INDIVIDUAL HYDROLOGIC & HYDRAULIC ASSESSMENT (IHHA) REPORT FOR ALVARADO CHANNEL (LOWER PORTION) MAP NUMBERS 59 & 60

Job Number 15541-A
September 13, 2010

RICK
ENGINEERING COMPANY

INDIVIDUAL HYDROLOGIC & HYDRAULIC ASSESSMENT (IHHA) REPORT

Site Name/Facility: Alvarado Channel (Lower Portion)
Map Numbers 59 & 60

Date: September 13, 2010

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• **Instructions**: This form must be completed for each target facility following the completion of the Individual Maintenance Plan (IMP) report form and prior to any work being conducted in the facility. Attach additional sheets if needed.

Description of creek/channel (limits of reach, surrounding land use and area, creek/channel geometry and vegetative condition):

The area of study extends from the location where the channel transitions from an underground culvert, and flows in an easterly direction for approximately 3,420 feet to a point where the channel confluences with San Diego River (see workmap located in the Attachments). The lower portion of the channel is aligned north of Camino Del Rio North Road, which becomes Alvarado Canyon Road, just east of Fairmount Avenue. The central and upper portions of the channel are bounded by Mission Gorge Road to the north and Alvarado Canyon Road to the south. The upper portion of the channel, within the area of study, is concrete-lined (approximately 550 feet) and transitions into an earthen channel (approximately 700 feet). The central portion of the channel is concrete-lined (approximately 1,120 feet). The downstream portion of the channel, within the area of study consists of a concrete lined portion (approximately 280 feet), an earthen portion with rock lined slope on the left bank (approximately 330 feet), and a naturally lined portion (approximately 440 feet), that confluences with San Diego River. The channel geometry is trapezoidal in shape throughout the area of study.

For the purposes of this assessment, the area of study has been divided into four reaches: Reach 1 (HEC-RAS Cross Sections 13.60 to 1041.78), Reach 2 (HEC-RAS Cross Sections 1041.78 to 2168.69), Reach 3 (HEC-RAS Cross Sections 2168.69 to 2926.63), and Reach 4 (HEC-RAS Cross Sections 2926.63 to 3415.77). Reach 1 is the most downstream reach. Reach 1 extends from the downstream limits of the area of study (at the confluence with the San Diego River), and continues upstream for approximately 1,050 feet. Reach 1 consists of light to moderate vegetation and is bounded by parking lots to the north and south, or more specifically by the Camino Del Rio North Road to the south and Fairmont Avenue to the east. At the upstream limits of Reach 1, there is a triple 8'Wx12'H reinforced concrete box (RCB) culvert crossing. The downstream limits of Reach 2 begin at the culvert crossing under Fairmount Avenue, and extend upstream approximately 1,120 feet. Reach 2 has light vegetation and is bounded by commercial buildings and parking lots to the north and south, which are bounded by Mission George Road to the north and Alvarado Canyon Road to the south. Reach 3 is located upstream of Reach 2 and is approximately 700 feet in length. Reach 3 has light vegetation Reach 4 is the most upstream reach with moderate vegetation and extends for approximately 550 feet in length. Reach 3 and Reach 4 are bounded by the commercial buildings and parking lot to the north and south, Mission George to the north, and Alvarado Canyon Road to the south.

Note: See attached pictures

Hydrologic information (source of hydrologic information, summary of flow rates and return frequencies):

There are two (2) sources of hydrologic information. The first source of hydrologic information is based on the Federal Emergency Management Agency's (FEMA's) DRAFT (no date) Flood Insurance Study (FIS) for San Diego County. The second source of hydrologic information is based on FEMA's 2006 FIS for San Diego County. The difference between these two sources is that the DRAFT FIS has not been officially adopted at the authoring of this assessment. While the hydrologic information utilized for this project is based on the 2006 FIS, hydrologic information from the DRAFT FIS was compared for any discrepancies of information. For this project reach, no discrepancies were noted. The FIS provided the 10-, 50-, and 100-year flow rate information for Alvarado Creek. This flow rate information was then plotted on log-probability paper to determine a flow rate distribution. From this distribution, flow rates were determined and equated to a return frequency storm event.

The following flow rates were provided in the FIS:

100-Year =5,100 cubic feet per second (cfs)
50-Year = 4,500 cfs
10-Year = 2,700 cfs

The following flow rates were determined from log-probability paper:

25-Year = 3,800 cfs
5-Year = 2,050 cfs
2-Year = 1,180 cfs

Hydraulic analyses (description of hydraulic models created for project):

The US Army Corps of Engineers Hydraulic Engineering Center River Analysis System (HEC-RAS) Version 4.0 was used to analyze the hydraulic characteristics of Alvarado Channel. HEC-RAS has the ability to perform one-dimensional hydraulic calculations for natural and engineered channels, by utilizing the energy equation and the momentum equation. For the purposes of this project, all HEC-RAS modeling was performed using a sub-critical flow regime.

The hydraulic modeling prepared for the Current Vegetated Condition, Ultimate Vegetated Condition, Maintained Condition (no sediment removed) and Maintained Condition (sediment removed) analyses are based on the 1999 City of San Diego 2-foot contour topographic information. The topography and the hydraulic modeling performed for Alvarado Channel are all on the National Geodetic Vertical Datum of 1929 (NGVD 29).

The following provides general descriptions of hydraulic analyses/models that were prepared for this area of study:

Current Vegetated Condition:

The hydraulic analysis for Current Vegetated Condition was created to reflect the current vegetated condition of the channel and determine the actual channel capacity. A field visit was performed on October 13, 2009 to determine and confirm the Manning's Roughness Coefficients within Alvarado Channel for the Current Vegetated Condition.

Based on the site visit, it was determined that Manning's Roughness Coefficients ranged from a n-value of 0.016 for the concrete portion to a n-value of 0.06, reflecting light to moderate vegetation in the earthen or sedimented portions.

Note: See Hydraulic Profiles for Current Vegetated Condition Model

Ultimate Vegetated Condition:

The Ultimate Vegetated Condition reflects dense vegetation in the channel, which assumes no maintenance is being performed. The existing vegetation that currently exists in the channel will become more dense. This dense vegetation will reduce velocities. The slower velocities will cause sediment to drop out and ultimately cause deposition in the upstream areas where the channel is fully lined. The vegetation will migrate upstream and thus further decrease the capacity of the channel and potentially cause flooding to occur more frequently.

To establish this ultimate vegetated condition in the hydraulic model, a Manning's Roughness Coefficients of 0.17 was assumed throughout the area of study for earthen portions and 0.17 for the bottom of the channel only for the concrete-lined portions.

Note: See Hydraulic Profiles for Ultimate Vegetated Condition Model

Maintained Condition (No sediment removed): 2 models were prepared.

1. Maintained Condition (bank to bank):

This Maintained Condition (Bank to Bank) assumes vegetation-only maintenance of the channel. With this model, maintenance was proposed for the bottom and the sides of the channel for earthen portions of the channel and for the bottom of the channel only for concrete-lined portions of the channel. The limits of maintenance, for modeling purposes, begin at 280 feet downstream of the downstream side of the culvert crossing at Fairmount Avenue and extend upstream for approximately 2650 feet.

For the above-described limits of maintenance, to establish the maintained condition (bank to bank) in this hydraulic model, the Manning's Roughness Coefficient of 0.035 was utilized for the bottom and the sides of the earthen portions of the channel. For the portions of the channel that is concrete-lined, for the side slopes, the Manning's Roughness Coefficient of 0.016 was utilized.

2. Maintained Condition (bottom of the channel only):

This Maintained Condition (bottom of the channel only) assumes vegetation-only maintenance of the channel bottom. The limits of maintenance, for modeling purposes, begin 280 feet downstream of the downstream side of the culvert crossing at Fairmount Avenue and extend upstream for approximately 2650 feet.

For the above-described limits of maintenance, to establish the maintained condition (bottom of the channel only) in this hydraulic model, the Manning's Roughness Coefficient of 0.035 was utilized for the bottom of the channel.

It is important to note that maintenance for the lower portions of Reach 1, the earthen portion with a rock lined left bank and the naturally lined portion, were not modeled in the 2 models (maintained condition, no sediment removed), located approximately 280 feet downstream of the downstream side of the culvert crossing at Fairmount Avenue, due to the Arundo Donax removal project that is currently in process. The Manning's Roughness Coefficients for the above-described portions of Reach 1 were kept the same as the current vegetated condition.

Additional Notes:
For the two models prepared for the Maintained Condition (No sediment removed), it is important to note that the Manning's Roughness Coefficients for the remaining portions of the channel, outside of the limits of maintenance, were kept the same as the current vegetated condition model.

Note: See Hydraulic Profiles for Maintained Condition Model (No sediment removed)

Maintained Condition (Sediment and vegetation removed):

1. Maintained Condition (bottom of the channel only):

In addition to the vegetation-only maintenance (2 models), a Maintained Condition was also prepared that modeled the removal of sediment and vegetation from the bottom of the channel, that has deposited over the years. The limits of maintenance, for modeling purposes, begin 280 feet downstream of the downstream side of the culvert crossing at Fairmount Avenue and extend approximately 1220 feet upstream of the beginning limits of maintenance. Sediment removal was also assumed within the entire Reach 4. The removal of sediment, to the historic flowline from the bottom of the channel, will increase the capacity of the channel compared to the current vegetated condition, and thus reduce the flooding potential.
For modeling purposes, the sediment and vegetation removal was assumed to be limited to a portion of Reach 1, Reach 2 and Reach 4. The depth of sediment removed ranged from 0.3 feet to 0.8 feet.

In the hydraulic analysis, the channel bottom was adjusted to reflect the historic flowline based on 1999 City of San Diego 2-foot contour topographic information and as-built information.

Note: See Hydraulic Profiles for Maintained Condition Model (Sediment and vegetation removed)

Hydraulics Results (Describe capacity of channel for each condition):

Based on the hydrologic and hydraulic assessment, maintenance is recommended in the entire limits of study area, except for the downstream portion of the channel for approximately 770 feet. However, the proposed maintenance is for the bottom of the channel only and consists of vegetation removal in the upper portion of Reach 2 and entire Reach 3, and sediment and vegetation removal in the upper portion of Reach 1, the remaining portion of Reach 2, and entire Reach 4. Additionally, based on the site visit, 1999 City of San Diego 2-foot contour topographic information, and the hydraulic results it was determined that the culvert crossing under Fairmount Avenue and the channel downstream of Reach 4 is severely undersized. In order to bring the channel to the current design standards, improvements would be required for Reaches 2 and 3. These improvements would consist of, but would not be limited to, re-grading of the channel and upsizing the culvert crossing under Fairmount Avenue. The re-grading would consist of widening the channel and/or removing the abandoned road crossing. Also, it is important to note that portions of the channel (located in a portion of Reach 2 and Reach 3) that needs improvements are not owned by the City of San Diego and additional coordination would be required for the future improvements mentioned above.

The results of the hydraulic analyses describe these benefits in more detail (see below).

Current Vegetated Condition:

Capacity:
Reach 1 ranges from 3,800 to 4,500 cfs (25- to 50-year storm event and a 6-hour precipitation of 2.1” to 2.2”).
Reach 2 ranges from 1,180 to 2,050 cfs (2- to 5-year storm event and a 6-hour precipitation of 1.25 to 1.62”).
Reach 3 is less than 1,180 cfs (less than 2-year storm event and a 6-hour precipitation of less than 1.25”).
Reach 4 ranges from 3,800 to 4,500 cfs (25- to 50-year storm event and a 6-hour precipitation of 2.1” to 2.2”).

The hydraulic model determined that the current channel, based on the vegetated condition observed during the site visit, does not have capacity to convey the design storm (100-year).

Note: Reference Detailed Hydraulic Results for Current Vegetated Condition Model

Ultimate Vegetated Condition:

Capacity:
Reach 1 ranges from 1,180 to 2,050 cfs (2- to 5-year storm event and a 6-hour precipitation of 1.25” to 1.62”).
Reach 2 is less than 1,180 cfs (less than 2-year storm event and a 6-hour precipitation of less than 1.25”).
Reach 3 is less than 1,180 cfs (less than 2-year storm event and a 6-hour precipitation of less than 1.25”).
Reach 4 is approximately 2,700 cfs (10-year storm event and a 6-hour precipitation of 1.8”).

Due to the light to moderate vegetation that currently exists today in the lower and upper portion of the channel, there is a significant change in the capacity in Reach 1 and Reach 4 when comparing the Ultimate Vegetated Condition model to the Current Vegetated Condition model. Additionally, due to the undersized channel and crossing at Fairmount Avenue, there is not a significant change in the capacity in Reach 2 and Reach 3 when comparing the Ultimate Vegetated Condition model to the Current Vegetated Condition model.

Note: Reference Detailed Hydraulic Results for Ultimate Vegetated Condition Model

Maintained Condition (No sediment removed):Based on the 2 models prepared (maintained condition, bank to bank and channel bottom only), it was determined that the maintenance method of vegetation removal only along the channel bottom is the most beneficial model and least impactive. The following are the results for the determined maintenance model:

Capacity:
Reach 1 ranges 3,800 cfs to 4,500 cfs (25- to 50-year storm event and a 6-hour precipitation of 2.1" to 2.2").
Reach 2 ranges from 1,180 to 2,050 cfs (2- to 5-year storm event and a 6-hour precipitation of 1.25" to 1.62").
Reach 3 is less than 1,180 cfs (less than 2-year storm event and a 6-hour precipitation of less than 1.25").
Reach 4 is approximately 5,100 cfs (100-year storm event and a 6-hour precipitation of 2.6").

In Reach 3, at cross section 2231.64, where the abandoned road is located, the channel has capacity of less than a 2-year storm event. At that location, the water overtops the channel banks and inundates the neighboring properties. Upstream and downstream of the abandoned road the channel in Reach 3 has capacity of 1,180 to 2,050 cfs (2- to 5-year storm event and 6-hour precipitation of 1.25 to 1.62"). It should be noted that increased capacities identified above would only be realized if non-City portions of the Reaches are maintained as assumed.

Based on the result of the hydraulic analyses, it was determined that the channel bottom only method would be a beneficial approach because it would increase the channel capacity while allowing retention of vegetation along the channel banks.

Note: Reference Detailed Hydraulic Results for Maintained Condition Model (No sediment removed)

Maintained Condition (Sediment and vegetation removed): Based on the profiles, there was evidence of deposition in portion of Reach 1, Reach 2 and Reach 4. This hydraulic analysis modeled the removal of sediment and vegetation for a length of approximately 280 feet in Reach 1, 940 feet in Reach 2, and 550 feet in Reach 4 from the channel bottom and removal of vegetation only from the channel bottom in upper portion of Reach 2 and entire Reach 3.

Capacity:
Reach 1 is 3,800 cfs to 4,500 cfs (25- to 50-year storm event and a 6-hour precipitation of 2.1 to 2.2").
Reach 2 ranges from 1,180 to 2,050 cfs (2- to 5-year storm event and a 6-hour precipitation of 1.25 to 1.62").
Reach 3 is less than 1,180 cfs (less than 2-year storm event and a 6-hour precipitation of less than 1.25").
Reach 4 is approximately 5,100 cfs (100-year storm event and a 6-hour precipitation of 2.6").

In Reach 3, at cross section 2231.64 where the abandoned road is located, the channel has capacity of less than 2-year storm event. At that location, the water overtops the channel banks and inundates the neighboring properties. Upstream and downstream of the abandoned road, the channel in Reach 3 has a capacity of 1,180 to 2,050 cfs (2- to 5-year storm event and 6-hour precipitation of 1.25 to 1.62"). By the sediment and vegetation removed maintenance method in a portion of Reach 1, Reach 2 and Reach 4, the capacity of the channel in these Reaches would not change compared to the maintained condition (no sediment removed), due to the undersized channel and crossing at Fairmount Avenue, but will bring the channel back to the original (historic) design, lower the area of flooding in Reach 3 and Reach 4, and prevent siltation of the underground culvert located upstream of Reach 4. Therefore, this is the recommended approach. It should be noted that increased capacities identified above would only be realized if non-City portions of the Reaches are maintained as assumed.

Note: Reference Detailed Hydraulic Results for Maintained Condition Model (Sediment and vegetation removed)

Are there areas of native vegetation identified in the IBA that can be retained during maintenance? If so, identify location and any thinning or other modifications, which must be made in the retained area.

This portion of Alvarado channel is subject to frequent flooding. Based on the hydraulic results it was determined that the culvert crossing under Fairmount Avenue and the channel downstream of Reach 4 (Reach 2 and Reach 3) is severely undersized and has capacity for less than a 2-year storm event in it's current condition. The proposed maintenance will mitigate the frequency of flooding but it will not increase the channel capacity in the deficient areas. However, in order to preserve additional vegetation in the portion of the channel where maintenance of vegetation removal only in the channel bottom is proposed, if there are individual mature trees such as Sycamores or Cottonwoods along the channel bottom, and the trees are located no closer than 50 feet apart, maintenance should be performed around the trees. It is recommended that the trees be trimmed to remove branches below the top of bank elevation where possible, to improve the channel capacity, while retaining the mature trees.

Is a downstream check dam or comparable mechanism required pursuant to Water Quality Protocol # 24? If not, explain why. If so, describe what mechanism should be included in the IMP?

As stated previously, the channel reach has very little capacity. This channel is subject to frequent flooding and failures. The lower portion of Reach 1 may experience erosive velocities in the portion of the earthen channel with rock lined left bank side, and a part of the naturally lined portion of the channel where maintenance is not proposed. However, these velocities are consistent with the current condition. Due to the channel configuration and lack of capacity in its current condition, it would be counter productive to install check dams or some other comparable mechanism that would further reduce the capacity of the channel and increase the frequency of flooding.

Conclusion/Recommendations (Describe the limits of recommended maintenance, degree to which native vegetation within the facility can be retained, and capacity of maintained channel):

Several hydraulic models were created to determine the limits of maintenance. Throughout the limit of study there are two kinds of maintenance proposed: "vegetation removal" and "sediment and vegetation removal" from the channel bottom. The following summarizes the recommended limits of maintenance:

Upper portion of Reach 1 – sediment and vegetation removal for a length of 280 feet
Lower portion of Reach 2 – sediment and vegetation removal for a length of 800 feet
Central portion of Reach 2 – sediment and vegetation removal for a length of 140 feet
Upper portion of Reach 2 - vegetation removal for a length of 180 feet.
Reach 3– vegetation removal for a length of 700 feet.
Reach 4 – sediment and vegetation removal for a length of 550 feet

Throughout this limit of study there are portions that are not owned by the City. These extents are the lower portion of Reach 1, the central and upper portion of Reach 2, and the entire extents of Reach 3. Please refer to the maintenance plan for limits of maintenance and notes. It should be noted that increased capacities identified above would only be realized if non-City portions of the Reaches are maintained as assumed.

It is important to note that maintenance for the lower portions of Reach 1, the earthen portion with a rock lined left bank and the naturally lined portion, should not be performed in the first year maintenance plan for a distance of approximately 470 feet (280 feet downstream of the downstream side of Fairmount Avenue culvert crossing) due to the Arundo Donax removal project that is currently in process. But as vegetation re-establishes, maintenance should be performed.

Additional Comments:

It is important to note that the frequency of flooding will be increased and the capacity of the channel will be reduced should maintenance be neglected within 1,020 feet of the property owned by the "San Diego Metropolitan Transit Development Board" (see Note 1, Map Number 59 & 60 on the IMP exhibit) for the first year maintenance plan. Also, it is important to note that maintenance should be performed in a portion of Reach

1 for approximately 470 feet, from which 300 feet are owned by the private property “Willis Enterprises Incorporation” in the next cycle of maintenance when vegetation re-establishes. The City is not responsible for maintenance on properties owned by others. If the City maintains its portion, flooding frequency will be reduced, however, significant benefits with respect to increasing the capacity and further reducing the frequency of flooding would be achieved when this additional offsite area is maintained. It would be beneficial for the City to notify and request the responsible parties to maintain these offsite areas to minimize the backwater effect that could contribute to the frequency of flooding of adjacent properties.

Additionally, due to the low capacity of this channel, future improvements should be considered. However these future improvements are not a part of the scope of this individual permit. These improvements can be, but not limited to widening and re-alignment of portion of the channel downstream of Reach 4 and/or upsizing the culvert crossing under Fairmount Avenue.

LIST OF ATTACHMENTS:

- ☑ Site Photos
- ☑ Hydraulic Workmap
- ☑ Hydraulic Profiles for Current Vegetated Condition Model
- ☑ Hydraulic Profiles for Ultimate Vegetated Condition Model
- ☑ Hydraulic Profiles for Maintained Condition Model (No Sediment Removed)
- ☑ Hydraulic Profiles for Maintained Condition Model (Sediment Removed)
- ☑ Detailed Hydraulic Results for Current Vegetated Condition Model
- ☑ Detailed Hydraulic Results for Ultimate Vegetated Condition Model
- ☑ Detailed Hydraulic Results for Maintained Condition Model (No Sediment Removed)
- ☑ Detailed Hydraulic Results for Maintained Condition Model (Sediment Removed)

SITE PHOTOS:

A site visit was conducted on October 13, 2009. See Hydraulic Workmap for picture locations and orientation.

1.

2.

3.

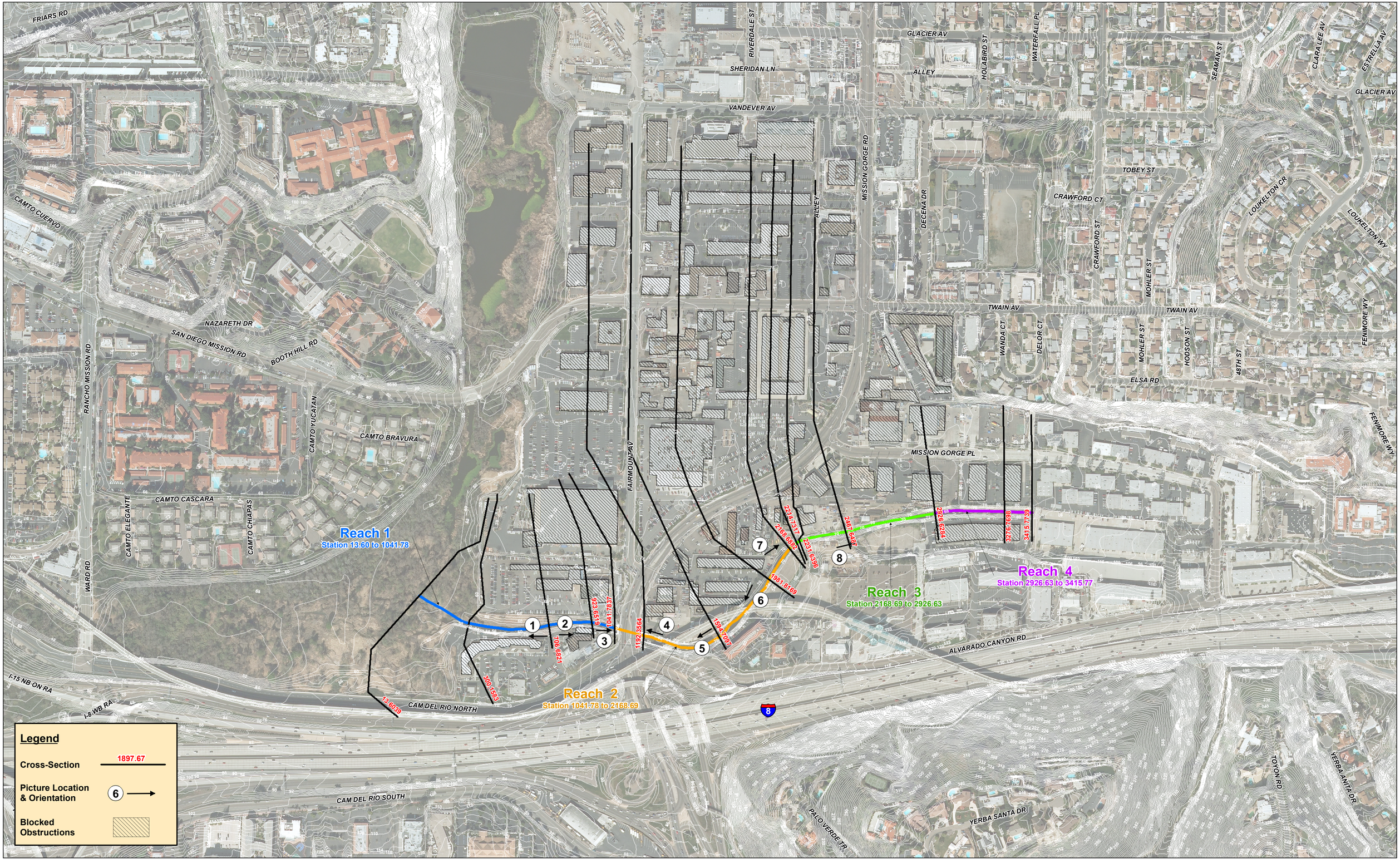
4.

5.

6.

7.

8.



Alvarado Channel, Map Numbers 59 & 60 - Hydraulic Workmap

W:\15541-A\AlvaradoCreek\AlvaradoLower\Exhibits\AlvaradoChannel_HydraulicWorkmap_59&60.mxd

Exhibit Date: August 25, 2010

REC JN: 15541A

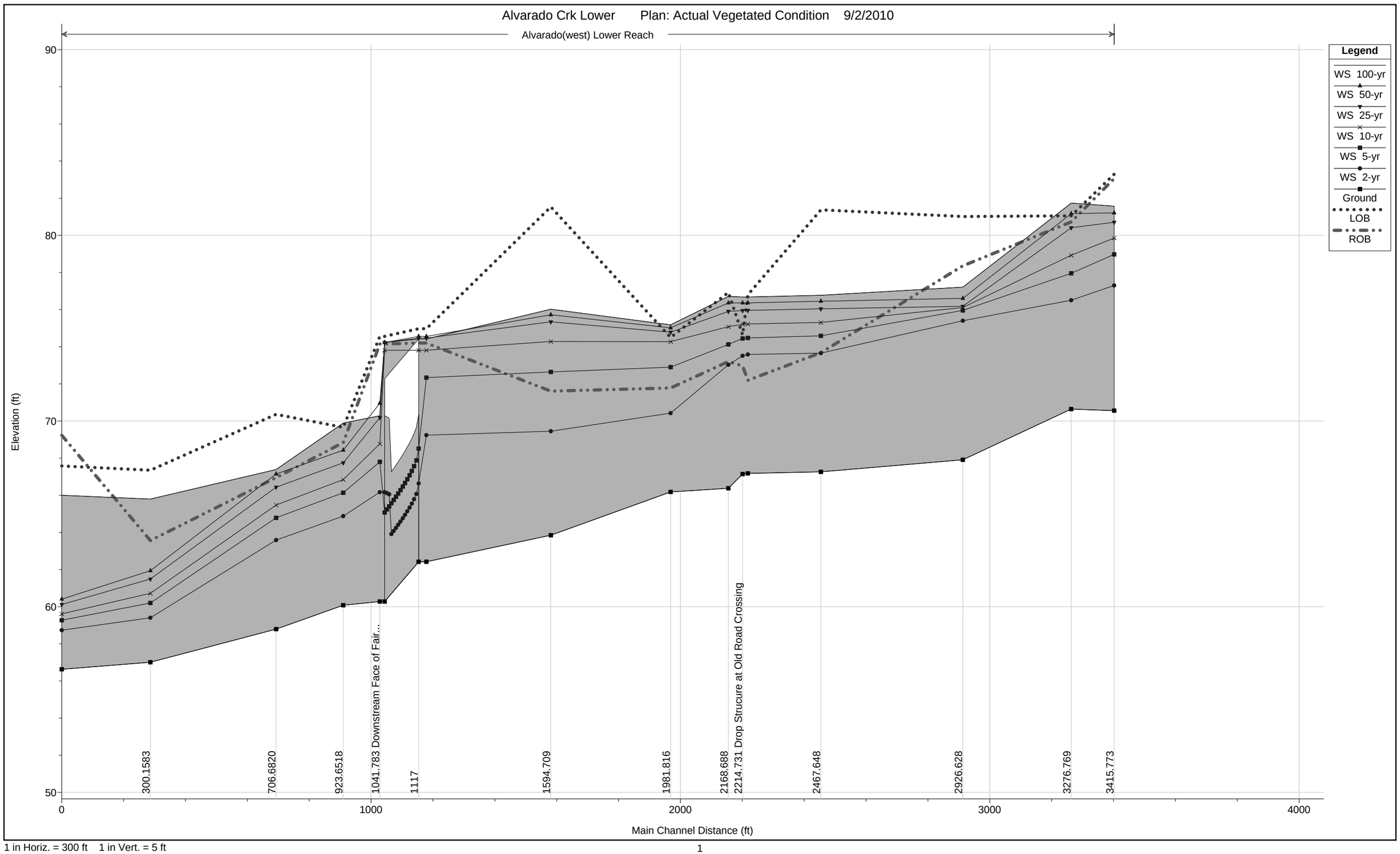
0 200 400 800 Feet

Data Sources:
SanGIS Topo 2' Contours: 1999
SanGIS Roads - March 2010
Eagle Aerial Photo: March 2009

RICK ENGINEERING COMPANY

HYDRAULIC PROFILE FOR CURRENT VEGETATED CONDITION MODEL

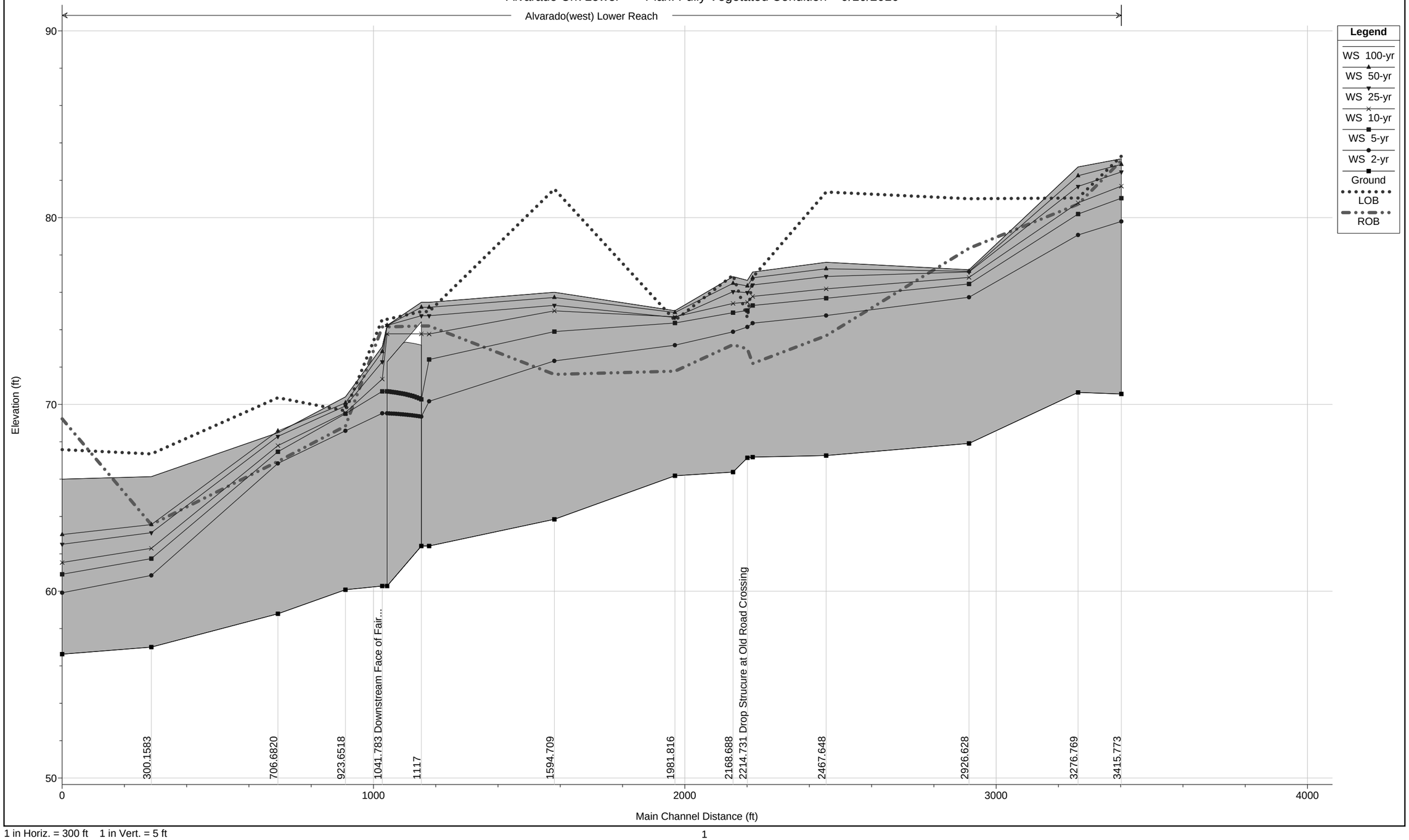
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010



1 in Horiz. = 300 ft 1 in Vert. = 5 ft

Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010

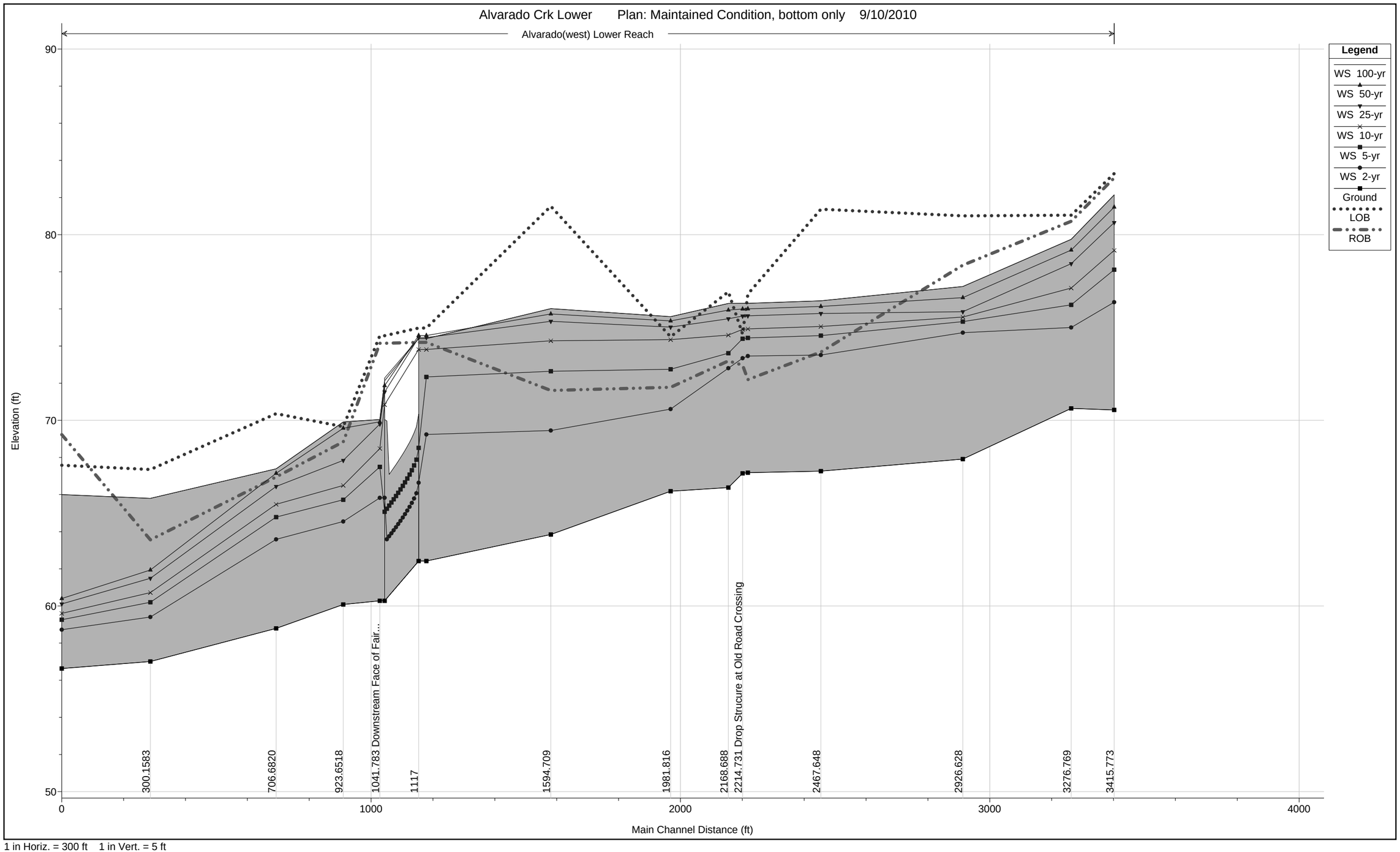
Alvarado(west) Lower Reach



1 in Horiz. = 300 ft 1 in Vert. = 5 ft

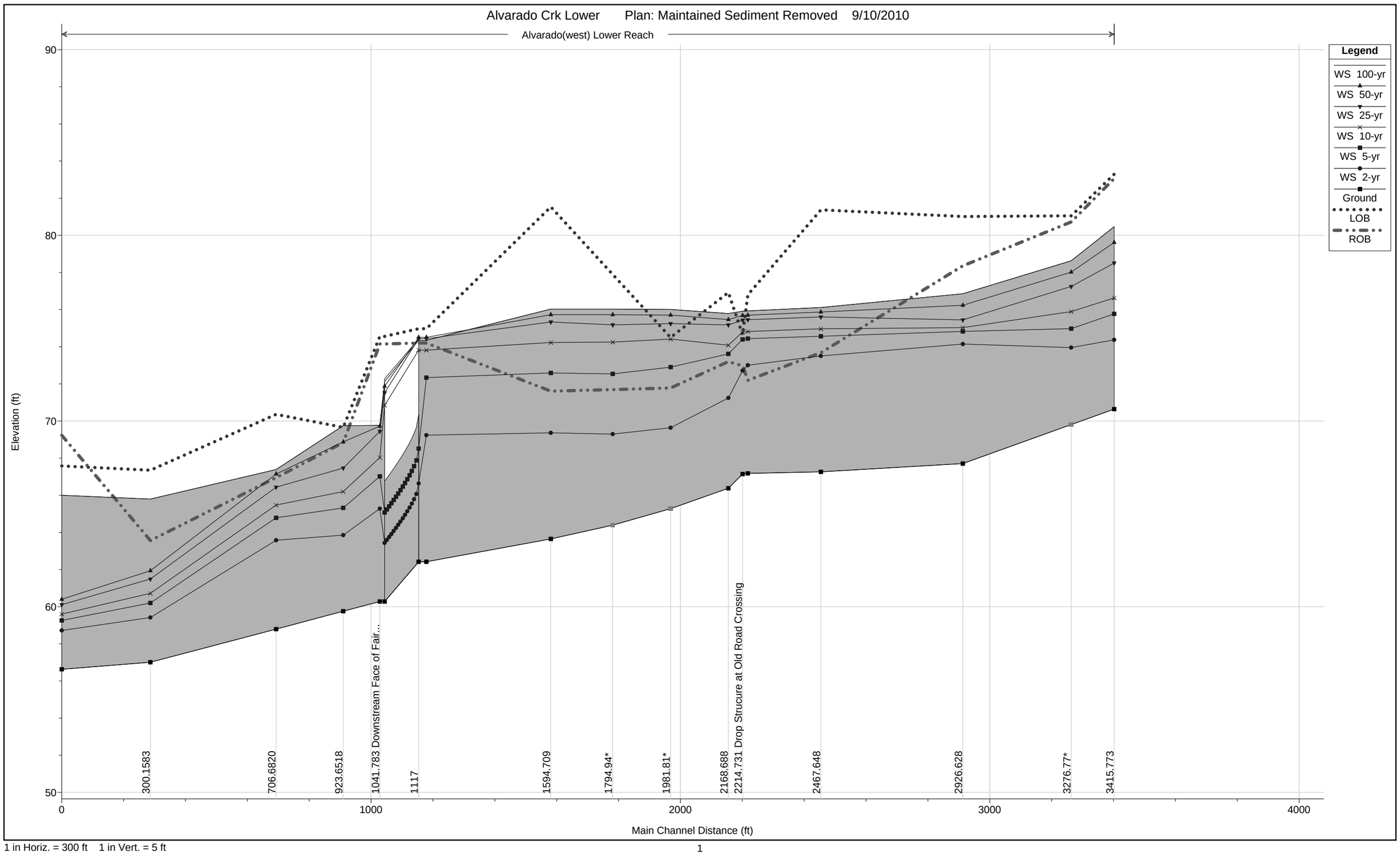
HYDRAULIC PROFILE FOR
MAINTAINED CONDITION MODEL (NO SEDIMENT REMOVED)

Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010



1 in Horiz. = 300 ft 1 in Vert. = 5 ft

Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010



1 in Horiz. = 300 ft 1 in Vert. = 5 ft

DETAILED HYDRAULIC RESULTS FOR CURRENT VEGETATED CONDITION MODEL

HEC-RAS Plan: Actual River: Alvarado(west) Reach: Lower Reach

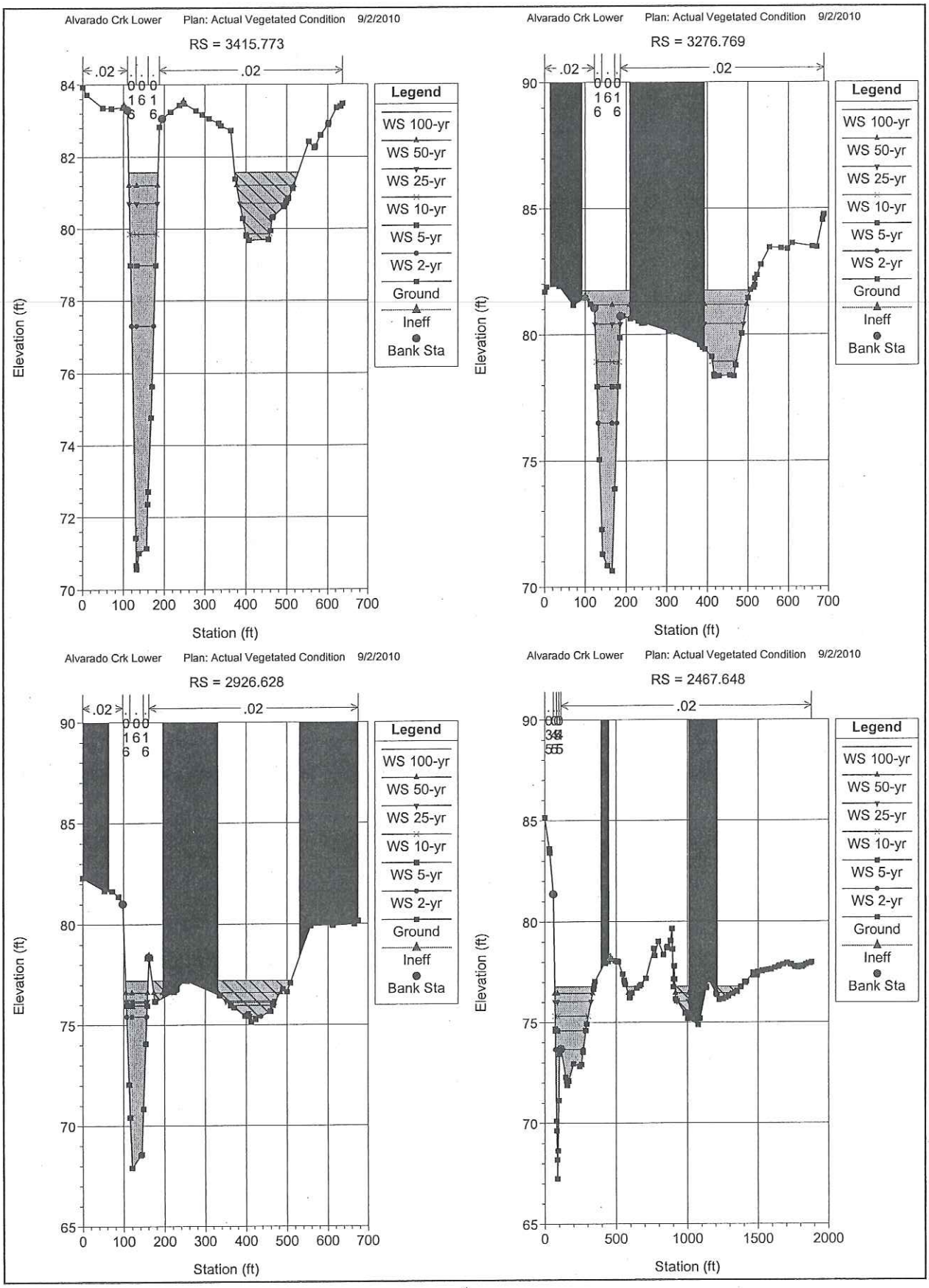
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	13.60388	100-yr	5100.00	56.63	66.00	58.46	66.01	0.000048	0.68	7538.81	968.59	0.04
Lower Reach	13.60388	50-yr	4500.00	56.63	60.41	58.38	60.46	0.001301	1.83	2454.26	834.32	0.19
Lower Reach	13.60388	25-yr	3800.00	56.63	60.12	58.27	60.16	0.001300	1.72	2212.26	829.02	0.19
Lower Reach	13.60388	10-yr	2700.00	56.63	59.61	58.08	59.65	0.001301	1.51	1793.83	819.76	0.18
Lower Reach	13.60388	5-yr	2050.00	56.63	59.27	57.96	59.30	0.001301	1.35	1515.80	813.55	0.17
Lower Reach	13.60388	2-yr	1180.00	56.63	58.73	57.77	58.75	0.001300	1.09	1083.20	803.84	0.17
Lower Reach	300.1583	100-yr	5100.00	57.01	65.80	62.30	66.15	0.001822	5.19	1253.34	404.93	0.34
Lower Reach	300.1583	50-yr	4500.00	57.01	61.94	61.94	63.90	0.019204	11.24	400.32	101.94	1.00
Lower Reach	300.1583	25-yr	3800.00	57.01	61.49	61.49	63.27	0.019749	10.69	355.52	99.88	1.00
Lower Reach	300.1583	10-yr	2700.00	57.01	60.72	60.72	62.17	0.021043	9.65	279.66	96.30	1.00
Lower Reach	300.1583	5-yr	2050.00	57.01	60.20	60.20	61.43	0.022332	8.90	230.31	93.89	1.00
Lower Reach	300.1583	2-yr	1180.00	57.01	59.40	59.40	60.28	0.024988	7.51	157.09	90.22	1.00
Lower Reach	706.6820	100-yr	5100.00	58.79	67.39	67.39	68.43	0.005167	8.70	663.72	298.55	0.66
Lower Reach	706.6820	50-yr	4500.00	58.79	67.14	67.14	68.17	0.005234	8.53	592.15	289.40	0.66
Lower Reach	706.6820	25-yr	3800.00	58.79	66.44	65.45	67.73	0.006871	9.22	428.33	155.90	0.74
Lower Reach	706.6820	10-yr	2700.00	58.79	65.48	64.42	66.54	0.006432	8.29	325.67	76.87	0.71
Lower Reach	706.6820	5-yr	2050.00	58.79	64.79	63.69	65.65	0.005879	7.47	274.57	71.26	0.67
Lower Reach	706.6820	2-yr	1180.00	58.79	63.59	62.47	64.16	0.004929	6.05	195.06	61.53	0.60
Lower Reach	923.6518	100-yr	5100.00	60.08	69.89	69.89	71.08	0.005823	9.30	614.47	239.79	0.69
Lower Reach	923.6518	50-yr	4500.00	60.08	68.43	68.43	71.10	0.013178	13.12	343.00	90.36	1.00
Lower Reach	923.6518	25-yr	3800.00	60.08	67.75	67.75	70.23	0.014012	12.63	300.81	66.83	1.00
Lower Reach	923.6518	10-yr	2700.00	60.08	66.84	66.52	68.68	0.012750	10.88	248.11	55.64	0.91
Lower Reach	923.6518	5-yr	2050.00	60.08	66.14	65.66	67.62	0.012251	9.76	210.14	51.81	0.85
Lower Reach	923.6518	2-yr	1180.00	60.08	64.88	64.24	65.85	0.011718	7.90	149.29	45.00	0.76
Lower Reach	1041.783	100-yr	5100.00	60.28	70.28	68.38	71.90	0.005861	10.21	499.54	103.10	0.68
Lower Reach	1041.783	50-yr	4500.00	60.28	70.96	67.84	72.00	0.003624	8.20	548.92	250.77	0.54
Lower Reach	1041.783	25-yr	3800.00	60.28	70.18	67.14	71.11	0.003403	7.72	492.38	92.29	0.51
Lower Reach	1041.783	10-yr	2700.00	60.28	68.77	65.90	69.49	0.003363	6.80	397.11	65.07	0.48
Lower Reach	1041.783	5-yr	2050.00	60.28	67.80	65.04	68.38	0.003278	6.11	335.54	61.29	0.46
Lower Reach	1041.783	2-yr	1180.00	60.28	66.16	63.64	66.53	0.002991	4.88	241.73	53.54	0.40
Lower Reach	1117		Culvert									
Lower Reach	1192.356	100-yr	5100.00	62.42	74.42	71.17	75.87	0.001377	9.83	597.28	1050.32	0.61
Lower Reach	1192.356	50-yr	4500.00	62.42	74.55	70.50	75.61	0.000996	8.44	629.40	1122.90	0.52
Lower Reach	1192.356	25-yr	3800.00	62.42	74.47	69.68	75.25	0.000745	7.25	608.15	1083.29	0.45

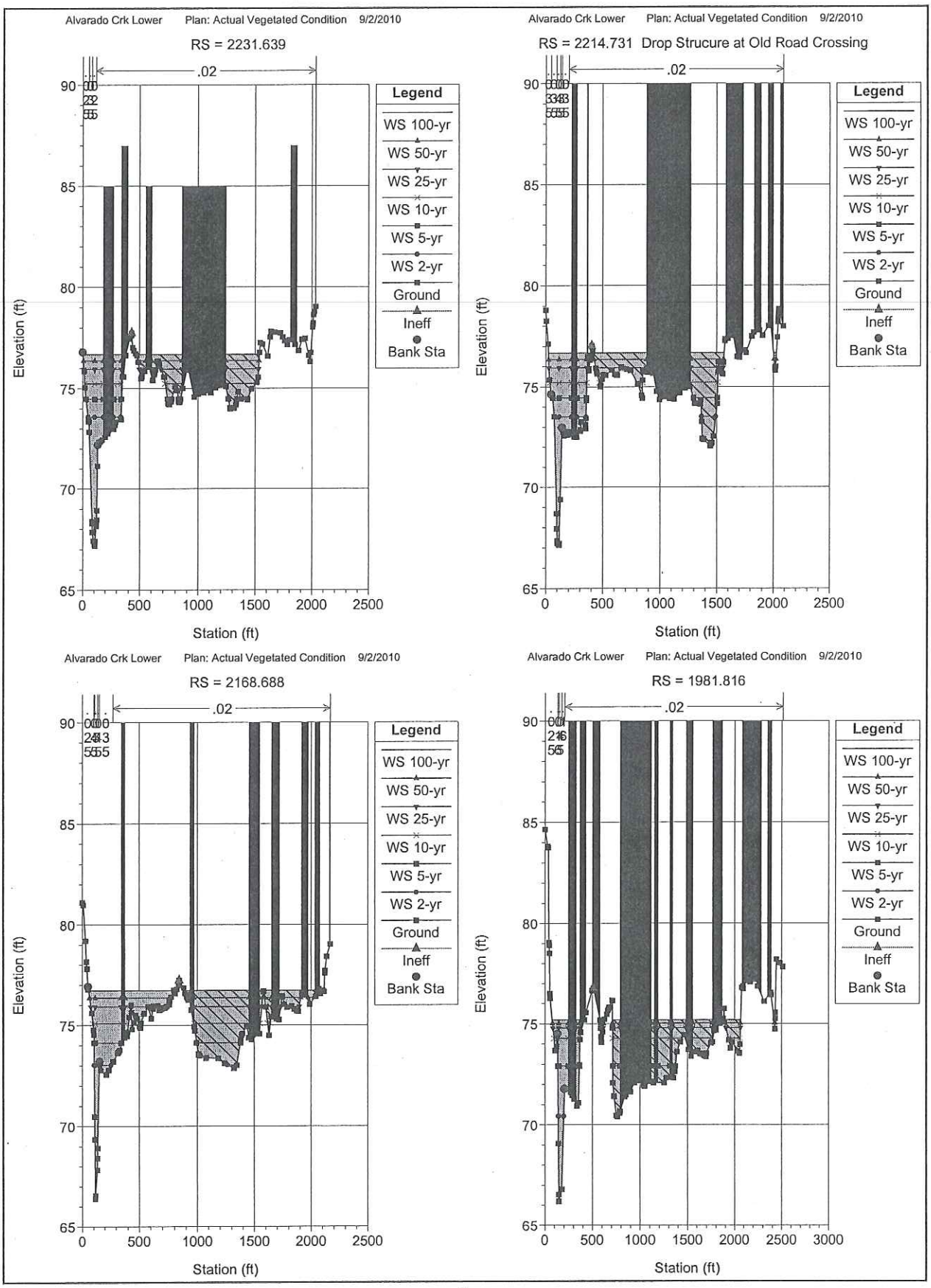
HEC-RAS Plan: Actual River: Alvarado(west) Reach: Lower Reach (Continued)

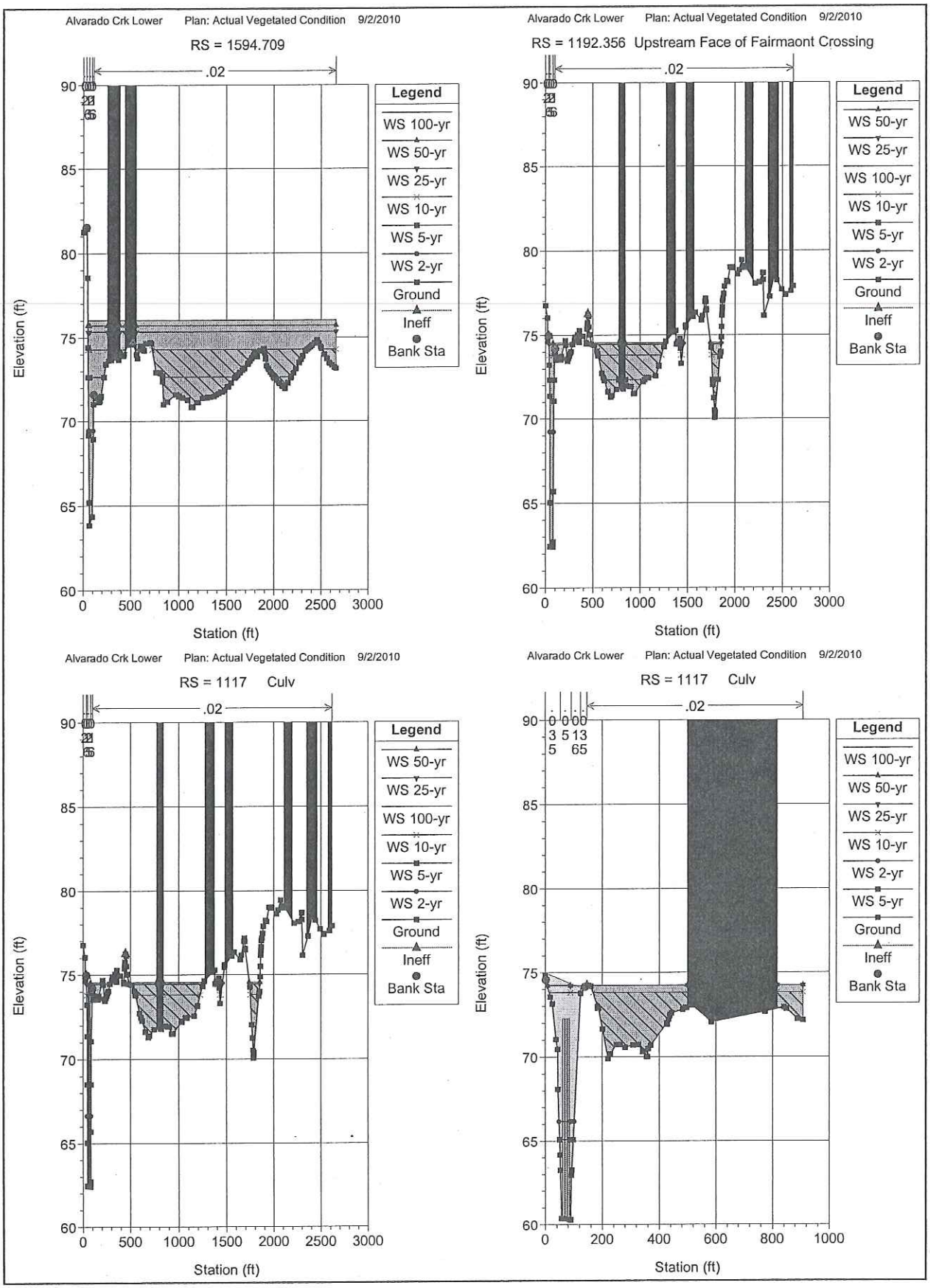
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	1192.356	10-yr	2700.00	62.42	73.81	68.27	74.34	0.000510	5.82	478.72	861.72	0.37
Lower Reach	1192.356	5-yr	2050.00	62.42	72.34	67.32	72.78	0.000488	5.37	381.86	464.72	0.34
Lower Reach	1192.356	2-yr	1180.00	62.42	69.24	65.86	69.59	0.000577	4.79	246.33	40.69	0.34
Lower Reach	1594.709	100-yr	5100.00	63.85	76.02	72.92	76.03	0.000013	1.13	8056.92	2353.25	0.06
Lower Reach	1594.709	50-yr	4500.00	63.85	75.72	72.51	75.73	0.000014	1.13	7355.12	2352.92	0.07
Lower Reach	1594.709	25-yr	3800.00	63.85	75.34	70.94	75.35	0.000015	1.14	6454.02	2352.49	0.07
Lower Reach	1594.709	10-yr	2700.00	63.85	74.28	69.69	74.50	0.000229	4.19	832.92	2068.73	0.26
Lower Reach	1594.709	5-yr	2050.00	63.85	72.64	68.85	72.97	0.000390	4.80	507.37	1122.38	0.33
Lower Reach	1594.709	2-yr	1180.00	63.85	69.45	67.49	69.93	0.000984	5.54	212.96	49.69	0.47
Lower Reach	1981.816	100-yr	5100.00	66.18	75.18	73.37	76.41	0.004782	3.77	820.38	1020.78	0.25
Lower Reach	1981.816	50-yr	4500.00	66.18	75.02	72.67	76.06	0.004260	3.50	787.67	1000.44	0.24
Lower Reach	1981.816	25-yr	3800.00	66.18	74.78	72.23	75.62	0.003716	3.20	741.40	964.82	0.22
Lower Reach	1981.816	10-yr	2700.00	66.18	74.27	71.92	74.81	0.002997	2.72	644.69	868.92	0.20
Lower Reach	1981.816	5-yr	2050.00	66.18	72.90	71.28	73.43	0.007873	3.72	433.57	403.06	0.30
Lower Reach	1981.816	2-yr	1180.00	66.18	70.42	69.72	71.16	0.046012	6.91	170.79	65.17	0.71
Lower Reach	2168.688	100-yr	5100.00	66.38	76.71	74.86	76.87	0.000936	3.13	1597.61	1647.21	0.26
Lower Reach	2168.688	50-yr	4500.00	66.38	76.36	74.68	76.53	0.001150	3.39	1350.86	1503.50	0.28
Lower Reach	2168.688	25-yr	3800.00	66.38	75.90	74.44	76.11	0.001462	3.73	1054.85	1223.56	0.31
Lower Reach	2168.688	10-yr	2700.00	66.38	75.08	74.04	75.31	0.002021	4.19	706.64	829.21	0.33
Lower Reach	2168.688	5-yr	2050.00	66.38	74.12	73.61	74.50	0.004100	5.53	451.38	626.98	0.44
Lower Reach	2168.688	2-yr	1180.00	66.38	73.03	71.24	73.53	0.005738	5.81	225.76	228.27	0.50
Lower Reach	2214.731	100-yr	5100.00	67.14	76.68	74.53	76.95	0.000988	3.87	1235.58	1102.73	0.28
Lower Reach	2214.731	50-yr	4500.00	67.14	76.36	74.29	76.61	0.000996	3.74	1135.76	1070.93	0.28
Lower Reach	2214.731	25-yr	3800.00	67.14	75.95	74.07	76.17	0.001011	3.57	1013.73	998.79	0.28
Lower Reach	2214.731	10-yr	2700.00	67.14	75.21	73.67	75.39	0.001067	3.30	804.89	580.18	0.28
Lower Reach	2214.731	5-yr	2050.00	67.14	74.44	72.36	74.63	0.001409	3.66	602.09	455.69	0.32
Lower Reach	2214.731	2-yr	1180.00	67.14	73.51	71.08	73.69	0.001506	3.62	380.87	351.26	0.32
Lower Reach	2231.639	100-yr	5100.00	67.18	76.68	74.33	76.99	0.000690	4.44	1142.23	902.61	0.34
Lower Reach	2231.639	50-yr	4500.00	67.18	76.36	74.09	76.64	0.000660	4.26	1064.31	853.45	0.33
Lower Reach	2231.639	25-yr	3800.00	67.18	75.96	73.76	76.20	0.000621	4.02	967.45	783.30	0.32
Lower Reach	2231.639	10-yr	2700.00	67.18	75.23	72.24	75.41	0.000567	3.57	795.45	636.18	0.30
Lower Reach	2231.639	5-yr	2050.00	67.18	74.48	71.56	74.65	0.000625	3.57	624.76	402.29	0.30
Lower Reach	2231.639	2-yr	1180.00	67.18	73.58	70.45	73.71	0.000455	2.96	436.50	200.68	0.25
Lower Reach	2467.648	100-yr	5100.00	67.26	76.77	75.33	77.26	0.001346	3.24	961.62	627.14	0.26

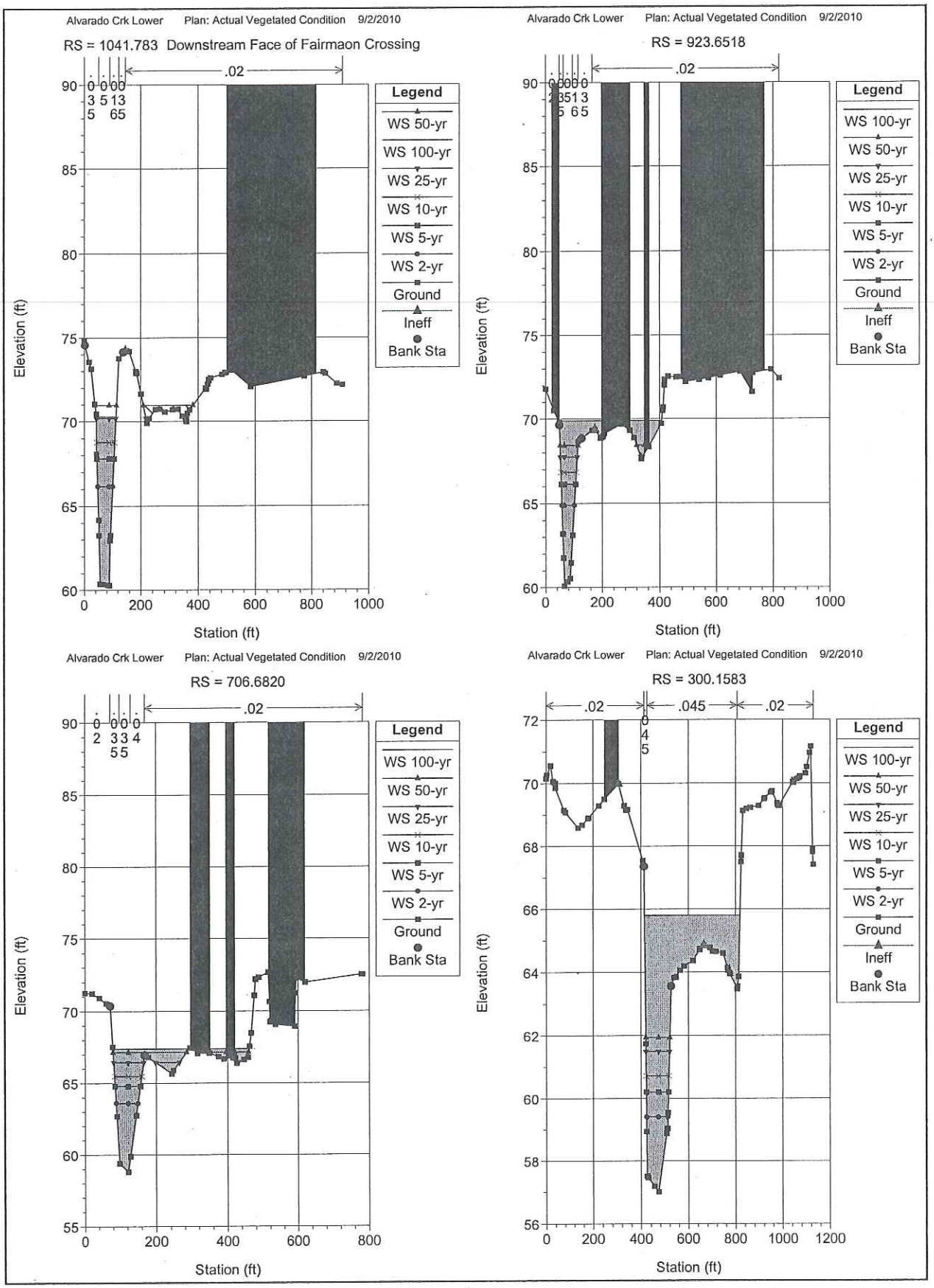
HEC-RAS Plan: Actual River: Alvarado(west) Reach: Lower Reach (Continued)

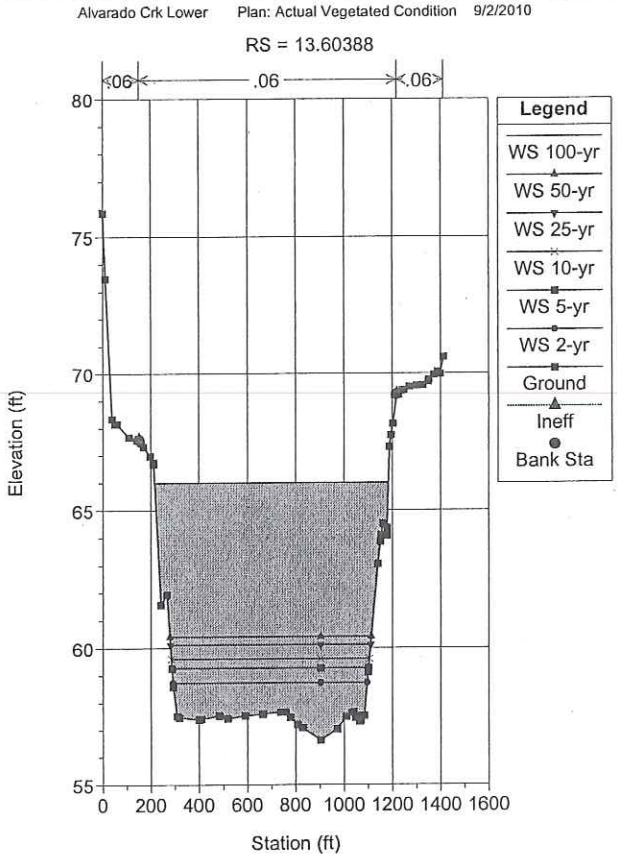
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	2467.648	50-yr	4500.00	67.26	76.45	75.09	76.91	0.001391	3.18	874.18	497.49	0.26
Lower Reach	2467.648	25-yr	3800.00	67.26	76.04	74.80	76.47	0.001459	3.11	768.07	335.95	0.26
Lower Reach	2467.648	10-yr	2700.00	67.26	75.31	74.30	75.67	0.001641	3.01	589.61	242.52	0.27
Lower Reach	2467.648	5-yr	2050.00	67.26	74.59	73.97	74.98	0.002585	3.38	428.59	214.91	0.33
Lower Reach	2467.648	2-yr	1180.00	67.26	73.66	73.44	74.05	0.005974	4.32	237.12	194.24	0.48
Lower Reach	2926.628	100-yr	5100.00	67.91	77.21	77.21	80.42	0.016674	14.38	354.62	259.42	1.00
Lower Reach	2926.628	50-yr	4500.00	67.91	76.61	76.61	79.64	0.017705	13.98	321.93	227.81	1.00
Lower Reach	2926.628	25-yr	3800.00	67.91	76.18	75.85	78.68	0.015926	12.69	299.48	175.38	0.93
Lower Reach	2926.628	10-yr	2700.00	67.91	76.11	74.50	77.40	0.008327	9.11	296.23	166.57	0.67
Lower Reach	2926.628	5-yr	2050.00	67.91	75.96	73.58	76.74	0.005240	7.11	288.28	154.30	0.53
Lower Reach	2926.628	2-yr	1180.00	67.91	75.40	72.07	75.72	0.002405	4.53	260.52	77.14	0.35
Lower Reach	3276.769	100-yr	5100.00	70.64	81.73	80.17	82.36	0.002231	6.42	810.63	228.65	0.41
Lower Reach	3276.769	50-yr	4500.00	70.64	81.17	79.89	81.83	0.002693	6.70	688.14	197.23	0.44
Lower Reach	3276.769	25-yr	3800.00	70.64	80.41	79.55	81.15	0.003553	7.18	554.14	156.77	0.49
Lower Reach	3276.769	10-yr	2700.00	70.64	78.93	77.13	79.94	0.006215	8.21	345.28	114.55	0.61
Lower Reach	3276.769	5-yr	2050.00	70.64	77.95	76.22	78.90	0.006970	7.80	262.97	51.47	0.61
Lower Reach	3276.769	2-yr	1180.00	70.64	76.51	74.74	77.09	0.006295	6.12	192.67	45.57	0.52
Lower Reach	3415.773	100-yr	5100.00	70.56	81.57	79.31	83.05	0.004626	9.75	523.16	227.99	0.64
Lower Reach	3415.773	50-yr	4500.00	70.56	81.21	78.76	82.48	0.004234	9.05	497.11	211.13	0.60
Lower Reach	3415.773	25-yr	3800.00	70.56	80.70	78.06	81.75	0.003809	8.23	462.00	180.21	0.56
Lower Reach	3415.773	10-yr	2700.00	70.56	79.85	76.84	80.54	0.002921	6.67	405.09	123.61	0.47
Lower Reach	3415.773	5-yr	2050.00	70.56	78.97	75.99	79.51	0.002699	5.87	349.44	61.38	0.43
Lower Reach	3415.773	2-yr	1180.00	70.56	77.30	74.63	77.64	0.002530	4.67	252.65	54.24	0.38


Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 3415.773
.02
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 3276.769
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 2926.628
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 2467.648


Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 2231.639
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 2214.731 Drop Strucure at Old Road Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 2168.688
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1981.816
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1594.709
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1192.356 Upstream Face of Fairmaont Crossing
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1117 Culv
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1117 Culv
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 2-yr
WS 5-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 1041.783 Downstream Face of Fairmaon Crossing
.02
Legend
WS 50-yr
WS 100-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 923.6518
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 706.6820
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Actual Vegetated Condition 9/2/2010
RS = 300.1583
.02
.045
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower
Plan: Actual Vegetated Condition
9/2/2010
RS = 13.60388
.06
.06
.06
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
80
75
70
65
60
55
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X     X    X   X
XXXXXXX  XXXX     X       XXX XXXX      XXXXXX   XXXX
X     X  X        X           X  X      X    X       X
X     X  X        X    X      X   X     X    X       X
X     X  XXXXXX    XXXX       X    X    X    X   XXXXX
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PROJECT DATA
Project Title: Alvarado Crk Lower
Project File : AlvaradoCrkLower.prj
Run Date and Time: 9/2/2010 3:57:42 PM

Project in English units

Project Description:
City of San Diego - 1st Year Maintenance
J-15541A October 13,
2009
Utilized 1999 City 2-foot Contour Topo (NGVD 29)
Alvarado Creek
(Lower/Westerly Portion)
Helix Map Number 59 and 60 - Phase A Priority

PLAN DATA

Plan Title: Actual Vegetated Condition
Plan File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.p03

Geometry Title: Actual Vegetated Condition
Geometry File : w:\15541-
A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g01

Flow Title : Actual Vegetated Condition
Flow File : w:\15541-
A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f02

Plan Description:
Actual Vegetated Model Output

Plan Summary Information:
Number of: Cross Sections = 15 Multiple Openings = 0

```
          Culverts          =    1    Inline Structures  =    0
          Bridges           =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

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



FLOW DATA

Flow Title: Actual Vegetated Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f02

Flow Data (cfs)

  River            Reach           RS                  100-yr            50-yr
25-yr           10-yr           5-yr          2-yr
  Alvarado(west)   Lower Reach     3415.773            5100              4500
3800            2700            2050          1180


Boundary Conditions

  River            Reach           Profile                       Upstream
Downstream

  Alvarado(west)   Lower Reach     100-yr
Known WS = 66
  Alvarado(west)   Lower Reach     50-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     25-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     10-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     5-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     2-yr
Normal S = 0.0013



GEOMETRY DATA

Geometry Title: Actual Vegetated Condition
```

Geometry File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g01

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3415.773

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	83.93	10.52	83.72	49.34	83.36	70.68	83.34	100.85	83.38
109.41	83.29	130.02	71.42	131.31	70.67	131.95	70.56	137.65	71
157.14	71.13	159.47	72.36	160.66	72.71	167.65	74.77	169.83	75.63
188.02	82.83	194.79	83.06	215.5	83.25	236.72	83.43	246.85	83.49
277.39	83.28	293.32	83.17	309.77	83.06	333.91	82.93	338.78	82.86
362.9	82.73	374.16	81.39	392.18	80.28	400.42	79.82	401.41	79.79
407.16	79.67	455.28	79.7	459.96	79.94	464.45	80.31	465.99	80.33
492.85	80.61	494.47	80.65	497.4	80.72	499.2	80.77	503.06	80.83
504.06	80.86	514.76	81.12	553.49	82.42	566.92	82.25	568.15	82.26
569.27	82.29	582.64	82.6	600.74	82.89	602.56	82.94	622.5	83.36
631.58	83.4	632.75	83.39	637.02	83.47				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	109.41	.016	130.02	.06	160.66	.016	188.02	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
109.41	194.79	138.55	139	139.44		.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	100.85	83.38	F
246.85	637.02	83.49	F

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3276.769

```
INPUT
Description:
Station Elevation Data    num=      51
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   81.69    4.45   81.89   35.41   81.92   70.17   81.17   100.3
81.46
  112.67    81.2  122.62   81.05  134.98   75.05  140.38   72.26  142.25
71.29
  154.18   70.84  165.75   70.64  172.28   73.88  184.34   79.88  186.01
80.72
  191.45   80.73  210.25   80.63  229.99   80.52  238.65   80.44  245.22
80.45
  304.34   80.13  380.38   79.61  384.55   79.58  387.47   79.49  393.73
79.41
  410.54   79.12  416.31   78.42  416.91   78.34  422.24   78.35  429.59
78.36
  455.88   78.38  465.27   78.36  469.47   78.78  484.52   80.04  500.14
81.43
  505.85   81.76  514.04   81.84  516.55    82.2  516.86   81.95  522.35
82.35
  531.72   82.76  552.96   83.45  582.28   83.42   597.3    83.4  609.57
83.62
  660.02   83.49  670.66   83.47  684.79   84.54  685.45   84.57   687.4
84.72
  688.83   84.77

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02  122.62    .016  140.38     .06  172.28    .016  186.01
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       122.62  186.01           345.32  350.14  353.92             .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
       0   100.3   81.46          F
Blocked Obstructions      num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
   13.62   92.64      90  208.28  393.34      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 2926.628

INPUT
Description:
Station Elevation Data    num=      42
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   82.29   53.38   81.66   72.39   81.64   87.76   81.37   97.81
81.01
```

```
     113    72.05   115.78    70.41   120.03    67.91   141.42    68.53   144.01
68.59
  148.04    70.84    153.8    74.06   161.57    78.36   175.86    76.17   177.43
76.16
  223.02    76.64   227.21    76.74   229.11    76.79   247.52    77.21   249.49
77.2
  254.91    77.19   335.23    76.46   335.65    76.45   362.99    75.94    370.4
75.85
  397.23    75.43   404.82    75.53   407.82    75.41   412.56    75.13   423.65
75.26
   459.1    75.66   460.33    75.67   467.47    76.07   490.09    76.78   499.97
76.64
  507.82    77.08   557.44    79.91   610.52    79.96    613.3    79.92   666.44
79.99
  674.48    80.17   676.28    80.14

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta    n
Val
       0     .02    97.81    .016   115.78     .06   148.04    .016   161.57
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        97.81  161.57           455.11  458.98  464.26              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  161.54  676.28   78.35         F
Blocked Obstructions      num=        3
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  530.39  676.28      90   195.38  332.19      90        0   65.03      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2467.648

INPUT
Description:
Station Elevation Data     num=      131
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    85.14    31.71     83.6    33.83    83.49    34.64    83.42    35.08
83.41
   59.99    81.37    73.72    74.68    82.27    70.11    83.15    69.63    86.73
68.19
   89.02    67.26    92.06    68.64    97.86    71.13   103.24    73.43   113.31
73.68
   146.6    72.29   153.08    72.07   156.92    71.89   165.93    72.07   166.17
72.08
  167.48    72.11    202.5    72.94   245.26    72.82   258.71     72.9   268.41
73.53
  269.48    73.55   294.79    74.91   342.16    76.66   346.46    76.82    346.9
76.83
```

```
  352.33   77.04  420.61   77.94  422.58   77.93  442.68   78.03  457.77
78.17
  493.61   78.06  507.21   78.02  507.95   78.05  514.77      78  545.03
77.39
  554.65    77.1   558.3      77   562.9   76.89  592.83   76.22  596.07
76.24
  609.78   76.47  643.62   76.71  645.17    76.7  665.46   76.81  673.24
76.88
     708   77.18   763.5   78.67  770.56   78.32  794.79   79.02  831.94
78.37
  855.73   78.71  859.72   78.76  881.44   79.06  892.44   79.65  895.56
78.63
  902.16   76.75  903.47   77.15  906.73   77.79  909.69   77.14  916.27
76.15
  924.71   76.06  982.71   75.44  989.78   75.49   992.3   75.48  994.07
75.47
  994.82   75.46 1002.08   75.17 1075.12   74.87 1081.44   75.17 1087.78
75.18
 1134.03    76.7 1136.68   76.76 1149.13   77.15 1153.32   77.09 1201.92
76.41
 1209.82   76.35 1225.56   76.12  1254.7   76.16 1273.65   76.22  1290.4
76.3
 1316.22   76.41 1319.91   76.43  1349.5   76.55 1350.69   76.52 1377.48
76.74
 1378.49   76.78 1405.71   77.02 1408.81   76.97 1416.98   77.03 1463.22
77.46
 1464.35   77.47 1465.26   77.38 1465.46   77.33  1492.9   77.32 1495.06
77.49
 1497.02   77.51 1526.26   77.54 1528.61   77.57 1557.48   77.59 1560.29
77.6
 1588.83   77.63 1592.01   77.64 1617.89   77.71 1643.35   77.77 1650.27
77.81
 1675.79   77.87 1677.17   77.88 1702.31   77.94 1703.75   77.95  1727.8
77.87
 1732.13   77.89 1735.39   77.86 1758.02   77.78 1761.23   77.75 1763.95
77.79
  1784.6   77.72 1787.59   77.76 1790.47    77.8 1810.66   77.74 1813.79
77.78
 1820.99   77.81  1838.1   77.88 1855.62   77.95 1868.06   77.94 1868.49
77.93
 1878.22   77.98

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    59.99    .045    82.27     .05    97.86    .045   113.31
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         59.99  113.31           232.89  236.01  234.37              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  457.77 1878.22   78.17         F
Blocked Obstructions      num=        2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
```

393.47 449.7 90 1007.94 1212.91 90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2231.639

INPUT
Description:
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	76.8	12.75	75.85	17.94	75.04	51.03	73.41	51.81	73.4
52.64	73.35	54.8	73.36	56.84	72.84	80.96	68.39	81.55	68.28
83.35	67.85	92.65	67.42	102.28	67.26	105.78	67.18	107.28	67.35
108.73	67.41	119.2	68.15	120.35	68.23	124.25	68.47	125.11	68.93
130.5	71.14	132.75	72.19	144.53	72.32	146.66	72.33	154.89	72.34
163.13	72.39	172.13	72.44	200.97	72.59	222.6	72.75	229.84	72.92
250.17	73.03	264.5	73.1	267.34	73.09	274.94	72.99	287.98	73.17
291.98	73.34	338.77	73.46	352.25	75.59	358.58	75.57	378.11	76.64
409.95	77.45	424.63	77.62	428.34	77.74	429.8	77.64	437.38	77.02
448.59	76.88	465.55	76.73	477.09	76.63	488.11	76.31	513.25	75.49
517.54	75.56	518.31	75.58	536.09	75.88	541.8	75.85	581.1	76.06
611.82	75.41	615.4	75.4	627.3	75.69	630.96	75.78	636.47	75.92
653.45	76.35	658.88	76.34	668.58	76.19	707.85	75.57	742.43	74.25
749.35	74.2	763.74	74.34	800.8	75.09	816.48	74.89	829.18	74.42
829.93	74.37	830.73	74.44	833.71	74.31	838.94	74.34	865.2	75
909.05	76.09	917.31	75.9	966.88	74.57	1003.02	74.72	1049.97	74.77
1113.38	74.78	1153.48	75.02	1242.96	75.08	1279.83	74.03	1281.75	73.98
1314.45	74.01	1329.84	74.17	1334.15	74.24	1350.52	74.82	1379.5	74.47
1430.9	74.43	1469.75	74.96	1516.6	75.29	1527.23	75.55	1539.52	76.78
1545.51	77.26	1565.11	77.18	1611.43	76.59	1631.79	77.54	1640.26	77.82
1672.84	77.77	1719.97	77.73	1741.31	77.53	1760.68	77.35	1780.39	77.16
1802.24	77.4	1849.81	77.16	1880.35	76.86	1910.12	77.41	1912.12	77.42

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 1936.96   77.47 1970.04   76.62 1982.33   76.31 1990.43   76.76 2006.08
78.02
 2008.62   78.15 2009.51   78.23 2014.93   78.64 2020.55   78.77 2034.15
79.03

Manning's n Values          num=        4
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val
       0    .025    54.8    .035    81.55    .025    119.2     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
            0  132.75             16.13   16.91   37.54              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  428.34 2034.15   77.74        F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  184.32  275.65      85  340.74  396.32      87  552.57  607.29      85
  856.96 1244.13      85 1807.53 1866.52      87  2031.7 2034.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2214.731

INPUT
Description: Drop Strucure at Old Road Crossing
Station Elevation Data    num=      132
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     78.8     4.69    78.26    19.99    77.13    31.38    75.35    32.65
75.36
   47.05    74.64    60.75    74.49    75.72    73.53    95.88     68.7    98.81
67.95
  102.07    67.35    102.3    67.29   103.51    67.24    104.5    67.22   105.37
67.21
  117.44    67.15   118.92    67.14   119.21    67.22   128.26     69.4    143.1
72.97
  147.52    72.88   154.75    72.74   160.75    72.57   182.67    72.73   192.62
72.61
   193.9    72.63   202.04    72.79   203.03    72.78   212.51    72.63   248.98
72.52
  251.05    72.53    271.5    72.51   302.09     72.8   304.45    72.82    305.5
72.87
  313.36    73.25   350.18    73.13   351.51    72.93    353.9    73.43   358.18
74.32
   368.7     76.5   376.42    75.82    377.9    75.85   380.05    75.81   390.48
76.33
  394.76    76.55   404.34    77.03   405.94    76.97   411.53    76.77   439.48
75.92
  447.47    75.73   451.19    75.64   480.79    75.01   483.64    75.07   496.29
75.38
  505.79    75.61   526.86    75.57   580.21    75.84   608.69    75.63   609.25
75.62
```

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  621.32   75.58  627.49   75.57  662.49   75.98  709.38   75.88  743.92
75.81
  808.08   75.14  842.46   74.58  847.52   74.44   850.1   75.33  851.67
75.84
   853.5   75.75  863.11   75.73  896.48   75.71  940.17   75.67  942.15
75.68
  970.19   74.78  995.12   74.37 1085.56   74.41 1125.08   74.38 1176.36
74.69
 1223.87   74.93 1267.55      75 1298.95   74.42 1308.02   74.18 1312.54
74.17
 1339.62   74.15 1356.07   74.13 1358.46   74.16 1362.15   74.33 1370.72
73.27
 1375.79   72.41  1381.3    72.4 1385.28   72.39 1386.68   72.37 1443.12
72.05
 1450.89   72.15 1451.83   72.14 1458.42   72.22 1472.94   72.54 1505.43
74.16
 1512.29   75.72 1513.91   76.23 1530.37   75.83  1550.2   75.66 1553.68
75.62
 1560.85    76.2 1573.52   77.27 1574.42   77.36 1599.33   77.39 1640.48
77.53
 1644.68   77.62 1681.27    76.5 1698.12   76.47 1703.78   76.46 1749.14
76.81
 1764.78   76.68 1814.25    77.5 1830.66   77.69 1879.63   77.79 1905.43
77.53
  1957.8   78.01 1977.52   78.05 2014.28   75.94  2016.6   75.81 2020.51
75.99
 2035.53   77.45 2040.76    78.2 2042.13    78.4 2046.47   78.66 2048.95
78.81
  2049.4   78.84 2088.99   77.99

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    47.05    .035    95.88    .045   128.26    .035   143.1
.035
  202.04     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        47.05   143.1            31.05   46.04   52.74              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  404.34 2088.99   77.03         F
Blocked Obstructions      num=        7
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
   224.9  275.77      90  363.14  373.41      90  883.42 1272.26      90
 1579.78 1738.28      90  1834.2 1893.63      90 1952.63 1999.56      90
 2059.58 2088.99      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 2168.688

INPUT
```

