsh below 115th Avenue.) Marsh acreage or value below 115th Ave. remains unchanged.

- Open Water in the Study Area is expected to have the following values.

  Upstream of 115th Avenue. The HV of the Gravel Pit's Open Water in the Transition Reach is expected to be unaffected by the lack of discharge from 91st Avenue (since it relies on another source of water). All Open Water in Reaches 1, 2, and 3 dries up and becomes the SC VI habitat-type. In Reach 4 (upstream of the 115th Ave. "dike"), only ½ of the surface water is expected to be converted to SC VI (because of the continued influence of ground water in that Reach). The HV of this Open Water is expected to drop 0.2 points (from 0.7 to 0.5).

  Downstream of 115th Avenue. The HV of Open Water is estimated to drop by 0.2 points due to the increased TDS level in ground water that's expected.

Habitat Values for **TY 50** were determined as follows:

- The without project condition assumption is that no discharge from the 91st Avenue Treatment Plant has occurred over the past 30 years. Dramatic changes are predicted in both the quality and quantity of most habitat-types, especially upstream of the 115th Avenue "dike". For the areas downstream of 115th Avenue, the Buckeye Irrigation District "dike" is assumed to be non-functional by TY 30. As such, habitat values and surface area of open water downstream of 115th Avenue changes. (See following discussion on "Open Water Habitat." The Habitat Values of most habitat-types in these

Reaches are expected to be affected by the increased TDSs levels in the ground water.

- No changes to the acreages or HVs of Mesquite, Desert Wash, Quailbush, or Salt Cedar III, IV, V or VI are expected during this period.

- The area of Cobble is expected to increase due to the loss of Cottonwood/Willow (C/W) and C/W - SC mixes (see below).

- The value of the C/W II habitat is expected to degrade to a 0.1 value with only about 1 acre remaining in TY 50, as no recruitment of young plants is expected to occur in the 30 years following the cessation of discharges from 91st Avenue Treatment Plant. The once C/W habitat is expected to convert to Cobble.

- The C/W - SC mixes are predicted to have similar fates, as discussed below.

  The HV of the C/W - SC II in Reach 4 is predicted to degrade to a 0.2 value and have only 1 acre remaining; the 13.5 acres that were once C/W - SC II habitat (cf. TY-20 matrix) becomes SC II habitat-type.

  For the C/W - SC III Mixture:

    Upstream of 115th Avenue (Reaches 1-4), C/W - SC III habitat is similarly reduced in value and acreage. In TY 50 the HV is predicted to drop to 0.2 and only a few acres are expected to remain. What was once a C/W - SC III mixture is expected to become Cobble in Reaches 1-3 and become the SC II type in Reach 4 (due to the Open Water that is still expected to remain behind the 115th Avenue "dike").

    Downstream of 115th Avenue (Reaches 5-7), the HV is only expected to drop to 0.6 and only ½ of the acreages is expected to be converted to the SC II habitat-type.

  For the C/W - SC IV Mixture:

    The habitat in the Transition Reach is supported by non-Treatment Plant waters and is, therefore, expected to retain ½ of its original area and drop in HV to 0.5 due to the increased TDSs levels in the ground water. The once C/W - SC IV habitat is predicted to become Cobble.

    Upstream of 115th Avenue (Reaches 1-4), the HV is predicted to drop to 0.2. Ninety percent of what was once a C/W - SC IV mixture is expected to be converted into Cobble.

    Downstream of 115th Avenue (Reaches 5-7), the same scenario as predicted for the C/W - SC III mixture applies.

The acreages of the SC II habitat-type are expected to increase as C/W and the C/W - SC mixes are expected to be converted to this type as discussed above.

No change is expected in either the acreage or the value of SC III, IV, V, or VI habitat-types.

For Open Water Habitat:

> Upstream of 115th Avenue. The value and area of Open Water in the Transition Reach and Reach 4 are expected to remain as predicted under TY-20. (The Transition Reach is expected to still be supported by non-Treatment Plant Waters and ½ of the surface area of Open Water upstream of the 115th Avenue "dike" is expected to still remain in TY-50.)
>
> Downstream of 115th Avenue. It was assumed that the buckeye irrigation district dike might be destroyed sometime between Target Year (TY) 30 and 50 (for the analysis - it will be conservatively assumed to be non-functional by TY 30). It was reasoned that, since discharge into the River stops at TY 20, the 91st Ave Treatment Plant would honor its obligation to supply water to the Irrigation District via a pipeline. As such, should the irrigation dike become damaged by a severe flood event after TY 20, the Irrigation District would be disinclined to repair it. As such it was determined that the HV would drop 0.2 points (from the TY-20 HV), and the surface water area would be only 1/3 of the original area .

HABITAT UNIT TABLES -- WITHOUT PROJECT -- TY - 0, TY - 20, TY - 50

W/O-PROJECT (TY -0)	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Hab Units																									
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Hab Units																									
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Hab Units																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Hab Units																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Hab Units																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Hab Units																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Hab Units																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Hab Units																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Hab Units																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.689
Feature																									
With-Proj Hab Units																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Hab Units																									

Qualibush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									
With-Proj Hab Units																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Hab Units																									
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																									
With-Proj Hab Units																									
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Hab Units																									
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Hab Units																									
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Hab Units																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Hab Units																									
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Hab Units																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Hab Units																									
TOTAL																									**1768.192**

W/O-PROJECT (TY-20)	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Hab Units																									
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Hab Units																									
Cottonwood/Willow II													0.8	5.5	4.4							1	0.3	0.3	4.7
Feature																									
With-Proj Hab Units																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Hab Units																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Hab Units																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Hab Units																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Hab Units																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Hab Units																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Hab Units																									
Marsh							0.7	7	4.9	0.7	7	4.9	0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	18.83
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC II													0.8	14.5	11.6										11.6
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC III				0.77	46.3	35.65	0.77	13.1	10.09	0.77	44.2	34.03	0.77	20.7	15.94	0.87	58.5	50.9	0.87	5.4	4.698	0.87	4	3.48	154.784
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC IIIB																						0.87	25.3	22.01	22.011
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willow-SC IV	0.75	25.8	19.35	0.75	31.9	23.93	0.75	21.1	15.83	0.75	14.4	10.8	0.77	11.2	8.624	0.87	37.9	32.97	0.87	5.6	4.872	0.87	97	84.39	200.759
Feature																									
With-Proj Hab Units																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Hab Units																									

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									
With-Proj Hab Units																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Hab Units																									
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																									
With-Proj Hab Units																									
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Hab Units																									
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Hab Units																									
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Hab Units																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Hab Units																									
Salt Cedar VI	0.15	64.8	9.72	0.15	16.7	2.505	0.15	73	10.95	0.15	21.8	3.27	0.15	32.8	4.92	0.15	19.9	2.985	0.15	1	0.15				34.5
Feature																									
With-Proj Hab Units																									
Open Water	0.6	46.9	28.14		13.6			63			21.8		0.5	32.8	16.4	0.7	76.3	53.41	0.5	54.3	27.15	0.5	130.4	65.2	190.3
Feature																									
With-Proj Hab Units																									
TOTAL																									**1578.622**

W/O-PROJECT (TY-50)	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Hab Units																									
Cobble	0.1	150	15	0.1	281	28.1	0.1	212	21.2	0.1	204	20.4	0.1	107	10.7	0.1	95.6	9.56	0.1	164	16.4	0.1	324	32.4	153.76
Feature																									
With-Proj Hab Units																									
Cottonwood/Willow II													0.1	1	0.1							1	0.3	0.3	0.4
Feature																									
With-Proj Hab Units																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Hab Units																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Hab Units																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Hab Units																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Hab Units																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Hab Units																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Hab Units																									
Marsh							0.7	7	4.9	0.7	7	4.9	0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	18.83
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willlow-SC II													0.2	1	0.2										0.2
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willlow-SC III							0.2	1	0.2	0.2	3	0.6	0.2	2	0.4	0.6	29	17.4	0.6	2.7	1.62	0.6	2	1.2	21.42
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willlow-SC IIIB																						0.6	12.6	7.56	7.56
Feature																									
With-Proj Hab Units																									
Mix: Cottonwood/Willlow-SC IV	0.5	13	6.5	0.2	3.1	0.62	0.2	2.1	0.42	0.2	1.4	0.28	0.2	1.1	0.22	0.6	18.9	11.34	0.6	2.8	1.68	0.6	48.5	29.1	50.16
Feature																									
With-Proj Hab Units																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Hab Units																									

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									
With-Proj Hab Units																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Hab Units																									
Salt Cedar II													0.41	32.2	13.2	0.41	56.5	23.17	0.41	5.5	2.255	0.41	64.9	26.61	65.231
Feature																									
With-Proj Hab Units																									
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Hab Units																									
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Hab Units																									
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Hab Units																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Hab Units																									
Salt Cedar VI	0.15	64.8	9.72	0.15	16.7	2.505	0.15	73	10.95	0.15	21.8	3.27	0.15	32.8	4.92	0.15	19.9	2.985	0.15	1	0.15				34.5
Feature																									
With-Proj Hab Units																									
Open Water	0.6	46.9	28.14		13.6			63			21.8		0.5	32.8	16.4	0.5	76.3	38.15	0.3	54.3	16.29	0.3	43.5	13.05	112.03
Feature																									
With-Proj Hab Units																									
TOTAL																									**1275.043**

APPENDIX 2

CALCULATIONS OF AVERAGE ANNUAL HABITAT UNITS FOR HABITAT TYPES IN THE TRES RIOS FEASIBILITY STUDY AREA - ALTERNATIVE 3.

Habitat values for this alternative was determined as follows:

- The diurnal wetland marsh is presumed to be an area with various linked "cells" which will be designed to take the seasonal/diurnal fluctuation out of the water discharges from the treatment plant. The ratio of "wet:dry" is expected to be about 80:20; the wet area would have various wetland type vegetation associated with it; the dry area would also have suitable native vegetation. The Habitat Value is estimated at 0.55, like the value assigned to the existing Hayfield Site. This HV is expected to be reached in TY 1.

- The constructed wetland marsh on the overbank is expected to have a Habitat Value of 0.7, like the value assigned to the existing marsh (i.e., w/o Project), and reach that maximum value in TY 1.

- The Open Water near the north bank is expected maintain its value of 0.7

- The Open Water near the south bank is expected to increase in size (increase by 1/4), but not in value.

- The new open water created in this Reach is expected to have a value of 0.7 (just like what already exists in Reach 2).

In River Reach 3

The Cottonwood/Willow "stringers" are proposed to be created by constructing a "V" shaped ditches which would be fed by waters from the wetlands in the overbank. The "stringers" would be planted with cottonwoods and willows and other riparian vegetation understory. It is expected to have a HV of 0.75 by TY 10, a HV of 0.9 by TY 20, and a maximum HV of 0.97 (like C/W habitat under w/o Project conditions) by TY 30.

Open Water is expected to be created by removing salt cedar from large tracts of existing salt cedar habitat and excavating gravel to ground water. The constructed Open Water habitat type is expected to be 50-80% open water and lined with marsh-like vegetation on the riverside and riparian vegetation on the upbank side. The constructed Open Water habitat type is expected to have a Habitat Value of 0.63 by TY 1 and a maximum value of 0.7 by TY 20.

In River Reach 4.

The created Open Water and the C/W "stringers" are expected to have values as

already discussed.

In River Reaches 5-7.

The Open Water habitat to be created in these River Reaches are expected to have the same value as expected for the upper Reaches (i.e., 0.63 in TY 1, and 0.7 by TY 20).

HABITAT UNIT TABLES -- ALTERNATIVE 3 -- TY - 1, TY - 10, TY - 20, TY - 30

ALTERNATIVE 3 -TY 1	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-181.4	-18.14	0.1	-76.44	-7.644													-25.784
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-7.42	-0.742	0.1	-20.01	-2.001	0.1	-13.78	-1.378	0.1	-0.4	-0.04	0.1	-0.36	-0.036				-4.197
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.689
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.42	-4.598																-4.5976

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)										0.1	-12.7	-1.27													-1.27
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-2.98	-1.222							-1.2218
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-22.08	-8.832	0.4	-35.56	-14.22	0.4	-65.6	-26.24	0.4	-22.15	-8.86	0.4	-13.32	-5.328	0.4	-2.3	-0.92	-64.404
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Change in Hab Units (+/-)							0.35	-7.04	-2.464	0.35	-5.77	-2.02	0.35	-32.14	-11.25				0.35	-39.9	-13.97	0.35	-43.6	-15.26	-44.9575
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Change in Hab Units (+/-)							0.2	-8.3	-1.66	0.2	-5.28	-1.056													-2.716
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	150.9	83.01																83.0115
Constructed Wetlands																									
Feature							Overbank WL-east cell			Overbank WL-east cells															
With-Proj Change in Hab Units (+/-)							0.7	46.89	32.82	0.7	10.07	7.049													39.872
Feature										Overbank WL-west cel			Overbank WL-west cells												
With-Proj Change in Hab Units (+/-)										0.7	16.12	11.28	0.7	64.27	44.99										56.273
Cottonwood Willow																									
Feature										Stubout															
With-Proj Change in Hab Units (+/-)										0.1	5.57	0.557													0.557
Feature							Dewatering system			Dewatering system															
With-Proj Change in Hab Units (+/-)							0.1	15.24	1.524	0.1	15.05	1.505													3.029
Feature													Riparian Cor - cell 1			Riparian Cor - cell 2									
With-Proj Change in Hab Units (+/-)													0.1	42.47	4.247	0.1	27.14	2.714							6.961
Open Water/Marsh																									
Feature							Open Water - cell 1			Open Water - cell 2			Open Water - cell 4												
With-Proj Change in Hab Units (+/-)							0.63	6.74	4.246	0.63	3.03	1.909	0.63	23.73	14.95										21.105
Feature							Open Water - cell 2			Open Water - cell 3			Open Water - cell 5												
With-Proj Change in Hab Units (+/-)							0.63	22.86	14.4	0.63	29.8	18.77	0.63	18.36	11.57										44.7426
Feature										Open Water - cell 4			Open Water - cell 6												
With-Proj Change in Hab Units (+/-)										0.63	11.85	7.466	0.63	22.96	14.46										21.9303

Feature																				Open Water -d/s cell 1			Open Water -d/s cell 4			
With-Proj Change in Hab Units (+/-)																				0.63	4.59	2.892	0.63	9.18	5.783	8.6751
Feature																				Open Water -d/s cell 2			Open Water -d/s cell 5			
With-Proj Change in Hab Units (+/-)																				0.63	6.43	4.051	0.63	45.9	28.92	32.9679
Feature																				Open Water -d/s cell 3						
With-Proj Change in Hab Units (+/-)																				0.63	2.66	1.676				1.6758
Feature																				Open Water -d/s cell 4						
With-Proj Change in Hab Units (+/-)																				0.63	30.72	19.35				19.3536
TOTAL - ALTERNATIVE 3																										**1959.198**

ALTERNATIVE 3 -TY 10	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-181.4	-18.14	0.1	-76.44	-7.644													-25.784
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-7.42	-0.742	0.1	-20.01	-2.001	0.1	-13.78	-1.378	0.1	-0.4	-0.04	0.1	-0.36	-0.036				-4.197
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.689
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.42	-4.598																-4.5976
Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491

Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)										0.1	-12.7	-1.27													-1.27
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-2.98	-1.222							-1.2218
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-22.08	-8.832	0.4	-35.56	-14.22	0.4	-65.6	-26.24	0.4	-22.15	-8.86	0.4	-13.32	-5.328	0.4	-2.3	-0.92	-64.404
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Change in Hab Units (+/-)							0.35	-7.04	-2.464	0.35	-5.77	-2.02	0.35	-32.14	-11.25				0.35	-39.9	-13.97	0.35	-43.6	-15.26	-44.9575
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Change in Hab Units (+/-)							0.2	-8.3	-1.66	0.2	-5.28	-1.056													-2.716
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	150.9	83.01																83.0115
Constructed Wetlands																									
Feature							Overbank WL-east cell			Overbank WL-east cells															
With-Proj Change in Hab Units (+/-)							0.7	46.89	32.82	0.7	10.07	7.049													39.872
Feature										Overbank WL-west cel			Overbank WL-west cells												
With-Proj Change in Hab Units (+/-)										0.7	16.12	11.28	0.7	64.27	44.99										56.273
Cottonwood Willow																									
Feature										Stubout															
With-Proj Change in Hab Units (+/-)										0.75	5.57	4.178													4.1775
Feature							Dewatering system			Dewatering system															
With-Proj Change in Hab Units (+/-)							0.75	15.24	11.43	0.75	15.05	11.29													22.7175
Feature													Riparian Cor - cell 1			Riparian Cor - cell 2									
With-Proj Change in Hab Units (+/-)													0.75	42.47	31.85	0.75	27.14	20.36							52.2075
Open Water/Marsh																									
Feature							Open Water - cell 1			Open Water - cell 2			Open Water - cell 4												
With-Proj Change in Hab Units (+/-)							0.67	6.74	4.516	0.67	3.03	2.03	0.67	23.73	15.9										22.445
Feature							Open Water - cell 2			Open Water - cell 3			Open Water - cell 5												
With-Proj Change in Hab Units (+/-)							0.67	22.86	15.32	0.67	29.8	19.97	0.67	18.36	12.3										47.5834
Feature										Open Water - cell 4			Open Water - cell 6												
With-Proj Change in Hab Units (+/-)										0.67	11.85	7.94	0.67	22.96	15.38										23.3227
Feature																			Open Water -d/s cell 1			Open Water -d/s cell 4			

With-Proj Change in Hab Units (+/-)																			0.67	4.59	3.075	0.67	9.18	6.151	9.2259
Feature																			Open Water -d/s cell 2			Open Water -d/s cell 5			
With-Proj Change in Hab Units (+/-)																			0.67	6.43	4.308	0.67	45.9	30.75	35.0611
Feature																			Open Water -d/s cell 3						
With-Proj Change in Hab Units (+/-)																			0.67	2.66	1.782				1.7822
Feature																			Open Water -d/s cell 4						
With-Proj Change in Hab Units (+/-)																			0.67	30.72	20.58				20.5824
TOTAL - ALTERNATIVE 3																									**2037.306**

ALTERNATIVE 3 -TY 20	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	**Total**
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-181.4	-18.14	0.1	-76.44	-7.644													-25.784
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-7.42	-0.742	0.1	-20.01	-2.001	0.1	-13.78	-1.378	0.1	-0.4	-0.04	0.1	-0.36	-0.036				-4.197
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.689
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.42	-4.598																-4.5976

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)										0.1	-12.7	-1.27													-1.27
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-2.98	-1.222							-1.2218
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-22.08	-8.832	0.4	-35.56	-14.22	0.4	-65.6	-26.24	0.4	-22.15	-8.86	0.4	-13.32	-5.328	0.4	-2.3	-0.92	-64.404
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																									
With-Proj Change in Hab Units (+/-)							0.35	-7.04	-2.464	0.35	-5.77	-2.02	0.35	-32.14	-11.25				0.35	-39.9	-13.97	0.35	-43.6	-15.26	-44.9575
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																									
With-Proj Change in Hab Units (+/-)							0.2	-8.3	-1.66	0.2	-5.28	-1.056													-2.716
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	150.9	83.01																83.0115
Constructed Wetlands																									
Feature							Overbank WL-east cell			Overbank WL-east cells															
With-Proj Change in Hab Units (+/-)							0.7	46.89	32.82	0.7	10.07	7.049													39.872
Feature										Overbank WL-west cel			Overbank WL-west cells												
With-Proj Change in Hab Units (+/-)										0.7	16.12	11.28	0.7	64.27	44.99										56.273
Cottonwood Willow																									
Feature										Stubout															
With-Proj Change in Hab Units (+/-)										0.9	5.57	5.013													5.013
Feature							Dewatering system			Dewatering system															
With-Proj Change in Hab Units (+/-)							0.9	15.24	13.72	0.9	15.05	13.55													27.261
Feature													Riparian Cor - cell 1			Riparian Cor - cell 2									
With-Proj Change in Hab Units (+/-)													0.9	42.47	38.22	0.9	27.14	24.43							62.649
Open Water/Marsh																									
Feature							Open Water - cell 1			Open Water - cell 2			Open Water - cell 4												
With-Proj Change in Hab Units (+/-)							0.7	6.74	4.718	0.7	3.03	2.121	0.7	23.73	16.61										23.45
Feature							Open Water - cell 2			Open Water - cell 3			Open Water - cell 5												
With-Proj Change in Hab Units (+/-)							0.7	22.86	16	0.7	29.8	20.86	0.7	18.36	12.85										49.714
Feature										Open Water - cell 4			Open Water - cell 6												
With-Proj Change in Hab Units (+/-)										0.7	11.85	8.295	0.7	22.96	16.07										24.367

Appendix G: Incremental Cost Analysis of Restoration Features

Feature																				Open Water -d/s cell 1			Open Water -d/s cell 4			
With-Proj Change in Hab Units (+/-)																				0.7	4.59	3.213	0.7	9.18	6.426	9.639
Feature																				Open Water -d/s cell 2			Open Water -d/s cell 5			
With-Proj Change in Hab Units (+/-)																				0.7	6.43	4.501	0.7	45.9	32.13	36.631
Feature																				Open Water -d/s cell 3						
With-Proj Change in Hab Units (+/-)																				0.7	2.66	1.862				1.862
Feature																				Open Water -d/s cell 4						
With-Proj Change in Hab Units (+/-)																				0.7	30.72	21.5				21.504
TOTAL - ALTERNATIVE 3																										**2060.291**

ALTERNATIVE 3 -TY 30	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-181.4	-18.14	0.1	-76.44	-7.644													-25.784
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-7.42	-0.742	0.1	-20.01	-2.001	0.1	-13.78	-1.378	0.1	-0.4	-0.04	0.1	-0.36	-0.036				-4.197
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.689
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.42	-4.598																-4.5976

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666														27.491
Feature																										
With-Proj Change in Hab Units (+/-)																										
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																										
With-Proj Change in Hab Units (+/-)										0.1	-12.7	-1.27														-1.27
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																										
With-Proj Change in Hab Units (+/-)																0.41	-2.98	-1.222								-1.2218
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature																										
With-Proj Change in Hab Units (+/-)							0.4	-22.08	-8.832	0.4	-35.56	-14.22	0.4	-65.6	-26.24	0.4	-22.15	-8.86	0.4	-13.32	-5.328	0.4	-2.3	-0.92	-64.404
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature																										
With-Proj Change in Hab Units (+/-)							0.35	-7.04	-2.464	0.35	-5.77	-2.02	0.35	-32.14	-11.25				0.35	-39.9	-13.97	0.35	-43.6	-15.26	-44.9575
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																										
With-Proj Change in Hab Units (+/-)																										
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature																										
With-Proj Change in Hab Units (+/-)							0.2	-8.3	-1.66	0.2	-5.28	-1.056														-2.716
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																										
With-Proj Change in Hab Units (+/-)																										
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																										
With-Proj Change in Hab Units (+/-)																										
Constructed Wetlands-Diurnal																										
Feature							Diurnal Wetlands																			
With-Proj Change in Hab Units (+/-)							0.55	150.9	83.01																	83.0115
Constructed Wetlands																										
Feature							Overbank WL-east cell			Overbank WL-east cells																
With-Proj Change in Hab Units (+/-)							0.7	46.89	32.82	0.7	10.07	7.049														39.872
Feature										Overbank WL-west cel			Overbank WL-west cells													
With-Proj Change in Hab Units (+/-)										0.7	16.12	11.28	0.7	64.27	44.99											56.273
Cottonwood Willow																										
Feature										Stubout																
With-Proj Change in Hab Units (+/-)										0.97	5.57	5.403														5.4029
Feature							Dewatering system			Dewatering system																
With-Proj Change in Hab Units (+/-)							0.97	15.24	14.78	0.97	15.05	14.6														29.3813
Feature													Riparian Cor - cell 1			Riparian Cor - cell 2										
With-Proj Change in Hab Units (+/-)													0.97	42.47	41.2	0.97	27.14	26.33								67.5217
Open Water/Marsh																										
Feature							Open Water - cell 1			Open Water - cell 2			Open Water - cell 4													
With-Proj Change in Hab Units (+/-)							0.7	6.74	4.718	0.7	3.03	2.121	0.7	23.73	16.61											23.45
Feature							Open Water - cell 2			Open Water - cell 3			Open Water - cell 5													
With-Proj Change in Hab Units (+/-)							0.7	22.86	16	0.7	29.8	20.86	0.7	18.36	12.85											49.714
Feature										Open Water - cell 4			Open Water - cell 6													
With-Proj Change in Hab Units (+/-)										0.7	11.85	8.295	0.7	22.96	16.07											24.367

APPENDIX 3

CALCULATIONS OF AVERAGE ANNUAL HABITAT UNITS FOR HABITAT TYPES IN THE TRES RIOS FEASIBILITY STUDY AREA - ALTERNATIVES 3.5 & 4.

The habitat values assigned to the various habitat-types remain the same as identified in Alternative 3. The amount of acerages changes and the placement of the proposed features (e.g., openwater/marsh, riparian corridors) differ, however.

