Memorandum JE Fuller/ Hydrology & Geomorphology, Inc.

FINAL

DATE: November 29, 2001

TO: Joe Tram, P.E. - FCDMC

FROM: W. Scott Ogden, P.E.

RE: FCDMC On Call 2000C005 – Task 4
Detailed Floodplain Delineation
T1NR6WS05
Zone A Study Sections 50 to 60

CC: Jon Fuller, P.E. – JE Fuller

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Registered Professional Engineer (Civil) CERTIFICATE NO. 28857 W. SCOTT OGDEN Date Signed 11/29/01 ARIZONA, U.S.A.

INTRODUCTION

This technical memorandum summarizes the assumptions made and procedures implemented for conducting the hydrology, hydraulics, floodplain delineation and floodplain mapping work of Task 4 of the FCDMC 2000C005 on-call contract. The purpose of Task 4 was to perform sufficient analyses, modeling, and floodplain delineation mapping to update a target reach of wash from Zone A to a Zone AE complete with base flood elevations and a jurisdictional floodway. The results of this task will be used by the Flood Control District of Maricopa County (District) to perform in-house floodplain management of the newly created Zone A floodplains.

PROJECT LOCATION

The project area is generally located within Sections 7, and 18, Township 1 North, Range 5 West, Gila & Salt River Base & Meridian, Maricopa County, Arizona. The specific study area is in Unincorporated Maricopa County, extending north and south of Buckeye Road and west of 347th Avenue. A recent FCDMC floodplain delineation contract entitled; *Zone A – Floodplain Delineation of Watershed "PP", Luke Wash* [1] (herein referred to as the Zone A Study), has delineated and mapped several unnumbered A zone flood hazard areas for Watershed "PP" using approximate methods. One of the watercourses within that study area, T1NR5WS05 (locally referred to as Dickey Wash) is the focus of this detailed floodplain delineation analyses. More specifically, the study reach primarily lies between Sections 50 and 60. Pertinent excerpts from the Zone A Study are provided in Appendix A for reference.

PROJECT MAPPING

Base topographic mapping, orthophotography, and mass point files for this project were provided by the District and were originally developed as a part of the Zone A Study. The topographic mapping is based on LIDAR technology, which is capable of producing an extremely dense network of individual elevation points. The contour mapping provided, however, does not accurately depict the topography along the bottom area of

[1] Entellus, 2000, *Zone A – Floodplain Delineation of Watershed "PP", Luke Wash*, FCD 99-03, Technical Data Notebook Volumes 1 and 2.

the watercourse where heavy vegetation exists. This is due to LIDAR's inability to effectively remove those points that are actually shots on the tree canopy or the top of a bush, etc. These tree and bush top points tend to skew the contour mapping in the more heavily vegetated areas. Supplemental survey data was therefore acquired along each of the cross section locations modeled, to better define the actual ground geometry in the immediate vicinity of the main wash. The LIDAR mass point file was loaded and the cross section overbank geometry data were hand-digitized using appropriate mass spot elevations that were considered to reflect the ground surface. The study reach was also checked during the field reconnaissance to generally verify the cross section data selections. A coordinate and elevation listing of the surveyed points is provided in Appendix B.

REACH DESCRIPTION

The study reach of River T1NR5WS05 consists of a main channel with an approximate 10 foot bottom width and 3 to 4 foot channel banks. The majority of the study reach channel banks are lined with dense vegetation. The floodplain is relatively wide with sparse vegetation in the overbanks. Several structures lie within the floodplain and are susceptible to overbank flooding.

On a larger scale, watercourse is generally situated within the alluvial plain of the piedmont and tends to be fairly well incised and riverine in planform. Several small tributaries draining comparatively small areas confluence with the modeled reach. The wash crossing at Buckeye Road is an at-grade dip crossing and is subject to flooding with every rain storm.

A field visit to the study area and reach of watercourse to be delineated was conducted on August 9, 2001. Photographs of the study reach at its crossing with Buckeye Road and in the left overbank area near 349th Avenue and Buckeye Road were taken and noted during the field reconnaissance. Copies of those photographs and field notes are included in Appendix C.

HYDROLOGY

The peak 100-year discharge estimated in the Zone A Study for cross sections 50 to 60 was reported as 2,820 cfs, decreasing to 2,440 cfs at section 60. Additional hydrologic analyses were deemed unnecessary and the discharge rates determined for the Zone A study were used for the detailed floodplain delineation.

HECRAS HYDRAULIC MODELING

HECRAS version 3.0 was used to hydraulically model the study reach for this task. The following discussions briefly summarize the procedures used to develop the modeling parameters and geometry.

Reach Geometry – there is a single river and reach modeled in this task. The river designations follow the Zone A Study naming convention. The reaches are named to correspond to the reach between the Zone A Study cross section numbers. Cross section numbers are derived by adding the distance in river miles that the section is located

upstream of the last Zone A Study cross section, to that downstream section number. For example, cross section 50.193 is located 0.193 miles upstream of the Zone A Study Cross Section 50.

Roughness Coefficients – the Manning's n values used in the Zone A Study are generally adopted for this study with only minor adjustments to the main channel and overbank values to compensate for the local differences in bank station locations and roughness elements. The selected values are summarized in the HECRAS output provided in Appendix E.

C & E Coefficients – all C&E coefficients are set to 0.1 and 0.3, since the overall floodplain limits appear to change gradually.

Cross Sections – the cross sections for this task were generated using the supplemental field survey data, the LIDAR mass point files, and notes made during the field visit. A baseline station of 100+00 (10,000) is set for all of the cross sections at the thalweg line. The cross sections are oriented to be perpendicular to the 100-year floodplain and not necessarily to the thalweg line. Left and right bank stations were set to bracket the incised portion of the main watercourse and to allow for the development of a floodway.

It should be noted that the bank stations are not equivalent to those used in the Zone A Study cross sections. Cross section plots are included Appendix D.

Boundary Conditions – the upstream starting water surface conditions were set to start with critical depth. The downstream starting water surface conditions were set at the approximate energy slope used in the Zone A Study for this reach. Pertinent excerpts from the Zone A Study are provided in Appendix A.

Floodway Encroachments – initial encroachment stations were estimated using Floodway Method 4 (equal conveyance reduction) and target values of 0.9 and 1.0 foot. Once the encroachment limits were acceptable and the rise in water surface was less than 1.0 foot, the Method 4 results were then converted to Method 1 (user defined values).

There are two tributaries that enter the modeled reach between sections 50.245 and 50.476. Per direction of the Flood Control District of Maricopa County, arbitrary floodway limits were delineated up each tributary to the limit of the main branch floodplain. These limits were established by offsetting a distance of 10 feet from the right and left bank of each tributary wash. No analysis was performed in setting the floodway limits for these tributaries. Any continuance of the delineations upstream along each of the watercourses will require an analysis of the junction with the main stem and re-establishment of the floodway limits using equal conveyance reduction methodology.

FINAL RESULTS

The HECRAS floodplain and floodway modeling results are summarized in a tabular format similar to the typical FIS study data tables and provided in Appendix F. General output from the HECRAS model are provided in Appendix E. The floodplain and floodway limits, along with base flood and floodway elevations, are indicated on Exhibit

1 in Appendix G and on Plate 1 which is included in a pocket in Appendix H. A diskette with the HECRAS files is provided in Appendix I.

The HECRAS modeling results indicate that a total of **eight** residential structures exist within the floodplain, none of which are located within the floodway.

APPENDIX A

ZONE A - FLOOPLAIN DELINEATION OF WATERSHED "PP" LUKE WASH F.C.D. CONTRACT NO. 99-03

Technical Data Notebook

Volume 1 of 2

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October, 2000

Slope Calculations

(listed from south to north, west to east)

Wash	Reach	Cross Sections	Reach Length [ft]	Interval Length [ft]	Change in Elevation [ft]	Slope
T1S-R5W-S29	1	10 – 40	4004	4004	20	0.0049
T1S-R5W-S29W	1	10 – 50	6401	6401	40	0.0075
T1S-R5W-S29E	1	80 – 130	8912	1755	10	0.0057
	2	10 – 60	11016	6858	40	0.0058
T1S-R5W-S17	1	90 – 250	17924	17924	40	0.0055
	2	70 – 85	13312	13312	40	0.0047
	3	1 – 60	19123	19123	40	0.0041
T2N-R6W-S35	1	10 – 160	16558	3333	20	0.0060
T1N-R6W-S11	1	10 – 40	9373	1891	10	0.0053
T2N-R6W-S36	1	220 – 350	14146	9231	60	0.0065
	2	10 – 210	17344	7547	40	0.0053
T2N-R6W-S36W	1	10 – 50	7490	4255	20	0.0047
T1S-R5W-S32	1	10 – 160	22855	22855	30	0.0043
(LUKE WASH)						
T1N-R5W-S32	1	10 – 70	9558	1611	10	0.0062
T1N-R6W-S12	1	10 – 60	6626	1358	10	0.0074
T1S-R6W-S13	5	140	2603	1514	10	0.0066
(Phillips Wash South)	6	100 – 130	7092	3974	20	0.0050
	7	50 – 90	12120	6657	30	0.0045
	8	10 – 40	4605	3437	20	0.0058
T3N-R5W-S19	1	320 – 540	13008	13008	60	0.0080
(Phillips Wash North)	2	180 – 310	17298	11321	60	0.0053
	3	140 – 170	4524	10487	60	0.0057
	4	10 – 130	15509	15509	50	0.0064
T2N-R5W-S19	1	10 – 70	10783	3974	20	0.0050
T2N-R5W-S08	1	10 – 90	5812	2100	20	0.0095
T3N-R5W-S31	1	10 – 50	3643	2500	20	0.0080
T3N-R5W-S30	1	1 – 50	2659	2557	20	0.0078
T1N-R6W-S05	1	70 – 110	9847	1534	10	0.0065
(Dickey Wash South)	2	60	3315	2065	10	0.0048
	3	10 – 50	5458	2287	10	0.0044
T2N-R5W-S31	1	140 – 160	5242	2710	20	0.0074
(Dickey Wash North)	2	100 – 130	2686	2686	30	0.0069
	3	10 – 90	8225	8225	30	0.0039
T1N-R5W-S30	1	10 – 80	16876	16876	40	0.0062
T2N-R5W-S32	1	10 – 120	7127	7127	30	0.0079
T1S-R5W-S08	1	10 – 50	4293	4293	30	0.0070
T1S-R5W-S09	1	10 – 130	15063	1817	10	0.0055
T1N-R5W-S33W	1	30 – 100	6596	1488	10	0.0067

Table E.5-1

Slope Calculations

(listed from south to north, west to east)

Wash	Reach	Cross Sections	Reach Length [ft]	Interval Length [ft]	Change in Elevation [ft]	Slope
	2	10 – 20	660	1818	10	0.0055
T1N-R5W-S33N	1	10 – 60	7121	1713	10	0.0058
T1N-R5W-S28W	1	10 – 80	6267	6267	40	0.0061
T1S-R5W-S09W	1	10 – 100	6228	1525	10	0.0066
T1N-R5W-S33E	1	10 – 50	4954	1214	10	0.0082
T1N-R5W-S28E	1	10 – 60	6544	6557	40	0.0058
T1S-R5W-S16	1	10 – 50	5720	5720	30	0.0088
T1S-R5W-S22N	1	10 – 150	8976	658	10	0.0152
T1S-R5W-S22S	1	1 – 110	6872	1843	10	0.0054
T1N-R5W-S22	1	10 – 190	9039	9039	50	0.0085
T1N-R5W-S15	1	10 – 60	6426	1068	10	0.0094
T1N-R5W-S10	1	10 – 90	6554	6554	30	0.0063
T1N-R5W-S04	1	10 – 50	6232	1095	10	0.0091
T2N-R5W-S33E	1	130 – 470	28656	28656	60	0.0043
	2	10 – 120	15395	5714	40	0.0070
T2N-R5W-S33W	1	10 – 120	8095	8095	40	0.0080
T2N-R5W-S21	1	10 – 20	2800	2354	20	0.0085
T2N-R5W-S05E	1	10 – 30	4414	3136	20	0.0064
T3N-R5W-S32E	1	10 – 60	3749	3757	20	0.0053
T2N-R5W-S28	1	10 – 60	5818	2941	20	0.0068
T2N-R5W-S05W	1	10 – 50	4685	2097	20	0.0095
T2N-R5W-S27S	1	10 – 100	10446	3024	20	0.0067
T2N-R5W-S27N	1	110 – 200	10791	2974	20	0.0067
T2N-R5W-S04	1	10 – 50	7772	2268	20	0.0088
T3N-R5W-S28S	1	10 – 50	3393	2293	20	0.0087
T3N-R5W-S28N	1	10 – 160	11103	11103	60	0.0070
T3N-R5W-S20	1	10 – 50	4409	2800	20	0.0071
T3N-R5W-S21S	1	10 – 60	3958	2143	20	0.0093
T3N-R5W-S21N	1	50 – 60	877	832	10	0.0120
	2	10 – 40	2030	4832	20	0.0041

WashSlopesFinal_9_26.wb3

Table E.5-1

SECTION 4: HYDROLOGY

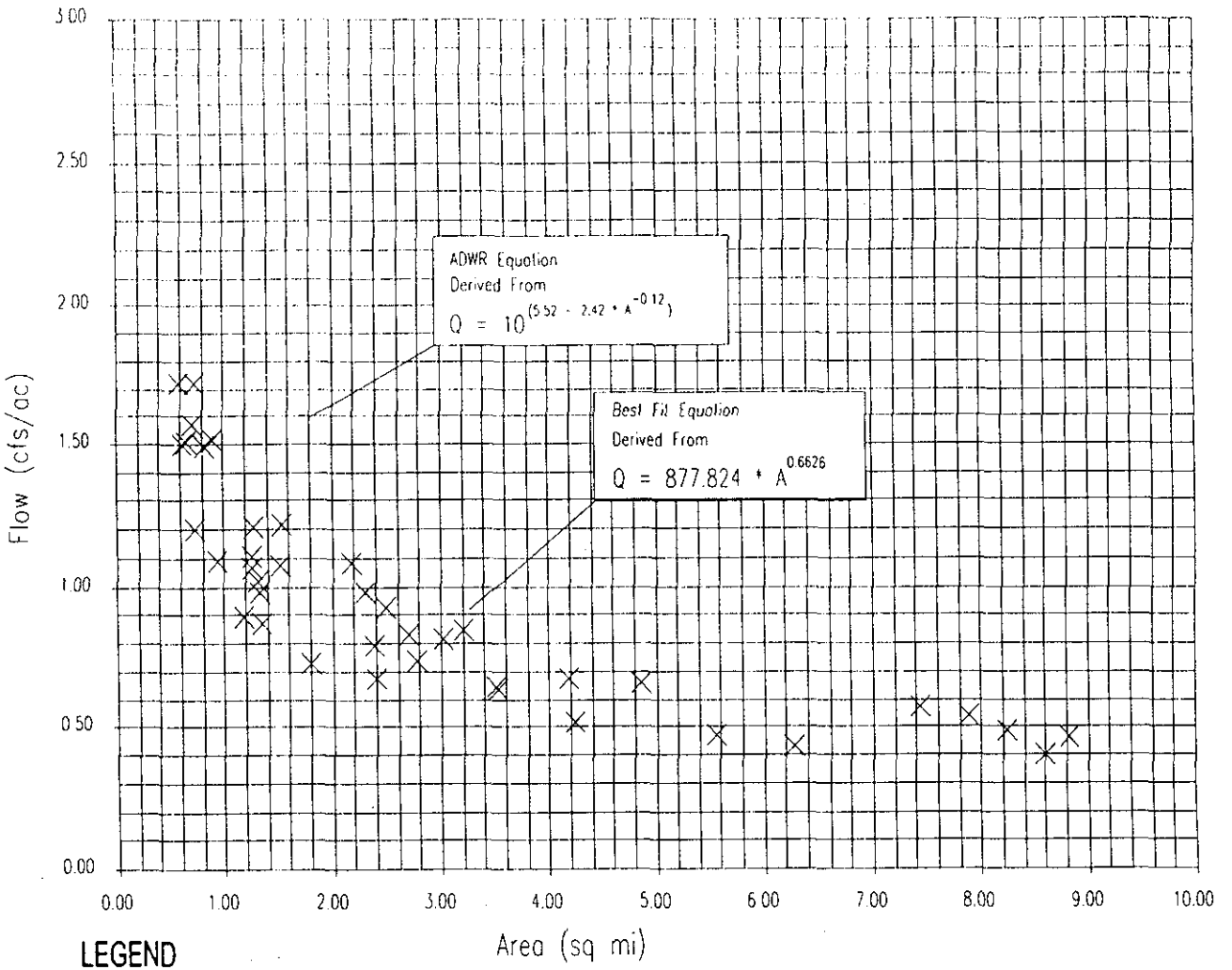
4.1 Method Description

An area/runoff relationship was developed as a means of calculating the 100-year peak flows for this project. This relationship was based on the results of a HEC-1 model developed for the *Luke Wash Flood Insurance Study* prepared by Coe & Van Loo Consultants, Inc. in 1992 (**Reference 3**). The model developed by Coe & Van Loo covers most of the watershed contributing to the washes to be delineated. However, concentration point locations and level of detail encountered in the model are not adequate to develop peak flows for individual washes within the watershed. To obtain the level of detail desired for this project, the flow values obtained from the Luke Wash FIS study were plotted against the contributing area as shown in **Figure 2**. It is apparent that most of the plotted values fall into a narrow band. A line falling at the upper limit of this band was considered to be a conservative estimate of the flow for this particular area. Based on this line, an equation was developed to estimate flows at desired concentration points. The only required parameter for this equation is the contributing area.

4.2 Parameter Estimation

4.2.1 Drainage Area Boundary

Based on the topographic mapping information and aerial photography, the watershed was divided into several sub-basins to obtain the contributing area for desired concentration points. The basin boundaries are shown in **Plates 1 and 2** located in the pockets at the end of this report and half size copies are included at the end of this section.



LEGEND

ADWR Region 13 Equation

Best-Fit Equation for HEC-1 Results

× Results from Arlington ADMS

A = Area (sq mi)

Q = 100-yrt Peak Flow (cfs)

FIGURE 2
Relationship Between Watershed Area and Peak Flow

The basins previously developed under the *Luke Wash Flood Insurance Study* (**Reference 3**) were not used in this study because they do not accurately depict the drainage conditions, in the upstream reaches of the watershed. The hydrology developed under the FIS focused on the lower portion of Luke Wash. Upstream boundaries, even though adequate for the FIS, were not accurate nor detailed enough for the purpose of this study.

4.2.2 Watershed Work Map

The watershed map was based on USGS 7.5 quadrangle topographic maps (**Reference 14**), 1996 aerial photography geo-registered on the State Plain Coordinates System (**Reference 2**), and the LIDAR mapping as described in **Section 3** of this report. The watershed maps are presented in **Plates 1 and 2** located in the pockets at the end of this report. Also half size versions are included at the end of **Section 4 – Hydrology.**

4.2.3 Gage Data

Most of the watercourses in this study are wide shallow streams that are not very well suited for gaging. No gaging stations are located within the study area, and it is unlikely that watersheds similar to the study area are gaged.

4.2.4 Statistical Parameters

The Arizona Department of Water Resources (ADWR) developed regional regression equations for the area (**Reference 4**). However, these equations are very general and, as shown in **Figure 2,** tend to significantly overestimate the peak runoff in the study area. ADWR regression equations were developed based on gage date across the entire region and is better representative of larger, better-defined watercourses.

4.2.5 Precipitation

The methodology used to develop the hydrology for this study does not require the use of precipitation values. The original *Luke Wash FIS*

(**Reference 3**) contains precipitation Values that were use to generate the HEC-1 for the study area.

4.2.6 Physical Parameters

4.2.6.1 Watershed parameters

The only parameter required to develop the hydrology for this project is the drainage area. Drainage contributing areas were estimated from the project's work maps (See **Plates 1** and **2**).

4.2.6.2 Storage routing parameters

Storage does not appear to play a large part in reducing peak flows within the study area. However, both Interstate 10 and the Southern Pacific Railroad could provide some storage. According to the *Luke Wash FIS* (**Reference 3**) the railroad will be overtopped by flows much less than the 100-year event and most likely will be breached by the time the 100-year runoff reaches the railroad. The same study shows that the reduction of flow at Interstate-10 is not significant due to many culvert crossings (see **Appendix E-4**) and limited storage volume available. The methodology used in developing the flows for this project does not consider storage directly. However, since the original study used to develop the peak flow equation includes storage upstream of Interstate-10, this parameter is factored in the calculation of the peak flows. For more details see **Section 4.3**

4.3 Problems Encountered During the Study

4.3.1 Special Problems and Solutions

4.3.1.1 CAP Overchute

There is an overchute crossing the CAP Canal on the northern boundary of the study. The design flow for this structure was not available, and since the area is outside the Luke Wash watershed, it was not included in the FIS model. Developing the hydrology upstream from this structure was outside the scope of work for this project. However, in order to obtain an approximate flow in Wash T3N-R5W-S28N, an analysis was performed to estimate this flow. It was assumed that during a 100-year event, the overchute would be flowing at maximum capacity. The capacity of the structure was estimated assuming critical depth at the drop on the downstream end of the overchute. To be consistent with the rest of the study, this flow was converted to an equivalent drainage area that can be added to the downstream contributing areas to obtain the total downstream flows. For detailed calculations see **Appendix D**.

4.3.1.2 Storage reduction

Storage reduction was not included for this study. However, the hydrological equation developed for this study was based on the flows obtained from the *Luke Wash FIS*, which accounts for storage at Interstate 10. Therefore, the equation reflects some of the effects of storage at Interstate 10 as estimated in the *Luke Wash FIS*.

The flow/area points plotted in **Figure 2** include both areas upstream and downstream from Interstate-10 that do not include storage. However, for the larger areas encountered as flows combine and move downstream crossing Interstate-10, storage effects are included in the plotted points.