Description:
Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.11	8.42	80.99	28.98	79.2	35.51	78.16	41.11	77.81
41.46	77.79	49.04	76.92	49.21	76.77	49.37	76.92	82.88	75.61
97.93	74.76	101.97	74.53	108.09	70.47	109.72	69.35	114.08	66.38
116.39	66.55	133.68	67.83	135.76	68.42	137.48	68.92	152.33	73.19
154.59	73.2	164.21	72.76	214.35	72.55	235.29	72.76	236.86	72.78
272.29	73.21	276.75	73.19	313.88	73.62	322.66	73.67	332.02	73.76
371.42	74.39	391.58	74.46	391.98	74.47	397.41	74.66	412.65	75.38
429.65	75.99	432.12	75.63	436.98	74.8	453.7	75.15	469.65	75.49
482.13	75.32	503.89	74.94	511.34	74.86	515.46	75.09	543.35	75.57
578.89	75.92	605.69	75.33	622.05	75.8	627.14	75.96	661.78	75.97
675.45	75.76	676.55	75.73	687.84	75.78	695.12	75.81	695.54	75.83
702.92	75.86	717.53	75.85	726.03	75.89	734.98	75.93	755.29	76.02
755.55	76.04	758.4	76.21	771.81	76.4	796.33	76.73	803.08	76.59
803.36	76.57	819.66	76.78	835.81	76.97	836.04	77	839.41	77.22
878.82	76.85	890.04	76.59	890.63	76.56	906.91	76.39	914.08	76.32
921.68	76.25	921.89	76.27	925.47	76.52	948.37	75.75	972.75	74.93
979.07	74.72	1009.42	73.57	1012.54	73.52	1023.73	73.49	1076.49	73.36
1078.47	73.37	1185.18	73.35	1241.16	73.1	1320.75	72.86	1323.48	72.88
1346.75	73.01	1381.97	74.25	1386.87	74.49	1395.25	74.58	1434.3	74.94
1437.78	74.92	1450.87	74.37	1477.49	74.27	1545.68	74.56	1578.98	76.66
1580.24	76.68	1600.5	75.9	1628.93	74.48	1647.38	75.39	1693.93	75.3
1716.25	75.27	1717.43	75.26	1744.84	76.44	1761.11	76.02	1787.9	75.88
1828.77	75.93	1850.39	75.79	1872.58	75.7	1885.99	75.68	1916.24	76.57
1917.11	76.58	1943.96	76.56	1944.71	76.54	1949.43	76.48	1987.9	76.01
2041.55	76.43	2068.14	76.8	2081.25	76.55	2105.17	76.72	2114.6	76.66
2120.74	77.58	2121.39	77.68	2122.26	77.7	2137.68	78.4	2168.38	79.02

```
Manning's n Values          num=        6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .025  101.97    .045  109.72     .05  137.48    .045  152.33
.035
  272.29     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         49.04  154.59           178.72  186.87  197.94              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  839.41 2168.38   77.22        F
Blocked Obstructions      num=        7
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  345.94  374.87      90  934.55  972.18      90 1452.21 1548.05      90
 1649.05 1720.79      90 1912.43 1972.34      90 2033.15  2077.5      90
 2162.07 2168.38      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1981.816

INPUT
Description:
Station Elevation Data     num=      127
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   84.65   26.29   83.82   34.24   83.75   43.66   79.05   44.52
78.91
   47.34    78.5   52.63   76.51   55.06   76.27   107.5   73.68  117.48
73.69
  121.54   73.87  135.14    74.5  143.27   69.08  147.09   66.53  147.68
66.18
  148.53    66.2  177.68   66.79  207.09   71.78  208.92   71.79  268.97
71.61
  286.29   71.45  307.37   71.27  338.31   70.93  355.82   71.08  365.49
72.96
  369.68   74.21  377.15   74.57  377.34   74.58  416.58   75.18  431.39
75.55
  497.42   76.64  498.44   76.65  500.16   76.66  511.31   76.77  581.67
75.17
  587.43   74.78  592.49   74.36  596.04   74.09  607.81   74.59  627.47
75.22
  651.82   75.47  661.48   75.65   668.9   75.72  678.56   75.82  710.64
76.16
  712.03   74.79  714.72   72.07  727.37   71.42   728.7    71.4  751.18
70.46
  761.32    70.4  785.21   70.57  788.19    70.6  790.66   70.63  792.22
70.66
  838.84   71.38  852.37   71.48  900.76   71.63  940.59   72.07  941.53
72.08
  964.43   72.28 1000.66   72.18 1004.87   72.17 1014.63   72.29 1037.68
71.95
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 1050.64   71.91 1122.41   72.15 1138.79   72.08 1253.51   72.09 1274.09
72.32
 1333.33   72.34 1353.17   72.32 1367.11   72.64 1389.46   73.61 1424.82
74.08
 1463.87   74.44 1510.27   73.71 1539.64   73.38 1583.36   73.61  1610.2
73.66
 1635.67   73.51 1653.24   73.48 1676.18   73.43 1686.19   73.39 1690.32
73.38
 1693.81   73.37 1694.24   73.38 1700.52   73.53 1747.46   74.04 1761.35
74.09
 1779.25   74.63 1800.08   74.67 1844.83   75.01 1876.85   75.26  1886.5
75.75
 1890.08   75.08 1936.81   74.18 1955.42   73.79 1972.69   74.08  2032.6
73.63
 2053.07   73.55 2055.82   73.53  2059.2   73.97 2077.89   76.79 2091.39
76.87
 2094.31   76.74 2133.72   77.12 2149.21   77.14 2169.15   77.07 2182.51
77.2
 2183.81   77.21 2229.19    77.2 2233.11   77.34 2234.63   77.35  2247.8
76.86
 2316.18   76.11 2379.09   76.54 2383.26   76.53 2386.26   76.42 2428.46
74.73
 2429.38   75.25 2430.87   75.55 2441.79    78.2 2470.28   78.04 2481.28
78.01
 2509.95   77.84 2513.55   77.81

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025   135.14    .016   147.68    .045   177.68     .16   207.09
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        135.14  207.09           397.08  387.11  367.43              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  511.31 2513.55   76.77         F
Blocked Obstructions      num=       10
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  245.39  330.92      90  505.65  581.04      90  366.42  431.68      90
  789.77 1118.24      90 1146.29 1186.87      90 1312.75 1341.97      90
 1486.06 1556.66      90 1762.96 1868.49      90 2082.76 2284.39      90
 2346.39 2390.73      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1594.709

INPUT
Description:
Station Elevation Data     num=      165
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
```

0	81.24	3.6	81.26	4.29	81.27	32.08	81.53	38.54
81.45								
42.88	78.55	47.5	74.42	55.83	69.17	62.95	65.2	65.36
63.85								
92.75	64.35	95.54	64.37	104.12	68.94	108.05	71.03	109.14
71.61								
127.14	71.39	166.03	71.16	168.57	71.15	175.1	71.21	184.39
71.43								
186.57	71.5	187.13	71.52	236.4	73.4	237.09	73.41	268.14
73.62								
294.5	73.66	295.95	73.67	324.02	73.93	345.93	73.81	371.75
73.66								
383.11	74.14	414.98	73.94	420.44	73.91	422.27	73.92	424.77
73.97								
424.88	73.98	426.56	73.99	466.28	74.58	467.34	74.59	504.82
74.6								
522.99	74.76	558.3	74.01	559.94	73.99	560.54	73.97	569.14
73.76								
596.78	74.29	605.83	74.52	616.15	74.43	634.74	74.26	639.37
74.21								
641.16	74.26	656.72	74.65	703.85	74.71	713.76	74.66	763.8
72.93								
801.7	72.92	804.8	72.9	810.04	72.86	831.79	72.73	833.5
72.38								
843.33	71	882.51	71.16	968.58	71.6	971.8	71.61	973.87
71.58								
998.07	71.48	999.71	71.52	1037.78	71.4	1090.42	71.27	1130.12
70.83								
1142.01	70.84	1189.25	71.11	1199.17	71.12	1246.15	71.38	1294.17
71.39								
1306.69	71.43	1330.64	71.44	1367.69	71.48	1392.75	71.57	1417.65
71.66								
1442.39	71.74	1455.9	71.75	1480.65	71.84	1507.67	72.05	1521.17
72.07								
1548.12	72.28	1583.8	72.57	1590.38	72.61	1610.57	72.72	1617.02
72.77								
1637.25	72.88	1643.58	72.92	1663.85	73.03	1684.25	73.14	1690.36
73.18								
1720.07	73.4	1721.93	73.42	1726.44	73.46	1742.1	73.58	1746.66
73.63								
1762.3	73.74	1766.72	73.79	1782.34	73.95	1798.11	74.11	1802.33
74.16								
1808.47	74.09	1815.84	73.89	1823.63	73.85	1858.05	74.2	1893.05
74.32								
1899.49	74.13	1900.86	74.08	1909.1	73.77	1910.32	73.71	1919.01
73.3								
1934.76	73.16	1944.06	73.08	1959.83	72.94	1976.87	72.79	1993.96
72.64								
2002.86	72.56	2027.9	72.43	2053.18	72.29	2059.57	72.25	2084.9
72.12								
2091.1	72.08	2116.49	71.94	2119.83	71.98	2148.08	72.26	2151.19
72.29								
2179.8	72.58	2185.55	72.64	2209	72.88	2232.84	73.12	2235.73
73.14								
2267.86	73.48	2270.89	73.51	2286.9	73.68	2288.93	73.7	2304.91
73.87								

```
 2306.98   73.89 2334.55   74.18 2337.73    74.2 2352.04   74.27  2355.1
74.28
 2369.42   74.36 2383.86   74.43 2386.87   74.44 2401.32   74.51 2404.21
74.53
 2429.19   74.65 2454.51   74.78  2457.5   74.85 2475.72   74.65 2494.14
74.45
 2498.97   74.36 2535.88   73.97 2559.62   73.72 2561.68   73.75 2585.58
73.49
  2587.3   73.45  2614.1   73.34 2640.94   73.22 2642.44   73.21 2656.25
73.15

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    32.08    .016    62.95    .025    92.75    .016   109.14
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         32.08  109.14           420.75  402.35  377.25              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  522.99 2656.25   74.76         F
Blocked Obstructions      num=       2
   Sta L   Sta R    Elev    Sta L   Sta R    Elev
  251.93  387.55      90    436.7  558.37      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1192.356

INPUT
Description: Upstream Face of Fairmaont Crossing
Station Elevation Data     num=      170
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    76.77    18.93    76.04    21.89    74.65    25.29    74.92     35.1
74.97
    40.34    73.23    44.03    71.37    46.29    65.04    47.46    62.46
47.6362.46033
    52.57    62.47     62.7    62.43    79.09    62.42    79.39    62.72    82.17
65.7
     87.2    71.07     98.3    73.93    99.47     74.2   101.43     74.1    101.8
74.06
   110.38    73.53    111.8    73.52   114.14    73.54   123.79     73.6   125.51
73.72
   156.53    73.67   157.07    73.54   161.04    73.58   162.42    73.59   167.25
73.63
   168.05    73.75   208.44    74.68   210.42    74.56   213.36    74.41   228.38
73.59
   233.28    73.45   243.72    73.63   251.87    73.77   260.77    73.92   269.63
74.02
   283.97    74.46    305.4    74.69   313.68    74.89   319.79    74.83   339.44
75.04
```

```
  342.79   75.01  350.26   74.65  353.09   74.63   353.6    74.6  354.11
74.58
  356.48   75.26   394.6   74.94  429.16   74.57  431.36   74.48  438.63
75.37
  440.77   75.59  442.53   75.76  448.54   76.25  448.64   76.24  454.45
76.12
  457.74    75.5   460.8   75.01  466.44   75.04  483.29   74.47  499.53
74.43
  514.59   74.39  538.86   74.05  548.88   73.89  553.46   73.78  554.01
73.81
  555.27   73.78   595.7   72.73  608.77   72.47  621.83   72.28  658.25
71.62
  687.91    71.3  700.08   71.38  751.01   71.76  813.92   71.82  821.41
71.78
  862.82   71.97  887.32   71.93  901.82   71.92  929.54   71.51  932.56
71.5
  934.69   71.49  937.68   71.51  938.79   71.52    1029   72.21 1033.02
72.24
 1069.62   72.48 1084.18   72.45 1159.78   72.56 1194.18   73.13 1194.99
73.15
 1196.07   73.18 1248.61   74.31 1249.84    74.3 1267.16   74.63 1356.36
75.17
 1374.72   75.27 1379.93   74.47 1383.42   74.45 1391.79   74.54 1398.41
74.61
 1419.11   74.79 1425.07    74.2 1432.86    73.3 1476.57   75.45 1478.13
75.52
 1480.72   75.56 1481.32   75.58 1556.48   76.09 1580.63   76.34 1644.38
75.89
 1653.98   76.15 1682.03   76.98 1687.06   77.16 1688.73   77.04 1692.49
76.96
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=          5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.63    .025    79.09    .016    99.47
.02
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          35.1   99.47            150.44  150.57  156.21              .1
.3
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97        F
  448.54 2616.93   76.25        F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  771.98  844.79      90 1272.38 1373.24      90 1481.65 1571.21      90
 2109.13 2197.69      90 2348.88 2459.84      90  2574.5 2616.93      90

CULVERT


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 1117

INPUT
Description:
Distance from Upstream XS =       25
Deck/Roadway Width        =      110
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    35.1   74.97              99    74.1

Upstream Bridge Cross Section Data
Station Elevation Data     num=      170
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta
Elev
       0   76.77   18.93   76.04   21.89   74.65   25.29   74.92    35.1
74.97
   40.34   73.23   44.03   71.37   46.29   65.04   47.46   62.46
47.6362.46033
   52.57   62.47    62.7   62.43   79.09   62.42   79.39   62.72   82.17
65.7
    87.2   71.07    98.3   73.93   99.47    74.2  101.43    74.1   101.8
74.06
  110.38   73.53   111.8   73.52  114.14   73.54  123.79    73.6  125.51
73.72
  156.53   73.67  157.07   73.54  161.04   73.58  162.42   73.59  167.25
73.63
  168.05   73.75  208.44   74.68  210.42   74.56  213.36   74.41  228.38
73.59
  233.28   73.45  243.72   73.63  251.87   73.77  260.77   73.92  269.63
74.02
  283.97   74.46   305.4   74.69  313.68   74.89  319.79   74.83  339.44
75.04
  342.79   75.01  350.26   74.65  353.09   74.63   353.6    74.6  354.11
74.58
  356.48   75.26   394.6   74.94  429.16   74.57  431.36   74.48  438.63
75.37
  440.77   75.59  442.53   75.76  448.54   76.25  448.64   76.24  454.45
76.12
```

```
  457.74    75.5   460.8   75.01  466.44   75.04  483.29   74.47  499.53
74.43
  514.59   74.39  538.86   74.05  548.88   73.89  553.46   73.78  554.01
73.81
  555.27   73.78   595.7   72.73  608.77   72.47  621.83   72.28  658.25
71.62
  687.91    71.3  700.08   71.38  751.01   71.76  813.92   71.82  821.41
71.78
  862.82   71.97  887.32   71.93  901.82   71.92  929.54   71.51  932.56
71.5
  934.69   71.49  937.68   71.51  938.79   71.52    1029   72.21 1033.02
72.24
 1069.62   72.48 1084.18   72.45 1159.78   72.56 1194.18   73.13 1194.99
73.15
 1196.07   73.18 1248.61   74.31 1249.84    74.3 1267.16   74.63 1356.36
75.17
 1374.72   75.27 1379.93   74.47 1383.42   74.45 1391.79   74.54 1398.41
74.61
 1419.11   74.79 1425.07    74.2 1432.86    73.3 1476.57   75.45 1478.13
75.52
 1480.72   75.56 1481.32   75.58 1556.48   76.09 1580.63   76.34 1644.38
75.89
 1653.98   76.15 1682.03   76.98 1687.06   77.16 1688.73   77.04 1692.49
76.96
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.63    .025    79.09    .016    99.47
.02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          35.1   99.47            .1        .3
Ineffective Flow     num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97         F
  448.54 2616.93   76.25         F
```

Blocked Obstructions num= 6

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
771.98	844.79	90	1272.38	1373.24	90	1481.65	1571.21	90
2109.13	2197.69	90	2348.88	2459.84	90	2574.5	2616.93	90

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
2.34	74.97	124.06	74.1

Downstream Bridge Cross Section Data
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	74.86	2.34	74.56	17.27	73.56	25.01	73.15	37.44	71.04
43.21	70.45	44.57	68.08	51.5	64.18	52.78	63.26	56.79	60.37
65.67	60.35	84.38	60.29	89.53	60.28	92.01	62.96	92.93	63.27
124.06	73.77	139.8	74.15	146.56	74.22	151.57	74.24	160.28	74.18
182.96	73	184.47	72.9	186.49	72.88	201.13	71.64	220.44	69.91
228.66	70.18	250.89	70.72	263.43	70.73	281.27	70.56	309.06	70.69
328.54	70.72	343.55	70.31	356.64	70.02	359.36	70	361.84	70.48
370.24	70.68	426.34	71.99	426.54	71.92	427.93	71.93	433.01	72.21
436.83	72.42	437.72	72.49	443.44	72.59	482.93	72.79	492.98	72.9
496.02	72.93	497.59	72.91	517.36	73.05	584.33	72.06	774.58	72.67
841.08	72.92	848.56	72.84	887.98	72.24	908.45	72.17		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.78	.05	92.01	.016	124.06	.035	146.56	.02

Bank Sta: Left	Right	Coeff Contr.	Expan.
2.34	139.8	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
146.56	908.45	74.22	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
499.89	817.02	90

Upstream Embankment side slope	=	0 horiz. to 1.0 vertical
Downstream Embankment side slope	=	0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow	=	.98
Elevation at which weir flow begins	=	74.1
Energy head used in spillway design	=	
Spillway height used in design	=	

```
Weir crest shape                                = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise     Span
Culvert #1           Box       12        8
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length     Top n  Bottom n  Depth Blocked  Entrance Loss
Coef    Exit Loss Coef
                25      110      .018      .018         0                    .4
1
Number of Barrels =  3
Upstream   Elevation =  62.42
Centerline Stations
    Sta.     Sta.     Sta.
   54.36    63.36    72.36
Downstream Elevation =  60.28
Centerline Stations
    Sta.     Sta.     Sta.
   64.16    73.16    82.16

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1041.783

INPUT
Description: Downstream Face of Fairmaon Crossing
Station Elevation Data     num=       54
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    74.86     2.34    74.56    17.27    73.56    25.01    73.15    37.44
71.04
   43.21    70.45    44.57    68.08     51.5    64.18    52.78    63.26    56.79
60.37
   65.67    60.35    84.38    60.29    89.53    60.28    92.01    62.96    92.93
63.27
  124.06    73.77    139.8    74.15   146.56    74.22   151.57    74.24   160.28
74.18
  182.96       73   184.47     72.9   186.49    72.88   201.13    71.64   220.44
69.91
  228.66    70.18   250.89    70.72   263.43    70.73   281.27    70.56   309.06
70.69
  328.54    70.72   343.55    70.31   356.64    70.02   359.36       70   361.84
70.48
  370.24    70.68   426.34    71.99   426.54    71.92   427.93    71.93   433.01
72.21
  436.83    72.42   437.72    72.49   443.44    72.59   482.93    72.79   492.98
72.9
  496.02    72.93   497.59    72.91   517.36    73.05   584.33    72.06   774.58
72.67
  841.08    72.92   848.56    72.84   887.98    72.24   908.45    72.17

Manning's n Values         num=       5
```

```
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    52.78     .05    92.01    .016   124.06    .035   146.56
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          2.34   139.8           116.66  118.13  124.58              .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  146.56  908.45   74.22        F
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  499.89  817.02      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 923.6518

INPUT
Description:
Station Elevation Data     num=      41
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0    71.8   28.48   70.51   48.23   69.81   48.51  69.657   60.29
63.2
   62.89   61.77   65.67   60.08    77.5   60.34    86.4   60.54   89.98
61.47
   95.85   63.11  115.82   68.66  128.53   68.84  166.16   69.32  175.37
69.36
  194.56   68.86  198.66    68.9  203.24   68.95  207.36   69.14  267.19
69.68
  295.45   69.32   310.7   68.88  337.01   67.64  361.62   68.34  405.48
69.72
  411.15    70.5  412.49   70.69  416.65   72.01  417.74   72.35  429.87
72.53
  459.15   72.49  472.74   72.51   492.7   72.22  540.06   72.34  572.32
72.43
  614.53   72.58  684.11   72.81  726.53    71.6  728.33   72.72  792.37
72.94
  821.37   72.42

Manning's n Values         num=       6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    48.23    .035    62.89     .05    95.85    .016  115.82
.035
  166.16     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         48.51  128.53           217.42  216.97  218.99              .1
.3
Ineffective Flow     num=       1
```

```
   Sta L   Sta R    Elev  Permanent
  175.37  821.37   69.36       F
Blocked Obstructions      num=        4
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  197.27   297.6      90  346.43  364.51      90  476.23  770.33      90
   21.29   48.51      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 706.6820

INPUT
Description:
Station Elevation Data    num=       44
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   71.26   20.07   71.23    41.3   70.92   61.42   70.53   72.14
70.36
   78.67   67.53   90.76   62.68   98.97   59.38  122.39   58.79   129.2
59.88
  145.25   62.74  168.96   66.95  171.58   66.94  177.87    66.8  242.61
65.66
  247.27   65.87   294.8   67.45  316.09   67.07  348.94   67.08  374.67
66.83
   390.3   66.67  415.05   66.76  420.51   66.79  421.71   66.71   426.1
66.38
  446.87   66.62  457.84   66.78  461.67   67.55  466.39   68.48  475.46
71.07
  478.88   72.18  479.52   72.19  488.24   72.32  514.26   72.66  517.04
70.64
  518.76   69.24  521.16   69.32  534.61   69.06   590.6   68.93  592.93
71.22
  594.97   72.24  619.91   71.97  778.79   72.51  781.74    72.5

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02   72.14    .035   98.97    .035   129.2     .04  168.96
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         72.14  168.96           420.18  406.52  381.53             .1
.3
Blocked Obstructions      num=        3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  295.09  350.86      90  395.63  420.97      90  514.53  619.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 300.1583

INPUT
```

Description:
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70.16	3.03	70.27	19.06	70.56	29.27	70.07	33.47	70.03
38.02	70.02	38.83	69.86	74.82	69.15	81.53	69.08	137.44	68.59
154.02	68.68	179.01	68.89	182.24	68.91	224.14	69.29	247.36	69.5
306.01	69.99	330.3	69.29	337.05	69.15	338.42	69.16	343.69	69.17
407.69	67.55	412.83	67.35	419.76	61.74	423.21	58.94	425.02	57.51
429.49	57.46	454.89	57.18	472.73	57.01	506.78	58.87	506.93	58.88
509.91	59.04	511.61	59.03	513.31	59.54	526.98	63.56	538.51	63.83
548.13	63.84	564.83	64.05	565.8	64.06	583.1	64.19	620	64.36
648.17	64.71	649.27	64.73	664.53	64.84	691.37	64.77	691.92	64.76
702.47	64.66	716.85	64.64	746.66	64.59	765.91	64.14	767.74	64.05
768.78	64.08	775.03	63.98	777.44	63.94	807.38	63.47	808.97	63.55
814.33	63.86	824.4	67.5	824.92	67.7	825.32	67.72	830.9	69.13
845.62	69.19	862.7	69.23	897.15	69.29	919.62	69.5	922.68	69.54
948.41	69.71	954.38	69.75	976.05	69.37	977.36	69.33	980.96	69.28
982.86	69.29	986.42	69.3	1042.11	70.04	1045.54	70.02	1047.77	70.1
1059.86	70.14	1067.83	70.17	1072.13	70.2	1073.11	70.22	1095.86	70.31
1101.11	70.51	1113.44	70.96	1118.04	71.16	1126.02	67.91	1126.29	67.81
1128.68	67.41								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	412.83	.045	425.02	.045	807.38	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr. Expan.
412.83	526.98	309.26	286.55	277.96	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	306.01	69.99	F
664.53	1128.68	64.84	F

Blocked Obstructions num= 1

Sta L	Sta R	Elev
247.08	307.3	72

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 13.60388

INPUT
Description:
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75.85	10.33	73.48	38.53	68.34	51.12	68.16	60.44	68.15
108.69	67.67	151.29	67.58	156.01	67.55	159.53	67.46	169.58	67.33
197.14	66.97	210.75	66.75	211.18	66.74	211.62	66.68	241.12	61.57
266.65	61.95	293.8	58.59	309.91	57.51	318.19	57.47	401.8	57.39
409.93	57.41	484.2	57.52	516.72	57.43	518.19	57.42	590.01	57.52
662.74	57.59	664.72	57.6	737.22	57.65	758.62	57.66	779	57.47
808.53	57.2	810.66	57.19	829.99	57.08	903.54	56.63	971.56	57.03
972.65	57.04	1009.45	57.49	1032.22	57.63	1039.89	57.65	1048.28	57.46
1064.18	57.51	1065.22	57.32	1069.26	57.35	1084.27	57.52	1100.33	59.12
1140.26	63.05	1150.65	63.85	1153.2	64.07	1153.41	64.09	1160.7	64.49
1178.04	64.07	1178.95	64.36	1188.24	67.3	1194.9	67.73	1202.1	68.16
1218.05	69.23	1222.37	69.26	1239.98	69.37	1248.73	69.39	1272.24	69.51
1302.61	69.55	1326.83	69.57	1348.91	69.7	1352.15	69.77	1372.76	69.94
1388.62	70.06	1398.96	69.98	1412.03	70.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	151.29	.06	1218.05	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr. Expan.
151.29	1218.05	23.58	13.6	15.76	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	151.29	67.58	F
1218.05	1412.03	69.23	F

SUMMARY OF MANNING'S N VALUES

River:Alvarado(west)

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Lower Reach	3415.773	.02	.016	.06	.016	.02	
Lower Reach	3276.769	.02	.016	.06	.016	.02	
Lower Reach	2926.628	.02	.016	.06	.016	.02	
Lower Reach	2467.648	.035	.045	.05	.045	.02	
Lower Reach	2231.639	.025	.035	.025	.02		
Lower Reach	2214.731	.035	.035	.045	.035	.035	.02
Lower Reach	2168.688	.025	.045	.05	.045	.035	.02
Lower Reach	1981.816	.025	.016	.045	.16	.02	
Lower Reach	1594.709	.02	.016	.025	.016	.02	
Lower Reach	1192.356	.02	.016	.025	.016	.02	
Lower Reach	1117	Culvert					
Lower Reach	1041.783	.035	.05	.016	.035	.02	
Lower Reach	923.6518	.02	.035	.05	.016	.035	.02
Lower Reach	706.6820	.02	.035	.035	.04	.02	
Lower Reach	300.1583	.02	.045	.045	.02		
Lower Reach	13.60388	.06	.06	.06			

SUMMARY OF REACH LENGTHS

River: Alvarado(west)

Reach	River Sta.	Left	Channel	Right
Lower Reach	3415.773	138.55	139	139.44
Lower Reach	3276.769	345.32	350.14	353.92
Lower Reach	2926.628	455.11	458.98	464.26
Lower Reach	2467.648	232.89	236.01	234.37
Lower Reach	2231.639	16.13	16.91	37.54
Lower Reach	2214.731	31.05	46.04	52.74
Lower Reach	2168.688	178.72	186.87	197.94
Lower Reach	1981.816	397.08	387.11	367.43
Lower Reach	1594.709	420.75	402.35	377.25
Lower Reach	1192.356	150.44	150.57	156.21
Lower Reach	1117	Culvert		
Lower Reach	1041.783	116.66	118.13	124.58
Lower Reach	923.6518	217.42	216.97	218.99
Lower Reach	706.6820	420.18	406.52	381.53
Lower Reach	300.1583	309.26	286.55	277.96
Lower Reach	13.60388	23.58	13.6	15.76

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Alvarado(west)

Reach	River Sta.	Contr.	Expan.
Lower Reach	3415.773	.1	.3
Lower Reach	3276.769	.1	.3
Lower Reach	2926.628	.1	.3
Lower Reach	2467.648	.1	.3
Lower Reach	2231.639	.1	.3
Lower Reach	2214.731	.1	.3
Lower Reach	2168.688	.1	.3
Lower Reach	1981.816	.1	.3
Lower Reach	1594.709	.1	.3
Lower Reach	1192.356	.1	.3
Lower Reach	1117	Culvert	
Lower Reach	1041.783	.1	.3
Lower Reach	923.6518	.1	.3
Lower Reach	706.6820	.1	.3
Lower Reach	300.1583	.1	.3
Lower Reach	13.60388	.1	.3

DETAILED HYDRAULIC RESULTS FOR ULTIMATE VEGETATED CONDITION MODEL

HEC-RAS Plan: Fully_Veg River: Alvarado(west) Reach: Lower Reach

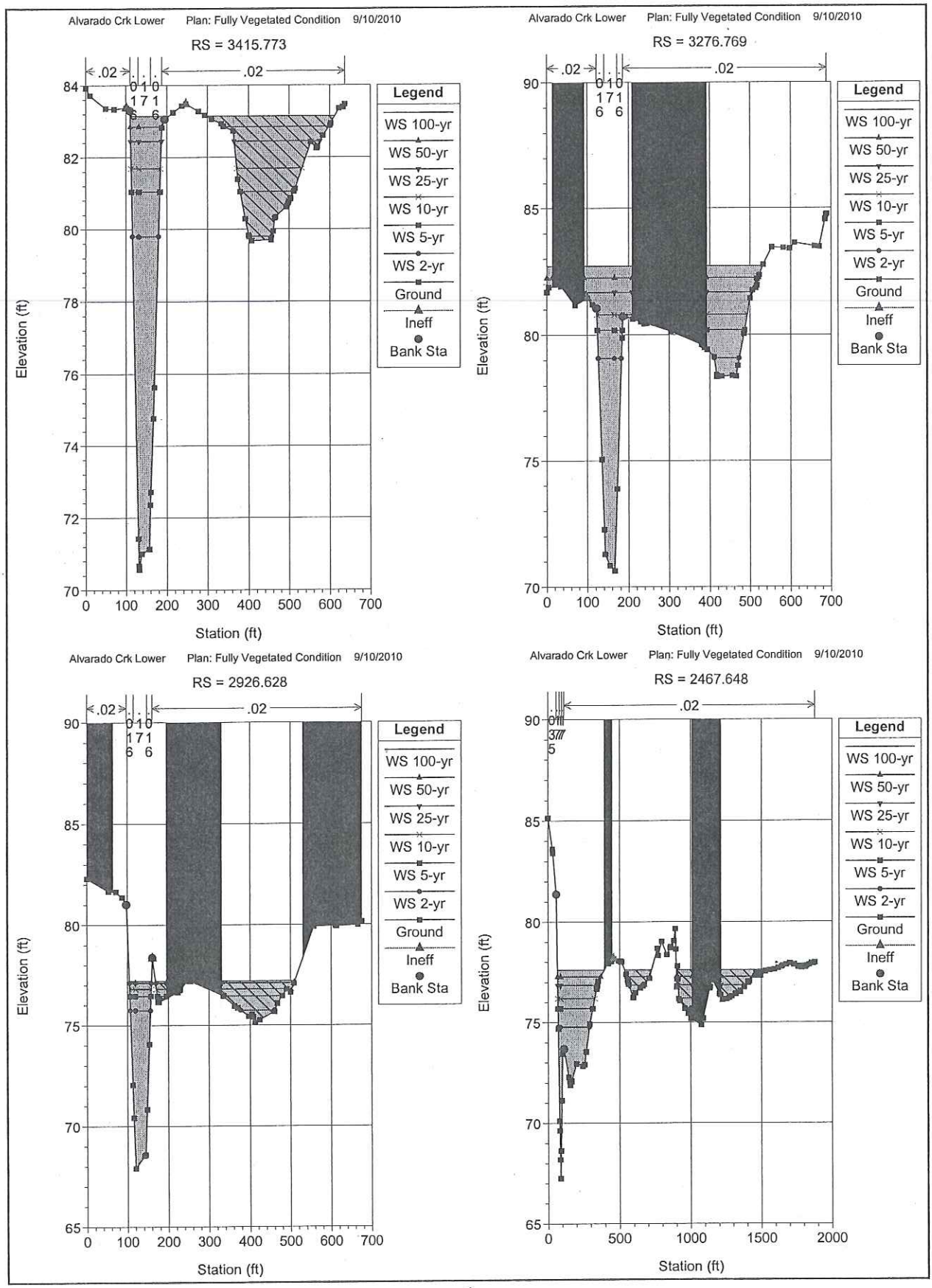
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	13.60388	100-yr	5100.00	56.63	66.00	58.46	66.01	0.000389	0.68	7538.81	968.59	0.04
Lower Reach	13.60388	50-yr	4500.00	56.63	63.03	58.38	63.05	0.001302	0.95	4741.55	907.43	0.07
Lower Reach	13.60388	25-yr	3800.00	56.63	62.51	58.27	62.52	0.001301	0.89	4269.00	899.10	0.07
Lower Reach	13.60388	10-yr	2700.00	56.63	61.54	58.08	61.55	0.001301	0.79	3407.97	854.92	0.07
Lower Reach	13.60388	5-yr	2050.00	56.63	60.91	57.96	60.92	0.001301	0.71	2872.96	843.43	0.07
Lower Reach	13.60388	2-yr	1180.00	56.63	59.92	57.77	59.92	0.001301	0.58	2044.45	825.32	0.06
Lower Reach	300.1583	100-yr	5100.00	57.01	66.13	62.30	66.38	0.008282	3.01	1390.91	406.29	0.19
Lower Reach	300.1583	50-yr	4500.00	57.01	63.56	61.94	64.52	0.092174	7.86	572.54	117.57	0.61
Lower Reach	300.1583	25-yr	3800.00	57.01	63.13	61.49	63.94	0.085108	7.23	525.65	107.49	0.58
Lower Reach	300.1583	10-yr	2700.00	57.01	62.30	60.72	62.89	0.075275	6.18	437.24	103.60	0.53
Lower Reach	300.1583	5-yr	2050.00	57.01	61.75	60.20	62.20	0.066174	5.38	381.12	101.06	0.49
Lower Reach	300.1583	2-yr	1180.00	57.01	60.85	59.42	61.10	0.050054	4.04	292.11	96.90	0.41
Lower Reach	706.6820	100-yr	5100.00	58.79	68.48		69.43	0.006434	2.36	997.59	308.82	0.17
Lower Reach	706.6820	50-yr	4500.00	58.79	68.58	66.14	69.28	0.004416	1.97	1026.46	309.36	0.14
Lower Reach	706.6820	25-yr	3800.00	58.79	68.29	65.44	68.88	0.004720	1.99	937.08	307.37	0.14
Lower Reach	706.6820	10-yr	2700.00	58.79	67.80	64.40	68.19	0.005302	2.01	787.19	303.75	0.15
Lower Reach	706.6820	5-yr	2050.00	58.79	67.47	63.67	67.73	0.005790	2.03	687.24	301.31	0.15
Lower Reach	706.6820	2-yr	1180.00	58.79	66.84		66.95	0.006739	2.06	508.86	247.35	0.16
Lower Reach	923.6518	100-yr	5100.00	60.08	70.40	69.47	71.58	0.015600	4.86	738.65	243.52	0.34
Lower Reach	923.6518	50-yr	4500.00	60.08	70.08	68.43	71.13	0.018930	5.19	661.36	241.20	0.38
Lower Reach	923.6518	25-yr	3800.00	60.08	69.92	67.75	70.72	0.017321	4.88	621.09	239.99	0.36
Lower Reach	923.6518	10-yr	2700.00	60.08	69.56	66.52	70.04	0.015118	4.40	537.05	233.40	0.33
Lower Reach	923.6518	5-yr	2050.00	60.08	69.51	65.66	69.79	0.009515	3.47	523.78	231.48	0.27
Lower Reach	923.6518	2-yr	1180.00	60.08	68.59	64.24	68.76	0.010351	3.34	353.33	99.57	0.25
Lower Reach	1041.783	100-yr	5100.00	60.28	73.09	68.38	73.84	0.020441	6.94	735.10	506.79	0.44
Lower Reach	1041.783	50-yr	4500.00	60.28	72.83	67.83	73.45	0.017775	6.34	710.27	453.57	0.41
Lower Reach	1041.783	25-yr	3800.00	60.28	72.28	67.14	72.80	0.016066	5.76	659.82	353.54	0.37
Lower Reach	1041.783	10-yr	2700.00	60.28	71.36	65.90	71.69	0.012224	4.65	580.91	276.37	0.31
Lower Reach	1041.783	5-yr	2050.00	60.28	70.70	65.04	70.93	0.009465	3.87	529.57	204.47	0.26
Lower Reach	1041.783	2-yr	1180.00	60.28	69.52	63.64	69.63	0.005326	2.64	447.07	67.73	0.18
Lower Reach	1117		Culvert									
Lower Reach	1192.356	100-yr	5100.00	62.42	75.47	71.17	75.94	0.006283	4.64	957.78	1400.81	0.28
Lower Reach	1192.356	50-yr	4500.00	62.42	75.20	70.50	75.66	0.007170	4.85	846.63	1374.45	0.29
Lower Reach	1192.356	25-yr	3800.00	62.42	74.75	69.68	75.23	0.009548	5.40	684.35	1222.73	0.33

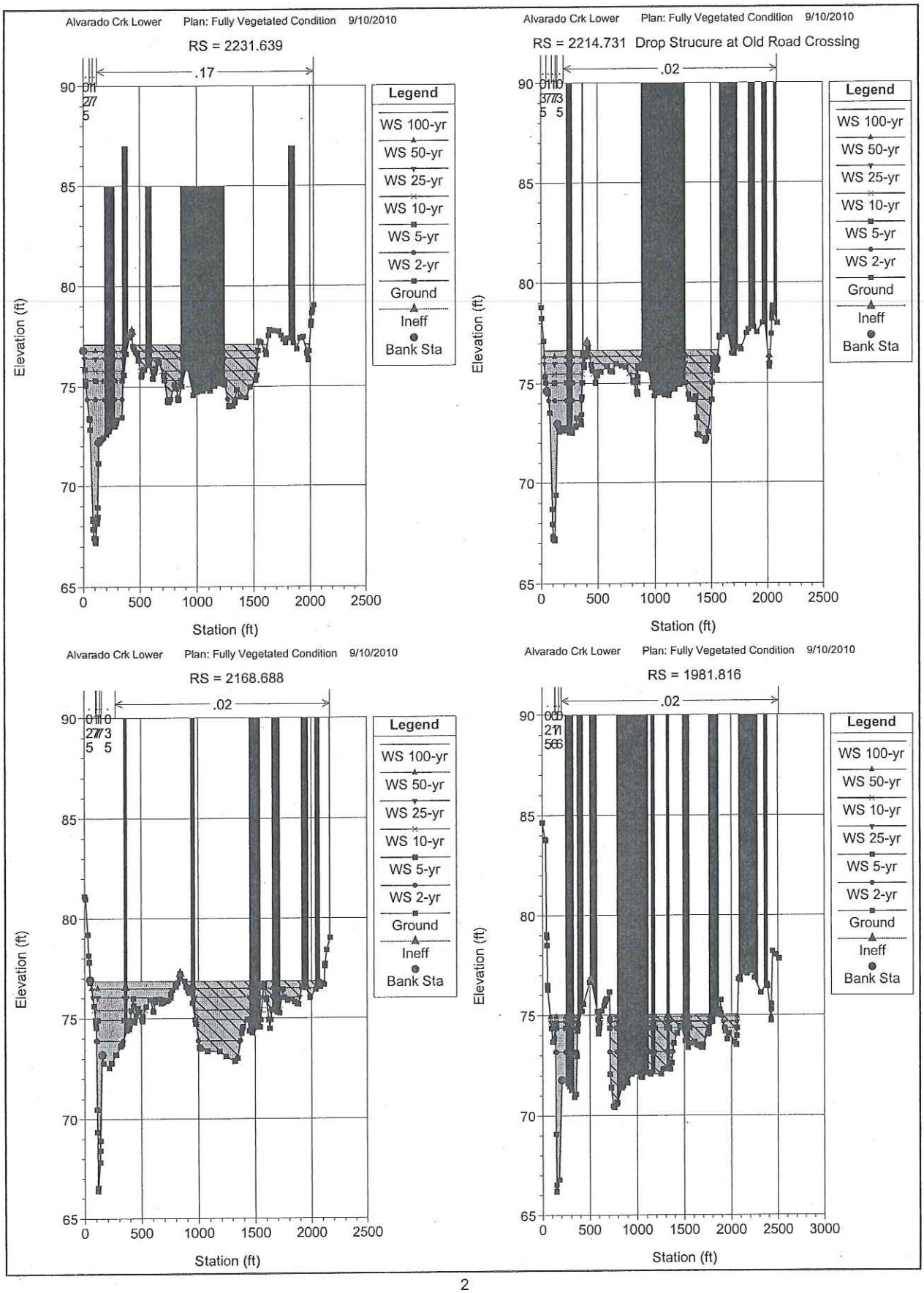
HEC-RAS Plan: Fully_Veg River: Alvarado(west) Reach: Lower Reach (Continued)

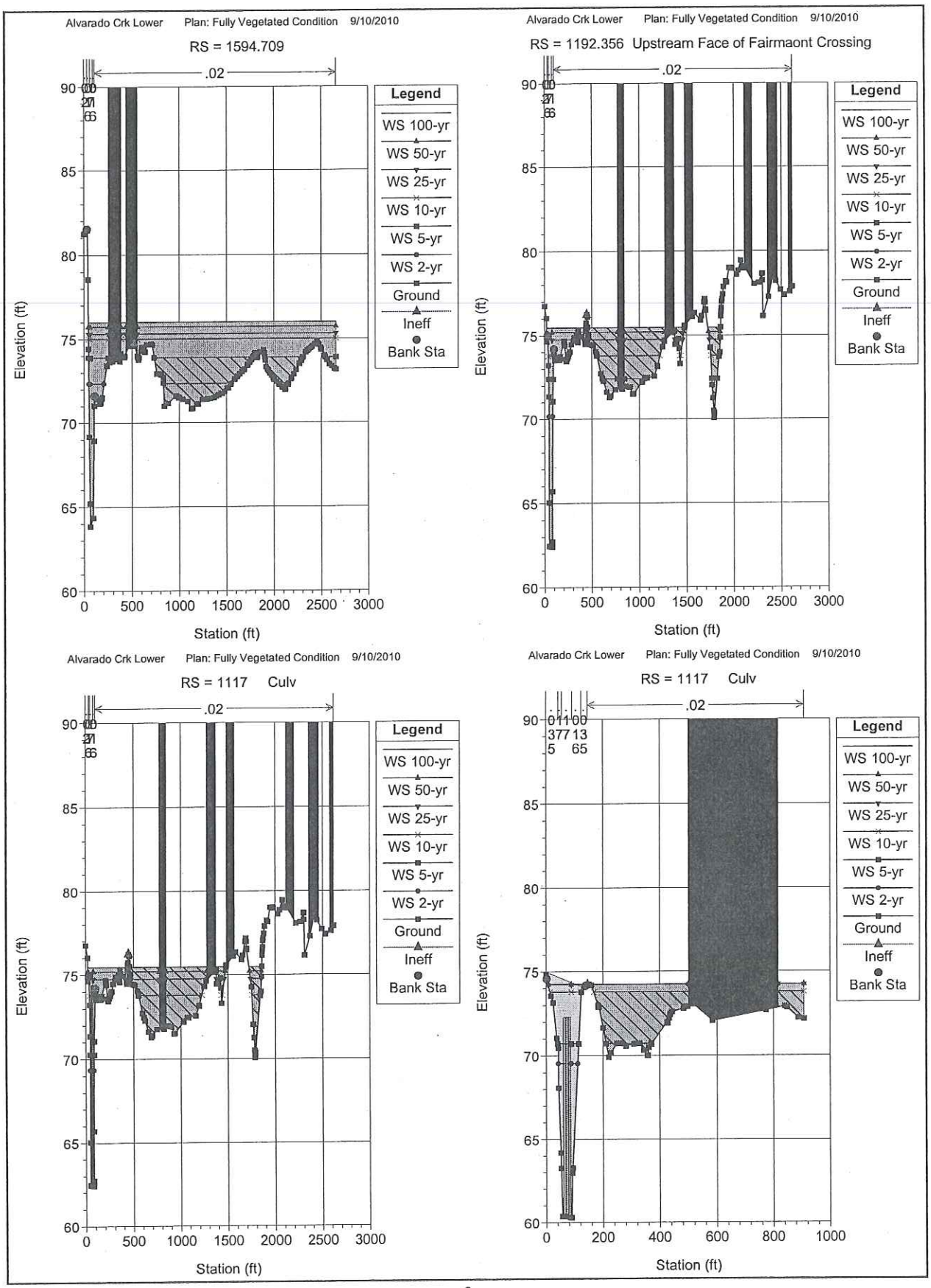
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	1192.356	10-yr	2700.00	62.42	73.77	68.27	74.29	0.012939	5.81	472.40	847.78	0.37
Lower Reach	1192.356	5-yr	2050.00	62.42	72.41	67.32	72.84	0.013596	5.32	385.31	481.85	0.34
Lower Reach	1192.356	2-yr	1180.00	62.42	70.17	65.86	70.43	0.012182	4.14	284.84	44.73	0.28
Lower Reach	1594.709	100-yr	5100.00	63.85	76.01	72.19	76.01	0.000017	0.25	8020.92	2353.23	0.01
Lower Reach	1594.709	50-yr	4500.00	63.85	75.72	72.05	75.73	0.000017	0.26	7358.78	2352.92	0.01
Lower Reach	1594.709	25-yr	3800.00	63.85	75.30	70.94	75.31	0.000020	0.27	6370.98	2352.45	0.02
Lower Reach	1594.709	10-yr	2700.00	63.85	75.01	69.69	75.01	0.000015	0.23	5670.73	2352.12	0.01
Lower Reach	1594.709	5-yr	2050.00	63.85	73.90	68.85	74.08	0.001309	1.91	741.54	1786.13	0.12
Lower Reach	1594.709	2-yr	1180.00	63.85	72.33	67.49	72.44	0.002698	2.37	456.38	985.92	0.17
Lower Reach	1981.816	100-yr	5100.00	66.18	75.02	74.20	76.47	0.005856	3.75	787.47	1000.29	0.25
Lower Reach	1981.816	50-yr	4500.00	66.18	74.92	72.96	76.11	0.004953	3.41	768.33	985.65	0.23
Lower Reach	1981.816	25-yr	3800.00	66.18	74.66	72.15	75.62	0.004463	3.16	717.03	947.96	0.22
Lower Reach	1981.816	10-yr	2700.00	66.18	74.69	71.45	75.17	0.002183	2.21	723.76	952.24	0.15
Lower Reach	1981.816	5-yr	2050.00	66.18	74.36	71.24	74.68	0.001723	1.90	659.85	894.88	0.14
Lower Reach	1981.816	2-yr	1180.00	66.18	73.17	69.72	73.35	0.002050	1.80	472.37	411.01	0.14
Lower Reach	2168.688	100-yr	5100.00	66.38	76.84	75.34	77.03	0.001169	1.18	1693.71	1672.12	0.10
Lower Reach	2168.688	50-yr	4500.00	66.38	76.48	74.93	76.69	0.001502	1.28	1436.00	1547.83	0.11
Lower Reach	2168.688	25-yr	3800.00	66.38	76.04	74.33	76.28	0.002174	1.45	1138.91	1366.64	0.12
Lower Reach	2168.688	10-yr	2700.00	66.38	75.41	73.58	75.67	0.002712	1.49	823.84	925.29	0.12
Lower Reach	2168.688	5-yr	2050.00	66.38	74.91	73.28	75.15	0.003436	1.58	655.49	782.55	0.13
Lower Reach	2168.688	2-yr	1180.00	66.38	73.89	71.24	74.07	0.008784	2.25	394.31	607.83	0.18
Lower Reach	2214.731	100-yr	5100.00	67.14	76.64	75.24	77.24	0.002245	1.31	1223.60	1098.95	0.10
Lower Reach	2214.731	50-yr	4500.00	67.14	76.34	74.98	76.89	0.002298	1.28	1130.84	1069.34	0.10
Lower Reach	2214.731	25-yr	3800.00	67.14	75.99	73.26	76.47	0.002318	1.23	1025.22	1022.54	0.10
Lower Reach	2214.731	10-yr	2700.00	67.14	75.47	73.04	75.81	0.002074	1.09	878.60	636.32	0.09
Lower Reach	2214.731	5-yr	2050.00	67.14	75.03	72.96	75.29	0.002124	1.03	755.06	544.47	0.09
Lower Reach	2214.731	2-yr	1180.00	67.14	74.14	71.08	74.30	0.002846	1.19	529.09	395.00	0.10
Lower Reach	2231.639	100-yr	5100.00	67.18	77.09	74.39	77.40	0.016692	4.95	1244.76	1033.15	0.37
Lower Reach	2231.639	50-yr	4500.00	67.18	76.78	74.10	77.05	0.015909	4.66	1167.05	931.94	0.35
Lower Reach	2231.639	25-yr	3800.00	67.18	76.40	73.69	76.63	0.014687	4.28	1073.24	857.68	0.33
Lower Reach	2231.639	10-yr	2700.00	67.18	75.78	72.24	75.94	0.011601	3.52	926.03	734.15	0.28
Lower Reach	2231.639	5-yr	2050.00	67.18	75.30	71.56	75.42	0.009911	3.04	811.73	647.76	0.25
Lower Reach	2231.639	2-yr	1180.00	67.18	74.35	70.45	74.43	0.007772	2.35	597.29	317.02	0.20
Lower Reach	2467.648	100-yr	5100.00	67.26	77.61	75.72	78.00	0.000936	0.81	1209.90	976.14	0.06