HABITAT UNIT TABLES -- ALTERNATIVE 3.5 -- TY - 1, TY - 10, TY - 20, TY - 30

ALTERNATIVE 3.5 -TY 1	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-194.8	-19.48	0.1	-55.17	-5.517	0.1	-19.63	-1.963							0.1	-0.711	-0.071	-27.03
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-0.587	-0.059	0.1	-8.191	-0.819	0.1	-29.67	-2.967	0.1	-3.004	-0.3	0.1	-18.65	-1.865	0.1	-2.369	-0.237	-6.25
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.80
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)													0.4	-1.534	-0.614	0.4	-0.273	-0.109							-0.72
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.08
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.39
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.50
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.43
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.54
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.69
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.61
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.64	-4.659																-4.66

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.49
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential/Road							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-5.383	-0.538	0.1	-0.543	-0.054	0.1	-9.921	-0.992	0.1	-0.818	-0.082	0.1	-0.52	-0.052				-1.72
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.94
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-4.808	-1.971							-1.97
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157.00
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-33.62	-13.45	0.4	-54.45	-21.78	0.4	-81.18	-32.47	0.4	-18.32	-7.327	0.4	-16.44	-6.576	0.4	-2.55	-1.02	-82.63
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.85
Feature																									
With-Proj Change in Hab Units (+/-)	0.35	-4.66	-1.631	0.35	-9.547	-3.341	0.35	-15.47	-5.413	0.35	-5.257	-1.84	0.35	-23.65	-8.277	0.35	-0.033	-0.012	0.35	-66.89	-23.41	0.35	-64.42	-22.55	-66.47
Salt Cedar IVB																						0.35	4.3	1.505	1.51
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.20
Feature																									
With-Proj Change in Hab Units (+/-)	0.2	-1.844	-0.369	0.2	-0.135	-0.027							0.2	-1.7	-0.34	0.2	-2.182	-0.436							-1.17
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.60
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	184.08	101.2																101.25
Constructed Wetlands																									
Feature							Overbank WL			Overbank WL			Overbank WL												
With-Proj Change in Hab Units (+/-)							0.7	32.75	22.93	0.7	58.41	40.89	0.7	37.37	26.16										89.97
Cottonwood Willow																									
Feature	Riparian Corridor			Riparian Corridor									Riparian Corridor			Riparian Corridor			Riparian Coridor			Riparian Corridor			
With-Proj Change in Hab Units (+/-)	0.1	6.504	0.65	0.1	9.682	0.968							0.1	40.94	4.094	0.1	27.12	2.712	0.1	31.68	3.168	0.1	6.8	0.68	12.27
Open Water/Marsh																									
Feature							Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			
With-Proj Change in Hab Units (+/-)							0.63	49.675	31.3	0.63	65.2	41.08	0.63	88.97	56.05	0.63	2.318	1.46	0.63	70.82	44.61	0.63	63.25	39.85	214.35
TOTAL - ALTERNATIVE 3.5																									1993.4

ALTERNATIVE 3.5 -TY 10	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-194.8	-19.48	0.1	-55.17	-5.517	0.1	-19.63	-1.963							0.1	-0.711	-0.071	-27.03
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-0.587	-0.059	0.1	-8.191	-0.819	0.1	-29.67	-2.967	0.1	-3.004	-0.3	0.1	-18.65	-1.865	0.1	-2.369	-0.237	-6.25
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.80
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)													0.4	-1.534	-0.614	0.4	-0.273	-0.109							-0.72
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.08
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.39
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.50
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.43
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.54
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.69
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.61
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.64	-4.659																-4.66

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.49
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential/Road							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-5.383	-0.538	0.1	-0.543	-0.054	0.1	-9.921	-0.992	0.1	-0.818	-0.082	0.1	-0.52	-0.052				-1.72
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.94
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-4.808	-1.971							-1.97
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157.00
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-33.62	-13.45	0.4	-54.45	-21.78	0.4	-81.18	-32.47	0.4	-18.32	-7.327	0.4	-16.44	-6.576	0.4	-2.55	-1.02	-82.63
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.85
Feature																									
With-Proj Change in Hab Units (+/-)	0.35	-4.66	-1.631	0.35	-9.547	-3.341	0.35	-15.47	-5.413	0.35	-5.257	-1.84	0.35	-23.65	-8.277	0.35	-0.033	-0.012	0.35	-66.89	-23.41	0.35	-64.42	-22.55	-66.47
Salt Cedar IVB																						0.35	4.3	1.505	1.51
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.20
Feature																									
With-Proj Change in Hab Units (+/-)	0.2	-1.844	-0.369	0.2	-0.135	-0.027							0.2	-1.7	-0.34	0.2	-2.182	-0.436							-1.17
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.60
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	184.08	101.2																101.25
Constructed Wetlands																									
Feature							Overbank WL			Overbank WL			Overbank WL												
With-Proj Change in Hab Units (+/-)							0.7	32.75	22.93	0.7	58.41	40.89	0.7	37.37	26.16										89.97
Cottonwood Willow																									
Feature	Riparian Corridor			Riparian Corridor									Riparian Corridor			Riparian Corridor			Riparian Coridor			Riparian Corridor			
With-Proj Change in Hab Units (+/-)	0.75	6.504	4.878	0.75	9.682	7.262							0.75	40.94	30.7	0.75	27.12	20.34	0.75	31.68	23.76	0.75	6.8	5.1	92.04
Open Water/Marsh																									
Feature							Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			
With-Proj Change in Hab Units (+/-)							0.67	49.675	33.28	0.67	65.2	43.69	0.67	88.97	59.61	0.67	2.318	1.553	0.67	70.82	47.45	0.67	63.25	42.38	227.96
TOTAL - ALTERNATIVE 3.5																									**2086.8**

ALTERNATIVE 3.5 -TY 20	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-194.8	-19.48	0.1	-55.17	-5.517	0.1	-19.63	-1.963							0.1	-0.711	-0.071	-27.03
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-0.587	-0.059	0.1	-8.191	-0.819	0.1	-29.67	-2.967	0.1	-3.004	-0.3	0.1	-18.65	-1.865	0.1	-2.369	-0.237	-6.25
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.80
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)													0.4	-1.534	-0.614	0.4	-0.273	-0.109							-0.72
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.08
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.39
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.50
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.43
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.54
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.69
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.61
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.64	-4.659																-4.66

Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.49
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential/Road							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-5.383	-0.538	0.1	-0.543	-0.054	0.1	-9.921	-0.992	0.1	-0.818	-0.082	0.1	-0.52	-0.052				-1.72
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.94
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-4.808	-1.971							-1.97
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157.00
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-33.62	-13.45	0.4	-54.45	-21.78	0.4	-81.18	-32.47	0.4	-18.32	-7.327	0.4	-16.44	-6.576	0.4	-2.55	-1.02	-82.63
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.85
Feature																									
With-Proj Change in Hab Units (+/-)	0.35	-4.66	-1.631	0.35	-9.547	-3.341	0.35	-15.47	-5.413	0.35	-5.257	-1.84	0.35	-23.65	-8.277	0.35	-0.033	-0.012	0.35	-66.89	-23.41	0.35	-64.42	-22.55	-66.47
Salt Cedar IVB																						0.35	4.3	1.505	1.51
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.20
Feature																									
With-Proj Change in Hab Units (+/-)	0.2	-1.844	-0.369	0.2	-0.135	-0.027							0.2	-1.7	-0.34	0.2	-2.182	-0.436							-1.17
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.60
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	184.08	101.2																101.25
Constructed Wetlands																									
Feature							Overbank WL			Overbank WL			Overbank WL												
With-Proj Change in Hab Units (+/-)							0.7	32.75	22.93	0.7	58.41	40.89	0.7	37.37	26.16										89.97
Cottonwood Willow																									
Feature	Riparian Corridor			Riparian Corridor									Riparian Corridor			Riparian Corridor			Riparian Corridor			Riparian Corridor			
With-Proj Change in Hab Units (+/-)	0.9	6.504	5.854	0.9	9.682	8.714							0.9	40.94	36.84	0.9	27.12	24.41	0.9	31.68	28.51	0.9	6.8	6.12	110.45
Open Water/Marsh																									
Feature							Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			
With-Proj Change in Hab Units (+/-)							0.7	49.675	34.77	0.7	65.2	45.64	0.7	88.97	62.28	0.7	2.318	1.623	0.7	70.82	49.57	0.7	63.25	44.28	238.16
TOTAL - ALTERNATIVE 3.5																									2115.4

ALTERNATIVE 3.5 -TY 30	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-194.8	-19.48	0.1	-55.17	-5.517	0.1	-19.63	-1.963							0.1	-0.711	-0.071	-27.03
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-0.587	-0.059	0.1	-8.191	-0.819	0.1	-29.67	-2.967	0.1	-3.004	-0.3	0.1	-18.65	-1.865	0.1	-2.369	-0.237	-6.25
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.80
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)													0.4	-1.534	-0.614	0.4	-0.273	-0.109							-0.72
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.08
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.39
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.50
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.43
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.54
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	97	94.09	235.69
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.61
Feature																									
With-Proj Change in Hab Units (+/-)							0.28	-16.64	-4.659																-4.66

Qualibush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.49
Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential/Road							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature																									
With-Proj Change in Hab Units (+/-)							0.1	-5.383	-0.538	0.1	-0.543	-0.054	0.1	-9.921	-0.992	0.1	-0.818	-0.082	0.1	-0.52	-0.052				-1.72
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.94
Feature																									
With-Proj Change in Hab Units (+/-)																0.41	-4.808	-1.971							-1.97
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157.00
Feature																									
With-Proj Change in Hab Units (+/-)							0.4	-33.62	-13.45	0.4	-54.45	-21.78	0.4	-81.18	-32.47	0.4	-18.32	-7.327	0.4	-16.44	-6.576	0.4	-2.55	-1.02	-82.63
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.85
Feature																									
With-Proj Change in Hab Units (+/-)	0.35	-4.66	-1.631	0.35	-9.547	-3.341	0.35	-15.47	-5.413	0.35	-5.257	-1.84	0.35	-23.65	-8.277	0.35	-0.033	-0.012	0.35	-66.89	-23.41	0.35	-64.42	-22.55	-66.47
Salt Cedar IVB																						0.35	4.3	1.505	1.51
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.20
Feature																									
With-Proj Change in Hab Units (+/-)	0.2	-1.844	-0.369	0.2	-0.135	-0.027							0.2	-1.7	-0.34	0.2	-2.182	-0.436							-1.17
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.60
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	184.08	101.2																101.25
Constructed Wetlands																									
Feature							Overbank WL			Overbank WL			Overbank WL												
With-Proj Change in Hab Units (+/-)							0.7	32.75	22.93	0.7	58.41	40.89	0.7	37.37	26.16										89.97
Cottonwood Willow																									
Feature	Riparian Corridor			Riparian Corridor									Riparian Corridor			Riparian Corridor			Riparian Coridor			Riparian Corridor			
With-Proj Change in Hab Units (+/-)	0.97	6.504	6.309	0.97	9.682	9.392							0.97	40.94	39.71	0.97	27.12	26.3	0.97	31.68	30.73	0.97	6.8	6.596	119.04
Open Water/Marsh																									
Feature							Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			Open Water/Marsh			
With-Proj Change in Hab Units (+/-)							0.7	49.675	34.77	0.7	65.2	45.64	0.7	88.97	62.28	0.7	2.318	1.623	0.7	70.82	49.57	0.7	63.25	44.28	238.16
TOTAL - ALTERNATIVE 3.5																									2124.0

HABITAT UNIT TABLES -- ALTERNATIVE 4 -- TY - 1, TY - 10, TY - 20, TY - 30

ALTERNATIVE 4 - TY 1	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	Total
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature							Diur/OB Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-196.1	-19.61				0.1	-31	-3.1										-22.71
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature							OB Wetlands/OW-M			C-W/OW-M/South			OBWet/OWM/South						CW Stringers						
With-Proj Change in Hab Units (+/-)							0.1	-27.9	-2.79	0.1	-84	-8.4	0.1	-34.3	-3.43				0.1	-14.9	-1.49				-16.11
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	94.6	91.76	233.361
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature							Diur/OB Wetlands																		
With-Proj Change in Hab Units (+/-)							0.28	-16.78	-4.698																-4.6984
Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491

Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature							Overbank Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-8	-0.8				0.1	-10.3	-1.03										-1.83
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																CW Stringers									
With-Proj Change in Hab Units (+/-)																0.41	-4.7	-1.927							-1.927
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature							Southside OW-M			Southside OW-M			OW-M/Southsd OW			CW stringers			CW stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.4	-45.2	-18.08	0.4	-29.7	-11.88	0.4	-39.9	-15.96	0.4	-5.1	-2.04	0.4	-8.7	-3.48	0.4	-0.5	-0.2	-51.64
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature							OW-M/southside			OW-M/Southside			C-W stringers						CW Stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.35	-16.8	-5.88	0.35	-60	-21	0.35	-14.5	-5.075				0.35	-45.4	-15.89	0.35	-52.3	-18.31	-66.15
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature							Southside OW-M			OW-M			OW-M			CW Stringers			CW stringers						
With-Proj Change in Hab Units (+/-)							0.2	-0.1	-0.02	0.2	-10.64	-2.128	0.2	-3.66	-0.732	0.2	-0.4	-0.08	0.2	-19.3	-3.86				-6.82
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	107.8	59.29																59.29
Constructed Wetlands																									
Feature							Overbank Wetlands			Overbank Wetlands			Overbank Wetlands												
With-Proj Change in Hab Units (+/-)							0.7	107.8	75.46	0.7	61.5	43.05	0.7	52.8	36.96										155.47
Feature																									
With-Proj Change in Hab Units (+/-)																									
Cottonwood Willow																									
Feature										C/W Stringer Cel 1E			C/W Stringer Cel 2E						C/W Stringer Cel 3W			C/W Stringer Cel 5W			
With-Proj Change in Hab Units (+/-)										0.1	56	5.6	0.1	14.5	1.45				0.1	20.2	2.02	0.1	4.6	0.46	9.53
Feature							Southside CW (C1)			Southside CW (C1)			Southside CW (C2)						C/W Stringer Cel 4W			C/W Stringer Cel 6W			
With-Proj Change in Hab Units (+/-)							0.1	40	4	0.1	26.7	2.67	0.1	24.6	2.46				0.1	23.8	2.38	0.1	9.2	0.92	12.43
Feature																			C/W Stringer Cel 5-6			C/W Stringer Cel 7-8			
With-Proj Change in Hab Units (+/-)																			0.1	25	2.5	0.1	39	3.9	6.4
Open Water/Marsh																									
Feature							Open W/M Cell 1																		
With-Proj Change in Hab Units (+/-)							0.63	38.3	24.13																24.129
Feature										Open W/M Cell 2															
With-Proj Change in Hab Units (+/-)										0.63	49.93	31.46													31.4559
Feature										Open W/M Cell 3			Open W/M Cell 3												
With-Proj Change in Hab Units (+/-)										0.63	35.67	22.47	0.63	12.9	8.127										30.5991
Feature													Open W/M Cell 4												
With-Proj Change in Hab Units (+/-)													0.63	31	19.53										19.53

Feature													Open W/M Cell 5														
With-Proj Change in Hab Units (+/-)													0.63	27.6	17.39												17.388
Feature																											
With-Proj Change in Hab Units (+/-)																											
Feature																											
With-Proj Change in Hab Units (+/-)																											
TOTAL - ALTERNATIVE 4																											**1960.20**

ALTERNATIVE 4 - TY 10	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	**Total**
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature							Diur/OB Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-196.1	-19.61				0.1	-31	-3.1										-22.71
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature							OB Wetlands/OW-M			C-W/OW-M/South			OBWet/OWM/South						CW Stringers						
With-Proj Change in Hab Units (+/-)							0.1	-27.9	-2.79	0.1	-84	-8.4	0.1	-34.3	-3.43				0.1	-14.9	-1.49				-16.11
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	94.6	91.76	233.361
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature							Diur/OB Wetlands																		
With-Proj Change in Hab Units (+/-)							0.28	-16.78	-4.698																-4.6984
Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491
Feature																									

With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature							Overbank Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-8	-0.8				0.1	-10.3	-1.03										-1.83
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																CW Stringers									
With-Proj Change in Hab Units (+/-)																0.41	-4.7	-1.927							-1.927
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature							Southside OW-M			Southside OW-M			OW-M/Southsd OW			CW stringers			CW stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.4	-45.2	-18.08	0.4	-29.7	-11.88	0.4	-39.9	-15.96	0.4	-5.1	-2.04	0.4	-8.7	-3.48	0.4	-0.5	-0.2	-51.64
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature							OW-M/southside			OW-M/Southside			C-W stringers						CW Stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.35	-16.8	-5.88	0.35	-60	-21	0.35	-14.5	-5.075				0.35	-45.4	-15.89	0.35	-52.3	-18.31	-66.15
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature							Southside OW-M			OW-M			OW-M			CW Stringers			CW stringers						
With-Proj Change in Hab Units (+/-)							0.2	-0.1	-0.02	0.2	-10.64	-2.128	0.2	-3.66	-0.732	0.2	-0.4	-0.08	0.2	-19.3	-3.86				-6.82
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	107.8	59.29																59.29
Constructed Wetlands																									
Feature							Overbank Wetlands			Overbank Wetlands			Overbank Wetlands												
With-Proj Change in Hab Units (+/-)							0.7	107.8	75.46	0.7	61.5	43.05	0.7	52.8	36.96										155.47
Feature																									
With-Proj Change in Hab Units (+/-)																									
Cottonwood Willow																									
Feature										C/W Stringer Cel 1E			C/W Stringer Cel 2E						C/W Stringer Cel 3W			C/W Stringer Cel 5W			
With-Proj Change in Hab Units (+/-)										0.75	56	42	0.75	14.5	10.9				0.75	20.2	15.15	0.75	4.6	3.45	71.475
Feature							Southside CW (C1)			Southside CW (C1)			Southside CW (C2)						C/W Stringer Cel 4W			C/W Stringer Cel 6W			
With-Proj Change in Hab Units (+/-)							0.75	40	30	0.75	26.7	20.03	0.75	24.6	18.45				0.75	23.8	17.85	0.75	9.2	6.9	93.225
Feature																			C/W Stringer Cel 5-6			C/W Stringer Cel 7-8			
With-Proj Change in Hab Units (+/-)																			0.75	25	18.75	0.75	39	29.25	48
Open Water/Marsh																									
Feature							Open W/M Cell 1																		
With-Proj Change in Hab Units (+/-)							0.67	38.3	25.66																25.661
Feature										Open W/M Cell 2															
With-Proj Change in Hab Units (+/-)										0.67	49.93	33.45													33.4531
Feature										Open W/M Cell 3			Open W/M Cell 3												
With-Proj Change in Hab Units (+/-)										0.67	35.67	23.9	0.67	12.9	8.643										32.5419
Feature													Open W/M Cell 4												
With-Proj Change in Hab Units (+/-)													0.67	31	20.77										20.77
Feature													Open W/M Cell 5												

With-Proj Change in Hab Units (+/-)													0.67	27.6	18.49											18.492
Feature																										
With-Proj Change in Hab Units (+/-)																										
Feature																										
With-Proj Change in Hab Units (+/-)																										
TOTAL - ALTERNATIVE 4																										**2152.36**

ALTERNATIVE 4 - TY 20	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	**Total**
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature							Diur/OB Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-196.1	-19.61				0.1	-31	-3.1										-22.71
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature							OB Wetlands/OW-M			C-W/OW-M/South			OBWet/OWM/South						CW Stringers						
With-Proj Change in Hab Units (+/-)							0.1	-27.9	-2.79	0.1	-84	-8.4	0.1	-34.3	-3.43				0.1	-14.9	-1.49				-16.11
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	94.6	91.76	233.361
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature							Diur/OB Wetlands																		
With-Proj Change in Hab Units (+/-)							0.28	-16.78	-4.698																-4.6984
Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491

Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature							Overbank Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-8	-0.8				0.1	-10.3	-1.03										-1.83
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																CW Stringers									
With-Proj Change in Hab Units (+/-)																0.41	-4.7	-1.927							-1.927
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature							Southside OW-M			Southside OW-M			OW-M/Southsd OW			CW stringers			CW stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.4	-45.2	-18.08	0.4	-29.7	-11.88	0.4	-39.9	-15.96	0.4	-5.1	-2.04	0.4	-8.7	-3.48	0.4	-0.5	-0.2	-51.64
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature							OW-M/southside			OW-M/Southside			C-W stringers						CW Stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.35	-16.8	-5.88	0.35	-60	-21	0.35	-14.5	-5.075				0.35	-45.4	-15.89	0.35	-52.3	-18.31	-66.15
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature							Southside OW-M			OW-M			OW-M			CW Stringers			CW stringers						
With-Proj Change in Hab Units (+/-)							0.2	-0.1	-0.02	0.2	-10.64	-2.128	0.2	-3.66	-0.732	0.2	-0.4	-0.08	0.2	-19.3	-3.86				-6.82
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	107.8	59.29																59.29
Constructed Wetlands																									
Feature							Overbank Wetlands			Overbank Wetlands			Overbank Wetlands												
With-Proj Change in Hab Units (+/-)							0.7	107.8	75.46	0.7	61.5	43.05	0.7	52.8	36.96										155.47
Feature																									
With-Proj Change in Hab Units (+/-)																									
Cottonwood Willow																									
Feature										C/W Stringer Cel 1E			C/W Stringer Cel 2E						C/W Stringer Cel 3W			C/W Stringer Cel 5W			
With-Proj Change in Hab Units (+/-)										0.9	56	50.4	0.9	14.5	13.1				0.9	20.2	18.18	0.9	4.6	4.14	85.77
Feature							Southside CW (C1)			Southside CW (C1)			Southside CW (C2)						C/W Stringer Cel 4W			C/W Stringer Cel 6W			
With-Proj Change in Hab Units (+/-)							0.9	40	36	0.9	26.7	24.03	0.9	24.6	22.14				0.9	23.8	21.42	0.9	9.2	8.28	111.87
Feature																			C/W Stringer Cel 5-6			C/W Stringer Cel 7-8			
With-Proj Change in Hab Units (+/-)																			0.9	25	22.5	0.9	39	35.1	57.6
Open Water/Marsh																									
Feature							Open W/M Cell 1																		
With-Proj Change in Hab Units (+/-)							0.7	38.3	26.81																26.81
Feature										Open W/M Cell 2															
With-Proj Change in Hab Units (+/-)										0.7	49.93	34.95													34.951
Feature										Open W/M Cell 3			Open W/M Cell 3												
With-Proj Change in Hab Units (+/-)										0.7	35.67	24.97	0.7	12.9	9.03										33.999
Feature													Open W/M Cell 4												
With-Proj Change in Hab Units (+/-)													0.7	31	21.7										21.7

Feature													Open W/M Cell 5														
With-Proj Change in Hab Units (+/-)													0.7	27.6	19.32												19.32
Feature																											
With-Proj Change in Hab Units (+/-)																											
Feature																											
With-Proj Change in Hab Units (+/-)																											
TOTAL - ALTERNATIVE 4																											**2200.76**

ALTERNATIVE 4 - TY 30	Transition 75th-83rd			Reach 1 83rd-91st			Reach 2 91st-99th			Reach 3 99th-107th			Reach 4 107th-115th			Reach 5 115th-El Mirage			Reach 6 El Mirage-Dysart			Reach 7 Dysart-Bullard			
Habitat Type	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreag	Units	HSI	Acreage	Units	**Total**
Agriculture							0.1	267.9	26.79	0.1	200	20	0.1	235.7	23.57	0.1	174.1	17.41	0.1	178.2	17.82	0.1	116.5	11.65	117.24
Feature							Diur/OB Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-196.1	-19.61				0.1	-31	-3.1										-22.71
Cobble	0.1	136.6	13.66	0.1	206.8	20.68	0.1	180.6	18.06	0.1	149.5	14.95	0.1	92.7	9.27	0.1	95.6	9.56	0.1	163.8	16.38	0.1	236.9	23.69	126.25
Feature							OB Wetlands/OW-M			C-W/OW-M/South			OBWet/OWM/South						CW Stringers						
With-Proj Change in Hab Units (+/-)							0.1	-27.9	-2.79	0.1	-84	-8.4	0.1	-34.3	-3.43				0.1	-14.9	-1.49				-16.11
Cottonwood/Willow II													1	5.5	5.5							1	0.3	0.3	5.8
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert													0.4	4.5	1.8	0.4	13.2	5.28				0.4	127	50.8	57.88
Feature																									
With-Proj Change in Hab Units (+/-)																									
Desert Wash																						0.4	5.9	2.36	2.36
Feature																									
With-Proj Change in Hab Units (+/-)																									
Gravel Mine							0.1	17.2	1.72																1.72
Feature																									
With-Proj Change in Hab Units (+/-)																									
Hayfield Wetland				0.55	16.5	9.075																			9.075
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite IV	0.8	6	4.8	0.8	12.5	10													0.8	20.3	16.24	0.8	106.4	85.12	116.16
Feature																									
With-Proj Change in Hab Units (+/-)																									
Honey-Mesquite V	0.78	11.6	9.048	0.78	3	2.34																			11.388
Feature																									
With-Proj Change in Hab Units (+/-)																									
Marsh													0.7	2.6	1.82	0.7	3.4	2.38	0.7	0.6	0.42	0.7	6.3	4.41	9.03
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC II													1	14.5	14.5										14.5
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC III				0.97	46.3	44.91	0.97	13.1	12.71	0.97	44.2	42.87	0.97	20.7	20.08	0.97	58.5	56.75	0.97	5.4	5.238	0.97	4	3.88	186.434
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IIIB																						0.97	25.3	24.54	24.541
Feature																									
With-Proj Change in Hab Units (+/-)																									
Mix: Cottonwood/Willlow-SC IV	0.95	25.8	24.51	0.95	31.9	30.31	0.95	21.1	20.05	0.95	14.4	13.68	0.97	11.2	10.86	0.97	37.9	36.76	0.97	5.6	5.432	0.97	94.6	91.76	233.361
Feature																									
With-Proj Change in Hab Units (+/-)																									
Quailbush/saltbush	0.28	31.5	8.82	0.28	53.8	15.06	0.28	37	10.36										0.28	37.8	10.58	0.28	13.5	3.78	48.608
Feature							Diur/OB Wetlands																		
With-Proj Change in Hab Units (+/-)							0.28	-16.78	-4.698																-4.6984
Quailbush/saltbush-SC				0.37	19.1	7.067	0.37	53.4	19.76	0.37	1.8	0.666													27.491

Feature																									
With-Proj Change in Hab Units (+/-)																									
Residential							0.1	37.7	3.77	0.1	27.2	2.72	0.1	35.2	3.52	0.1	93.8	9.38	0.1	4.3	0.43	0.1	6.6	0.66	20.48
Feature							Overbank Wetlands						OB Wetlands												
With-Proj Change in Hab Units (+/-)							0.1	-8	-0.8				0.1	-10.3	-1.03										-1.83
Salt Cedar II																0.41	7.8	3.198				0.41	1.8	0.738	3.936
Feature																CW Stringers									
With-Proj Change in Hab Units (+/-)																0.41	-4.7	-1.927							-1.927
Salt Cedar III							0.4	68.1	27.24	0.4	128.6	51.44	0.4	111.7	44.68	0.4	25.3	10.12	0.4	32.9	13.16	0.4	25.9	10.36	157
Feature							Southside OW-M			Southside OW-M			OW-M/Southsd OW			CW stringers			CW stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.4	-45.2	-18.08	0.4	-29.7	-11.88	0.4	-39.9	-15.96	0.4	-5.1	-2.04	0.4	-8.7	-3.48	0.4	-0.5	-0.2	-51.64
Salt Cedar IV	0.35	62.7	21.95	0.35	54	18.9	0.35	39.5	13.83	0.35	13	4.55	0.35	31.4	10.99	0.35	6.2	2.17	0.35	208.6	73.01	0.35	141.3	49.46	194.845
Feature							OW-M/southside			OW-M/Southside			C-W stringers						CW Stringers			CW Stringers			
With-Proj Change in Hab Units (+/-)							0.35	-16.8	-5.88	0.35	-60	-21	0.35	-14.5	-5.075				0.35	-45.4	-15.89	0.35	-52.3	-18.31	-66.15
Salt Cedar IVB																						0.35	4.3	1.505	1.505
Feature																									
With-Proj Change in Hab Units (+/-)																									
Salt Cedar V	0.2	24.5	4.9	0.2	43.8	8.76	0.2	21.8	4.36	0.2	42.3	8.46	0.2	6.1	1.22	0.2	16.2	3.24				0.2	71.3	14.26	45.2
Feature							Southside OW-M			OW-M			OW-M			CW Stringers			CW stringers						
With-Proj Change in Hab Units (+/-)							0.2	-0.1	-0.02	0.2	-10.64	-2.128	0.2	-3.66	-0.732	0.2	-0.4	-0.08	0.2	-19.3	-3.86				-6.82
Salt Cedar VI	0.15	64.8	9.72	0.15	8.3	1.245	0.15	10	1.5							0.15	19.9	2.985	0.15	1	0.15				15.6
Feature																									
With-Proj Change in Hab Units (+/-)																									
Open Water	0.6	46.9	28.14	0.3	13.6	4.08	0.7	63	44.1	0.7	21.8	15.26	0.7	65.6	45.92	0.9	76.3	68.67	0.7	54.3	38.01	0.7	130.4	91.28	335.46
Feature																									
With-Proj Change in Hab Units (+/-)																									
Constructed Wetlands-Diurnal																									
Feature							Diurnal Wetlands																		
With-Proj Change in Hab Units (+/-)							0.55	107.8	59.29																59.29
Constructed Wetlands																									
Feature							Overbank Wetlands			Overbank Wetlands			Overbank Wetlands												
With-Proj Change in Hab Units (+/-)							0.7	107.8	75.46	0.7	61.5	43.05	0.7	52.8	36.96										155.47
Feature																									
With-Proj Change in Hab Units (+/-)																									
Cottonwood Willow																									
Feature										C/W Stringer Cel 1E			C/W Stringer Cel 2E						C/W Stringer Cel 3W			C/W Stringer Cel 5W			
With-Proj Change in Hab Units (+/-)										0.97	56	54.32	0.97	14.5	14.1				0.97	20.2	19.59	0.97	4.6	4.462	92.441
Feature							Southside CW (C1)			Southside CW (C1)			Southside CW (C2)						C/W Stringer Cel 4W			C/W Stringer Cel 6W			
With-Proj Change in Hab Units (+/-)							0.97	40	38.8	0.97	26.7	25.9	0.97	24.6	23.86				0.97	23.8	23.09	0.97	9.2	8.924	120.571
Feature																			C/W Stringer Cel 5-6			C/W Stringer Cel 7-8			
With-Proj Change in Hab Units (+/-)																			0.97	25	24.25	0.97	39	37.83	62.08
Open Water/Marsh																									
Feature							Open W/M Cell 1																		
With-Proj Change in Hab Units (+/-)							0.7	38.3	26.81																26.81
Feature										Open W/M Cell 2															
With-Proj Change in Hab Units (+/-)										0.7	49.93	34.95													34.951
Feature										Open W/M Cell 3			Open W/M Cell 3												
With-Proj Change in Hab Units (+/-)										0.7	35.67	24.97	0.7	12.9	9.03										33.999
Feature													Open W/M Cell 4												
With-Proj Change in Hab Units (+/-)													0.7	31	21.7										21.7

Appendix G

Incremental Cost Analysis of Restoration Features

Appendix F, "Habitat Evaluation," presents the results of the ecosystem output analysis for the proposed alternatives based on differences between the without- and with-project conditions. Appendix G, "Incremental Cost Analysis of Restoration Features," uses the quantified ecosystem output information from Appendix F to investigate the incremental justification of the alternatives on a feature-by-feature basis using the computer model, IWR-PLAN, as described below.