4.4 Calibration

Flows estimated for this project are based on the Luke Wash FIS hydrology model previously approved by FEMA. In addition, the results obtained during this study

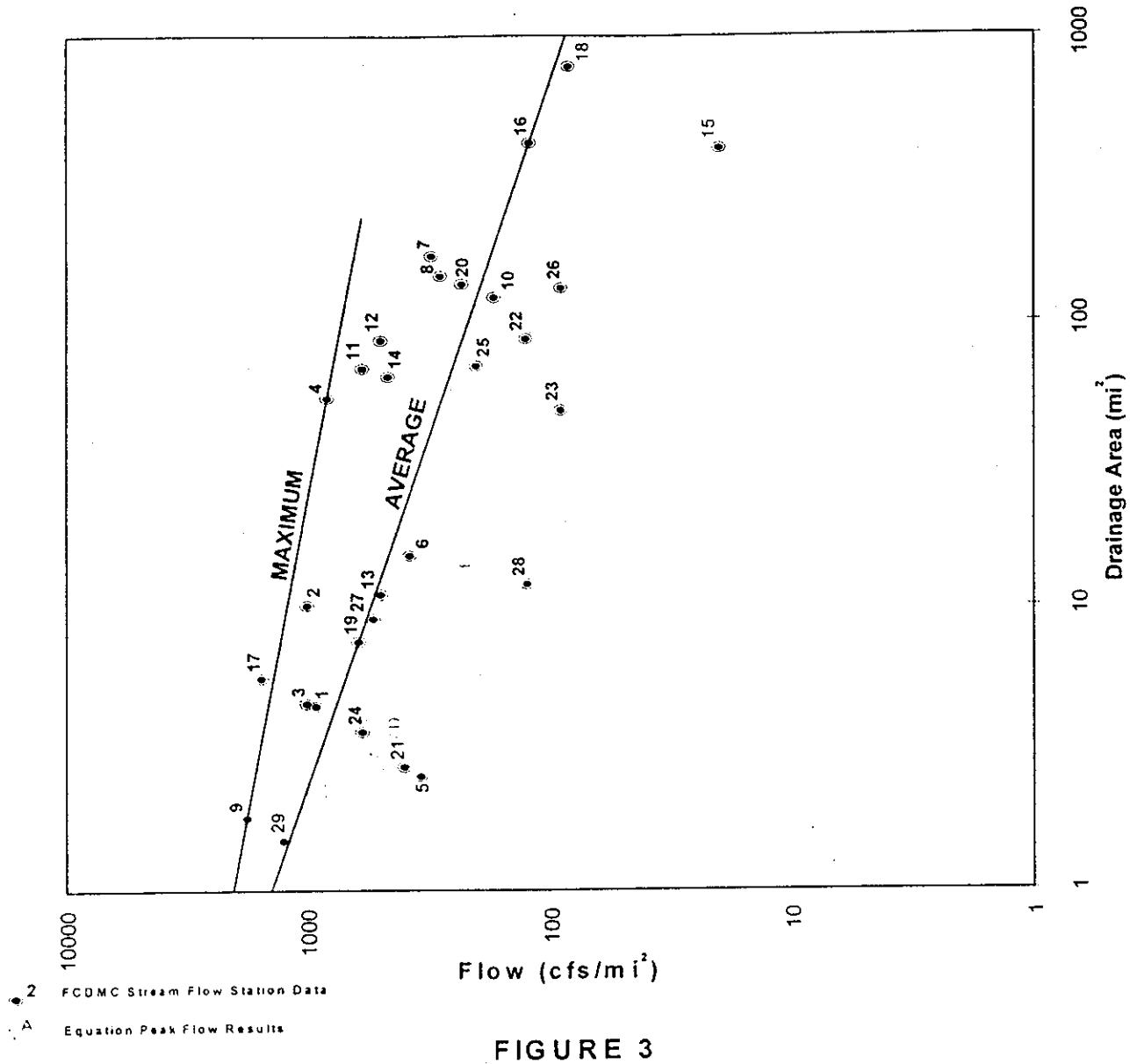
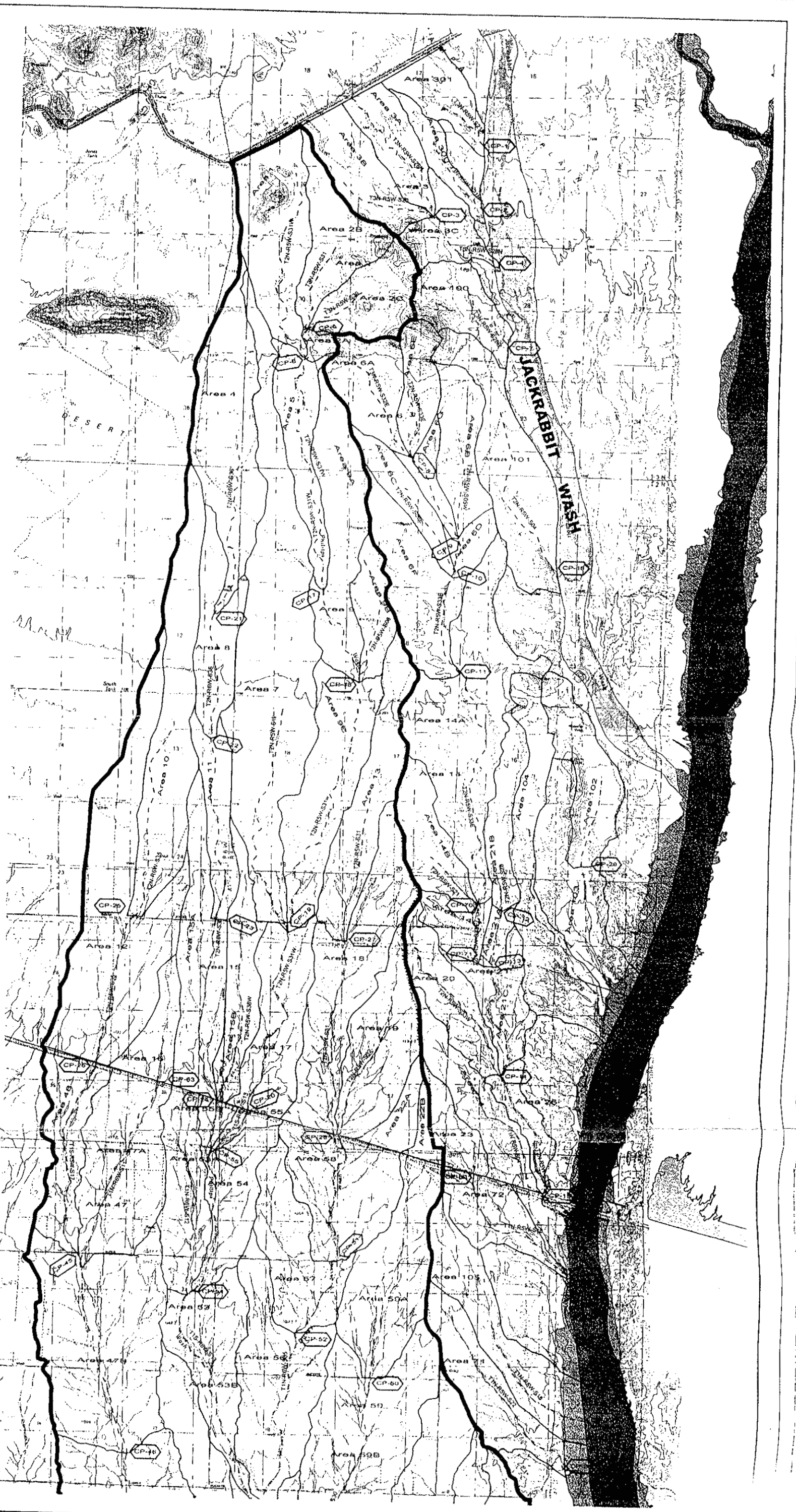


FIGURE 3
VERIFICATION OF RESULTS



FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

PLATE 1

HYDROLOGY MAP

Basin Areas

Basin ID	Area s-ft	Area Acres	Area s-miles
1	25,306,851	581	0.908
2	31,855,170	731	1.143
2A	1,754,495	40	0.063
2B	16,091,257	369	0.577
2C	14,009,418	322	0.503
3	35,798,208	822	1.284
3A	11,433,080	262	0.410
3B	14,850,614	341	0.533
3C	9,514,515	218	0.341
4	31,900,532	732	1.144
5	14,835,226	341	0.532
6	75,383,527	1,731	2.704
6A	14,018,549	322	0.503
6B	13,277,006	305	0.476
6C	8,216,052	189	0.295
6D	4,240,957	97	0.152
6E	9,438,619	217	0.339
6F	21,382,899	491	0.767
6G	4,809,445	110	0.173
7	65,952,557	1,514	2.366
8	15,067,652	346	0.540
9	62,062,529	1,425	2.226
9A	24,376,486	560	0.874
9B	8,726,648	200	0.313
9C	28,959,395	665	1.039
10	33,164,265	761	1.190
11	11,491,508	264	0.412
12	53,158,085	1,220	1.907
13	22,661,704	520	0.813
14	64,371,582	1,478	2.309
14A	44,528,721	1,022	1.597
14B	12,916,483	297	0.463
14C	6,926,378	159	0.248
15	38,779,303	890	1.391
15A	23,671,218	543	0.849
15B	15,108,085	347	0.542
16	8,720,989	200	0.313
17	21,463,250	493	0.770
18	33,974,797	780	1.219
19	22,214,481	510	0.797
20	14,292,768	328	0.513
21	24,630,028	565	0.883
21A	3,032,458	70	0.109
21B	10,173,267	234	0.365
21C	11,424,303	262	0.410
22A	5,727,230	131	0.205
22B	2,790,737	64	0.100
23	7,591,127	174	0.272
24	15,968,893	367	0.573
25	6,693,951	154	0.240
40	21,174,639	486	0.760
41	33,396,534	767	1.198
42	14,155,360	325	0.508
43	42,644,746	979	1.530
44	65,638,270	1,507	2.354

Table D-1

Basin Areas

Basin ID	Area s-ft	Area Acres	Area s-miles
45	137,098,096	3,147	4.918
46	43,600,104	1,001	1.564
47	80,154,530	1,840	2.875
47A	30,053,731	690	1.078
47B	50,100,799	1,150	1.797
48	17,429,759	400	0.625
50	75,351,705	1,730	2.703
51	57,909,033	1,329	2.077
51A	32,672,072	750	1.172
51B	25,236,961	579	0.905
52	8,759,240	201	0.314
53	39,260,625	901	1.408
53A	17,945,547	412	0.644
53B	21,315,078	489	0.765
54	15,643,677	359	0.561
55	5,265,552	121	0.189
55A	2,398,409	55	0.086
55B	2,867,143	66	0.103
56	31,421,870	721	1.127
57	20,567,505	472	0.738
58	25,341,074	582	0.909
59	77,324,681	1,775	2.774
59A	27,389,486	629	0.982
59B	49,935,195	1,146	1.791
60	13,161,943	302	0.472
61	37,151,984	853	1.333
61A	32,616,891	749	1.170
61B	4,535,093	104	0.163
62	63,523,417	1,458	2.279
62A	3,498,438	80	0.125
62B	46,121,651	1,059	1.654
62C	13,903,328	319	0.499
63	18,935,665	435	0.679
64	59,854,661	1,374	2.147
64A	13,825,292	317	0.496
64B	46,029,369	1,057	1.651
65	8,127,157	187	0.292
66	20,334,237	467	0.729
67	17,187,432	395	0.617
70	16,215,186	372	0.582
71	18,678,876	429	0.670
72	12,578,181	289	0.451
100	12,158,040	279	0.436
101	27,575,946	633	0.989
102	17,487,507	401	0.627
103	23,130,300	531	0.830
104	28,202,205	647	1.012
105	23,241,019	534	0.834
106	15,589,052	358	0.559
107	18,990,482	436	0.681
108	7,179,775	165	0.258
300	5,714,321	131	0.205
301	9,989,656	229	0.358
CAP shute	324,000,000	7,438	11.622

FinalBasinAreas_10_2.wb3

Table D-1

Flow Calculations

(listed from south to north, west to east)

Wash	Basin ID No.	Conc. Point	Location	Area [sqmls]	100 yr Flow [cfs]
T1S-R5W-S29	44,43,42,41,40	44	Arlington Canal	6.349	2990
T1S-R5W-S29W	42,41	43L	Ray Rd. Align.	1.706	1250
	42,41,44,43	43C	Ray Rd. Align.	5.590	2750
T1S-R5W-S29E	44	42	Southern Pac R/R	2.354	1550
	44,43	43R	Extension	3.884	2160
	44,43,42,41	43C	Extension	5.590	2750
T1S-R5W-S17	10,12,48	45L	Van Buren	3.722	2100
	10,12,48,47A,16	45C	Van Buren	5.112	2590
	10,12,48,47,16	46	Lower Buckeye	6.910	3160
	10,12,48,47,16,46	47	Salome Highway	8.474	3620
	10,12,48,47,16,46,45	48	Southern Pac R/R	13.391	4900
T2N-R6W-S35	10	25	Indian School Rd	1.190	990
	10,12	26	I-10	3.096	1860
T1N-R6W-S11	16	63	I-10	0.313	410
	16,47A	45R	Van Buren	1.391	1090
T2N-R6W-S36	4	21	Glendale Ave	1.144	960
	4,8	22	Bethany Home Rd.	1.685	1240
	4,8,11	23	Indian School Rd	2.097	1430
	4,8,11,15A	24L	I-10	2.946	1800
	4,8,11,15(15A,15B)	24	I-10	3.488	2010
	4,8,11,15,55B	55L	McDowell	3.591	2050
T2N-R6W-S36W	15B	24R	I-10	0.542	590
T1S-R5W-S32	Phillips,59	59C	Broadway Align.	18.537	6930
(LUKE WASH)	Phillips,59,51B	50R	Salome Highway	22.216	7650
	Phillips,59,51	50C	Salome Highway	23.388	7880
	Phillips,59,51,50	49	Southern Pac R/R	26.091	8390
T1N-R5W-S32	51A	50L	Salome Highway	1.172	980
T1N-R6W-S12	53A	54L	Van Buren	0.644	660
T1S-R6W-S13	1,2,5,9,7,17	20	I-10	7.944	3470
(PHILLIPS SOUTH)	1,2,5,9,7,17,55A	55R	McDowell	8.030	3490
	1,2,5,9,7,17,55A,(4,8,11,15,55B)	55C	McDowell	11.621	4460
	1,2,5,9,7,17,55A,(4,8,11,15,55B),54	54R	Van Buren	12.182	4600
	1,2,5,9,7,17,4,8,11,15,55,54,53A	54C	Van Buren	12.826	4760
	1,2,5,9,7,17,4,8,11,15,55,54,53	53L	Lower Buckeye	13.591	4950
	1,2,5,9,7,17,4,8,11,15,55,54,53,Dickey	53C	Confluenc Dickey	19.398	6260
	1,2,5,9,7,17,4,8,11,15,55,54,53,Dickey,52	59L	Broadway Align.	19.712	6330
T2N-R5W-S31W	1	6L	Dunlap	0.908	820
(PHIILLIPS NORTH)	1,2	6	Dunlap	2.050	1410
	1,2,5	17	Glendale Ave	2.583	1650
	1,2,5,9A	18L	Bethany Home Rd.	3.457	2000
	1,2,5,9A,9B	18	Bethany Home Rd.	3.770	2120
	1,2,5,9(9A,9B,9C)	19R	Indian School Rd	4.809	2490
	1,2,5,9,7	19C	Indian School Rd	7.174	3240
	1,2,5,9,7,17	20	I-10	7.944	3470
T2N-R5W-S19	7	19L	Indian School Rd	2.366	1550
T2N-R5W-S08	9B	18R	Bethany Home Rd.	0.313	410

Table D-2

Flow Calculations

(listed from south to north, west to east)

Wash	Basin ID No.	Conc. Point	Location	Area [sqmls]	100 yr Flow [cfs]
T3N-R5W-S31	2B	5L	Peoria Ave.	0.577	610
T3N-R5W-S30	2C	5R	Peoria Ave.	0.503	560
	2B,2C	5C	Peoria Ave.	1.080	920
	2(2A,2B,2C)	6R	Peoria Ave.	1.143	960
T1N-R6W-S05	13,18,19	28C	I-10 Dickey/2n5w 32	2.828	1750
(DICKEY SOUTH)	13,18,19,58,22A	51	Van Buren	3.943	2180
	13,18,19,58,22A,57	52	Buckeye Rd.	4.681	2440
	13,18,19,58,22A,57,56	53R	Lower Buckeye	5.808	2820
T2N-R5W-S31	13	27	Indian School Rd	0.813	770
(DICKEY NORTH)	13,18	28L	I-10	2.032	1400
	13,18,19	28C	I-10 Dickey/2n5w 32	2.828	1750
T1N-R5W-S30	22B,59A	60	Buckeye Align.	1.083	930
	22B,59A,59B	59R	Broadway Align.	2.874	1770
T2N-R5W-S32	19	28R	I-10	0.797	760
	13,18,19	28C	I-10 Dickey/2n5w 32	2.828	1750
T1S-R5W-S08	60	61	Southern Pac R/R	0.472	530
T1S-R5W-S09	67,66,65	35R	Baseline	1.637	1220
	67,66,65,64B	35C	Baseline	3.289	1930
	67,66,65,64	36	Salome Highway	3.784	2120
	67,66,65,64,62C,62A,63	56	Baseline	5.088	2580
	67,66,65,64,63,62	37	Southern Pac R/R	6.742	3110
	67,66,65,64,63,62,61A	62L	Southern Pac R/R	6.905	3160
	67,66,65,64,63,62,61	62	Southern Pac R/R	7.214	3250
T1N-R5W-S33W	63	57	Baseline	0.679	680
	63,62A	56L	Dobbins Rd.	0.805	760
T1N-R5W-S33N	64B	35L	Baseline	1.651	1220
T1N-R5W-S28W	67	34L	Southern Rd.	0.617	640
	67,66	34	Southern Rd.	1.346	1070
T1S-R5W-S09W	61A	62R	I-10	1.170	970
T1N-R5W-S33E	62C	56R	Dobbins Rd.	0.499	550
T1N-R5W-S28E	66	34R	Southern Rd.	0.729	710
	66,67	34C	Southern Rd.	1.346	1070
T1S-R5W-S16	70	38	Elliot Align.	0.582	610
T1S-R5W-S22N	106	39		0.559	600
T1S-RW-S22S	107	40		0.681	680
	107,108	41		0.939	840
T1N-R5W-S22	71	33	Lower Buckeye	0.670	670
T1N-R5W-S15	105	32	Buckeye Rd.	0.834	780
T1N-R5W-S10	23,72	31	I-10	0.723	710
T1N-R5W-S04	24	15L	I-10	0.573	610

Table D-2

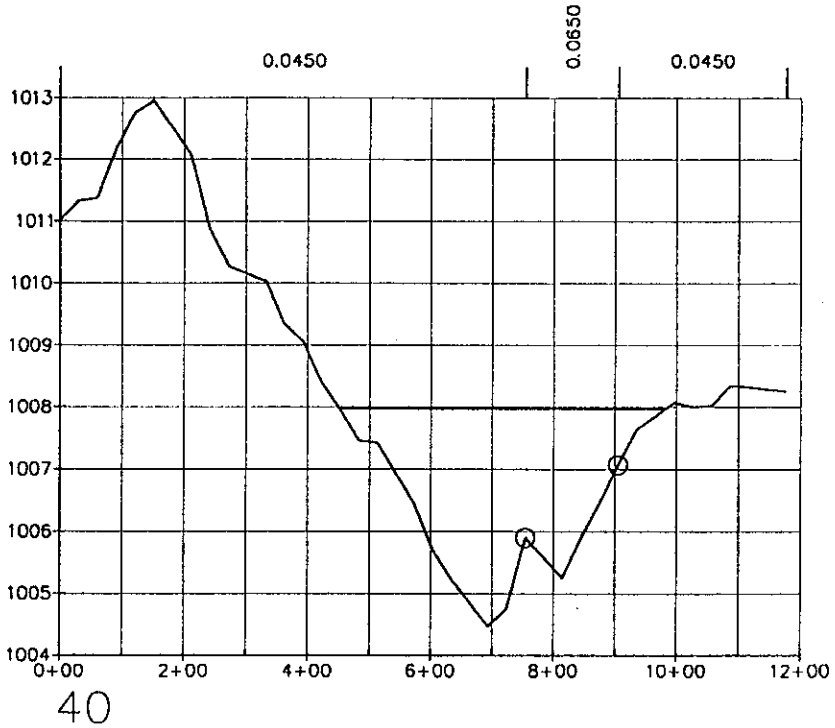
Table D-2

Flow Calculations

(listed from south to north, west to east)

Wash	Basin ID No.	Conc. Point	Location	Area [sqmls]	100 yr Flow [cfs]
T2N-R5W-S33E	6E	8R	Peoria	0.339	430
	6E,6A	8C	Peoria	0.841	780
	6E,6A,6G	9L	Northern Ave.	1.014	890
	6E,6A,6G,6B	9C	Northern Ave.	1.490	1140
	6E,6A,6G,6B,6D	10R	Northern Ave.	1.642	1220
	6E,6A,6G,6B,6D,6C	10C	Northern Ave.	1.937	1360
	6	11	Glendale Ave	2.704	1700
	6,14A	70R	Camelback Rd.	4.301	2310
	6,14A,14B	70C	Camelback Rd.	4.765	2470
	6,14	13L	Indian School Rd	5.013	2550
	6,14,21A,21B	13C	Indian School Rd	5.487	2710
	6,14,21	14R	Thomas Rd.	5.897	2840
	6,14,21,20	14C	Thomas Rd.	6.409	3010
	6,14,21,20,25	15R	I-10	6.649	3080
	6,14,21,20,25,24	15C	I-10	7.222	3250
T2N-R5W-S33W	20	14L	Thomas Rd.	0.513	560
T2N-R5W-S21	14B	70L	Camelback Rd.	0.463	530
T2N-R5W-S05E	6C	10L	Northern Ave.	0.295	390
T3N-R5W-S32E	6A	8L	Dunlap	0.503	560
T2N-R5W-S28	21B	12	Camelback Rd.	0.365	450
	21B,21A	13R	Indian School Rd	0.474	540
T2N-R5W-S05W	6B	9R	Northern Ave.	0.476	540
T2N-R5W-S27S	104	72(30L)	Indian School Rd	1.012	890
T2N-R5W-S27N	102	29	Camelback Rd.	0.627	640
	102,103	30(30R)	Indian School Rd	1.457	1130
		30C	Hassayampa Confl.	2.469	1600
T2N-R5W-S04	101	16	Northern Ave.	0.989	870
T3N-R5W-S28S	100	7	Peoria Ave.	0.436	510
T3N-R5W-S28N	Upstream of CAP estimate		CAP Overshute		4460
	3A	3R	Cactus	0.410	4950
	3A,3B	3C	Cactus	0.943	5300
	3(3A,3B,3C)	4	Peoria Ave.	1.284	5500
T3N-R5W-S20	3B	3L	Cactus	0.533	580
T3N-R5W-S21S	300	2	Cactus	0.205	310
T3N-R5W-S21N	301	1	Thunderbird Rd.	0.358	450
Railroad Crossing	Phillips,59,51,50,10,12,48,47,16,46,45	48,49	Railroad	39.482	10030
at T1S-R5W-S32 and					
T1S-R5W-S17					

FinalFlowSummary_9_26.wb3



Normal Depth Results

Cross-Section:	40	
Elevation:	1007.98	ft MSL
Depth:	3.51	ft
Discharge:	2820.00	cfs
Energy Gradient:	0.0044	ft/ft
Froude Number:	0.2864	
Flow Regime:	Subcritical	
Flow Area:	926.83	sq ft
Average Velocity:	3.03	ft/s
Maximum Velocity:	3.42	ft/s
Composite n:	0.051	
Hydraulic Radius:	1.74	ft
Wetted Perimeter:	532.33	ft
Wetted Top Width:	532.25	ft
Critical Slope:	0.0632	ft/ft

ZONE A - DELINEATION OF WATERSHED "PP"
LUKE WASH FCD 99-03

FIGURE E2 – WASH: T1N-R6W-S05 (DICKEY SOUTH)-40

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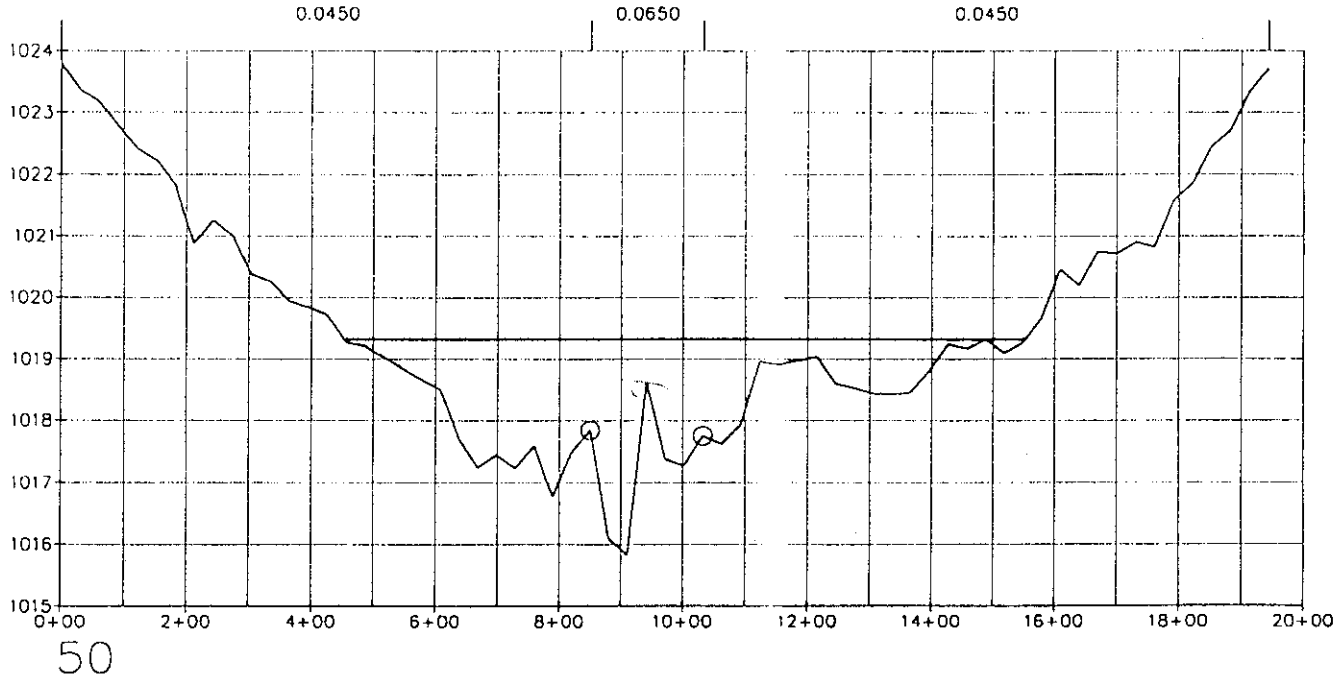
File: WASH-T1N-R6W-S05(DICKEY-SOUTH)_X-SECTION-R14.dwg Date: 9/29/00