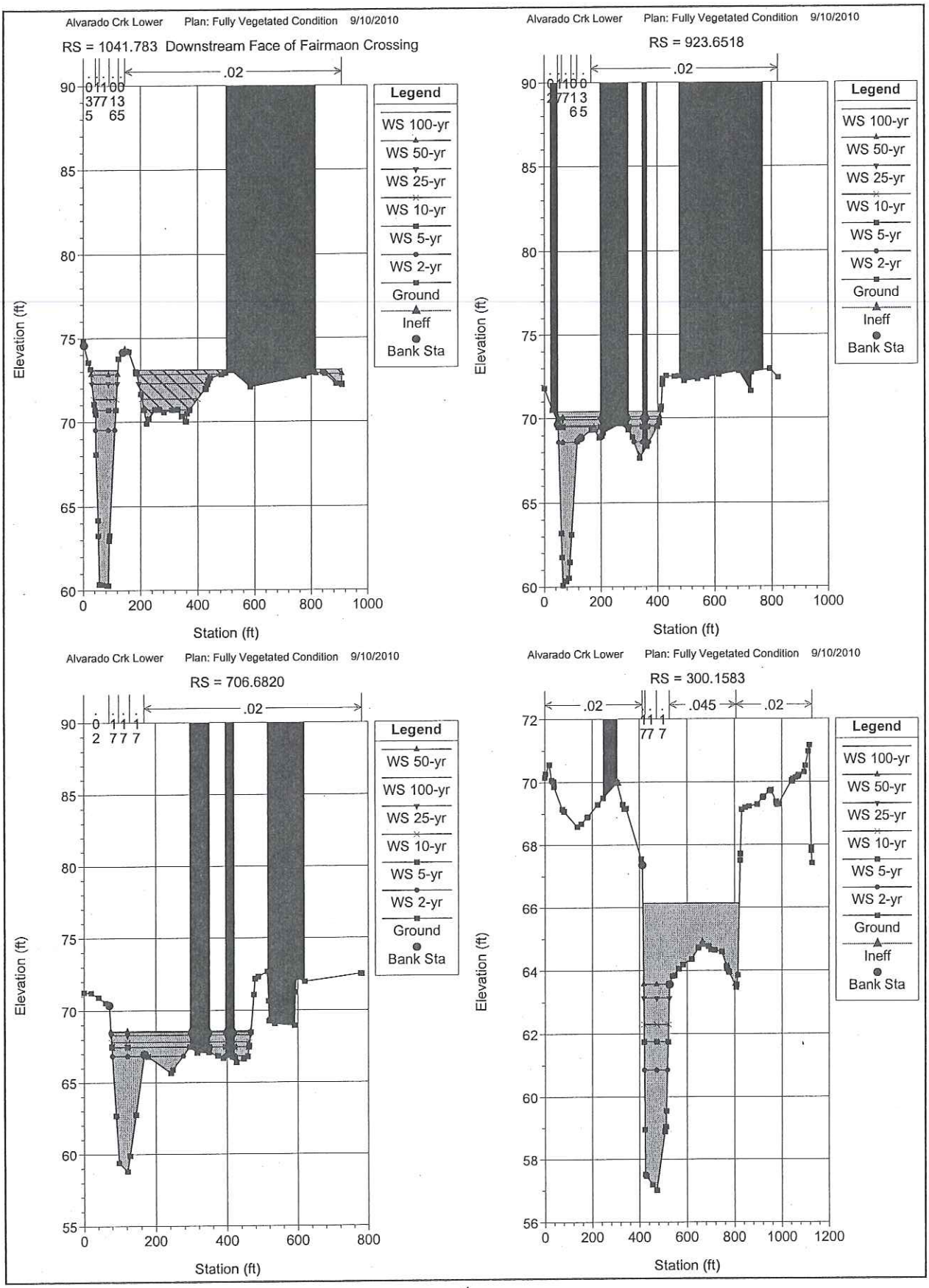
HEC-RAS Plan: Fully_Veg River: Alvarado(west) Reach: Lower Reach (Continued)

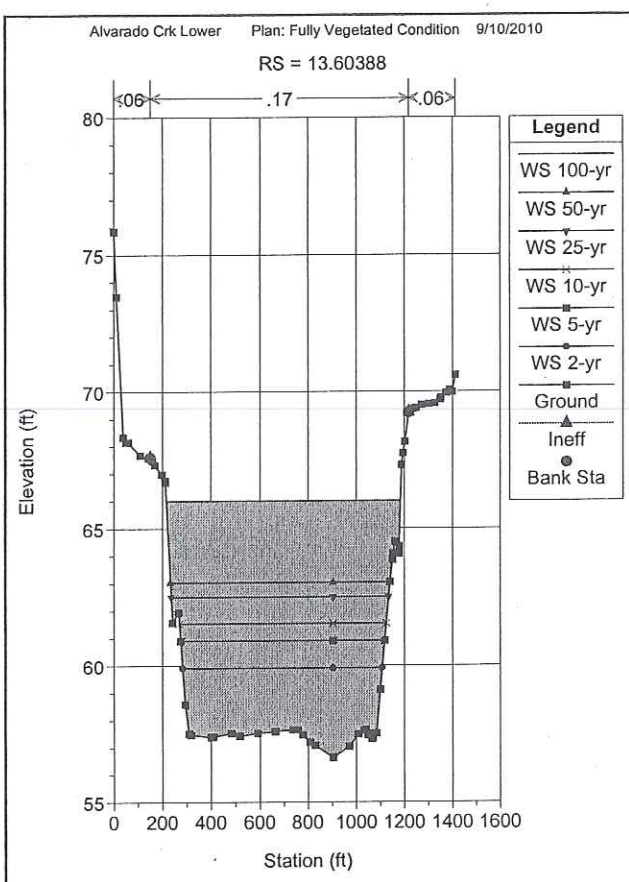
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	2467.648	50-yr	4500.00	67.26	77.26	75.48	77.64	0.000907	0.77	1101.95	794.32	0.06
Lower Reach	2467.648	25-yr	3800.00	67.26	76.85	75.18	77.19	0.000866	0.72	983.08	653.50	0.06
Lower Reach	2467.648	10-yr	2700.00	67.26	76.19	74.66	76.45	0.000806	0.65	805.50	392.92	0.05
Lower Reach	2467.648	5-yr	2050.00	67.26	75.68	74.31	75.90	0.000794	0.61	678.80	292.02	0.05
Lower Reach	2467.648	2-yr	1180.00	67.26	74.76	73.75	74.92	0.000898	0.57	465.57	218.42	0.05
Lower Reach	2926.628	100-yr	5100.00	67.91	77.21	77.21	80.42	0.120201	14.38	354.62	259.42	1.00
Lower Reach	2926.628	50-yr	4500.00	67.91	77.12	76.61	79.69	0.097738	12.86	349.99	257.10	0.90
Lower Reach	2926.628	25-yr	3800.00	67.91	77.09	75.85	78.94	0.070989	10.92	348.05	256.13	0.76
Lower Reach	2926.628	10-yr	2700.00	67.91	76.80	74.50	77.83	0.041723	8.12	332.40	248.10	0.58
Lower Reach	2926.628	5-yr	2050.00	67.91	76.45	73.58	77.11	0.029101	6.53	313.78	217.95	0.47
Lower Reach	2926.628	2-yr	1180.00	67.91	75.74	72.07	76.02	0.014527	4.26	277.21	134.13	0.32
Lower Reach	3276.769	100-yr	5100.00	70.64	82.71	79.41	83.31	0.002447	2.76	1059.89	266.58	0.17
Lower Reach	3276.769	50-yr	4500.00	70.64	82.24	79.42	82.85	0.002893	2.89	936.42	256.77	0.18
Lower Reach	3276.769	25-yr	3800.00	70.64	81.67	78.92	82.29	0.003410	2.99	796.25	226.59	0.19
Lower Reach	3276.769	10-yr	2700.00	70.64	80.79	77.13	81.29	0.004214	3.06	617.53	184.76	0.21
Lower Reach	3276.769	5-yr	2050.00	70.64	80.19	76.22	80.55	0.004792	3.08	520.48	153.45	0.21
Lower Reach	3276.769	2-yr	1180.00	70.64	79.07	74.74	79.24	0.006295	3.13	362.07	118.05	0.23
Lower Reach	3415.773	100-yr	5100.00	70.56	83.15	79.31	84.12	0.015629	7.92	644.48	410.82	0.51
Lower Reach	3415.773	50-yr	4500.00	70.56	82.85	78.76	83.67	0.013728	7.27	619.15	335.42	0.46
Lower Reach	3415.773	25-yr	3800.00	70.56	82.45	78.06	83.09	0.011579	6.46	588.20	286.89	0.41
Lower Reach	3415.773	10-yr	2700.00	70.56	81.69	76.84	82.09	0.008148	5.08	531.76	233.01	0.33
Lower Reach	3415.773	5-yr	2050.00	70.56	81.04	75.99	81.32	0.006342	4.22	485.43	201.91	0.28
Lower Reach	3415.773	2-yr	1180.00	70.56	79.80	74.63	79.93	0.003934	2.94	401.33	120.84	0.21


Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 3415.773
.02
.02
0 1 0
1 7 1
5 6
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 3276.769
.02
.02
0 1 0
1 7 1
6 6
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 2926.628
.02
.02
0 1 0
1 7 1
6 6
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 2467.648
.02
0 1 1
3 7 7
5
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 2231.639
.17
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 2214.731 Drop Strucure at Old Road Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 2168.688
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1981.816
.02
Legend
WS 100-yr
WS 50-yr
WS 10-yr
WS 25-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1594.709
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1192.356 Upstream Face of Fairmaont Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1117 Culv
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1117 Culv
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 1041.783 Downstream Face of Fairmaon Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 923.6518
.02
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 706.6820
.02
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Fully Vegetated Condition 9/10/2010
RS = 300.1583
.02
.045
.02
Elevation (ft)
Station (ft)


Alvarado Crk Lower
Plan: Fully Vegetated Condition
9/10/2010
RS = 13.60388
.06
.17
.06
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
80
75
70
65
60
55
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Alvarado Crk Lower
Project File : AlvaradoCrkLower.prj
Run Date and Time: 9/10/2010 9:23:37 AM

Project in English units

Project Description:
City of San Diego - 1st Year Maintenance
J-15541A October 13,
2009
Utilized 1999 City 2-foot Contour Topo (NGVD 29)
Alvarado Creek
(Lower/Westerly Portion)
Helix Map Number 59 and 60 - Phase A Priority

PLAN DATA

Plan Title: Fully Vegetated Condition
Plan File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.p04

Geometry Title: Fully Vegetated Condition
Geometry File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g04

Flow Title : Fully Vegetated Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f03

Plan Summary Information:

Number of:	Cross Sections	= 15	Multiple Openings	=	0
	Culverts	= 1	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information

```
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

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

```
FLOW DATA

Flow Title: Fully Vegetated Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f03

Flow Data (cfs)

  River            Reach           RS                100-yr            50-yr
25-yr            10-yr           5-yr            2-yr
  Alvarado(west)   Lower Reach     3415.773          5100              4500
3800             2700            2050            1180

Boundary Conditions

  River            Reach           Profile                           Upstream
Downstream

  Alvarado(west)   Lower Reach     100-yr
Known WS = 66
  Alvarado(west)   Lower Reach     50-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     25-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     10-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     5-yr
Normal S = 0.0013
  Alvarado(west)   Lower Reach     2-yr
Normal S = 0.0013
```

```
GEOMETRY DATA

Geometry Title: Fully Vegetated Condition
Geometry File : w:\15541-
A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g04

CROSS SECTION
```

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3415.773

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	83.93	10.52	83.72	49.34	83.36	70.68	83.34	100.85	83.38
109.41	83.29	130.02	71.42	131.31	70.67	131.95	70.56	137.65	71
157.14	71.13	159.47	72.36	160.66	72.71	167.65	74.77	169.83	75.63
188.02	82.83	194.79	83.06	215.5	83.25	236.72	83.43	246.85	83.49
277.39	83.28	293.32	83.17	309.77	83.06	333.91	82.93	338.78	82.86
362.9	82.73	374.16	81.39	392.18	80.28	400.42	79.82	401.41	79.79
407.16	79.67	455.28	79.7	459.96	79.94	464.45	80.31	465.99	80.33
492.85	80.61	494.47	80.65	497.4	80.72	499.2	80.77	503.06	80.83
504.06	80.86	514.76	81.12	553.49	82.42	566.92	82.25	568.15	82.26
569.27	82.29	582.64	82.6	600.74	82.89	602.56	82.94	622.5	83.36
631.58	83.4	632.75	83.39	637.02	83.47				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	109.41	.016	130.02	.17	160.66	.016	188.02	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

109.41	194.79	138.55	139	139.44	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	100.85	83.38	F
246.85	637.02	83.49	F

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3276.769

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0   81.69    4.45   81.89   35.41   81.92   70.17   81.17   100.3
81.46
  112.67    81.2  122.62   81.05  134.98   75.05  140.38   72.26  142.25
71.29
  154.18   70.84  165.75   70.64  172.28   73.88  184.34   79.88  186.01
80.72
  191.45   80.73  210.25   80.63  229.99   80.52  238.65   80.44  245.22
80.45
  304.34   80.13  380.38   79.61  384.55   79.58  387.47   79.49  393.73
79.41
  410.54   79.12  416.31   78.42  416.91   78.34  422.24   78.35  429.59
78.36
  455.88   78.38  465.27   78.36  469.47   78.78  484.52   80.04  500.14
81.43
  505.85   81.76  514.04   81.84  516.55    82.2  516.86   81.95  522.35
82.35
  531.72   82.76  552.96   83.45  582.28   83.42   597.3    83.4  609.57
83.62
  660.02   83.49  670.66   83.47  684.79   84.54  685.45   84.57   687.4
84.72
  688.83   84.77

Manning's n Values          num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02  122.62    .016  140.38     .17  172.28    .016  186.01
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
       122.62  186.01           345.32  350.14  353.92              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
       0   100.3   81.46          F
Blocked Obstructions      num=       2
   Sta L   Sta R    Elev    Sta L   Sta R    Elev
   13.62   92.64      90   208.28  393.34      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2926.628

INPUT
Description:
Station Elevation Data      num=      42
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta
Elev
       0   82.29   53.38   81.66   72.39   81.64   87.76   81.37   97.81
81.01
     113   72.05  115.78   70.41  120.03   67.91  141.42   68.53  144.01
68.59
  148.04   70.84   153.8   74.06  161.57   78.36  175.86   76.17  177.43
76.16
```

```
  223.02   76.64  227.21   76.74  229.11   76.79  247.52   77.21  249.49
77.2
  254.91   77.19  335.23   76.46  335.65   76.45  362.99   75.94   370.4
75.85
  397.23   75.43  404.82   75.53  407.82   75.41  412.56   75.13  423.65
75.26
   459.1   75.66  460.33   75.67  467.47   76.07  490.09   76.78  499.97
76.64
  507.82   77.08  557.44   79.91  610.52   79.96   613.3   79.92  666.44
79.99
  674.48   80.17  676.28   80.14

Manning's n Values          num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02   97.81    .016  115.78     .17  148.04    .016  161.57
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         97.81  161.57           455.11  458.98  464.26             .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  161.54  676.28   78.35          F
Blocked Obstructions      num=       3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  530.39  676.28      90  195.38  332.19      90       0   65.03      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2467.648

INPUT
Description:
Station Elevation Data     num=     131
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   85.14   31.71    83.6   33.83   83.49   34.64   83.42   35.08
83.41
   59.99   81.37   73.72   74.68   82.27   70.11   83.15   69.63   86.73
68.19
   89.02   67.26   92.06   68.64   97.86   71.13  103.24   73.43  113.31
73.68
   146.6   72.29  153.08   72.07  156.92   71.89  165.93   72.07  166.17
72.08
  167.48   72.11   202.5   72.94  245.26   72.82  258.71    72.9  268.41
73.53
  269.48   73.55  294.79   74.91  342.16   76.66  346.46   76.82   346.9
76.83
  352.33   77.04  420.61   77.94  422.58   77.93  442.68   78.03  457.77
78.17
  493.61   78.06  507.21   78.02  507.95   78.05  514.77      78  545.03
77.39
```

```
  554.65    77.1   558.3      77   562.9   76.89  592.83   76.22  596.07
76.24
  609.78   76.47  643.62   76.71  645.17    76.7  665.46   76.81  673.24
76.88
     708   77.18   763.5   78.67  770.56   78.32  794.79   79.02  831.94
78.37
  855.73   78.71  859.72   78.76  881.44   79.06  892.44   79.65  895.56
78.63
  902.16   76.75  903.47   77.15  906.73   77.79  909.69   77.14  916.27
76.15
  924.71   76.06  982.71   75.44  989.78   75.49   992.3   75.48  994.07
75.47
  994.82   75.46 1002.08   75.17 1075.12   74.87 1081.44   75.17 1087.78
75.18
 1134.03    76.7 1136.68   76.76 1149.13   77.15 1153.32   77.09 1201.92
76.41
 1209.82   76.35 1225.56   76.12  1254.7   76.16 1273.65   76.22  1290.4
76.3
 1316.22   76.41 1319.91   76.43  1349.5   76.55 1350.69   76.52 1377.48
76.74
 1378.49   76.78 1405.71   77.02 1408.81   76.97 1416.98   77.03 1463.22
77.46
 1464.35   77.47 1465.26   77.38 1465.46   77.33  1492.9   77.32 1495.06
77.49
 1497.02   77.51 1526.26   77.54 1528.61   77.57 1557.48   77.59 1560.29
77.6
 1588.83   77.63 1592.01   77.64 1617.89   77.71 1643.35   77.77 1650.27
77.81
 1675.79   77.87 1677.17   77.88 1702.31   77.94 1703.75   77.95  1727.8
77.87
 1732.13   77.89 1735.39   77.86 1758.02   77.78 1761.23   77.75 1763.95
77.79
  1784.6   77.72 1787.59   77.76 1790.47    77.8 1810.66   77.74 1813.79
77.78
 1820.99   77.81  1838.1   77.88 1855.62   77.95 1868.06   77.94 1868.49
77.93
 1878.22   77.98

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    59.99     .17    82.27     .17    97.86     .17   113.31
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        59.99  113.31           232.89  236.01  234.37              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R     Elev  Permanent
  457.77 1878.22    78.17         F
Blocked Obstructions      num=        2
   Sta L   Sta R     Elev    Sta L   Sta R     Elev
  393.47   449.7       90 1007.94 1212.91       90

CROSS SECTION
```

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2231.639

INPUT
Description:
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	76.8	12.75	75.85	17.94	75.04	51.03	73.41	51.81	73.4
52.64	73.35	54.8	73.36	56.84	72.84	80.96	68.39	81.55	68.28
83.35	67.85	92.65	67.42	102.28	67.26	105.78	67.18	107.28	67.35
108.73	67.41	119.2	68.15	120.35	68.23	124.25	68.47	125.11	68.93
130.5	71.14	132.75	72.19	144.53	72.32	146.66	72.33	154.89	72.34
163.13	72.39	172.13	72.44	200.97	72.59	222.6	72.75	229.84	72.92
250.17	73.03	264.5	73.1	267.34	73.09	274.94	72.99	287.98	73.17
291.98	73.34	338.77	73.46	352.25	75.59	358.58	75.57	378.11	76.64
409.95	77.45	424.63	77.62	428.34	77.74	429.8	77.64	437.38	77.02
448.59	76.88	465.55	76.73	477.09	76.63	488.11	76.31	513.25	75.49
517.54	75.56	518.31	75.58	536.09	75.88	541.8	75.85	581.1	76.06
611.82	75.41	615.4	75.4	627.3	75.69	630.96	75.78	636.47	75.92
653.45	76.35	658.88	76.34	668.58	76.19	707.85	75.57	742.43	74.25
749.35	74.2	763.74	74.34	800.8	75.09	816.48	74.89	829.18	74.42
829.93	74.37	830.73	74.44	833.71	74.31	838.94	74.34	865.2	75
909.05	76.09	917.31	75.9	966.88	74.57	1003.02	74.72	1049.97	74.77
1113.38	74.78	1153.48	75.02	1242.96	75.08	1279.83	74.03	1281.75	73.98
1314.45	74.01	1329.84	74.17	1334.15	74.24	1350.52	74.82	1379.5	74.47
1430.9	74.43	1469.75	74.96	1516.6	75.29	1527.23	75.55	1539.52	76.78
1545.51	77.26	1565.11	77.18	1611.43	76.59	1631.79	77.54	1640.26	77.82
1672.84	77.77	1719.97	77.73	1741.31	77.53	1760.68	77.35	1780.39	77.16
1802.24	77.4	1849.81	77.16	1880.35	76.86	1910.12	77.41	1912.12	77.42
1936.96	77.47	1970.04	76.62	1982.33	76.31	1990.43	76.76	2006.08	78.02
2008.62	78.15	2009.51	78.23	2014.93	78.64	2020.55	78.77	2034.15	79.03

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.025	54.8	.17	81.55	.17	119.2	.17

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr. Expan.	
0	132.75	16.13	16.91	37.54	.1 .3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
428.34	2034.15	77.74	F

Blocked Obstructions num= 6

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
184.32	275.65	85	340.74	396.32	87	552.57	607.29	85
856.96	1244.13	85	1807.53	1866.52	87	2031.7	2034.15	90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2214.731

INPUT
Description: Drop Strucure at Old Road Crossing
Station Elevation Data num= 132

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	78.8	4.69	78.26	19.99	77.13	31.38	75.35	32.65	75.36
47.05	74.64	60.75	74.49	75.72	73.53	95.88	68.7	98.81	67.95
102.07	67.35	102.3	67.29	103.51	67.24	104.5	67.22	105.37	67.21
117.44	67.15	118.92	67.14	119.21	67.22	128.26	69.4	143.1	72.97
147.52	72.88	154.75	72.74	160.75	72.57	182.67	72.73	192.62	72.61
193.9	72.63	202.04	72.79	203.03	72.78	212.51	72.63	248.98	72.52
251.05	72.53	271.5	72.51	302.09	72.8	304.45	72.82	305.5	72.87
313.36	73.25	350.18	73.13	351.51	72.93	353.9	73.43	358.18	74.32
368.7	76.5	376.42	75.82	377.9	75.85	380.05	75.81	390.48	76.33
394.76	76.55	404.34	77.03	405.94	76.97	411.53	76.77	439.48	75.92
447.47	75.73	451.19	75.64	480.79	75.01	483.64	75.07	496.29	75.38
505.79	75.61	526.86	75.57	580.21	75.84	608.69	75.63	609.25	75.62
621.32	75.58	627.49	75.57	662.49	75.98	709.38	75.88	743.92	75.81
808.08	75.14	842.46	74.58	847.52	74.44	850.1	75.33	851.67	75.84

```
   853.5   75.75  863.11   75.73  896.48   75.71  940.17   75.67  942.15
75.68
  970.19   74.78  995.12   74.37 1085.56   74.41 1125.08   74.38 1176.36
74.69
 1223.87   74.93 1267.55      75 1298.95   74.42 1308.02   74.18 1312.54
74.17
 1339.62   74.15 1356.07   74.13 1358.46   74.16 1362.15   74.33 1370.72
73.27
 1375.79   72.41  1381.3    72.4 1385.28   72.39 1386.68   72.37 1443.12
72.05
 1450.89   72.15 1451.83   72.14 1458.42   72.22 1472.94   72.54 1505.43
74.16
 1512.29   75.72 1513.91   76.23 1530.37   75.83  1550.2   75.66 1553.68
75.62
 1560.85    76.2 1573.52   77.27 1574.42   77.36 1599.33   77.39 1640.48
77.53
 1644.68   77.62 1681.27    76.5 1698.12   76.47 1703.78   76.46 1749.14
76.81
 1764.78   76.68 1814.25    77.5 1830.66   77.69 1879.63   77.79 1905.43
77.53
  1957.8   78.01 1977.52   78.05 2014.28   75.94  2016.6   75.81 2020.51
75.99
 2035.53   77.45 2040.76    78.2 2042.13    78.4 2046.47   78.66 2048.95
78.81
  2049.4   78.84 2088.99   77.99

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    47.05     .17    95.88     .17   128.26     .17    143.1
.035
  202.04     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        47.05   143.1            31.05   46.04   52.74              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  404.34 2088.99   77.03        F
Blocked Obstructions      num=        7
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
   224.9  275.77      90  363.14  373.41      90  883.42 1272.26      90
 1579.78 1738.28      90  1834.2 1893.63      90 1952.63 1999.56      90
 2059.58 2088.99      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2168.688

INPUT
Description:
Station Elevation Data     num=     130
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
```

```
       0   81.11    8.42   80.99   28.98    79.2   35.51   78.16   41.11
77.81
   41.46   77.79   49.04   76.92   49.21   76.77   49.37   76.92   82.88
75.61
   97.93   74.76  101.97   74.53  108.09   70.47  109.72   69.35  114.08
66.38
  116.39   66.55  133.68   67.83  135.76   68.42  137.48   68.92  152.33
73.19
  154.59    73.2  164.21   72.76  214.35   72.55  235.29   72.76  236.86
72.78
  272.29   73.21  276.75   73.19  313.88   73.62  322.66   73.67  332.02
73.76
  371.42   74.39  391.58   74.46  391.98   74.47  397.41   74.66  412.65
75.38
  429.65   75.99  432.12   75.63  436.98    74.8   453.7   75.15  469.65
75.49
  482.13   75.32  503.89   74.94  511.34   74.86  515.46   75.09  543.35
75.57
  578.89   75.92  605.69   75.33  622.05    75.8  627.14   75.96  661.78
75.97
  675.45   75.76  676.55   75.73  687.84   75.78  695.12   75.81  695.54
75.83
  702.92   75.86  717.53   75.85  726.03   75.89  734.98   75.93  755.29
76.02
  755.55   76.04   758.4   76.21  771.81    76.4  796.33   76.73  803.08
76.59
  803.36   76.57  819.66   76.78  835.81   76.97  836.04      77  839.41
77.22
  878.82   76.85  890.04   76.59  890.63   76.56  906.91   76.39  914.08
76.32
  921.68   76.25  921.89   76.27  925.47   76.52  948.37   75.75  972.75
74.93
  979.07   74.72 1009.42   73.57 1012.54   73.52 1023.73   73.49 1076.49
73.36
 1078.47   73.37 1185.18   73.35 1241.16    73.1 1320.75   72.86 1323.48
72.88
 1346.75   73.01 1381.97   74.25 1386.87   74.49 1395.25   74.58  1434.3
74.94
 1437.78   74.92 1450.87   74.37 1477.49   74.27 1545.68   74.56 1578.98
76.66
 1580.24   76.68  1600.5    75.9 1628.93   74.48 1647.38   75.39 1693.93
75.3
 1716.25   75.27 1717.43   75.26 1744.84   76.44 1761.11   76.02  1787.9
75.88
 1828.77   75.93 1850.39   75.79 1872.58    75.7 1885.99   75.68 1916.24
76.57
 1917.11   76.58 1943.96   76.56 1944.71   76.54 1949.43   76.48  1987.9
76.01
 2041.55   76.43 2068.14    76.8 2081.25   76.55 2105.17   76.72  2114.6
76.66
 2120.74   77.58 2121.39   77.68 2122.26    77.7 2137.68    78.4 2168.38
79.02

Manning's n Values          num=        6
     Sta    n Val      Sta    n Val      Sta    n Val      Sta    n Val      Sta    n
Val
```

```
      0     .025  101.97      .17  109.72      .17  137.48      .17  152.33
.035
  272.29      .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        49.04  154.59           178.72  186.87  197.94              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  839.41 2168.38   77.22       F
Blocked Obstructions      num=       7
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  345.94  374.87      90   934.55  972.18      90 1452.21 1548.05      90
 1649.05 1720.79      90 1912.43 1972.34      90 2033.15  2077.5      90
 2162.07 2168.38      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1981.816

INPUT
Description:
Station Elevation Data     num=      127
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    84.65    26.29    83.82    34.24    83.75    43.66    79.05    44.52
78.91
   47.34     78.5    52.63    76.51    55.06    76.27    107.5    73.68   117.48
73.69
  121.54    73.87   135.14     74.5   143.27    69.08   147.09    66.53   147.68
66.18
  148.53     66.2   177.68    66.79   207.09    71.78   208.92    71.79   268.97
71.61
  286.29    71.45   307.37    71.27   338.31    70.93   355.82    71.08   365.49
72.96
  369.68    74.21   377.15    74.57   377.34    74.58   416.58    75.18   431.39
75.55
  497.42    76.64   498.44    76.65   500.16    76.66   511.31    76.77   581.67
75.17
  587.43    74.78   592.49    74.36   596.04    74.09   607.81    74.59   627.47
75.22
  651.82    75.47   661.48    75.65    668.9    75.72   678.56    75.82   710.64
76.16
  712.03    74.79   714.72    72.07   727.37    71.42    728.7     71.4   751.18
70.46
  761.32     70.4   785.21    70.57   788.19     70.6   790.66    70.63   792.22
70.66
  838.84    71.38   852.37    71.48   900.76    71.63   940.59    72.07   941.53
72.08
  964.43    72.28  1000.66    72.18  1004.87    72.17  1014.63    72.29  1037.68
71.95
 1050.64    71.91  1122.41    72.15  1138.79    72.08  1253.51    72.09  1274.09
72.32
```

```
 1333.33   72.34 1353.17   72.32 1367.11   72.64 1389.46   73.61 1424.82
74.08
 1463.87   74.44 1510.27   73.71 1539.64   73.38 1583.36   73.61  1610.2
73.66
 1635.67   73.51 1653.24   73.48 1676.18   73.43 1686.19   73.39 1690.32
73.38
 1693.81   73.37 1694.24   73.38 1700.52   73.53 1747.46   74.04 1761.35
74.09
 1779.25   74.63 1800.08   74.67 1844.83   75.01 1876.85   75.26  1886.5
75.75
 1890.08   75.08 1936.81   74.18 1955.42   73.79 1972.69   74.08  2032.6
73.63
 2053.07   73.55 2055.82   73.53  2059.2   73.97 2077.89   76.79 2091.39
76.87
 2094.31   76.74 2133.72   77.12 2149.21   77.14 2169.15   77.07 2182.51
77.2
 2183.81   77.21 2229.19    77.2 2233.11   77.34 2234.63   77.35  2247.8
76.86
 2316.18   76.11 2379.09   76.54 2383.26   76.53 2386.26   76.42 2428.46
74.73
 2429.38   75.25 2430.87   75.55 2441.79    78.2 2470.28   78.04 2481.28
78.01
 2509.95   77.84 2513.55   77.81

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025   135.14    .016   143.27     .17   177.68    .016   207.09
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        135.14  207.09           397.08  387.11  367.43              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  511.31 2513.55   76.77        F
Blocked Obstructions      num=       10
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  245.39  330.92      90  505.65  581.04      90  366.42  431.68      90
  789.77 1118.24      90 1146.29 1186.87      90 1312.75 1341.97      90
 1486.06 1556.66      90 1762.96 1868.49      90 2082.76 2284.39      90
 2346.39 2390.73      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1594.709

INPUT
Description:
Station Elevation Data     num=      165
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    81.24      3.6    81.26     4.29    81.27    32.08    81.53    38.54
81.45
```

42.88	78.55	47.5	74.42	55.83	69.17	62.95	65.2	65.36
63.85								
92.75	64.35	95.54	64.37	104.12	68.94	108.05	71.03	109.14
71.61								
127.14	71.39	166.03	71.16	168.57	71.15	175.1	71.21	184.39
71.43								
186.57	71.5	187.13	71.52	236.4	73.4	237.09	73.41	268.14
73.62								
294.5	73.66	295.95	73.67	324.02	73.93	345.93	73.81	371.75
73.66								
383.11	74.14	414.98	73.94	420.44	73.91	422.27	73.92	424.77
73.97								
424.88	73.98	426.56	73.99	466.28	74.58	467.34	74.59	504.82
74.6								
522.99	74.76	558.3	74.01	559.94	73.99	560.54	73.97	569.14
73.76								
596.78	74.29	605.83	74.52	616.15	74.43	634.74	74.26	639.37
74.21								
641.16	74.26	656.72	74.65	703.85	74.71	713.76	74.66	763.8
72.93								
801.7	72.92	804.8	72.9	810.04	72.86	831.79	72.73	833.5
72.38								
843.33	71	882.51	71.16	968.58	71.6	971.8	71.61	973.87
71.58								
998.07	71.48	999.71	71.52	1037.78	71.4	1090.42	71.27	1130.12
70.83								
1142.01	70.84	1189.25	71.11	1199.17	71.12	1246.15	71.38	1294.17
71.39								
1306.69	71.43	1330.64	71.44	1367.69	71.48	1392.75	71.57	1417.65
71.66								
1442.39	71.74	1455.9	71.75	1480.65	71.84	1507.67	72.05	1521.17
72.07								
1548.12	72.28	1583.8	72.57	1590.38	72.61	1610.57	72.72	1617.02
72.77								
1637.25	72.88	1643.58	72.92	1663.85	73.03	1684.25	73.14	1690.36
73.18								
1720.07	73.4	1721.93	73.42	1726.44	73.46	1742.1	73.58	1746.66
73.63								
1762.3	73.74	1766.72	73.79	1782.34	73.95	1798.11	74.11	1802.33
74.16								
1808.47	74.09	1815.84	73.89	1823.63	73.85	1858.05	74.2	1893.05
74.32								
1899.49	74.13	1900.86	74.08	1909.1	73.77	1910.32	73.71	1919.01
73.3								
1934.76	73.16	1944.06	73.08	1959.83	72.94	1976.87	72.79	1993.96
72.64								
2002.86	72.56	2027.9	72.43	2053.18	72.29	2059.57	72.25	2084.9
72.12								
2091.1	72.08	2116.49	71.94	2119.83	71.98	2148.08	72.26	2151.19
72.29								
2179.8	72.58	2185.55	72.64	2209	72.88	2232.84	73.12	2235.73
73.14								
2267.86	73.48	2270.89	73.51	2286.9	73.68	2288.93	73.7	2304.91
73.87								
2306.98	73.89	2334.55	74.18	2337.73	74.2	2352.04	74.27	2355.1
74.28								

```
 2369.42   74.36 2383.86   74.43 2386.87   74.44 2401.32   74.51 2404.21
74.53
 2429.19   74.65 2454.51   74.78  2457.5   74.85 2475.72   74.65 2494.14
74.45
 2498.97   74.36 2535.88   73.97 2559.62   73.72 2561.68   73.75 2585.58
73.49
  2587.3   73.45  2614.1   73.34 2640.94   73.22 2642.44   73.21 2656.25
73.15

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    32.08    .016    62.95     .17    92.75    .016   109.14
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         32.08  109.14           420.75  402.35  377.25              .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  522.99 2656.25   74.76         F
Blocked Obstructions      num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  251.93  387.55      90   436.7  558.37      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1192.356

INPUT
Description: Upstream Face of Fairmaont Crossing
Station Elevation Data     num=     170
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    76.77    18.93    76.04    21.89    74.65    25.29    74.92     35.1
74.97
    40.34    73.23    44.03    71.37    46.29    65.04    47.46    62.46
47.6362.46033
    52.57    62.47     62.7    62.43    79.09    62.42    79.39    62.72    82.17
65.7
     87.2    71.07     98.3    73.93    99.47     74.2   101.43     74.1    101.8
74.06
   110.38    73.53    111.8    73.52   114.14    73.54   123.79     73.6   125.51
73.72
   156.53    73.67   157.07    73.54   161.04    73.58   162.42    73.59   167.25
73.63
   168.05    73.75   208.44    74.68   210.42    74.56   213.36    74.41   228.38
73.59
   233.28    73.45   243.72    73.63   251.87    73.77   260.77    73.92   269.63
74.02
   283.97    74.46    305.4    74.69   313.68    74.89   319.79    74.83   339.44
75.04
   342.79    75.01   350.26    74.65   353.09    74.63    353.6     74.6   354.11
74.58
```

```
  356.48   75.26   394.6   74.94  429.16   74.57  431.36   74.48  438.63
75.37
  440.77   75.59  442.53   75.76  448.54   76.25  448.64   76.24  454.45
76.12
  457.74    75.5   460.8   75.01  466.44   75.04  483.29   74.47  499.53
74.43
  514.59   74.39  538.86   74.05  548.88   73.89  553.46   73.78  554.01
73.81
  555.27   73.78   595.7   72.73  608.77   72.47  621.83   72.28  658.25
71.62
  687.91    71.3  700.08   71.38  751.01   71.76  813.92   71.82  821.41
71.78
  862.82   71.97  887.32   71.93  901.82   71.92  929.54   71.51  932.56
71.5
  934.69   71.49  937.68   71.51  938.79   71.52    1029   72.21 1033.02
72.24
 1069.62   72.48 1084.18   72.45 1159.78   72.56 1194.18   73.13 1194.99
73.15
 1196.07   73.18 1248.61   74.31 1249.84    74.3 1267.16   74.63 1356.36
75.17
 1374.72   75.27 1379.93   74.47 1383.42   74.45 1391.79   74.54 1398.41
74.61
 1419.11   74.79 1425.07    74.2 1432.86    73.3 1476.57   75.45 1478.13
75.52
 1480.72   75.56 1481.32   75.58 1556.48   76.09 1580.63   76.34 1644.38
75.89
 1653.98   76.15 1682.03   76.98 1687.06   77.16 1688.73   77.04 1692.49
76.96
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.63     .17    79.09    .016    99.47
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
```

```
          35.1   99.47           150.44  150.57  156.21              .3
.5
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97        F
  448.54 2616.93   76.25        F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  771.98  844.79      90 1272.38 1373.24      90 1481.65 1571.21      90
 2109.13 2197.69      90 2348.88 2459.84      90  2574.5 2616.93      90

CULVERT


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1117

INPUT
Description:
Distance from Upstream XS =       25
Deck/Roadway Width        =      110
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    35.1   74.97               99    74.1

Upstream Bridge Cross Section Data
Station Elevation Data     num=      170
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0   76.77    18.93   76.04    21.89   74.65    25.29   74.92    35.1
74.97
   40.34   73.23    44.03   71.37    46.29   65.04    47.46   62.46
47.6362.46033
   52.57   62.47     62.7   62.43    79.09   62.42    79.39   62.72   82.17
65.7
    87.2   71.07     98.3   73.93    99.47    74.2   101.43    74.1   101.8
74.06
  110.38   73.53    111.8   73.52   114.14   73.54   123.79    73.6  125.51
73.72
  156.53   73.67   157.07   73.54   161.04   73.58   162.42   73.59  167.25
73.63
  168.05   73.75   208.44   74.68   210.42   74.56   213.36   74.41  228.38
73.59
  233.28   73.45   243.72   73.63   251.87   73.77   260.77   73.92  269.63
74.02
  283.97   74.46    305.4   74.69   313.68   74.89   319.79   74.83  339.44
75.04
  342.79   75.01   350.26   74.65   353.09   74.63    353.6    74.6  354.11
74.58
  356.48   75.26    394.6   74.94   429.16   74.57   431.36   74.48  438.63
75.37
  440.77   75.59   442.53   75.76   448.54   76.25   448.64   76.24  454.45
76.12
  457.74    75.5    460.8   75.01   466.44   75.04   483.29   74.47  499.53
74.43
```

```
  514.59   74.39  538.86   74.05  548.88   73.89  553.46   73.78  554.01
73.81
  555.27   73.78   595.7   72.73  608.77   72.47  621.83   72.28  658.25
71.62
  687.91    71.3  700.08   71.38  751.01   71.76  813.92   71.82  821.41
71.78
  862.82   71.97  887.32   71.93  901.82   71.92  929.54   71.51  932.56
71.5
  934.69   71.49  937.68   71.51  938.79   71.52    1029   72.21 1033.02
72.24
 1069.62   72.48 1084.18   72.45 1159.78   72.56 1194.18   73.13 1194.99
73.15
 1196.07   73.18 1248.61   74.31 1249.84    74.3 1267.16   74.63 1356.36
75.17
 1374.72   75.27 1379.93   74.47 1383.42   74.45 1391.79   74.54 1398.41
74.61
 1419.11   74.79 1425.07    74.2 1432.86    73.3 1476.57   75.45 1478.13
75.52
 1480.72   75.56 1481.32   75.58 1556.48   76.09 1580.63   76.34 1644.38
75.89
 1653.98   76.15 1682.03   76.98 1687.06   77.16 1688.73   77.04 1692.49
76.96
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.63     .17    79.09    .016    99.47
.02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          35.1   99.47             .3       .5
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97         F
  448.54 2616.93   76.25         F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
```

```
  771.98   844.79       90 1272.38 1373.24       90 1481.65 1571.21       90
 2109.13 2197.69       90 2348.88 2459.84       90  2574.5 2616.93       90

Downstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    2.34   74.97          124.06    74.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=       54
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0   74.86     2.34   74.56    17.27   73.56    25.01   73.15    37.44
71.04
   43.21   70.45    44.57   68.08     51.5   64.18    52.78   63.26    56.79
60.37
   65.67   60.35    84.38   60.29    89.53   60.28    92.01   62.96    92.93
63.27
  124.06   73.77    139.8   74.15   146.56   74.22   151.57   74.24   160.28
74.18
  182.96      73   184.47    72.9   186.49   72.88   201.13   71.64   220.44
69.91
  228.66   70.18   250.89   70.72   263.43   70.73   281.27   70.56   309.06
70.69
  328.54   70.72   343.55   70.31   356.64   70.02   359.36      70   361.84
70.48
  370.24   70.68   426.34   71.99   426.54   71.92   427.93   71.93   433.01
72.21
  436.83   72.42   437.72   72.49   443.44   72.59   482.93   72.79   492.98
72.9
  496.02   72.93   497.59   72.91   517.36   73.05   584.33   72.06   774.58
72.67
  841.08   72.92   848.56   72.84   887.98   72.24   908.45   72.17

Manning's n Values        num=       6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    43.21     .17    56.79     .17    92.01    .016   124.06
.035
  146.56     .02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          2.34   139.8            .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  146.56  908.45   74.22          F
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
  499.89  817.02      90

Upstream Embankment side slope                =       0 horiz. to 1.0 vertical
Downstream Embankment side slope              =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins           =    74.1
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested
```