For ecosystem restoration projects, economic analysis consists of comparing the cost of alternatives to their relative output of habitat units. Each alternative and each component within an alternative increases the overall output of habitat values compared to the No Action Plan (future, without-project condition). The analysis uses the increase in habitat values in which relative Habitat Suitability Indices (HSIs) were identified for various habitat types. The habitat types that would be restored and created within the study area (for example, open water/marsh, cottonwood-willow riparian, constructed wetlands) result in HSIs of 0.7 to 0.97 compared to HSIs for existing habitat (for example, salt cedar, cobble, mesquite) of 0.1-0.4. The increased habitat output, by component, is then incrementally compared to the incremental cost of its implementation.

The data for Alternative 3.5 (with- and without-GRIC land) are summarized in the tables below. These table incorporate cost data and habitat output data from the IWR-PLAN model to reflect the economics of the selected plan (these tables are also reproduced as Table 5.10 and 5.11 in the Main Report). Column headings are as follows:

- *Increased Habitat Units (HU's) of Individual Features* - represents the habitat output of each plan feature as determined by the HEP analysis discussed in Appendix F, "Habitat Evaluation."

- *Cost of Individual Features* - represents the cost of each plan feature as presented in Appendix D, "Design and Costs," as well as the cost tables within this appendix.

- *Incremental Cost per Output* - represents the cost of each individual plan feature divided by its individual habitat output. This yields the incremental cost per habitat unit for each successively added plan feature. By definition, the first added increments are more economically justified.

Incremental Cost of Alternative 3.5 - Target Year 50

Plan Components	Increased Habitat Units (HUs) of Individual Features	Cost ($ 1000) of Individual Features	Incremental Cost per Output ($ 1000/HU)	Cumulative Incremental Output (HU's)	Cumulative Cost ($ 1000)	Average Cost ($ 1000/HU) of Cumulative Features
Independent Riparian Corridors	47	5,925	126	47	5,925	126
Add: Pump-Diurnal Wetlands	80	25,908	226	204	41,463	203
Add: Overbank Wetlands	77	9,631				
Add: Dewatering System and South O/W Marsh	77	19,483	253	281	60,946	217
Add: North Open Water Marsh	50	10,458	263	356	80,631	227
Add: Pipeline and North Riparian Corridors	25	9,228				
Subtotal	356	80,631		356	80,631	
Degradation Preventions Benefits [1]	493			493		
TOTAL	**849**	**80,631**	**n/a**	**849**	**80,631**	**95**

Notes: [1] These are additional benefits due to the prevention of degradation at Target Year 50 that would otherwise occur if there were no project. This degradation would occur to habitat that is adjacent to proposed features.

Incremental Cost of Alternative 3.5 (No GRIC Land) - Target Year 50

Plan Components	Increased Habitat Units (HUs) of Individual Features	Cost ($ 1000) of Individual Features	Incremental Cost per Output ($ 1000/HU)	Cumulative Incremental Output (HU's)	Cumulative Cost ($ 1000)	Average Cost ($ 1000/HU) of Cumulative Features
Independent Riparian Corridors	47	5,925	126	47	5,925	126
Add: Pump-Diurnal Wetlands	80	25,908	226	204	41,463	203
Add: Overbank Wetlands	77	9,228				
Add: North Open Water Marsh	50	10,458	263	279	61,149	219
Add: Pipeline and North Riparian Corridors	25	9,228				
Subtotal	279	61,149		279	61,149	
Degradation Preventions Benefits [1]	493			493		
TOTAL	**772**	**61,149**	**n/a**	**772**	**61,149**	**79**

Notes: [1] These are additional benefits due to the prevention of degradation at Target Year 50 that would otherwise occur if there were no project. This degradation would occur to habitat that is adjacent to proposed features.

- *Cumulative Incremental Output* - represents the cumulative addition of each successive plan feature's habitat output.

- *Cumulative Cost* - represents the cumulative addition of each successive plan feature's cost.

- *Average Cost of Cumulative Features* - represents the average cost per habitat unit at each successive addition of an individual plan feature.

The information developed and modeled by IWR-PLAN helps in ranking the individual features of the plan for the purpose of identifying their incremental justification. As discussed below under "Procedures for Decision Making," this information can be used when there are budgetary and/or restoration target constraints on formulation.

Once the overall costs per habitat output are incrementally determined for each plan feature, another category of benefits may be considered in order to get a more realistic average cost per output for the overall plan. This category of benefits is termed "degradation-prevention benefits," and they take into consideration the degradation that would occur to the entire study area if the project is not implemented. Degradation-prevention benefits are calculated by comparing the without-project conditions at target years 1, 20, and 50. According to the Habitat Evaluation provided in the Habitat Evaluation appendix, this degradation would be prevented by implementing the project. Degradation-prevention benefits are calculated to be 190 Habitat Units at target year 20, and 493 Habitat Units at target year 50.

As displayed in the main report, the restoration benefits for Alternative 3.5—including the degradation-prevention benefits—averaged over the three target years total 631 habitat units. Using the *total first cost* of restoration equal to $80,631,229 results in an average cost per habitat unit of $127,874. Using the *average annual cost* of restoration equal to $ 8,069,000 results in an average annual cost per habitat unit of $ 12,788.

The restoration benefits for Alternative 3.5 (Without-GRIC Land)—including the degradation-prevention benefits—averaged over the three target years total 560 habitat units. Using the *total first cost* of restoration equal to $61,148,644 results in an average cost per habitat unit of $109,272. Using the *average annual cost* of restoration equal to $6,536,000 results in an average annual cost per habitat unit of $11,671.

IWR-PLAN

Due to the complexity of the analysis procedure, especially with combinable, non-combinable, dependable, and non-dependable components of each alternative, the IWR-PLAN Decision Support System was used. IWR-PLAN, developed by the Institute of Water Resources of the U.S. Corps of Engineers, is a Decision Support System that performs incremental analysis. It was used to identify the most cost-effective combinations of components and the best buys for the whole possible range of outputs of habitat units and associated costs. ***Cost-effective combinations*** incur the least cost for the same output of habitat units. ***Best buy combinations*** give the least incremental increase in cost per incremental increase in output of habitat units.

Data Sheet Attachments

The accompanying data sheets represent IWR-PLAN output for three alternatives measures: Alternatives 3, 4, and 3.5. Alternative 3.5 was evaluated with- and without-the GRIC land. The first two alternatives used preliminary construction cost input which differs from the more detailed, up-to-date cost input used in Alternative 3.5. The incremental cost analysis was evaluated for Alternatives 3 & 4 at Target Year 50, whereas for Alternative 3.5 (with- and without-GRIC land), it was evaluated for Target Years 1, 20, and 50.

The data sheets consist of the following information for Alternatives 3, 4, and 3.5 (Target Years 1, 20, and 50 as applicable):

- Increased (Net) habitat values calculations (spreadsheets)
- Incremental Cost Analysis input data tables (spreadsheets)
- Incremental Cost Analysis input data (IWR-PLAN output)
- Cost effective combinations average cost data (IWR-PLAN output)
- Best buy combinations average cost data (IWR-PLAN output)
- Best buy combinations incremental cost analysis data (IWR-PLAN output)
- Combined cost effective & best buy graph (IWR-PLAN output)
- Best buy graph (IWR-PLAN output)

The best buy tables begin with the most cost effective components on a cost per habitat unit basis. The actual costs differ among the alternatives due to the relative size differences among the components and their locations.

For alternative 3, the most cost effective component, at target year 50, on a cost per habitat unit basis is the independent riparian corridors. This is followed by the wetlands system, the riparian corridors & overbank side drains, the de-watering system & south open water marsh, and then the independent north open water marsh.

For alternative 4, the most cost effective component, at target year 50, on a cost per habitat unit basis is the de-watering system riparian corridors. This is followed by the wetlands system, the pipeline & north riparian corridors, the independent riparian corridors, and then the independent open water marsh in river.

For alternative 3.5 (with-GRIC land), the most cost effective component, at target year 50, on a cost per habitat unit basis is the independent riparian corridors. This is followed by the wetlands system, the de-watering system & south open water marsh, and then the north open water marsh with the pipeline & north riparian corridors.

For alternative 3.5 (without-GRIC land), the most cost effective component, at target year 50, on a cost per habitat unit basis is the independent riparian corridors. This is followed by the wetlands system, and then the north open water marsh with the pipeline & north riparian corridors

Options that exist within the IWR-PLAN program allows modification of the combination scenarios. For example, *constraints* can be applied to either the cost or habitat unit variables to screen out those plans that do not meet a minimum output target, for example, or exceed a maximum cost limit. *Sensitivities* can be applied to either cost or habitat variables to investigate the impacts of the cost or output estimates being higher or lower by some percentage. Individual solutions categories can be *excluded* from any given run to investigate how the set of cost effective or best buy plans might change. *Plans of interest*, for example an interest group's preferred plan, can be tagged and labeled so that it is not screened from the analysis and can be compared to the cost effective and best buy sets. Finally, *automated edits* can be applied to account for non-additive effects such as synergisms when two or more solutions employed together yield greater habitat values than the additive total of the two solutions employed singly.

Procedures for Decision Making

Incremental analysis is a very powerful tool for decision making for ecosystem restoration projects. Once the appropriate input categories and values are modeled, decision making for selecting the best appropriate plan is simply a matter of understanding the cost effectiveness of

the various components of the analyzed plans. Selection of a plan may fall into the following four categories which show the constraints on the degree of restoration and the corresponding selection criteria.

Restoration Constraint		Selection Criteria	Discussion
1	specified available budget	cost effectiveness at the target budget	a cost-effective plan which satisfies the specified available budget may be identified from IWR-PLAN output; the corresponding increase in habitat units may then be identified
2	specified target increase in habitat units	habitat output; no budget constraint	a cost-effective plan which satisfies the target increase in habitat units may be identified from IWR-PLAN output; the corresponding budget may then be identified
3	range of available budget	best buy plans within the target range	a best buy plan which satisfies the given range of available budget may be identified from IWR-PLAN output; the corresponding increase in habitat units may then be identified
4	range of target increase in habitat units	range of desired habitat output; no budget constraint	a best buy plan which satisfies the given range of increase in habitat units may be identified from IWR-PLAN output; the corresponding budget range may then be identified

The selection criteria and decision-making categories in the table above would become useful when considering the Tres Rios Ecosystem Restoration project in relation to other competing projects on a federal, state, and municipal level. Plan selection could depend upon the availability of funds and/or desire for a high output restoration project. The selection criteria above along with IWR-PLAN decision tools could help identify appropriate measures in response to the priorities of the approving administration.

Alternative 3 Results

Increased (Net) habitat values calculations (spreadsheets)
Target Year 50
Incremental Cost Analysis input data tables (spreadsheets)
Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Alternative 3
Habitat Suitability Indices

Replaced Habitats in Alternative 3	Existing Conditions Habitat Acres to be replaced by features						
	H S I	A	B	C	D	E	F
Road	0.10				0.84		
Residential	0.10		12.70				
Agriculture	0.10	168.00	117.85	1.08			
Desert	0.40						
Marsh	N/A						
Water	N/A						
Cottonwood-Willow II	N/A						
Salt Cedar II	0.41				4.81		
Salt Cedar III	0.40				17.71	15.62	123.24
Salt Cedar IV	0.35				23.68	83.50	12.81
Salt Cedar V	0.20				2.02		13.58
Mix: Cottonwood-Willow/Salt Cedar II	N/A						
Mix: Cottonwood-Willow/Salt Cedar III	N/A						
Mix: Cottonwood-Willow/Salt Cedar IV	N/A						
Cobble	0.10		6.89	4.49	19.90	0.36	23.99
Quailbush-Saltbush	0.28	16.08	4.40				
Replaced Habitat Units (R-HU)		**21.30**	**14.98**	**0.56**	**19.82**	**35.51**	**58.89**

Replaced habitats would have changed in acreages or "H S I" without the project.
Neigboring habitats would have also changed in acreages or "H S I" without the project.
Some of the "H S I" values for the neighboring habitats change by reach.
Therefore Total Habitat Units for the Without-Project conditions have to be compared.

Habitat Suitability Indices (With Project)

ID	New Features	Target Year 1		Target Year 20		Target Year 50	
		Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**						
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**						
	Overbank Wetlands	141.84	0.70	141.84	0.70	141.84	0.70
C	**Riparian Corridors & Side Drains**						
	C/W Riparian Corridors	5.57	0.10	5.57	0.90	5.57	0.97
D	**Independent Riparian Corridors**						
	C/W Riparian Corridors	68.96	0.10	68.96	0.90	68.96	0.97
E	**North Open Water Marsh**						
	Openwater Marsh	99.48	0.63	99.48	0.70	99.48	0.70
F	**Dewatering System & South O/W Marsh**						
	C/W Riparian Corridors	30.29	0.10	30.29	0.90	30.29	0.97
	Openwater Marsh	143.33	0.63	143.33	0.70	143.33	0.70

W-P (With Project), W/0-P (Without Project)

Total Habitat Units in Study Area	Target Year 1		Target Year 20		Target Year 50	
	W/O-P	W-P	W/O-P	W-P	W/O-P	W-P
Total Habitat Units	**1768.19**	**1981.12**	**1578.62**	**2081.97**	**1275.043**	**2089.30**
Deviation from W/O-P at Target Year 1	0.00	212.92	-189.57	313.77	-493.15	321.11
Study Area Total Net Habitat Units W-P	**212.92**		**503.34**		**814.26**	

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features Habitat Units	Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**	**101.25**	**HU**	**101.25**	**HU**	**101.25**	**HU**
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**	**99.29**	**HU**	**99.29**	**HU**	**99.29**	**HU**
	Overbank Wetlands	141.84	0.70	141.84	0.70	141.84	0.70
C	**Riparian Corridors & Side Drains**	**0.56**	**HU**	**5.01**	**HU**	**5.40**	**HU**
	C/W Riparian Corridors	5.57	0.10	5.57	0.90	5.57	0.97
D	**Independent Riparian Corridors**	**6.90**	**HU**	**62.06**	**HU**	**66.89**	**HU**
	C/W Riparian Corridors	68.96	0.10	68.96	0.90	68.96	0.97
E	**North Open Water Marsh**	**62.67**	**HU**	**69.64**	**HU**	**69.64**	**HU**
	Openwater Marsh	99.48	0.63	99.48	0.70	99.48	0.70
F	**Dewatering System & South O/W Marsh**	**93.33**	**HU**	**127.59**	**HU**	**129.71**	**HU**
	C/W Riparian Corridors	30.29	0.10	30.29	0.90	30.29	0.97
	Openwater Marsh	143.33	0.63	143.33	0.70	143.33	0.70

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features	N-HU	R-HU	N-HU	R-HU	N-HU	R-HU
A	**Pump-Diurnal Wetlands**	101.25	21.30	101.25	21.30	101.25	21.30
	Diurnal Wetlands - Net HU	**79.94**		**79.94**		**79.94**	
B	**Overbank Wetlands**	99.29	14.98	99.29	14.98	99.29	14.98
	Overbank Wetlands - Net HU	**84.31**		**84.31**		**84.31**	
C	**Riparian Corridors & Side Drains**	0.56	0.56	5.01	0.56	5.40	0.56
	C/W Riparian Corridors - Net HU	**0.00**		**4.46**		**4.85**	
D	**Independent Riparian Corridors**	6.90	19.82	62.06	19.82	66.89	19.82
	C/W Riparian Corridors - Net HU	**-12.93**		**42.24**		**47.06**	
E	**North Open Water Marsh**	62.67	35.51	69.64	35.51	69.64	35.51
	Openwater Marsh - Net HU	**27.16**		**34.13**		**34.13**	
F	**Dewatering System & South O/W Marsh**	93.33	58.89	127.59	58.89	129.71	58.89
	Net HU	**34.43**		**68.70**		**70.82**	

N-HU (New Habitat Units), R-HU (Replaced Habitat Units)

Total Habitat Units	363.99	151.06	464.83	151.06	472.17	151.06
Study Area Net Habitat Units	**212.92**		**313.77**		**321.11**	
Degradation Prevention Benefits	**0.00**		**189.57**		**493.15**	
Study Area Total Net Habitat Units W-P	**212.92**		**503.34**		**814.26**	

W-P (With Project)

With-Project Conditions (Alternative 3) Target Year 50, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	13,806,252.00	4,028,550.00	79.94	184.08		17,834,802.00	223,102.35 $/HU
B	Overbank Wetlands & Conveyance	10,633,784.86	4,008,861.65	84.31	141.84	A	14,642,646.51	173,676.27 $/HU
C	Riparian Corridors, Overbank Side Drains	1,079,282.03	44,214.35	4.85	5.57	A & B	1,123,496.38	231,648.74 $/HU
D	Independent Riparian Corridors	6,165,085.00	415,485.00	47.06	68.96		6,580,570.00	139,833.62 $/HU
E	Independent North Open Water Marsh	18,586,624.66	1,063,178.05	34.13	99.48		19,649,802.71	575,734.04 $/HU
F	Dewatering System & South O/W Marsh	32,465,846.30	1,796,803.06	70.82	173.62		34,262,649.36	483,799.06 $/HU
	Sub-Total			**321.11**			**94,093,966.94**	**293,027.21** $/HU
	Degradation Prevention Benefits			493.15				
	Total	82,736,874.83	11,357,092.11	**814.26**	673.55		**94,093,966.94**	**115,557.64** $/HU

Construction costs include Contingencies (20%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (7.5%)

SCENARIO STATISTICS

SCENARIO: Alt 3 TY 50 Alternative 3.0 Target Year 50

FILE: C:\IWRPLAN2\Data\Alternative 3 TY50.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 8/17/99 9:11:27 AM **EDITED:** **ANALYZED:** 8/17/99 9:11:29 AM

POSSIBLE COMBINATIONS: 64 **COST EFFECTIVE:** 14

ACTUAL COMBINATIONS: 32 **BEST BUY:** 6

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

INPUT DATA

8/17/99 9:12:56 AM

CODE		Cost	Habitats
A	0	0	0
A	1	17834802	79.94
B	0	0	0
B	1	14642647	84.31
C	0	0	0
C	1	1123496.4	4.85
D	0	0	0
D	1	6580570	47.06
E	0	0	0
E	1	19649803	34.13
F	0	0	0
F	1	34262649	70.82

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3 TY 50 *8/17/99 9:12:24 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	47.06	6,580,570.00	139,833.6167
3	A1 B0 C0 D0 E0 F0	79.94	17,834,802.00	223,102.3518
4	A1 B0 C0 D1 E0 F0	127.00	24,415,372.00	192,247.0236
5	A1 B1 C0 D0 E0 F0	164.25	32,477,448.51	197,731.8022
6	A1 B1 C1 D0 E0 F0	169.10	33,600,944.89	198,704.5824
7	A1 B1 C0 D1 E0 F0	211.31	39,058,018.51	184,837.5302
8	A1 B1 C1 D1 E0 F0	216.16	40,181,514.89	185,887.8372
9	A1 B1 C0 D1 E1 F0	245.44	58,707,821.22	239,194.1868
10	A1 B1 C1 D1 E1 F0	250.29	59,831,317.60	239,047.9747
11	A1 B1 C0 D1 E0 F1	282.13	73,320,667.87	259,882.5643
12	A1 B1 C1 D1 E0 F1	286.98	74,444,164.25	259,405.4089
13	A1 B1 C0 D1 E1 F1	316.26	92,970,470.58	293,968.4771
14	A1 B1 C1 D1 E1 F1	321.11	94,093,966.96	293,027.2086

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3 TY 50 *8/17/99 9:12:35 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	47.06	6,580,570.00	139,833.6167
3	A1 B1 C0 D1 E0 F0	211.31	39,058,018.51	184,837.5302
4	A1 B1 C1 D1 E0 F0	216.16	40,181,514.89	185,887.8372
5	A1 B1 C1 D1 E0 F1	286.98	74,444,164.25	259,405.4089
6	A1 B1 C1 D1 E1 F1	321.11	94,093,966.96	293,027.2086

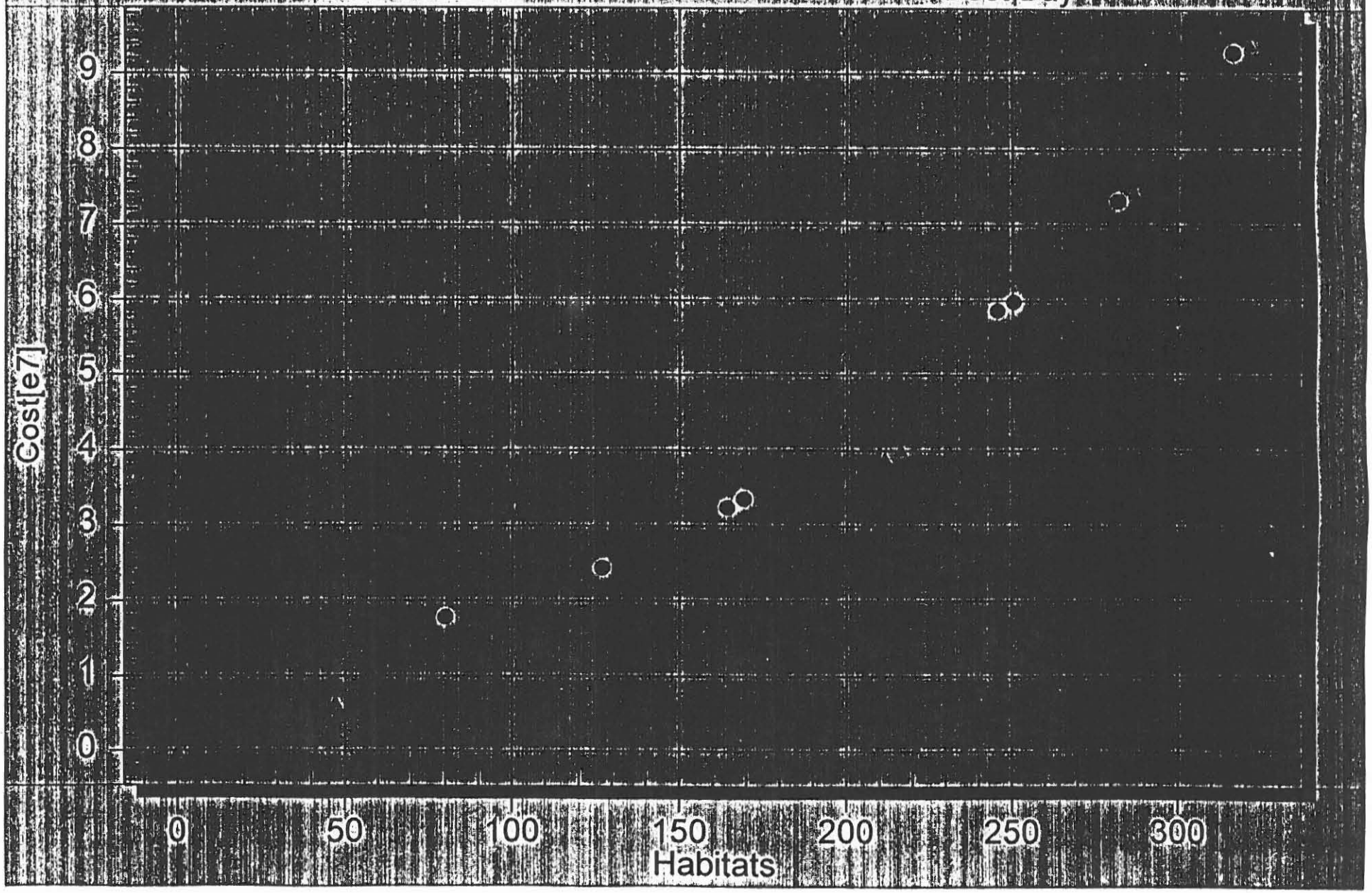
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3 TY 50

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D1 E0 F0	47.06	6,580,570.00	139,833.6000	6,580,570.0000	47.0600	139833.6
3	A1 B1 C0 D1 E0 F0	211.31	39,058,018.51	184,837.5000	32,477,450.0000	164.2500	197731.8
4	A1 B1 C1 D1 E0 F0	216.16	40,181,514.89	185,887.8000	1,123,496.0000	4.8500	231648.7
5	A1 B1 C1 D1 E0 F1	286.98	74,444,164.25	259,405.4000	34,262,650.0000	70.8200	483799.1
6	A1 B1 C1 D1 E1 F1	321.11	94,093,966.96	293,027.2000	19,649,800.0000	34.1300	575734.1

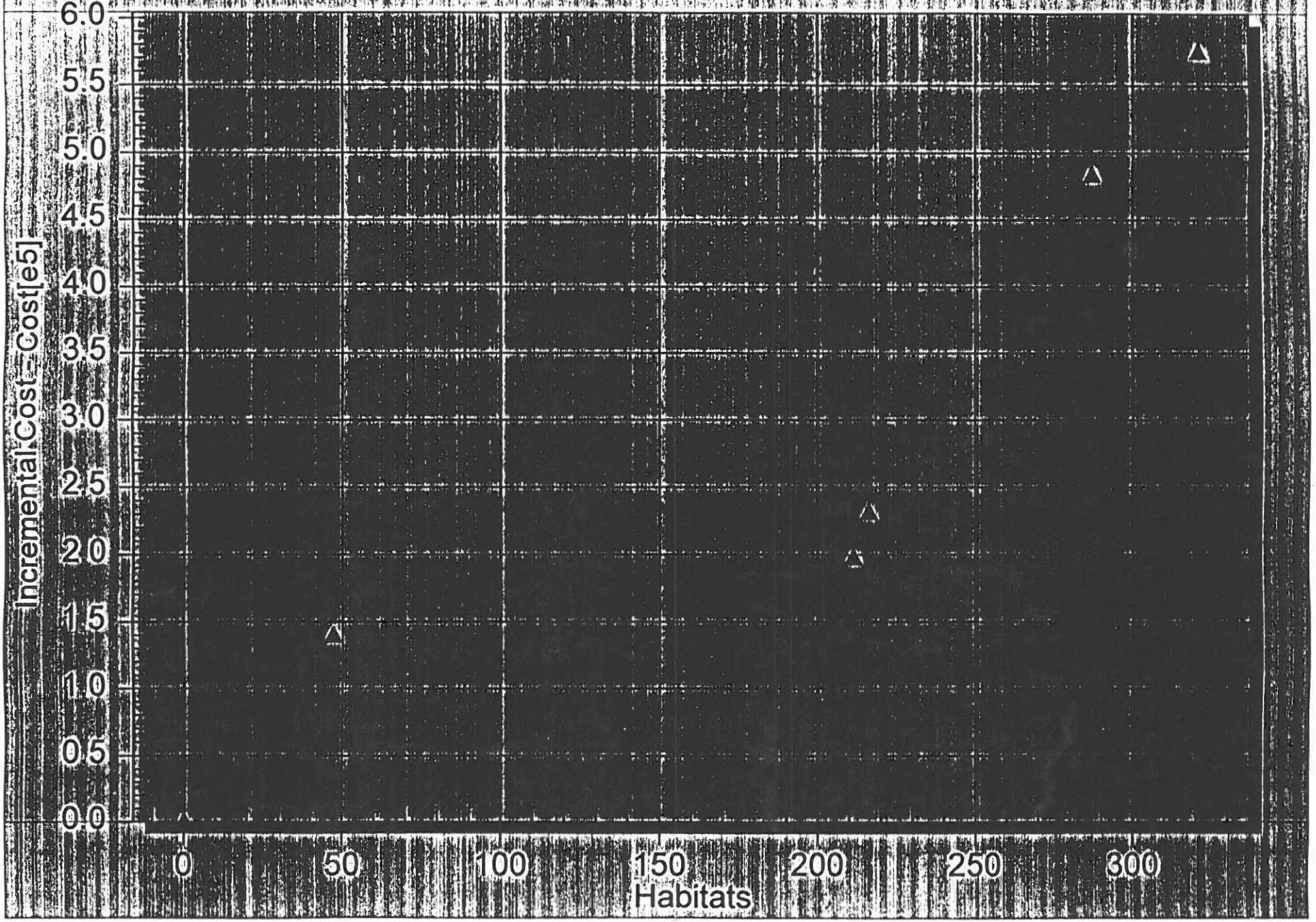
Cost Effective and Best Buy Plans - Alt 3 TY 50

Alternative 3.0 Target Year 50



Best Buy Plans - Alt 3 TY 50

Alternative 3.0 Target Year 50



Alternative 4 Results

Increased (Net) habitat values calculations (spreadsheets)

Target Year 50

Incremental Cost Analysis input data tables (spreadsheets)

Incremental Cost Analysis input data (IWR-PLAN output)

Cost effective combinations average cost data (IWR-PLAN output)

Best buy combinations average cost data (IWR-PLAN output)

Best buy combinations incremental cost analysis data (IWR-PLAN output)

Combined cost effective & best buy graph (IWR-PLAN output)

Best buy graph (IWR-PLAN output)

Alternative 4
Habitat Suitability Indices

Replaced Habitats in Alternative 4	Existing Conditions Habitat Acres to be replaced by features						
	H S I	A	B	C	D	E	F
Road	0.10						
Residential	0.10		15.85				
Agriculture	0.10	168.00	101.61				
Desert	0.40						
Marsh	N/A						
Water	N/A						
Cottonwood-Willow II	N/A						
Salt Cedar II	0.41				4.65		
Salt Cedar III	0.40			0.46	13.77	2.30	112.53
Salt Cedar IV	0.35			105.95	6.22	47.87	52.92
Salt Cedar V	0.20			19.30	0.40	14.30	0.10
Mix: Cottonwood-Willow/Salt Cedar II	N/A						
Mix: Cottonwood-Willow/Salt Cedar III	N/A						
Mix: Cottonwood-Willow/Salt Cedar IV	N/A						
Cobble	0.10		10.52	65.89	4.36	72.67	2.61
Quailbush-Saltbush	0.28	16.08	0.56				
Replaced Habitat Units (R-HU)		**21.30**	**12.95**	**47.72**	**10.11**	**27.80**	**63.82**

Replaced habitats would have changed in acreages or "H S I" without the project.
Neigboring habitats would have also changed in acreages or "H S I" without the project.
Some of the "H S I" values for the neighboring habitats change by reach.
Therefore Total Habitat Units for the Without-Project conditions have to be compared.