Normal Depth Results

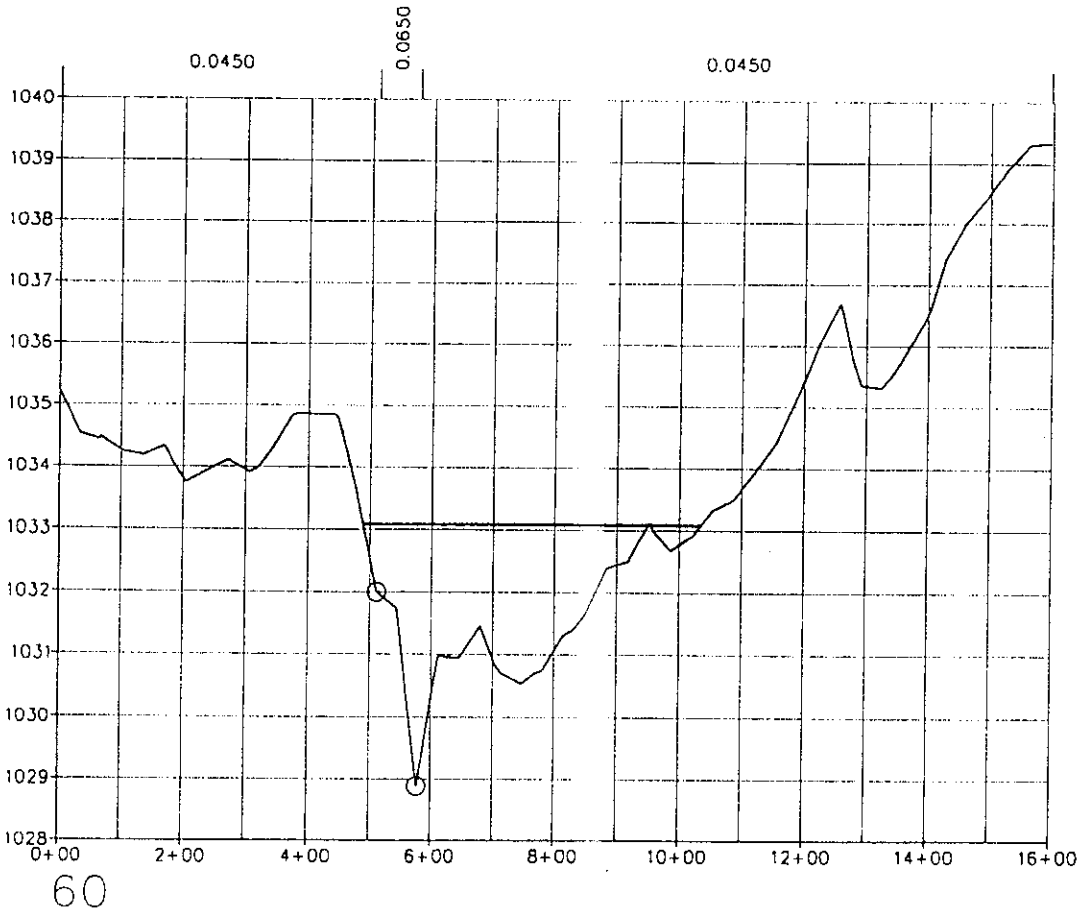
Cross-Section:	50	
Elevation:	1019.32	ft MSL
Depth:	3.50	ft
Discharge:	2820.00	cfs
Energy Gradient:	0.0044	ft/ft
Froude Number:	0.218	
Flow Regime:	Subcritical	
Flow Area:	1219.28	sq ft
Average Velocity:	2.31	ft/s
Maximum Velocity:	2.60	ft/s
Composite n:	0.0485	
Hydraulic Radius:	1.11	ft
Wetted Perimeter:	1100.95	ft
Wetted Top Width:	1100.67	ft
Critical Slope:	0.1044	ft/ft

ZONE A - DELINEATION OF WATERSHED "PP"

LUKE WASH FCD 99-03

FIGURE E2 – WASH: T1N–R6W–S05 (DICKEY SOUTH)–50

Entellus™



Normal Depth Results

Cross-Section:	60	
Elevation:	1033.08	ft MSL
Depth:	4.20	ft
Discharge:	2440.00	cfs
Energy Gradient:	0.0048	ft/ft
Froude Number:	0.2509	
Flow Regime:	Subcritical	
Flow Area:	836.64	sq ft
Average Velocity:	2.93	ft/s
Maximum Velocity:	3.03	ft/s
Composite n:	0.0476	
Hydraulic Radius:	1.54	ft
Wetted Perimeter:	543.54	ft
Wetted Top Width:	543.29	ft
Critical Slope:	0.0778	ft/ft

ZONE A - DELINEATION OF WATERSHED "PP"

LUKE WASH FCD 99-03

FIGURE E2 – WASH: T1N–R6W–S05 (DICKEY SOUTH)–60

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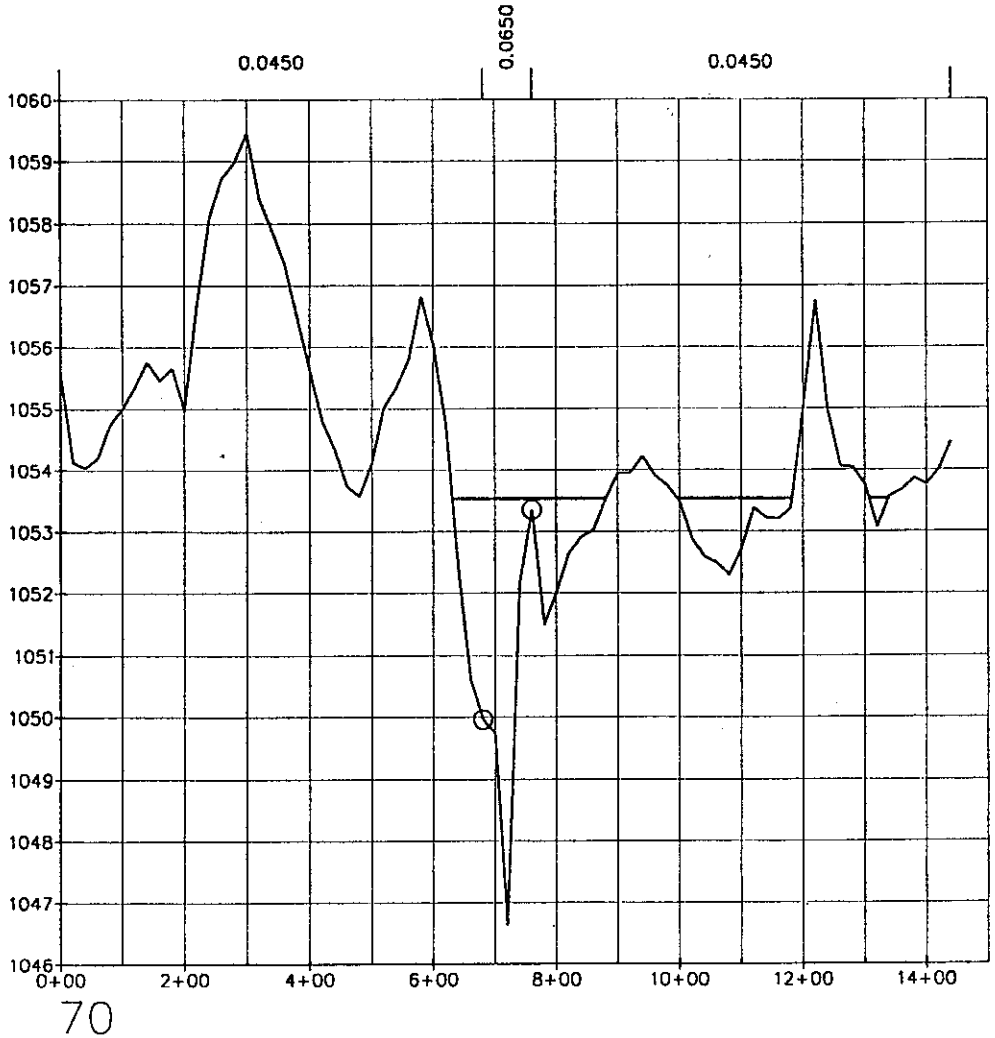

Normal Depth Results

Cross-Section:	70	
Elevation:	1053.53	ft MSL
Depth:	6.91	ft
Discharge:	2180.00	cfs
Energy Gradient:	0.0065	ft/ft
Froude Number:	0.2341	
Flow Regime:	Subcritical	
Flow Area:	624.38	sq ft
Average Velocity:	3.48	ft/s
Maximum Velocity:	4.55	ft/s
Composite n:	0.0487	
Hydraulic Radius:	1.33	ft
Wetted Perimeter:	470.34	ft
Wetted Top Width:	469.00	ft
Critical Slope:	0.163	ft/ft

ZONE A - DELINEATION OF WATERSHED "PP"
LUKE WASH FCD 99-03

FIGURE E2 – WASH: T1N–R6W–S05 (DICKEY SOUTH)–70

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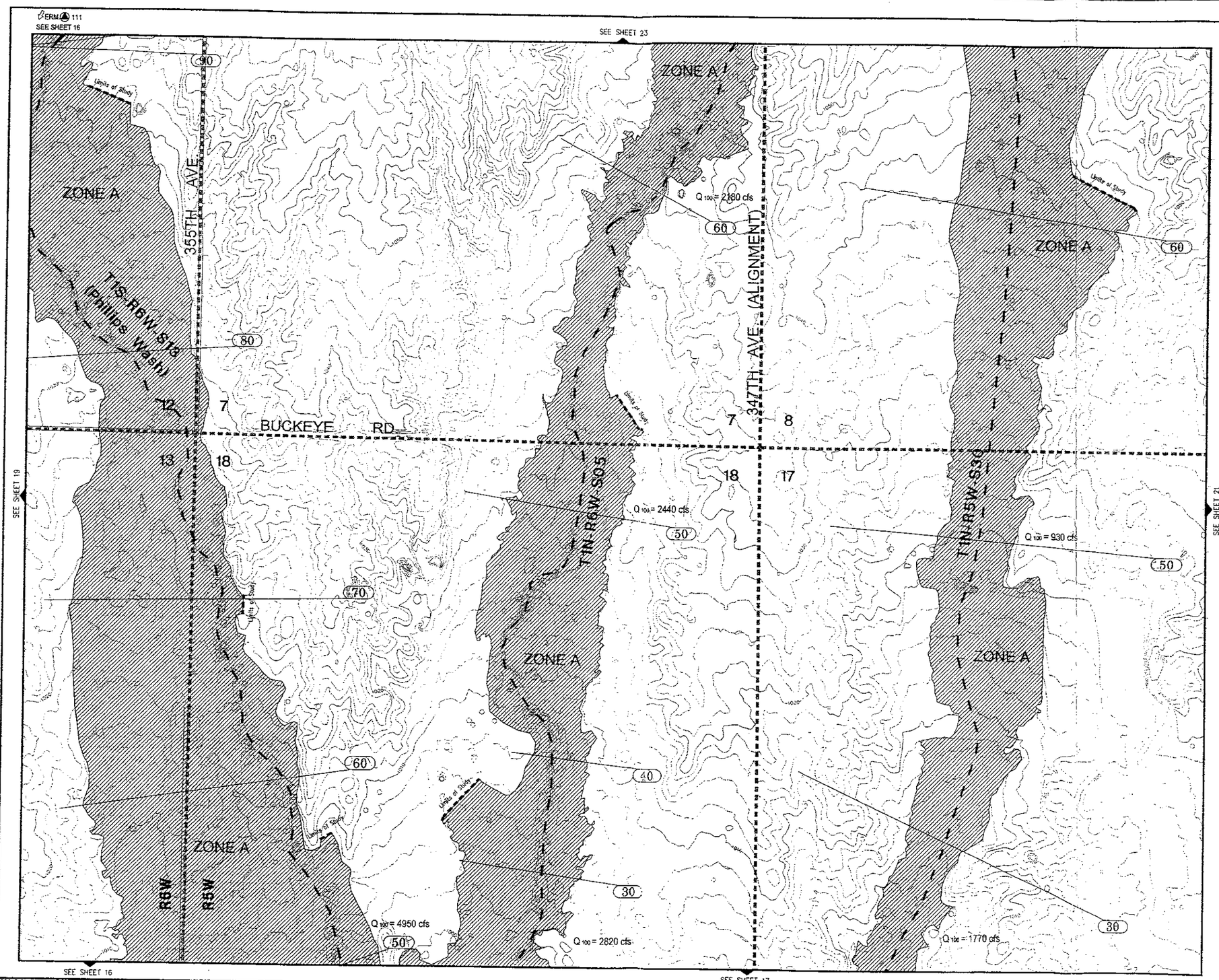


USGS 7.5 MINUTES QUADRANGLE TOPOGRAPHIC MAPPING SUPPLEMENTED W/ LIDAR MAPPING - EAGLE SCAN NOVEMBER 1999

FILE: 310\310010\Dwg\000_Plan_20.dwg DATE: 03/13/2001

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

ZONE A DELINEATION OF WATERSHED "PP" LUKE WASH

F.C.D. CONTRACT NO. 99-03

LEGEND

100-YR. APPROXIMATED ZONE A FLOODPLAIN BOUNDARY	
HYDRAULIC BASE LINE	
CROSS SECTION	30
ELEVATION REFERENCE MARK	ERM 6
ZONE DESIGNATIONS	ZONE A
CORPORATE LIMITS	Corporate Limits
LIMITS OF STUDY	Limits of Study
SECTION LINES	
SECTION CORNER	29 28 / 32 33
WASH I.D. LABEL	T1S-R5W-S22N
EXISTING ZONE A	
EXISTING FLOOD PLAIN	
EXISTING FLOODWAY	
FLOW AT DOWNSTREAM CONC. POINT	Q_{100} = 850 cfs

ELEVATION REFERENCE MARKS

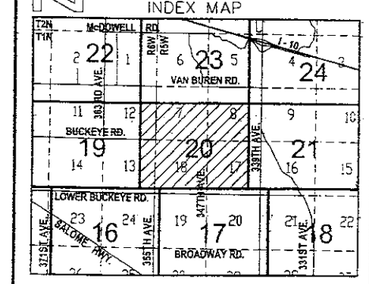
NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

I.D. NUMBER	ELEV. (FT)	DESCRIPTION/LOCATION
111	981.39	Brass Cap in Handhole in Center of Salome Hwy. Approximately 2.35 miles Southeasterly of Wintersburg Rd. (See sheet 16)

NOTES

NGVD 29 + 1.97 FEET = NAVD 88

INDEX MAP



400' 0' 400' 800'

SCALE: 1" = 400'

CONTOUR INTERVAL = 10 - 20 FEET

SUPPLEMENTAL LIDAR MAPPING CI. = 2 FEET

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Phoenix, AZ 85008-3279
Tel 602.344.2666
Fax 602.344.8947
E-mail www.entellus.com

	BY	DATE
DESIGN	HAA/JCS	03/2001
DESIGN CHK.	SEK	03/2001
PLANS	GLT/RCS	03/2001
PLANS CHK.	HAA	03/2001

SUBMITTED BY: DATE:

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

RECOMMENDED BY: DATE

APPROVED BY: DATE

CHIEF ENGINEER AND GENERAL MANAGER

APPENDIX B

10	887003.9	428809	1020.504	BASE	
5	897673.8	425752.8	1077.482	4CK1	
94	866021.3	425482.2	918.425	4AK2	
98	865866	457204.3	920.688	4AI1	
124	897428.6	457319	1105.41	4CI1	
5A	897674	425752.7	1077.577	GRID	
94A	866021.1	425482.2	918.331	GRID	
98A	865866.1	457204.3	920.782	GRID	
124A	897428.4	457319	1105.316	GRID	
11	886346.9	430121.5		ENDPNTS	
12	886654.2	428188.6		ENDPNTS	
13	886843.8	428565.8		ENDPNTS	
14	886683.8	429815.6		ENDPNTS	
15	886920.3	429805.2		ENDPNTS	
16	887018.1	428558.9		ENDPNTS	
17	887123.9	429676.5		ENDPNTS	
18	887126	428871		ENDPNTS	
19	887184.9	429703.7		ENDPNTS	
20	887191.8	428711.5		ENDPNTS	
21	887238.8	429693.3		ENDPNTS	
22	887256.2	428732.4		ENDPNTS	
23	887459.1	429338.9		ENDPNTS	
24	887473.9	428792.3		ENDPNTS	
25	887659.6	429505.9		ENDPNTS	
26	887868.2	428747		ENDPNTS	
27	887818.6	429964.8		ENDPNTS	
28	888126.6	428935.6		ENDPNTS	
29	888066.2	429972.3		ENDPNTS	
30	888343.4	429092		ENDPNTS	
31	888261.4	430098.2		ENDPNTS	
32	888633.8	428888.1		ENDPNTS	
33	888827.5	429759.7		ENDPNTS	
34	888988	428991		ENDPNTS	
35	888860.1	430362.9		ENDPNTS	
36	889400.2	428973.6		ENDPNTS	
37	889133.9	430506.5		ENDPNTS	
38	889938.2	429024.7		ENDPNTS	
200	889938.2	429024.9	1038.706	NG	
201	889477	429962.9	1030.189	TOP	
202	889473	429968.8	1026.889	TOE	
203	889461.9	429984.5	1026.73	TOE	
204	889457.3	429991.4	1031.054	TOP	
205	889396.1	430061.8	1034.47	NG	
206	889133.7	430506.2	1034.711	NG	
207	888859.9	430362.7	1033.579	NG	
208	889119.2	429627.5	1029.477	NG	

209	889174.6	429551.6	1028.238	TOP	
210	889181.8	429547.5	1025.206	TOE	
211	889201	429531.8	1024.458	TOE	
212	889183.9	429488.7	1029.077	TOP	
213	889206.5	429452.6	1029.527	NG	
214	889222.4	429417.5	1028.62	NG	
215	889245.5	429380.7	1029.019	TOP	
216	889243.5	429375.1	1026.972	TOE	
217	889242.4	429372.8	1026.768	TOE	
218	889242.2	429364.4	1029.228	TOP	
219	889372.6	428959.2	1035.162	NG	
220	888988.1	428991.3	1031.592	NG	
221	888877.1	429497.6	1027.462	TOP	
222	888878.6	429508.5	1023.287	TOE	
223	888872.1	429529.3	1023.129	TOE	
224	888872.5	429546.9	1028.033	TOP	
225	888876.3	429668.6	1030.479	NG	
226	888826.2	429759.4	1030.485	NG	
227	888260.9	430099.3	1030.567	NG	
228	888433.9	429513.6	1026.473	TOP	
229	888439.7	429507.9	1021.142	TOE	
230	888444.1	429490	1021.461	TOE	
231	888450.9	429475.8	1024.105	TOP	
232	888456.6	429453	1024.726	NG	
233	888633.7	428887.8	1030.768	NG	
234	888181	429176	1024.863	NG	
235	888284.9	429408.4	1023.77	TOP	
236	888282.2	429413.6	1020.452	TOE	
237	888268.3	429434.7	1020.309	TOE	
238	888255.1	429441.3	1024.642	TOP	
239	888239	429513.8	1026.425	NG	
240	888066.2	429972.3	1027.864	NG	
241	887828	429964.9	1026.299	NG	
242	888050.5	429361.5	1023.741	TOP	
243	888061.1	429349	1019.685	TOE	
244	888073	429328.1	1019.349	TOE	
245	888074.7	429304.5	1023.935	TOP	
246	888067.8	429288	1022.958	TOP	
247	888066.5	429281.5	1019.633	TOE	
248	888066.3	429279.9	1019.697	TOE	
249	888067	429275.8	1022.764	TOP	
250	888126.3	428935.6	1026.876	NG	
251	887869	428745.6	1026.53	NG	
252	887771.8	429171.8	1022.524	TOP	
253	887768.3	429181.7	1017.902	TOE	
254	887773.4	429207	1018.161	TOE	

255	887767.9	429213.8	1022.309	TOP	
256	887659.5	429506.2	1024.479	NG	
257	887460.4	429341.2	1021.75	NG	
258	887390.9	429206.1	1020.777	TOP	
259	887393.8	429181.7	1018.795	TOP	
260	887395.7	429171.3	1016.779	TOE	
261	887415	429154.2	1017.097	TOE	
262	887416.3	429144.9	1021.635	TOP	
263	887473.3	428792.6	1024.343	NG	
264	887255.9	428731.5	1022.91	NG	
265	887281.6	429156.7	1020.942	TOP	
266	887286.2	429170.1	1015.998	TOE	
267	887288.6	429191.1	1016.987	TOE	
268	887289.4	429202.5	1018.909	TOP	
269	887295.5	429220.3	1020.099	NG	
270	887292.4	429277.1	1019.74	NG	
271	887293.1	429299.2	1020.68	NG	
272	887291.4	429360.2	1021.138	NG	
274	887295.2	429404.7	1018.658	TOE	
273	887244.2	429363.7	1020.579	TOP	
275	887238.9	429371.3	1017.866	TOE	
276	887236.8	429378.6	1018.401	TOE	
277	887234.8	429384.1	1020.178	TOP	
278	887233.8	429460	1021.108	NG	
279	887237.6	429691.5	1022.088	NG	
280	887173.5	429703.3	1022.405	CL	
281	887175.2	429563.2	1020.827	CL	
282	887175.1	429392.2	1018.854	CL	
283	887175.2	429245.6	1016.135	CL	
284	887175.4	429224.3	1016.181	CL	
285	887175	429067.4	1019.786	CL	
286	887175.8	428889.6	1020.904	CL	
287	887177.6	428712.3	1022.034	CL	
288	887125.5	428871.1	1021.21	NG	
289	887117.5	429236.6	1019.921	TOP	
290	887125.3	429247.3	1016.157	TOE	
291	887119.9	429276.9	1015.51	TOE	
292	887120.4	429289.6	1016.659	TOE	
293	887119.5	429299.5	1019.281	TOP	
294	887090.9	429386.5	1019.348	NG	
295	887124.3	429676.6	1021.649	NG	
296	886920.1	429805.3	1021.965	NG	
297	886970.8	429337.4	1021.116	NG	
298	886969.4	429296.5	1019.208	TOP	
299	886970.7	429287.8	1014.395	TOE	
300	886971.6	429266.2	1015.466	TOE	

301	886992.6	429244.8	1016.66	TOE	
302	886989.9	429235.6	1018.339	TOP	
303	886984.3	429203.3	1019.425	NG	
304	887018.1	428597.4	1021.247	NG	
305	886843.7	428597.5	1020.619	NG	
306	886716.5	429233.5	1018.208	NG	
307	886705.9	429268	1015.632	TOP	
308	886705.3	429275.3	1013.952	TOE	
309	886703.6	429290.4	1013.212	TOE	
310	886703.7	429299.1	1018.105	TOP	
311	886659.7	429442.3	1017.47	NG	
312	886683.9	429815.8	1021.073	NG	
313	886346.7	430121.5	1023.035	NG	
314	886368.3	429643.1	1018.935	NG	
315	886513.6	429238.4	1016.924	TOP	
316	886512.6	429231.6	1014.016	TOE	
317	886511.6	429205.7	1012.413	TOE	
318	886513.9	429191.8	1020.069	TOP	
319	886514.3	429024.7	1017.949	NG	
320	886526.4	428591.8	1018.521	NG	
321	886654.4	428188.4	1023.393	NG	
322	887215.8	428940.1	1023.453	TBM1	
323	889158.5	428954.4	1034.343	TBM2	

APPENDIX C

P1. Looking east at Buckeye Road crossing

P2. Just south of Buckeye Road looking upstream

P3. Same point as P2 looking upstream at left branch.

P4. Standing in Dickey Wash looking downstream at Buckeye Road crossing.

P5. Standing in the left branch looking downstream at Buckeye Road crossing.

P6. Looking west at Buckeye Road crossing.

P7. Looking north along 349th Avenue at left branch crossing.

P8. Looking upstream at left branch crossing of 349th Avenue.

P9. Looking downstream at left branch crossing of 349th Avenue.