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	12	8

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	25	110	.018	.018	0	.4	1

Number of Barrels = 3
Upstream Elevation = 62.42
Centerline Stations

Sta.	Sta.	Sta.
54.36	63.36	72.36

Downstream Elevation = 60.28
Centerline Stations

Sta.	Sta.	Sta.
64.16	73.16	82.16

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 1041.783

INPUT
Description: Downstream Face of Fairmaon Crossing
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	74.86	2.34	74.56	17.27	73.56	25.01	73.15	37.44	71.04
43.21	70.45	44.57	68.08	51.5	64.18	52.78	63.26	56.79	60.37
65.67	60.35	84.38	60.29	89.53	60.28	92.01	62.96	92.93	63.27
124.06	73.77	139.8	74.15	146.56	74.22	151.57	74.24	160.28	74.18
182.96	73	184.47	72.9	186.49	72.88	201.13	71.64	220.44	69.91
228.66	70.18	250.89	70.72	263.43	70.73	281.27	70.56	309.06	70.69
328.54	70.72	343.55	70.31	356.64	70.02	359.36	70	361.84	70.48
370.24	70.68	426.34	71.99	426.54	71.92	427.93	71.93	433.01	72.21
436.83	72.42	437.72	72.49	443.44	72.59	482.93	72.79	492.98	72.9
496.02	72.93	497.59	72.91	517.36	73.05	584.33	72.06	774.58	72.67
841.08	72.92	848.56	72.84	887.98	72.24	908.45	72.17		

Manning's n Values num= 6

```
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .035   43.21     .17   56.79     .17   92.01    .016  124.06
.035
  146.56     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         2.34   139.8           116.66  118.13  124.58             .3
.5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  146.56  908.45   74.22        F
Blocked Obstructions      num=       1
   Sta L   Sta R    Elev
  499.89  817.02      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 923.6518

INPUT
Description:
Station Elevation Data    num=      41
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta
Elev
       0     71.8   28.48    70.51   48.23    69.81   48.51   69.657   60.29
63.2
   62.89    61.77   65.67    60.08    77.5    60.34    86.4    60.54   89.98
61.47
   95.85    63.11  115.82    68.66  128.53    68.84  166.16    69.32  175.37
69.36
  194.56    68.86  198.66     68.9  203.24    68.95  207.36    69.14  267.19
69.68
  295.45    69.32   310.7    68.88  337.01    67.64  361.62    68.34  405.48
69.72
  411.15     70.5  412.49    70.69  416.65    72.01  417.74    72.35  429.87
72.53
  459.15    72.49  472.74    72.51   492.7    72.22  540.06    72.34  572.32
72.43
  614.53    72.58  684.11    72.81  726.53     71.6  728.33    72.72  792.37
72.94
  821.37    72.42

Manning's n Values        num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02   48.51     .17   62.89     .17   95.85    .016  115.82
.035
  166.16     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        48.51  128.53           217.42  216.97  218.99             .1
.3
```

```
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  175.37  821.37   69.36       F
Blocked Obstructions      num=       4
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  197.27   297.6      90  346.43  364.51      90  476.23  770.33      90
   21.29   48.51      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 706.6820

INPUT
Description:
Station Elevation Data    num=      44
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   71.26   20.07   71.23    41.3   70.92   61.42   70.53   72.14
70.36
   78.67   67.53   90.76   62.68   98.97   59.38  122.39   58.79   129.2
59.88
  145.25   62.74  168.96   66.95  171.58   66.94  177.87    66.8  242.61
65.66
  247.27   65.87   294.8   67.45  316.09   67.07  348.94   67.08  374.67
66.83
   390.3   66.67  415.05   66.76  420.51   66.79  421.71   66.71   426.1
66.38
  446.87   66.62  457.84   66.78  461.67   67.55  466.39   68.48  475.46
71.07
  478.88   72.18  479.52   72.19  488.24   72.32  514.26   72.66  517.04
70.64
  518.76   69.24  521.16   69.32  534.61   69.06   590.6   68.93  592.93
71.22
  594.97   72.24  619.91   71.97  778.79   72.51  781.74    72.5

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02   72.14     .17   98.97     .17   129.2     .17  168.96
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         72.14  168.96           420.18  406.52  381.53             .1
.3
Blocked Obstructions      num=       3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  295.09  350.86      90  395.63  420.97      90  514.53  619.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 300.1583
```

```
INPUT
Description:
Station Elevation Data    num=       86
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   70.16    3.03   70.27   19.06   70.56   29.27   70.07   33.47
70.03
   38.02   70.02   38.83   69.86   74.82   69.15   81.53   69.08  137.44
68.59
  154.02   68.68  179.01   68.89  182.24   68.91  224.14   69.29  247.36
69.5
  306.01   69.99   330.3   69.29  337.05   69.15  338.42   69.16  343.69
69.17
  407.69   67.55  412.83   67.35  419.76   61.74  423.21   58.94  425.02
57.51
  429.49   57.46  454.89   57.18  472.73   57.01  506.78   58.87  506.93
58.88
  509.91   59.04  511.61   59.03  513.31   59.54  526.98   63.56  538.51
63.83
  548.13   63.84  564.83   64.05   565.8   64.06   583.1   64.19     620
64.36
  648.17   64.71  649.27   64.73  664.53   64.84  691.37   64.77  691.92
64.76
  702.47   64.66  716.85   64.64  746.66   64.59  765.91   64.14  767.74
64.05
  768.78   64.08  775.03   63.98  777.44   63.94  807.38   63.47  808.97
63.55
  814.33   63.86   824.4    67.5  824.92    67.7  825.32   67.72   830.9
69.13
  845.62   69.19   862.7   69.23  897.15   69.29  919.62    69.5  922.68
69.54
  948.41   69.71  954.38   69.75  976.05   69.37  977.36   69.33  980.96
69.28
  982.86   69.29  986.42    69.3 1042.11   70.04 1045.54   70.02 1047.77
70.1
 1059.86   70.14 1067.83   70.17 1072.13    70.2 1073.11   70.22 1095.86
70.31
 1101.11   70.51 1113.44   70.96 1118.04   71.16 1126.02   67.91 1126.29
67.81
 1128.68   67.41

Manning's n Values        num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02  412.83     .17  425.02     .17  472.73     .17  526.98
.045
  807.38     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        412.83  526.98           309.26  286.55  277.96            .1
.3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  306.01   69.99         F
  664.53 1128.68   64.84         F
Blocked Obstructions     num=       1
```

Sta L	Sta R	Elev
247.08	307.3	72

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 13.60388

INPUT
Description:
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75.85	10.33	73.48	38.53	68.34	51.12	68.16	60.44	68.15
108.69	67.67	151.29	67.58	156.01	67.55	159.53	67.46	169.58	67.33
197.14	66.97	210.75	66.75	211.18	66.74	211.62	66.68	241.12	61.57
266.65	61.95	293.8	58.59	309.91	57.51	318.19	57.47	401.8	57.39
409.93	57.41	484.2	57.52	516.72	57.43	518.19	57.42	590.01	57.52
662.74	57.59	664.72	57.6	737.22	57.65	758.62	57.66	779	57.47
808.53	57.2	810.66	57.19	829.99	57.08	903.54	56.63	971.56	57.03
972.65	57.04	1009.45	57.49	1032.22	57.63	1039.89	57.65	1048.28	57.46
1064.18	57.51	1065.22	57.32	1069.26	57.35	1084.27	57.52	1100.33	59.12
1140.26	63.05	1150.65	63.85	1153.2	64.07	1153.41	64.09	1160.7	64.49
1178.04	64.07	1178.95	64.36	1188.24	67.3	1194.9	67.73	1202.1	68.16
1218.05	69.23	1222.37	69.26	1239.98	69.37	1248.73	69.39	1272.24	69.51
1302.61	69.55	1326.83	69.57	1348.91	69.7	1352.15	69.77	1372.76	69.94
1388.62	70.06	1398.96	69.98	1412.03	70.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.06	151.29	.17	1218.05	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr. Expan.
151.29	1218.05	23.58	13.6	15.76	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	151.29	67.58	F
1218.05	1412.03	69.23	F

SUMMARY OF MANNING'S N VALUES

River:Alvarado(west)

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Lower Reach	3415.773	.02	.016	.17	.016	.02	
Lower Reach	3276.769	.02	.016	.17	.016	.02	
Lower Reach	2926.628	.02	.016	.17	.016	.02	
Lower Reach	2467.648	.035	.17	.17	.17	.02	
Lower Reach	2231.639	.025	.17	.17	.17		
Lower Reach	2214.731	.035	.17	.17	.17	.035	.02
Lower Reach	2168.688	.025	.17	.17	.17	.035	.02
Lower Reach	1981.816	.025	.016	.17	.016	.02	
Lower Reach	1594.709	.02	.016	.17	.016	.02	
Lower Reach	1192.356	.02	.016	.17	.016	.02	
Lower Reach	1117	Culvert					
Lower Reach	1041.783	.035	.17	.17	.016	.035	.02
Lower Reach	923.6518	.02	.17	.17	.016	.035	.02
Lower Reach	706.6820	.02	.17	.17	.17	.02	
Lower Reach	300.1583	.02	.17	.17	.17	.045	.02
Lower Reach	13.60388	.06	.17	.06			

SUMMARY OF REACH LENGTHS

River: Alvarado(west)

Reach	River Sta.	Left	Channel	Right
Lower Reach	3415.773	138.55	139	139.44
Lower Reach	3276.769	345.32	350.14	353.92
Lower Reach	2926.628	455.11	458.98	464.26
Lower Reach	2467.648	232.89	236.01	234.37
Lower Reach	2231.639	16.13	16.91	37.54
Lower Reach	2214.731	31.05	46.04	52.74
Lower Reach	2168.688	178.72	186.87	197.94
Lower Reach	1981.816	397.08	387.11	367.43
Lower Reach	1594.709	420.75	402.35	377.25
Lower Reach	1192.356	150.44	150.57	156.21
Lower Reach	1117	Culvert		

Lower Reach	1041.783	116.66	118.13	124.58
Lower Reach	923.6518	217.42	216.97	218.99
Lower Reach	706.6820	420.18	406.52	381.53
Lower Reach	300.1583	309.26	286.55	277.96
Lower Reach	13.60388	23.58	13.6	15.76

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Alvarado(west)

Reach	River Sta.	Contr.	Expan.
Lower Reach	3415.773	.1	.3
Lower Reach	3276.769	.1	.3
Lower Reach	2926.628	.1	.3
Lower Reach	2467.648	.1	.3
Lower Reach	2231.639	.1	.3
Lower Reach	2214.731	.1	.3
Lower Reach	2168.688	.1	.3
Lower Reach	1981.816	.1	.3
Lower Reach	1594.709	.1	.3
Lower Reach	1192.356	.3	.5
Lower Reach	1117	Culvert	
Lower Reach	1041.783	.3	.5
Lower Reach	923.6518	.1	.3
Lower Reach	706.6820	.1	.3
Lower Reach	300.1583	.1	.3
Lower Reach	13.60388	.1	.3

DETAILED HYDRAULIC RESULTS FOR MAINTAINED CONDITION MODEL (NO SEDIMENT REMOVED)

HEC-RAS Plan: M bottom only River: Alvarado(west) Reach: Lower Reach

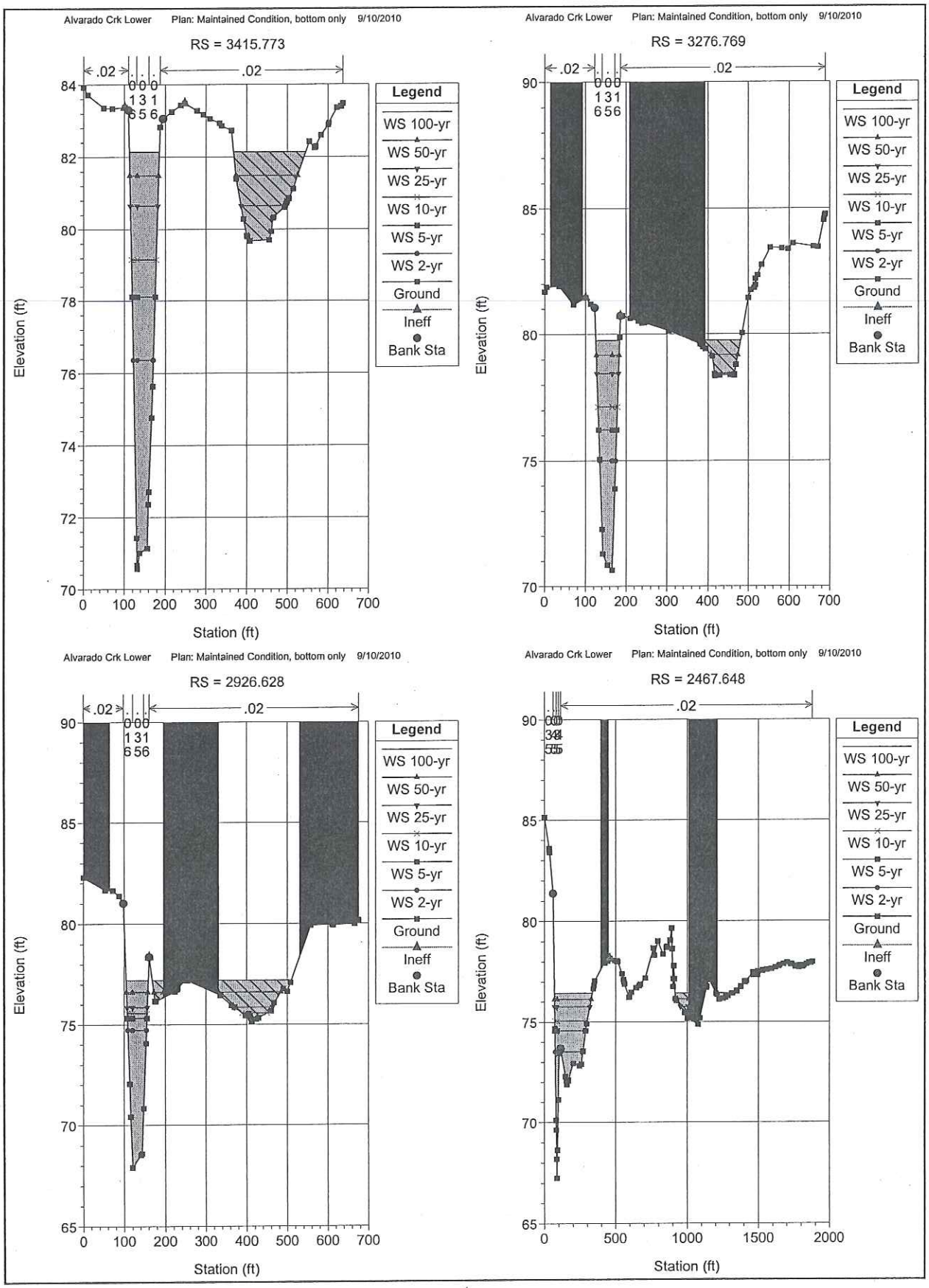
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	13.60388	100-yr	5100.00	56.63	66.00	58.46	66.01	0.000048	0.68	7538.81	968.59	0.04
Lower Reach	13.60388	50-yr	4500.00	56.63	60.40	58.38	60.45	0.001301	1.84	2446.06	834.14	0.19
Lower Reach	13.60388	25-yr	3800.00	56.63	60.11	58.27	60.15	0.001300	1.72	2204.03	828.83	0.19
Lower Reach	13.60388	10-yr	2700.00	56.63	59.60	58.08	59.64	0.001301	1.51	1784.96	819.56	0.18
Lower Reach	13.60388	5-yr	2050.00	56.63	59.26	57.96	59.29	0.001301	1.36	1506.06	813.33	0.18
Lower Reach	13.60388	2-yr	1180.00	56.63	58.72	57.77	58.74	0.001300	1.10	1070.73	803.56	0.17
Lower Reach	300.1583	100-yr	5100.00	57.01	65.79	62.30	66.15	0.001823	5.20	1253.12	404.93	0.34
Lower Reach	300.1583	50-yr	4500.00	57.01	61.94	61.94	63.90	0.019204	11.24	400.32	101.94	1.00
Lower Reach	300.1583	25-yr	3800.00	57.01	61.49	61.49	63.27	0.019749	10.69	355.52	99.88	1.00
Lower Reach	300.1583	10-yr	2700.00	57.01	60.72	60.72	62.17	0.021043	9.65	279.66	96.30	1.00
Lower Reach	300.1583	5-yr	2050.00	57.01	60.20	60.20	61.43	0.022332	8.90	230.31	93.89	1.00
Lower Reach	300.1583	2-yr	1180.00	57.01	59.40	59.40	60.28	0.024988	7.51	157.09	90.22	1.00
Lower Reach	706.6820	100-yr	5100.00	58.79	67.39	67.39	68.43	0.005167	8.70	663.72	298.55	0.66
Lower Reach	706.6820	50-yr	4500.00	58.79	67.14	67.14	68.17	0.005234	8.53	592.15	289.40	0.66
Lower Reach	706.6820	25-yr	3800.00	58.79	66.44	65.45	67.73	0.006871	9.22	428.33	155.90	0.74
Lower Reach	706.6820	10-yr	2700.00	58.79	65.48	64.42	66.54	0.006432	8.29	325.67	76.87	0.71
Lower Reach	706.6820	5-yr	2050.00	58.79	64.79	63.69	65.65	0.005879	7.47	274.57	71.26	0.67
Lower Reach	706.6820	2-yr	1180.00	58.79	63.59	62.47	64.16	0.004929	6.05	195.06	61.53	0.60
Lower Reach	923.6518	100-yr	5100.00	60.08	69.91	69.91	71.16	0.004097	9.52	619.67	239.94	0.70
Lower Reach	923.6518	50-yr	4500.00	60.08	69.57	69.57	70.85	0.004341	9.45	539.34	233.73	0.72
Lower Reach	923.6518	25-yr	3800.00	60.08	67.84	67.84	70.23	0.007991	12.40	307.47	72.43	0.98
Lower Reach	923.6518	10-yr	2700.00	60.08	66.49	66.49	68.65	0.009487	11.80	228.88	53.74	1.01
Lower Reach	923.6518	5-yr	2050.00	60.08	65.72	65.64	67.55	0.009625	10.84	189.06	49.56	0.98
Lower Reach	923.6518	2-yr	1180.00	60.08	64.55	64.22	65.74	0.008777	8.76	134.71	43.20	0.87
Lower Reach	1041.783	100-yr	5100.00	60.28	70.04		71.77	0.003843	10.57	482.99	78.82	0.71
Lower Reach	1041.783	50-yr	4500.00	60.28	69.92		71.32	0.003152	9.49	474.30	69.61	0.64
Lower Reach	1041.783	25-yr	3800.00	60.28	69.80		70.83	0.002371	8.16	465.95	68.71	0.55
Lower Reach	1041.783	10-yr	2700.00	60.28	68.48		69.27	0.002248	7.14	378.32	64.04	0.52
Lower Reach	1041.783	5-yr	2050.00	60.28	67.49		68.14	0.002196	6.47	316.88	59.82	0.50
Lower Reach	1041.783	2-yr	1180.00	60.28	65.82		66.26	0.002038	5.27	223.79	51.92	0.45
Lower Reach	1117		Culvert									
Lower Reach	1192.356	100-yr	5100.00	62.42	74.40	71.17	75.86	0.001392	9.87	592.81	1038.91	0.62
Lower Reach	1192.356	50-yr	4500.00	62.42	74.57	70.50	75.61	0.000989	8.41	632.69	1128.52	0.52
Lower Reach	1192.356	25-yr	3800.00	62.42	74.46	69.68	75.25	0.000749	7.27	605.97	1074.74	0.45

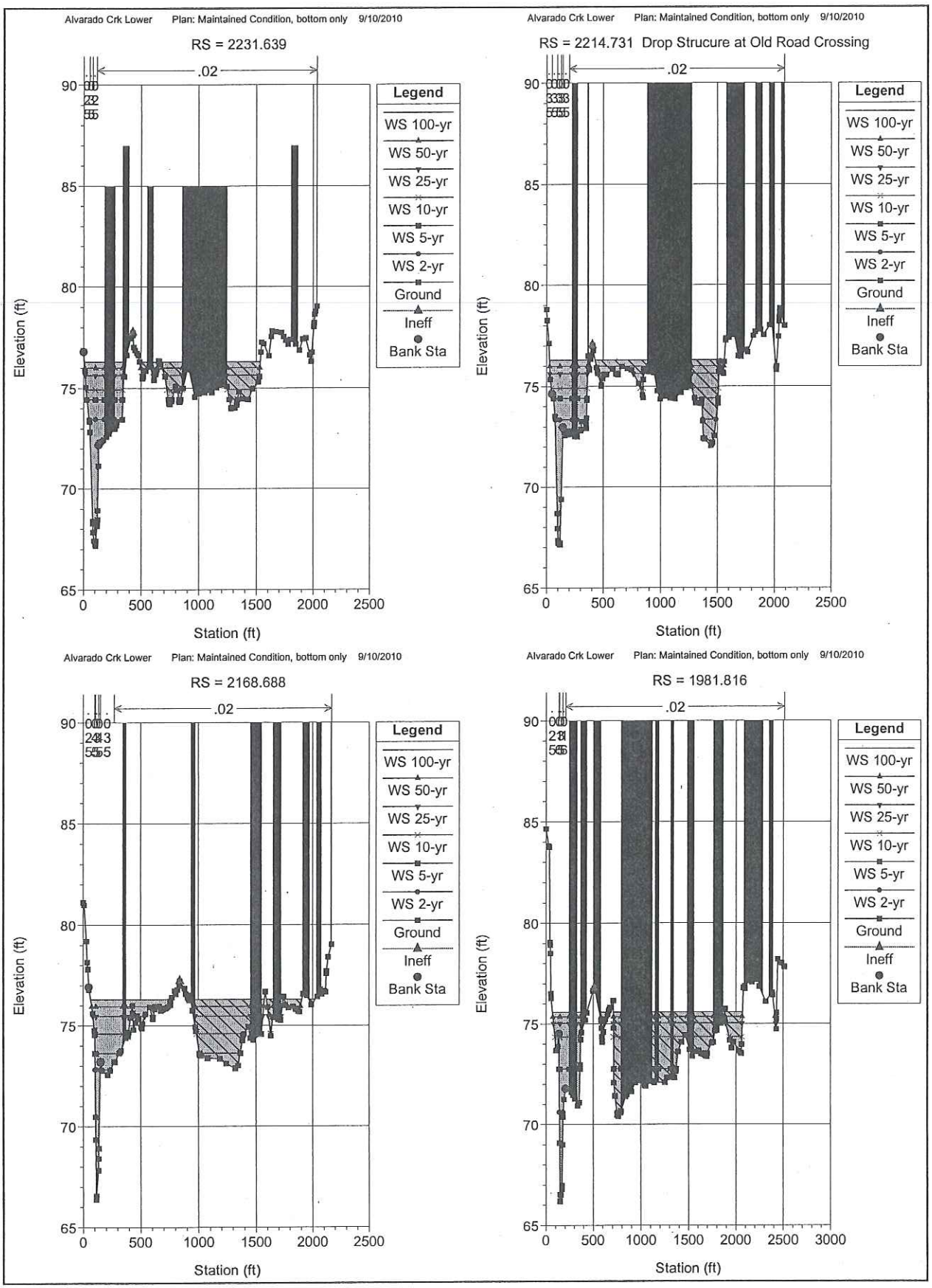
HEC-RAS Plan: M bottom only River: Alvarado(west) Reach: Lower Reach (Continued)

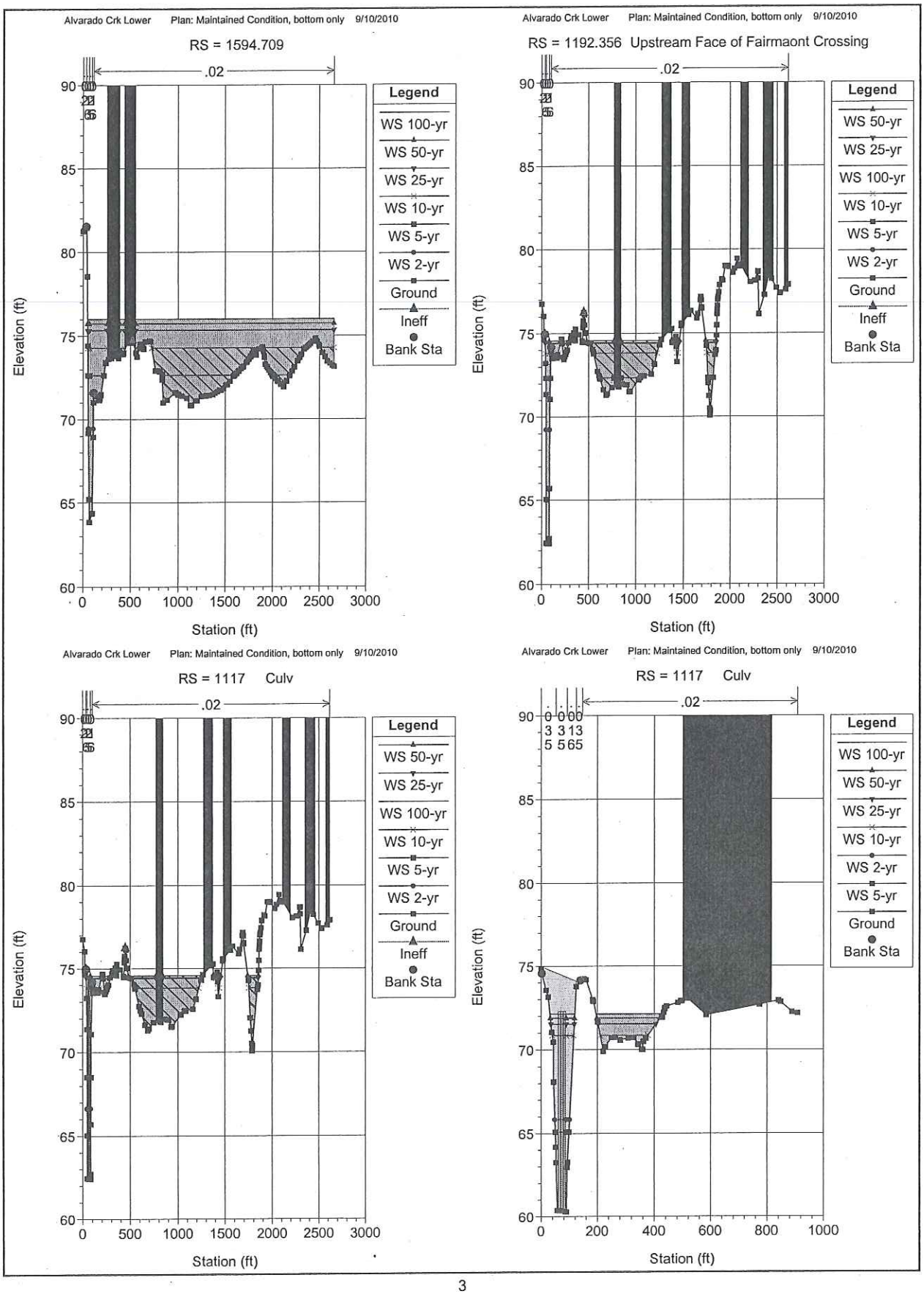
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	1192.356	10-yr	2700.00	62.42	73.82	68.27	74.34	0.000510	5.82	479.10	862.44	0.37
Lower Reach	1192.356	5-yr	2050.00	62.42	72.34	67.32	72.78	0.000488	5.37	381.86	464.72	0.34
Lower Reach	1192.356	2-yr	1180.00	62.42	69.24	65.86	69.59	0.000577	4.79	246.33	40.69	0.34
Lower Reach	1594.709	100-yr	5100.00	63.85	76.02	72.92	76.02	0.000013	1.13	8047.80	2353.25	0.06
Lower Reach	1594.709	50-yr	4500.00	63.85	75.73	72.51	75.73	0.000014	1.12	7367.58	2352.92	0.07
Lower Reach	1594.709	25-yr	3800.00	63.85	75.33	70.94	75.34	0.000015	1.14	6441.59	2352.48	0.07
Lower Reach	1594.709	10-yr	2700.00	63.85	74.28	69.69	74.50	0.000229	4.18	833.45	2070.46	0.26
Lower Reach	1594.709	5-yr	2050.00	63.85	72.64	68.85	72.97	0.000390	4.80	507.35	1122.32	0.33
Lower Reach	1594.709	2-yr	1180.00	63.85	69.45	67.49	69.93	0.000984	5.54	212.93	49.69	0.47
Lower Reach	1981.816	100-yr	5100.00	66.18	75.58	73.93	76.23	0.001249	6.87	830.10	1094.48	0.48
Lower Reach	1981.816	50-yr	4500.00	66.18	75.35	73.64	75.92	0.001144	6.41	781.60	1056.05	0.46
Lower Reach	1981.816	25-yr	3800.00	66.18	75.02	73.31	75.50	0.001041	5.89	714.04	1001.00	0.44
Lower Reach	1981.816	10-yr	2700.00	66.18	74.34	72.71	74.70	0.000903	5.05	583.39	891.29	0.40
Lower Reach	1981.816	5-yr	2050.00	66.18	72.75	72.28	73.37	0.002548	6.70	337.91	398.45	0.62
Lower Reach	1981.816	2-yr	1180.00	66.18	70.60	70.60	72.07	0.010407	9.73	121.25	81.82	1.00
Lower Reach	2168.688	100-yr	5100.00	66.38	76.29	74.98	76.54	0.001473	4.39	1307.66	1470.73	0.37
Lower Reach	2168.688	50-yr	4500.00	66.38	75.94	74.78	76.22	0.001769	4.76	1075.26	1274.22	0.39
Lower Reach	2168.688	25-yr	3800.00	66.38	75.47	74.55	75.80	0.002172	5.20	848.14	947.46	0.42
Lower Reach	2168.688	10-yr	2700.00	66.38	74.59	74.08	75.00	0.003027	5.95	568.01	690.63	0.46
Lower Reach	2168.688	5-yr	2050.00	66.38	73.62	73.62	74.42	0.006281	7.71	332.74	566.07	0.65
Lower Reach	2168.688	2-yr	1180.00	66.38	72.81	71.24	73.42	0.004750	6.32	196.49	122.60	0.56
Lower Reach	2214.731	100-yr	5100.00	67.14	76.30	74.61	76.63	0.001232	4.54	1118.36	1065.29	0.34
Lower Reach	2214.731	50-yr	4500.00	67.14	76.00	74.34	76.30	0.001244	4.39	1027.49	1023.76	0.34
Lower Reach	2214.731	25-yr	3800.00	67.14	75.61	74.12	75.88	0.001264	4.20	918.10	714.00	0.34
Lower Reach	2214.731	10-yr	2700.00	67.14	74.90	73.69	75.12	0.001372	3.92	720.47	530.05	0.35
Lower Reach	2214.731	5-yr	2050.00	67.14	74.40	72.36	74.60	0.001293	3.91	590.44	452.14	0.34
Lower Reach	2214.731	2-yr	1180.00	67.14	73.35	71.08	73.58	0.001505	4.04	343.66	345.17	0.36
Lower Reach	2231.639	100-yr	5100.00	67.18	76.30	74.33	76.67	0.000882	4.90	1049.98	837.31	0.38
Lower Reach	2231.639	50-yr	4500.00	67.18	76.00	74.09	76.33	0.000843	4.70	978.44	790.54	0.37
Lower Reach	2231.639	25-yr	3800.00	67.18	75.63	73.76	75.91	0.000798	4.42	889.81	701.82	0.35
Lower Reach	2231.639	10-yr	2700.00	67.18	74.92	72.24	75.14	0.000738	3.96	725.65	558.91	0.33
Lower Reach	2231.639	5-yr	2050.00	67.18	74.44	71.56	74.62	0.000647	3.63	616.33	347.69	0.31
Lower Reach	2231.639	2-yr	1180.00	67.18	73.46	70.45	73.60	0.000502	3.10	412.68	197.49	0.27
Lower Reach	2467.648	100-yr	5100.00	67.26	76.44	75.28	77.01	0.001740	4.02	870.89	492.72	0.32

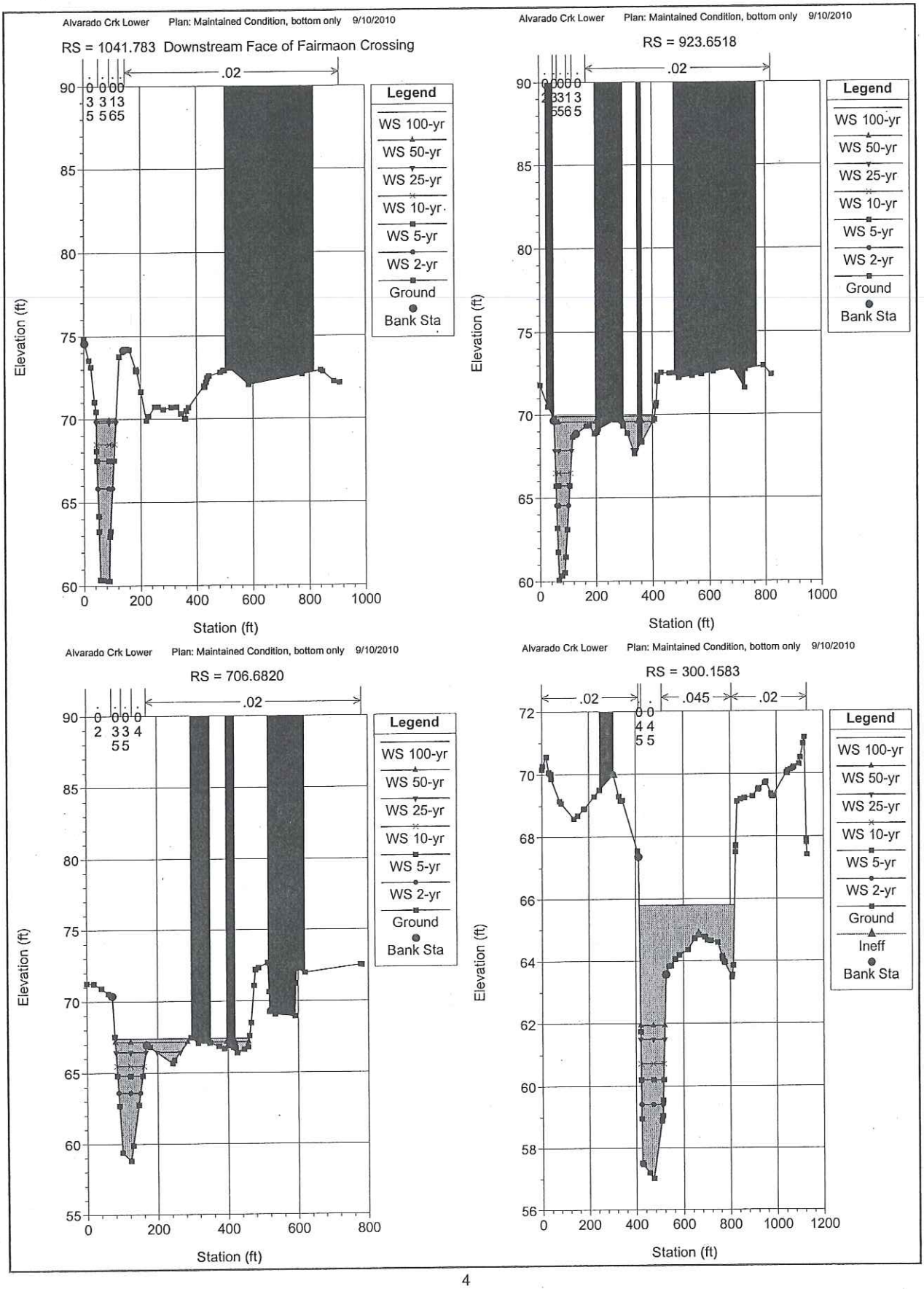
HEC-RAS Plan: M bottom only River: Alvarado(west) Reach: Lower Reach (Continued)

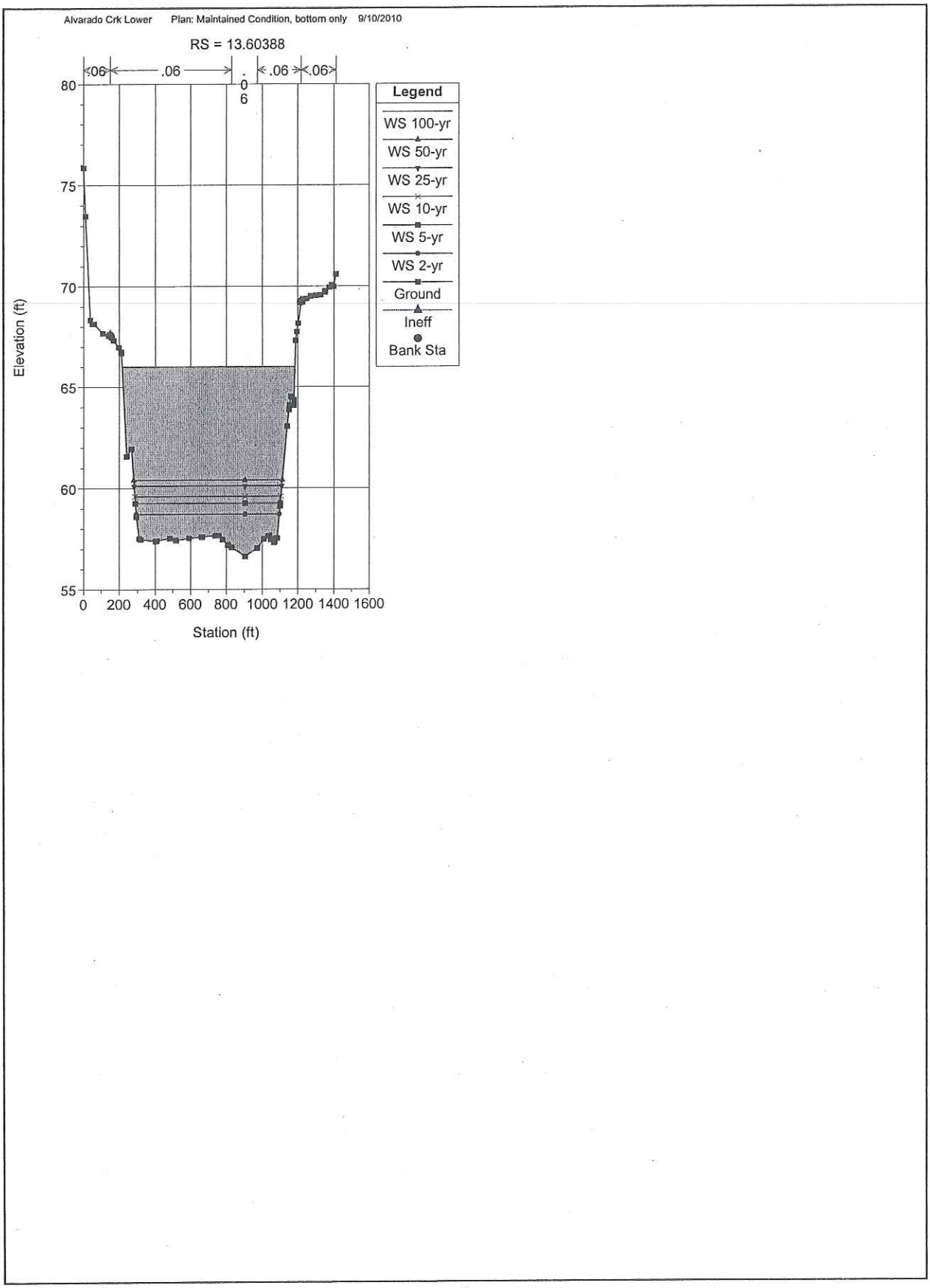
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	2467.648	50-yr	4500.00	67.26	76.13	75.05	76.68	0.001797	3.95	791.58	357.67	0.33
Lower Reach	2467.648	25-yr	3800.00	67.26	75.75	74.76	76.25	0.001878	3.87	696.27	300.77	0.33
Lower Reach	2467.648	10-yr	2700.00	67.26	75.05	74.27	75.48	0.002151	3.78	530.91	225.72	0.35
Lower Reach	2467.648	5-yr	2050.00	67.26	74.56	73.95	74.95	0.002535	3.81	423.21	214.39	0.37
Lower Reach	2467.648	2-yr	1180.00	67.26	73.52	73.50	74.01	0.006948	5.91	210.72	181.71	0.61
Lower Reach	2926.628	100-yr	5100.00	67.91	77.21	77.21	80.42	0.005910	14.39	354.53	259.38	1.00
Lower Reach	2926.628	50-yr	4500.00	67.91	76.61	76.61	79.64	0.006176	13.97	322.01	227.88	1.00
Lower Reach	2926.628	25-yr	3800.00	67.91	75.85	75.85	78.65	0.006562	13.44	282.81	143.64	1.00
Lower Reach	2926.628	10-yr	2700.00	67.91	75.56	74.51	77.13	0.003896	10.06	268.32	110.80	0.76
Lower Reach	2926.628	5-yr	2050.00	67.91	75.32	73.58	76.31	0.002583	7.99	256.43	67.98	0.61
Lower Reach	2926.628	2-yr	1180.00	67.91	74.72	72.08	75.14	0.001231	5.17	228.02	46.52	0.41
Lower Reach	3276.769	100-yr	5100.00	70.64	79.75	79.75	82.83	0.006268	14.09	362.00	146.50	1.00
Lower Reach	3276.769	50-yr	4500.00	70.64	79.17	79.17	82.08	0.006568	13.70	328.56	122.90	1.00
Lower Reach	3276.769	25-yr	3800.00	70.64	78.44	78.44	81.13	0.006996	13.18	288.39	103.34	1.00
Lower Reach	3276.769	10-yr	2700.00	70.64	77.13	77.13	79.43	0.007970	12.18	221.73	48.10	1.00
Lower Reach	3276.769	5-yr	2050.00	70.64	76.22	76.22	78.24	0.008837	11.40	179.80	44.41	1.00
Lower Reach	3276.769	2-yr	1180.00	70.64	75.00	74.74	76.31	0.008398	9.17	128.63	39.45	0.90
Lower Reach	3415.773	100-yr	5100.00	70.56	82.14	79.31	83.41	0.001607	9.02	565.22	252.23	0.58
Lower Reach	3415.773	50-yr	4500.00	70.56	81.48	78.76	82.66	0.001640	8.71	516.83	224.27	0.57
Lower Reach	3415.773	25-yr	3800.00	70.56	80.65	78.06	81.72	0.001684	8.29	458.30	176.85	0.56
Lower Reach	3415.773	10-yr	2700.00	70.56	79.15	76.84	80.03	0.001767	7.49	360.55	62.14	0.55
Lower Reach	3415.773	5-yr	2050.00	70.56	78.11	75.99	78.85	0.001829	6.88	298.09	57.70	0.53
Lower Reach	3415.773	2-yr	1180.00	70.56	76.36	74.63	76.88	0.001979	5.80	203.60	50.24	0.51


Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 3415.773
.02
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 3276.769
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 2926.628
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 2467.648


Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 2231.639
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 2214.731 Drop Strucure at Old Road Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 2168.688
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1981.816
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1594.709
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1192.356 Upstream Face of Fairmaont Crossing
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1117 Culv
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1117 Culv
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 2-yr
WS 5-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 1041.783 Downstream Face of Fairmaon Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 923.6518
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 706.6820
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 300.1583
.02
.045
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Condition, bottom only 9/10/2010
RS = 13.60388
.06
.06
.06
.06
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
80
75
70
65
60
55
0
200
400
600
800
1000
1200
1400
1600
Station (ft)

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Alvarado Crk Lower
Project File : AlvaradoCrkLower.prj
Run Date and Time: 9/10/2010 9:25:31 AM

Project in English units

Project Description:
City of San Diego - 1st Year Maintenance
J-15541A October 13,
2009
Utilized 1999 City 2-foot Contour Topo (NGVD 29)
Alvarado Creek
(Lower/Westerly Portion)
Helix Map Number 59 and 60 - Phase A Priority

PLAN DATA

Plan Title: Maintained Condition, bottom only
Plan File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.p09

Geometry Title: Maintained Condition bottom only
Geometry File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g09