Habitat Suitability Indices (With Project)

ID	New Features	Target Year 1		Target Year 20		Target Year 50	
		Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**						
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**						
	Overbank Wetlands	128.53	0.70	128.53	0.70	128.53	0.70
C	**Pipeline & North Riparian Corridors**						
	C/W Riparian Corridors	191.60	0.10	191.60	0.90	191.60	0.97
D	**Independent Riparian Corridors**						
	C/W Riparian Corridors	29.40	0.10	29.40	0.90	29.40	0.97
E	**Independent Open Water Marsh in River**						
	Openwater Marsh	137.14	0.63	137.14	0.70	137.14	0.70
F	**Dewatering System Riparian Corridors**						
	C/W Riparian Corridors	168.16	0.10	168.16	0.90	168.16	0.97

W-P (With Project), W/0-P (Without Project)

Total Habitat Units in Study Area	Target Year 1		Target Year 20		Target Year 50	
	W/O-P	W-P	W/O-P	W-P	W/O-P	W-P
Total Habitat Units	**1768.19**	**1901.03**	**1578.62**	**2221.96**	**1275.043**	**2249.20**
Deviation from W/O-P at Target Year 1	0.00	132.84	-189.57	453.76	-493.15	481.00
Study Area Total Net Habitat Units W-P	**132.84**		**643.33**		**974.15**	

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features Habitat Units	Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**	**101.25**	**HU**	**101.25**	**HU**	**101.25**	**HU**
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**	**89.97**	**HU**	**89.97**	**HU**	**89.97**	**HU**
	Overbank Wetlands	128.53	0.70	128.53	0.70	128.53	0.70
C	**Pipeline & North Riparian Corridors**	**19.16**	**HU**	**172.44**	**HU**	**185.85**	**HU**
	C/W Riparian Corridors	191.60	0.10	191.60	0.90	191.60	0.97
D	**Independent Riparian Corridors**	**2.94**	**HU**	**26.46**	**HU**	**28.52**	**HU**
	C/W Riparian Corridors	29.40	0.10	29.40	0.90	29.40	0.97
E	**Independent Open Water Marsh in River**	**86.40**	**HU**	**96.00**	**HU**	**96.00**	**HU**
	Openwater Marsh	137.14	0.63	137.14	0.70	137.14	0.70
F	**Dewatering System Riparian Corridors**	**16.82**	**HU**	**151.34**	**HU**	**163.12**	**HU**
	C/W Riparian Corridors	168.16	0.10	168.16	0.90	168.16	0.97

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features	N-HU	R-HU	N-HU	R-HU	N-HU	R-HU
A	**Pump-Diurnal Wetlands**	101.25	21.30	101.25	21.30	101.25	21.30
	Diurnal Wetlands - Net HU	**79.94**		**79.94**		**79.94**	
B	**Overbank Wetlands**	89.97	12.95	89.97	12.95	89.97	12.95
	Overbank Wetlands - Net HU	**77.02**		**77.02**		**77.02**	
C	**Pipeline & North Riparian Corridors**	19.16	47.72	172.44	47.72	185.85	47.72
	C/W Riparian Corridors - Net HU	**-28.56**		**124.72**		**138.14**	
D	**Independent Riparian Corridors**	2.94	10.11	26.46	10.11	28.52	10.11
	C/W Riparian Corridors - Net HU	**-7.17**		**16.35**		**18.41**	
E	**Independent Open Water Marsh in River**	86.40	27.80	96.00	27.80	96.00	27.80
	Openwater Marsh - Net HU	**58.60**		**68.20**		**68.20**	
F	**Dewatering System Riparian Corridors**	16.82	63.82	151.34	63.82	163.12	63.82
	C/W Riparian Corridors - Net HU	**-47.00**		**87.53**		**99.30**	

N-HU (New Habitat Units), R-HU (Replaced Habitat Units)

Total Habitat Units	316.53	183.70	637.46	183.70	664.70	183.70
Study Area Net Habitat Units	**132.84**		**453.76**		**481.00**	
Check for Habitat Calculations	**0.00**		**189.57**		**493.15**	
Study Area Total Net Habitat Units W-P	**132.84**		**643.33**		**974.15**	

W-P (With Project)

With-Project Conditions (Alternative 4) Target Year 50, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	13,806,252.00	4,028,550.00	79.94	184.08		17,834,802.00	223,102.35 $/HU
B	Overbank Wetlands	7,479,176.00	6,345,037.50	77.02	128.53	A	13,824,213.50	179,488.62 $/HU
C	Pipeline & North Riparian Corridors	32,095,875.74	1,272,188.82	138.14	191.60	A & B	33,368,064.56	241,552.52 $/HU
D	Independent Riparian Corridors	5,188,471.07	286,242.48	18.41	29.40		5,474,713.55	297,377.16 $/HU
E	Independent Open Water Marsh in River	25,968,878.11	1,055,741.75	68.20	137.14		27,024,619.86	396,255.42 $/HU
F	Dewatering System Riparian Corridors	17,455,169.04	1,650,176.90	99.30	168.16		19,105,345.94	192,400.26 $/HU
							0.00	
	Sub-Total			**481.01**			**116,631,759.41**	**242,472.63** $/HU
	Degradation Prevention Benefits			493.15				
	Total	101,993,821.96	14,637,937.45	**974.16**	838.91		**116,631,759.41**	**119,725.47** $/HU

Construction costs include Contingencies (20%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (7.5%)

SCENARIO STATISTICS

SCENARIO: Alt 4 TY 50 Alternative 4.0 Target Year 50

FILE: C:\IWRPLAN2\Data\Alternative 4 TY50.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 8/17/99 9:49:51 AM **EDITED:** **ANALYZED:** 8/17/99 9:49:53 AM

POSSIBLE COMBINATIONS: 64 **COST EFFECTIVE:** 18

ACTUAL COMBINATIONS: 32 **BEST BUY:** 6

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

INPUT DATA

8/17/99 9:51:21 AM

CODE		Cost	Habitats
A	0	0	0
A	1	17834802	79.94
B	0	0	0
B	1	13824214	77.02
C	0	0	0
C	1	33368065	138.14
D	0	0	0
D	1	5474713.6	18.41
E	0	0	0
E	1	27024620	68.2
F	0	0	0
F	1	19105346	99.3

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 4 TY 50

8/17/99 9:50:39 AM

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	18.41	5,474,713.55	297,377.1619
3	A1 B0 C0 D0 E0 F0	79.94	17,834,802.00	223,102.3518
4	A0 B0 C0 D0 E0 F1	99.30	19,105,345.94	192,400.2612
5	A0 B0 C0 D1 E0 F1	117.71	24,580,059.49	208,818.7876
6	A1 B1 C0 D0 E0 F0	156.96	31,659,016.00	201,701.1723
7	A1 B0 C0 D0 E0 F1	179.24	36,940,147.94	206,093.2155
8	A1 B0 C0 D1 E0 F1	197.65	42,414,861.49	214,595.8082
9	A1 B1 C0 D0 E0 F1	256.26	50,764,361.94	198,097.0965
10	A1 B1 C0 D1 E0 F1	274.67	56,239,075.49	204,751.4308
11	A1 B1 C1 D0 E0 F0	295.10	65,027,080.56	220,356.0846
12	A1 B1 C1 D1 E0 F0	313.51	70,501,794.11	224,878.9324
13	A1 B1 C0 D0 E1 F1	324.46	77,788,981.80	239,749.0655
14	A1 B1 C0 D1 E1 F1	342.87	83,263,695.35	242,843.3381
15	A1 B1 C1 D0 E0 F1	394.40	84,132,426.50	213,317.5114
16	A1 B1 C1 D1 E0 F1	412.81	89,607,140.05	217,066.3018
17	A1 B1 C1 D0 E1 F1	462.60	111,157,046.36	240,287.6056
18	A1 B1 C1 D1 E1 F1	481.01	116,631,759.91	242,472.6303

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

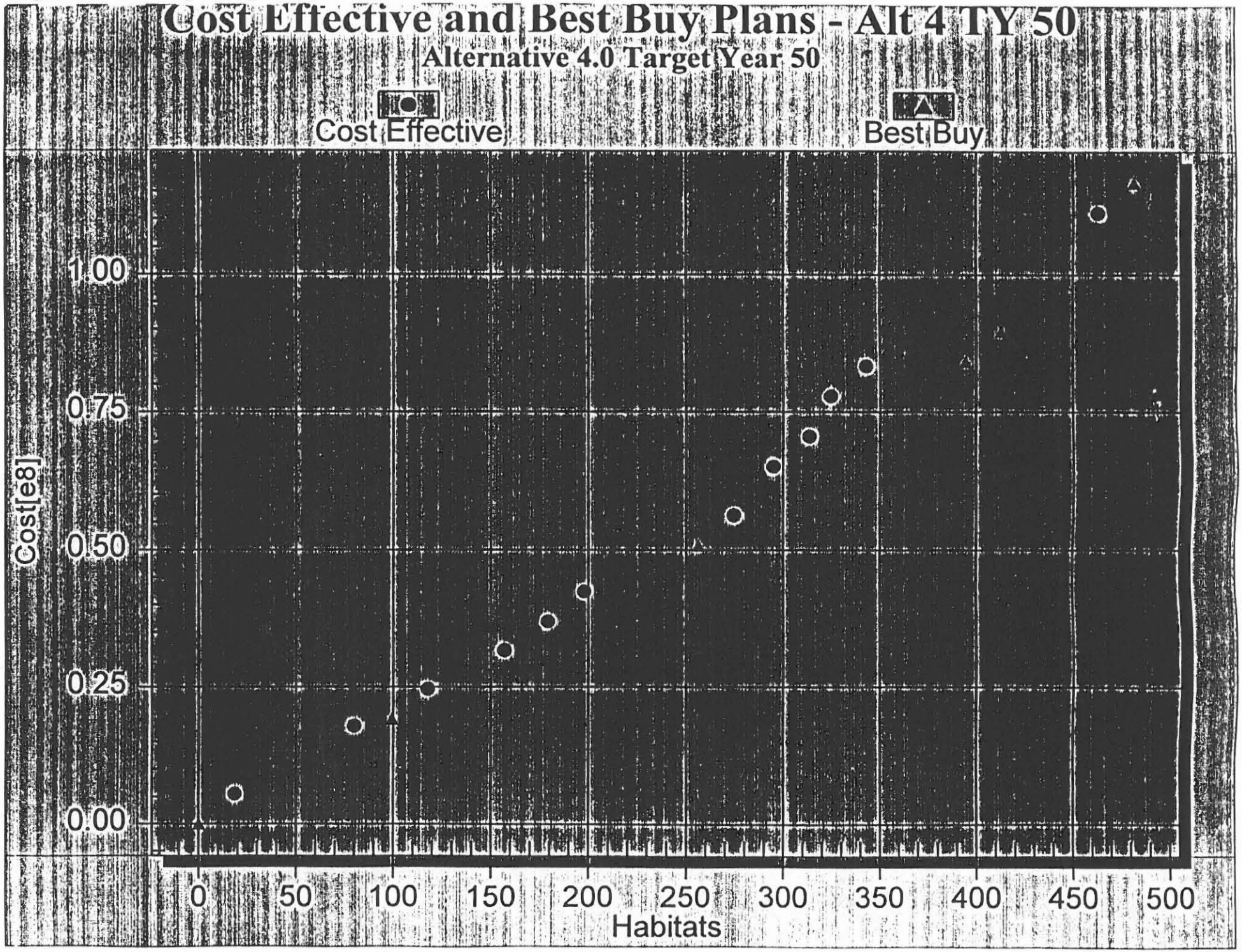
Scenario: Alt 4 TY 50 *8/17/99 9:50:49 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D0 E0 F1	99.30	19,105,345.94	192,400.2612
3	A1 B1 C0 D0 E0 F1	256.26	50,764,361.94	198,097.0965
4	A1 B1 C1 D0 E0 F1	394.40	84,132,426.50	213,317.5114
5	A1 B1 C1 D1 E0 F1	412.81	89,607,140.05	217,066.3018
6	A1 B1 C1 D1 E1 F1	481.01	116,631,759.91	242,472.6303

Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 4 TY 50

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D0 E0 F1	99.30	19,105,345.94	192,400.3000	19,105,350.0000	99.3000	192400.3
3	A1 B1 C0 D0 E0 F1	256.26	50,764,361.94	198,097.1000	31,659,020.0000	156.9600	201701.2
4	A1 B1 C1 D0 E0 F1	394.40	84,132,426.50	213,317.5000	33,368,060.0000	138.1400	241552.5
5	A1 B1 C1 D1 E0 F1	412.81	89,607,140.05	217,066.3000	5,474,714.0000	18.4100	297377.2
6	A1 B1 C1 D1 E1 F1	481.01	116,631,759.91	242,472.6000	27,024,620.0000	68.2000	396255.4


Cost Effective and Best Buy Plans - Alt 4 TY 50
Alternative 4.0 Target Year 50
Cost Effective
Best Buy
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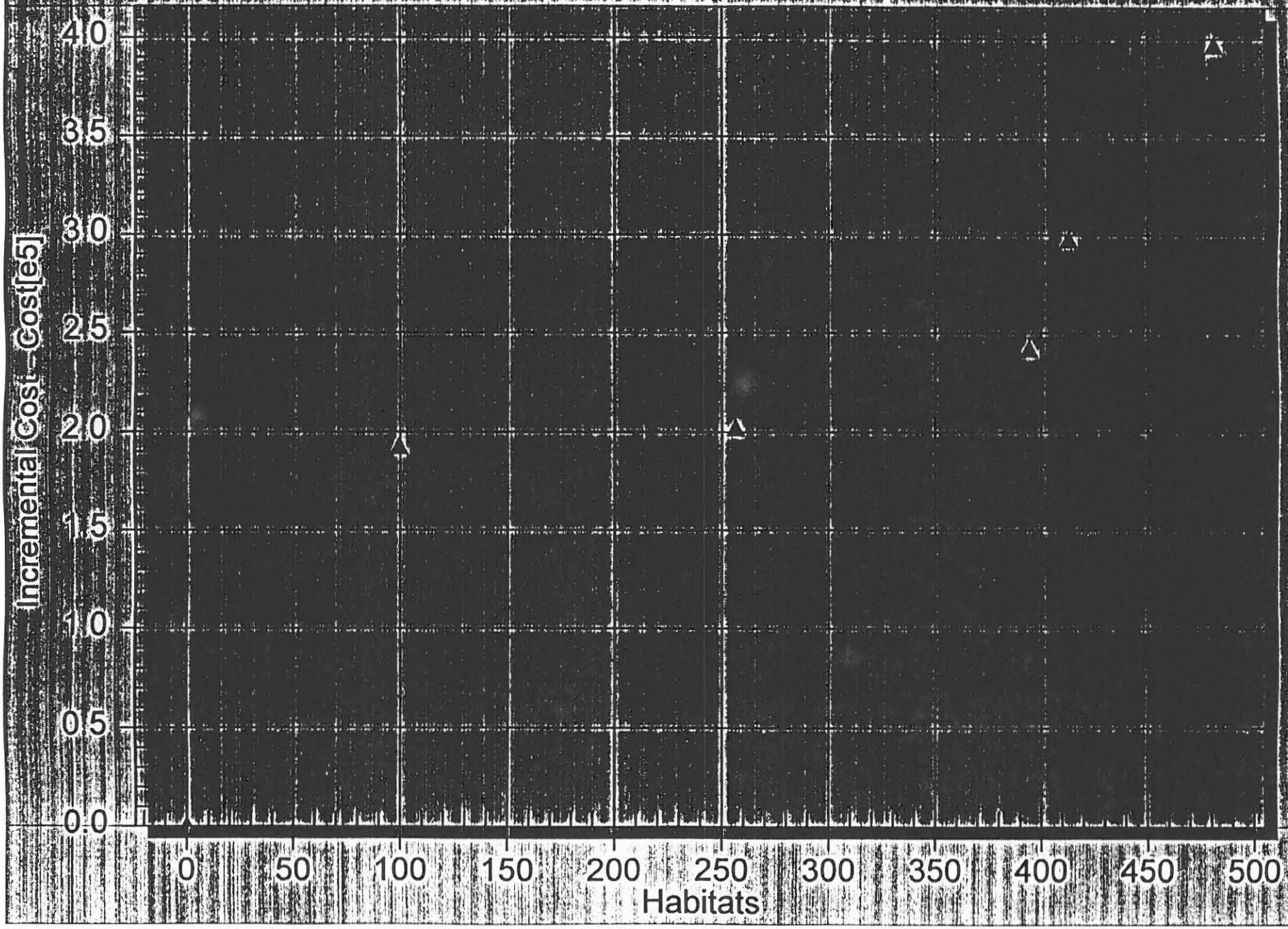
0.75
0.50
0.25
0.00
0
50
100
150
200
250
300
350
400
450
500
Habitats

Best Buy Plans - Alt 4 TY 50

Alternative 4.0 Target Year 50



Alternative 3.5 Results

Increased (Net) habitat values calculations (spreadsheets)
Incremental Cost Analysis target years 1, 20, & 50 input data tables (spreadsheets)

Target Year 1

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Target Year 20

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Target Year 50

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Alternative 3.5
Habitat Suitability Indices

Replaced Habitats in Alternative 3.5	Existing Conditions Habitat Acres to be replaced by features						
	H S I	A	B	C	D	E	F
Road	0.10			0.17	0.84		0.33
Residential	0.10		15.85				
Agriculture	0.10	168.00	101.61	0.71			
Desert	0.40						1.81
Marsh	N/A						
Water	N/A						
Cottonwood-Willow II	N/A						
Salt Cedar II	0.41				4.81		
Salt Cedar III	0.40			8.26	17.71	10.17	170.42
Salt Cedar IV	0.35			22.30	23.68	109.00	34.93
Salt Cedar V	0.20				2.02		3.84
Mix: Cottonwood-Willow/Salt Cedar II	N/A						
Mix: Cottonwood-Willow/Salt Cedar III	N/A						
Mix: Cottonwood-Willow/Salt Cedar IV	N/A						
Cobble	0.10		10.52	6.12	19.90	14.90	11.03
Quailbush-Saltbush	0.28	16.08	0.56				
Replaced Habitat Units (R-HU)		**21.30**	**12.95**	**11.81**	**19.82**	**43.71**	**83.02**

Replaced habitats would have changed in acreages or "H S I" without the project.
Neigboring habitats would have also changed in acreages or "H S I" without the project.
Some of the "H S I" values for the neighboring habitats change by reach.
Therefore Total Habitat Units for the Without-Project conditions have to be compared.

Habitat Suitability Indices (With Project)

ID	New Features	Target Year 1		Target Year 20		Target Year 50	
		Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**						
	Diurnal Wetlands	184.083	0.55	184.083	0.55	184.083	0.55
B	**Overbank Wetlands**						
	Overbank Wetlands	128.531	0.70	128.531	0.70	128.531	0.70
C	**Pipeline & North Riparian Corridors**						
	C/W Riparian Corridors	37.577	0.10	37.577	0.90	37.577	0.97
D	**Independent Riparian Corridors**						
	C/W Riparian Corridors	68.955	0.10	68.955	0.90	68.955	0.97
E	**North Open Water Marsh**						
	Openwater Marsh	134.065	0.63	134.065	0.70	134.065	0.70
F	**Dewatering System & South O/W Marsh**						
	C/W Riparian Corridors	16.186	0.10	16.186	0.90	16.186	0.97
	Openwater Marsh	206.17	0.63	206.17	0.70	206.17	0.70

W-P (With Project), W/0-P (Without Project)

Total Habitat Units in Study Area	Target Year 1		Target Year 20		Target Year 50	
	W/O-P	W-P	W/O-P	W-P	W/O-P	W-P
Total Habitat Units	**1768.19**	**1993.41**	**1578.62**	**2115.40**	**1275.04**	**2124.00**
Deviation from W/O-P at Target Year 1	0.00	225.22	-189.57	347.21	-493.15	355.80
Study Area Total Net Habitat Units W-P	**225.22**		**536.78**		**848.95**	

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features Habitat Units	Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**	**101.25**	**HU**	**101.25**	**HU**	**101.25**	**HU**
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**	**89.97**	**HU**	**89.97**	**HU**	**89.97**	**HU**
	Overbank Wetlands	128.53	0.70	128.53	0.70	128.53	0.70
C	**Pipeline & North Riparian Corridors**	**3.76**	**HU**	**33.82**	**HU**	**36.45**	**HU**
	C/W Riparian Corridors	37.58	0.10	37.58	0.90	37.58	0.97
D	**Independent Riparian Corridors**	**6.90**	**HU**	**62.06**	**HU**	**66.89**	**HU**
	C/W Riparian Corridors	68.96	0.10	68.96	0.90	68.96	0.97
E	**North Open Water Marsh**	**84.46**	**HU**	**93.85**	**HU**	**93.85**	**HU**
	Openwater Marsh	134.07	0.63	134.07	0.70	134.07	0.70
F	**Dewatering System & South O/W Marsh**	**131.51**	**HU**	**158.89**	**HU**	**160.02**	**HU**
	C/W Riparian Corridors	16.19	0.10	16.19	0.90	16.19	0.97
	Openwater Marsh	206.17	0.63	206.17	0.70	206.17	0.70

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features	N-HU	R-HU	N-HU	R-HU	N-HU	R-HU
A	**Pump-Diurnal Wetlands**	101.25	21.30	101.25	21.30	101.25	21.30
	Diurnal Wetlands - Net HU	**79.94**		**79.94**		**79.94**	
B	**Overbank Wetlands**	89.97	12.95	89.97	12.95	89.97	12.95
	Overbank Wetlands - Net HU	**77.02**		**77.02**		**77.02**	
C	**Pipeline & North Riparian Corridors**	3.76	11.81	33.82	11.81	36.45	11.81
	C/W Riparian Corridors - Net HU	**-8.05**		**22.01**		**24.64**	
D	**Independent Riparian Corridors**	6.90	19.82	62.06	19.82	66.89	19.82
	C/W Riparian Corridors - Net HU	**-12.93**		**42.24**		**47.06**	
E	**North Open Water Marsh**	84.46	43.71	93.85	43.71	93.85	43.71
	Openwater Marsh - Net HU	**40.75**		**50.14**		**50.14**	
F	**Dewatering System & South O/W Marsh**	131.51	83.02	158.89	83.02	160.02	83.02
	Net HU	**48.49**		**75.87**		**77.00**	

N-HU (New Habitat Units), R-HU (Replaced Habitat Units)

Total Habitat Units	417.84	192.62	539.83	192.62	548.42	192.62
Study Area Net Habitat Units	**225.22**		**347.21**		**355.80**	
Degradation Prevention Net Benefits	0.00		189.57		493.15	
Study Area Total Net Habitat Units W-P	**225.22**		**536.78**		**848.95**	

W-P (With Project)

With-Project Conditions (Alternative 3.5) Target Year 1, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	-8.05	37.58	A & B	9,227,757.00	-1,146,305.22 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	-12.93	68.96		5,924,662.00	-458,210.52 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	40.75	134.07	C	10,457,967.00	256,637.23 $/HU
F	Dewatering System & South O/W Marsh	16,492,585.00	2,990,000.00	48.49	222.36		19,482,585.00	401,785.63 $/HU
	Sub-Total			**225.22**			**80,631,229.00**	**358,010.96** $/HU
	Degradation Prevention Benefits			0.00				
	Total	68,429,729.00	12,201,500.00	**225.22**	775.58		**80,631,229.00**	**358,010.96** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

With-Project Conditions (Alternative 3.5) Target Year 20, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	22.01	37.58	A & B	9,227,757.00	419,252.93 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	42.24	68.96		5,924,662.00	140,261.88 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	50.14	134.07	C	10,457,967.00	208,575.33 $/HU
F	Dewatering System & South O/W Marsh	16,492,585.00	2,990,000.00	75.87	222.36		19,482,585.00	256,789.05 $/HU
	Sub-Total			**347.22**			**80,631,229.00**	**232,219.43** $/HU
	Degradation Prevention Benefits			189.57				
	Total	68,429,729.00	12,201,500.00	**536.79**	775.58		**80,631,229.00**	**150,210.01** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

With-Project Conditions (Alternative 3.5) Target Year 50, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	24.64	37.58	A & B	9,227,757.00	374,503.13 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	47.06	68.96		5,924,662.00	125,895.92 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	50.14	134.07	C	10,457,967.00	208,575.33 $/HU
F	Dewatering System & South O/W Marsh	16,492,585.00	2,990,000.00	77.00	222.36		19,482,585.00	253,020.58 $/HU
	Sub-Total			**355.80**			**80,631,229.00**	**226,619.53** $/HU
	Degradation Prevention Benefits			493.15				
	Total	68,429,729.00	12,201,500.00	**848.95**	775.58		**80,631,229.00**	**94,977.59** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 1 Alternative 3.5 Target Year1 Update 2

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY1 Update 2.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/1/00 3:26:17 PM **EDITED:** **ANALYZED:** 3/1/00 3:26:20 PM

POSSIBLE COMBINATIONS: 64 **COST EFFECTIVE:** 6

ACTUAL COMBINATIONS: 20 **BEST BUY:** 4

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/1/00 3:27:14 PM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	-8.05
D	0	0	0
D	1	5924662	-12.93
E	0	0	0
E	1	10457967	40.75
F	0	0	0
F	1	19482585	48.49

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1

3/1/00 3:28:33 PM

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D0 E0 F1	48.49	19,482,585.00	401,785.6259
3	A1 B0 C0 D0 E0 F0	79.94	25,907,730.00	324,089.6923
4	A1 B1 C0 D0 E0 F0	156.96	35,538,258.00	226,416.0168
5	A1 B1 C0 D0 E0 F1	205.45	55,020,843.00	267,806.4882
6	A1 B1 C1 D0 E1 F1	238.15	74,706,567.00	313,695.4315

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1 *3/1/00 3:29:33 PM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A1 B1 C0 D0 E0 F0	156.96	35,538,258.00	226,416.0168
3	A1 B1 C0 D0 E0 F1	205.45	55,020,843.00	267,806.4882
4	A1 B1 C1 D0 E1 F1	238.15	74,706,567.00	313,695.4315