P10. Looking south along 349th Avenue at left branch crossing.

P11. Looking north along 348th at end of study limits for left branch.

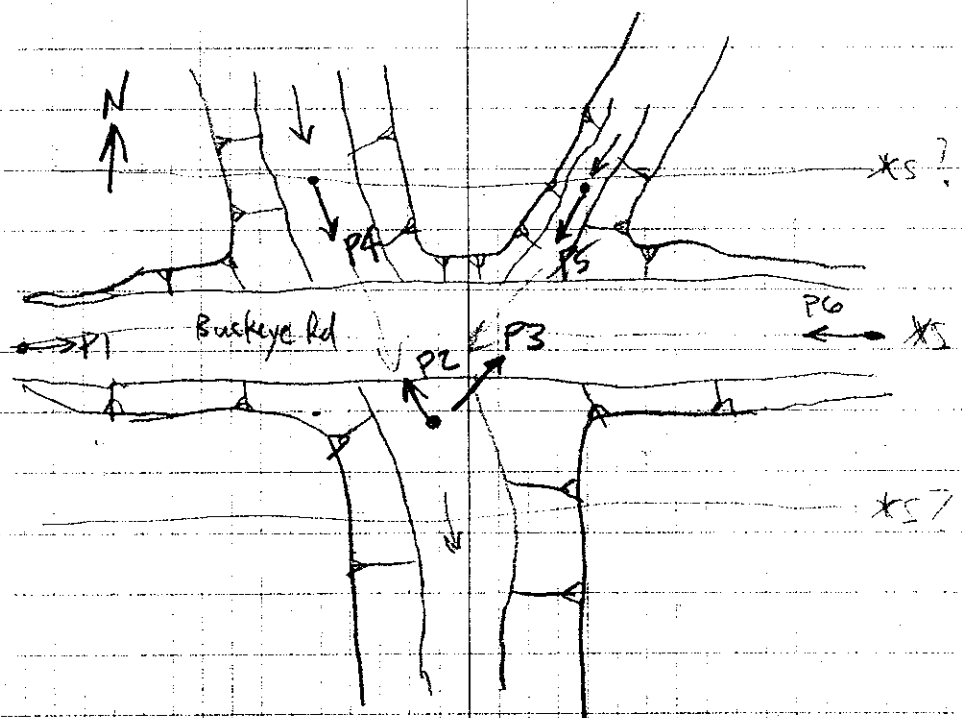
P12. Same point as P11 looking north-west.

P13. Same as P11 looking north-east. Note the desert pavement and varnish in P13 and not in P12.

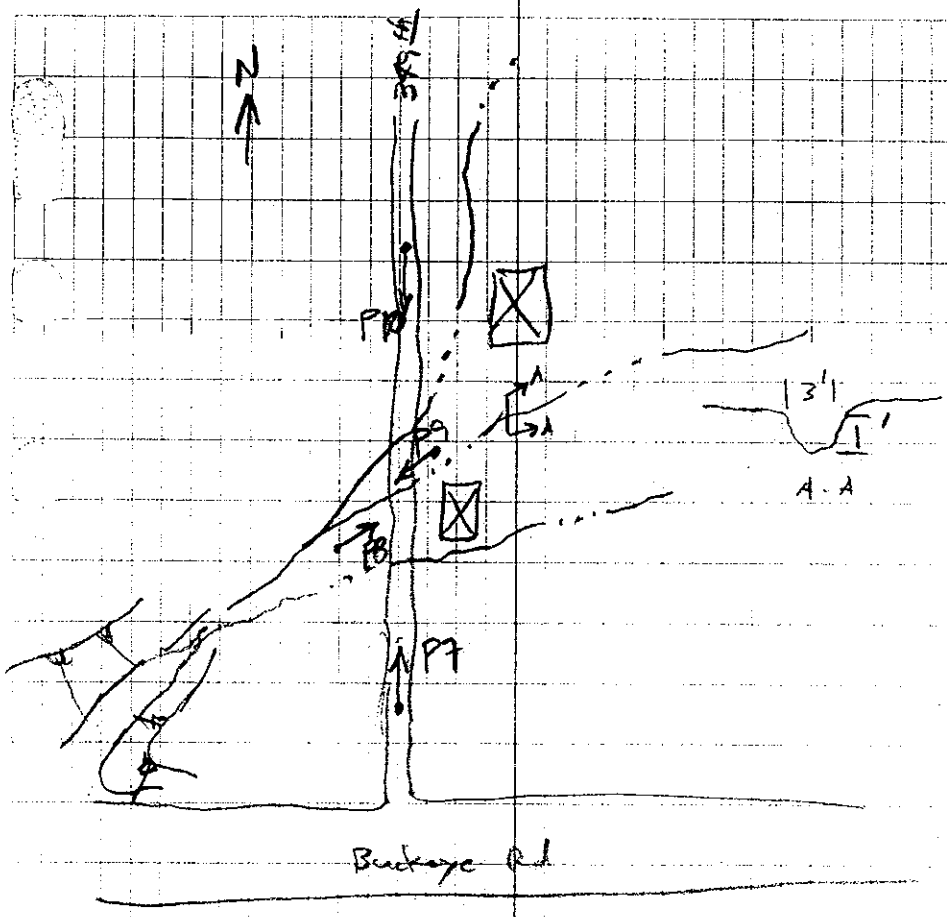
FCDMC 2001C005 - Task 4
"Dickey Wash"
8/9/01

Photos

P1 - Looking east @ Buckeye Rd crossing
P2 - just S. of Buckeye Rd looking U.S. at Dickey Wash mainstem
P3 - Same pt as P2 looking US at left branch.



P4 + P5 - standing in Dickey + left branch looking D.S. at Buckeye Rd crossing
P6 - Looking west @ Buckeye Rd crossing.



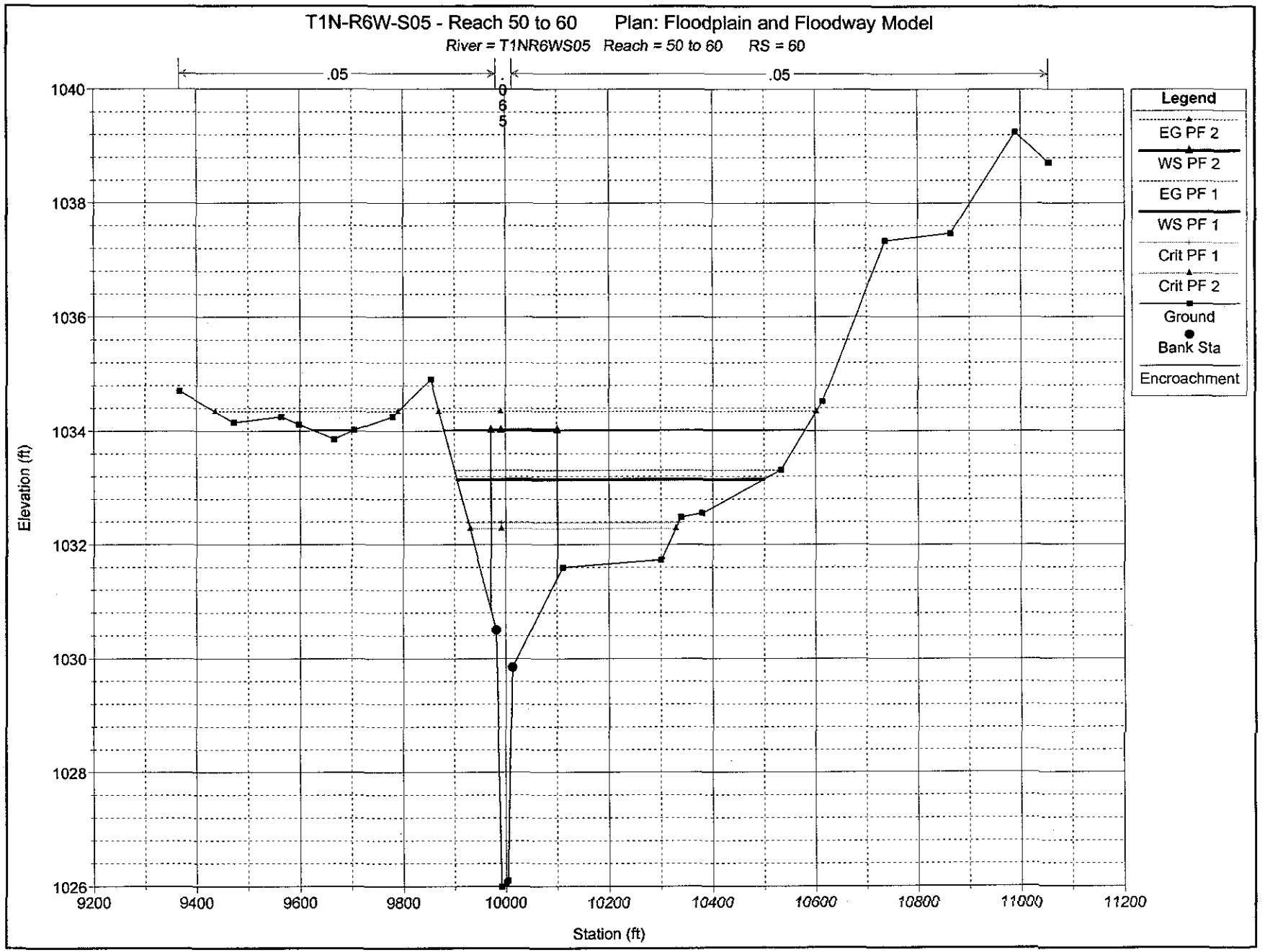
P11 - Looking N along 348th @ end of study limits for left branch

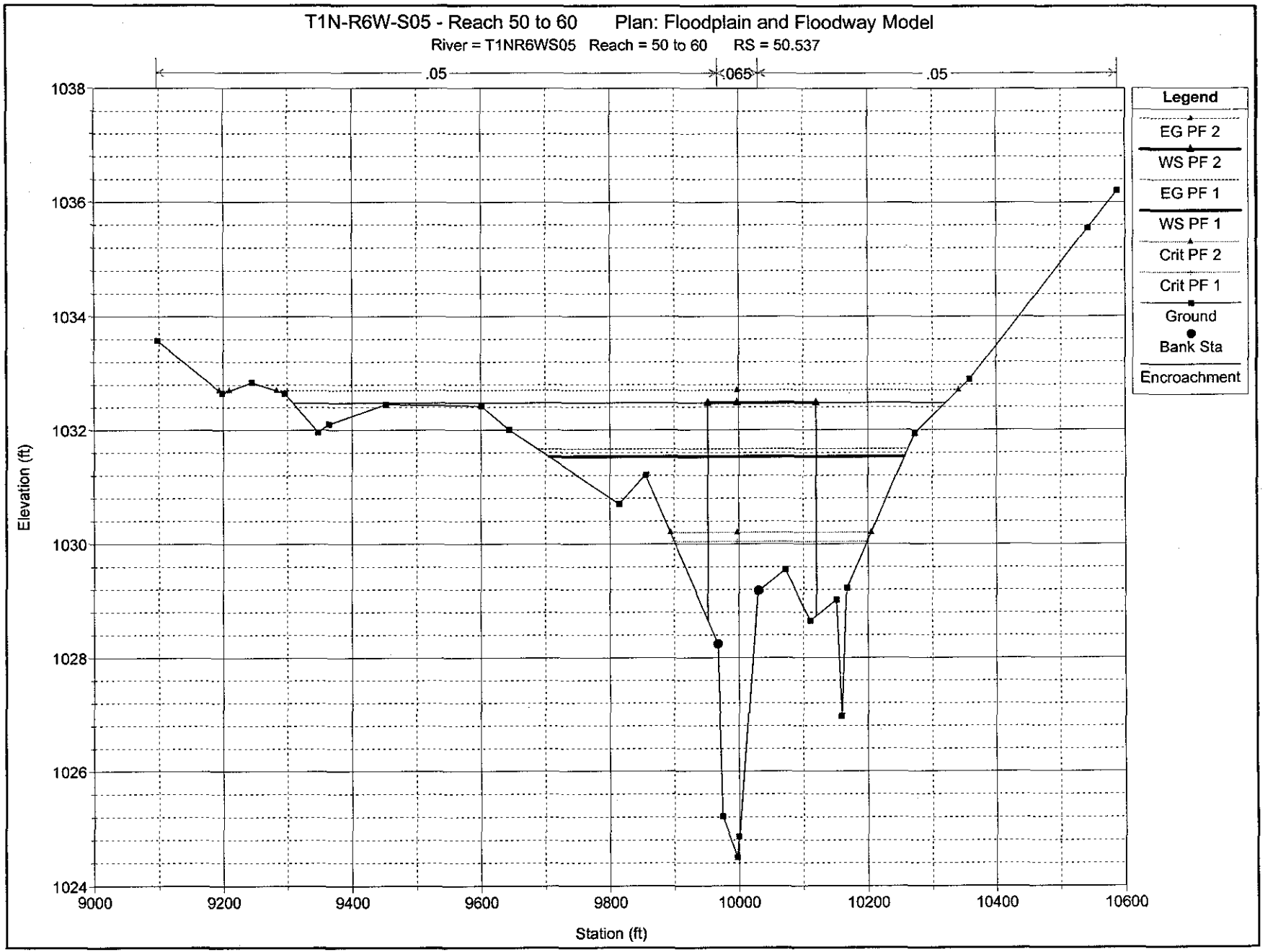
P12 - Same pt as P11 only looking NW

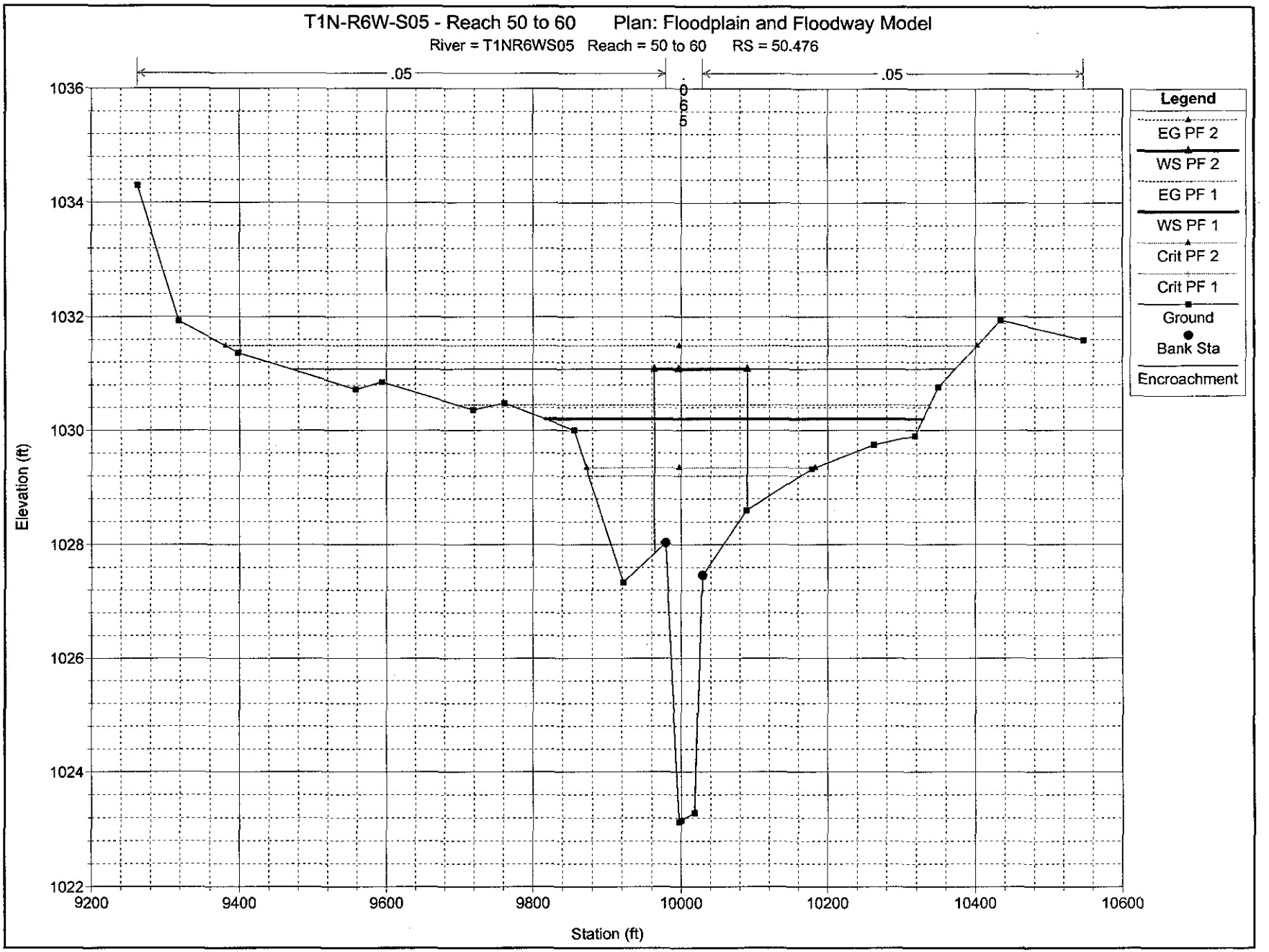
P13 - " " " " " " NE

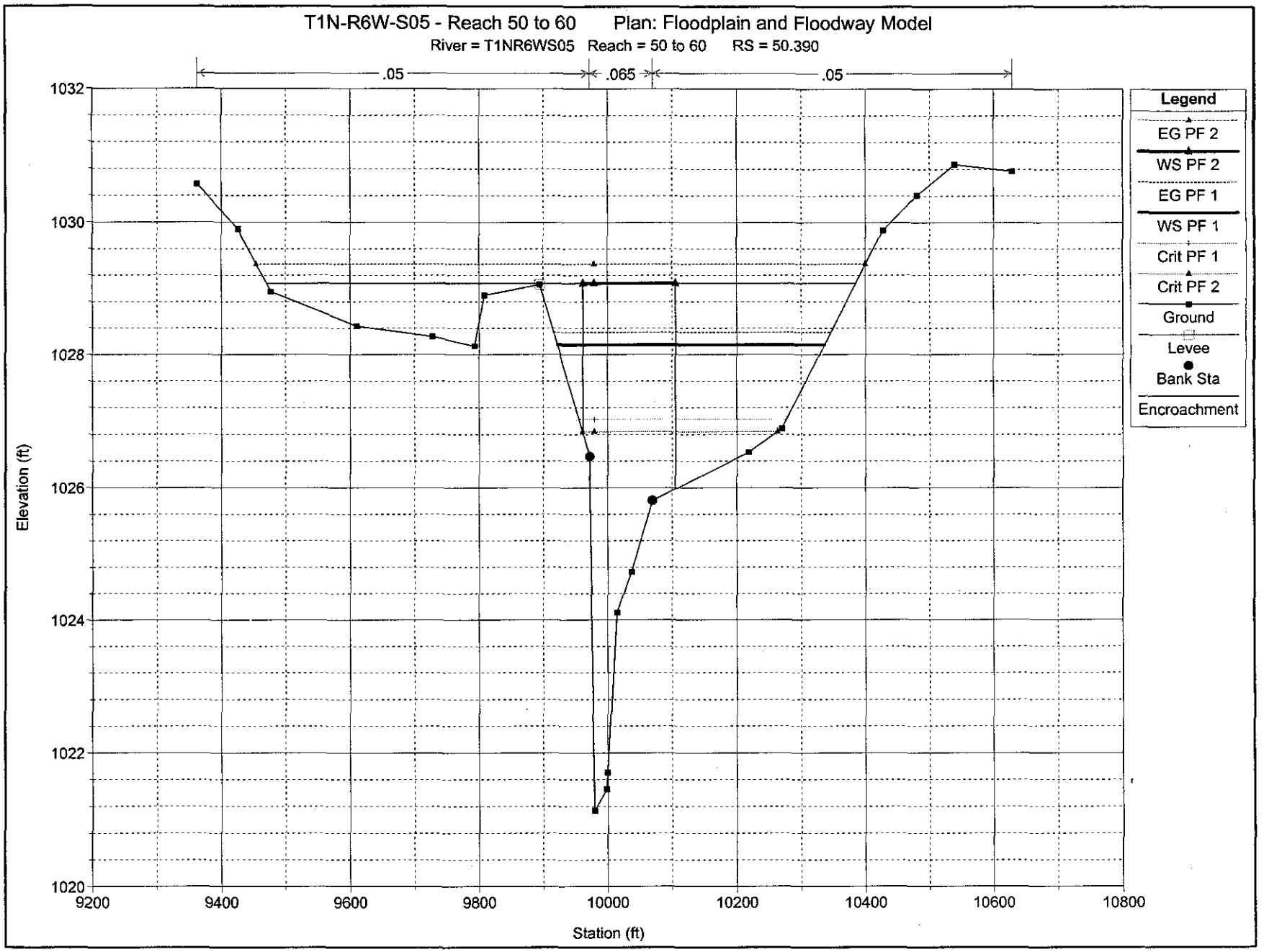
↳ (Note the desert pavement + varnish in P13 and not in P12)