Flow Title : Maintained Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f04

Plan Description:
Model output

Plan Summary Information:
Number of: Cross Sections = 15 Multiple Openings = 0

```
        Culverts          =    1    Inline Structures  =    0
        Bridges           =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

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



FLOW DATA

Flow Title: Maintained Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f04

Flow Data (cfs)

  River           Reach           RS                100-yr          50-yr
25-yr           10-yr           5-yr            2-yr
  Alvarado(west)  Lower Reach     3415.773          5100            4500
3800            2700            2050            1180


Boundary Conditions

  River           Reach           Profile                         Upstream
Downstream

  Alvarado(west)  Lower Reach     100-yr
Known WS = 66
  Alvarado(west)  Lower Reach     50-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach     25-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach     10-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach     5-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach     2-yr
Normal S = 0.0013



GEOMETRY DATA

Geometry Title: Maintained Condition bottom only
```

Geometry File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g09

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3415.773

INPUT
Description:
Station Elevation Data num= 53

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	83.93	10.52	83.72	49.34	83.36	70.68	83.34	100.85	83.38
109.41	83.29	130.02	71.42	131.31	70.67	131.95	70.56	137.65	71
157.14	71.13	159.47	72.36	160.66	72.71	167.65	74.77	169.83	75.63
188.02	82.83	194.79	83.06	215.5	83.25	236.72	83.43	246.85	83.49
277.39	83.28	293.32	83.17	309.77	83.06	333.91	82.93	338.78	82.86
362.9	82.73	374.16	81.39	392.18	80.28	400.42	79.82	401.41	79.79
407.16	79.67	455.28	79.7	459.96	79.94	464.45	80.31	465.99	80.33
492.85	80.61	494.47	80.65	497.4	80.72	499.2	80.77	503.06	80.83
504.06	80.86	514.76	81.12	553.49	82.42	566.92	82.25	568.15	82.26
569.27	82.29	582.64	82.6	600.74	82.89	602.56	82.94	622.5	83.36
631.58	83.4	632.75	83.39	637.02	83.47				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	109.41	.016	130.02	.035	160.66	.016	188.02	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
109.41	194.79	138.55	139	139.44	.1

.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	100.85	83.38	F
246.85	637.02	83.49	F

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3276.769

INPUT
Description:
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.69	4.45	81.89	35.41	81.92	70.17	81.17	100.3	81.46
112.67	81.2	122.62	81.05	134.98	75.05	140.38	72.26	142.25	71.29
154.18	70.84	165.75	70.64	172.28	73.88	184.34	79.88	186.01	80.72
191.45	80.73	210.25	80.63	229.99	80.52	238.65	80.44	245.22	80.45
304.34	80.13	380.38	79.61	384.55	79.58	387.47	79.49	393.73	79.41
410.54	79.12	416.31	78.42	416.91	78.34	422.24	78.35	429.59	78.36
455.88	78.38	465.27	78.36	469.47	78.78	484.52	80.04	500.14	81.43
505.85	81.76	514.04	81.84	516.55	82.2	516.86	81.95	522.35	82.35
531.72	82.76	552.96	83.45	582.28	83.42	597.3	83.4	609.57	83.62
660.02	83.49	670.66	83.47	684.79	84.54	685.45	84.57	687.4	84.72
688.83	84.77								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	122.62	.016	140.38	.035	172.28	.016	186.01	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr. Expan.
122.62	186.01	345.32	350.14	353.92	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	100.3	81.46	F
186.01	688.83	80.72	F

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
13.62	92.64	90	208.28	393.34	90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2926.628

INPUT
Description:
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0   82.29   53.38   81.66   72.39   81.64   87.76   81.37   97.81
81.01
     113   72.05  115.78   70.41  120.03   67.91  141.42   68.53  144.01
68.59
  148.04   70.84   153.8   74.06  161.57   78.36  175.86   76.17  177.43
76.16
  223.02   76.64  227.21   76.74  229.11   76.79  247.52   77.21  249.49
77.2
  254.91   77.19  335.23   76.46  335.65   76.45  362.99   75.94   370.4
75.85
  397.23   75.43  404.82   75.53  407.82   75.41  412.56   75.13  423.65
75.26
   459.1   75.66  460.33   75.67  467.47   76.07  490.09   76.78  499.97
76.64
  507.82   77.08  557.44   79.91  610.52   79.96   613.3   79.92  666.44
79.99
  674.48   80.17  676.28   80.14

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    97.81    .016   120.03    .035   148.04    .016   161.57
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         97.81  161.57           455.11  458.98  464.26              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  161.57  676.28   78.36         F
Blocked Obstructions      num=        3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  530.39  676.28      90  195.38  332.19      90       0   65.03      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2467.648

INPUT
Description:
Station Elevation Data     num=      131
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0   85.14    31.71     83.6    33.83   83.49    34.64   83.42    35.08
83.41
   59.99   81.37    73.72   74.68    82.27   70.11    83.15   69.63    86.73
68.19
   89.02   67.26    92.06   68.64    97.86   71.13   103.24   73.43   113.31
73.68
   146.6   72.29   153.08   72.07   156.92   71.89   165.93   72.07   166.17
72.08
  167.48   72.11    202.5   72.94   245.26   72.82   258.71    72.9   268.41
73.53
```

```
  269.48   73.55  294.79   74.91  342.16   76.66  346.46   76.82   346.9
76.83
  352.33   77.04  420.61   77.94  422.58   77.93  442.68   78.03  457.77
78.17
  493.61   78.06  507.21   78.02  507.95   78.05  514.77      78  545.03
77.39
  554.65    77.1   558.3      77   562.9   76.89  592.83   76.22  596.07
76.24
  609.78   76.47  643.62   76.71  645.17    76.7  665.46   76.81  673.24
76.88
     708   77.18   763.5   78.67  770.56   78.32  794.79   79.02  831.94
78.37
  855.73   78.71  859.72   78.76  881.44   79.06  892.44   79.65  895.56
78.63
  902.16   76.75  903.47   77.15  906.73   77.79  909.69   77.14  916.27
76.15
  924.71   76.06  982.71   75.44  989.78   75.49   992.3   75.48  994.07
75.47
  994.82   75.46 1002.08   75.17 1075.12   74.87 1081.44   75.17 1087.78
75.18
 1134.03    76.7 1136.68   76.76 1149.13   77.15 1153.32   77.09 1201.92
76.41
 1209.82   76.35 1225.56   76.12  1254.7   76.16 1273.65   76.22  1290.4
76.3
 1316.22   76.41 1319.91   76.43  1349.5   76.55 1350.69   76.52 1377.48
76.74
 1378.49   76.78 1405.71   77.02 1408.81   76.97 1416.98   77.03 1463.22
77.46
 1464.35   77.47 1465.26   77.38 1465.46   77.33  1492.9   77.32 1495.06
77.49
 1497.02   77.51 1526.26   77.54 1528.61   77.57 1557.48   77.59 1560.29
77.6
 1588.83   77.63 1592.01   77.64 1617.89   77.71 1643.35   77.77 1650.27
77.81
 1675.79   77.87 1677.17   77.88 1702.31   77.94 1703.75   77.95  1727.8
77.87
 1732.13   77.89 1735.39   77.86 1758.02   77.78 1761.23   77.75 1763.95
77.79
  1784.6   77.72 1787.59   77.76 1790.47    77.8 1810.66   77.74 1813.79
77.78
 1820.99   77.81  1838.1   77.88 1855.62   77.95 1868.06   77.94 1868.49
77.93
 1878.22   77.98

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    59.99    .045    82.27    .035    97.86    .045   113.31
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         59.99  113.31           232.89  236.01  234.37              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  457.77 1878.22   78.17       F
```

Blocked Obstructions num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
393.47	449.7	90	1007.94	1212.91	90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2231.639

INPUT
Description:
Station Elevation Data num= 120

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	76.8	12.75	75.85	17.94	75.04	51.03	73.41	51.81	73.4
52.64	73.35	54.8	73.36	56.84	72.84	80.96	68.39	81.55	68.28
83.35	67.85	92.65	67.42	102.28	67.26	105.78	67.18	107.28	67.35
108.73	67.41	119.2	68.15	120.35	68.23	124.25	68.47	125.11	68.93
130.5	71.14	132.75	72.19	144.53	72.32	146.66	72.33	154.89	72.34
163.13	72.39	172.13	72.44	200.97	72.59	222.6	72.75	229.84	72.92
250.17	73.03	264.5	73.1	267.34	73.09	274.94	72.99	287.98	73.17
291.98	73.34	338.77	73.46	352.25	75.59	358.58	75.57	378.11	76.64
409.95	77.45	424.63	77.62	428.34	77.74	429.8	77.64	437.38	77.02
448.59	76.88	465.55	76.73	477.09	76.63	488.11	76.31	513.25	75.49
517.54	75.56	518.31	75.58	536.09	75.88	541.8	75.85	581.1	76.06
611.82	75.41	615.4	75.4	627.3	75.69	630.96	75.78	636.47	75.92
653.45	76.35	658.88	76.34	668.58	76.19	707.85	75.57	742.43	74.25
749.35	74.2	763.74	74.34	800.8	75.09	816.48	74.89	829.18	74.42
829.93	74.37	830.73	74.44	833.71	74.31	838.94	74.34	865.2	75
909.05	76.09	917.31	75.9	966.88	74.57	1003.02	74.72	1049.97	74.77
1113.38	74.78	1153.48	75.02	1242.96	75.08	1279.83	74.03	1281.75	73.98
1314.45	74.01	1329.84	74.17	1334.15	74.24	1350.52	74.82	1379.5	74.47
1430.9	74.43	1469.75	74.96	1516.6	75.29	1527.23	75.55	1539.52	76.78
1545.51	77.26	1565.11	77.18	1611.43	76.59	1631.79	77.54	1640.26	77.82
1672.84	77.77	1719.97	77.73	1741.31	77.53	1760.68	77.35	1780.39	77.16

```
 1802.24    77.4 1849.81   77.16 1880.35   76.86 1910.12   77.41 1912.12
77.42
 1936.96   77.47 1970.04   76.62 1982.33   76.31 1990.43   76.76 2006.08
78.02
 2008.62   78.15 2009.51   78.23 2014.93   78.64 2020.55   78.77 2034.15
79.03

Manning's n Values          num=       4
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val
       0    .025     54.8    .035    81.55    .025    119.2     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
            0  132.75             16.13   16.91   37.54              .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  428.34 2034.15   77.74          F
Blocked Obstructions      num=       6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  184.32  275.65      85  340.74  396.32      87  552.57  607.29      85
  856.96 1244.13      85 1807.53 1866.52      87  2031.7 2034.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2214.731

INPUT
Description: Drop Strucure at Old Road Crossing
Station Elevation Data     num=      132
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     78.8     4.69    78.26    19.99    77.13    31.38    75.35    32.65
75.36
    47.05    74.64    60.75    74.49    75.72    73.53    95.88     68.7    98.81
67.95
  102.07    67.35    102.3    67.29   103.51    67.24    104.5    67.22   105.37
67.21
  117.44    67.15   118.92    67.14   119.21    67.22   128.26     69.4    143.1
72.97
  147.52    72.88   154.75    72.74   160.75    72.57   182.67    72.73   192.62
72.61
   193.9    72.63   202.04    72.79   203.03    72.78   212.51    72.63   248.98
72.52
  251.05    72.53    271.5    72.51   302.09     72.8   304.45    72.82    305.5
72.87
  313.36    73.25   350.18    73.13   351.51    72.93    353.9    73.43   358.18
74.32
   368.7     76.5   376.42    75.82    377.9    75.85   380.05    75.81   390.48
76.33
  394.76    76.55   404.34    77.03   405.94    76.97   411.53    76.77   439.48
75.92
  447.47    75.73   451.19    75.64   480.79    75.01   483.64    75.07   496.29
75.38
```

```
  505.79   75.61  526.86   75.57  580.21   75.84  608.69   75.63  609.25
75.62
  621.32   75.58  627.49   75.57  662.49   75.98  709.38   75.88  743.92
75.81
  808.08   75.14  842.46   74.58  847.52   74.44   850.1   75.33  851.67
75.84
   853.5   75.75  863.11   75.73  896.48   75.71  940.17   75.67  942.15
75.68
  970.19   74.78  995.12   74.37 1085.56   74.41 1125.08   74.38 1176.36
74.69
 1223.87   74.93 1267.55      75 1298.95   74.42 1308.02   74.18 1312.54
74.17
 1339.62   74.15 1356.07   74.13 1358.46   74.16 1362.15   74.33 1370.72
73.27
 1375.79   72.41  1381.3    72.4 1385.28   72.39 1386.68   72.37 1443.12
72.05
 1450.89   72.15 1451.83   72.14 1458.42   72.22 1472.94   72.54 1505.43
74.16
 1512.29   75.72 1513.91   76.23 1530.37   75.83  1550.2   75.66 1553.68
75.62
 1560.85    76.2 1573.52   77.27 1574.42   77.36 1599.33   77.39 1640.48
77.53
 1644.68   77.62 1681.27    76.5 1698.12   76.47 1703.78   76.46 1749.14
76.81
 1764.78   76.68 1814.25    77.5 1830.66   77.69 1879.63   77.79 1905.43
77.53
  1957.8   78.01 1977.52   78.05 2014.28   75.94  2016.6   75.81 2020.51
75.99
 2035.53   77.45 2040.76    78.2 2042.13    78.4 2046.47   78.66 2048.95
78.81
  2049.4   78.84 2088.99   77.99

Manning's n Values          num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .035   47.05    .035   95.88    .035  128.26    .035   143.1
.035
  202.04     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         47.05   143.1            31.05   46.04   52.74            .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  404.34 2088.99   77.03       F
Blocked Obstructions     num=       7
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
   224.9  275.77      90  363.14  373.41      90  883.42 1272.26      90
 1579.78 1738.28      90  1834.2 1893.63      90 1952.63 1999.56      90
 2059.58 2088.99      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 2168.688
```

INPUT
Description:
Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.11	8.42	80.99	28.98	79.2	35.51	78.16	41.11	77.81
41.46	77.79	49.04	76.92	49.21	76.77	49.37	76.92	82.88	75.61
97.93	74.76	101.97	74.53	108.09	70.47	109.72	69.35	114.08	66.38
116.39	66.55	133.68	67.83	135.76	68.42	137.48	68.92	152.33	73.19
154.59	73.2	164.21	72.76	214.35	72.55	235.29	72.76	236.86	72.78
272.29	73.21	276.75	73.19	313.88	73.62	322.66	73.67	332.02	73.76
371.42	74.39	391.58	74.46	391.98	74.47	397.41	74.66	412.65	75.38
429.65	75.99	432.12	75.63	436.98	74.8	453.7	75.15	469.65	75.49
482.13	75.32	503.89	74.94	511.34	74.86	515.46	75.09	543.35	75.57
578.89	75.92	605.69	75.33	622.05	75.8	627.14	75.96	661.78	75.97
675.45	75.76	676.55	75.73	687.84	75.78	695.12	75.81	695.54	75.83
702.92	75.86	717.53	75.85	726.03	75.89	734.98	75.93	755.29	76.02
755.55	76.04	758.4	76.21	771.81	76.4	796.33	76.73	803.08	76.59
803.36	76.57	819.66	76.78	835.81	76.97	836.04	77	839.41	77.22
878.82	76.85	890.04	76.59	890.63	76.56	906.91	76.39	914.08	76.32
921.68	76.25	921.89	76.27	925.47	76.52	948.37	75.75	972.75	74.93
979.07	74.72	1009.42	73.57	1012.54	73.52	1023.73	73.49	1076.49	73.36
1078.47	73.37	1185.18	73.35	1241.16	73.1	1320.75	72.86	1323.48	72.88
1346.75	73.01	1381.97	74.25	1386.87	74.49	1395.25	74.58	1434.3	74.94
1437.78	74.92	1450.87	74.37	1477.49	74.27	1545.68	74.56	1578.98	76.66
1580.24	76.68	1600.5	75.9	1628.93	74.48	1647.38	75.39	1693.93	75.3
1716.25	75.27	1717.43	75.26	1744.84	76.44	1761.11	76.02	1787.9	75.88
1828.77	75.93	1850.39	75.79	1872.58	75.7	1885.99	75.68	1916.24	76.57
1917.11	76.58	1943.96	76.56	1944.71	76.54	1949.43	76.48	1987.9	76.01
2041.55	76.43	2068.14	76.8	2081.25	76.55	2105.17	76.72	2114.6	76.66

```
 2120.74   77.58 2121.39   77.68 2122.26    77.7 2137.68    78.4 2168.38
79.02

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025  101.97    .045  109.72    .035  137.48    .045  152.33
.035
  272.29     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         49.04  154.59           178.72  186.87  197.94              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  839.41 2168.38   77.22          F
Blocked Obstructions      num=        7
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  345.94  374.87      90  934.55  972.18      90 1452.21 1548.05      90
 1649.05 1720.79      90 1912.43 1972.34      90 2033.15  2077.5      90
 2162.07 2168.38      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1981.816

INPUT
Description:
Station Elevation Data     num=      132
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    84.65    26.29    83.82    34.24    83.75    43.66    79.05    44.52
78.91
    47.34     78.5    52.63    76.51    55.06    76.27    107.5    73.68   117.48
73.69
  121.54    73.87   135.14     74.5   143.27    69.08   147.09    66.53   147.68
66.18
  148.53     66.2   158.03     66.5   167.47    66.79   168.15    66.98   174.94
69
  179.59    70.38   189.33    71.24   207.09    71.78   208.92    71.79   268.97
71.61
  286.29    71.45   307.37    71.27   338.31    70.93   355.82    71.08   365.49
72.96
  369.68    74.21   377.15    74.57   377.34    74.58   416.58    75.18   431.39
75.55
  497.42    76.64   498.44    76.65   500.16    76.66   511.31    76.77   581.67
75.17
  587.43    74.78   592.49    74.36   596.04    74.09   607.81    74.59   627.47
75.22
  651.82    75.47   661.48    75.65    668.9    75.72   678.56    75.82   710.64
76.16
  712.03    74.79   714.72    72.07   727.37    71.42    728.7     71.4   751.18
70.46
```

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  761.32    70.4  785.21   70.57  788.19    70.6  790.66   70.63  792.22
70.66
  838.84   71.38  852.37   71.48  900.76   71.63  940.59   72.07  941.53
72.08
  964.43   72.28 1000.66   72.18 1004.87   72.17 1014.63   72.29 1037.68
71.95
 1050.64   71.91 1122.41   72.15 1138.79   72.08 1253.51   72.09 1274.09
72.32
 1333.33   72.34 1353.17   72.32 1367.11   72.64 1389.46   73.61 1424.82
74.08
 1463.87   74.44 1510.27   73.71 1539.64   73.38 1583.36   73.61  1610.2
73.66
 1635.67   73.51 1653.24   73.48 1676.18   73.43 1686.19   73.39 1690.32
73.38
 1693.81   73.37 1694.24   73.38 1700.52   73.53 1747.46   74.04 1761.35
74.09
 1779.25   74.63 1800.08   74.67 1844.83   75.01 1876.85   75.26  1886.5
75.75
 1890.08   75.08 1936.81   74.18 1955.42   73.79 1972.69   74.08  2032.6
73.63
 2053.07   73.55 2055.82   73.53  2059.2   73.97 2077.89   76.79 2091.39
76.87
 2094.31   76.74 2133.72   77.12 2149.21   77.14 2169.15   77.07 2182.51
77.2
 2183.81   77.21 2229.19    77.2 2233.11   77.34 2234.63   77.35  2247.8
76.86
 2316.18   76.11 2379.09   76.54 2383.26   76.53 2386.26   76.42 2428.46
74.73
 2429.38   75.25 2430.87   75.55 2441.79    78.2 2470.28   78.04 2481.28
78.01
 2509.95   77.84 2513.55   77.81

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025   135.14    .016   143.27    .035   174.94    .016   207.09
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        135.14  207.09           397.08  387.11  367.43             .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  511.31 2513.55   76.77         F
Blocked Obstructions      num=       10
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  245.39  330.92      90  505.65  581.04      90  366.42  431.68      90
  789.77 1118.24      90 1146.29 1186.87      90 1312.75 1341.97      90
 1486.06 1556.66      90 1762.96 1868.49      90 2082.76 2284.39      90
 2346.39 2390.73      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1594.709
```

INPUT
Description:
Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.24	3.6	81.26	4.29	81.27	32.08	81.53	38.54	81.45
42.88	78.55	47.5	74.42	55.83	69.17	62.95	65.2	65.36	63.85
92.75	64.35	95.54	64.37	104.12	68.94	108.05	71.03	109.14	71.61
127.14	71.39	166.03	71.16	168.57	71.15	175.1	71.21	184.39	71.43
186.57	71.5	187.13	71.52	236.4	73.4	237.09	73.41	268.14	73.62
294.5	73.66	295.95	73.67	324.02	73.93	345.93	73.81	371.75	73.66
383.11	74.14	414.98	73.94	420.44	73.91	422.27	73.92	424.77	73.97
424.88	73.98	426.56	73.99	466.28	74.58	467.34	74.59	504.82	74.6
522.99	74.76	558.3	74.01	559.94	73.99	560.54	73.97	569.14	73.76
596.78	74.29	605.83	74.52	616.15	74.43	634.74	74.26	639.37	74.21
641.16	74.26	656.72	74.65	703.85	74.71	713.76	74.66	763.8	72.93
801.7	72.92	804.8	72.9	810.04	72.86	831.79	72.73	833.5	72.38
843.33	71	882.51	71.16	968.58	71.6	971.8	71.61	973.87	71.58
998.07	71.48	999.71	71.52	1037.78	71.4	1090.42	71.27	1130.12	70.83
1142.01	70.84	1189.25	71.11	1199.17	71.12	1246.15	71.38	1294.17	71.39
1306.69	71.43	1330.64	71.44	1367.69	71.48	1392.75	71.57	1417.65	71.66
1442.39	71.74	1455.9	71.75	1480.65	71.84	1507.67	72.05	1521.17	72.07
1548.12	72.28	1583.8	72.57	1590.38	72.61	1610.57	72.72	1617.02	72.77
1637.25	72.88	1643.58	72.92	1663.85	73.03	1684.25	73.14	1690.36	73.18
1720.07	73.4	1721.93	73.42	1726.44	73.46	1742.1	73.58	1746.66	73.63
1762.3	73.74	1766.72	73.79	1782.34	73.95	1798.11	74.11	1802.33	74.16
1808.47	74.09	1815.84	73.89	1823.63	73.85	1858.05	74.2	1893.05	74.32
1899.49	74.13	1900.86	74.08	1909.1	73.77	1910.32	73.71	1919.01	73.3
1934.76	73.16	1944.06	73.08	1959.83	72.94	1976.87	72.79	1993.96	72.64
2002.86	72.56	2027.9	72.43	2053.18	72.29	2059.57	72.25	2084.9	72.12

```
  2091.1   72.08 2116.49   71.94 2119.83   71.98 2148.08   72.26 2151.19
72.29
  2179.8   72.58 2185.55   72.64    2209   72.88 2232.84   73.12 2235.73
73.14
 2267.86   73.48 2270.89   73.51  2286.9   73.68 2288.93    73.7 2304.91
73.87
 2306.98   73.89 2334.55   74.18 2337.73    74.2 2352.04   74.27  2355.1
74.28
 2369.42   74.36 2383.86   74.43 2386.87   74.44 2401.32   74.51 2404.21
74.53
 2429.19   74.65 2454.51   74.78  2457.5   74.85 2475.72   74.65 2494.14
74.45
 2498.97   74.36 2535.88   73.97 2559.62   73.72 2561.68   73.75 2585.58
73.49
  2587.3   73.45  2614.1   73.34 2640.94   73.22 2642.44   73.21 2656.25
73.15

Manning's n Values          num=          5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    32.08    .016    62.95     .025    92.75     .016   109.14
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         32.08  109.14           420.75  402.35  377.25              .1
.3
Ineffective Flow      num=          1
   Sta L   Sta R    Elev  Permanent
  522.99 2656.25   74.76         F
Blocked Obstructions       num=          2
   Sta L   Sta R    Elev    Sta L   Sta R     Elev
  251.93  387.55      90    436.7  558.37       90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1192.356

INPUT
Description: Upstream Face of Fairmaont Crossing
Station Elevation Data     num=       170
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    76.77    18.93    76.04    21.89    74.65    25.29    74.92     35.1
74.97
    40.34    73.23    44.03    71.37    46.29    65.04    47.46    62.46
47.6362.46033
    52.57    62.47     62.7    62.43    79.09    62.42    79.39    62.72    82.17
65.7
     87.2    71.07     98.3    73.93    99.47     74.2   101.43     74.1    101.8
74.06
  110.38    73.53    111.8    73.52   114.14    73.54   123.79     73.6   125.51
73.72
  156.53    73.67   157.07    73.54   161.04    73.58   162.42    73.59   167.25
73.63
```

168.05	73.75	208.44	74.68	210.42	74.56	213.36	74.41	228.38
73.59								
233.28	73.45	243.72	73.63	251.87	73.77	260.77	73.92	269.63
74.02								
283.97	74.46	305.4	74.69	313.68	74.89	319.79	74.83	339.44
75.04								
342.79	75.01	350.26	74.65	353.09	74.63	353.6	74.6	354.11
74.58								
356.48	75.26	394.6	74.94	429.16	74.57	431.36	74.48	438.63
75.37								
440.77	75.59	442.53	75.76	448.54	76.25	448.64	76.24	454.45
76.12								
457.74	75.5	460.8	75.01	466.44	75.04	483.29	74.47	499.53
74.43								
514.59	74.39	538.86	74.05	548.88	73.89	553.46	73.78	554.01
73.81								
555.27	73.78	595.7	72.73	608.77	72.47	621.83	72.28	658.25
71.62								
687.91	71.3	700.08	71.38	751.01	71.76	813.92	71.82	821.41
71.78								
862.82	71.97	887.32	71.93	901.82	71.92	929.54	71.51	932.56
71.5								
934.69	71.49	937.68	71.51	938.79	71.52	1029	72.21	1033.02
72.24								
1069.62	72.48	1084.18	72.45	1159.78	72.56	1194.18	73.13	1194.99
73.15								
1196.07	73.18	1248.61	74.31	1249.84	74.3	1267.16	74.63	1356.36
75.17								
1374.72	75.27	1379.93	74.47	1383.42	74.45	1391.79	74.54	1398.41
74.61								
1419.11	74.79	1425.07	74.2	1432.86	73.3	1476.57	75.45	1478.13
75.52								
1480.72	75.56	1481.32	75.58	1556.48	76.09	1580.63	76.34	1644.38
75.89								
1653.98	76.15	1682.03	76.98	1687.06	77.16	1688.73	77.04	1692.49
76.96								
1696.11	76.55	1697.49	76.47	1747.83	74.25	1764.6	72.03	1774.73
71.24								
1781.54	70.5	1784.97	70.15	1786.06	70.06	1786.58	70.1	1790.93
70.38								
1840.62	73.72	1845.09	73.92	1850.6	73.99	1854.08	74.87	1856.38
75.48								
1858.9	76.15	1861.82	76.42	1864.2	76.64	1866.65	77.02	1871.47
77.16								
1881.03	77.44	1887.79	77.88	1911.88	78.22	1921.72	78.15	1946.47
79								
1969.69	79.01	1979.5	78.97	1980.5	78.96	2026.36	78.6	2045.29
78.85								
2073.87	79.44	2086.71	79.09	2101.29	78.97	2121.21	78.98	2218.29
78.05								
2263.61	78.13	2297.66	78.65	2299.32	78.67	2300.66	78.26	2307.54
76.13								
2363.75	77.28	2409.66	78.45	2440.17	78.23	2492.2	77.69	2529.08
77.41								
2530.74	77.37	2531.9	77.4	2588.93	77.6	2610.61	77.88	2616.93
77.89								

```
Manning's n Values          num=        5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02    35.1    .016   47.63    .025   79.09    .016   99.47
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          35.1   99.47           150.44  150.57  156.21              .1
.3
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97        F
  448.54 2616.93   76.25        F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  771.98  844.79      90 1272.38 1373.24      90 1481.65 1571.21      90
 2109.13 2197.69      90 2348.88 2459.84      90  2574.5 2616.93      90

CULVERT


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1117

INPUT
Description:
Distance from Upstream XS =       25
Deck/Roadway Width        =      110
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    35.1   74.97               99    74.1

Upstream Bridge Cross Section Data
Station Elevation Data     num=      170
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   76.77   18.93   76.04   21.89   74.65   25.29   74.92    35.1
74.97
   40.34   73.23   44.03   71.37   46.29   65.04   47.46   62.46
.47.6362.46033
   52.57   62.47    62.7   62.43   79.09   62.42   79.39   62.72   82.17
65.7
    87.2   71.07    98.3   73.93   99.47    74.2  101.43    74.1   101.8
74.06
  110.38   73.53   111.8   73.52  114.14   73.54  123.79    73.6  125.51
73.72
  156.53   73.67  157.07   73.54  161.04   73.58  162.42   73.59  167.25
73.63
  168.05   73.75  208.44   74.68  210.42   74.56  213.36   74.41  228.38
73.59
  233.28   73.45  243.72   73.63  251.87   73.77  260.77   73.92  269.63
74.02
  283.97   74.46   305.4   74.69  313.68   74.89  319.79   74.83  339.44
75.04
```

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  342.79   75.01  350.26   74.65  353.09   74.63   353.6    74.6  354.11
74.58
  356.48   75.26   394.6   74.94  429.16   74.57  431.36   74.48  438.63
75.37
  440.77   75.59  442.53   75.76  448.54   76.25  448.64   76.24  454.45
76.12
  457.74    75.5   460.8   75.01  466.44   75.04  483.29   74.47  499.53
74.43
  514.59   74.39  538.86   74.05  548.88   73.89  553.46   73.78  554.01
73.81
  555.27   73.78   595.7   72.73  608.77   72.47  621.83   72.28  658.25
71.62
  687.91    71.3  700.08   71.38  751.01   71.76  813.92   71.82  821.41
71.78
  862.82   71.97  887.32   71.93  901.82   71.92  929.54   71.51  932.56
71.5
  934.69   71.49  937.68   71.51  938.79   71.52    1029   72.21 1033.02
72.24
 1069.62   72.48 1084.18   72.45 1159.78   72.56 1194.18   73.13 1194.99
73.15
 1196.07   73.18 1248.61   74.31 1249.84    74.3 1267.16   74.63 1356.36
75.17
 1374.72   75.27 1379.93   74.47 1383.42   74.45 1391.79   74.54 1398.41
74.61
 1419.11   74.79 1425.07    74.2 1432.86    73.3 1476.57   75.45 1478.13
75.52
 1480.72   75.56 1481.32   75.58 1556.48   76.09 1580.63   76.34 1644.38
75.89
 1653.98   76.15 1682.03   76.98 1687.06   77.16 1688.73   77.04 1692.49
76.96
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=         5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02    35.1    .016   47.63    .025   79.09    .016   99.47
.02
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
          35.1   99.47            .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97          F
  448.54 2616.93   76.25          F
Blocked Obstructions     num=       6
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  771.98  844.79      90  1272.38 1373.24      90  1481.65 1571.21      90
 2109.13 2197.69      90  2348.88 2459.84      90   2574.5 2616.93      90

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    2.34   74.97          124.06    74.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=      54
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   74.86    2.34   74.56   17.27   73.56   25.01   73.15   37.44
71.04
   43.21   70.45   44.57   68.08    51.5   64.18   52.78   63.26   56.79
60.37
   65.67   60.35   84.38   60.29   89.53   60.28   92.01   62.96   92.93
63.27
  124.06   73.77   139.8   74.15  146.56   74.22  151.57   74.24  160.28
74.18
  182.96      73  184.47    72.9  186.49   72.88  201.13   71.64  220.44
69.91
  228.66   70.18  250.89   70.72  263.43   70.73  281.27   70.56  309.06
70.69
  328.54   70.72  343.55   70.31  356.64   70.02  359.36      70  361.84
70.48
  370.24   70.68  426.34   71.99  426.54   71.92  427.93   71.93  433.01
72.21
  436.83   72.42  437.72   72.49  443.44   72.59  482.93   72.79  492.98
72.9
  496.02   72.93  497.59   72.91  517.36   73.05  584.33   72.06  774.58
72.67
  841.08   72.92  848.56   72.84  887.98   72.24  908.45   72.17

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0    .035   52.78    .035   92.01    .016  124.06    .035  146.56
.02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          2.34   139.8            .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
  499.89  817.02      90

Upstream Embankment side slope                =       0 horiz. to 1.0 vertical
Downstream Embankment side slope              =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
```

```
Elevation at which weir flow begins          =    74.1
Energy head used in spillway design          =
Spillway height used in design               =
Weir crest shape                             = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1           Box      12       8
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss
Coef   Exit Loss Coef
                25     110     .018     .018        0                    .4
1
Number of Barrels =  3
Upstream   Elevation =  62.42
Centerline Stations
    Sta.    Sta.    Sta.
   54.36   63.36   72.36
Downstream Elevation =  60.28
Centerline Stations
    Sta.    Sta.    Sta.
   64.16   73.16   82.16

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 1041.783

INPUT
Description: Downstream Face of Fairmaon Crossing
Station Elevation Data    num=      54
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   74.86    2.34   74.56   17.27   73.56   25.01   73.15   37.44
71.04
   43.21   70.45   44.57   68.08    51.5   64.18   52.78   63.26   56.79
60.37
   65.67   60.35   84.38   60.29   89.53   60.28   92.01   62.96   92.93
63.27
  124.06   73.77   139.8   74.15  146.56   74.22  151.57   74.24  160.28
74.18
  182.96      73  184.47    72.9  186.49   72.88  201.13   71.64  220.44
69.91
  228.66   70.18  250.89   70.72  263.43   70.73  281.27   70.56  309.06
70.69
  328.54   70.72  343.55   70.31  356.64   70.02  359.36      70  361.84
70.48
  370.24   70.68  426.34   71.99  426.54   71.92  427.93   71.93  433.01
72.21
  436.83   72.42  437.72   72.49  443.44   72.59  482.93   72.79  492.98
72.9
  496.02   72.93  497.59   72.91  517.36   73.05  584.33   72.06  774.58
72.67
```

```
  841.08   72.92  848.56   72.84  887.98   72.24  908.45   72.17

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    52.78    .035    92.01    .016   124.06    .035   146.56
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          2.34   139.8           116.66  118.13  124.58              .1
.3
Blocked Obstructions      num=        1
   Sta L    Sta R     Elev
  499.89   817.02       90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 923.6518

INPUT
Description:
Station Elevation Data      num=       41
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     71.8    28.48    70.51    48.23    69.81    48.51   69.657    60.29
63.2
   62.89    61.77    65.67    60.08     77.5    60.34     86.4    60.54    89.98
61.47
   95.85    63.11   115.82    68.66   128.53    68.84   166.16    69.32   175.37
69.36
  194.56    68.86   198.66     68.9   203.24    68.95   207.36    69.14   267.19
69.68
  295.45    69.32    310.7    68.88   337.01    67.64   361.62    68.34   405.48
69.72
  411.15     70.5   412.49    70.69   416.65    72.01   417.74    72.35   429.87
72.53
  459.15    72.49   472.74    72.51    492.7    72.22   540.06    72.34   572.32
72.43
  614.53    72.58   684.11    72.81   726.53     71.6   728.33    72.72   792.37
72.94
  821.37    72.42

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    48.23    .035    62.89    .035    95.85    .016   115.82
.035
  166.16     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         48.51  128.53           217.42  216.97  218.99              .1
.3
Blocked Obstructions      num=        4
```

```
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  197.27   297.6      90  346.43  364.51      90  476.23  770.33      90
   21.29   48.51      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 706.6820

INPUT
Description:
Station Elevation Data    num=      44
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0   71.26   20.07   71.23    41.3   70.92   61.42   70.53   72.14
70.36
   78.67   67.53   90.76   62.68   98.97   59.38  122.39   58.79   129.2
59.88
  145.25   62.74  168.96   66.95  171.58   66.94  177.87    66.8  242.61
65.66
  247.27   65.87   294.8   67.45  316.09   67.07  348.94   67.08  374.67
66.83
   390.3   66.67  415.05   66.76  420.51   66.79  421.71   66.71   426.1
66.38
  446.87   66.62  457.84   66.78  461.67   67.55  466.39   68.48  475.46
71.07
  478.88   72.18  479.52   72.19  488.24   72.32  514.26   72.66  517.04
70.64
  518.76   69.24  521.16   69.32  534.61   69.06   590.6   68.93  592.93
71.22
  594.97   72.24  619.91   71.97  778.79   72.51  781.74    72.5

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02   72.14    .035   98.97    .035   129.2     .04  168.96
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
         72.14  168.96           420.18  406.52  381.53             .1
.3
Blocked Obstructions      num=       3
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  295.09  350.86      90  395.63  420.97      90  514.53  619.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 300.1583

INPUT
Description:
Station Elevation Data    num=      86
```

```
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    70.16     3.03    70.27    19.06    70.56    29.27    70.07    33.47
70.03
   38.02    70.02    38.83    69.86    74.82    69.15    81.53    69.08   137.44
68.59
  154.02    68.68   179.01    68.89   182.24    68.91   224.14    69.29   247.36
69.5
  306.01    69.99    330.3    69.29   337.05    69.15   338.42    69.16   343.69
69.17
  407.69    67.55   412.83    67.35   419.76    61.74   423.21    58.94   425.02
57.51
  429.49    57.46   454.89    57.18   472.73    57.01   506.78    58.87   506.93
58.88
  509.91    59.04   511.61    59.03   513.31    59.54   526.98    63.56   538.51
63.83
  548.13    63.84   564.83    64.05    565.8    64.06    583.1    64.19      620
64.36
  648.17    64.71   649.27    64.73   664.53    64.84   691.37    64.77   691.92
64.76
  702.47    64.66   716.85    64.64   746.66    64.59   765.91    64.14   767.74
64.05
  768.78    64.08   775.03    63.98   777.44    63.94   807.38    63.47   808.97
63.55
  814.33    63.86    824.4     67.5   824.92     67.7   825.32    67.72    830.9
69.13
  845.62    69.19    862.7    69.23   897.15    69.29   919.62     69.5   922.68
69.54
  948.41    69.71   954.38    69.75   976.05    69.37   977.36    69.33   980.96
69.28
  982.86    69.29   986.42     69.3  1042.11    70.04  1045.54    70.02  1047.77
70.1
 1059.86    70.14  1067.83    70.17  1072.13     70.2  1073.11    70.22  1095.86
70.31
 1101.11    70.51  1113.44    70.96  1118.04    71.16  1126.02    67.91  1126.29
67.81
 1128.68    67.41

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02   412.83    .045   425.02    .045   509.91    .045   807.38
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        412.83  526.98           309.26  286.55  277.96              .1
.3
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0  306.01   69.99         F
  664.53 1128.68   64.84         F
Blocked Obstructions      num=        1
   Sta L   Sta R    Elev
  247.08   307.3      72