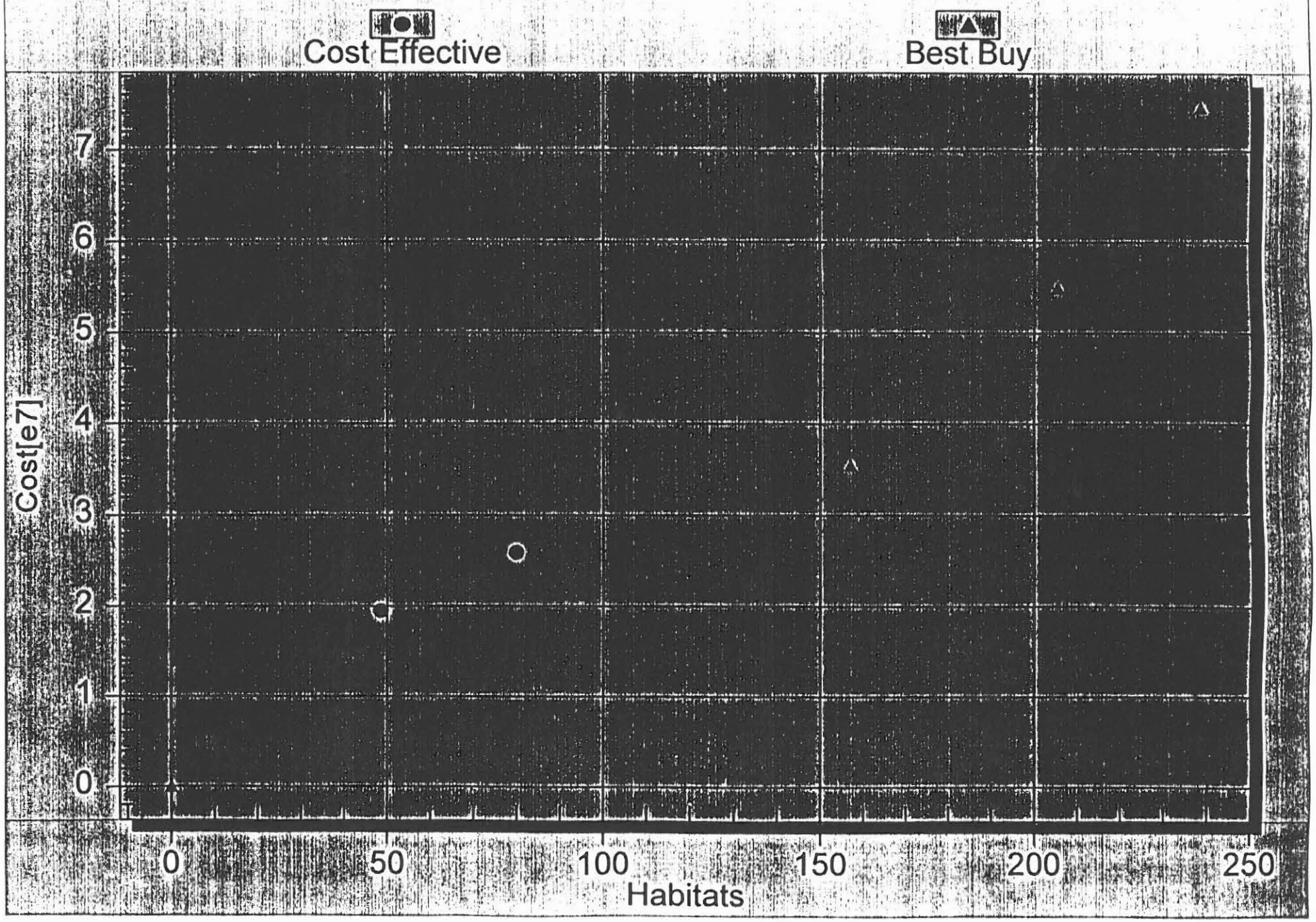
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A1 B1 C0 D0 E0 F0	156.96	35,538,258.00	226,416.0000	35,538,260.0000	156.9600	226416
3	A1 B1 C0 D0 E0 F1	205.45	55,020,843.00	267,806.5000	19,482,580.0000	48.4900	401785.6
4	A1 B1 C1 D0 E1 F1	238.15	74,706,567.00	313,695.4000	19,685,720.0000	32.7000	602009.9

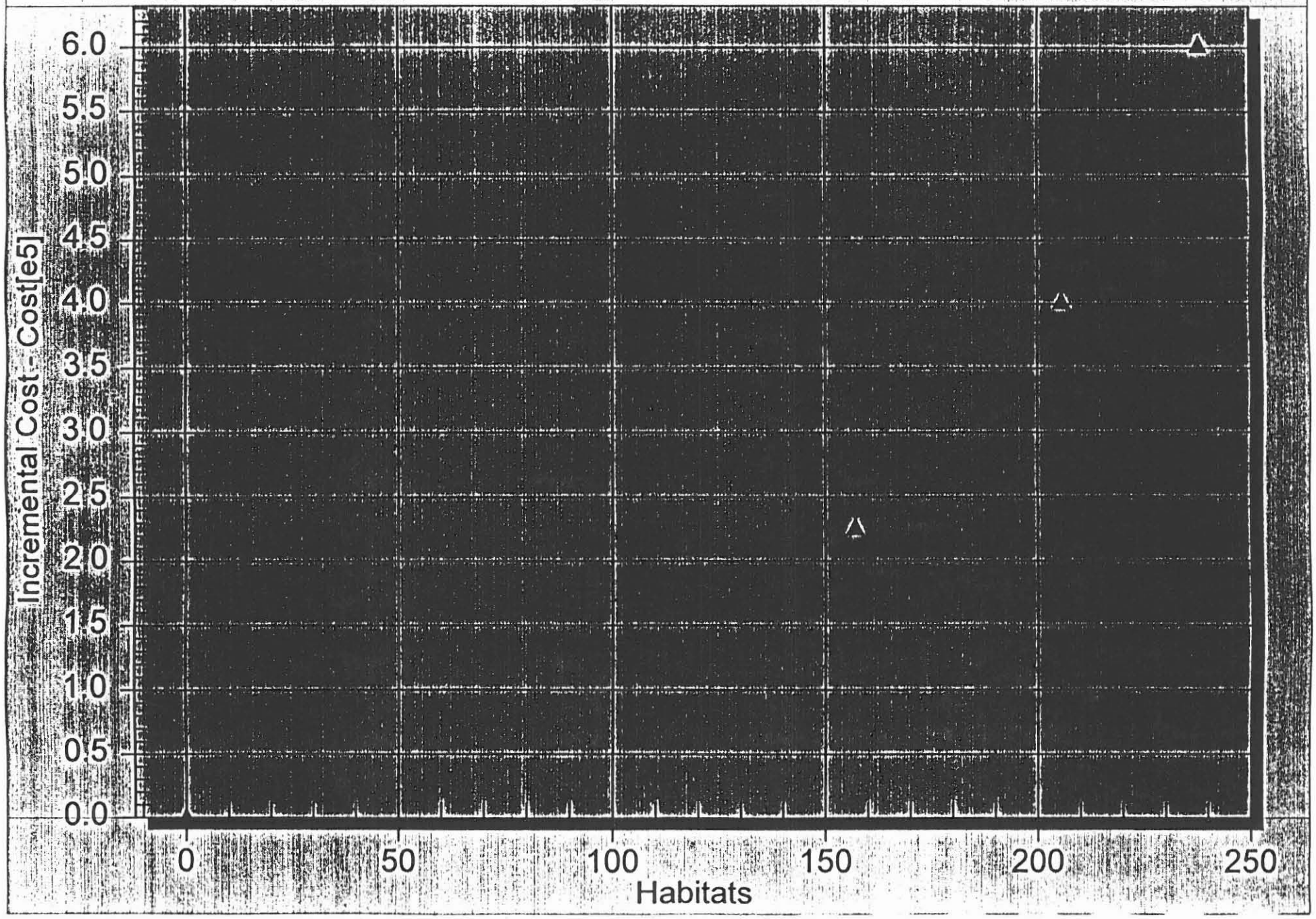
Cost Effective and Best Buy Plans - Alt 3.5 TY 1

Alternative 3.5 Target Year1 Update 2



Best Buy Plans - Alt 3.5 TY 1

Alternative 3.5 Target Year1 Update 2



SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 20 Alternative 3.5 Target Year 20 Update 2

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY20 Update 2.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/1/00 3:38:33 PM **EDITED:** **ANALYZED:** 3/1/00 3:38:34 PM

POSSIBLE COMBINATIONS: 64 **COST EFFECTIVE:** 13

ACTUAL COMBINATIONS: 20 **BEST BUY:** 5

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/1/00 3:48:36 PM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	22.01
D	0	0	0
D	1	5924662	42.24
E	0	0	0
E	1	10457967	50.14
F	0	0	0
F	1	19482585	75.87

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20 — 3/1/00 3:49:12 PM

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	42.24	5,924,662.00	140,261.8845
3	A0 B0 C0 D0 E0 F1	75.87	19,482,585.00	256,789.0471
4	A0 B0 C0 D1 E0 F1	118.11	25,407,247.00	215,115.1215
5	A1 B0 C0 D1 E0 F0	122.18	31,832,392.00	260,536.8473
6	A1 B1 C0 D0 E0 F0	156.96	35,538,258.00	226,416.0168
7	A1 B1 C0 D1 E0 F0	199.20	41,462,920.00	208,147.1888
8	A1 B1 C1 D1 E0 F0	221.21	50,690,677.00	229,151.8331
9	A1 B1 C0 D0 E0 F1	232.83	55,020,843.00	236,313.3746
10	A1 B1 C0 D1 E0 F1	275.07	60,945,505.00	221,563.6202
11	A1 B1 C1 D1 E0 F1	297.08	70,173,262.00	236,209.9838
12	A1 B1 C1 D0 E1 F1	304.98	74,706,567.00	244,955.6266
13	A1 B1 C1 D1 E1 F1	347.22	80,631,229.00	232,219.4257

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20 *3/1/00 3:49:38 PM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	-0.00	0.0000
2	A0 B0 C0 D1 E0 F0	42.24	5,924,662.00	140,261.8845
3	A1 B1 C0 D1 E0 F0	199.20	41,462,920.00	208,147.1888
4	A1 B1 C0 D1 E0 F1	275.07	60,945,505.00	221,563.6202
5	A1 B1 C1 D1 E1 F1	347.22	80,631,229.00	232,219.4257

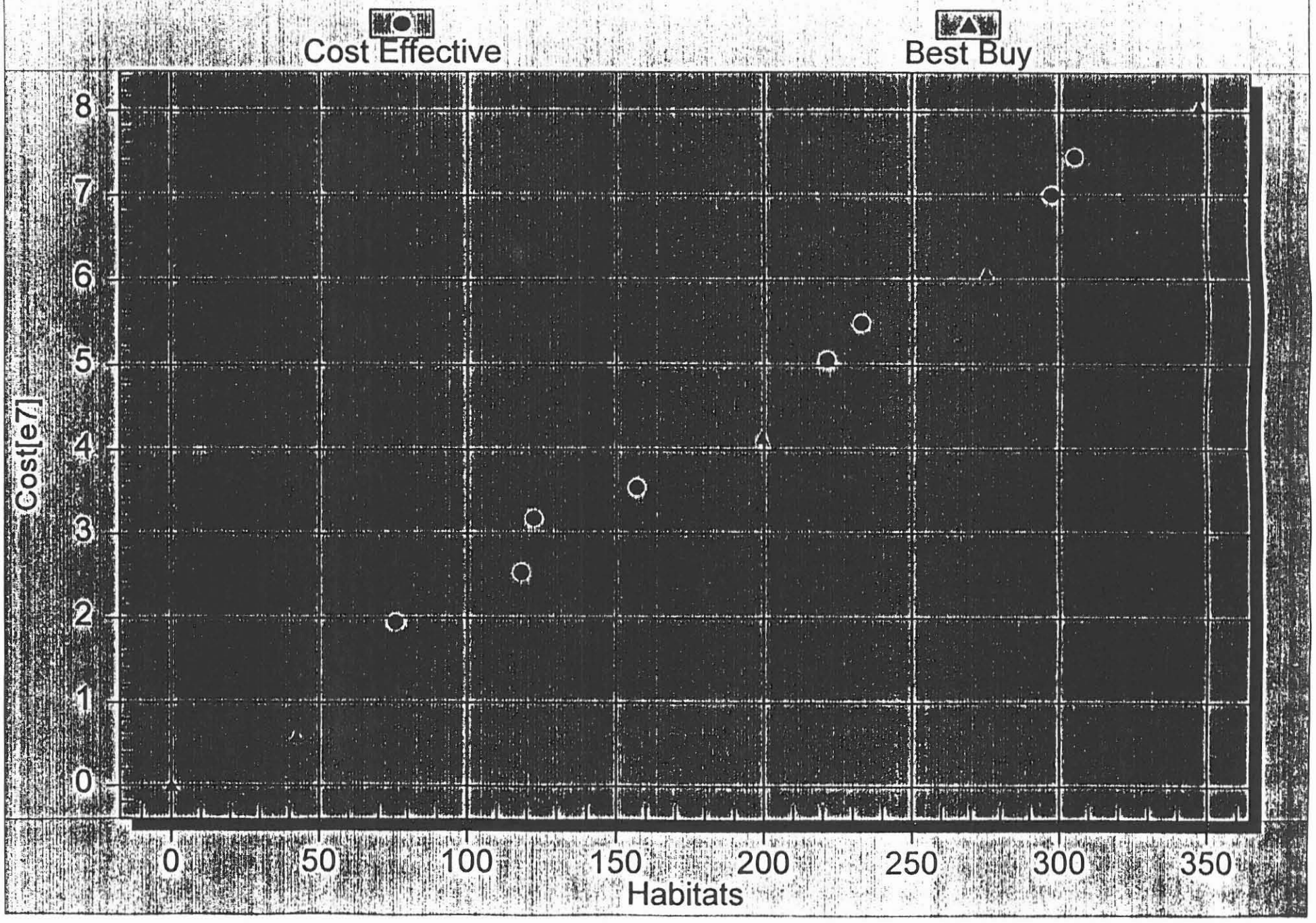
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D1 E0 F0	42.24	5,924,662.00	140,261.9000	5,924,662.0000	42.2400	140261.9
3	A1 B1 C0 D1 E0 F0	199.20	41,462,920.00	208,147.2000	35,538,260.0000	156.9600	226416
4	A1 B1 C0 D1 E0 F1	275.07	60,945,505.00	221,563.6000	19,482,580.0000	75.8700	256789
5	A1 B1 C1 D1 E1 F1	347.22	80,631,229.00	232,219.4000	19,685,720.0000	72.1500	272844.4

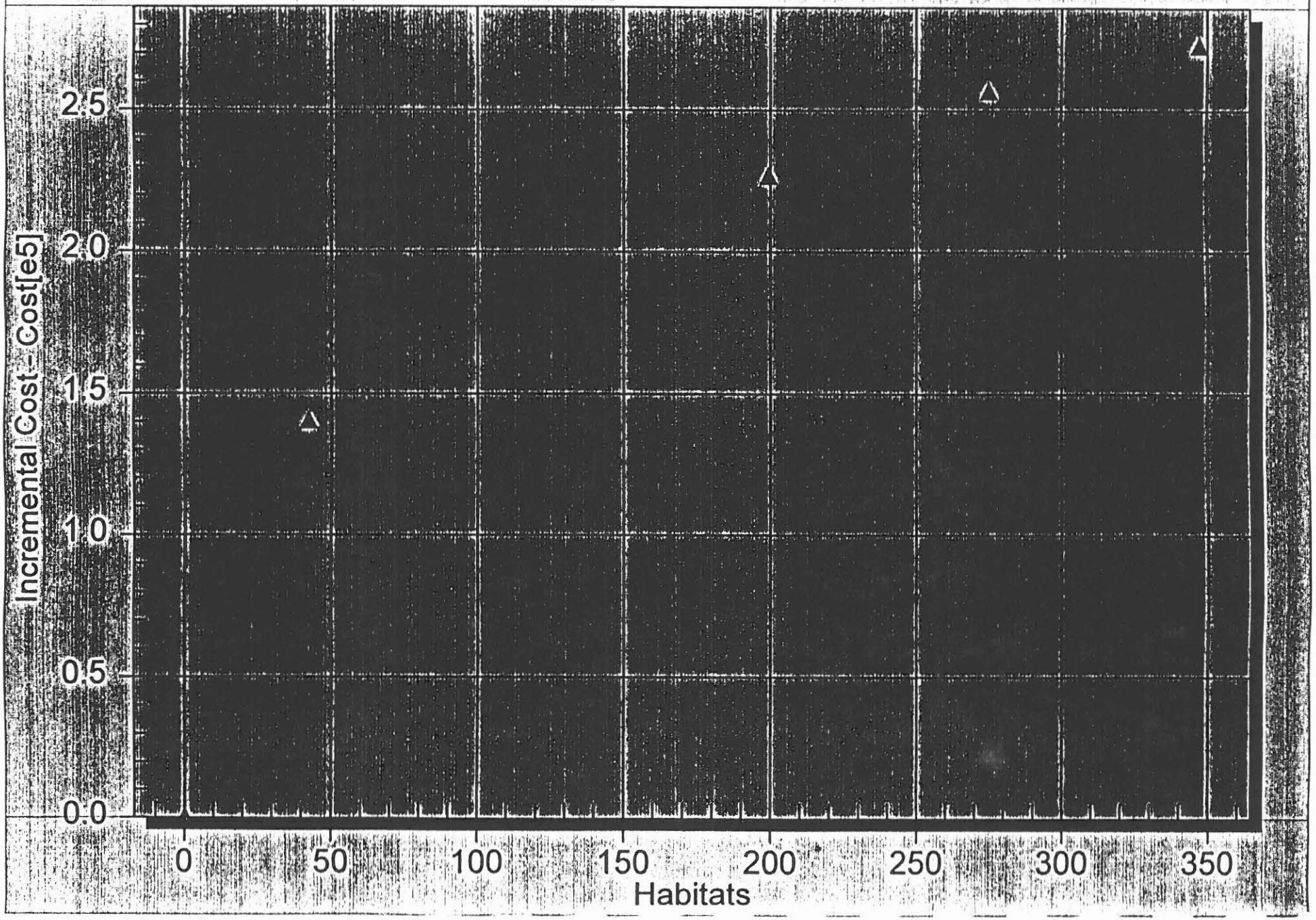
Cost Effective and Best Buy Plans - Alt 3.5 TY 20

Alternative 3.5 Target Year 20 Update 2



Best Buy Plans - Alt 3.5 TY 20

Alternative 3.5 Target Year 20 Update 2



SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 50 Alternative 3.5 Target Year 50 Update 2

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY50 Update 2.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/1/00 4:04:16 PM **EDITED:** **ANALYZED:** 3/1/00 4:04:17 PM

POSSIBLE COMBINATIONS: 64 **COST EFFECTIVE:** 13

ACTUAL COMBINATIONS: 20 **BEST BUY:** 5

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/1/00 4:06:27 PM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	24.64
D	0	0	0
D	1	5924662	47.06
E	0	0	0
E	1	10457967	50.14
F	0	0	0
F	1	19482585	77

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50 — 3/1/00 4:07:09 PM

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	47.06	5,924,662.00	125,895.9201
3	A0 B0 C0 D0 E0 F1	77.00	19,482,585.00	253,020.5844
4	A0 B0 C0 D1 E0 F1	124.06	25,407,247.00	204,798.0574
5	A1 B0 C0 D1 E0 F0	127.00	31,832,392.00	250,648.7559
6	A1 B1 C0 D0 E0 F0	156.96	35,538,258.00	226,416.0168
7	A1 B1 C0 D1 E0 F0	204.02	41,462,920.00	203,229.6834
8	A1 B1 C1 D1 E0 F0	228.66	50,690,677.00	221,685.8086
9	A1 B1 C0 D0 E0 F1	233.96	55,020,843.00	235,172.0080
10	A1 B1 C0 D1 E0 F1	281.02	60,945,505.00	216,872.4824
11	A1 B1 C1 D1 E0 F1	305.66	70,173,262.00	229,579.4739
12	A1 B1 C1 D0 E1 F1	308.74	74,706,567.00	241,972.4266
13	A1 B1 C1 D1 E1 F1	355.80	80,631,229.00	226,619.5306

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50 *3/1/00 4:07:22 PM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0 F0	47.06	5,924,662.00	125,895.9201
3	A1 B1 C0 D1 E0 F0	204.02	41,462,920.00	203,229.6834
4	A1 B1 C0 D1 E0 F1	281.02	60,945,505.00	216,872.4824
5	A1 B1 C1 D1 E1 F1	355.80	80,631,229.00	226,619.5306

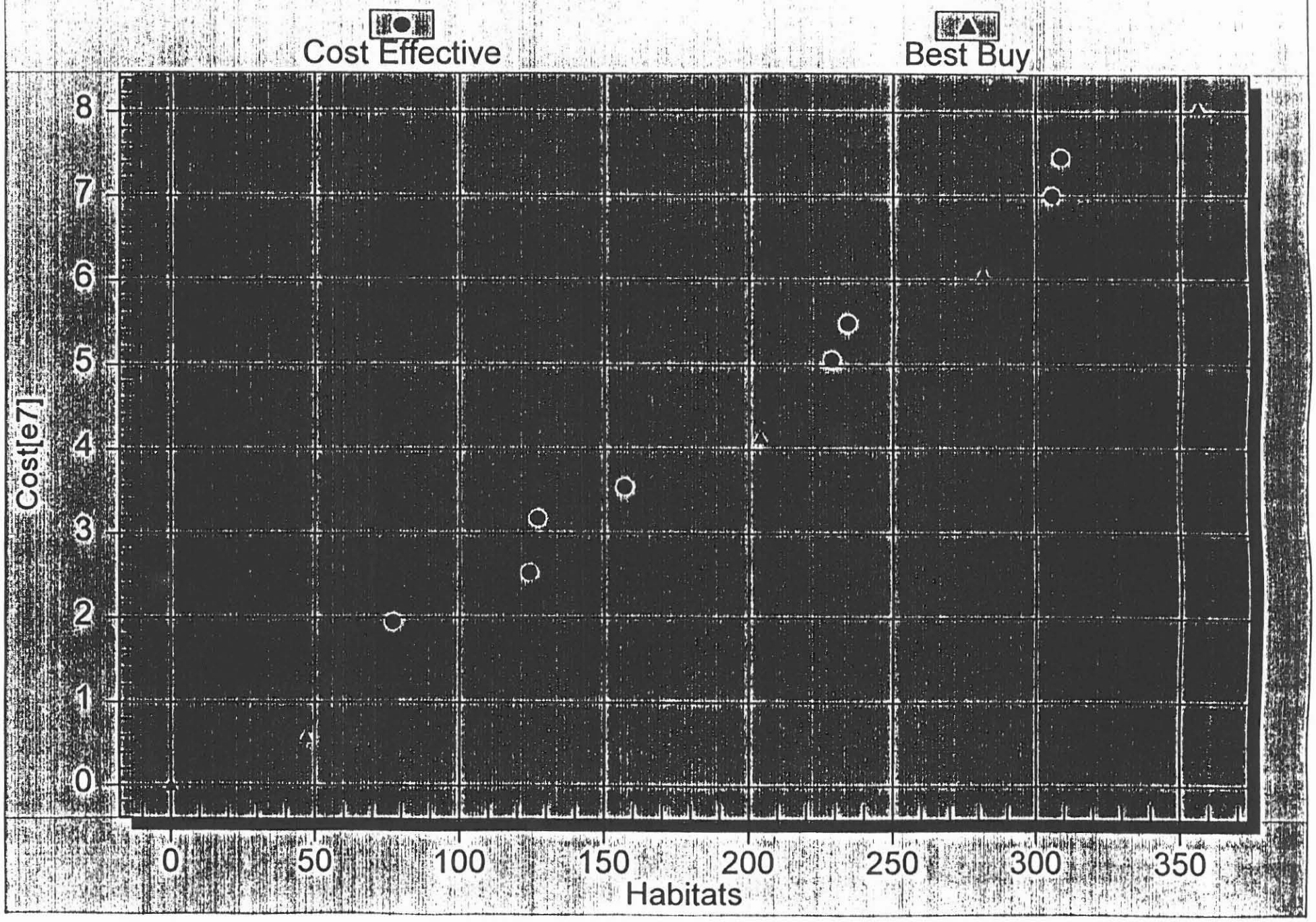
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0 F0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D1 E0 F0	47.06	5,924,662.00	125,895.9000	5,924,662.0000	47.0600	125895.9
3	A1 B1 C0 D1 E0 F0	204.02	41,462,920.00	203,229.7000	35,538,260.0000	156.9600	226416
4	A1 B1 C0 D1 E0 F1	281.02	60,945,505.00	216,872.5000	19,482,580.0000	77.0000	253020.6
5	A1 B1 C1 D1 E1 F1	355.80	80,631,229.00	226,619.5000	19,685,720.0000	74.7800	263248.5

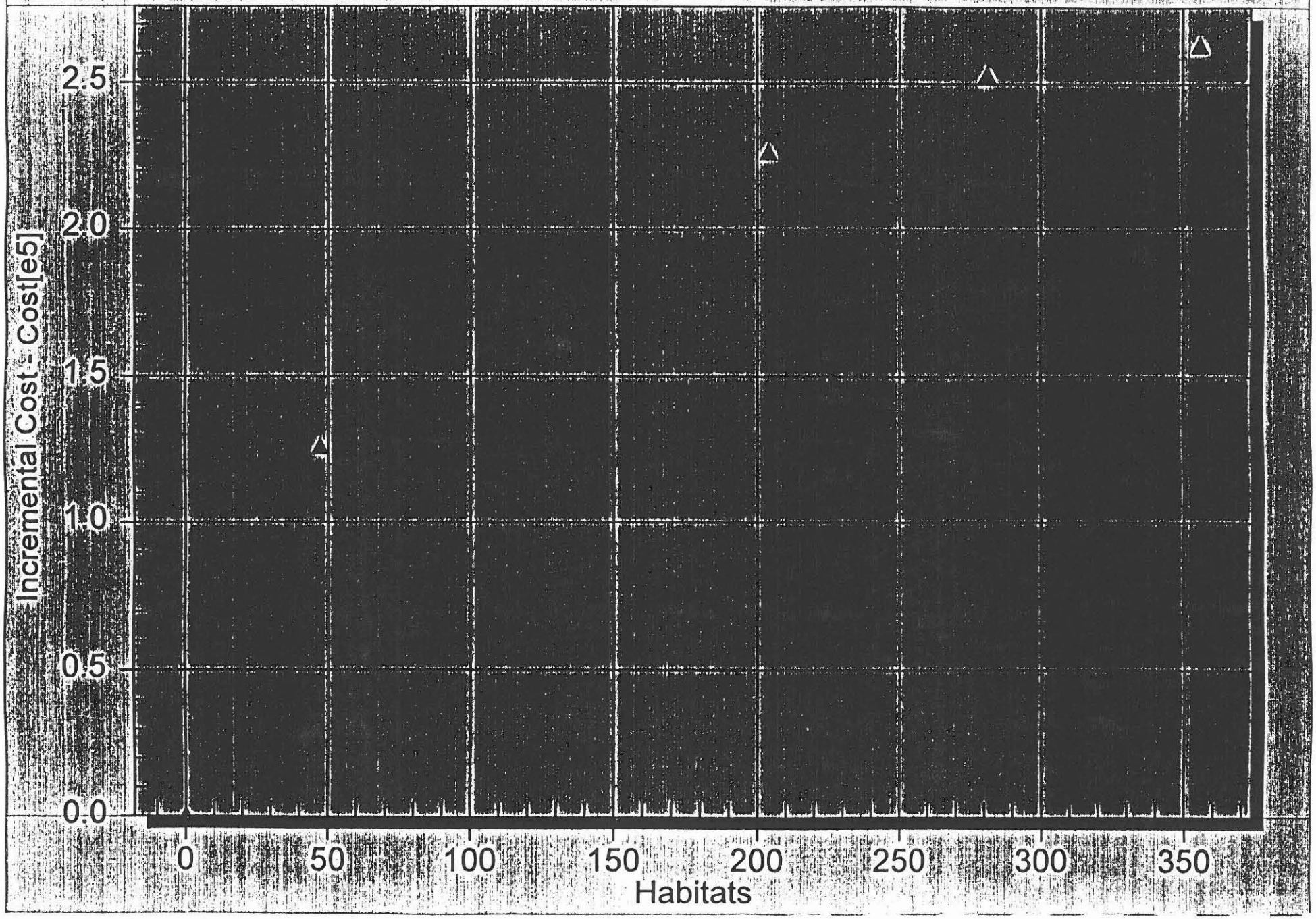
Cost Effective and Best Buy Plans - Alt 3.5 TY 50

Alternative 3.5 Target Year 50 Update 2



Best Buy Plans - Alt 3.5 TY 50

Alternative 3.5 Target Year 50 Update 2



Alternative 3.5 (No GRIC Land) Results

Increased (Net) habitat values calculations (spreadsheets)
Incremental Cost Analysis target years 1, 20, & 50 input data tables (spreadsheets)

Target Year 1

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Target Year 20

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Target Year 50

Incremental Cost Analysis input data (IWR-PLAN output)
Cost effective combinations average cost data (IWR-PLAN output)
Best buy combinations average cost data (IWR-PLAN output)
Best buy combinations incremental cost analysis data (IWR-PLAN output)
Combined cost effective & best buy graph (IWR-PLAN output)
Best buy graph (IWR-PLAN output)

Alternative 3.5 (No GRIC Land)
Habitat Suitability Indices

	Existing Conditions Habitat Acres to be replaced by features						
Replaced Habitats in Alternative 3.5	**H S I**	**A**	**B**	**C**	**D**	**E**	
Road	0.10			0.17	0.84		
Residential	0.10		15.85				
Agriculture	0.10	168.00	101.61	0.71			
Desert	0.40						
Marsh	N/A						
Water	N/A						
Cottonwood-Willow II	N/A						
Salt Cedar II	0.41				4.81		
Salt Cedar III	0.40			8.26	17.71	10.17	
Salt Cedar IV	0.35			22.30	23.68	109.00	
Salt Cedar V	0.20				2.02		
Mix: Cottonwood-Willow/Salt Cedar II	N/A						
Mix: Cottonwood-Willow/Salt Cedar III	N/A						
Mix: Cottonwood-Willow/Salt Cedar IV	N/A						
Cobble	0.10		10.52	6.12	19.90	14.90	
Quailbush-Saltbush	0.28	16.08	0.56				
Replaced Habitat Units (R-HU)		**21.30**	**12.95**	**11.81**	**19.82**	**43.71**	**0.00**

Replaced habitats would have changed in acreages or "H S I" without the project.
Neigboring habitats would have also changed in acreages or "H S I" without the project.
Some of the "H S I" values for the neighboring habitats change by reach.
Therefore Total Habitat Units for the Without-Project conditions have to be compared.