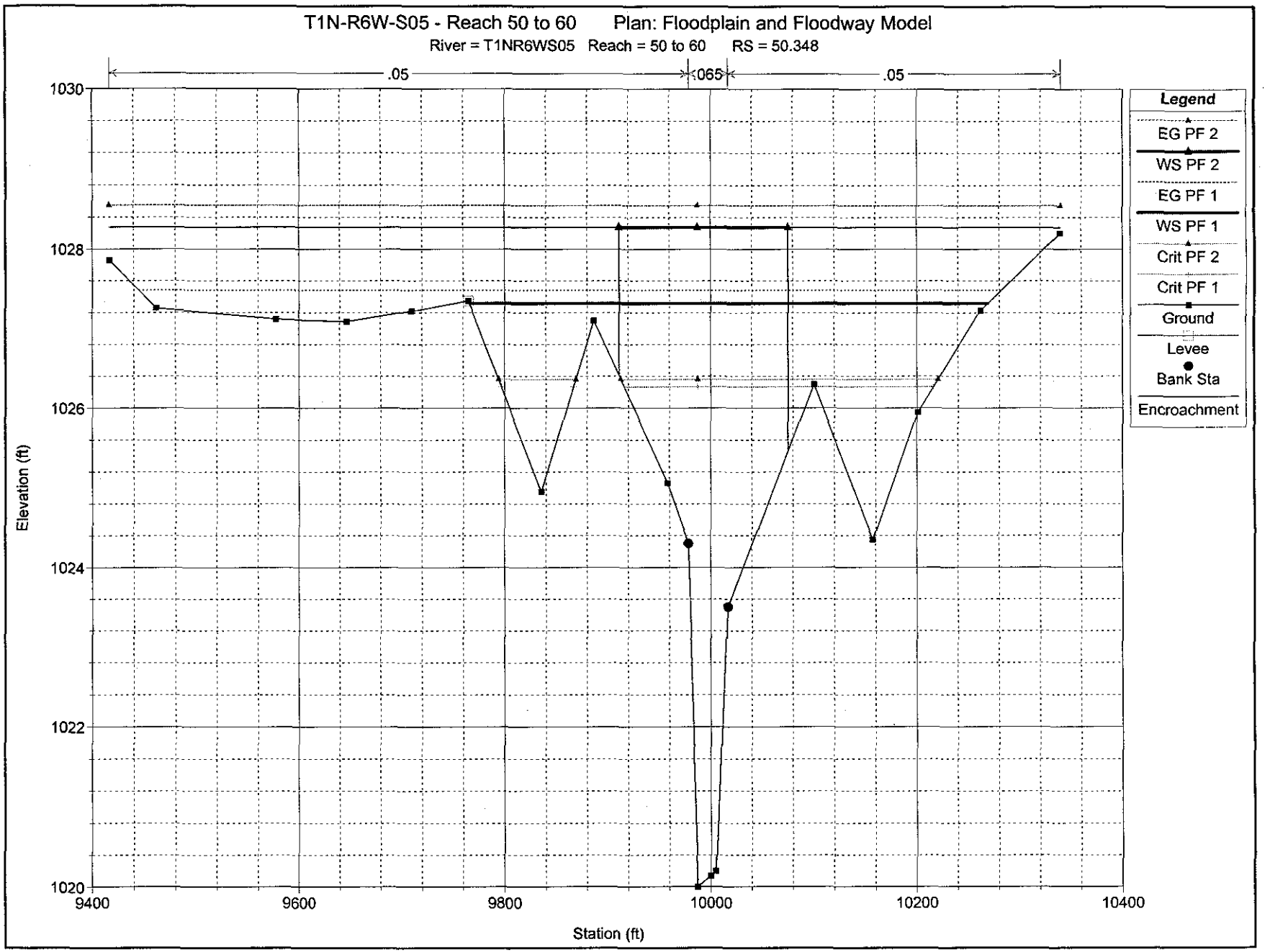
APPENDIX D

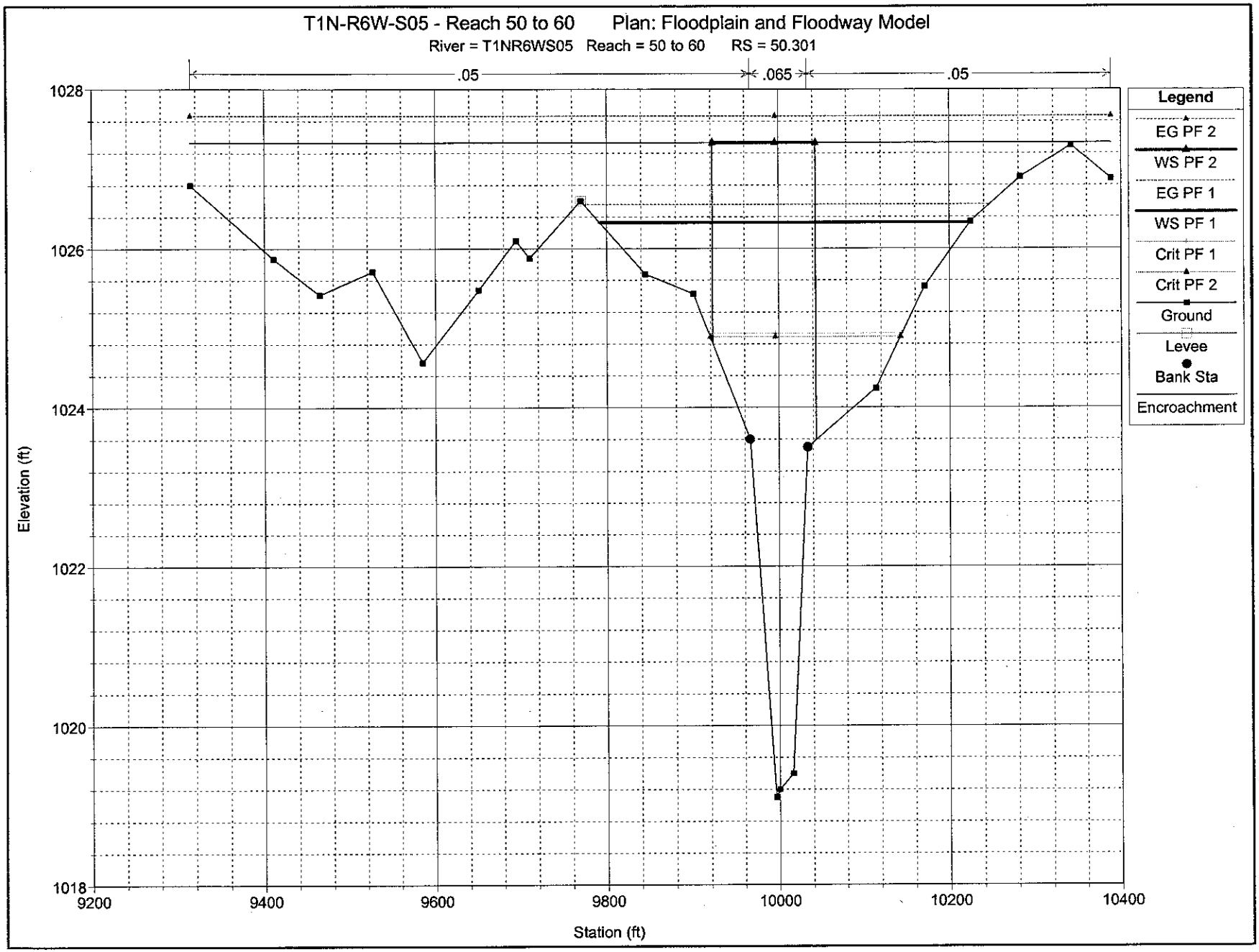

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 60
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1040
1038
1036
1034
1032
1030
1028
1026
9200
9400
9600
9800
10000
10200
10400
10600
10800
11000
11200
Station (ft)

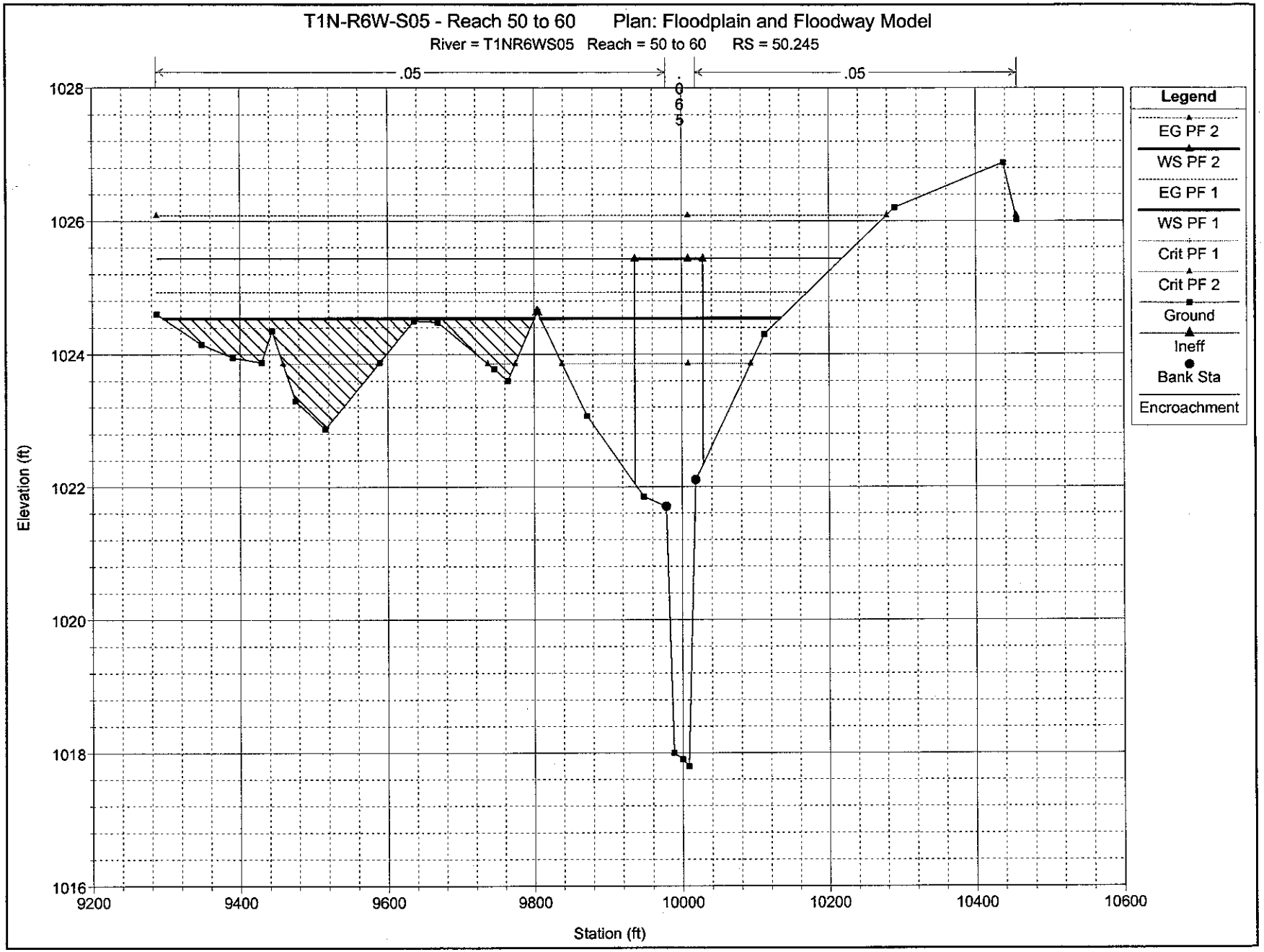

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.537
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1038
1036
1034
1032
1030
1028
1026
1024
9000
9200
9400
9600
9800
10000
10200
10400
10600
Station (ft)

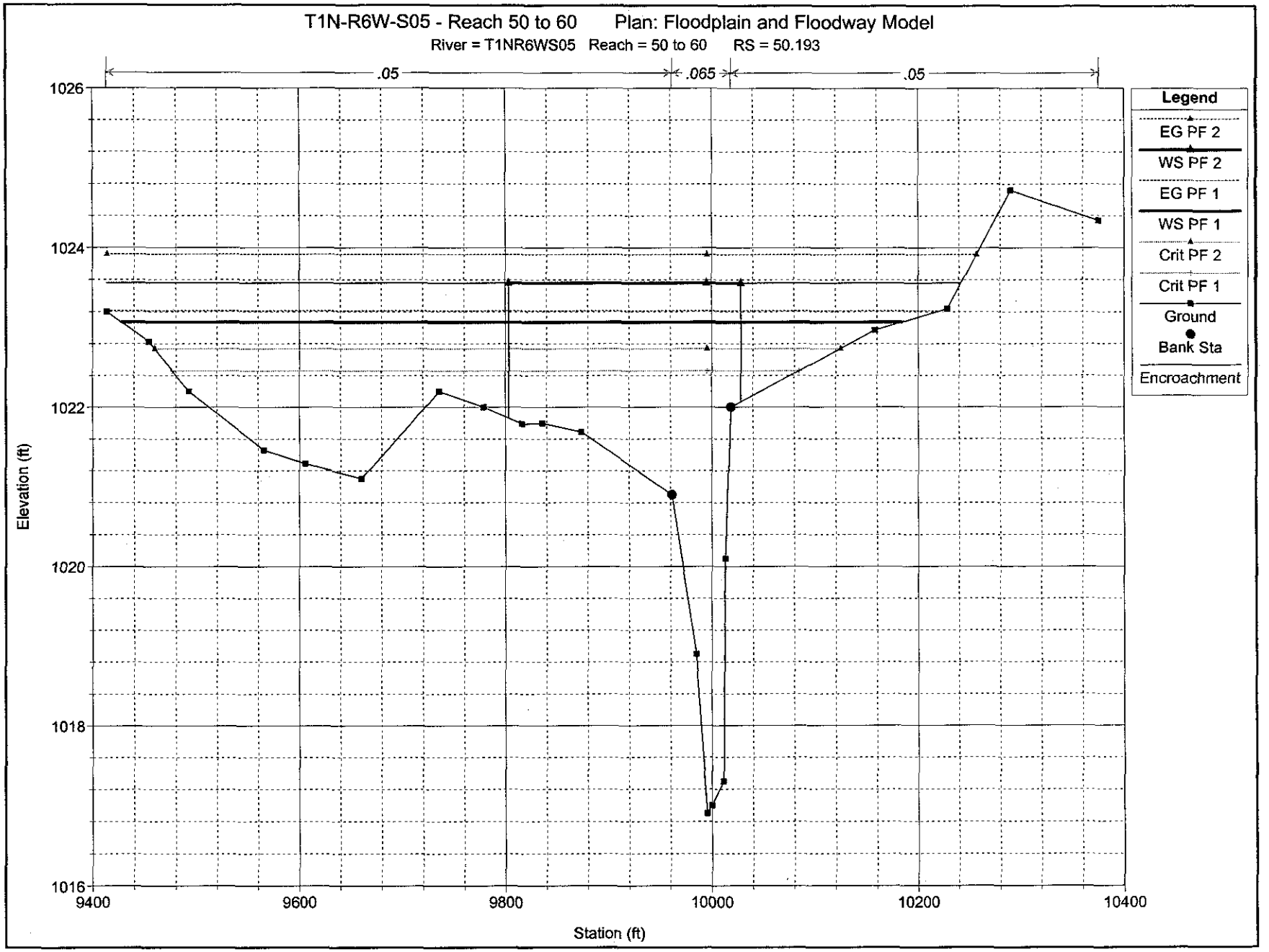

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.476
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1036
1034
1032
1030
1028
1026
1024
1022
9200
9400
9600
9800
10000
10200
10400
10600
Station (ft)

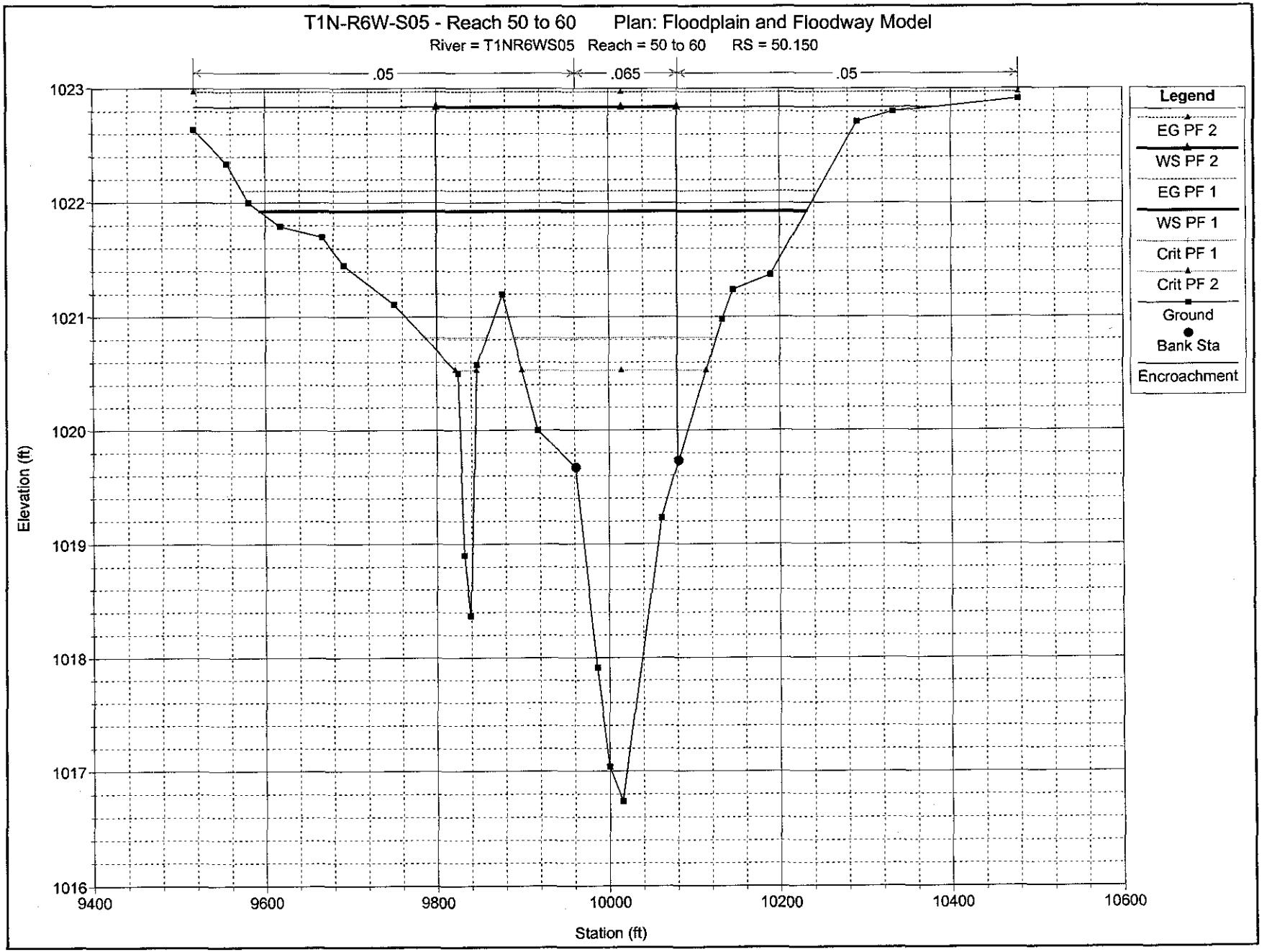

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.390
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Levee
Bank Sta
Encroachment
Elevation (ft)
1032
1030
1028
1026
1024
1022
1020
9200
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)

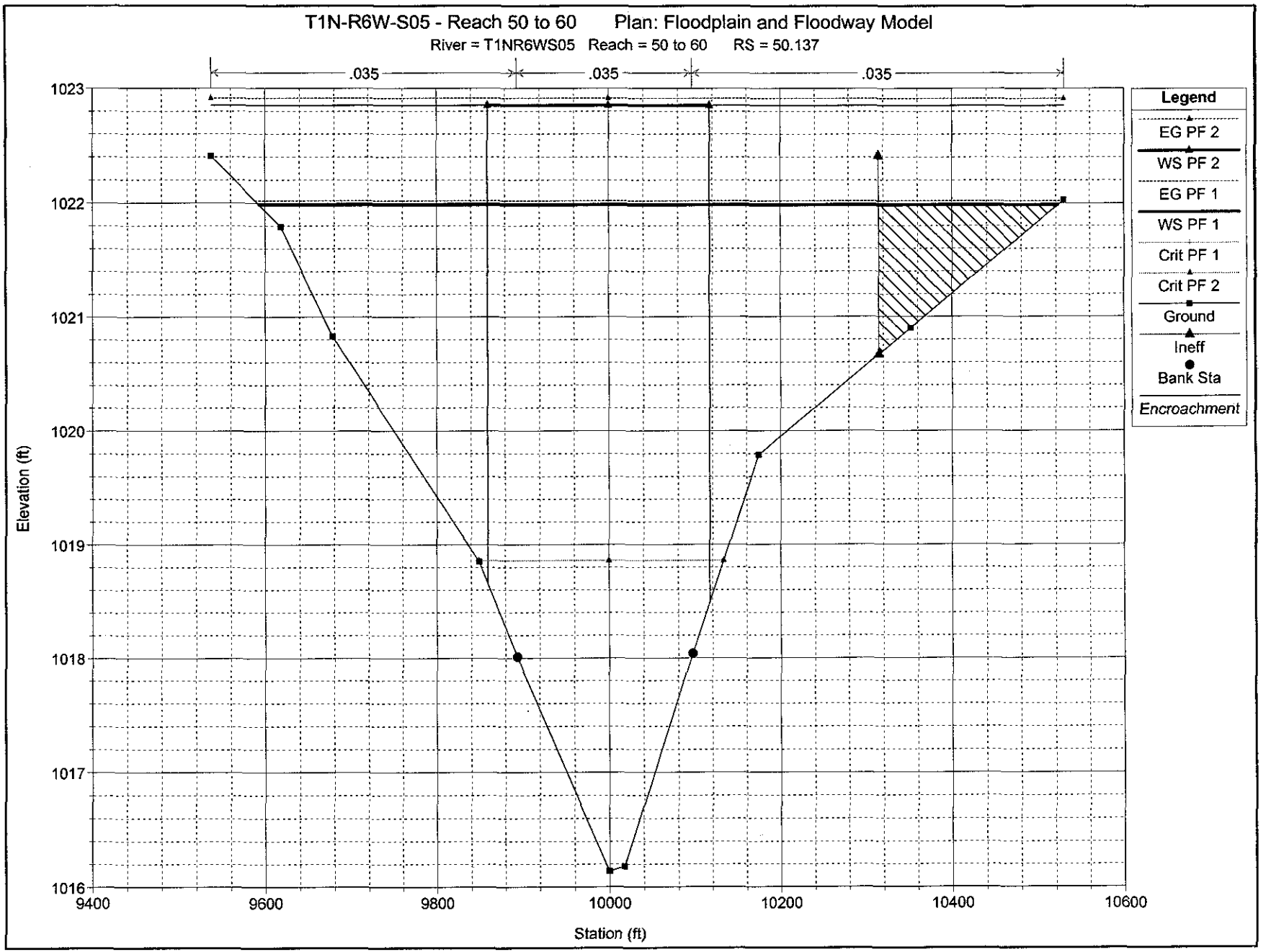

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.348
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Levee
Bank Sta
Encroachment
Elevation (ft)
1030
1028
1026
1024
1022
1020
9400
9600
9800
10000
10200
10400
Station (ft)

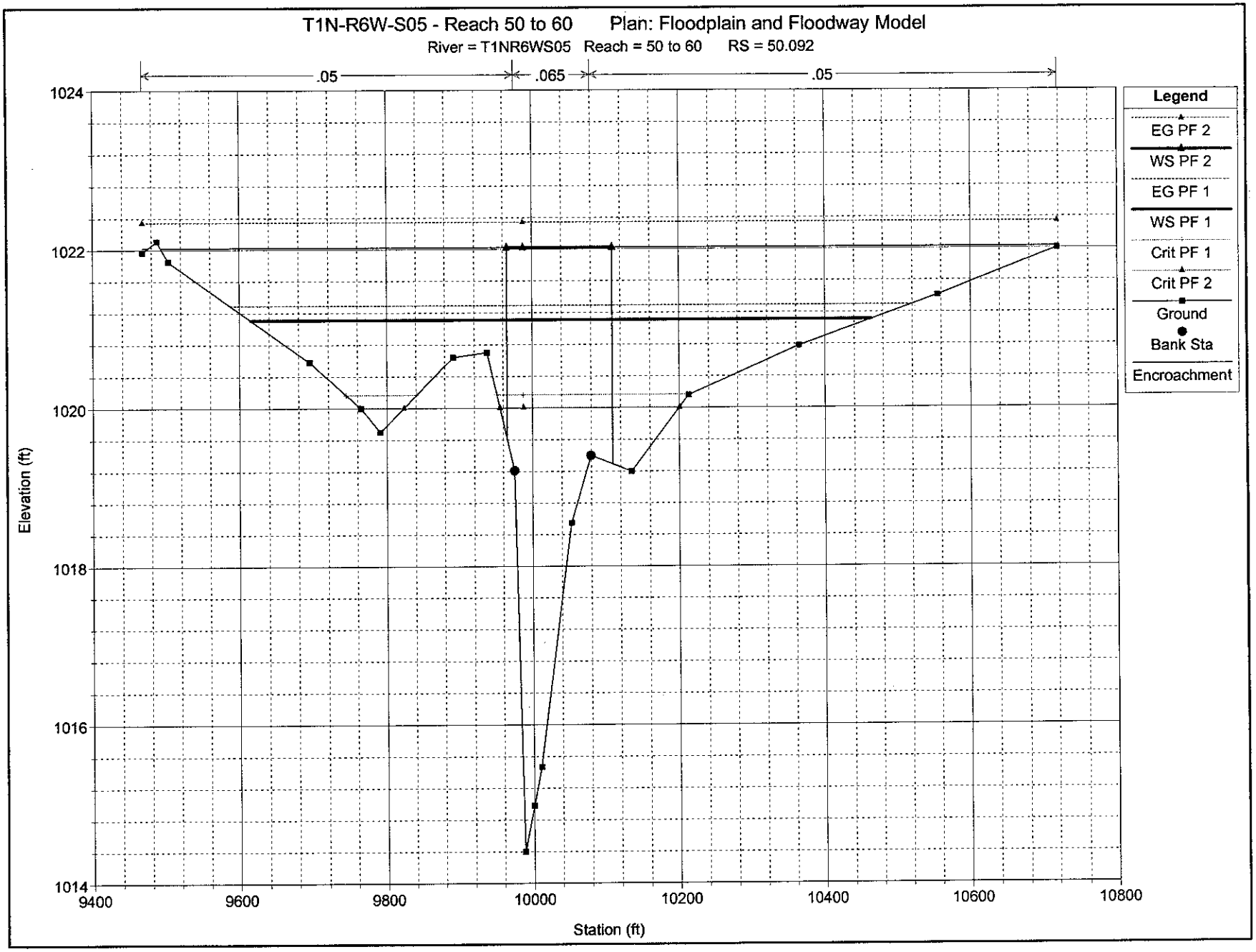

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.301
.05
.065
.05
Elevation (ft)
1028
1026
1024
1022
1020
1018
9200
9400
9600
9800
10000
10200
10400
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Levee
Bank Sta
Encroachment