CROSS SECTION
```

RIVER: Alvarado(west)
REACH: Lower Reach RS: 13.60388

INPUT
Description:
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	75.85	10.33	73.48	38.53	68.34	51.12	68.16	60.44	68.15
108.69	67.67	151.29	67.58	156.01	67.55	159.53	67.46	169.58	67.33
197.14	66.97	210.75	66.75	211.18	66.74	211.62	66.68	241.12	61.57
266.65	61.95	293.8	58.59	309.91	57.51	318.19	57.47	401.8	57.39
409.93	57.41	484.2	57.52	516.72	57.43	518.19	57.42	590.01	57.52
662.74	57.59	664.72	57.6	737.22	57.65	758.62	57.66	779	57.47
808.53	57.2	810.66	57.19	829.99	57.08	903.54	56.63	971.56	57.03
972.65	57.04	1009.45	57.49	1032.22	57.63	1039.89	57.65	1048.28	57.46
1064.18	57.51	1065.22	57.32	1069.26	57.35	1084.27	57.52	1100.33	59.12
1140.26	63.05	1150.65	63.85	1153.2	64.07	1153.41	64.09	1160.7	64.49
1178.04	64.07	1178.95	64.36	1188.24	67.3	1194.9	67.73	1202.1	68.16
1218.05	69.23	1222.37	69.26	1239.98	69.37	1248.73	69.39	1272.24	69.51
1302.61	69.55	1326.83	69.57	1348.91	69.7	1352.15	69.77	1372.76	69.94
1388.62	70.06	1398.96	69.98	1412.03	70.6				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.06	151.29	.06	829.99	.06	971.56	.06	1218.05	.06

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
151.29	1218.05	23.58	13.6	15.76	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	151.29	67.58	F
1218.05	1412.03	69.23	F

SUMMARY OF MANNING'S N VALUES

River:Alvarado(west)

Reach	River Sta.	n1	n2	n3	n4	n5	n6
Lower Reach	3415.773	.02	.016	.035	.016	.02	
Lower Reach	3276.769	.02	.016	.035	.016	.02	
Lower Reach	2926.628	.02	.016	.035	.016	.02	
Lower Reach	2467.648	.035	.045	.035	.045	.02	
Lower Reach	2231.639	.025	.035	.025	.02		
Lower Reach	2214.731	.035	.035	.035	.035	.035	.02
Lower Reach	2168.688	.025	.045	.035	.045	.035	.02
Lower Reach	1981.816	.025	.016	.035	.016	.02	
Lower Reach	1594.709	.02	.016	.025	.016	.02	
Lower Reach	1192.356	.02	.016	.025	.016	.02	
Lower Reach	1117	Culvert					
Lower Reach	1041.783	.035	.035	.016	.035	.02	
Lower Reach	923.6518	.02	.035	.035	.016	.035	.02
Lower Reach	706.6820	.02	.035	.035	.04	.02	
Lower Reach	300.1583	.02	.045	.045	.045	.02	
Lower Reach	13.60388	.06	.06	.06	.06	.06	

SUMMARY OF REACH LENGTHS

River: Alvarado(west)

Reach	River Sta.	Left	Channel	Right
Lower Reach	3415.773	138.55	139	139.44
Lower Reach	3276.769	345.32	350.14	353.92
Lower Reach	2926.628	455.11	458.98	464.26
Lower Reach	2467.648	232.89	236.01	234.37
Lower Reach	2231.639	16.13	16.91	37.54
Lower Reach	2214.731	31.05	46.04	52.74
Lower Reach	2168.688	178.72	186.87	197.94
Lower Reach	1981.816	397.08	387.11	367.43
Lower Reach	1594.709	420.75	402.35	377.25
Lower Reach	1192.356	150.44	150.57	156.21
Lower Reach	1117	Culvert		
Lower Reach	1041.783	116.66	118.13	124.58

Lower Reach	923.6518	217.42	216.97	218.99
Lower Reach	706.6820	420.18	406.52	381.53
Lower Reach	300.1583	309.26	286.55	277.96
Lower Reach	13.60388	23.58	13.6	15.76

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Alvarado(west)

Reach	River Sta.	Contr.	Expan.
Lower Reach	3415.773	.1	.3
Lower Reach	3276.769	.1	.3
Lower Reach	2926.628	.1	.3
Lower Reach	2467.648	.1	.3
Lower Reach	2231.639	.1	.3
Lower Reach	2214.731	.1	.3
Lower Reach	2168.688	.1	.3
Lower Reach	1981.816	.1	.3
Lower Reach	1594.709	.1	.3
Lower Reach	1192.356	.1	.3
Lower Reach	1117	Culvert	
Lower Reach	1041.783	.1	.3
Lower Reach	923.6518	.1	.3
Lower Reach	706.6820	.1	.3
Lower Reach	300.1583	.1	.3
Lower Reach	13.60388	.1	.3

HEC-RAS Plan: Sed Removed River: Alvarado(west) Reach: Lower Reach

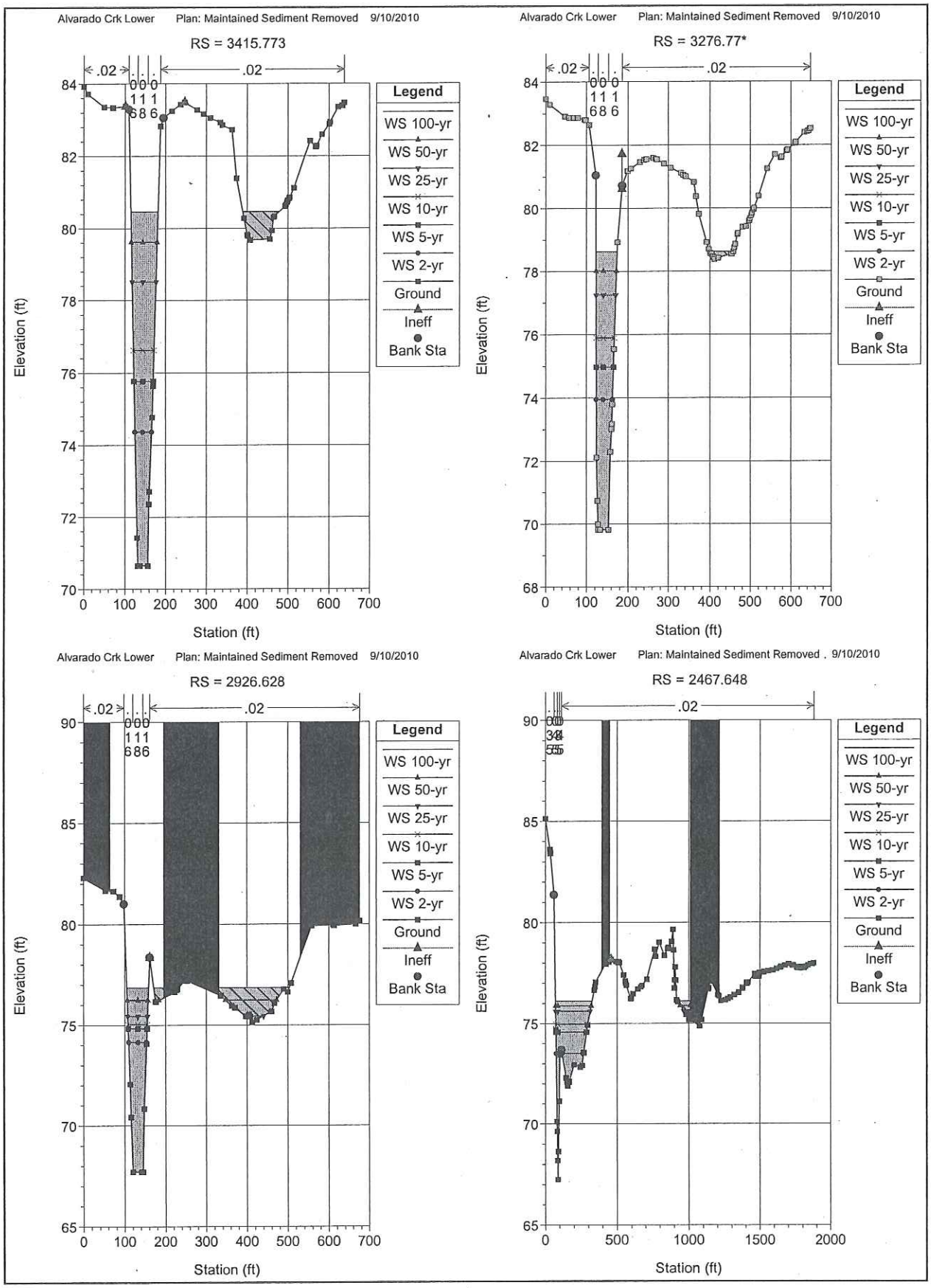
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	13.60388	100-yr	5100.00	56.63	66.00	58.46	66.01	0.000048	0.68	7538.81	968.59	0.04
Lower Reach	13.60388	50-yr	4500.00	56.63	60.40	58.38	60.45	0.001301	1.84	2446.95	834.16	0.19
Lower Reach	13.60388	25-yr	3800.00	56.63	60.11	58.27	60.16	0.001300	1.72	2205.05	828.86	0.19
Lower Reach	13.60388	10-yr	2700.00	56.63	59.60	58.08	59.64	0.001301	1.51	1786.27	819.59	0.18
Lower Reach	13.60388	5-yr	2050.00	56.63	59.26	57.96	59.29	0.001301	1.36	1507.64	813.36	0.18
Lower Reach	13.60388	2-yr	1180.00	56.63	58.72	57.77	58.74	0.001300	1.10	1072.96	803.61	0.17
Lower Reach	300.1583	100-yr	5100.00	57.01	65.79	62.30	66.15	0.001823	5.20	1253.11	404.93	0.34
Lower Reach	300.1583	50-yr	4500.00	57.01	61.94	61.94	63.90	0.019207	11.24	400.31	101.94	1.00
Lower Reach	300.1583	25-yr	3800.00	57.01	61.49	61.49	63.27	0.019749	10.69	355.52	99.88	1.00
Lower Reach	300.1583	10-yr	2700.00	57.01	60.72	60.72	62.17	0.021040	9.65	279.67	96.30	1.00
Lower Reach	300.1583	5-yr	2050.00	57.01	60.20	60.20	61.43	0.022332	8.90	230.31	93.89	1.00
Lower Reach	300.1583	2-yr	1180.00	57.01	59.42	59.42	60.28	0.024369	7.45	158.32	90.28	0.99
Lower Reach	706.6820	100-yr	5100.00	58.79	67.39	67.39	68.43	0.005167	8.70	663.72	298.55	0.66
Lower Reach	706.6820	50-yr	4500.00	58.79	67.14	67.14	68.17	0.005234	8.53	592.15	289.40	0.66
Lower Reach	706.6820	25-yr	3800.00	58.79	66.44	65.45	67.73	0.006871	9.22	428.34	155.90	0.74
Lower Reach	706.6820	10-yr	2700.00	58.79	65.48	64.42	66.54	0.006433	8.29	325.66	76.87	0.71
Lower Reach	706.6820	5-yr	2050.00	58.79	64.79	63.69	65.65	0.005879	7.47	274.57	71.26	0.67
Lower Reach	706.6820	2-yr	1180.00	58.79	63.58	62.47	64.15	0.004975	6.07	194.39	61.44	0.60
Lower Reach	923.6518	100-yr	5100.00	59.76	69.75	69.75	71.26	0.002040	10.27	594.02	238.76	0.76
Lower Reach	923.6518	50-yr	4500.00	59.76	68.87	68.87	70.85	0.003071	11.39	416.49	132.61	0.90
Lower Reach	923.6518	25-yr	3800.00	59.76	67.47	67.47	70.01	0.002709	12.80	296.98	59.02	1.01
Lower Reach	923.6518	10-yr	2700.00	59.76	66.20	66.20	68.40	0.002896	11.91	226.66	52.16	1.01
Lower Reach	923.6518	5-yr	2050.00	59.76	65.32	65.32	67.27	0.003047	11.22	182.75	47.37	1.01
Lower Reach	923.6518	2-yr	1180.00	59.76	63.85	63.85	65.38	0.003382	9.91	119.10	39.42	1.00
Lower Reach	1041.783	100-yr	5100.00	60.28	69.76		71.64	0.001376	11.01	463.32	68.57	0.75
Lower Reach	1041.783	50-yr	4500.00	60.28	69.73		71.21	0.001088	9.76	460.84	68.44	0.66
Lower Reach	1041.783	25-yr	3800.00	60.28	69.44		70.59	0.000877	8.61	441.54	67.44	0.59
Lower Reach	1041.783	10-yr	2700.00	60.28	68.03		68.96	0.000863	7.71	350.17	62.41	0.57
Lower Reach	1041.783	5-yr	2050.00	60.28	67.02		67.80	0.000854	7.09	289.01	57.57	0.56
Lower Reach	1041.783	2-yr	1180.00	60.28	65.28		65.84	0.000853	6.01	196.22	49.34	0.53
Lower Reach	1117		Culvert									
Lower Reach	1192.356	100-yr	5100.00	62.42	74.35	71.17	75.87	0.001019	10.03	581.10	1021.64	0.63
Lower Reach	1192.356	50-yr	4500.00	62.42	74.50	70.50	75.61	0.000733	8.58	617.42	1101.95	0.53
Lower Reach	1192.356	25-yr	3800.00	62.42	74.44	69.68	75.25	0.000541	7.35	601.11	1060.21	0.46

HEC-RAS Plan: Sed Removed River: Alvarado(west) Reach: Lower Reach (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	1192.356	10-yr	2700.00	62.42	73.82	68.27	74.34	0.000355	5.82	478.94	862.13	0.37
Lower Reach	1192.356	5-yr	2050.00	62.42	72.34	67.32	72.78	0.000324	5.37	381.86	464.72	0.34
Lower Reach	1192.356	2-yr	1180.00	62.42	69.24	65.86	69.59	0.000355	4.79	246.33	40.69	0.34
Lower Reach	1594.709	100-yr	5100.00	63.65	76.03	72.71	76.04	0.000012	1.29	8092.02	2353.26	0.07
Lower Reach	1594.709	50-yr	4500.00	63.65	75.72	72.19	75.73	0.000013	1.29	7376.14	2352.92	0.07
Lower Reach	1594.709	25-yr	3800.00	63.65	75.33	70.58	75.34	0.000014	1.31	6460.61	2352.48	0.08
Lower Reach	1594.709	10-yr	2700.00	63.65	74.23	69.31	74.47	0.000171	4.29	836.87	2023.71	0.26
Lower Reach	1594.709	5-yr	2050.00	63.65	72.59	68.45	72.91	0.000264	4.74	515.32	1099.25	0.32
Lower Reach	1594.709	2-yr	1180.00	63.65	69.36	67.06	69.79	0.000546	5.22	225.87	49.39	0.43
Lower Reach	1794.94*	100-yr	5100.00	64.39	76.03	73.95	76.04	0.000031	1.57	6181.99	2430.00	0.10
Lower Reach	1794.94*	50-yr	4500.00	64.39	75.72	73.26	75.74	0.000036	1.65	5441.20	2429.33	0.10
Lower Reach	1794.94*	25-yr	3800.00	64.39	75.18	72.69	75.42	0.000313	4.72	1208.62	2377.68	0.30
Lower Reach	1794.94*	10-yr	2700.00	64.39	74.25	70.46	74.52	0.000340	4.68	775.91	1685.20	0.32
Lower Reach	1794.94*	5-yr	2050.00	64.39	72.54	69.48	73.05	0.000661	5.86	397.04	555.52	0.44
Lower Reach	1794.94*	2-yr	1180.00	64.39	69.29	67.92	70.05	0.001285	6.96	169.64	41.93	0.61
Lower Reach	1981.81*	100-yr	5100.00	65.28	76.01	73.06	76.06	0.000065	2.88	4425.16	2212.83	0.17
Lower Reach	1981.81*	50-yr	4500.00	65.28	75.70	72.79	75.76	0.000071	2.94	3758.79	2064.28	0.18
Lower Reach	1981.81*	25-yr	3800.00	65.28	75.24	72.43	75.47	0.000176	4.45	1245.35	1776.77	0.28
Lower Reach	1981.81*	10-yr	2700.00	65.28	74.41	70.62	74.57	0.000144	3.73	987.38	1029.70	0.25
Lower Reach	1981.81*	5-yr	2050.00	65.28	72.90	69.84	73.15	0.000258	4.35	618.88	594.38	0.32
Lower Reach	1981.81*	2-yr	1180.00	65.28	69.64	68.58	70.28	0.001160	6.45	182.83	54.96	0.62
Lower Reach	2168.688	100-yr	5100.00	66.38	75.79	74.98	76.21	0.002710	5.87	991.32	1093.85	0.48
Lower Reach	2168.688	50-yr	4500.00	66.38	75.46	74.78	75.92	0.003078	6.19	844.32	944.04	0.50
Lower Reach	2168.688	25-yr	3800.00	66.38	75.18	74.55	75.62	0.003047	6.08	738.55	854.33	0.49
Lower Reach	2168.688	10-yr	2700.00	66.38	74.08	74.08	74.85	0.005861	7.87	441.26	624.64	0.63
Lower Reach	2168.688	5-yr	2050.00	66.38	73.62	73.62	74.42	0.006281	7.71	332.74	566.07	0.65
Lower Reach	2168.688	2-yr	1180.00	66.38	71.24	71.24	72.78	0.015519	9.94	118.68	38.62	1.00
Lower Reach	2214.731	100-yr	5100.00	67.14	75.91	74.61	76.32	0.001722	5.11	1003.04	972.32	0.40
Lower Reach	2214.731	50-yr	4500.00	67.14	75.68	74.34	76.04	0.001663	4.86	936.93	758.88	0.39
Lower Reach	2214.731	25-yr	3800.00	67.14	75.43	74.12	75.73	0.001517	4.48	866.81	628.03	0.37
Lower Reach	2214.731	10-yr	2700.00	67.14	74.79	73.69	75.03	0.001567	4.11	691.04	513.77	0.37
Lower Reach	2214.731	5-yr	2050.00	67.14	74.40	72.36	74.60	0.001293	3.91	590.44	452.14	0.34
Lower Reach	2214.731	2-yr	1180.00	67.14	72.71	71.08	73.16	0.003056	5.34	225.78	239.20	0.50
Lower Reach	2231.639	100-yr	5100.00	67.18	75.93	74.33	76.37	0.001143	5.44	960.28	778.58	0.43

HEC-RAS Plan: Sed Removed River: Alvarado(west) Reach: Lower Reach (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Lower Reach	2231.639	50-yr	4500.00	67.18	75.70	74.09	76.09	0.001058	5.13	906.45	716.71	0.41
Lower Reach	2231.639	25-yr	3800.00	67.18	75.45	73.76	75.77	0.000923	4.67	848.54	667.19	0.38
Lower Reach	2231.639	10-yr	2700.00	67.18	74.82	72.24	75.06	0.000806	4.12	701.84	532.98	0.35
Lower Reach	2231.639	5-yr	2050.00	67.18	74.44	71.56	74.62	0.000647	3.63	616.33	347.69	0.31
Lower Reach	2231.639	2-yr	1180.00	67.18	73.01	70.45	73.20	0.000718	3.63	344.91	128.53	0.32
Lower Reach	2467.648	100-yr	5100.00	67.26	76.11	75.28	76.82	0.002352	4.51	786.56	344.84	0.37
Lower Reach	2467.648	50-yr	4500.00	67.26	75.87	75.05	76.52	0.002329	4.37	725.55	315.26	0.37
Lower Reach	2467.648	25-yr	3800.00	67.26	75.60	74.76	76.16	0.002208	4.12	659.76	282.41	0.36
Lower Reach	2467.648	10-yr	2700.00	67.26	74.97	74.27	75.43	0.002414	3.95	511.26	223.17	0.37
Lower Reach	2467.648	5-yr	2050.00	67.26	74.56	73.95	74.95	0.002535	3.81	423.21	214.39	0.37
Lower Reach	2467.648	2-yr	1180.00	67.26	73.50	73.50	74.01	0.007108	6.04	208.30	180.62	0.62
Lower Reach	2926.628	100-yr	5100.00	67.71	76.85	76.85	80.11	0.002519	14.49	352.07	249.53	1.00
Lower Reach	2926.628	50-yr	4500.00	67.71	76.23	76.23	79.32	0.002577	14.10	319.25	185.93	1.00
Lower Reach	2926.628	25-yr	3800.00	67.71	75.45	75.45	78.31	0.002664	13.59	279.64	84.72	1.00
Lower Reach	2926.628	10-yr	2700.00	67.71	75.03	74.07	76.71	0.001660	10.41	259.48	47.60	0.79
Lower Reach	2926.628	5-yr	2050.00	67.71	74.82	73.12	75.87	0.001066	8.21	249.75	46.88	0.63
Lower Reach	2926.628	2-yr	1180.00	67.71	74.15	71.56	74.60	0.000514	5.39	218.79	44.51	0.43
Lower Reach	3276.77*	100-yr	5100.00	69.81	78.63	78.63	82.02	0.002657	14.77	345.30	109.69	1.00
Lower Reach	3276.77*	50-yr	4500.00	69.81	78.02	78.02	81.19	0.002696	14.31	314.51	49.43	1.00
Lower Reach	3276.77*	25-yr	3800.00	69.81	77.24	77.24	80.16	0.002759	13.71	277.12	47.49	1.00
Lower Reach	3276.77*	10-yr	2700.00	69.81	75.89	75.89	78.34	0.002888	12.54	215.23	44.10	1.00
Lower Reach	3276.77*	5-yr	2050.00	69.81	74.97	74.97	77.09	0.003006	11.66	175.84	41.79	1.00
Lower Reach	3276.77*	2-yr	1180.00	69.81	73.95	73.53	75.15	0.002207	8.78	134.45	39.22	0.84
Lower Reach	3415.773	100-yr	5100.00	70.64	80.47	79.14	82.42	0.001366	11.21	455.02	157.69	0.76
Lower Reach	3415.773	50-yr	4500.00	70.64	79.62	78.58	81.59	0.001535	11.28	398.95	64.11	0.80
Lower Reach	3415.773	25-yr	3800.00	70.64	78.51	77.88	80.56	0.001854	11.49	330.63	59.40	0.86
Lower Reach	3415.773	10-yr	2700.00	70.64	76.63	76.63	78.84	0.002740	11.92	226.50	51.38	1.00
Lower Reach	3415.773	5-yr	2050.00	70.64	75.77	75.77	77.70	0.002880	11.15	183.83	47.71	1.00
Lower Reach	3415.773	2-yr	1180.00	70.64	74.37	74.37	75.84	0.003181	9.72	121.37	41.40	1.00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.02
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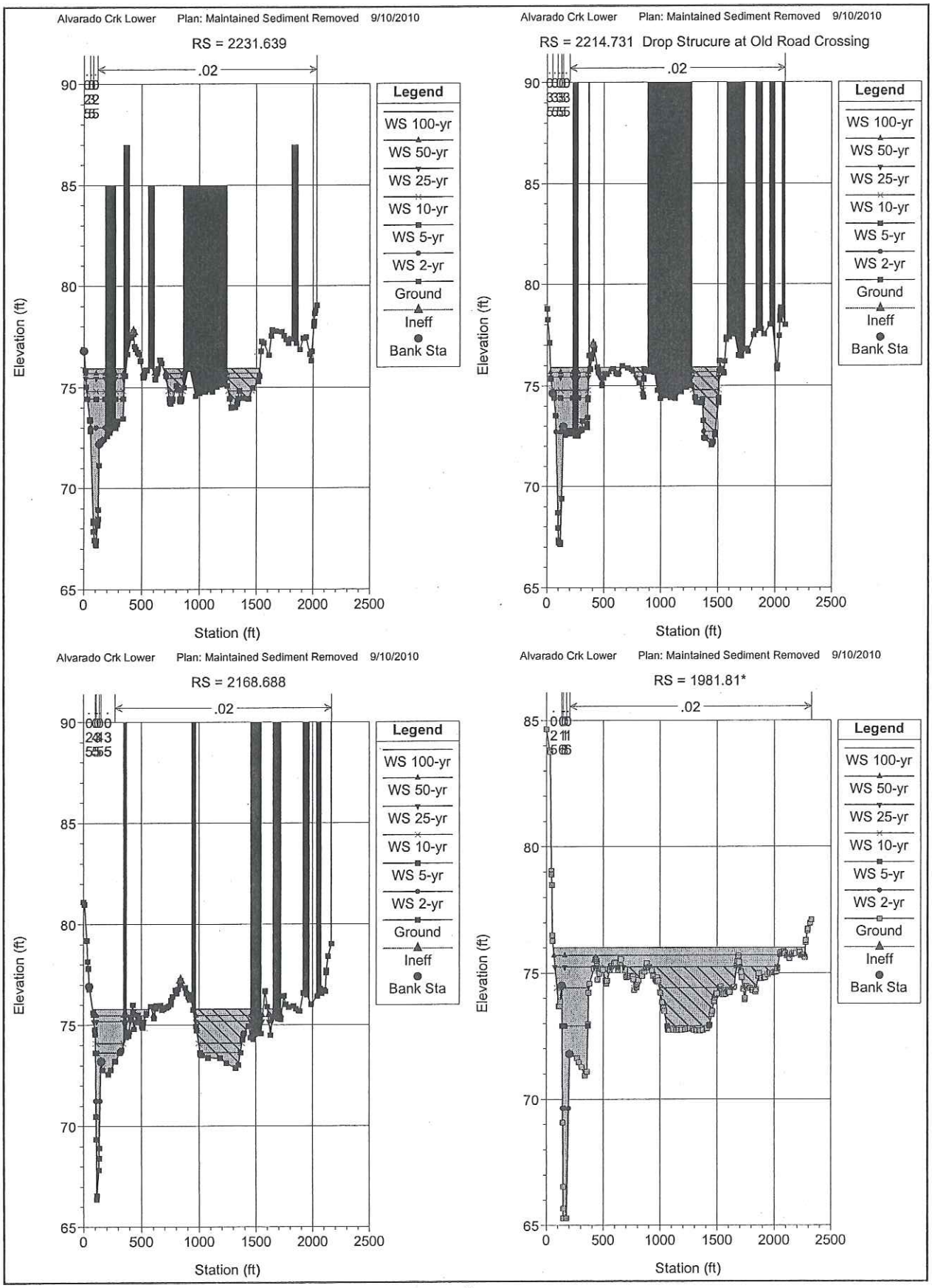
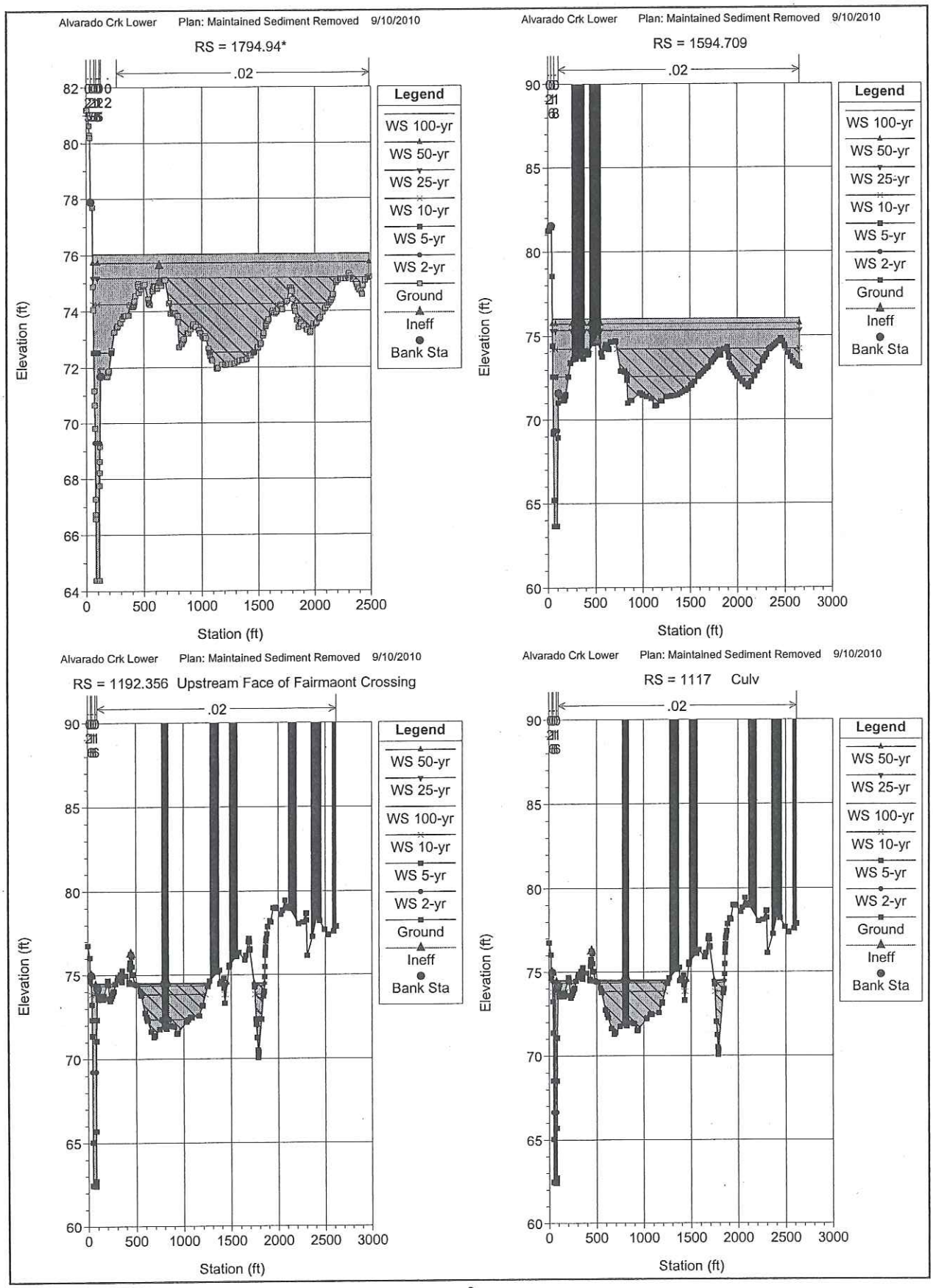
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 3276.77*
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 2926.628
Alvarado Crk Lower Plan: Maintained Sediment Removed , 9/10/2010
RS = 2467.648


Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 2231.639
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 2214.731 Drop Strucure at Old Road Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 2168.688
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1981.81*
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1794.94*
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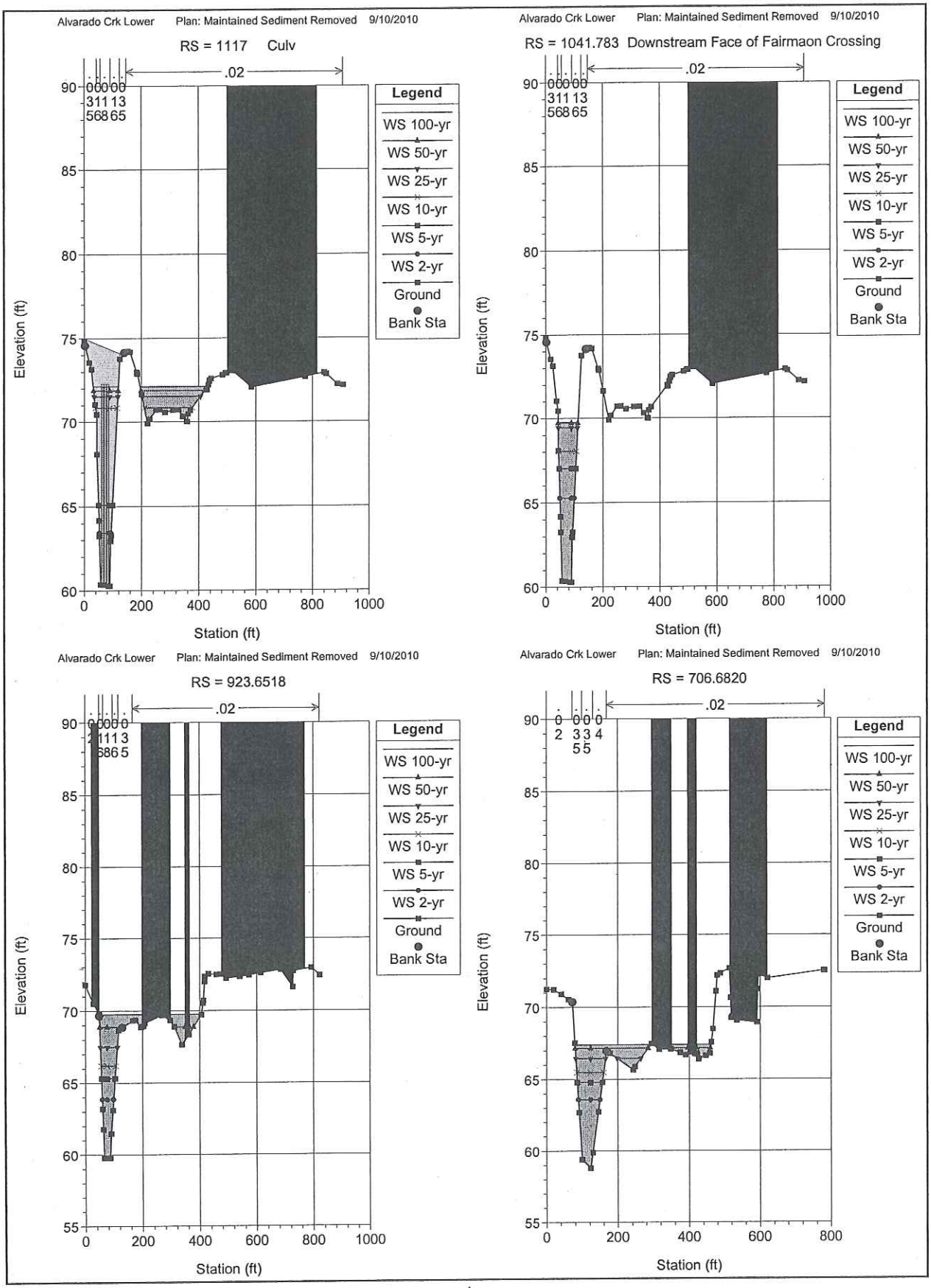
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1594.709
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1192.356 Upstream Face of Fairmaont Crossing
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1117 Culv
.02
Legend
WS 50-yr
WS 25-yr
WS 100-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1117 Culv
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 1041.783 Downstream Face of Fairmaon Crossing
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 923.6518
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 706.6820
.02
Legend
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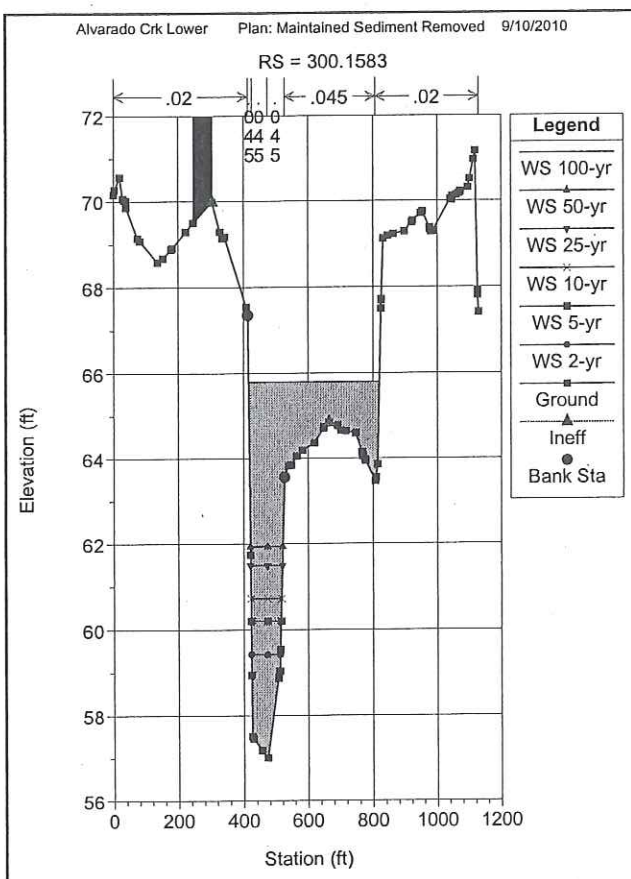
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta
Elevation (ft)
Station (ft)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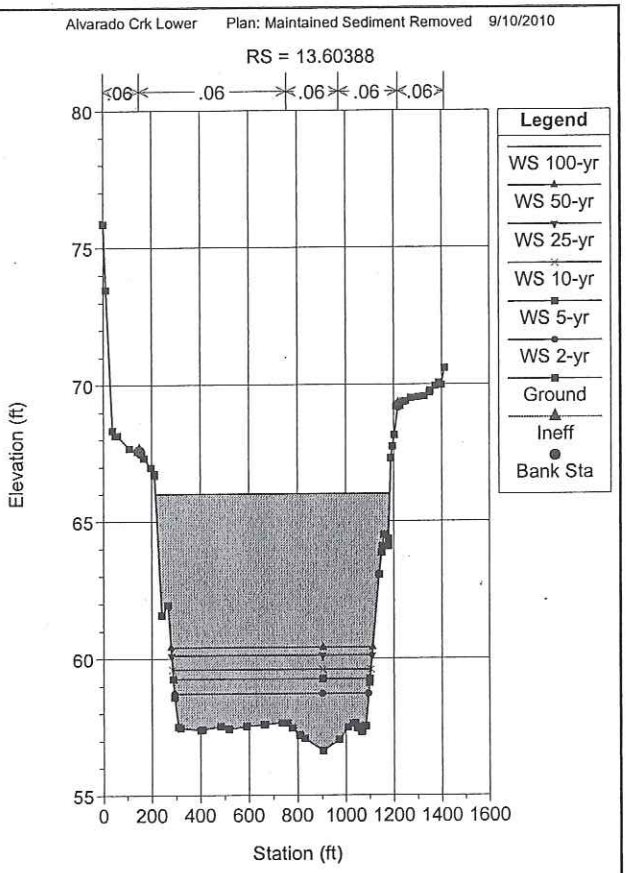
.02
.045
.02
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Alvarado Crk Lower Plan: Maintained Sediment Removed 9/10/2010
RS = 13.60388
.06
.06
.06
.06
.06
Legend
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

HEC-RAS Version 4.0.0 March 2008
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
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PROJECT DATA
Project Title: Alvarado Crk Lower
Project File : AlvaradoCrkLower.prj
Run Date and Time: 9/10/2010 9:27:45 AM

Project in English units

Project Description:
City of San Diego - 1st Year Maintenance
J-15541A October 13,
2009
Utilized 1999 City 2-foot Contour Topo (NGVD 29)
Alvarado Creek
(Lower/Westerly Portion)
Helix Map Number 59 and 60 - Phase A Priority

PLAN DATA

Plan Title: Maintained Sediment Removed
Plan File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.p08

Geometry Title: Maintained Condition Sediment Removed
Geometry File : w:\15541-
A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g08

Flow Title : Maintained Condition
Flow File : w:\15541-
A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f04

Plan Description:
model output

Plan Summary Information:
Number of: Cross Sections = 16 Multiple Openings = 0

```
        Culverts          =    1    Inline Structures  =    0
        Bridges           =    0    Lateral Structures =    0

Computational Information
    Water surface calculation tolerance  =  0.01
    Critical depth calculation tolerance =  0.01
    Maximum number of iterations         =  20
    Maximum difference tolerance         =  0.3
    Flow tolerance factor                =  0.001

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



FLOW DATA

Flow Title: Maintained Condition
Flow File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.f04

Flow Data (cfs)

  River           Reach          RS              100-yr          50-yr
25-yr          10-yr          5-yr          2-yr
  Alvarado(west)  Lower Reach    3415.773          5100          4500
3800           2700           2050          1180

Boundary Conditions

  River           Reach          Profile                       Upstream
Downstream

  Alvarado(west)  Lower Reach    100-yr
Known WS = 66
  Alvarado(west)  Lower Reach    50-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach    25-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach    10-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach    5-yr
Normal S = 0.0013
  Alvarado(west)  Lower Reach    2-yr
Normal S = 0.0013



GEOMETRY DATA

Geometry Title: Maintained Condition Sediment Removed
```

Geometry File : w:\15541-A\AlvaradoCreek\HECRAS\LowerReach\AlvaradoCrkLower.g08

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3415.773

INPUT
Description:
Station Elevation Data num= 52

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	83.93	10.52	83.72	49.34	83.36	70.68	83.34	100.85	83.38
109.41	83.29	130.02	71.42	131.95	70.64	137.65	70.64	156.95	70.64
159.47	72.36	160.66	72.71	167.65	74.77	169.83	75.63	188.02	82.83
194.79	83.06	215.5	83.25	236.72	83.43	246.85	83.49	277.39	83.28
293.32	83.17	309.77	83.06	333.91	82.93	338.78	82.86	362.9	82.73
374.16	81.39	392.18	80.28	400.42	79.82	401.41	79.79	407.16	79.67
455.28	79.7	459.96	79.94	464.45	80.31	465.99	80.33	492.85	80.61
494.47	80.65	497.4	80.72	499.2	80.77	503.06	80.83	504.06	80.86
514.76	81.12	553.49	82.42	566.92	82.25	568.15	82.26	569.27	82.29
582.64	82.6	600.74	82.89	602.56	82.94	622.5	83.36	631.58	83.4
632.75	83.39	637.02	83.47						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	109.41	.016	131.95	.018	156.95	.016	188.02	.02

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff	Contr.	Expan.
109.41	194.79	137.5	139	140.2	.1	.3	

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	100.85	83.38	F
246.85	637.02	83.49	F

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 3276.77*

```
INPUT
Description:
Station Elevation Data    num=      87
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta
Elev
       0  83.464  10.203  83.282  47.853  82.908  57.912   82.87   68.55
82.86
   78.536  82.867   95.21  82.806  97.811  82.784 106.114  82.642  122.62
81.05
  124.269  72.115  126.64  70.741 127.925  69.991 128.563   69.81 133.714
69.81
   153.56   69.81 157.804  72.292 160.824  73.011 161.344  73.176 162.794
73.798
  166.854  75.542 174.728  78.926  186.01   80.72 198.199  81.183 199.611
81.189
  207.024   81.26 229.233  81.463 239.834  81.541 240.606   81.54 244.373
81.55
  246.082  81.557 262.636  81.598 264.407  81.587 269.281  81.561 271.797
81.542
  288.469  81.416 305.685  81.287 330.949  81.122 336.046  81.057 341.505
81.021
  341.882  81.017 361.289  80.831 366.466  80.379 373.074  79.816  373.13
79.813
  391.933  78.928 397.255  78.699 400.557  78.586 401.593  78.569  404.08
78.544
  406.778  78.471 407.611  78.444  411.04  78.381 421.012  78.423 452.889
78.55
  453.995  78.553 457.972  78.625 460.415  78.754  462.87  78.865 467.569
79.176
  469.181  79.206 480.755  79.404 489.639  79.427 496.698  79.603 497.292
79.618
  498.987  79.677 502.054  79.782 503.938  79.852 507.977  79.968 509.024
80.008
  520.222  80.396 541.316   81.26 560.756  81.713 574.812  81.595 576.099
81.603
  577.271  81.624 589.045  81.815 591.264   81.84 591.545  81.841 610.207
82.054
  612.112   82.09  632.98   82.4 639.329  82.421 642.483  82.453 643.708
82.455
  646.558  82.511 648.177  82.524

Manning's n Values        num=      6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n
Val
       0     .02 106.114    .016 128.563    .018  153.56    .016  186.01
.02
  648.177     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
       122.62  186.01           345.32  350.14  353.92             .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  185.35 648.177  81.724         F

CROSS SECTION
```

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2926.628

INPUT
Description:
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	82.29	53.38	81.66	72.39	81.64	87.76	81.37	97.81	81.01
113	72.05	115.78	70.41	120.03	67.71	141.42	67.71	145.03	67.71
148.04	70.84	153.8	74.06	161.57	78.36	175.86	76.17	177.43	76.16
223.02	76.64	227.21	76.74	229.11	76.79	247.52	77.21	249.49	77.2
254.91	77.19	335.23	76.46	335.65	76.45	362.99	75.94	370.4	75.85
397.23	75.43	404.82	75.53	407.82	75.41	412.56	75.13	423.65	75.26
459.1	75.66	460.33	75.67	467.47	76.07	490.09	76.78	499.97	76.64
507.82	77.08	557.44	79.91	610.52	79.96	613.3	79.92	666.44	79.99
674.48	80.17	676.28	80.14						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	97.81	.016	120.03	.018	145.03	.016	161.57	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
97.81	161.57	455.11	458.98	464.26	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
161.54	676.28	78.35	F

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
530.39	676.28	90	195.38	332.19	90	0	65.03	90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2467.648

INPUT
Description:
Station Elevation Data num= 131

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
       0   85.14   31.71    83.6   33.83   83.49   34.64   83.42   35.08
83.41
   59.99   81.37   73.72   74.68   82.27   70.11   83.15   69.63   86.73
68.19
   89.02   67.26   92.06   68.64   97.86   71.13  103.24   73.43  113.31
73.68
   146.6   72.29  153.08   72.07  156.92   71.89  165.93   72.07  166.17
72.08
  167.48   72.11   202.5   72.94  245.26   72.82  258.71    72.9  268.41
73.53
  269.48   73.55  294.79   74.91  342.16   76.66  346.46   76.82   346.9
76.83
  352.33   77.04  420.61   77.94  422.58   77.93  442.68   78.03  457.77
78.17
  493.61   78.06  507.21   78.02  507.95   78.05  514.77      78  545.03
77.39
  554.65    77.1   558.3      77   562.9   76.89  592.83   76.22  596.07
76.24
  609.78   76.47  643.62   76.71  645.17    76.7  665.46   76.81  673.24
76.88
     708   77.18   763.5   78.67  770.56   78.32  794.79   79.02  831.94
78.37
  855.73   78.71  859.72   78.76  881.44   79.06  892.44   79.65  895.56
78.63
  902.16   76.75  903.47   77.15  906.73   77.79  909.69   77.14  916.27
76.15
  924.71   76.06  982.71   75.44  989.78   75.49   992.3   75.48  994.07
75.47
  994.82   75.46 1002.08   75.17 1075.12   74.87 1081.44   75.17 1087.78
75.18
 1134.03    76.7 1136.68   76.76 1149.13   77.15 1153.32   77.09 1201.92
76.41
 1209.82   76.35 1225.56   76.12  1254.7   76.16 1273.65   76.22  1290.4
76.3
 1316.22   76.41 1319.91   76.43  1349.5   76.55 1350.69   76.52 1377.48
76.74
 1378.49   76.78 1405.71   77.02 1408.81   76.97 1416.98   77.03 1463.22
77.46
 1464.35   77.47 1465.26   77.38 1465.46   77.33  1492.9   77.32 1495.06
77.49
 1497.02   77.51 1526.26   77.54 1528.61   77.57 1557.48   77.59 1560.29
77.6
 1588.83   77.63 1592.01   77.64 1617.89   77.71 1643.35   77.77 1650.27
77.81
 1675.79   77.87 1677.17   77.88 1702.31   77.94 1703.75   77.95  1727.8
77.87
 1732.13   77.89 1735.39   77.86 1758.02   77.78 1761.23   77.75 1763.95
77.79
  1784.6   77.72 1787.59   77.76 1790.47    77.8 1810.66   77.74 1813.79
77.78
 1820.99   77.81  1838.1   77.88 1855.62   77.95 1868.06   77.94 1868.49
77.93
 1878.22   77.98

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
```

```
       0    .035   59.99    .045   82.27    .035   97.86    .045  113.31
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        59.99  113.31           232.89  236.01  234.37              .1
.3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
  457.77 1878.22   78.17       F
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev    Sta L   Sta R    Elev
  393.47   449.7      90  1007.94 1212.91      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 2231.639

INPUT
Description:
Station Elevation Data     num=      120
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     76.8    12.75    75.85    17.94    75.04    51.03    73.41    51.81
73.4
    52.64    73.35     54.8    73.36    56.84    72.84    80.96    68.39    81.55
68.28
    83.35    67.85    92.65    67.42   102.28    67.26   105.78    67.18   107.28
67.35
   108.73    67.41    119.2    68.15   120.35    68.23   124.25    68.47   125.11
68.93
    130.5    71.14   132.75    72.19   144.53    72.32   146.66    72.33   154.89
72.34
   163.13    72.39   172.13    72.44   200.97    72.59    222.6    72.75   229.84
72.92
   250.17    73.03    264.5     73.1   267.34    73.09   274.94    72.99   287.98
73.17
   291.98    73.34   338.77    73.46   352.25    75.59   358.58    75.57   378.11
76.64
   409.95    77.45   424.63    77.62   428.34    77.74    429.8    77.64   437.38
77.02
   448.59    76.88   465.55    76.73   477.09    76.63   488.11    76.31   513.25
75.49
   517.54    75.56   518.31    75.58   536.09    75.88    541.8    75.85    581.1
76.06
   611.82    75.41    615.4     75.4    627.3    75.69   630.96    75.78   636.47
75.92
   653.45    76.35   658.88    76.34   668.58    76.19   707.85    75.57   742.43
74.25
   749.35     74.2   763.74    74.34    800.8    75.09   816.48    74.89   829.18
74.42
   829.93    74.37   830.73    74.44   833.71    74.31   838.94    74.34    865.2
75
   909.05    76.09   917.31     75.9   966.88    74.57  1003.02    74.72  1049.97
74.77
```

```
 1113.38   74.78 1153.48   75.02 1242.96   75.08 1279.83   74.03 1281.75
73.98
 1314.45   74.01 1329.84   74.17 1334.15   74.24 1350.52   74.82  1379.5
74.47
  1430.9   74.43 1469.75   74.96  1516.6   75.29 1527.23   75.55 1539.52
76.78
 1545.51   77.26 1565.11   77.18 1611.43   76.59 1631.79   77.54 1640.26
77.82
 1672.84   77.77 1719.97   77.73 1741.31   77.53 1760.68   77.35 1780.39
77.16
 1802.24    77.4 1849.81   77.16 1880.35   76.86 1910.12   77.41 1912.12
77.42
 1936.96   77.47 1970.04   76.62 1982.33   76.31 1990.43   76.76 2006.08
78.02
 2008.62   78.15 2009.51   78.23 2014.93   78.64 2020.55   78.77 2034.15
79.03

Manning's n Values          num=        4
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val
       0    .025     54.8    .035    81.55    .025    119.2      .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
            0  132.75             16.13   16.91   37.54              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  428.34 2034.15   77.74         F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  184.32  275.65      85  340.74  396.32      87  552.57  607.29      85
  856.96 1244.13      85 1807.53 1866.52      87  2031.7 2034.15      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 2214.731

INPUT
Description: Drop Strucure at Old Road Crossing
Station Elevation Data    num=      132
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     78.8     4.69    78.26    19.99    77.13    31.38    75.35    32.65
75.36
   47.05    74.64    60.75    74.49    75.72    73.53    95.88     68.7    98.81
67.95
  102.07    67.35    102.3    67.29   103.51    67.24    104.5    67.22   105.37
67.21
  117.44    67.15   118.92    67.14   119.21    67.22   128.26     69.4    143.1
72.97
  147.52    72.88   154.75    72.74   160.75    72.57   182.67    72.73   192.62
72.61
   193.9    72.63   202.04    72.79   203.03    72.78   212.51    72.63   248.98
72.52
```

```
  251.05   72.53   271.5   72.51  302.09    72.8  304.45   72.82   305.5
72.87
  313.36   73.25  350.18   73.13  351.51   72.93   353.9   73.43  358.18
74.32
   368.7    76.5  376.42   75.82   377.9   75.85  380.05   75.81  390.48
76.33
  394.76   76.55  404.34   77.03  405.94   76.97  411.53   76.77  439.48
75.92
  447.47   75.73  451.19   75.64  480.79   75.01  483.64   75.07  496.29
75.38
  505.79   75.61  526.86   75.57  580.21   75.84  608.69   75.63  609.25
75.62
  621.32   75.58  627.49   75.57  662.49   75.98  709.38   75.88  743.92
75.81
  808.08   75.14  842.46   74.58  847.52   74.44   850.1   75.33  851.67
75.84
   853.5   75.75  863.11   75.73  896.48   75.71  940.17   75.67  942.15
75.68
  970.19   74.78  995.12   74.37 1085.56   74.41 1125.08   74.38 1176.36
74.69
 1223.87   74.93 1267.55      75 1298.95   74.42 1308.02   74.18 1312.54
74.17
 1339.62   74.15 1356.07   74.13 1358.46   74.16 1362.15   74.33 1370.72
73.27
 1375.79   72.41  1381.3    72.4 1385.28   72.39 1386.68   72.37 1443.12
72.05
 1450.89   72.15 1451.83   72.14 1458.42   72.22 1472.94   72.54 1505.43
74.16
 1512.29   75.72 1513.91   76.23 1530.37   75.83  1550.2   75.66 1553.68
75.62
 1560.85    76.2 1573.52   77.27 1574.42   77.36 1599.33   77.39 1640.48
77.53
 1644.68   77.62 1681.27    76.5 1698.12   76.47 1703.78   76.46 1749.14
76.81
 1764.78   76.68 1814.25    77.5 1830.66   77.69 1879.63   77.79 1905.43
77.53
  1957.8   78.01 1977.52   78.05 2014.28   75.94  2016.6   75.81 2020.51
75.99
 2035.53   77.45 2040.76    78.2 2042.13    78.4 2046.47   78.66 2048.95
78.81
  2049.4   78.84 2088.99   77.99

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    47.05    .035    95.88    .035   128.26    .035    143.1
.035
  202.04     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
         47.05   143.1             31.05   46.04   52.74              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  404.34 2088.99   77.03         F
Blocked Obstructions      num=        7
```