Habitat Suitability Indices (With Project)

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features	Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**						
	Diurnal Wetlands	184.083	0.55	184.083	0.55	184.083	0.55
B	**Overbank Wetlands**						
	Overbank Wetlands	128.531	0.70	128.531	0.70	128.531	0.70
C	**Pipeline & North Riparian Corridors**						
	C/W Riparian Corridors	37.577	0.10	37.577	0.90	37.577	0.97
D	**Independent Riparian Corridors**						
	C/W Riparian Corridors	68.955	0.10	68.955	0.90	68.955	0.97
E	**North Open Water Marsh**						
	Openwater Marsh	134.065	0.63	134.065	0.70	134.065	0.70

W-P (With Project), W/0-P (Without Project)

	Target Year 1		Target Year 20		Target Year 50	
Total Habitat Units in Study Area	**W/O-P**	**W-P**	**W/O-P**	**W-P**	**W/O-P**	**W-P**
Total Habitat Units	**1768.19**	**1944.93**	**1578.62**	**2039.54**	**1275.04**	**2047.00**
Deviation from W/O-P at Target Year 1	0.00	176.74	-189.57	271.35	-493.15	278.80
Study Area Total Net Habitat Units W-P	**176.74**		**460.92**		**771.95**	

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features Habitat Units	Acres	H S I	Acres	H S I	Acres	H S I
A	**Pump-Diurnal Wetlands**	**101.25**	**HU**	**101.25**	**HU**	**101.25**	**HU**
	Diurnal Wetlands	184.08	0.55	184.08	0.55	184.08	0.55
B	**Overbank Wetlands**	**89.97**	**HU**	**89.97**	**HU**	**89.97**	**HU**
	Overbank Wetlands	128.53	0.70	128.53	0.70	128.53	0.70
C	**Pipeline & North Riparian Corridors**	**3.76**	**HU**	**33.82**	**HU**	**36.45**	**HU**
	C/W Riparian Corridors	37.58	0.10	37.58	0.90	37.58	0.97
D	**Independent Riparian Corridors**	**6.90**	**HU**	**62.06**	**HU**	**66.89**	**HU**
	C/W Riparian Corridors	68.96	0.10	68.96	0.90	68.96	0.97
E	**North Open Water Marsh**	**84.46**	**HU**	**93.85**	**HU**	**93.85**	**HU**
	Openwater Marsh	134.07	0.63	134.07	0.70	134.07	0.70
		0.00	**HU**	**0.00**	**HU**	**0.00**	**HU**
		0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	0.00	0.00	0.00	0.00

		Target Year 1		Target Year 20		Target Year 50	
ID	New Features	N-HU	R-HU	N-HU	R-HU	N-HU	R-HU
A	**Pump-Diurnal Wetlands**	101.25	21.30	101.25	21.30	101.25	21.30
	Diurnal Wetlands - Net HU	**79.94**		**79.94**		**79.94**	
B	**Overbank Wetlands**	89.97	12.95	89.97	12.95	89.97	12.95
	Overbank Wetlands - Net HU	**77.02**		**77.02**		**77.02**	
C	**Pipeline & North Riparian Corridors**	3.76	11.81	33.82	11.81	36.45	11.81
	C/W Riparian Corridors - Net HU	**-8.05**		**22.01**		**24.64**	
D	**Independent Riparian Corridors**	6.90	19.82	62.06	19.82	66.89	19.82
	C/W Riparian Corridors - Net HU	**-12.93**		**42.24**		**47.06**	
E	**North Open Water Marsh**	84.46	43.71	93.85	43.71	93.85	43.71
	Openwater Marsh - Net HU	**40.75**		**50.14**		**50.14**	
		0.00	0.00	0.00	0.00	0.00	0.00
		0.00		**0.00**		**0.00**	

N-HU (New Habitat Units), R-HU (Replaced Habitat Units)

Total Habitat Units	286.33	109.59	380.94	109.59	388.40	109.59
Study Area Net Habitat Units	**176.74**		**271.35**		**278.80**	
Degradation Prevention Net Benefits	0.00		189.57		493.15	
Study Area Total Net Habitat Units W-P	**176.74**		**460.92**		**771.95**	

W-P (With Project)

With-Project Conditions (Alternative 3.5 - No GRIC Land) Target Year 1, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	-8.05	37.58	A & B	9,227,757.00	-1,146,305.22 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	-12.93	68.96		5,924,662.00	-458,210.52 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	40.75	134.07	C	10,457,967.00	256,637.23 $/HU
	Sub-Total			**176.73**			**61,148,644.00**	**346,000.36** $/HU
	Degradation Prevention Benefits			0.00				
	Total	51,937,144.00	9,211,500.00	**176.73**	553.22		**61,148,644.00**	**346,000.36** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

With-Project Conditions (Alternative 3.5 - No GRIC Land) Target Year 20, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	22.01	37.58	A & B	9,227,757.00	419,252.93 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	42.24	68.96		5,924,662.00	140,261.88 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	50.14	134.07	C	10,457,967.00	208,575.33 $/HU
	Sub-Total			**271.35**			**61,148,644.00**	**225,349.71** $/HU
	Degradation Prevention Benefits			189.57				
	Total	51,937,144.00	9,211,500.00	**460.92**	553.22		**61,148,644.00**	**132,666.50** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

With-Project Conditions (Alternative 3.5 - No GRIC Land) Target Year 50, by Feature.

ID	Feature	Construction Costs	Real Estate Costs	Increased Habitat Values	Habitat Acreage (Not RE)	Dependency	Total Cost $	Average Cost Per Habitat Unit
A	Pump-Diurnal Wetlands	22,687,730.00	3,220,000.00	79.94	184.08		25,907,730.00	324,089.69 $/HU
B	Overbank Wetlands	7,537,528.00	2,093,000.00	77.02	128.53	A	9,630,528.00	125,039.31 $/HU
C	Pipeline & North Riparian Corridors	8,434,257.00	793,500.00	24.64	37.58	A & B	9,227,757.00	374,503.13 $/HU
D	Independent Riparian Corridors	3,969,662.00	1,955,000.00	47.06	68.96		5,924,662.00	125,895.92 $/HU
E	North Open Water Marsh	9,307,967.00	1,150,000.00	50.14	134.07	C	10,457,967.00	208,575.33 $/HU
	Sub-Total			**278.80**			**61,148,644.00**	**219,327.99** $/HU
	Degradation Prevention Benefits			493.15				
	Total	51,937,144.00	9,211,500.00	**771.95**	553.22		**61,148,644.00**	**79,213.22** $/HU

Construction costs include Contingencies (15%), Planning, Survey, Engineering, & Design (10%), Engineering During Construction (1%), and Supervision & Administration (6.3%)

SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 1 Alternative 3.5 Target Year1 No GRIC

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY1 No GRIC.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/3/00 11:12:09 AM **EDITED:** **ANALYZED:** 3/3/00 11:12:12 AM

POSSIBLE COMBINATIONS: 32 **COST EFFECTIVE:** 4

ACTUAL COMBINATIONS: 10 **BEST BUY:** 3

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/3/00 11:12:29 AM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	-8.05
D	0	0	0
D	1	5924662	-12.93
E	0	0	0
E	1	10457967	40.75

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1 *3/3/00 11:12:52 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A1 B0 C0 D0 E0	79.94	25,907,730.00	324,089.6923
3	A1 B1 C0 D0 E0	156.96	35,538,258.00	226,416.0168
4	A1 B1 C1 D0 E1	189.66	55,223,982.00	291,173.5843

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1 *3/3/00 11:12:59 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A1 B1 C0 D0 E0	156.96	35,538,258.00	226,416.0168
3	A1 B1 C1 D0 E1	189.66	55,223,982.00	291,173.5843

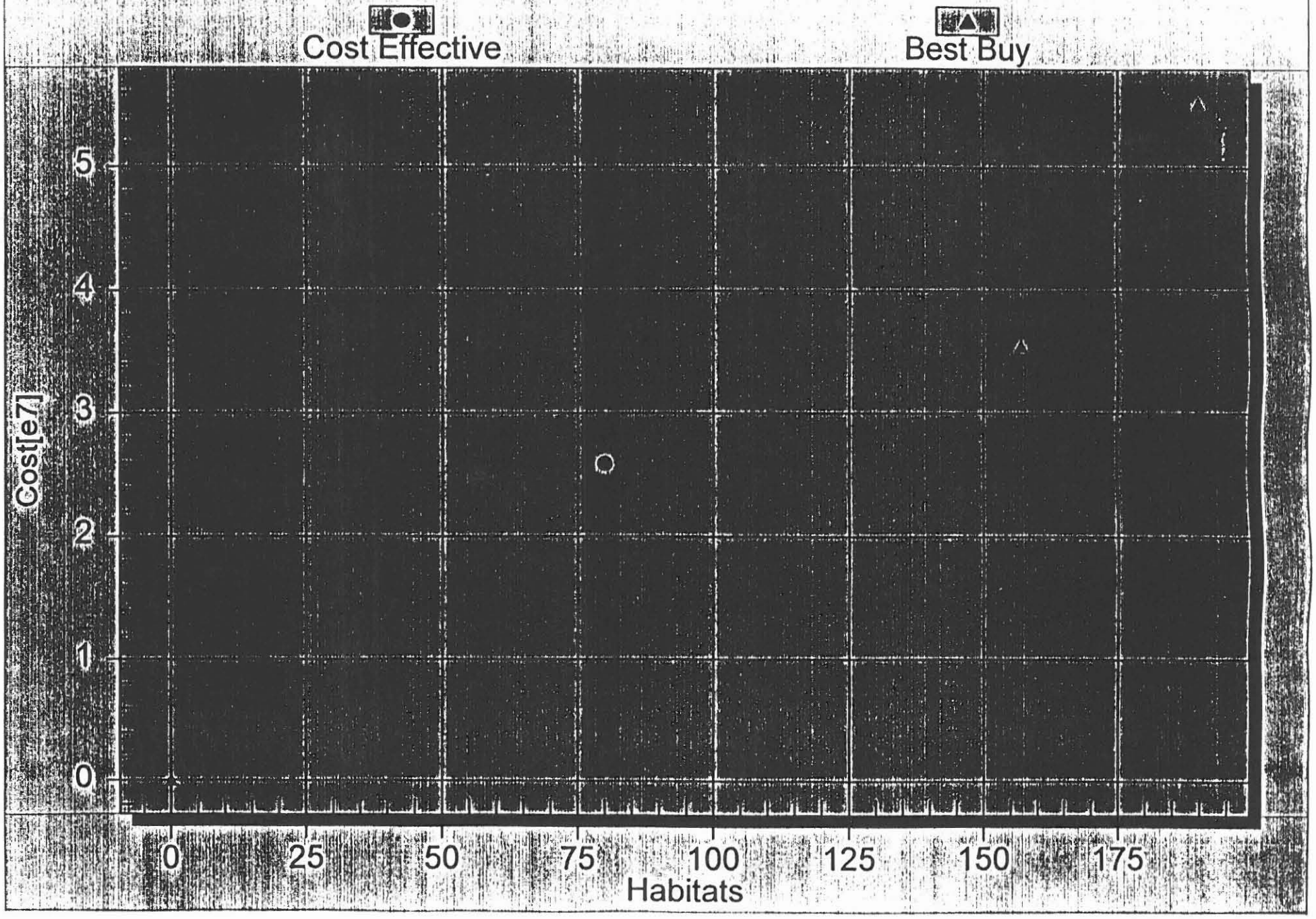
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 1

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A1 B1 C0 D0 E0	156.96	35,538,258.00	226,416.0000	35,538,260.0000	156.9600	226416
3	A1 B1 C1 D0 E1	189.66	55,223,982.00	291,173.6000	19,685,720.0000	32.7000	602009.9

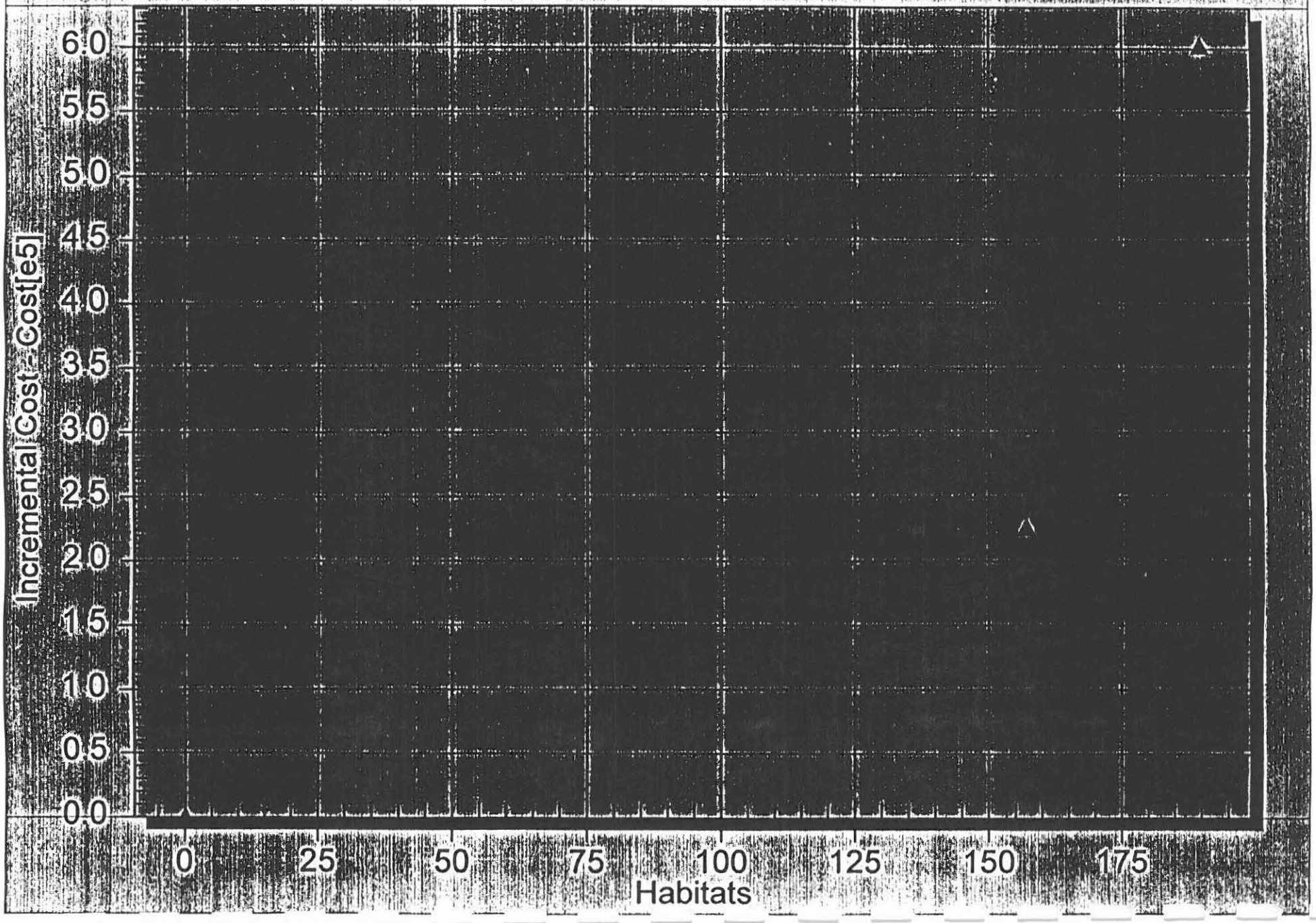
Cost Effective and Best Buy Plans - Alt 3.5 TY 1

Alternative 3.5 Target Year1 No GRIC



Best Buy Plans - Alt 3.5 TY 1

Alternative 3.5 Target Year1 No GRIC



SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 20 Alternative 3.5 Target Year 20 No GRIC

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY20 No GRIC.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/3/00 11:15:15 AM **EDITED:** **ANALYZED:** 3/3/00 11:15:16 AM

POSSIBLE COMBINATIONS: 32 **COST EFFECTIVE:** 9

ACTUAL COMBINATIONS: 10 **BEST BUY:** 4

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/3/00 11:17:41 AM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	22.01
D	0	0	0
D	1	5924662	42.24
E	0	0	0
E	1	10457967	50.14

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20

3/3/00 11:17:50 AM

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0	42.24	5,924,662.00	140,261.8845
3	A1 B0 C0 D0 E0	79.94	25,907,730.00	324,089.6923
4	A1 B0 C0 D1 E0	122.18	31,832,392.00	260,536.8473
5	A1 B1 C0 D0 E0	156.96	35,538,258.00	226,416.0168
6	A1 B1 C0 D1 E0	199.20	41,462,920.00	208,147.1888
7	A1 B1 C1 D1 E0	221.21	50,690,677.00	229,151.8331
8	A1 B1 C1 D0 E1	229.11	55,223,982.00	241,036.9779
9	A1 B1 C1 D1 E1	271.35	61,148,644.00	225,349.7107

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20 *3/3/00 11:17:59 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0	42.24	5,924,662.00	140,261.8845
3	A1 B1 C0 D1 E0	199.20	41,462,920.00	208,147.1888
4	A1 B1 C1 D1 E1	271.35	61,148,644.00	225,349.7107

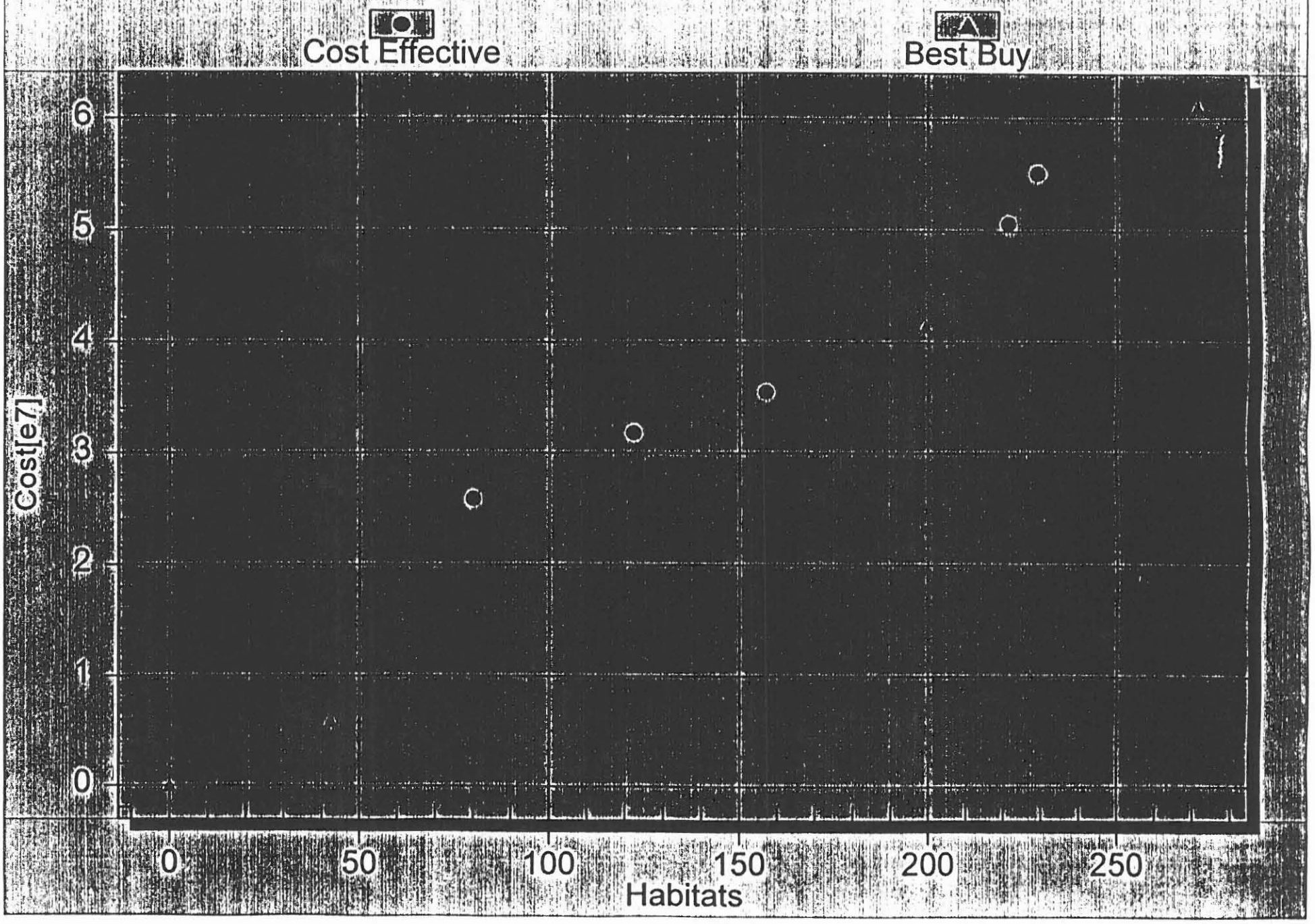
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 20

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D1 E0	42.24	5,924,662.00	140,261.9000	5,924,662.0000	42.2400	140261.9
3	A1 B1 C0 D1 E0	199.20	41,462,920.00	208,147.2000	35,538,260.0000	156.9600	226416
4	A1 B1 C1 D1 E1	271.35	61,148,644.00	225,349.7000	19,685,720.0000	72.1500	272844.4

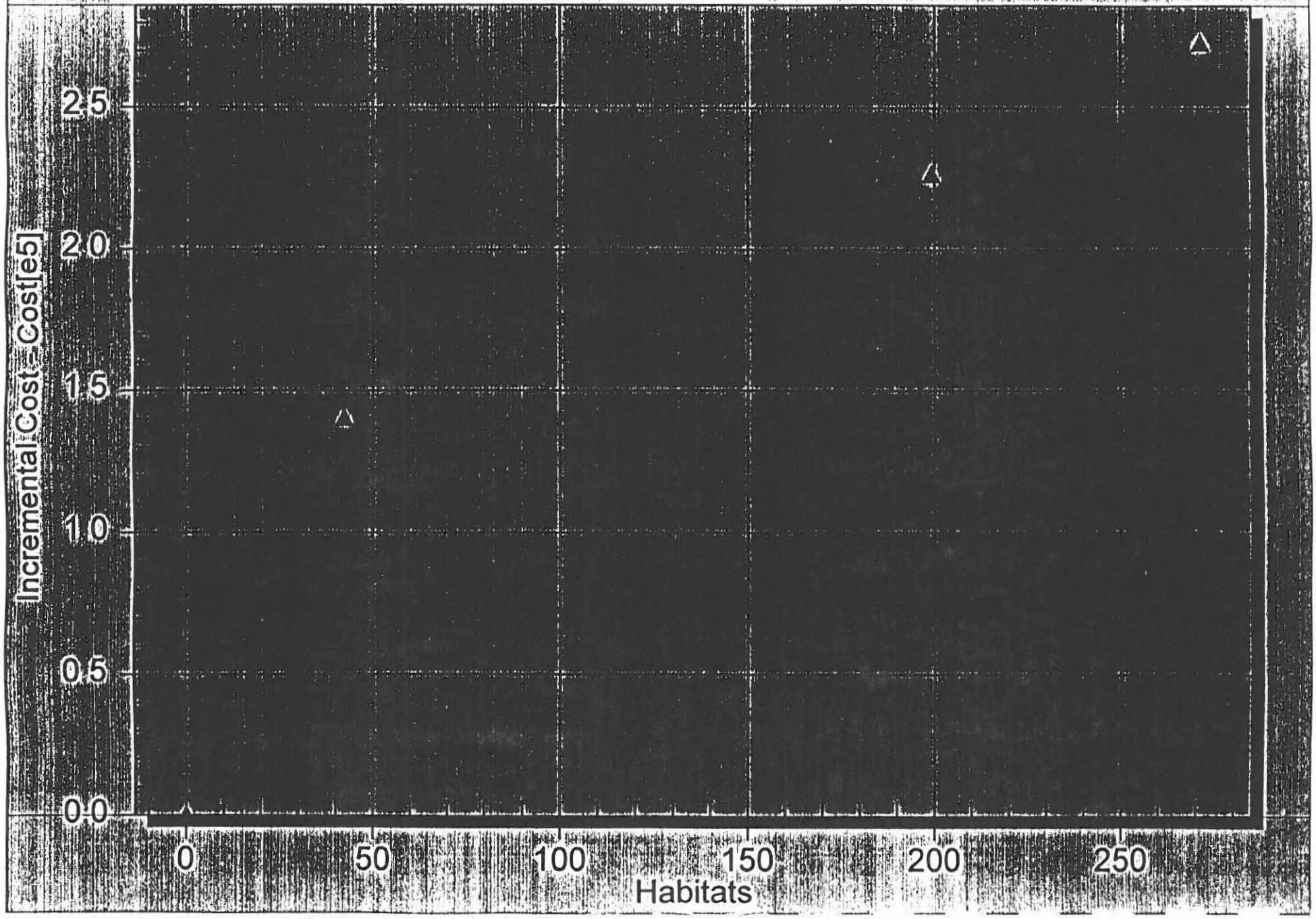
Cost Effective and Best Buy Plans - Alt 3.5 TY 20