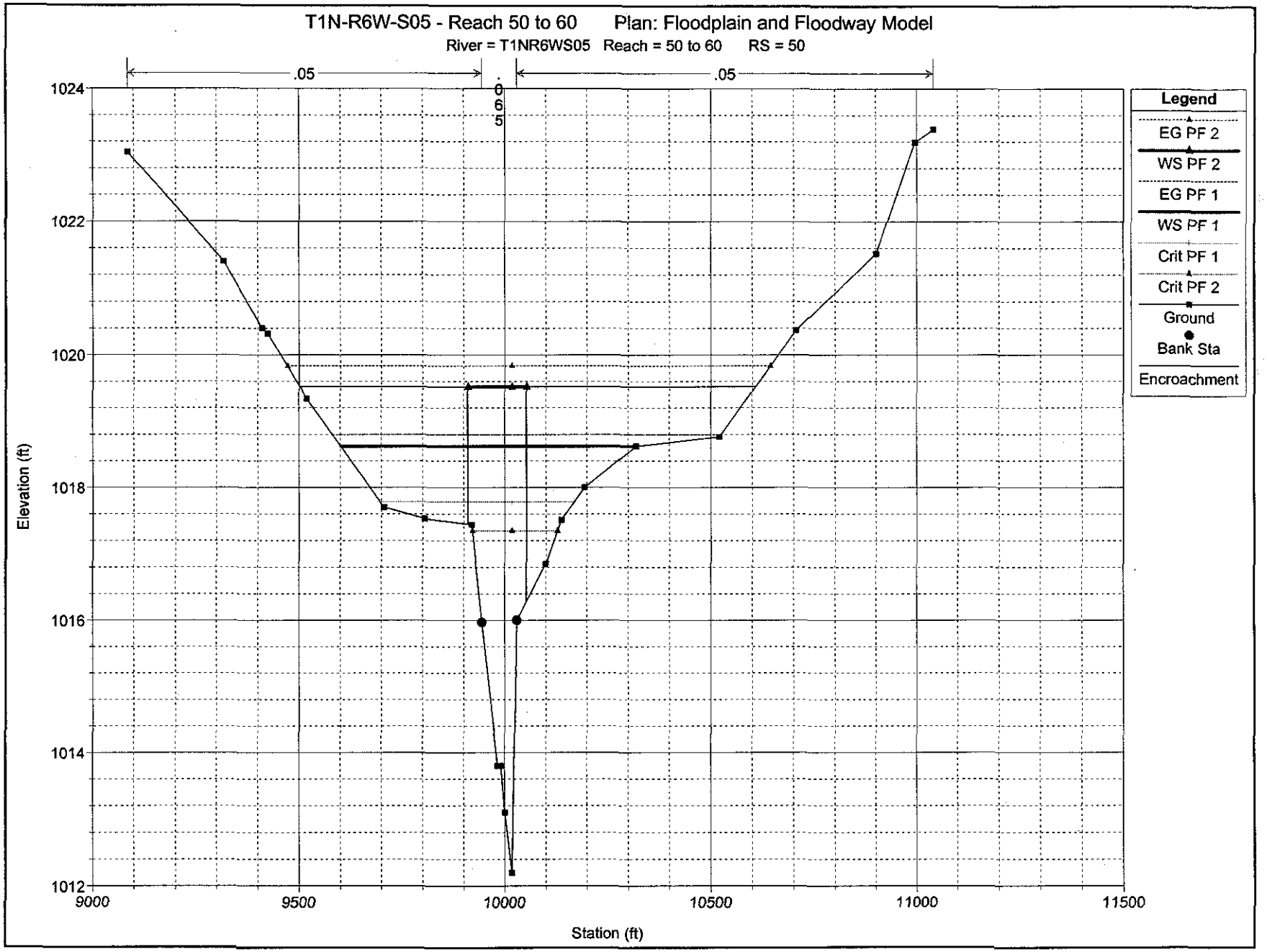

T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.245
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment
Elevation (ft)
1028
1026
1024
1022
1020
1018
1016
9200
9400
9600
9800
10000
10200
10400
10600
Station (ft)


T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.193
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 2
Crit PF 1
Ground
Bank Sta
Encroachment
Elevation (ft)
1026
1024
1022
1020
1018
1016
9400
9600
9800
10000
10200
10400
Station (ft)


T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.150
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1023
1022
1021
1020
1019
1018
1017
1016
9400
9600
9800
10000
10200
10400
10600
Station (ft)


T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.137
.035
.035
.035
Elevation (ft)
1023
1022
1021
1020
1019
1018
1017
1016
9400
9600
9800
10000
10200
10400
10600
Station (ft)
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Ineff
Bank Sta
Encroachment


T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50.092
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1024
1022
1020
1018
1016
1014
9400
9600
9800
10000
10200
10400
10600
10800
Station (ft)


T1N-R6W-S05 - Reach 50 to 60 Plan: Floodplain and Floodway Model
River = T1NR6WS05 Reach = 50 to 60 RS = 50
.05
.065
.05
Legend
EG PF 2
WS PF 2
EG PF 1
WS PF 1
Crit PF 1
Crit PF 2
Ground
Bank Sta
Encroachment
Elevation (ft)
1024
1022
1020
1018
1016
1014
1012
9000
9500
10000
10500
11000
11500
Station (ft)

APPENDIX E

```
                    HEC-RAS Version 3.0.1  Mar 2001
                      U.S. Army Corp of Engineers
                     Hydrologic Engineering Center
                       609 Second Street, Suite D
                      Davis, California 95616-4687
                            (916) 756-1104

          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
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PROJECT DATA
Project Title: T1N-R6W-S05 - Reach 50 to 60
Project File : T1NR6WS05_50to60.prj
Run Date and Time: 11/29/2001 8:59:03 AM

Project in English units

Project Description:
FCD 2001C005 -Task 4
Detailed Floodplain Delineation
Wash T1N-R6W-S05 between
Sections 50 and 60
Original Zone A Delineation per Watershed "PP" Study (FCD
99-03)


PLAN DATA

Plan Title: Floodplain and Floodway Model
Plan File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.p01

          Geometry Title: Existing Condition Geometry
          Geometry File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.g01

          Flow Title    : Existin Condition 100-year Q - -Pp/FW
          Flow File     : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.f01

Plan Summary Information:
Number of:  Cross Sections =   14    Mulitple Openings =    0
            Culverts       =    0    Inline Weirs      =    0
            Bridges        =    0

Computational Information
    Water surface calculation tolerance =  0.003
    Critical depth calculaton tolerance =  0.003
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.1
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed at all cross sections
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset      =       10
   Right Offset     =       10

River = T1NR6WS05        Reach = 50 to 60
RS      Profile           Method  Value1  Value2
60      PF 2                   1  9971.410100.66
50.537  PF 2                   1 9952.3110120.15
50.476  PF 2                   1 9963.8510090.55
50.390  PF 2                   1  9962.110105.14
50.348  PF 2                   1 9911.3810075.34
50.301  PF 2                   1 9922.48 10043.5
50.245  PF 2                   1 9936.93 10028.4
50.193  PF 2                   1 9803.31 10028.6
50.150  PF 2                   1    9800   10080
50.137  PF 2                   1 9859.7410116.91
50.124  PF 2                   1 9866.7210154.98
50.092  PF 2                   1  9965.410109.33
50.052  PF 2                   1  9875.310074.52
50      PF 2                   1 9910.35 10052.9

River = T1NR6WS05        Reach = 50 to 60
RS      Profile           Method  Value1  Value2
60      PF 3                   4      .9
50.537  PF 3                   4      .9
50.476  PF 3                   4      .9
50.390  PF 3                   4      .9
```

```
                    HEC-RAS Version 3.0.1  Mar 2001
                      U.S. Army Corp of Engineers
                     Hydrologic Engineering Center
                       609 Second Street, Suite D
                      Davis, California 95616-4687
                            (916) 756-1104

          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: T1N-R6W-S05 - Reach 50 to 60
Project File : T1NR6WS05_50to60.prj
Run Date and Time: 11/29/2001 8:59:03 AM

Project in English units

Project Description:
FCD 2001C005 -Task 4
Detailed Floodplain Delineation
Wash T1N-R6W-S05 between
Sections 50 and 60
Original Zone A Delineation per Watershed "PP" Study (FCD
99-03)


PLAN DATA

Plan Title: Floodplain and Floodway Model
Plan File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.p01

          Geometry Title: Existing Condition Geometry
          Geometry File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.g01

          Flow Title    : Existin Condition 100-year Q - -Pp/FW
          Flow File     : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.f01

Plan Summary Information:
Number of:  Cross Sections =   14    Mulitple Openings =    0
            Culverts       =    0    Inline Weirs      =    0
            Bridges        =    0

Computational Information
    Water surface calculation tolerance =  0.003
    Critical depth calculaton tolerance =  0.003
    Maximum number of interations       =  20
    Maximum difference tolerance        =  0.1
    Flow tolerance factor               =  0.001

Computation Options
    Critical depth computed at all cross sections
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method:         Average Conveyance
    Computational Flow Regime:     Subcritical Flow

Encroachment Data
   Equal Conveyance = True
   Left Offset      =       10
   Right Offset     =       10

River = T1NR6WS05        Reach = 50 to 60
RS      Profile           Method  Value1  Value2
60      PF 2                   1  9971.410100.66
50.537  PF 2                   1 9952.3110120.15
50.476  PF 2                   1 9963.8510090.55
50.390  PF 2                   1  9962.110105.14
50.348  PF 2                   1 9911.3810075.34
50.301  PF 2                   1 9922.48 10043.5
50.245  PF 2                   1 9936.93 10028.4
50.193  PF 2                   1 9803.31 10028.6
50.150  PF 2                   1    9800   10080
50.137  PF 2                   1 9859.7410116.91
50.124  PF 2                   1 9866.7210154.98
50.092  PF 2                   1  9965.410109.33
50.052  PF 2                   1  9875.310074.52
50      PF 2                   1 9910.35 10052.9

River = T1NR6WS05        Reach = 50 to 60
RS      Profile           Method  Value1  Value2
60      PF 3                   4      .9
50.537  PF 3                   4      .9
50.476  PF 3                   4      .9
50.390  PF 3                   4      .9
```

50.348	PF 3	4	.9
50.301	PF 3	4	.9
50.245	PF 3	4	.9
50.193	PF 3	4	.9
50.150	PF 3	4	.9
50.137	PF 3	4	.9
50.124	PF 3	4	.7
50.092	PF 3	4	.9
50.052	PF 3	4	.9
50	PF 3	4	.9

FLOW DATA

Flow Title: Existin Condition 100-year Q - -FP/FW
Flow File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2
T1NR6WS05	50 to 60	60	2440	2440
T1NR6WS05	50 to 60	50.537	2820	2820

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
T1NR6WS05	50 to 60	PF 1	Critical	Normal S = .0044

GEOMETRY DATA

Geometry Title: Existing Condition Geometry
Geometry File : x:\projects\Agency\FCDMC\2001c005\task4_T1NR6WS5_ FDS\HEC-RAS\T1NR6WS05_50to60.g01

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 60

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9367.3	1034.71	9472.2	1034.15	9564	1034.25	9598.2	1034.12	9666.3	1033.86
9704.6	1034.02	9779.9	1034.25	9853.5	1034.91	9981.4	1030.5	9990.8	1026
10000	1026.07	10003.3	1026.1	10012.9	1029.85	10111.4	1031.6	10300.7	1031.73
10338.7	1032.48	10379.5	1032.55	10533.3	1033.31	10614.6	1034.52	10737	1037.34
10864.7	1037.47	10989.1	1039.25	11053.2	1038.71				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9367.3	.05	9981.4	.065	10012.9	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9981.4	10012.9	490.71	500.53	492.45	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1033.31	Element			
Vel Head (ft)	0.16	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1033.14	Reach Len. (ft)	490.71	500.53	492.45
Crit W.S. (ft)	1032.39	Flow Area (sq ft)	101.36	184.32	618.99
E.G. Slope (ft/ft)	0.004033	Area (sq ft)	101.36	184.32	618.99
Q Total (cfs)	2440.00	Flow (cfs)	230.32	838.50	1371.19
Top Width (ft)	594.93	Top Width (ft)	76.68	31.50	486.75
Vel Total (ft/s)	2.70	Avg. Vel. (ft/s)	2.27	4.55	2.22
Max Chl Dpth (ft)	7.14	Hydr. Depth (ft)	1.32	5.85	1.27
Conv. Total (cfs)	38421.6	Conv. (cfs)	3626.7	13203.5	21591.5
Length Wtd. (ft)	495.46	Wetted Per. (ft)	76.72	33.23	486.78
Min Ch El (ft)	1026.00	Shear (lb/sq ft)	0.33	1.40	0.32
Alpha	1.42	Stream Power (lb/ft s)	0.76	6.35	0.71
Frctn Loss (ft)	1.63	Cum Volume (acre-ft)	24.23	24.68	26.34
C & E Loss (ft)	0.01	Cum SA (acres)	21.85	5.03	21.40

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1034.34	Element			
Vel Head (ft)	0.32	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1034.02	Reach Len. (ft)	490.71	500.53	492.45
Crit W.S. (ft)	1032.28	Flow Area (sq ft)	33.45	211.83	297.31
E.G. Slope (ft/ft)	0.004114	Area (sq ft)	33.45	211.83	297.31
Q Total (cfs)	2440.00	Flow (cfs)	118.64	1067.90	1253.47
Top Width (ft)	129.26	Top Width (ft)	10.00	31.50	87.76
Vel Total (ft/s)	4.50	Avg. Vel. (ft/s)	3.55	5.04	4.22
Max Chl Dpth (ft)	8.02	Hydr. Depth (ft)	3.34	6.72	3.39
Conv. Total (cfs)	38041.9	Conv. (cfs)	1849.7	16649.5	19542.7
Length Wtd. (ft)	496.48	Wetted Per. (ft)	13.18	33.23	90.38

Min Ch El (ft)	1026.00	Shear (lb/sq ft)	0.65	1.64	0.84
Alpha	1.03	Stream Power (lb/ft s)	2.31	8.25	3.56
Frctn Loss (ft)	1.62	Cum Volume (acre-ft)	10.29	29.15	11.29
C & E Loss (ft)	0.03	Cum SA (acres)	3.84	5.02	3.57

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.537

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9097.1	1033.58	9198.6	1032.65	9245	1032.84	9295.9	1032.65	9347.6	1031.96
9364	1032.1	9452.5	1032.45	9601.2	1032.42	9643.7	1032	9814.6	1030.7
9855.8	1031.21	9967.5	1028.24	9974.2	1025.21	9997.5	1024.5	10000	1024.86
10030.4	1029.18	10071.6	1029.55	10110.7	1028.65	10151.3	1029.02	10158.9	1026.97
10167	1029.23	10272.7	1031.94	10358.6	1032.89	10542.3	1035.55	10587.7	1036.2

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9097.1	.05	9967.5	.065	10030.4	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9967.5	10030.4	328.12	322.08	343.38	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1031.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1031.53	Reach Len. (ft)	328.12	322.08	343.38
Crit W.S. (ft)	1030.04	Flow Area (sq ft)	269.55	341.70	450.54
E.G. Slope (ft/ft)	0.002808	Area (sq ft)	269.55	341.70	450.54
Q Total (cfs)	2820.00	Flow (cfs)	433.09	1265.74	1121.18
Top Width (ft)	550.54	Top Width (ft)	261.49	62.90	226.15
Vel Total (ft/s)	2.66	Avg. Vel. (ft/s)	1.61	3.70	2.49
Max Chl Dpth (ft)	7.03	Hydr. Depth (ft)	1.03	5.43	1.99
Conv. Total (cfs)	53220.8	Conv. (cfs)	8173.5	23887.8	21159.5
Length Wtd. (ft)	330.17	Wetted Per. (ft)	261.54	63.90	226.78
Min Ch El (ft)	1024.50	Shear (lb/sq ft)	0.18	0.94	0.35
Alpha	1.28	Stream Power (lb/ft s)	0.29	3.47	0.87
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	22.14	21.66	20.29
C & E Loss (ft)	0.01	Cum SA (acres)	19.94	4.48	17.37

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1032.70	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1032.48	Reach Len. (ft)	328.12	322.08	343.38
Crit W.S. (ft)	1030.20	Flow Area (sq ft)	61.28	401.47	295.94
E.G. Slope (ft/ft)	0.002709	Area (sq ft)	61.28	401.47	295.94
Q Total (cfs)	2820.00	Flow (cfs)	206.72	1626.51	986.77
Top Width (ft)	167.84	Top Width (ft)	15.19	62.90	89.75
Vel Total (ft/s)	3.72	Avg. Vel. (ft/s)	3.37	4.05	3.33
Max Chl Dpth (ft)	7.98	Hydr. Depth (ft)	4.03	6.38	3.30
Conv. Total (cfs)	54180.6	Conv. (cfs)	3971.7	31250.1	18958.8
Length Wtd. (ft)	329.29	Wetted Per. (ft)	19.03	63.90	93.50
Min Ch El (ft)	1024.50	Shear (lb/sq ft)	0.54	1.06	0.54
Alpha	1.03	Stream Power (lb/ft s)	1.84	4.31	1.78
Frctn Loss (ft)	1.19	Cum Volume (acre-ft)	9.76	25.63	7.94
C & E Loss (ft)	0.02	Cum SA (acres)	3.70	4.48	2.57

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.476

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9262.2	1034.3	9317.7	1031.93	9398.2	1031.37	9558.4	1030.72	9593.8	1030.85
9718.3	1030.36	9761.4	1030.48	9855.5	1030	9921.4	1027.34	9978.9	1028.03
9996.7	1023.13	10000	1023.16	10017.9	1023.29	10028.8	1027.46	10089.5	1028.6
10177.8	1029.32	10262.4	1029.74	10317.8	1029.9	10349.9	1030.76	10434.1	1031.94
10546.6	1031.59								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9262.2	.05	9978.9	.065	10028.8	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9978.9	10028.8	458.62	454.08	453.83	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1030.45	Element			
Vel Head (ft)	0.25	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1030.20	Reach Len. (ft)	458.62	454.08	453.83
Crit W.S. (ft)	1029.20	Flow Area (sq ft)	249.49	283.00	320.87
E.G. Slope (ft/ft)	0.004967	Area (sq ft)	249.49	283.00	320.87
Q Total (cfs)	2820.00	Flow (cfs)	694.54	1422.95	702.51
Top Width (ft)	512.90	Top Width (ft)	162.77	49.90	300.23
Vel Total (ft/s)	3.30	Avg. Vel. (ft/s)	2.78	5.03	2.19
Max Chl Dpth (ft)	7.07	Hydr. Depth (ft)	1.53	5.67	1.07
Conv. Total (cfs)	40012.2	Conv. (cfs)	9854.6	20189.8	9967.8
Length Wtd. (ft)	454.62	Wetted Per. (ft)	162.83	51.33	300.25
Min Ch El (ft)	1023.13	Shear (lb/sq ft)	0.48	1.71	0.33
Alpha	1.45	Stream Power (lb/ft s)	1.32	8.60	0.73
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	20.19	19.35	17.25
C & E Loss (ft)	0.02	Cum SA (acres)	18.35	4.07	15.30

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1031.49	Element			
Vel Head (ft)	0.41	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1031.08	Reach Len. (ft)	458.62	454.08	453.83
Crit W.S. (ft)	1029.34	Flow Area (sq ft)	47.26	326.86	187.72
E.G. Slope (ft/ft)	0.005041	Area (sq ft)	47.26	326.86	187.72
Q Total (cfs)	2820.00	Flow (cfs)	187.82	1822.53	809.65
Top Width (ft)	126.70	Top Width (ft)	15.05	49.90	61.75
Vel Total (ft/s)	5.02	Avg. Vel. (ft/s)	3.97	5.58	4.31
Max Chl Dpth (ft)	7.95	Hydr. Depth (ft)	3.14	6.55	3.04
Conv. Total (cfs)	39718.4	Conv. (cfs)	2645.4	25669.5	11403.5
Length Wtd. (ft)	454.24	Wetted Per. (ft)	18.28	51.33	64.23
Min Ch El (ft)	1023.13	Shear (lb/sq ft)	0.81	2.00	0.92
Alpha	1.05	Stream Power (lb/ft s)	3.23	11.17	3.97
Frctn Loss (ft)	2.09	Cum Volume (acre-ft)	9.35	22.93	6.03
C & E Loss (ft)	0.04	Cum SA (acres)	3.58	4.06	1.97

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.390

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9362.3	1030.57	9425.6	1029.9	9477.1	1028.95	9609.9	1028.43	9727.1	1028.27
9792.5	1028.13	9808.4	1028.9	9894.6	1029.06	9972.1	1026.47	9979.4	1021.14
9998.4	1021.46	10000	1021.71	10015	1024.11	10036.9	1024.73	10069.7	1025.81
10217.9	1026.53	10269.8	1026.89	10427.1	1029.88	10480.3	1030.41	10539.7	1030.87
10628.4	1030.77								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9362.3	.05	9972.1	.065	10069.7	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9972.1	10069.7	221.43	221.76	222.81	.1	.3

Left Levee Station= 9894.6 Elevation= 1029.06

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1028.33	Element			
Vel Head (ft)	0.19	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1028.15	Reach Len. (ft)	221.43	221.76	222.81
Crit W.S. (ft)	1027.02	Flow Area (sq ft)	42.05	426.78	408.99
E.G. Slope (ft/ft)	0.004294	Area (sq ft)	42.05	426.78	408.99
Q Total (cfs)	2820.00	Flow (cfs)	72.77	1686.82	1060.41
Top Width (ft)	413.97	Top Width (ft)	50.16	97.60	266.20
Vel Total (ft/s)	3.21	Avg. Vel. (ft/s)	1.73	3.95	2.59
Max Chl Dpth (ft)	7.01	Hydr. Depth (ft)	0.84	4.37	1.54
Conv. Total (cfs)	43035.6	Conv. (cfs)	1110.6	25742.3	16182.8
Length Wtd. (ft)	222.13	Wetted Per. (ft)	50.19	99.58	266.22
Min Ch El (ft)	1021.14	Shear (lb/sq ft)	0.22	1.15	0.41
Alpha	1.16	Stream Power (lb/ft s)	0.39	4.54	1.07
Frctn Loss (ft)	0.84	Cum Volume (acre-ft)	18.65	15.65	13.45
C & E Loss (ft)	0.01	Cum SA (acres)	17.23	3.30	12.34

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1029.37	Element			
Vel Head (ft)	0.29	Wt. n-Val.	0.050	0.065	0.050

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9966.1 10033.5            292.07  295.68  293.17          .1          .3
Left Levee      Station=  9769.9       Elevation=  1026.6
```

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1026.56	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.23	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1026.33	Reach Len. (ft)	292.07	295.68	293.17
Crit W.S. (ft)	1024.93	Flow Area (sq ft)	179.17	374.70	301.18
E.G. Slope (ft/ft)	0.004059	Area (sq ft)	179.17	374.70	301.18
Q Total (cfs)	2820.00	Flow (cfs)	345.89	1699.16	774.96
Top Width (ft)	431.49	Top Width (ft)	174.00	67.40	190.09
Vel Total (ft/s)	3.30	Avg. Vel. (ft/s)	1.93	4.53	2.57
Max Chl Dpth (ft)	7.23	Hydr. Depth (ft)	1.03	5.56	1.58
Conv. Total (cfs)	44261.3	Conv. (cfs)	5428.9	26669.1	12163.3
Length Wtd. (ft)	294.27	Wetted Per. (ft)	174.03	68.21	190.12
Min Ch El (ft)	1019.10	Shear (lb/sq ft)	0.26	1.39	0.40
Alpha	1.35	Stream Power (lb/ft s)	0.50	6.31	1.03
Frctn Loss (ft)	1.61	Cum Volume (acre-ft)	16.46	12.22	9.04
C & E Loss (ft)	0.02	Cum SA (acres)	15.45	2.65	9.73

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1027.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.34	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1027.33	Reach Len. (ft)	292.07	295.68	293.17
Crit W.S. (ft)	1024.89	Flow Area (sq ft)	136.27	442.30	37.85
E.G. Slope (ft/ft)	0.003807	Area (sq ft)	136.27	442.30	37.85
Q Total (cfs)	2820.00	Flow (cfs)	514.23	2169.41	136.36
Top Width (ft)	121.02	Top Width (ft)	43.62	67.40	10.00
Vel Total (ft/s)	4.57	Avg. Vel. (ft/s)	3.77	4.90	3.60
Max Chl Dpth (ft)	8.23	Hydr. Depth (ft)	3.12	6.56	3.78
Conv. Total (cfs)	45705.4	Conv. (cfs)	8334.4	35160.9	2210.1
Length Wtd. (ft)	294.66	Wetted Per. (ft)	46.15	68.21	13.74
Min Ch El (ft)	1019.10	Shear (lb/sq ft)	0.70	1.54	0.65
Alpha	1.04	Stream Power (lb/ft s)	2.65	7.56	2.36
Frctn Loss (ft)	1.55	Cum Volume (acre-ft)	7.48	14.48	2.85
C & E Loss (ft)	0.03	Cum SA (acres)	2.94	2.65	1.02

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