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
224.9	275.77	90	363.14	373.41	90	883.42	1272.26	90
1579.78	1738.28	90	1834.2	1893.63	90	1952.63	1999.56	90
2059.58	2088.99	90						

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 2168.688

INPUT
Description:
Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.11	8.42	80.99	28.98	79.2	35.51	78.16	41.11	77.81
41.46	77.79	49.04	76.92	49.21	76.77	49.37	76.92	82.88	75.61
97.93	74.76	101.97	74.53	108.09	70.47	109.72	69.35	114.08	66.38
116.39	66.55	133.68	67.83	135.76	68.42	137.48	68.92	152.33	73.19
154.59	73.2	164.21	72.76	214.35	72.55	235.29	72.76	236.86	72.78
272.29	73.21	276.75	73.19	313.88	73.62	322.66	73.67	332.02	73.76
371.42	74.39	391.58	74.46	391.98	74.47	397.41	74.66	412.65	75.38
429.65	75.99	432.12	75.63	436.98	74.8	453.7	75.15	469.65	75.49
482.13	75.32	503.89	74.94	511.34	74.86	515.46	75.09	543.35	75.57
578.89	75.92	605.69	75.33	622.05	75.8	627.14	75.96	661.78	75.97
675.45	75.76	676.55	75.73	687.84	75.78	695.12	75.81	695.54	75.83
702.92	75.86	717.53	75.85	726.03	75.89	734.98	75.93	755.29	76.02
755.55	76.04	758.4	76.21	771.81	76.4	796.33	76.73	803.08	76.59
803.36	76.57	819.66	76.78	835.81	76.97	836.04	77	839.41	77.22
878.82	76.85	890.04	76.59	890.63	76.56	906.91	76.39	914.08	76.32
921.68	76.25	921.89	76.27	925.47	76.52	948.37	75.75	972.75	74.93
979.07	74.72	1009.42	73.57	1012.54	73.52	1023.73	73.49	1076.49	73.36
1078.47	73.37	1185.18	73.35	1241.16	73.1	1320.75	72.86	1323.48	72.88
1346.75	73.01	1381.97	74.25	1386.87	74.49	1395.25	74.58	1434.3	74.94
1437.78	74.92	1450.87	74.37	1477.49	74.27	1545.68	74.56	1578.98	76.66

```
 1580.24   76.68  1600.5    75.9 1628.93   74.48 1647.38   75.39 1693.93
75.3
 1716.25   75.27 1717.43   75.26 1744.84   76.44 1761.11   76.02  1787.9
75.88
 1828.77   75.93 1850.39   75.79 1872.58    75.7 1885.99   75.68 1916.24
76.57
 1917.11   76.58 1943.96   76.56 1944.71   76.54 1949.43   76.48  1987.9
76.01
 2041.55   76.43 2068.14    76.8 2081.25   76.55 2105.17   76.72  2114.6
76.66
 2120.74   77.58 2121.39   77.68 2122.26    77.7 2137.68    78.4 2168.38
79.02

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025   101.97    .045   109.72    .035   137.48    .045   152.33
.035
  272.29     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        49.04  154.59           187.46  186.87  184.07              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R    Elev  Permanent
  839.41 2168.38   77.22        F
Blocked Obstructions      num=        7
   Sta L   Sta R    Elev    Sta L   Sta R    Elev    Sta L   Sta R    Elev
  345.94  374.87      90   934.55  972.18      90 1452.21 1548.05      90
 1649.05 1720.79      90 1912.43 1972.34      90 2033.15  2077.5      90
 2162.07 2168.38      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1981.81*

INPUT
Description:
Station Elevation Data     num=      251
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    84.65    26.29    83.82    34.24    83.75    43.66    79.05    44.52
78.91
    47.34     78.5    52.63    76.51    55.06    76.27    107.5    73.68   117.48
73.69
   121.54    73.87   135.14     74.5   143.27    69.08   147.09    66.53   147.68
65.66
   148.53    65.28   177.68    65.28   207.09    71.78   208.92    71.79   268.97
71.61
   286.29    71.45   307.37    71.27   338.31    70.93   355.82    71.08   365.49
72.96
   369.68    74.21   377.15    74.57   377.34    74.58   416.58    75.18   431.39
75.55
```

438.57	75.49	441.25	75.26	446.5	74.73	446.53	74.73	447.41
74.74								
464.69	74.97	479.6	75.17	482.02	75.21	495.2	75.14	495.57
75.13								
519.21	74.69	525.53	74.6	526.93	74.58	527.3	74.57	527.45
74.58								
531.78	74.69	534.83	74.69	558.57	75.12	562.07	75.19	566.34
75.25								
575.21	75.28	591.17	75.32	595.15	75.33	596.68	75.36	600.68
75.42								
610.05	75.38	629.79	75.12	647.56	75.44	650.52	75.5	653.09
75.55								
659.03	75.54	690.71	75.13	702.01	74.87	705.56	74.84	706.76
74.82								
719.02	74.85	726.93	74.87	727.38	74.88	734.55	74.9	735.4
74.9								
737.22	74.9	741.72	74.88	751.27	74.85	760.39	74.86	760.5
74.85								
761.86	74.75	770.23	74.33	770.31	74.33	792.29	74.42	792.57
74.43								
795.66	74.55	803.95	74.64	810.23	74.71	836.87	74.98	844.2
74.9								
844.5	74.89	862.21	75.06	877.87	75.21	879.75	75.22	880
75.24								
880.63	75.27	882.41	75.33	883.66	75.38	903.19	75.24	904.6
75.24								
926.47	75.09	937.3	74.92	938.66	74.9	939.3	74.88	956.98
74.75								
964.77	74.69	973.02	74.64	973.25	74.65	977.14	74.82	982.5
74.7								
1002.01	74.21	1016.6	73.84	1026.81	73.63	1028.5	73.6	1035.36
73.48								
1067.38	72.79	1068.33	72.77	1071.72	72.74	1075.9	72.73	1083.87
72.74								
1116.24	72.75	1141.18	72.72	1143.33	72.72	1157.48	72.72	1168.23
72.74								
1188.8	72.74	1220.62	72.75	1242.14	72.77	1259.24	72.79	1263.52
72.79								
1284.77	72.76	1296.37	72.73	1317.63	72.7	1320.05	72.7	1340.83
72.72								
1352.43	72.7	1375.57	72.73	1406.21	72.77	1406.5	72.77	1409.47
72.79								
1411.86	72.8	1429.2	72.9	1434.74	72.93	1452.11	73.35	1457.55
73.48								
1473	73.85	1474.96	73.91	1478.32	74.02	1487.43	74.1	1492.48
74.14								
1497.72	74.18	1523.24	74.4	1524.84	74.42	1528.71	74.45	1529.84
74.46								
1533.62	74.46	1542.16	74.26	1546.07	74.18	1547.84	74.13	1559.5
74.14								
1563.3	74.15	1576.71	74.17	1576.76	74.17	1590.26	74.25	1593.88
74.28								
1599.15	74.27	1605.48	74.22	1612.17	74.23	1641.73	74.42	1650.83
74.45								
1671.79	75.3	1677.32	75.46	1678.5	75.49	1685.57	75.66	1686.62
75.68								

```
    1687    75.69 1688.37    75.68 1694.08    75.44 1707.61    75.07 1710.37
75
  1715.6    74.82 1729.14    74.35 1741.25    73.94 1743.77    74.01 1758.45
74.41
  1761.3    74.48 1766.09    74.46  1787.6    74.39 1809.31    74.32 1811.86
74.31
  1814.8     74.3  1836.1    74.25 1836.55    74.24 1837.39    74.24 1841.87
74.34
 1863.68    74.88 1866.55    74.97 1867.16    74.99 1884.83    74.77 1890.81
74.78
 1893.48    74.78 1913.93    74.79 1918.05    74.81 1922.99    74.83 1943.12
74.93
 1958.32       75  1963.6    74.99 1966.08    74.99 1981.81    74.99 1993.67
75.01
 1996.27    75.01 2005.91    75.03 2010.02    75.04 2011.77    75.04 2020.48
75.07
 2025.49    75.18 2027.27    75.22 2050.95    75.75 2053.34     75.8 2053.68
75.8
 2054.28    75.81 2065.97    75.82 2068.59    75.82 2080.89    75.84 2083.45
75.85
 2084.26    75.84 2089.39    75.81 2093.29    75.78 2095.88    75.77 2108.29
75.7
 2110.77    75.68 2131.18    75.57 2132.22    75.57 2153.97    75.72 2156.53
75.76
 2172.18    75.77     2188    75.78 2189.45    75.78 2192.15    75.78 2218.33
75.9
 2223.84    75.81 2232.57    75.68 2244.23    75.68     2246     75.7 2258.56
75.7
 2266.53    75.64     2268    75.62  2268.8    75.61 2275.47    76.22 2276.18
76.29
 2277.12     76.3 2291.02    76.67 2293.87    76.75 2314.07    76.97 2315.36
76.98
 2327.22    77.11

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .025   135.14    .016   147.68    .018   177.68    .016   207.09
.02
 2327.22     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        135.14  207.09           187.46  186.87  184.07              .1
.3
Ineffective Flow      num=        1
   Sta L   Sta R     Elev  Permanent
  431.39 2327.22    75.55         F

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1794.94*

INPUT
Description:
```

Station Elevation Data num= 284

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	81.19	4.26	81.18	5.08	81.18	6.52	81.18	22.45	80.64
27.51	80.3	31.85	80.2	32.12	80.2	38	77.89	52.39	77.7
58.55	74.89	61.08	74.06	69.65	71.17	71.34	70.66	74.1	69.83
78.27	67.28	79.14	66.73	79.38	66.58	82.36	64.39	112.36	64.39
113.07	67.76	114.26	68.23	115.24	68.63	116.58	69.17	123.17	71.69
123.71	71.89	125	71.69	136.27	71.91	141.68	71.86	177.73	71.67
180.08	71.66	186.14	71.69	194.75	71.82	195.06	71.83	196.77	71.87
197.29	71.89	219.61	72.55	221.45	72.61	242.96	73.26	243.6	73.27
262.99	73.43	268.22	73.45	272.38	73.48	296.82	73.59	298.16	73.61
311.75	73.74	322.05	73.83	324.18	73.85	333.02	73.84	344.49	73.85
368.42	73.86	378.95	74.23	379.22	74.23	402.85	74.15	403.32	74.15
408.5	74.18	409.69	74.19	413.56	74.23	415.25	74.26	417.57	74.32
417.67	74.33	419.23	74.36	427.56	74.56	447.49	74.98	450.38	74.89
456.05	74.66	456.08	74.66	457.03	74.67	475.69	74.79	491.77	74.89
494.39	74.93	508.62	74.96	509.02	74.95	534.53	74.44	541.35	74.31
542.87	74.29	543.27	74.28	543.42	74.28	548.1	74.28	551.4	74.24
577.02	74.72	580.8	74.8	585.41	74.9	594.97	74.87	612.2	74.81
616.5	74.79	618.15	74.83	622.46	74.91	632.58	75.03	653.89	74.91
673.07	75.09	676.27	75.12	679.03	75.14	685.45	75.11	719.65	74.29
731.84	73.93	735.68	73.92	736.96	73.91	750.2	73.92	758.74	73.93
759.23	73.94	766.97	73.94	767.88	73.94	769.84	73.93	774.7	73.91
785.01	73.86	794.86	73.83	794.98	73.82	796.45	73.61	805.47	72.73
805.56	72.72	829.28	72.82	829.59	72.83	832.93	72.9	841.88	72.96
848.65	73.01	877.4	73.23	885.31	73.21	885.64	73.2	904.75	73.35
921.66	73.47	923.69	73.48	923.96	73.49	924.64	73.5	926.56	73.52
927.91	73.54	948.99	73.42	950.51	73.45	974.12	73.33	985.8	73.22
987.27	73.21	987.96	73.2	1007.05	73.1	1015.46	73.06	1024.37	73.03

1024.61	73.03	1028.81	73.11	1034.6	73.04	1055.66	72.67	1071.4	72.39
1082.42	72.29	1084.24	72.27	1091.65	72.23	1126.21	71.98	1127.24	71.97
1130.89	71.95	1135.41	71.95	1144.01	71.98	1178.95	72.09	1205.87	72.07
1208.19	72.08	1223.47	72.08	1235.07	72.11	1257.27	72.11	1291.62	72.13
1314.85	72.19	1333.31	72.24	1337.93	72.24	1360.86	72.27	1373.38	72.25
1396.32	72.28	1398.94	72.29	1421.37	72.4	1433.88	72.4	1458.87	72.51
1491.94	72.67	1492.25	72.67	1495.45	72.69	1498.04	72.71	1516.75	72.81
1522.73	72.85	1541.49	73.12	1547.35	73.21	1564.03	73.45	1566.14	73.49
1569.78	73.55	1579.6	73.62	1585.05	73.66	1590.72	73.7	1618.26	73.92
1619.98	73.94	1624.16	73.97	1625.39	73.98	1629.47	74	1638.68	73.93
1642.9	73.91	1644.81	73.9	1657.4	73.95	1661.5	73.97	1675.98	74.06
1676.02	74.06	1690.6	74.18	1694.51	74.22	1700.2	74.18	1707.03	74.06
1714.25	74.04	1746.16	74.31	1755.97	74.35	1778.6	74.83	1784.57	74.82
1785.84	74.81	1793.48	74.75	1794.61	74.73	1795.01	74.73	1796.49	74.68
1802.67	74.41	1817.26	74.15	1820.25	74.1	1825.89	73.98	1840.5	73.67
1853.58	73.4	1856.3	73.42	1872.14	73.55	1875.21	73.58	1880.39	73.54
1903.6	73.45	1927.03	73.34	1929.79	73.33	1932.96	73.31	1955.96	73.22
1956.44	73.22	1957.34	73.21	1962.18	73.25	1985.72	73.46	1988.82	73.53
1989.48	73.54	2008.55	73.53	2015	73.56	2017.89	73.58	2039.96	73.7
2044.41	73.73	2049.74	73.77	2071.47	73.94	2087.88	74.06	2093.57	74.09
2096.25	74.1	2113.23	74.19	2126.03	74.27	2128.84	74.29	2139.24	74.35
2143.68	74.38	2145.56	74.39	2154.97	74.46	2160.38	74.55	2162.3	74.58
2187.85	74.99	2190.43	75.03	2190.8	75.03	2191.45	75.03	2204.06	75.07
2206.9	75.08	2220.18	75.13	2222.93	75.14	2223.81	75.13	2229.35	75.13
2233.56	75.13	2236.35	75.13	2249.75	75.12	2252.42	75.13	2274.45	75.12
2275.58	75.13	2299.05	75.27	2301.82	75.32	2318.71	75.23	2335.78	75.14
2337.35	75.12	2340.26	75.09	2368.53	75	2374.48	74.92	2383.9	74.8
2396.48	74.73	2398.39	74.76	2411.94	74.68	2420.55	74.6	2422.14	74.57

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    2423    74.57  2430.2    74.87 2430.96     74.9 2431.98     74.9 2446.98
75.06
 2450.06     75.1 2471.86    75.16 2473.25    75.16 2486.05     75.2

Manning's n Values          num=         9
     Sta    n Val      Sta    n Val      Sta    n Val      Sta    n Val      Sta    n
Val
       0     .025       38     .025    69.65     .016    82.36     .018   112.36
.016
  113.07     .025      125       .02   262.99      .02 2486.05      .02

Bank Sta: Left    Right     Lengths: Left Channel    Right      Coeff Contr.
Expan.
            38      125            200.87  200.23  197.23              .1
.3
Ineffective Flow      num=         1
   Sta L    Sta R     Elev  Permanent
633.3748 2486.0575.61819         F

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 1594.709

INPUT
Description:
Station Elevation Data      num=       164
     Sta      Elev      Sta      Elev      Sta      Elev      Sta      Elev      Sta
Elev
       0     81.24       3.6     81.26      4.29     81.27     32.08     81.53     38.54
81.45
    42.88     78.55      47.5     74.42     55.83     69.17     62.95      65.2     65.36
63.65
    95.36     63.65    104.12     68.94    108.05     71.03    109.14     71.61    127.14
71.39
   166.03     71.16    168.57     71.15     175.1     71.21    184.39     71.43    186.57
71.5
   187.13     71.52     236.4      73.4    237.09     73.41    268.14     73.62     294.5
73.66
   295.95     73.67    324.02     73.93    345.93     73.81    371.75     73.66    383.11
74.14
   414.98     73.94    420.44     73.91    422.27     73.92    424.77     73.97    424.88
73.98
   426.56     73.99    466.28     74.58    467.34     74.59    504.82      74.6    522.99
74.76
    558.3     74.01    559.94     73.99    560.54     73.97    569.14     73.76    596.78
74.29
   605.83     74.52    616.15     74.43    634.74     74.26    639.37     74.21    641.16
74.26
   656.72     74.65    703.85     74.71    713.76     74.66     763.8     72.93     801.7
72.92
    804.8      72.9    810.04     72.86    831.79     72.73     833.5     72.38    843.33
71
   882.51     71.16    968.58      71.6     971.8     71.61    973.87     71.58    998.07
71.48
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  999.71   71.52 1037.78    71.4 1090.42   71.27 1130.12   70.83 1142.01
70.84
 1189.25   71.11 1199.17   71.12 1246.15   71.38 1294.17   71.39 1306.69
71.43
 1330.64   71.44 1367.69   71.48 1392.75   71.57 1417.65   71.66 1442.39
71.74
  1455.9   71.75 1480.65   71.84 1507.67   72.05 1521.17   72.07 1548.12
72.28
  1583.8   72.57 1590.38   72.61 1610.57   72.72 1617.02   72.77 1637.25
72.88
 1643.58   72.92 1663.85   73.03 1684.25   73.14 1690.36   73.18 1720.07
73.4
 1721.93   73.42 1726.44   73.46  1742.1   73.58 1746.66   73.63  1762.3
73.74
 1766.72   73.79 1782.34   73.95 1798.11   74.11 1802.33   74.16 1808.47
74.09
 1815.84   73.89 1823.63   73.85 1858.05    74.2 1893.05   74.32 1899.49
74.13
 1900.86   74.08  1909.1   73.77 1910.32   73.71 1919.01    73.3 1934.76
73.16
 1944.06   73.08 1959.83   72.94 1976.87   72.79 1993.96   72.64 2002.86
72.56
  2027.9   72.43 2053.18   72.29 2059.57   72.25  2084.9   72.12  2091.1
72.08
 2116.49   71.94 2119.83   71.98 2148.08   72.26 2151.19   72.29  2179.8
72.58
 2185.55   72.64    2209   72.88 2232.84   73.12 2235.73   73.14 2267.86
73.48
 2270.89   73.51  2286.9   73.68 2288.93    73.7 2304.91   73.87 2306.98
73.89
 2334.55   74.18 2337.73    74.2 2352.04   74.27  2355.1   74.28 2369.42
74.36
 2383.86   74.43 2386.87   74.44 2401.32   74.51 2404.21   74.53 2429.19
74.65
 2454.51   74.78  2457.5   74.85 2475.72   74.65 2494.14   74.45 2498.97
74.36
 2535.88   73.97 2559.62   73.72 2561.68   73.75 2585.58   73.49  2587.3
73.45
  2614.1   73.34 2640.94   73.22 2642.44   73.21 2656.25   73.15

Manning's n Values          num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .02   32.08    .016   65.36    .018  109.14     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.
Expan.
        32.08  109.14           420.75  402.35  377.25            .1
.3
Ineffective Flow      num=       1
   Sta L   Sta R    Elev  Permanent
  522.99 2656.25   74.76        F
Blocked Obstructions      num=       2
   Sta L   Sta R    Elev    Sta L   Sta R    Elev
  251.93  387.55      90    436.7  558.37      90

CROSS SECTION
```

RIVER: Alvarado(west)
REACH: Lower Reach RS: 1192.356

INPUT
Description: Upstream Face of Fairmaont Crossing
Station Elevation Data num= 170

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	76.77	18.93	76.04	21.89	74.65	25.29	74.92	35.1	74.97
40.34	73.23	44.03	71.37	46.29	65.04	47.46	62.46	47.6362.46033	
52.57	62.47	62.7	62.43	79.09	62.42	79.39	62.72	82.17	65.7
87.2	71.07	98.3	73.93	99.47	74.2	101.43	74.1	101.8	74.06
110.38	73.53	111.8	73.52	114.14	73.54	123.79	73.6	125.51	73.72
156.53	73.67	157.07	73.54	161.04	73.58	162.42	73.59	167.25	73.63
168.05	73.75	208.44	74.68	210.42	74.56	213.36	74.41	228.38	73.59
233.28	73.45	243.72	73.63	251.87	73.77	260.77	73.92	269.63	74.02
283.97	74.46	305.4	74.69	313.68	74.89	319.79	74.83	339.44	75.04
342.79	75.01	350.26	74.65	353.09	74.63	353.6	74.6	354.11	74.58
356.48	75.26	394.6	74.94	429.16	74.57	431.36	74.48	438.63	75.37
440.77	75.59	442.53	75.76	448.54	76.25	448.64	76.24	454.45	76.12
457.74	75.5	460.8	75.01	466.44	75.04	483.29	74.47	499.53	74.43
514.59	74.39	538.86	74.05	548.88	73.89	553.46	73.78	554.01	73.81
555.27	73.78	595.7	72.73	608.77	72.47	621.83	72.28	658.25	71.62
687.91	71.3	700.08	71.38	751.01	71.76	813.92	71.82	821.41	71.78
862.82	71.97	887.32	71.93	901.82	71.92	929.54	71.51	932.56	71.5
934.69	71.49	937.68	71.51	938.79	71.52	1029	72.21	1033.02	72.24
1069.62	72.48	1084.18	72.45	1159.78	72.56	1194.18	73.13	1194.99	73.15
1196.07	73.18	1248.61	74.31	1249.84	74.3	1267.16	74.63	1356.36	75.17
1374.72	75.27	1379.93	74.47	1383.42	74.45	1391.79	74.54	1398.41	74.61
1419.11	74.79	1425.07	74.2	1432.86	73.3	1476.57	75.45	1478.13	75.52
1480.72	75.56	1481.32	75.58	1556.48	76.09	1580.63	76.34	1644.38	75.89
1653.98	76.15	1682.03	76.98	1687.06	77.16	1688.73	77.04	1692.49	76.96

```
 1696.11   76.55 1697.49   76.47 1747.83   74.25  1764.6   72.03 1774.73
71.24
 1781.54    70.5 1784.97   70.15 1786.06   70.06 1786.58    70.1 1790.93
70.38
 1840.62   73.72 1845.09   73.92  1850.6   73.99 1854.08   74.87 1856.38
75.48
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=        5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.46    .018    79.09    .016    99.47
.02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          35.1   99.47           150.44  150.57  156.21              .3
.5
Ineffective Flow      num=        2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97        F
  448.54 2616.93   76.25        F
Blocked Obstructions      num=        6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  771.98  844.79      90 1272.38 1373.24      90 1481.65 1571.21      90
 2109.13 2197.69      90 2348.88 2459.84      90  2574.5 2616.93      90

CULVERT


RIVER: Alvarado(west)
REACH: Lower Reach         RS: 1117

INPUT
Description:
Distance from Upstream XS =       25
Deck/Roadway Width        =      110
Weir Coefficient          =      2.6
Upstream  Deck/Roadway Coordinates
    num=        2
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    35.1   74.97               99    74.1

Upstream Bridge Cross Section Data
```

Station Elevation Data num= 170

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	76.77	18.93	76.04	21.89	74.65	25.29	74.92	35.1	74.97
40.34	73.23	44.03	71.37	46.29	65.04	47.46	62.46	47.6362.46033	
52.57	62.47	62.7	62.43	79.09	62.42	79.39	62.72	82.17	65.7
87.2	71.07	98.3	73.93	99.47	74.2	101.43	74.1	101.8	74.06
110.38	73.53	111.8	73.52	114.14	73.54	123.79	73.6	125.51	73.72
156.53	73.67	157.07	73.54	161.04	73.58	162.42	73.59	167.25	73.63
168.05	73.75	208.44	74.68	210.42	74.56	213.36	74.41	228.38	73.59
233.28	73.45	243.72	73.63	251.87	73.77	260.77	73.92	269.63	74.02
283.97	74.46	305.4	74.69	313.68	74.89	319.79	74.83	339.44	75.04
342.79	75.01	350.26	74.65	353.09	74.63	353.6	74.6	354.11	74.58
356.48	75.26	394.6	74.94	429.16	74.57	431.36	74.48	438.63	75.37
440.77	75.59	442.53	75.76	448.54	76.25	448.64	76.24	454.45	76.12
457.74	75.5	460.8	75.01	466.44	75.04	483.29	74.47	499.53	74.43
514.59	74.39	538.86	74.05	548.88	73.89	553.46	73.78	554.01	73.81
555.27	73.78	595.7	72.73	608.77	72.47	621.83	72.28	658.25	71.62
687.91	71.3	700.08	71.38	751.01	71.76	813.92	71.82	821.41	71.78
862.82	71.97	887.32	71.93	901.82	71.92	929.54	71.51	932.56	71.5
934.69	71.49	937.68	71.51	938.79	71.52	1029	72.21	1033.02	72.24
1069.62	72.48	1084.18	72.45	1159.78	72.56	1194.18	73.13	1194.99	73.15
1196.07	73.18	1248.61	74.31	1249.84	74.3	1267.16	74.63	1356.36	75.17
1374.72	75.27	1379.93	74.47	1383.42	74.45	1391.79	74.54	1398.41	74.61
1419.11	74.79	1425.07	74.2	1432.86	73.3	1476.57	75.45	1478.13	75.52
1480.72	75.56	1481.32	75.58	1556.48	76.09	1580.63	76.34	1644.38	75.89
1653.98	76.15	1682.03	76.98	1687.06	77.16	1688.73	77.04	1692.49	76.96
1696.11	76.55	1697.49	76.47	1747.83	74.25	1764.6	72.03	1774.73	71.24
1781.54	70.5	1784.97	70.15	1786.06	70.06	1786.58	70.1	1790.93	70.38
1840.62	73.72	1845.09	73.92	1850.6	73.99	1854.08	74.87	1856.38	75.48

```
  1858.9   76.15 1861.82   76.42  1864.2   76.64 1866.65   77.02 1871.47
77.16
 1881.03   77.44 1887.79   77.88 1911.88   78.22 1921.72   78.15 1946.47
79
 1969.69   79.01  1979.5   78.97  1980.5   78.96 2026.36    78.6 2045.29
78.85
 2073.87   79.44 2086.71   79.09 2101.29   78.97 2121.21   78.98 2218.29
78.05
 2263.61   78.13 2297.66   78.65 2299.32   78.67 2300.66   78.26 2307.54
76.13
 2363.75   77.28 2409.66   78.45 2440.17   78.23  2492.2   77.69 2529.08
77.41
 2530.74   77.37  2531.9    77.4 2588.93    77.6 2610.61   77.88 2616.93
77.89

Manning's n Values          num=       5
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02     35.1    .016    47.46    .018    79.09    .016    99.47
.02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          35.1   99.47            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    35.1   74.97          F
  448.54 2616.93   76.25          F
Blocked Obstructions      num=       6
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  771.98  844.79      90 1272.38 1373.24      90 1481.65 1571.21      90
 2109.13 2197.69      90 2348.88 2459.84      90  2574.5 2616.93      90

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    2.34   74.97          124.06    74.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=      54
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta
Elev
       0   74.86     2.34   74.56    17.27   73.56    25.01   73.15    37.44
71.04
   43.21   70.45    44.57   68.08     51.5   64.18    52.78   63.26    56.79
60.37
   65.67   60.35    84.38   60.29    89.53   60.28    92.01   62.96    92.93
63.27
  124.06   73.77    139.8   74.15   146.56   74.22   151.57   74.24   160.28
74.18
  182.96      73   184.47    72.9   186.49   72.88   201.13   71.64   220.44
69.91
  228.66   70.18   250.89   70.72   263.43   70.73   281.27   70.56   309.06
70.69
  328.54   70.72   343.55   70.31   356.64   70.02   359.36      70   361.84
70.48
  370.24   70.68   426.34   71.99   426.54   71.92   427.93   71.93   433.01
72.21
```

```
  436.83   72.42  437.72   72.49  443.44   72.59  482.93   72.79  492.98
72.9
  496.02   72.93  497.59   72.91  517.36   73.05  584.33   72.06  774.58
72.67
  841.08   72.92  848.56   72.84  887.98   72.24  908.45   72.17

Manning's n Values        num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    43.21    .016    56.79    .018    92.01    .016   124.06
.035
  146.56     .02

Bank Sta: Left   Right    Coeff Contr.   Expan.
          2.34   139.8             .3       .5
Blocked Obstructions      num=        1
   Sta L   Sta R    Elev
  499.89  817.02      90

Upstream Embankment side slope                =       0 horiz. to 1.0 vertical
Downstream Embankment side slope              =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins           =    74.1
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1            Box      12       8
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss
Coef   Exit Loss Coef
                 25     110     .018      .018          0                    .4
1
Number of Barrels =  3
Upstream   Elevation =  62.42
Centerline Stations
    Sta.     Sta.     Sta.
   54.36    63.36    72.36
Downstream Elevation =  60.28
Centerline Stations
    Sta.     Sta.     Sta.
   64.16    73.16    82.16

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach        RS: 1041.783

INPUT
Description: Downstream Face of Fairmaon Crossing
Station Elevation Data    num=       54
```

```
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    74.86     2.34    74.56    17.27    73.56    25.01    73.15    37.44
71.04
   43.21    70.45    44.57    68.08     51.5    64.18    52.78    63.26    56.79
60.37
   65.67    60.35    84.38    60.29    89.53    60.28    92.01    62.96    92.93
63.27
  124.06    73.77    139.8    74.15   146.56    74.22   151.57    74.24   160.28
74.18
  182.96       73   184.47     72.9   186.49    72.88   201.13    71.64   220.44
69.91
  228.66    70.18   250.89    70.72   263.43    70.73   281.27    70.56   309.06
70.69
  328.54    70.72   343.55    70.31   356.64    70.02   359.36       70   361.84
70.48
  370.24    70.68   426.34    71.99   426.54    71.92   427.93    71.93   433.01
72.21
  436.83    72.42   437.72    72.49   443.44    72.59   482.93    72.79   492.98
72.9
  496.02    72.93   497.59    72.91   517.36    73.05   584.33    72.06   774.58
72.67
  841.08    72.92   848.56    72.84   887.98    72.24   908.45    72.17

Manning's n Values          num=        6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0    .035    43.21     .016    56.79     .018    92.01     .016   124.06
.035
  146.56      .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
          2.34   139.8           116.66  118.13  124.58              .3
.5
Blocked Obstructions      num=        1
   Sta L   Sta R    Elev
  499.89  817.02      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 923.6518

INPUT
Description:
Station Elevation Data      num=       41
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0     71.8    28.48    70.51    48.23    69.81    48.51   69.657    60.29
63.2
   62.89    61.77    65.67    59.76     77.5    59.76     86.4    59.76    89.98
61.47
   95.85    63.11   115.82    68.66   128.53    68.84   166.16    69.32   175.37
69.36
```

```
  194.56   68.86  198.66    68.9  203.24   68.95  207.36   69.14  267.19
69.68
  295.45   69.32   310.7   68.88  337.01   67.64  361.62   68.34  405.48
69.72
  411.15    70.5  412.49   70.69  416.65   72.01  417.74   72.35  429.87
72.53
  459.15   72.49  472.74   72.51   492.7   72.22  540.06   72.34  572.32
72.43
  614.53   72.58  684.11   72.81  726.53    71.6  728.33   72.72  792.37
72.94
  821.37   72.42

Manning's n Values          num=       6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02    48.51    .016    62.89    .018    95.85    .016   115.82
.035
  166.16     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        48.51  128.53           217.42  216.97  218.99              .1
.3
Blocked Obstructions      num=       4
   Sta L   Sta R    Elev   Sta L   Sta R    Elev   Sta L   Sta R    Elev
  197.27   297.6      90  346.43  364.51      90  476.23  770.33      90
   21.29   48.51      90

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 706.6820

INPUT
Description:
Station Elevation Data      num=       44
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0    71.26    20.07    71.23     41.3    70.92    61.42    70.53    72.14
70.36
   78.67    67.53    90.76    62.68    98.97    59.38   122.39    58.79    129.2
59.88
  145.25    62.74   168.96    66.95   171.58    66.94   177.87     66.8   242.61
65.66
  247.27    65.87    294.8    67.45   316.09    67.07   348.94    67.08   374.67
66.83
   390.3    66.67   415.05    66.76   420.51    66.79   421.71    66.71    426.1
66.38
  446.87    66.62   457.84    66.78   461.67    67.55   466.39    68.48   475.46
71.07
  478.88    72.18   479.52    72.19   488.24    72.32   514.26    72.66   517.04
70.64
  518.76    69.24   521.16    69.32   534.61    69.06    590.6    68.93   592.93
71.22
  594.97    72.24   619.91    71.97   778.79    72.51   781.74     72.5
```

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.02	72.14	.035	98.97	.035	129.2	.04	168.96	.02

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
72.14	168.96	420.18	406.52	381.53	.1

Blocked Obstructions num= 3

Sta L	Sta R	Elev	Sta L	Sta R	Elev	Sta L	Sta R	Elev
295.09	350.86	90	395.63	420.97	90	514.53	619.15	90

CROSS SECTION

RIVER: Alvarado(west)
REACH: Lower Reach RS: 300.1583

INPUT
Description:
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	70.16	3.03	70.27	19.06	70.56	29.27	70.07	33.47	70.03
38.02	70.02	38.83	69.86	74.82	69.15	81.53	69.08	137.44	68.59
154.02	68.68	179.01	68.89	182.24	68.91	224.14	69.29	247.36	69.5
306.01	69.99	330.3	69.29	337.05	69.15	338.42	69.16	343.69	69.17
407.69	67.55	412.83	67.35	419.76	61.74	423.21	58.94	425.02	57.51
429.49	57.46	454.89	57.18	472.73	57.01	506.78	58.87	506.93	58.88
509.91	59.04	511.61	59.03	513.31	59.54	526.98	63.56	538.51	63.83
548.13	63.84	564.83	64.05	565.8	64.06	583.1	64.19	620	64.36
648.17	64.71	649.27	64.73	664.53	64.84	691.37	64.77	691.92	64.76
702.47	64.66	716.85	64.64	746.66	64.59	765.91	64.14	767.74	64.05
768.78	64.08	775.03	63.98	777.44	63.94	807.38	63.47	808.97	63.55
814.33	63.86	824.4	67.5	824.92	67.7	825.32	67.72	830.9	69.13
845.62	69.19	862.7	69.23	897.15	69.29	919.62	69.5	922.68	69.54
948.41	69.71	954.38	69.75	976.05	69.37	977.36	69.33	980.96	69.28
982.86	69.29	986.42	69.3	1042.11	70.04	1045.54	70.02	1047.77	70.1
1059.86	70.14	1067.83	70.17	1072.13	70.2	1073.11	70.22	1095.86	70.31

```
 1101.11   70.51 1113.44   70.96 1118.04   71.16 1126.02   67.91 1126.29
67.81
 1128.68   67.41

Manning's n Values          num=         6
     Sta   n Val      Sta   n Val      Sta   n Val      Sta   n Val      Sta   n
Val
       0     .02  412.83    .045  425.02    .045  472.73    .045  526.98
.045
  807.38     .02

Bank Sta: Left   Right    Lengths: Left Channel   Right      Coeff Contr.
Expan.
        412.83  526.98           309.26  286.55  277.96              .1
.3
Ineffective Flow      num=         2
   Sta L   Sta R    Elev  Permanent
       0  306.01   69.99        F
  664.53 1128.68   64.84        F
Blocked Obstructions      num=         1
   Sta L   Sta R    Elev
  247.08   307.3      72

CROSS SECTION


RIVER: Alvarado(west)
REACH: Lower Reach          RS: 13.60388

INPUT
Description:
Station Elevation Data      num=        68
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta
Elev
       0   75.85    10.33   73.48    38.53   68.34    51.12   68.16    60.44
68.15
   108.69   67.67   151.29   67.58   156.01   67.55   159.53   67.46   169.58
67.33
   197.14   66.97   210.75   66.75   211.18   66.74   211.62   66.68   241.12
61.57
   266.65   61.95    293.8   58.59   309.91   57.51   318.19   57.47    401.8
57.39
   409.93   57.41    484.2   57.52   516.72   57.43   518.19   57.42   590.01
57.52
   662.74   57.59   664.72    57.6   737.22   57.65   758.62   57.66      779
57.47
   808.53    57.2   810.66   57.19   829.99   57.08   903.54   56.63   971.56
57.03
   972.65   57.04  1009.45   57.49  1032.22   57.63  1039.89   57.65  1048.28
57.46
  1064.18   57.51  1065.22   57.32  1069.26   57.35  1084.27   57.52  1100.33
59.12
  1140.26   63.05  1150.65   63.85   1153.2   64.07  1153.41   64.09   1160.7
64.49
  1178.04   64.07  1178.95   64.36  1188.24    67.3   1194.9   67.73   1202.1
68.16
```

```
 1218.05    69.23 1222.37    69.26 1239.98    69.37 1248.73    69.39 1272.24
69.51
 1302.61    69.55 1326.83    69.57 1348.91     69.7 1352.15    69.77 1372.76
69.94
 1388.62    70.06 1398.96    69.98 1412.03     70.6

Manning's n Values          num=        5
     Sta    n Val      Sta    n Val      Sta    n Val      Sta    n Val      Sta    n
Val
       0      .06  151.29      .06  758.62      .06  971.56      .06 1218.05
.06

Bank Sta: Left    Right    Lengths: Left Channel    Right      Coeff Contr.
Expan.
         151.29 1218.05           23.58    13.6    15.76              .1
.3
Ineffective Flow      num=        2
   Sta L    Sta R     Elev  Permanent
       0  151.29    67.58         F
 1218.05 1412.03    69.23         F


SUMMARY OF MANNING'S N VALUES

River:Alvarado(west)

      Reach          River Sta.        n1        n2        n3        n4
n5        n6        n7        n8        n9

 Lower Reach          3415.773          .02      .016      .018      .016
.02
 Lower Reach          3276.77*          .02      .016      .018      .016
.02       .02
 Lower Reach          2926.628          .02      .016      .018      .016
.02
 Lower Reach          2467.648         .035      .045      .035      .045
.02
 Lower Reach          2231.639         .025      .035      .025       .02
 Lower Reach          2214.731         .035      .035      .035      .035
.035       .02
 Lower Reach          2168.688         .025      .045      .035      .045
.035       .02
 Lower Reach          1981.81*         .025      .016      .018      .016
.02       .02
 Lower Reach          1794.94*         .025      .025      .016      .018
.016      .025       .02       .02       .02
 Lower Reach          1594.709          .02      .016      .018       .02
 Lower Reach          1192.356          .02      .016      .018      .016
.02
 Lower Reach          1117          Culvert
 Lower Reach          1041.783         .035      .016      .018      .016
.035       .02
 Lower Reach          923.6518          .02      .016      .018      .016
.035       .02
 Lower Reach          706.6820          .02      .035      .035       .04
.02
```

Lower Reach	300.1583	.02	.045	.045	.045
.045	.02				
Lower Reach	13.60388	.06	.06	.06	.06
.06					

SUMMARY OF REACH LENGTHS

River: Alvarado(west)

Reach	River Sta.	Left	Channel	Right
Lower Reach	3415.773	137.5	139	140.2
Lower Reach	3276.77*	345.32	350.14	353.92
Lower Reach	2926.628	455.11	458.98	464.26
Lower Reach	2467.648	232.89	236.01	234.37
Lower Reach	2231.639	16.13	16.91	37.54
Lower Reach	2214.731	31.05	46.04	52.74
Lower Reach	2168.688	187.46	186.87	184.07
Lower Reach	1981.81*	187.46	186.87	184.07
Lower Reach	1794.94*	200.87	200.23	197.23
Lower Reach	1594.709	420.75	402.35	377.25
Lower Reach	1192.356	150.44	150.57	156.21
Lower Reach	1117	Culvert		
Lower Reach	1041.783	116.66	118.13	124.58
Lower Reach	923.6518	217.42	216.97	218.99
Lower Reach	706.6820	420.18	406.52	381.53
Lower Reach	300.1583	309.26	286.55	277.96
Lower Reach	13.60388	23.58	13.6	15.76

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Alvarado(west)

Reach	River Sta.	Contr.	Expan.
Lower Reach	3415.773	.1	.3
Lower Reach	3276.77*	.1	.3
Lower Reach	2926.628	.1	.3
Lower Reach	2467.648	.1	.3
Lower Reach	2231.639	.1	.3
Lower Reach	2214.731	.1	.3
Lower Reach	2168.688	.1	.3
Lower Reach	1981.81*	.1	.3
Lower Reach	1794.94*	.1	.3
Lower Reach	1594.709	.1	.3
Lower Reach	1192.356	.3	.5
Lower Reach	1117	Culvert	
Lower Reach	1041.783	.3	.5
Lower Reach	923.6518	.1	.3
Lower Reach	706.6820	.1	.3
Lower Reach	300.1583	.1	.3

Lower Reach	13.60388	.1	.3