Alternative 3.5 Target Year 20 No GRIC



Best Buy Plans - Alt 3.5 TY 20

Alternative 3.5 Target Year 20 No GRIC



SCENARIO STATISTICS

SCENARIO: Alt 3.5 TY 50 Alternative 3.5 Target Year 50 No GRIC

FILE: C:\IWRPLAN2\Data\Alternative 3.5 TY50 No GRIC.mdb

COST VARIABLE: Cost Construction Real Estate Costs **SENSITIVITY:** Expect

OUTPUT VARIABLE: Habitats Net Habitat Units **SENSITIVITY:** Expect

CREATED: 3/3/00 11:36:37 AM **EDITED:** **ANALYZED:** 3/3/00 11:36:39 AM

POSSIBLE COMBINATIONS: 32 **COST EFFECTIVE:** 9

ACTUAL COMBINATIONS: 10 **BEST BUY:** 4

CONSTRAINT GROUP: NONE

EXCLUDED SOLUTIONS

DERIVED VARIABLES

DEPENDENCY / NON-COMBINABILITY

Dependency

B A

C AB

E C

INPUT DATA

3/3/00 11:38:54 AM

CODE		Cost	Habitats
A	0	0	0
A	1	25907730	79.94
B	0	0	0
B	1	9630528	77.02
C	0	0	0
C	1	9227757	24.64
D	0	0	0
D	1	5924662	47.06
E	0	0	0
E	1	10457967	50.14

Average Cost Of Cost Effective Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50 *3/3/00 11:39:08 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0	47.06	5,924,662.00	125,895.9201
3	A1 B0 C0 D0 E0	79.94	25,907,730.00	324,089.6923
4	A1 B0 C0 D1 E0	127.00	31,832,392.00	250,648.7559
5	A1 B1 C0 D0 E0	156.96	35,538,258.00	226,416.0168
6	A1 B1 C0 D1 E0	204.02	41,462,920.00	203,229.6834
7	A1 B1 C1 D1 E0	228.66	50,690,677.00	221,685.8086
8	A1 B1 C1 D0 E1	231.74	55,223,982.00	238,301.4672
9	A1 B1 C1 D1 E1	278.80	61,148,644.00	219,327.9914

Average Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50 *3/3/00 11:39:16 AM*

Counter	Plan Code	Habitats (HU)	Cost ($)	Average Cost $ / HU
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000
2	A0 B0 C0 D1 E0	47.06	5,924,662.00	125,895.9201
3	A1 B1 C0 D1 E0	204.02	41,462,920.00	203,229.6834
4	A1 B1 C1 D1 E1	278.80	61,148,644.00	219,327.9914

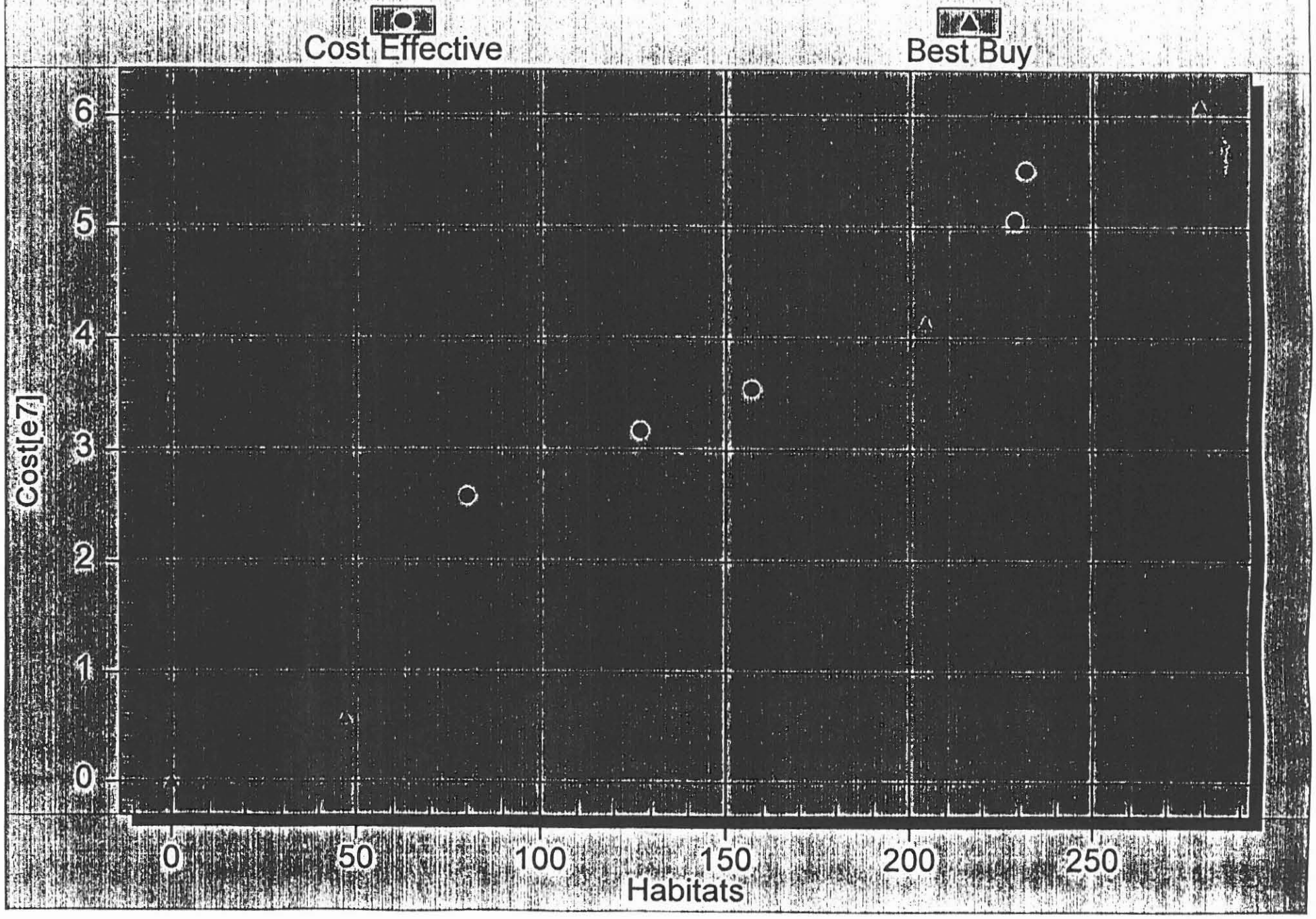
Incremental Cost Of Best Buy Plan Combinations (Ordered By Output)

Scenario: Alt 3.5 TY 50

Counter	Plan Code	Habitats (HU)	Cost ($)	Avg. Cost $ / HU	Inc. Cost ($)	Inc. Output (HU)	Incremental Cost Per Output
1	A0 B0 C0 D0 E0	0.00	0.00	0.0000	0.0000	0.0000	0
2	A0 B0 C0 D1 E0	47.06	5,924,662.00	125,895.9000	5,924,662.0000	47.0600	125895.9
3	A1 B1 C0 D1 E0	204.02	41,462,920.00	203,229.7000	35,538,260.0000	156.9600	226416
4	A1 B1 C1 D1 E1	278.80	61,148,644.00	219,328.0000	19,685,720.0000	74.7800	263248.5

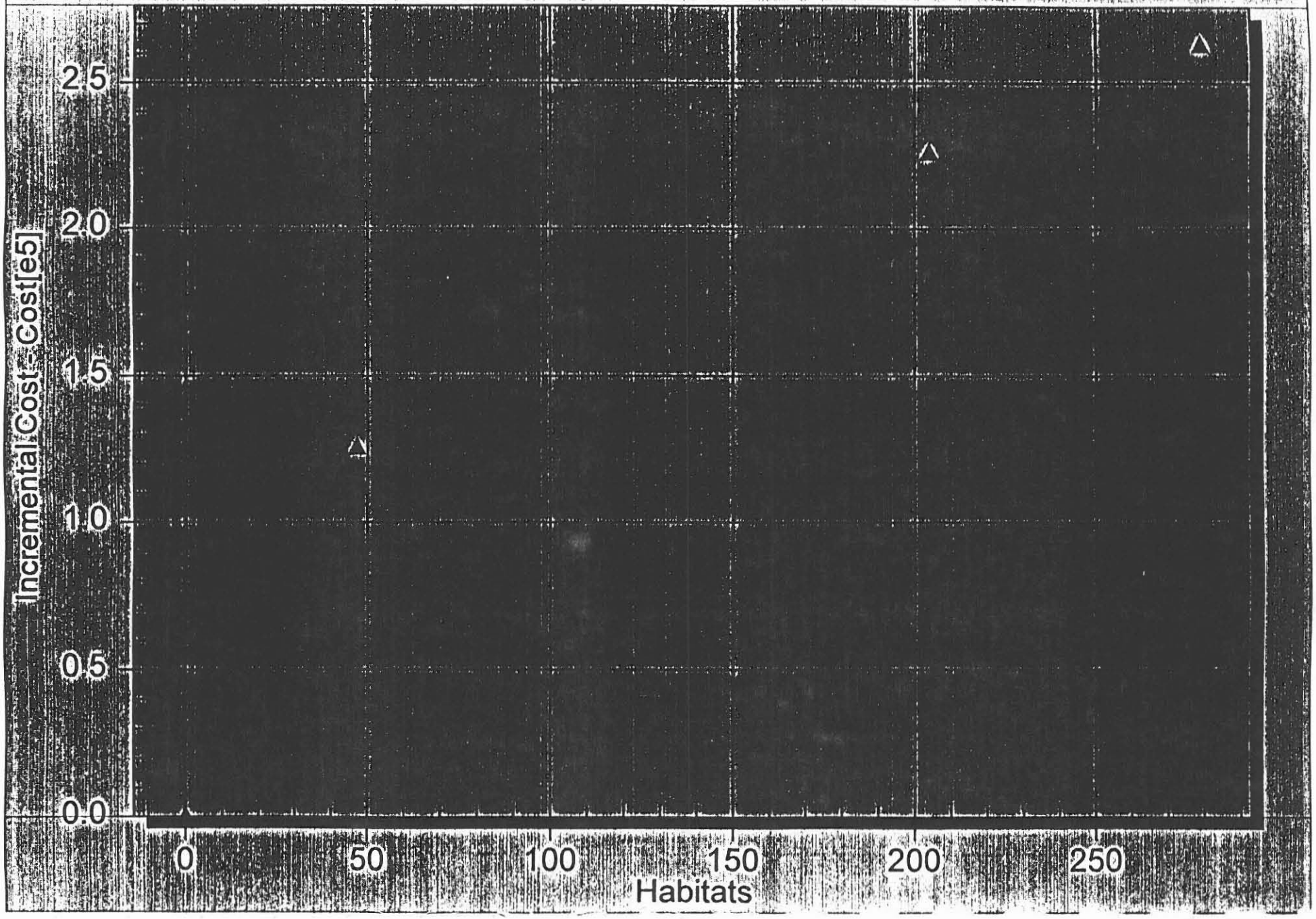
Cost Effective and Best Buy Plans - Alt 3.5 TY 50

Alternative 3.5 Target Year 50 No GRIC



Best Buy Plans - Alt 3.5 TY 50

Alternative 3.5 Target Year 50 No GRIC



Appendix H: Recreation

TRES RIOS RIVER MANAGEMENT PLAN

Environmental Education and Recreation Component

TRES RIOS RECREATION TECHNICAL COMMITTEE

Jim Burke, Chair	Phoenix Parks, Recreation and Library Department
Bing Brown	Phoenix Water Services Department
Bob Skaggs	Maricopa County Parks and Recreation Department
Carlin Holley	City of Avondale
Rick Mellegard	Bureau of Reclamation
T. J. Newman	Phoenix Parks, Recreation and Library Department
Adron Reichert	Citizen, Holly Acres
René Vera	Phoenix Parks, Recreation and Library Department
Bill Werner	Arizona Game and Fish Department

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1

INTRODUCTION

The United States Army Corps of Engineers and the multi-city Subregional Operating Group (SROG), consisting of the cities of Phoenix, Glendale, Mesa, Scottsdale and Tempe, have entered into a contract for a Feasibility Study of an environmental restoration project known as Tres Rios, Arizona, on the Salt River at its confluence with the Gila and Agua Fria Rivers. These rivers are virtually dry and have suffered an almost total loss of native habitat as a result of early 20th century reclamation projects. This desert riparian habitat is a critical and diminishing resource throughout Arizona.

The Tres Rios study area is approximately nine miles west of downtown Phoenix. The upstream boundary is located at 83rd Avenue, just upstream of where the City of Phoenix operates a wastewater treatment plant. The study area extends west from the treatment plant for approximately seven miles through the confluence of the both the Gila and Agua Fria Rivers. The Buckeye Irrigation Company diversion canal serves as the end of the study area.

2

RECREATION FEATURES

"A planning objective of the Tres Rios Feasibility Study is to ***"increase environmental education and passive recreation opportunities incidental to the restoration effort."*** To that end, the goal of the Recreation and Environmental Education Component is to ***provide opportunities for visitors of all ages and backgrounds to enjoy this unique resource while developing an awareness, knowledge, and understanding of desert riparian habitat and its relationship to the surrounding environment. Additionally, it presents an opportunity to acknowledge and understand the influence the Salt, Agua Fria, and Gila rivers have had on the environment and cultures throughout history."***

Existing Recreation Opportunities

On the western border of the study area lies Estrella Mountain Regional Park. The park is owned and managed by Maricopa County Parks and Recreation Department. The rugged and scenic Sierra Estrella mountains are the most dominant feature of Estrella Mountain Regional Park. The terrain of these mountains is characterized by very steep slopes, numerous rock out-crops, shallow soils and sparse desert vegetation.

The County has developed a master plan for the 19,200 acre park, located approximately 20 miles southwest of downtown Phoenix. The master plan envisions the preservation of scenic desert wilderness areas while incorporating sensitive development of recreational facilities and activities. The Plan accommodates the expected annual demand of 1 million visitors while insuring that the existing sonoran desert environment remains in its pristine condition. In fact, 90 percent of the park will remain essentially untouched. The remaining 10 percent will be sensitively utilized for educational, camping, picnicking, and sporting activities.

While water is a highly attractive feature for recreationists, park trails and facilities have presently been planned away from the Gila River. Once the County completes its Sun Circle Trail System through this reach of the Gila and Salt Rivers, recreation use patterns are expected to expand throughout the study area. The Sun Circle Trail, a component of the National Recreation Trail system, comprises a 110 mile loop encompassing the Phoenix metro area. The

trail offers a unique opportunity for hiking, horseback riding and bicycling throughout the urban area. Approximately 70 percent of the Sun Circle trail system is in place. The County has an agreement with the Maricopa County Flood District to establish the Sun Circle Trail within the flood control district corridor from Skunk Creek to the Gila River - Salt River confluence. The Tres Rios Project is an excellent opportunity to designate a segment of the Sun Circle Trail. This will benefit Tres Rios with a major non-motorized travelway connecting to the other valley areas.

Future Opportunities

The Tres Rios project provides a unique opportunity for resource-based recreation and environmental education. The restoration of the dry Salt, Agua Fria, and Gila river channels will bring a riparian open space feature to the west Valley of the Sun that spans a 7-mile corridor and contains well over 800 acres. A desert riparian habitat in an urban area is unlike any other resource within the metropolitan Phoenix area, providing many unique recreation and education opportunities for residents and out-of-town visitors. Drawing on a population base of two million in the Valley, it is estimated that visitation to the Tres Rios project will exceed 150,000 annually. Primary use times for this unique resource would coincide with the "visitor season" between October and May when temperatures are moderate.

The goal of the environmental education and recreation component is to provide opportunities for visitors of all ages and backgrounds to enjoy this unique resource while developing an awareness, knowledge and understanding of desert riparian habitat and its relationship to the surrounding environment. Additionally, it presents an opportunity to acknowledge and understand the influence the Salt, Agua Fria and Gila rivers have had on the environment and cultures throughout history. Visitors to this day-use area can participate in a variety of pursuits from enjoying scenic views, picnicking with the family, learning about the habitat, or exploring the resource on foot, by bicycle or horseback. Recognizing our diverse society, the Tres Rios project will have design components ranging from areas adapted for special needs to multi-lingual signage.

For planning purposes the features have been divided into three primary areas: ***The Bank, The Terrace***, and ***The Channel***. As shown by the conceptual plans and sections in the appendix, each of these areas provides a different venue for recreational opportunities which coincide with learning opportunities allowing participants to *learn, see* and *experience* the resource first-hand.

> ***The Bank*** provides recreational experiences including hiking, biking, and horseback riding to scenic overlooks, and leisure walking. Abundant educational opportunities will be accommodated by constructed features which will interpret cultural, biological, and ecological themes related to the restored desert riparian habitat.
>
> ***The Terrace*** is the area where the habitat has a permanent water source to create a self-sustaining ecosystem. This area will provide more limited and controlled recreational and educational experiences similar to the bank areas.
>
> ***The Channel*** represents an area seeming to be relatively unaltered by humans, and will undergo physical changes in response to seasonal river flows and flooding. People will enter this zone on its terms, and it will contain few manmade features, allowing one to observe the natural forces of land and water that define and shape desert rivers and associated habitat.

The Bank Experience

Tres Rios will provide a variety of recreation opportunities for users. Those visiting the project will be able to arrive by private vehicle or alternate mode of transportation, including horse, public transit or bicycle. Users would enter at one of five primary access points along *The Bank* at 91st Avenue, 99th Avenue, 107th Avenue, 115th Avenue, and El Mirage Road. These points coincide with existing river crossings or roads. Amenities at each access point will vary, but may include: parking; restroom facilities; water fountains; shade structures; site furniture; and appropriate lighting. Each access point as a trailhead will provide appropriate signage and a climate-controlled orientation kiosk or visitor center to give visitors an overview of the activities and experiences available and orient users to the sensitivity of the area and appropriate uses and expectations. All improved facilities will be designed to provide accessibility to all members of the community.

Opportunities available at ***The Bank*** will include:

Trails:

Multi-use non-motorized trails will allow visitors to explore ***The Bank*** on foot, horseback, or bicycle. The hard surface trail will accommodate a variety of cycling activities allowing travel along the entire project. Natural surface trails will traverse the bank leading foot traffic, equestrians and mountain bicyclists to scenic overlooks or loops throughout the area. Additionally, a barrier free trail will be provided for users with limited mobility. Interpretive trails will allow for self-guided tours of the area.

The Sun Circle Trail will be established through the bank area. Extending through other areas of the Valley, the Sun Circle Trail will serve as a non-motorized transportation corridor providing access to Tres Rios from central and south Phoenix and the East Valley along the ***Rio Vista Trail*** and from the West Valley along the West Valley Recreation Corridor.

Scenic Overlooks:

Accessible locations along the roadways and trails will allow for family picnicking, informal play and scenic vistas of the surrounding landscape. More secluded areas will accommodate informal seating and meditation areas.

Education Opportunities:

An opportunity exists for a major Interpretive Center to furnish visitors programmatic information regarding the restoration of the habitat, the water cycle, an historical perspective of the rivers, and the flora and fauna within the project area. Additionally, there will be exhibits, signage, and multimedia displays.

Outdoor Gathering Area:

Gathering areas will be provided for groups to attend lectures by special interest speakers.

Staging Areas:

Areas will be designed for groups and classes to gather and prepare for a learning experience at the Tres Rios Project.

The Terrace Experience

The Terrace will provide opportunities including interpretive trails, outdoor classrooms and study areas. *The Terrace* will be accessible by the trail system from select locations along *The Bank*. At each transition point to *The Terrace*, appropriate signage will inform visitors of the new habitat they are entering, and any user restrictions and expectations. *The Terrace* will provide opportunities for environmental education and developing an understanding of how the habitat has been restored. Some areas of *The Terrace* may be designated as "sensitive" habitat, and will be protected from public impacts.

Opportunities available at ***The Terrace*** will include:

Trails:

Trails will provide a transition from *The Bank* to the more sensitive *Terrace Habitat* and will be available for hikers, bikers, and equestrians. A barrier-free interpretive trail will be provided featuring multi-lingual signage regarding the project.

Scenic Overlooks:

Locations along *The Terrace* will allow family picnicking, informal play, and scenic vistas of the restored river bed and surrounding landscape. More secluded areas will provide informal seating and meditation nooks.

Habitat Views:

Special areas will provide wildlife blinds allowing visitors an opportunity to observe wildlife in its restored natural habitat without disturbing the seclusion needed by most. Interpretive signage will be provided.

Demonstration Walks:

Pathways along *The Terrace* will provide visitors insight into the inner workings of a habitat restoration project and its role in water conservation. Special "wetlands" walks or trails to areas featuring aquatic habitat will be provided as appropriate to the season and species.

Research Areas:

These unique study areas will allow opportunities for educational institutions to conduct long- and/or short-term research into the unique workings of the Tres Rios project including water conservation, riparian areas, and habitat restoration.

Bird Watching:

These unique areas will allow opportunities for novice and experienced bird watchers to view and learn about the variety of waterfowl, birds of prey, migratory and song birds that will find sanctuary within the Tres Rios habitat.

Urban Fishing:

When water quality allows, ponds providing habitat for fish will allow anglers opportunities to fish.

Outdoor Classrooms:

Areas will be designed for groups and classes of 50 to 75 to assemble for programmatic learning experiences.

The Channel Experience

The Channel is the true sensitive habitat of the Tres Rios Project, and will provide visitors unique opportunities to view, enjoy and experience a restored desert riparian habitat. This area will allow one to explore a riparian zone supported only by limited stream flows and surface runoff. Areas within *The Channel* will be designated as sanctuary or conservation areas, restricted from public use, allowing for the protection of biologically sensitive animals and plant life. No pets or mechanized means of travel will be allowed in *The Channel*. Natural surface trails will lead visitors to *The Channel* from *The Terrace*, and perhaps allow for occasional crossings of the stream bed, expanding opportunities to explore the river habitat. Visitors to the area will leave with a heightened awareness of the fragile relationship between water availability and habitat in the desert.

3

VISITATION ESTIMATES

Annual Visitation

The Tres Rios Recreation and Environmental Education Component is planned to provide high quality experiences in an outdoor setting unique to the Phoenix metropolitan area. The unparalleled desert river restoration project provides an outstanding prospect for physical and programmatic activities, yet also places a great responsibility upon the sponsoring agencies to design and manage these activities for sustainability of the restoration. From the outset of the project it will be realized that the overriding concern will be to create conditions favorable to the return of the natural systems formerly associated with the river, and that human use will be secondary. However, it is also of great value to the project that the public have the opportunity within this constraint to experience, enjoy, and learn from the river.

How to best achieve this balance is worthy of much additional study and is beyond the scope of this initial effort; however, some basic assumptions must be made in order to determine preliminary cost estimates and to serve as the basis for design. These assumptions are: (1) the Gila River Indian Community will allow portions of their land to be included in the project, (2) the Army Corps of Engineers will accept that Environmental Education is a project value, (3) the City of Phoenix will assume operational control of the recreational and environmental education functions not within other jurisdictions.

Due to the relatively remote location of the project and the intimacy of the expected recreation and education experience, it is projected that most visitors will arrive by private vehicle. However, in order to mitigate potential environmental impacts from increased traffic, facilities will be developed that promote alternative transportation and energy efficiency. Initial capacity of the parking facilities will be designed for not more than 250 vehicles in order to limit the potential impact of human activities upon the restoration project.

Based on historical data maintained by the City of Phoenix for resource-based recreational sites, it is estimated that 2.75 visitors arrive in each private vehicle. Additionally, an estimated one visitor per four vehicles arrives at a site by an alternate mode of transportation including bicycle, foot traffic and public transportation. It would be a legitimate goal of the Recreation/Education component to increase the ratio of visitors arriving by alternate means such as busses.

In the Valley of the Sun, visitation to outdoor recreational sites coincides with temperature. Visitation occurs in two seasons: WINTER (October through May); and SUMMER (June through September.) The WINTER months in the Valley have maximum average temperatures of 87 degrees. Visitors from around the world come to Phoenix during this time, and numerous "winter residents" arrive. SUMMER months bring hot sunny days and occasional afternoon

thunderstorms. Temperatures average 102 degrees, making the early mornings and evenings the best time for outdoor activities.

Anticipated visitation at Tres Rios is based on use projections during PRIME TIME and NON-PRIME TIME throughout the year. PRIME TIME includes weekends and holidays. NON-PRIME TIME is weekdays. A typical visit to Tres Rios is expected to span 3 hours, although many visits will be longer, and some much shorter. Turnover refers to the number of times a parking space will be filled daily.

Below is a breakdown of anticipated visitation during WINTER and SUMMER.

WINTER 79% of annual use

PRIME TIME	70 days	1.5 turnovers	78,750visitors
NON-PRIME TIME	170 days	0.5 turnover	63,750visitors
		Winter	**142,500**

SUMMER 21 % of annual use

PRIME TIME	28 days	1 turnovers	21,000visitors
NON-PRIME TIME	92 days	0 .25 turnover	17,250visitors
		Summer	**38,250**

TOTAL ANNUAL VISITATION **180,750**

Future Visitation Growth

The Tres Rios project is located in an area of Phoenix that is under tremendous population growth pressure. The area from 27th Avenue to the west city limits south of Interstate 10 and north of the Salt River (the Estrella Village Planning Area) is expected to have a population of approximately 100,000 when fully developed in about 15 years. The Laveen Village Planning Area (between the river and South Mountain from 27th Avenue to the Gila River Indian Community) adjoins the project area to the south and east of 83rd Avenue and will be home to approximately 93,000 new residents. Obviously, the existing rural, open character of the landscape in these parts of the City will change greatly with the addition of almost 200,000 people. This new population will be living within approximately 7 miles of the project. Efforts are underway to plan a network of trails and pathways to connect future parks within the area and to provide linkages to the Salt River throughout its Phoenix reach.

As the population grows, and the Tres Rios project matures, visitation to the resource is anticipated to increase. It is anticipated that WINTER PRIME TIME visitation will be at facility capacity with additional growth from those visiting the resource through alternative means such as improved trail linkages. Growth in this time period could increase by 50% over 50 years, for a total increase of 39,375 visitors.

The greatest increase over time will be during the four summer months. The City of Phoenix has documented changes in user patterns during the summer months with other resource-based facilities. As trees mature providing more shade and facilities are at capacity during WINTER PRIME TIME, visitors will seek alternative times to enjoy Tres Rios. It is anticipated that visitation during the summer will increase by 150% over 50 years for a total increase of 57,375 visitors.

Overall visitation increase for the resource over 50 years is projected to be approximately 96,750.

Potential Visitor Impact

While these numbers are relatively large and may be seen as potentially threatening to the success of the restoration project, it should be born in mind that the project will be constructed in proximity to over 2,500,000 people. Within the life of the project the population of metropolitan Phoenix is projected to increase to approximately 4,700,000.

The City of Phoenix has vast experience with large numbers of visitors to its resource-based recreation sites. The Summit Trail at Squaw Peak currently has about 500,000 hikers a year; the Echo Canyon Trail on Camelback Mountain carries approximately 300,000 hikers each year, and South Mountain Park, the largest municipal park in the nation, has approximately 3,000,000 visitors each year, most of whom use some portion of the natural areas.

Tres Rios must be artfully designed and carefully managed. The discussion in earlier chapters regarding the functions of the recreation and environmental education improvements stressed the intent to segregate the visitor experiences from the core restoration of the river channel where critical habitat is likely to occur. By providing visitor-related improvements at locations appropriate to the specific habitat, environmental education and recreation functions can serve as an integral part of the project. Indeed, the education and recreation components of the project are much more likely to enhance the restoration by building an informed and supportive base of popular opinion than they are likely to degrade the project by overcrowding facilities and disrupting natural functions.

Nonetheless, visitors must be carefully managed to prevent adverse effects to the project and to non-project lands owned by the Gila River Indian Community and other adjacent property owners. The presumption is that the visitor management program will include Phoenix Park Ranger coverage for the project area in addition to the design features already discussed.

4

Point Value Assessment

One of the Specific Planning Objectives stated in the Tres Rios Feasibility Study is to "increase environmental education and passive recreation opportunities". The vision for these opportunities is described in detail in Chapter One, *Description of Recreation Features.* This vision is in compliance with the Corps mission statement and its *Recreation Operations and Maintenance Policies,* (ER 1130-2-550).

There is an inherent difficulty in determining the values of environmental education and recreation when they are considered separate experiences. The dichotomy of the two is not as easily determined as it might seem. As an example, a recent survey by Arizona State Parks lists *visiting historic/archeological sites, retracing historic/prehistoric routes, and wildlife viewing/ bird watching* as three of the six most important activities for users of non-motorized trails. *Day hiking, walking*, and *backpacking* are the other three. It would be a logical deduction that the environmental education experience and the resource-based recreation experience are virtually inseparable. Indeed, the currently popular "ecotourism" trend is built upon the premise that first-hand learning experiences are rewarding not only as an educational experience but also as healthful, stimulating recreation. The education experience is recreation, in other words.