```
CROSS SECTION          RIVER: T1NR6WS05
REACH: 50 to 60           RS: 50.245

INPUT
Description:
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
  9286.9  1024.6  9347.7 1024.15  9390.3 1023.95  9429.3 1023.88  9443.5 1024.35
  9475.3  1023.3  9515.5 1022.87  9589.6 1023.88  9635.5  1024.5  9668.1 1024.48
  9745.3 1023.78    9764  1023.6  9804.3 1024.64  9872.3 1023.07  9948.5 1021.85
  9978.7  1021.7  9988.2    1018   10000  1017.9 10008.2  1017.8 10018.4  1022.1
 10111.7  1024.3 10289.9  1026.2 10437.3 1026.88 10455.2 1026.02

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
  9286.9     .05  9978.7    .065 10018.4     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        9978.7 10018.4            276.16  274.56  283.62          .1          .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
888        F
```

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1024.93	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.39	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1024.53	Reach Len. (ft)	276.16	274.56	283.62
Crit W.S. (ft)	1023.86	Flow Area (sq ft)	287.66	223.73	126.95
E.G. Slope (ft/ft)	0.007786	Area (sq ft)	595.77	223.73	126.95
Q Total (cfs)	2820.00	Flow (cfs)	1072.01	1392.83	355.17
Top Width (ft)	828.92	Top Width (ft)	674.04	39.70	115.18
Vel Total (ft/s)	4.42	Avg. Vel. (ft/s)	3.73	6.23	2.80
Max Chl Dpth (ft)	6.73	Hydr. Depth (ft)	1.69	5.64	1.10
Conv. Total (cfs)	31957.9	Conv. (cfs)	12148.6	15784.3	4024.9
Length Wtd. (ft)	276.10	Wetted Per. (ft)	169.81	41.27	115.21
Min Ch El (ft)	1017.80	Shear (lb/sq ft)	0.82	2.64	0.54
Alpha	1.30	Stream Power (lb/ft s)	3.07	16.41	1.50
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)	13.87	10.19	7.60
C & E Loss (ft)	0.08	Cum SA (acres)	12.61	2.29	8.70

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

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1026.08	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.65	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1025.43	Reach Len. (ft)	276.16	274.56	283.62
Crit W.S. (ft)	1023.86	Flow Area (sq ft)	150.81	259.40	32.14
E.G. Slope (ft/ft)	0.007792	Area (sq ft)	150.81	259.40	32.14
Q Total (cfs)	2820.00	Flow (cfs)	883.74	1782.89	153.37
Top Width (ft)	91.47	Top Width (ft)	41.77	39.70	10.00
Vel Total (ft/s)	6.38	Avg. Vel. (ft/s)	5.86	6.87	4.77
Max Chl Dpth (ft)	7.63	Hydr. Depth (ft)	3.61	6.53	3.21
Conv. Total (cfs)	31946.4	Conv. (cfs)	10011.4	20197.5	1737.5
Length Wtd. (ft)	275.51	Wetted Per. (ft)	45.17	41.27	13.10
Min Ch El (ft)	1017.80	Shear (lb/sq ft)	1.62	3.06	1.19
Alpha	1.03	Stream Power (lb/ft s)	9.52	21.02	5.70
Frctn Loss (ft)	2.08	Cum Volume (acre-ft)	6.52	12.10	2.62
C & E Loss (ft)	0.09	Cum SA (acres)	2.65	2.28	0.95

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.193

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9413.4	1023.2	9453.5	1022.83	9492.5	1022.2	9565.4	1021.46	9605.6	1021.29
9660.6	1021.1	9736.1	1022.2	9778.8	1022	9815.9	1021.79	9835.8	1021.8
9873.5	1021.69	9961.6	1020.9	9984.8	1018.9	9995.4	1016.9	10000	1017
10011.2	1017.31	10012.97	1020.1	10018.6	1022	10158	1022.97	10228.6	1023.24
10290.3	1024.72	10375.1	1024.34						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9413.4	.05	9961.6	.065	10018.6	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9961.6	10018.6	225.5	227.04	227.7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1023.21	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.14	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1023.07	Reach Len. (ft)	225.50	227.04	227.70
Crit W.S. (ft)	1022.46	Flow Area (sq ft)	710.38	241.91	82.87
E.G. Slope (ft/ft)	0.004678	Area (sq ft)	710.38	241.91	82.87
Q Total (cfs)	2820.00	Flow (cfs)	1746.29	967.53	106.19
Top Width (ft)	756.69	Top Width (ft)	534.12	57.00	165.57
Vel Total (ft/s)	2.72	Avg. Vel. (ft/s)	2.46	4.00	1.28
Max Chl Dpth (ft)	6.17	Hydr. Depth (ft)	1.33	4.24	0.50
Conv. Total (cfs)	41229.9	Conv. (cfs)	25531.6	14145.8	1552.5
Length Wtd. (ft)	226.38	Wetted Per. (ft)	534.14	59.13	165.58
Min Ch El (ft)	1016.90	Shear (lb/sq ft)	0.39	1.19	0.15
Alpha	1.25	Stream Power (lb/ft s)	0.95	4.78	0.19
Frctn Loss (ft)	1.11	Cum Volume (acre-ft)	9.73	8.72	6.92
C & E Loss (ft)	0.00	Cum SA (acres)	8.78	1.98	7.79

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

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1023.92	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.35	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1023.56	Reach Len. (ft)	225.50	227.04	227.70
Crit W.S. (ft)	1022.74	Flow Area (sq ft)	325.24	269.95	15.27
E.G. Slope (ft/ft)	0.007284	Area (sq ft)	325.24	269.95	15.27
Q Total (cfs)	2820.00	Flow (cfs)	1323.78	1449.41	46.82
Top Width (ft)	225.29	Top Width (ft)	158.29	57.00	10.00
Vel Total (ft/s)	4.62	Avg. Vel. (ft/s)	4.07	5.37	3.07
Max Chl Dpth (ft)	6.66	Hydr. Depth (ft)	2.05	4.74	1.53
Conv. Total (cfs)	33041.6	Conv. (cfs)	15510.5	16982.5	548.6
Length Wtd. (ft)	226.38	Wetted Per. (ft)	159.99	59.13	11.49
Min Ch El (ft)	1016.90	Shear (lb/sq ft)	0.92	2.08	0.60
Alpha	1.07	Stream Power (lb/ft s)	3.76	11.15	1.85
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	5.01	10.43	2.46
C & E Loss (ft)	0.07	Cum SA (acres)	2.02	1.98	0.89

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

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.150

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9517.1	1022.64	9555.3	1022.34	9580.1	1022	9617.1	1021.79	9667.1	1021.7
9692.1	1021.45	9750.2	1021.11	9825	1020.5	9831.7	1018.9	9839.1	1018.37
9846.8	1020.58	9876.7	1021.2	9917	1020	9961.5	1019.67	9985.8	1017.91
10000	1017.04	10014.8	1016.74	10061.4	1019.23	10081.23	1019.73	10132.4	1020.98
10145.5	1021.24	10189.5	1021.37	10291.2	1022.71	10332.3	1022.8	10478.1	1022.91

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9517.1	.05	9961.5	.06	10081.23	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9961.5	10081.23	65.09	68.64	64.33	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.10	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1021.93	Reach Len. (ft)	65.09	68.64	64.33
Crit W.S. (ft)	1020.82	Flow Area (sq ft)	376.05	445.97	129.97
E.G. Slope (ft/ft)	0.005148	Area (sq ft)	376.05	445.97	129.97
Q Total (cfs)	2820.00	Flow (cfs)	812.44	1756.12	251.44
Top Width (ft)	638.29	Top Width (ft)	368.17	119.73	150.39
Vel Total (ft/s)	2.96	Avg. Vel. (ft/s)	2.16	3.94	1.93
Max Chl Dpth (ft)	5.18	Hydr. Depth (ft)	1.02	3.72	0.86
Conv. Total (cfs)	39302.3	Conv. (cfs)	11323.0	24475.0	3504.3
Length Wtd. (ft)	67.22	Wetted Per. (ft)	368.72	119.90	150.41
Min Ch El (ft)	1016.74	Shear (lb/sq ft)	0.33	1.20	0.28
Alpha	1.29	Stream Power (lb/ft s)	0.71	4.71	0.54
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	6.91	6.93	6.36
C & E Loss (ft)	0.04	Cum SA (acres)	6.44	1.52	6.96

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.97	Element			
Vel Head (ft)	0.13	Wt. n-Val.	0.050	0.065	
W.S. Elev (ft)	1022.84	Reach Len. (ft)	65.09	68.64	64.33
Crit W.S. (ft)	1020.53	Flow Area (sq ft)	415.62	551.18	
E.G. Slope (ft/ft)	0.002412	Area (sq ft)	415.62	551.18	
Q Total (cfs)	2820.00	Flow (cfs)	1126.87	1693.13	
Top Width (ft)	280.00	Top Width (ft)	161.50	118.50	
Vel Total (ft/s)	2.92	Avg. Vel. (ft/s)	2.71	3.07	
Max Chl Dpth (ft)	6.10	Hydr. Depth (ft)	2.57	4.65	
Conv. Total (cfs)	57414.5	Conv. (cfs)	22942.7	34471.8	
Length Wtd. (ft)	67.67	Wetted Per. (ft)	164.18	121.80	
Min Ch El (ft)	1016.74	Shear (lb/sq ft)	0.38	0.68	
Alpha	1.01	Stream Power (lb/ft s)	1.03	2.09	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	3.09	8.29	2.42
C & E Loss (ft)	0.02	Cum SA (acres)	1.19	1.52	0.86

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

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.137

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9537.5	1022.41	9618.09	1021.79	9677.9	1020.83	9849.6	1018.85	9893.55	1018.01
9999.6	1016.14	10000	1016.14	10017.4	1016.18	10096.77	1018.04	10174.2	1019.79
10352	1020.9	10529.7	1022.03						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9537.5	.035	9893.55	.03	10096.77	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9893.55	10096.77	68.14	68.64	66.02	.1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
888		F	

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.02	Element			
Vel Head (ft)	0.04	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1021.98	Reach Len. (ft)	68.14	68.64	66.02
Crit W.S. (ft)	1018.86	Flow Area (sq ft)	566.68	1010.85	484.23

E.G. Slope (ft/ft)	0.000205	Area (sq ft)	566.68	1010.85	620.87
Q Total (cfs)	2820.00	Flow (cfs)	526.32	1792.24	501.43
Top Width (ft)	929.21	Top Width (ft)	300.51	203.22	425.48
Vel Total (ft/s)	1.37	Avg. Vel. (ft/s)	0.93	1.77	1.04
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)	1.89	4.97	2.22
Conv. Total (cfs)	196740.3	Conv. (cfs)	36719.4	125037.8	34983.1
Length Wtd. (ft)	67.94	Wetted Per. (ft)	300.53	203.26	218.14
Min Ch El (ft)	1016.14	Shear (lb/sq ft)	0.02	0.06	0.03
Alpha	1.26	Stream Power (lb/ft s)	0.02	0.11	0.03
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	6.21	5.78	5.81
C & E Loss (ft)	0.01	Cum SA (acres)	5.94	1.27	6.54

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.91	Element			
Vel Head (ft)	0.06	Wt. n-Val.	0.035	0.035	0.035
W.S. Elev (ft)	1022.85	Reach Len. (ft)	68.14	68.64	66.02
Crit W.S. (ft)	1018.86	Flow Area (sq ft)	152.73	1187.23	92.30
E.G. Slope (ft/ft)	0.000222	Area (sq ft)	152.73	1187.23	92.30
Q Total (cfs)	2820.00	Flow (cfs)	244.08	2434.62	141.30
Top Width (ft)	257.17	Top Width (ft)	33.81	203.22	20.14
Vel Total (ft/s)	1.97	Avg. Vel. (ft/s)	1.60	2.05	1.53
Max Chl Dpth (ft)	6.71	Hydr. Depth (ft)	4.52	5.84	4.58
Conv. Total (cfs)	189353.0	Conv. (cfs)	16389.1	163475.9	9488.0
Length Wtd. (ft)	68.13	Wetted Per. (ft)	38.01	203.26	24.50
Min Ch El (ft)	1016.14	Shear (lb/sq ft)	0.06	0.08	0.05
Alpha	1.02	Stream Power (lb/ft s)	0.09	0.17	0.08
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	2.67	6.92	2.36
C & E Loss (ft)	0.01	Cum SA (acres)	1.05	1.27	0.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.124

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9590.8	1021.92	9649	1021.52	9757.7	1020.71	9784.1	1020.21	9840	1020.9
9968.3	1019.28	9977.8	1016.66	9990.7	1015.51	10000	1015.72	10019.7	1016.16
10030.9	1019.92	10064.9	1020.87	10133.1	1019.7	10165.6	1020	10321.2	1021.6
10396.2	1021.21	10423.89	1021.63	10446.8	1022	10495.6	1022.59	10559.2	1022.52

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9590.8	.05	9968.3	.065	10030.9	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9968.3	10030.9	167	168.96	165.24	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1021.97	Element			
Vel Head (ft)	0.14	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1021.84	Reach Len. (ft)	167.00	168.96	165.24
Crit W.S. (ft)	1021.05	Flow Area (sq ft)	417.62	327.45	425.73
E.G. Slope (ft/ft)	0.003320	Area (sq ft)	417.62	327.45	425.73
Q Total (cfs)	2820.00	Flow (cfs)	781.79	1285.58	752.64
Top Width (ft)	833.65	Top Width (ft)	365.30	62.60	405.75
Vel Total (ft/s)	2.41	Avg. Vel. (ft/s)	1.87	3.93	1.77
Max Chl Dpth (ft)	6.33	Hydr. Depth (ft)	1.14	5.23	1.05
Conv. Total (cfs)	48944.6	Conv. (cfs)	13568.9	22312.8	13063.0
Length Wtd. (ft)	167.63	Wetted Per. (ft)	365.32	63.63	405.79
Min Ch El (ft)	1015.51	Shear (lb/sq ft)	0.24	1.07	0.22
Alpha	1.52	Stream Power (lb/ft s)	0.44	4.19	0.38
Frctn Loss (ft)	0.68	Cum Volume (acre-ft)	5.44	4.73	5.01
C & E Loss (ft)	0.00	Cum SA (acres)	5.42	1.06	5.91

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.87	Element			
Vel Head (ft)	0.14	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1022.73	Reach Len. (ft)	167.00	168.96	165.24
Crit W.S. (ft)	1020.99	Flow Area (sq ft)	285.55	383.55	310.52
E.G. Slope (ft/ft)	0.002038	Area (sq ft)	285.55	383.55	310.52
Q Total (cfs)	2820.00	Flow (cfs)	752.39	1311.19	756.42
Top Width (ft)	288.26	Top Width (ft)	101.58	62.60	124.08
Vel Total (ft/s)	2.88	Avg. Vel. (ft/s)	2.63	3.42	2.44
Max Chl Dpth (ft)	7.22	Hydr. Depth (ft)	2.81	6.13	2.50
Conv. Total (cfs)	62460.9	Conv. (cfs)	16664.9	29042.0	16754.0
Length Wtd. (ft)	167.97	Wetted Per. (ft)	103.76	63.63	126.93
Min Ch El (ft)	1015.51	Shear (lb/sq ft)	0.35	0.77	0.31
Alpha	1.07	Stream Power (lb/ft s)	0.92	2.62	0.76
Frctn Loss (ft)	0.51	Cum Volume (acre-ft)	2.32	5.68	2.05
C & E Loss (ft)	0.02	Cum SA (acres)	0.94	1.06	0.74

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.092

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9467.8	1021.97	9487.5	1022.11	9503.4	1021.85	9694.9	1020.58	9764.6	1020
9791.1	1019.7	9891.4	1020.64	9938.3	1020.7	9975.4	1019.21	9987.8	1014.4
10000	1014.98	10010.3	1015.47	10052.7	1018.55	10079.9	1019.4	10135.1	1019.2
10212.9	1020.16	10364.4	1020.78	10555	1021.41	10718.2	1022		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9467.8	.05	9975.4	.065	10079.9	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9975.4	10079.9	211.52	211.2	213.21	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1021.29	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1021.11	Reach Len. (ft)	211.52	211.20	213.21
Crit W.S. (ft)	1020.17	Flow Area (sq ft)	269.17	424.14	324.26
E.G. Slope (ft/ft)	0.005045	Area (sq ft)	269.17	424.14	324.26
Q Total (cfs)	2820.00	Flow (cfs)	467.80	1740.77	611.43
Top Width (ft)	848.86	Top Width (ft)	360.29	104.50	384.08
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)	1.74	4.10	1.89
Max Chl Dpth (ft)	6.71	Hydr. Depth (ft)	0.75	4.06	0.84
Conv. Total (cfs)	39701.2	Conv. (cfs)	6585.9	24507.3	8608.0
Length Wtd. (ft)	211.80	Wetted Per. (ft)	360.33	105.55	384.08
Min Ch El (ft)	1014.40	Shear (lb/sq ft)	0.24	1.27	0.27
Alpha	1.52	Stream Power (lb/ft s)	0.41	5.19	0.50
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)	4.12	3.27	3.59
C & E Loss (ft)	0.00	Cum SA (acres)	4.03	0.73	4.41

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1022.34	Element			
Vel Head (ft)	0.32	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1022.02	Reach Len. (ft)	211.52	211.20	213.21
Crit W.S. (ft)	1020.01	Flow Area (sq ft)	26.09	519.29	78.66
E.G. Slope (ft/ft)	0.005007	Area (sq ft)	26.09	519.29	78.66
Q Total (cfs)	2820.00	Flow (cfs)	89.99	2429.71	300.30
Top Width (ft)	143.93	Top Width (ft)	10.00	104.50	29.43
Vel Total (ft/s)	4.52	Avg. Vel. (ft/s)	3.45	4.68	3.82
Max Chl Dpth (ft)	7.62	Hydr. Depth (ft)	2.61	4.97	2.67
Conv. Total (cfs)	39854.8	Conv. (cfs)	1271.8	34338.8	4244.2
Length Wtd. (ft)	211.62	Wetted Per. (ft)	12.42	105.55	32.16
Min Ch El (ft)	1014.40	Shear (lb/sq ft)	0.66	1.54	0.76
Alpha	1.02	Stream Power (lb/ft s)	2.27	7.19	2.92
Frctn Loss (ft)	1.13	Cum Volume (acre-ft)	1.73	3.93	1.31
C & E Loss (ft)	0.00	Cum SA (acres)	0.73	0.73	0.45

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50.052

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9466.6	1021.07	9538.6	1020.37	9597.2	1020	9611.9	1018.9	9624.2	1019.7
9637.8	1019.6	9652.9	1020.38	9663.8	1019.43	9678.5	1019.56	9693.1	1019.73
9715.4	1019	9729.3	1018.8	9827.6	1018.1	9846.6	1018.65	9910.5	1018.55
9981.7	1018.5	9990	1014	10000	1014.44	10012.7	1015	10019.9	1017.5
10073.4	1018.45	10183.5	1018.75	10286.9	1020.39	10349.1	1020	10379.6	1019.8
10450	1019.8	10479.6	1019.9	10493.6	1019.72	10529.4	1020	10559.8	1019.75
10579.4	1020	10695.1	1020.62	10726.8	1021.65				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9466.6	.05	9981.7	.065	10019.9	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9981.7	10019.9	274.91	274.56	270.57	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1020.16	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1019.98	Reach Len. (ft)	274.91	274.56	270.57
Crit W.S. (ft)	1019.45	Flow Area (sq ft)	438.06	182.31	338.94
E.G. Slope (ft/ft)	0.005662	Area (sq ft)	438.06	182.31	338.94
Q Total (cfs)	2820.00	Flow (cfs)	1127.54	865.17	827.30
Top Width (ft)	873.29	Top Width (ft)	372.00	38.20	463.09
Vel Total (ft/s)	2.94	Avg. Vel. (ft/s)	2.57	4.75	2.44
Max Chl Dpth (ft)	5.98	Hydr. Depth (ft)	1.18	4.77	0.73
Conv. Total (cfs)	37475.8	Conv. (cfs)	14984.2	11497.4	10994.2
Length Wtd. (ft)	273.67	Wetted Per. (ft)	372.13	39.79	463.12
Min Ch El (ft)	1014.00	Shear (lb/sq ft)	0.42	1.62	0.26
Alpha	1.31	Stream Power (lb/ft s)	1.07	7.69	0.63
Frctn Loss (ft)	1.36	Cum Volume (acre-ft)	2.41	1.80	1.97
C & E Loss (ft)	0.00	Cum SA (acres)	2.25	0.39	2.34

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

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1021.21	Element			
Vel Head (ft)	0.34	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1020.87	Reach Len. (ft)	274.91	274.56	270.57
Crit W.S. (ft)	1019.79	Flow Area (sq ft)	247.72	216.24	157.62
E.G. Slope (ft/ft)	0.005729	Area (sq ft)	247.72	216.24	157.62
Q Total (cfs)	2820.00	Flow (cfs)	965.19	1156.66	698.15
Top Width (ft)	199.22	Top Width (ft)	106.40	38.20	54.62
Vel Total (ft/s)	4.54	Avg. Vel. (ft/s)	3.90	5.35	4.43
Max Chl Dpth (ft)	6.87	Hydr. Depth (ft)	2.33	5.66	2.89
Conv. Total (cfs)	37255.8	Conv. (cfs)	12751.4	15280.9	9223.4
Length Wtd. (ft)	273.92	Wetted Per. (ft)	108.67	39.79	57.05
Min Ch El (ft)	1014.00	Shear (lb/sq ft)	0.82	1.94	0.99
Alpha	1.06	Stream Power (lb/ft s)	3.18	10.40	4.38
Frctn Loss (ft)	1.37	Cum Volume (acre-ft)	1.06	2.15	0.73
C & E Loss (ft)	0.01	Cum SA (acres)	0.44	0.39	0.24

Warning: The cross section had to be extended vertically during the critical depth calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

CROSS SECTION RIVER: T1NR6WS05
REACH: 50 to 60 RS: 50

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9083.9	1023.04	9317.7	1021.4	9410.2	1020.4	9424.1	1020.32	9519.6	1019.34
9706	1017.7	9805	1017.53	9919.3	1017.44	9944.25	1015.97	9982.5	1013.8
9990.4	1013.8	10000	1013.1	10017.3	1012.2	10029.5	1016	10099.5	1016.85
10136.9	1017.51	10194	1018	10319.8	1018.62	10521.2	1018.76	10705.4	1020.37
10900.9	1021.52	10995.6	1023.19	11041.1	1023.39				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9083.9	.05	9944.25	.065	10029.5	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
9944.25	10029.5	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1018.80	Element			
Vel Head (ft)	0.18	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1018.62	Reach Len. (ft)			
Crit W.S. (ft)	1017.79	Flow Area (sq ft)	324.22	388.78	295.15
E.G. Slope (ft/ft)	0.004407	Area (sq ft)	324.22	388.78	295.15
Q Total (cfs)	2820.00	Flow (cfs)	616.61	1613.92	589.47
Top Width (ft)	717.55	Top Width (ft)	342.52	85.25	289.78
Vel Total (ft/s)	2.80	Avg. Vel. (ft/s)	1.90	4.15	2.00
Max Chl Dpth (ft)	6.42	Hydr. Depth (ft)	0.95	4.56	1.02
Conv. Total (cfs)	42478.0	Conv. (cfs)	9288.1	24310.7	8879.2
Length Wtd. (ft)		Wetted Per. (ft)	342.57	85.94	289.79
Min Ch El (ft)	1012.20	Shear (lb/sq ft)	0.26	1.24	0.28
Alpha	1.47	Stream Power (lb/ft s)	0.50	5.17	0.56
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1019.83	Element			
Vel Head (ft)	0.32	Wt. n-Val.	0.050	0.065	0.050
W.S. Elev (ft)	1019.52	Reach Len. (ft)			
Crit W.S. (ft)	1017.35	Flow Area (sq ft)	88.73	465.51	78.99
E.G. Slope (ft/ft)	0.004407	Area (sq ft)	88.73	465.51	78.99

Q Total (cfs)	2820.00	Flow (cfs)	319.36	2178.99	321.65
Top Width (ft)	142.55	Top Width (ft)	33.90	85.25	23.40
Vel Total (ft/s)	4.45	Avg. Vel. (ft/s)	3.60	4.68	4.07
Max Chl Dpth (ft)	7.32	Hydr. Depth (ft)	2.62	5.46	3.38
Conv. Total (cfs)	42477.8	Conv. (cfs)	4810.5	32822.2	4845.1
Length Wtd. (ft)		Wetted Per. (ft)	36.01	85.94	26.64
Min Ch El (ft)	1012.20	Shear (lb/sq ft)	0.68	1.49	0.82
Alpha	1.02	Stream Power (lb/ft s)	2.44	6.98	3.32
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF MANNING'S N VALUES

River:T1NR6WS05

Reach	River Sta.	n1	n2	n3
50 to 60	60	.05	.065	.05
50 to 60	50.537	.05	.065	.05
50 to 60	50.476	.05	.065	.05
50 to 60	50.390	.05	.065	.05
50 to 60	50.348	.05	.065	.05
50 to 60	50.301	.05	.065	.05
50 to 60	50.245	.05	.065	.05
50 to 60	50.193	.05	.065	.05
50 to 60	50.150	.05	.065	.05
50 to 60	50.137	.035	.035	.035
50 to 60	50.124	.05	.065	.05
50 to 60	50.092	.05	.065	.05
50 to 60	50.052	.05	.065	.05
50 to 60	50	.05	.065	.05

SUMMARY OF REACH LENGTHS

River: T1NR6WS05

Reach	River Sta.	Left	Channel	Right
50 to 60	60	490.71	500.53	492.45
50 to 60	50.537	328.12	322.08	343.38
50 to 60	50.476	458.62	454.08	453.83
50 to 60	50.390	221.43	221.76	222.81
50 to 60	50.348	249.19	248.16	253.42
50 to 60	50.301	292.07	295.68	293.17
50 to 60	50.245	276.16	274.56	283.62
50 to 60	50.193	225.5	227.04	227.7
50 to 60	50.150	65.09	68.64	64.33
50 to 60	50.137	68.14	68.64	66.02
50 to 60	50.124	167	168.96	165.24
50 to 60	50.092	211.52	211.2	213.21
50 to 60	50.052	274.91	274.56	270.57
50 to 60	50			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: T1NR6WS05

Reach	River Sta.	Contr.	Expan.
50 to 60	60	.1	.3
50 to 60	50.537	.1	.3
50 to 60	50.476	.1	.3
50 to 60	50.390	.1	.3
50 to 60	50.348	.1	.3
50 to 60	50.301	.1	.3
50 to 60	50.245	.1	.3
50 to 60	50.193	.1	.3
50 to 60	50.150	.1	.3
50 to 60	50.137	.1	.3
50 to 60	50.124	.1	.3
50 to 60	50.092	.1	.3
50 to 60	50.052	.1	.3
50 to 60	50	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
50 to 60	50	2820.00	1012.20	1018.62	1017.79	1018.80	0.004407	4.15	1008.15	717.55	0.34
50 to 60	50	2820.00	1012.20	1019.52	1017.35	1019.83	0.004407	4.68	633.23	142.55	0.35
50 to 60	50.052	2820.00	1014.00	1019.98	1019.45	1020.16	0.005662	4.75	959.31	873.29	0.38
50 to 60	50.052	2820.00	1014.00	1020.87	1019.79	1021.21	0.005729	5.35	621.57	199.22	0.40

50 to 60	50.092	2820.00	1014.40	1021.11	1020.17	1021.29	0.005045	4.10	1017.58	848.86	0.36
50 to 60	50.092	2820.00	1014.40	1022.02	1020.01	1022.34	0.005007	4.68	624.04	143.93	0.37
50 to 60	50.124	2820.00	1015.51	1021.84	1021.05	1021.97	0.003320	3.93	1170.79	833.65	0.30
50 to 60	50.124	2820.00	1015.51	1022.73	1020.99	1022.87	0.002038	3.42	979.62	288.26	0.24
50 to 60	50.137	2820.00	1016.14	1021.98	1018.86	1022.02	0.000205	1.77	2061.77	929.21	0.14
50 to 60	50.137	2820.00	1016.14	1022.85	1018.86	1022.91	0.000222	2.05	1432.27	257.17	0.15
50 to 60	50.150	2820.00	1016.74	1021.93	1020.82	1022.10	0.005148	3.94	951.99	638.29	0.36
50 to 60	50.150	2820.00	1016.74	1022.84	1020.53	1022.97	0.002412	3.07	966.80	280.00	0.25
50 to 60	50.193	2820.00	1016.90	1023.07	1022.46	1023.21	0.004678	4.00	1035.17	756.69	0.34
50 to 60	50.193	2820.00	1016.90	1023.56	1022.74	1023.92	0.007284	5.37	610.46	225.29	0.43
50 to 60	50.245	2820.00	1017.80	1024.53	1023.86	1024.93	0.007786	6.23	638.34	828.92	0.46
50 to 60	50.245	2820.00	1017.80	1025.43	1023.86	1026.08	0.007792	6.87	442.34	91.47	0.47
50 to 60	50.301	2820.00	1019.10	1026.33	1024.93	1026.56	0.004059	4.53	855.05	431.49	0.34
50 to 60	50.301	2820.00	1019.10	1027.33	1024.89	1027.67	0.003807	4.90	616.41	121.02	0.34
50 to 60	50.348	2820.00	1020.00	1027.32	1026.27	1027.48	0.003379	4.38	982.42	503.04	0.31
50 to 60	50.348	2820.00	1020.00	1028.27	1026.36	1028.55	0.003239	4.72	688.06	163.96	0.31
50 to 60	50.390	2820.00	1021.14	1028.15	1027.02	1028.33	0.004294	3.95	877.82	413.97	0.33
50 to 60	50.390	2820.00	1021.14	1029.08	1026.84	1029.37	0.004204	4.45	654.64	143.04	0.34
50 to 60	50.476	2820.00	1023.13	1030.20	1029.20	1030.45	0.004967	5.03	853.37	512.90	0.37
50 to 60	50.476	2820.00	1023.13	1031.08	1029.34	1031.49	0.005041	5.58	561.84	126.70	0.38
50 to 60	50.537	2820.00	1024.50	1031.53	1030.04	1031.67	0.002808	3.70	1061.79	550.54	0.28
50 to 60	50.537	2820.00	1024.50	1032.48	1030.20	1032.70	0.002709	4.05	758.69	167.84	0.28
50 to 60	60	2440.00	1026.00	1033.14	1032.39	1033.31	0.004033	4.55	904.67	594.93	0.33
50 to 60	60	2440.00	1026.00	1034.02	1032.28	1034.34	0.004114	5.04	542.59	129.26	0.34

Profile Output Table - Standard Table 2

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
50 to 60	50	1018.80	1018.62	0.18			616.61	1613.92	589.47	717.55
50 to 60	50	1019.83	1019.52	0.32			319.36	2178.99	321.65	142.55
50 to 60	50.052	1020.16	1019.98	0.18	1.36	0.00	1127.54	865.17	827.30	873.29
50 to 60	50.052	1021.21	1020.87	0.34	1.37	0.01	965.19	1156.66	698.15	199.22
50 to 60	50.092	1021.29	1021.11	0.18	1.13	0.00	467.80	1740.77	611.43	848.86
50 to 60	50.092	1022.34	1022.02	0.32	1.13	0.00	89.99	2429.71	300.30	143.93
50 to 60	50.124	1021.97	1021.84	0.14	0.68	0.00	781.79	1285.58	752.64	833.65
50 to 60	50.124	1022.87	1022.73	0.14	0.51	0.02	752.39	1311.19	756.42	288.26
50 to 60	50.137	1022.02	1021.98	0.04	0.04	0.01	526.32	1792.24	501.43	929.21
50 to 60	50.137	1022.91	1022.85	0.06	0.03	0.01	244.08	2434.62	141.30	257.17
50 to 60	50.150	1022.10	1021.93	0.18	0.04	0.04	812.44	1756.12	251.44	638.29
50 to 60	50.150	1022.97	1022.84	0.13	0.04	0.02	1126.87	1693.13		280.00
50 to 60	50.193	1023.21	1023.07	0.14	1.11	0.00	1746.29	967.53	106.19	756.69
50 to 60	50.193	1023.92	1023.56	0.35	0.88	0.07	1323.78	1449.41	46.82	225.29
50 to 60	50.245	1024.93	1024.53	0.39	1.64	0.08	1072.01	1392.83	355.17	828.92
50 to 60	50.245	1026.08	1025.43	0.65	2.08	0.09	883.74	1782.89	153.37	91.47
50 to 60	50.301	1026.56	1026.33	0.23	1.61	0.02	345.89	1699.16	774.96	431.49
50 to 60	50.301	1027.67	1027.33	0.34	1.55	0.03	514.23	2169.41	136.36	121.02
50 to 60	50.348	1027.48	1027.32	0.17	0.92	0.01	617.54	1038.74	1163.71	503.04
50 to 60	50.348	1028.55	1028.27	0.28	0.87	0.01	642.53	1290.81	886.66	163.96
50 to 60	50.390	1028.33	1028.15	0.19	0.84	0.01	72.77	1686.82	1060.41	413.97
50 to 60	50.390	1029.37	1029.08	0.29	0.82	0.01	74.28	2301.57	444.15	143.04
50 to 60	50.476	1030.45	1030.20	0.25	2.10	0.02	694.54	1422.95	702.51	512.90
50 to 60	50.476	1031.49	1031.08	0.41	2.09	0.04	187.82	1822.53	809.65	126.70
50 to 60	50.537	1031.67	1031.53	0.14	1.21	0.01	433.09	1265.74	1121.18	550.54
50 to 60	50.537	1032.70	1032.48	0.22	1.19	0.02	206.72	1626.51	986.77	167.84
50 to 60	60	1033.31	1033.14	0.16	1.63	0.01	230.32	838.50	1371.19	594.93
50 to 60	60	1034.34	1034.02	0.32	1.62	0.03	118.64	1067.90	1253.47	129.26

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : FPFW Model

River: T1NR6WS05 Reach: 50 to 60 RS: 60 Profile: PF 1
Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
River: T1NR6WS05 Reach: 50 to 60 RS: 60 Profile: PF 2
Warning:The cross section had to be extended vertically during the critical depth calculations.