Nonetheless, an attempt to logically separate the facilities supportive of the individual experiences is presented in this chapter.

Point Value Estimates for Recreation

(A) RECREATION EXPERIENCE

Total possible points: 30 scored points: 29

Numerous high quality value activities to include: habitat restoration; riparian resource areas; water conservation areas; flora and fauna sanctuary and conservation areas; study areas; urban fishing opportunities; outdoor classroom; birding; interpretive opportunities and scenic overlooks.

Some general activities to include: hiking; horseback riding; cycling; fishing and picnicking.

(B) AVAILABILITY OF OPPORTUNITY
Total possible points: 18 scored points: 16

None within one hour travel time: the nearest *water-based* recreation sites with a natural riparian habitat are located well over an hour and a half away, which are the Salt River Recreation Area and Verde River Recreation Area in the Tonto National Forest, northeast of the valley.

(C) CARRYING CAPACITY
Total possible points: 14 scored points: 14

Ultimate facilities to achieve intent of selected alternative. Areas within Tres Rios will be designed and managed to provide for recreational experiences while preserving the resource.

(D) ACCESSIBILITY
Total possible points: 18 scored points: 15
Good access, high standard road to site; good access within site. Tres Rios is located within a major metropolitan area with access to the interstate highway system, ultimately integrated with public transportation routes, traffic thoroughfares, and a planned system of neighborhood and regional trail linkages.

(E) ENVIRONMENTAL
Total possible points: 20 scored points: 17

High esthetic quality to include: geology; hydrology of project; topography; water resources; vegetation; and wildlife. Efforts are currently being made by local and federal governments to mitigate any existing negative factors of illegal dumping.

TOTAL POSSIBLE POINTS: 100 TOTAL SCORED POINTS: 91

Assessment Panel Members

A panel of Phoenix Parks, Recreation and Library Department employees from a variety of recreation, design, and resource management backgrounds reviewed and scored the factor justification utilizing Table 6-29 to determine point values for the Tres Rios Recreation Component:

René Vera	Recreation Supervisor
Sarah Hall	Park Manager
Walt Kinsler	Landscape Architect II
T. J. Newman	Landscape Architect II
Randy Singh	Park Manager

Point Value Criteria for Environmental Education

In keeping with the Corps of Engineers Recreation Operations and Maintenance Policies (ER1130-2-550), environmental education has been conceived as an inherent part of the recreation experience at Tres Rios. Chapter One of this report, *Description of Recreation Features*, describes the unique features that will be created in the project to provide opportunities to learn about the natural and built environment, as well as the influence the area rivers have had on the cultural activities of humans. These features include interpretive areas and trails, orientation areas/visitor centers, outdoor classrooms and staging areas, and interpretive centers.

The conceptual interpretive education program is described in Chapter 3. A vital part of the education experience at Tres Rios will be the physical features constructed to facilitate the interpretation of the project. Many of the features will be relatively minor in cost and scope, and will serve to offer information on an informal and relatively unstructured basis, but the major educational facilities will be specifically devoted to environmental education. Preliminary planning indicates opportunity for two major and one minor interpretive centers. One major center is envisioned to be devoted to cultural history, and the other two centers would explore biological and ecological themes.

Proposed Point Value Criteria

Formal Programs: 15 points possible

These are facility-based programs almost entirely dependent upon the built environment for basic infrastructure such as electricity, water and communications for comfort, security, or other conditions such as light and sound. Such programs may utilize computer-generated or -displayed graphics, projected photographic images, interactive technology, delicate or valuable displays, and climate-controlled indoor spaces for laboratories, lecture areas, and theaters.

Individual/Informal Interpretive Opportunities: 15 points possible

These programs take advantage of the site's natural environment and may be heavily dependent upon signage and displays for the presentation of written or recorded words, photographs and illustrations, and other visual, auditory, tactile and olfactory sensations.

Research Potential: 15 points possible

In order for the education opportunity to be as complete as possible, the potential to conduct original and continuing research should be valued. Consideration should be given to the proximity of major universities and other institutional research stations, the uniqueness of the project, the potential for participation by local students, and the applicability of the potential research to help solve or remedy local, regional and national issues.

Partnering Opportunities: 15 points possible

In order to increase efficiency and to provide as wide a range of experiences and information as possible, all opportunities for partnering in environmental education should be considered. Potential partners include concerned agencies and other governmental entities, non-profit organizations, schools and universities, youth and service organizations, local planning committees, and private citizens.

Proximity of Experience: 20 points possible

The number of people within a reasonable driving or commuting distance would indicate a relative value in terms of potential visitors. Also to be considered are opportunities for ecotourism values for long-distance travelers and tourists.

Opportunity for Varied and Unique Environmental Education Opportunities: 20 points possible

Diversity of habitat types, landscapes, cultural influences, agency involvement, research subjects, volunteer projects and other opportunities should be considered.

Total points: 100 possible

Point Value Estimates for Environmental Education

(A) Formal Programs

Total possible points: 15 **Scored points: 15**

The potential number, kind, and quality of the formal programs that may be offered are virtually unlimited. Program possibilities include exploring the full range of ecosystems and landscapes at Tres Rios, cultural impacts on the ecosystem, living history programs and events, wastewater treatment and reuse education, interactive exhibits, research laboratories, and museum-type exhibits.

(B) Individual/Informal Interpretive Opportunities

Total possible points: 15 **Scored Points: 14**

The wide range of natural and constructed systems within the project, the ready access into and through the site, and the great extent of the site allow for a large potential informal and self-guided interpretive program.

(C) Research Potential

Total possible points: 15 **Scored Points: 13**

The proximity to a major research institution, Arizona State University, as well as to state offices of agencies such as Arizona Game and Fish, and the local facilities of Federal agencies such as the Corps of Engineers is highly conducive to research performance in conjunction with the project. The project itself is unique in the region, if not the nation, and as such would certainly provide opportunities for local and regional solutions.

(D) Partnering Opportunities

Total possible points: 15 **Scored Points: 15**

Tres Rios offers a unique opportunity for partnering due to the involvement of several different agencies and intense interest in the project by many other government, commercial, and private interest. Current partners include the Corps of Engineers, City of Phoenix, Flood Control District of Maricopa County, the Sub-regional Operating Group, Arizona Game and Fish, Audubon Society, City of Avondale, Maricopa County Parks and Recreation, Bureau of Reclamation, and private citizens. Other potential partners may include, but not be limited to, schools and parent groups, local history groups, local conservation

interest organizations, trail user clubs and organizations, birding clubs, professional organizations, and commercial sponsors.

(E) Proximity of Experience

Total possible points: 20 **Scored Points: 20**

The location of the project only a few miles from downtown Phoenix puts approximately 2,500,000 people within an hour drive of the unique opportunity to experience the many wonders that will be Tres Rios.

(F) Opportunity for Varied and Unique Environmental Education Experiences

Total possible points: 20 **Scored Points: 18**

In conjunction with the constructed wetlands, the river channel, terrace, and bank experiences combine with the other unique experiences afforded by visitor centers and interpretive programs, trail systems, observation points, research projects, volunteer projects, and unique cultural exhibits to make Tres Rios one of the most diverse and unique projects in the nation.

TOTAL POINTS POSSIBLE: 100
TOTAL POINTS SCORED: 95

Assessment Panel Members

Rene Vera	Recreation Supervisor
TJ Newman	Landscape Architect II
Roland Wass	Civil Engineer III

5

ENVIRONMENTAL EDUCATION PROGRAM

Objectives

The purpose of the Environmental Education Program will be to provide visitors with educational information to understand and enhance the Tres Rios experience. The program will include educational information presented in a creative and exciting way. The objectives are defined in terms of what the visitor will learn while at Tres Rios.

The program is structured so visitors will learn the following:

The site is a constructed habitat restoration project which has multiple uses.

Tres Rios can benefit people

Complex ecological interactions occur among the organisms in a habitat restoration project including microorganisms, aquatic insects, plants, birds and other wildlife.

Wildlife can best be seen by blending in quietly with nature.

To more fully experience the restored environment, the visitor should rely not only on sight but also on hearing, touch and smell.

Recycling water is good for the environment.

People play the major role in Phoenix's urban water cycle.

A desert riparian area is a unique and limited resource to be appreciated and respected.

These learning objectives will be realized through the construction of physical features such as an environmental education center with major interpretive displays and exhibits, interpretive trails, and various view points located around the Tres Rios project and the development of interpretive signs, displays, and supplemental materials.

Partnerships

School districts, organizations, and individuals within the community as well as other governmental agencies will wish to become more involved with the Tres Rios Interpretive Education Program. They may fund or manage certain public use features and / or provide volunteer services. Individual volunteers and student programs may be organized to help with planting and replanting within the Tres Rios Project. School districts and local organizations that become partners could set up or rotate interpretive displays within the facility. A cascade effect will also be put into place. The vision is to incorporate students and programs from the universities, community colleges, high schools, elementary schools, and pre-schools, each educational level providing mentoring to the next.

School Curriculum

Support materials for school curriculum would be developed for pre- and post- visit activities as well as for onsite visits. These could include a packet of teaching materials to provide some hands on experience prior to a class visit. The packet could contain wildlife specimens, maps, diagrams, field guides for plant and animal identification, water-quality testing kits, and perhaps dip nets for viewing and identifying species during the visit. The curriculum would also be presented in an outdoor classroom setting at the site.

Guided Nature Walks

A monthly schedule of guided nature walks could become a part of the interpretive education program. These walks could be developed and led by volunteers. Environmental and wildlife organizations such as the Phoenix Audubon Society, Sonoran Anthropod Studies Institute, and the Arizona Native Plant Society as well as agencies such as the Arizona Game and Fish Department could periodically sponsor events which would be open to the general public.

6

PRELIMINARY COST ESTIMATES

Recreation Improvements

DESCRIPTION	QUANTITY	UNIT COST	TOTAL
Stabilized Outdoor Recreation Access Routes	11 miles	$92,700	$1,020,000
Interpretive Signage	200	$1,000	$200,000
Trailheads	5	$228,000	$1,140,00
Total			**$2,360,000**

Anticipated Cost Share: 50%/50%

Corps of Engineers: $1,180,000
Sponsor: $1,180,000

Environmental Education Facilities

DESCRIPTION	QUANTITY	UNIT COST	TOTAL
Environmental Education Center	1	$2,500,000	$2,500,000
Total			**$2,500,000**

Anticipated Cost Share: 100% Sponsor

Sponsor: $2,500,000

Total Anticipated Costs:

Corps of Engineers	***$1,180,000***
Sponsor	***$3,680,000***
TOTAL	**$4,860,000**

NOTES:

Stabilized Access Routes: The mileage was derived from assuming nine 1-mile recreational loop trails. This was then multiplied by a "meander factor" of 1.2 to allow for directional changes and curvature. Costs were derived from the City of Phoenix Parks and Libraries Levels of Service and Unit Cost Standards (September 1998), Appendix G, Multi-Use Trail System, excluding non-essential elements such as irrigation and lighting.

Environmental Education Center: Costs were derived from a recent City of Phoenix project and include accessible parking, exhibits, and FF&E.

Interpretive Signage: The number is based on an average of one signed interpretive opportunity per 100 meters of trail. Costs are approximated from a current City of Phoenix contract for interpretive signage.

Trailheads: These are 25-car parking lots with associated self-guided environmental education features such as signage and interactive electronic displays located within a climate-controlled facility. Restrooms are included.

7

PROJECTED OPERATIONAL MANAGEMENT COSTS

A total of 11 personnel are projected to be required at the completed project. The operational considerations include tasks from basic custodial responsibilities at the environmental education center to park rangers. The list of required personnel is presupposed upon associated operations within the City of Phoenix such as mountain preserves and South Mountain Park.

1	Environmental Education Supervisor
3	Education/Interpretive Specialists
1	Foreman I
3	Rangers
3	Groundskeepers
11	**Total**

Projected personnel costs will be in the range of $600,000 per year.

Capital Equipment Requirements

Initial capital costs for operational management systems are expected to be required for vehicles and major operating systems such as communications and security.

Rolling Stock:

- Ranger vehicles w/ radios (3)
- 1/2-ton pickups w/radios (3)
- Utility vehicles/runabouts (2)
- Tractor with loading bucket and trail maintenance implements

Equipment:

- Communications system
- Security systems
- Interactive environmental education systems (nesting monitor cameras, etc.)

Initial capital outlay for these systems is estimated at approximately $300,000.

Appendix I: Real Estate

March 7, 2000

Real Estate Appendix
Tres Rios Environmental Restoration Project

1. Abstract of Project Data:

Project Name: Tres Rios Environmental Restoration Project

Location: Maricopa County, Arizona

Project Purposes: Environmental Restoration, and Flood Control

Acreage ;

Environmental Restoration 1, 569 acres (gross appraisal Nov 30 1999)

Flood Control 78.27 acres , levee easement

GRIC Environmental Restoration (401.32 acres see gross appraisal)

Project Sponsor: City of Phoenix

2. Introduction and Purpose

The water supply for the proposed environmental restoration project is the 91st avenue regional wastewater treatment plant. The principle benefit from the project involves increased ecosystem restoration and flood control benefits in the study area. By benefiting the demands of local infrastructure, the project will indeed be a very significant contribution to the continued urban growth of Maricopa County. By using artificial wetlands as a way to further treat and cleanse the treated effluent, the project will add environmental restoration benefits by creating hundreds of acres of artificial wetlands, channels and riparian edges

The Corps' objectives in participating in such a project would be aimed primarily at environmental restoration, fish and wildlife habitat restoration, water quality improvement, flood control benefits and incidental recreation opportunities. From a real estate perspective , enlargement of capacities at the plant such as larger pumps or larger pipes or outlets, at the plant itself would not be considered facility relocations creditable to the project but must be viewed as elements which add capacity at the plant. (local plan).

3. Authority:

The Corps of Engineers has ample authority to conduct the study. Legal authority for this project is contained in the following enacted laws:

Section 6, Public Law 761, Seventy-fifth Congress, dated June 28, 1938, which reads, " The Secretary of War is hereby authorized and directed to cause preliminary examination and surveys at the following locations..... Gila River and Tributaries, Arizona."

Section 321 of WRDA 92,which reads, " The Secretary may participate in the study and construction of a water resources project in the vicinity of Phoenix, Arizona, for the purposes of providing flood control and improving water quality in the Tres Rios wetlands, Arizona, at a total costs of $6,500,000

Section 304 of WRDA 96, which reads, "Modifies the Tres Rios wetlands project to add ecosystem restoration as a project purpose to increase the authorized project cost from $6,500,000 to $17,500,000

4. Purpose of this Report:

This report is submitted as the Real Estate Plan to support the decision to authorize the project in the next Water Resources Development Authorization.

5. Special Considerations for Tribal Treaty lands.

The major issue to present here is a sponsorship issue. The land along the south bank and some land on the north bank of the river are within an Indian Reservation created by Federal treaty. This is currently known as the Gila River Indian Community. This is a self governing, sovereign entity created and governed through treaty obligations and responsibilities of the United States and the Tribe. Because they are a distinct sovereign entity, the Tribe will not subsume their sovereignty to a lesser sovereign (local sponsor) Due to the unique aspects of law that govern Native American tribes and their lands, and their unique relationship with the Federal government, the Gila River Indian Community (GRIC) must be contracted with as the official sponsor for any project that is located on tribal lands. GRIC will either become a co-sponsor with the City of Phoenix OR will eventually sign a Project Cooperation Agreement (PCA) for the separate project phase constructed on their lands. By being a local sponsor , the tribe will not have to convey or cede any lands protected and established by Federal treaty to another party (local sponsor). This is the only mechanism that will ensure that the tribal reservation lands can be made available for the construction, operation, maintenance, repair and replacement of the environmental restoration features. The City of Phoenix has no authority to acquire these lands involuntarily, i.e. by eminent domain.

Its is highly recommended that a separable project element be described for project implementation for the portion of the project located on Tribal lands. This will allow a

separate project to be commenced on the non-Tribal lands while the issues surrounding sponsorship and participation with the Gila River Indian Community are addressed and resolved.

6.: Land Use and Acreage Allocations

Environmental Restoration 1, 569 acres (gross appraisal Nov 30 1999)

Flood Control 78.27 acres , levee easement

GRIC Environmental Restoration (401.32 acres see gross appraisal

7. Federal Lands, Interests or Reservations:

There are no Federally owned lands within the study area. Federal regulatory power is exercised over these lands to the extent of the jurisdiction, authorities and governing regulations of the Corps and EPA in administering the Clean Water Act.

8. Navigational Servitude:

Neither the Salt River nor the Gila River are navigable waterways. The project area includes the confluence of these rivers.

9. Description of Lands.

This will be only a general overview of the project area. The study area encompasses the river corridor and historic floodplain from 83rd Avenue west to 101st Avenue. The northern limit of the project study area is Southern Avenue. The land north of the river has historically been used as irrigated farmland. Recently development pressure has been seen in this area on the fringe on the urban area. North of the project area and outside the floodplain limitations warehouse and large distributions concerns have been developed. The proximity of I-10 has been an attraction to this industry. Closer to the river, due to floodplain restrictions on development and also the proximity to the regional wastewater treatment plant the land is mostly undeveloped. Dairies and agricultural fields are the predominant land uses in these areas. Across the river lies the Gila River Indian Community (GRIC). The GRIC Tribal land boundary, established by Federal Treaty, generally runs through the centerline of the Gila River as historically present at the time of the Treaty.

The sponsor is a duly organized municipal corporation in the State of Arizona and is vested with sufficient power to acquire and hold title, and to condemn lands as needed for public purposes.. The sponsor does have "quick take" authority, that is the right to obtain possession based upon application of due process and a deposit of just compensation.

11. Project Maps:

Project maps are included in the main body of the Feasibility Report and in the gross appraisal of lands.

12. Crediting for LERRD's and Special Issues:

Given the anticipated estimated ranges for total project costs (likely between 70 –100 million) and estimated LERRD costs as reflected in the MCACES estimate , it appears that LERRDS and required cash will be substantially less than the sponsors' minimum statutory cost share of 35% of total project costs. Thus crediting is expected to follow normal procedures and will be governed by a standard model PCA.

13. Facility Relocations:

No information has been provided to date by plan formulation regarding the necessity for any facility relocations in the project area. Further engineering and design work will refine requirements for facility relocations during subsequent phases of the study and Preliminary Engineering and Design.

Note: The following policy statement and disclaimer concerning any potential facility relocations prevails over any other statement, description or presentation in this report. Any conclusion or categorization contained in this report that an item is a utility or facility relocation to be performed by the Non Federal Sponsor as part of its LERRD responsibilities is preliminary only. The Government will make a final determination of the relocations necessary for the construction, operation and maintenance of the project after further analysis.

14. Mineral Activity:

There is no known mineral activity currently occurring inside the project area. There are signs of previous common materials extraction, i.e. sand and gravel, inside and along the river bed. However due to stringent environmental and wetlands protection laws enacted in the 70's and 80's such uses have been discontinued.

5. Estates:.

The recommended estates for environmental restoration is fee simple title. Fee will be acquired as the standard project estate in all areas where permanent environmental restoration, recreation or environmental education (i.e interpretive centers and the like) project features are to be located. This is the prescribed standard estate for environmental restoration projects. The standard estate for the North Levee will be a permanent levee easement.

16. Construction Induced Flooding

There will be no construction induced flooding outside the project take areas.

17. Baseline Cost Estimate.

The total cost estimate for lands and damages is $10.5 M, according to the gross appraisal. Adding contingencies and other allowable costs the total cost estimate for the lands and damages category is approximately $13 million. This is enumerated in detail in the MCACES cost estimate in the main body of the report.

18. Relocation Assistance (URA Relocations):

The City of Phoenix will accomplish all property acquisitions in accordance with Public Law 91-646, as amended, and the Uniform Regulations as promulgated by the Department of Transportation.

19. Other Matters:

No timber activity affects these lands. The sponsor is not using any zoning ordinances in lieu of acquisitions of lands or easements within the project take areas.

20. Hazardous Waste Assessments:

The sponsor fully understands its responsibilities for assessing the properties for any potential or presence of hazardous waste materials as defined and regulated under CERRLA. There are no known "Superfund" sites or sites presently under CERRCLA remediation or response orders identified in the project area. There is no known presence of any substances in the project area that are regulated under CERRCLA or other environmental statutes or regulations. Assessments and site investigations for the presence of such substances have not been conducted to date. The LERRD estimate (i.e. Gross appraisal) is predicated on the assumption that all lands and properties are clean and require no remediation. The model PCA conditions shall be followed in assigning responsibility and cost allocation for such matters..

21. Recreation:

In a communication from the Study Manager on November 9, 1999, it is stated that "The recreation specialists have downsized the recreation plan so that it will fit within the restoration/flood control project (i.e. no separate (sic separable) recreation lands. Any recreation component would be cost-shared 50-50. However since there is no identified separable land, land acquired exclusively for recreation purposes, there are no LERRD credits for the recreation component.

22. Attitude of Landowners:

There is no focused or organized landowner opposition to the project. There will undoubtedly be some contested acquisitions involving the condemnation and the usual issues to adjudicate just compensation. There is no indication of any unusual or extraordinary landowner issues on this particular project.

ASSESSMENT OF NON-FEDERAL SPONSOR'S
REAL ESTATE CAPABILITY

Tres Rios Environmental Restoration Project
Sponsor: City of Phoenix, Arizona

The Sponsor is a duly organized municipal corporation in the State of Arizona.

I. Legal Authority

a. Does the sponsor have legal authority to acquire and hold title to real property for public purposes? YES

b. Does the sponsor have the power of eminent domain for this project? YES

c. Does the sponsor have "quick take" authority for this project? YES

d. Are there any lands and interests in the land required for this project located outside the sponsor's political boundaries? YES
(Appropriate mechanisms are in place for City of Phoenix to acquire lands and interests in Maricopa County, the location of project lands.)

e. Are there any lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn? No (However IF GRIC LANDS ARE INVOLVED, GRIC will sign a PCA for a separate project element and provide these lands in the sponsorship agreement (PCA). This is the guidance for project formulation provided to Real Estate Division by Planning Division.

II Human Resources

a. Will the sponsor's in-house staff require training to become familiar with real estate requirements of Federal projects including P.L. 91-646, as amended? NO

b. If the answer to II a is "yes", has a reasonable plan been developed to provide such training? NOT APPLICABLE

c. Does the sponsor's in house staff have sufficient real estate acquisiton experience to meet its responsibilities for the project? YES

e. Can the sponsor obtain contract support, if required, in a timely fashion? YES

f. Will the sponsor likely request USACE assistance in acquiring real estate? NO

III. Other project Variables:

a. Will the sponsor's staff be located within reasonable proximity to the project site? YES

b. Has the sponsor approved the project/real estate milestones? YES

IV Overall Assessment:

a. Has the sponsor performed satisfactorily on other USACE projects? YES

b. With Regard to the project the sponsor is considered to be... HIGHLY CAPABLE

V. Coordination:

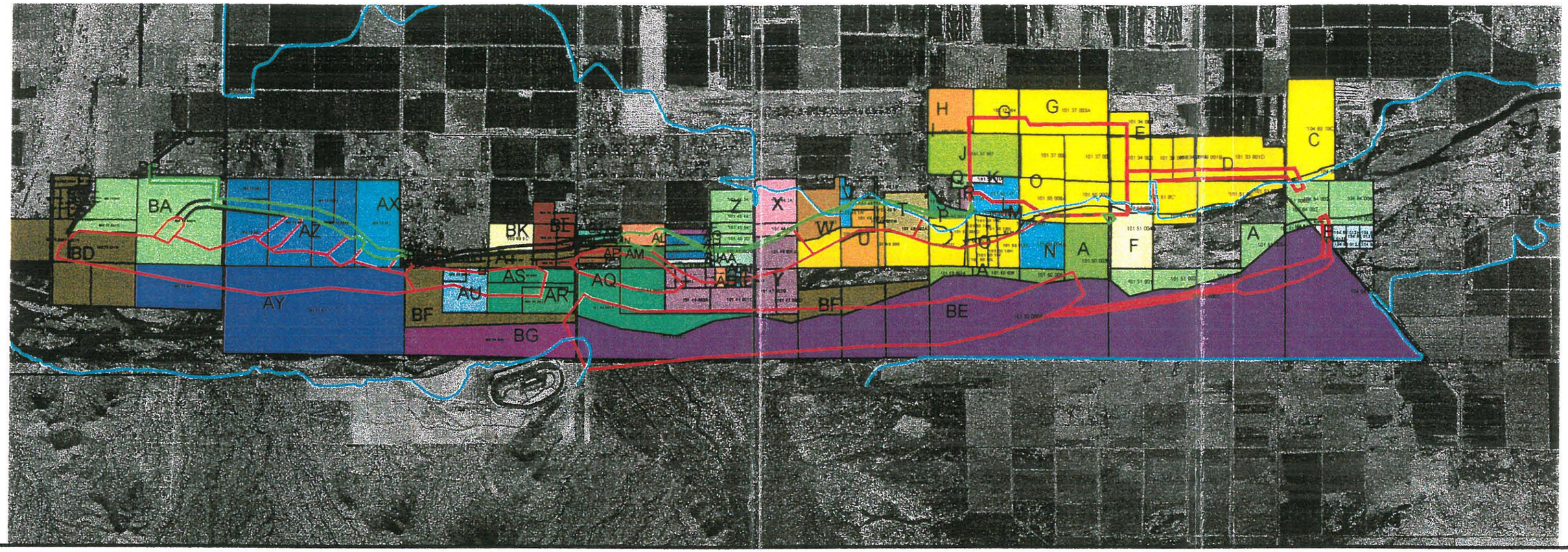
a. Has this assessment been coordinated with the sponsor? This assessment and rating of the City of Phoenix's capabilities is identical as the one provided on the City of Phoenix for the approved Rio Salado Project.

b. Does the sponsor concur in this assessment? YES,

Reviewed and Approved by:

Brian Kirchner

Brian Kirchner
Acting Chief
Arizona/Nevada Real Estate Office



REAL ESTATE: TRES RIOS, ARIZONA

1 0 1 2 3 Miles

N

FLOOD PLAIN
LEVEE
PIPELINE
HABITAT RESTORATION FEATURES

- BM 'Albert & Rosella Bevins'
- BN 'Arlene K Bryan'
- AH 'Barbara Neau'
- V 'Brown & Hauser Partnership'
- AL 'Carl E & Patricia J Weiler'
- C,D,G,O 'City of Phoenix'
- BE Gila River Ind. Com.
- AG, AI 'David G & D Marie Walker'
- BQ Rosella Davis
- BK 'Garlon E Shahan'
- K 'Hensler Family Ltd Trust'
- Q 'Hugh F Aycock'
- I SRP AI & PD
- R 'J L & Julie A Loveless'
- H Ed Boschma/C J Mina T/ Gerbe Dairy
- BO Karen McMurren
- AQ Game & Fish
- X 'Lakin Cattle Co.'
- AF Kathryn Alekson & Russell Faulkner
- BJ 'Louis M & Peggy A Michelena'
- AO BJ 'Louis M Michelena'
- T 'Mildred M Hale'
- 'Pamela M Amaud & Daryle Donahue'
- L 'Pioneer Title & Trust Co'
- AV 'Richard L Cutsinger'
- P Geraldine James
- Z Adron & Elsie Charlene Reichart
- AW 'Dewey W & Carol A Pendley'
- BL 'William L Amator'
- AM AEI Investments
- AB Aliser, Andrew; Cynthia A.
- AZ Allied Concrete Materials
- AJ Doyle Swindle
- B Bloemhof; Theodore; Aberdeen
- AU Roy Burleson/L Elgie, et al
- Y Cal. Portland Cement
- AA Daly, Jack W
- S Donahue; Patricia Dewitt; Robert
- A E D W C Levy Company
- N Cyr EJ/JE
- U Gomez Jimmie
- AD Donicio Guerrero
- BB, BD, BF, BH Flood Control District
- AN, AP, AT Flood Control District
- AR Harper, Randy & Shirley
- BA, BP HJU Properties LLC
- AX Lueck Investment LLC
- AE Jaimie Martinez
- AS, AV Managed by Game & Fish
- M Odem Dianna Dewitt
- W R & M Hayes; Tr/McGinness/Farmer
- BG State of Arizona
- F Tolleson Town of
- AC Warren & Margie Warren Tr
- AK Weatherington, Jack
- E Huffman, David
- J Javi Entrprise