```
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.537     Profile: PF 1
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.537     Profile: PF 2
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.476     Profile: PF 1
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.476     Profile: PF 2
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.390     Profile: PF 2
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
    Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.301     Profile: PF 1
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.301     Profile: PF 2
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
    Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.245     Profile: PF 1
    Warning:Divided flow computed for this cross-section.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.245     Profile: PF 2
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
    Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.193     Profile: PF 1
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.193     Profile: PF 2
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.150     Profile: PF 1
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.150     Profile: PF 2
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.137     Profile: PF 1
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.137     Profile: PF 2
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.124     Profile: PF 2
    Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
            This may indicate the need for additional cross sections.
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.092     Profile: PF 1
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.092     Profile: PF 2
    Warning:The cross section had to be extended vertically during the critical depth calculations.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
    Warning:The parabolic search method failed to converge on critical depth.  The program will try the cross section
            slice/secant method to find critical depth.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.052     Profile: PF 1
    Warning:Divided flow computed for this cross-section.
    Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
            the need for additional cross sections.
River: T1NR6WS05  Reach: 50 to 60     RS: 50.052     Profile: PF 2
    Warning:The cross section had to be extended vertically during the critical depth calculations.
```

Warning:The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning:The parabolic search method failed to converge on critical depth. The program will try the cross section slice/secant method to find critical depth.

APPENDIX F

HEC-RAS Plan: FPFW Model River: T1NR6WS05 Reach: 50 to 60

Reach	River Sta	Top Wdth Act	Area	Vel Total	W.S. Elev	Base WS	Prof Delta WS
		(ft)	(sq ft)	(ft/s)	(ft)	(ft)	(ft)
50 to 60	50	717.55	1008.15	2.80	1018.62	1018.62	
50 to 60	50	142.55	633.23	4.45	1019.52	1018.62	0.90
50 to 60	50.052	873.29	959.31	2.94	1019.98	1019.98	
50 to 60	50.052	199.22	621.57	4.54	1020.87	1019.98	0.89
50 to 60	50.092	848.86	1017.58	2.77	1021.11	1021.11	
50 to 60	50.092	143.93	624.04	4.52	1022.02	1021.11	0.91
50 to 60	50.124	833.65	1170.79	2.41	1021.84	1021.84	
50 to 60	50.124	288.26	979.62	2.88	1022.73	1021.84	0.90
50 to 60	50.137	721.85	2198.40	1.37	1021.98	1021.98	
50 to 60	50.137	257.17	1432.27	1.97	1022.85	1021.98	0.87
50 to 60	50.150	638.29	951.99	2.96	1021.93	1021.93	
50 to 60	50.150	280.00	966.80	2.92	1022.84	1021.93	0.91
50 to 60	50.193	756.69	1035.17	2.72	1023.07	1023.07	
50 to 60	50.193	225.29	610.46	4.62	1023.56	1023.07	0.49
50 to 60	50.245	324.66	946.45	4.42	1024.53	1024.53	
50 to 60	50.245	91.47	442.34	6.38	1025.43	1024.53	0.90
50 to 60	50.301	431.49	855.05	3.30	1026.33	1026.33	
50 to 60	50.301	121.02	616.41	4.57	1027.33	1026.33	1.00
50 to 60	50.348	503.04	982.42	2.87	1027.32	1027.32	
50 to 60	50.348	163.96	688.06	4.10	1028.27	1027.32	0.96
50 to 60	50.390	413.97	877.82	3.21	1028.15	1028.15	
50 to 60	50.390	143.04	654.64	4.31	1029.08	1028.15	0.93
50 to 60	50.476	512.90	853.37	3.30	1030.20	1030.20	
50 to 60	50.476	126.70	561.84	5.02	1031.08	1030.20	0.88
50 to 60	50.537	550.54	1061.79	2.66	1031.53	1031.53	
50 to 60	50.537	167.84	758.69	3.72	1032.48	1031.53	0.95
50 to 60	60	594.93	904.67	2.70	1033.14	1033.14	
50 to 60	60	129.26	542.59	4.50	1034.02	1033.14	0.87

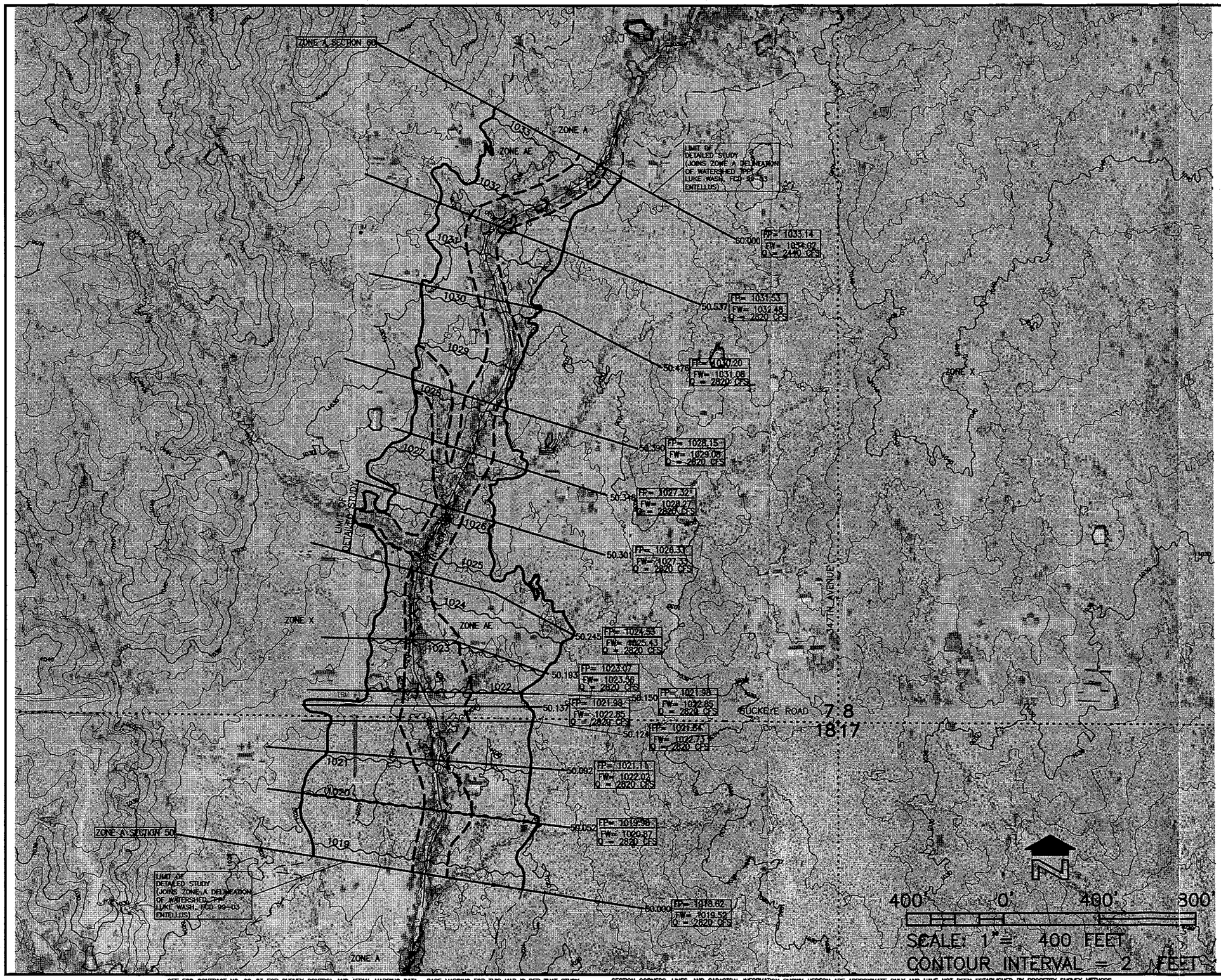
HEC-RAS Plan: FPFW Model River: T1NR6WS05 Reach: 50 to 60

Reach	River Sta	W.S. Elev	Prof Delta WS	E.G. Elev	Top Wdth Act	Q Left	Q Channel	Q Right	Enc Sta L	Ch Sta L	Ch Sta R	Enc Sta R
		(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft)	(ft)
50 to 60	50	1018.62		1018.80	717.55	616.61	1613.92	569.47		9944.25	10029.50	
50 to 60	50	1019.52	0.90	1019.83	142.55	319.36	2178.99	321.65	9910.35	9944.25	10029.50	10052.90
50 to 60	50.052	1019.98		1020.16	873.29	1127.54	865.17	827.30		9981.70	10019.90	
50 to 60	50.052	1020.87	0.89	1021.21	199.22	965.19	1156.66	698.15	9875.30	9981.70	10019.90	10074.52
50 to 60	50.092	1021.11		1021.29	848.86	467.80	1740.77	611.43		9975.40	10079.90	
50 to 60	50.092	1022.02	0.91	1022.34	143.93	89.99	2429.71	300.30	9965.40	9975.40	10079.90	10109.33
50 to 60	50.124	1021.84		1021.97	833.65	781.79	1285.58	752.64		9968.30	10030.90	
50 to 60	50.124	1022.73	0.90	1022.87	288.26	752.39	1311.19	756.42	9866.72	9968.30	10030.90	10154.98
50 to 60	50.137	1021.98		1022.02	721.85	526.32	1792.24	501.43		9893.55	10096.77	
50 to 60	50.137	1022.85	0.87	1022.91	257.17	244.08	2434.62	141.30	9859.74	9893.55	10096.77	10116.91
50 to 60	50.150	1021.93		1022.10	638.29	812.44	1756.12	251.44		9961.50	10081.23	
50 to 60	50.150	1022.84	0.91	1022.97	280.00	1126.87	1693.13		9800.00	9961.50	10081.23	10080.00
50 to 60	50.193	1023.07		1023.21	756.69	1746.29	967.53	106.19		9961.60	10018.60	
50 to 60	50.193	1023.56	0.49	1023.92	225.29	1323.78	1449.41	46.82	9803.31	9961.60	10018.60	10028.60
50 to 60	50.245	1024.53		1024.93	324.66	1072.01	1392.83	355.17		9978.70	10018.40	
50 to 60	50.245	1025.43	0.90	1026.08	91.47	883.74	1782.89	153.37	9936.93	9978.70	10018.40	10028.40
50 to 60	50.301	1026.33		1026.56	431.49	345.89	1699.16	774.96		9966.10	10033.50	
50 to 60	50.301	1027.33	1.00	1027.67	121.02	514.23	2169.41	136.36	9922.48	9966.10	10033.50	10043.50
50 to 60	50.348	1027.32		1027.48	503.04	617.54	1038.74	1163.71		9978.50	10016.60	
50 to 60	50.348	1028.27	0.96	1028.55	163.96	642.53	1290.81	886.66	9911.38	9978.50	10016.60	10075.34
50 to 60	50.390	1028.15		1028.33	413.97	72.77	1686.82	1060.41		9972.10	10069.70	
50 to 60	50.390	1029.08	0.93	1029.37	143.04	74.28	2301.57	444.15	9962.10	9972.10	10069.70	10105.14
50 to 60	50.476	1030.20		1030.45	512.90	694.54	1422.95	702.51		9978.90	10028.80	
50 to 60	50.476	1031.08	0.88	1031.49	126.70	187.82	1822.53	809.65	9963.85	9978.90	10028.80	10090.55
50 to 60	50.537	1031.53		1031.67	550.54	433.09	1265.74	1121.18		9967.50	10030.40	
50 to 60	50.537	1032.48	0.95	1032.70	167.84	206.72	1626.51	986.77	9952.31	9967.50	10030.40	10120.15
50 to 60	60	1033.14		1033.31	594.93	230.32	838.50	1371.19		9981.40	10012.90	
50 to 60	60	1034.02	0.87	1034.34	129.26	118.64	1067.90	1253.47	9971.40	9981.40	10012.90	10100.66

HEC-RAS Plan: FPFW Model River: T1NR6WS05 Reach: 50 to 60

Reach	River Sta	Prof Delta WS	Top Wdth Act	K Perc L	Enc Sta L	Dist Center L	Center Station	Dist Center R	Enc Sta R	K Perc R	Encr WD
		(ft)	(ft)		(ft)	(ft)	(ft)	(ft)	(ft)		(ft)
50 to 60	50		717.55				9986.88				
50 to 60	50	0.90	142.55	25.44	9910.35	76.53	9986.88	66.03	10052.90	25.44	142.55
50 to 60	50.052		873.29				10000.80				
50 to 60	50.052	0.89	199.22	27.18	9875.30	125.50	10000.80	73.72	10074.52	26.98	199.22
50 to 60	50.092		848.86				10027.65				
50 to 60	50.092	0.91	143.93	26.60	9965.40	62.25	10027.65	81.68	10109.33	26.91	143.93
50 to 60	50.124		833.65				9999.60				
50 to 60	50.124	0.90	288.26	19.32	9866.72	132.88	9999.60	155.38	10154.98	16.93	288.26
50 to 60	50.137		721.85				9995.16				
50 to 60	50.137	0.87	257.17	17.15	9859.74	135.42	9995.16	121.75	10116.91	17.62	257.17
50 to 60	50.150		638.29				10021.37				
50 to 60	50.150	0.91	280.00	11.58	9800.00	221.37	10021.37	58.63	10080.00	11.90	280.00
50 to 60	50.193		756.69				9990.10				
50 to 60	50.193	0.49	225.29	42.25	9803.31	186.79	9990.10	38.50	10028.60	6.62	225.29
50 to 60	50.245		324.66				9998.55				
50 to 60	50.245	0.90	91.47	51.63	9936.93	61.62	9998.55	29.85	10028.40	9.66	91.47
50 to 60	50.301		431.49				9999.80				
50 to 60	50.301	1.00	121.02	36.66	9922.48	77.32	9999.80	43.70	10043.50	19.44	121.02
50 to 60	50.348		503.04				9997.55				
50 to 60	50.348	0.96	163.96	23.94	9911.38	86.17	9997.55	77.79	10075.34	23.38	163.96
50 to 60	50.390		413.97				10020.90				
50 to 60	50.390	0.93	143.04	7.43	9962.10	58.80	10020.90	84.24	10105.14	35.32	143.04
50 to 60	50.476		512.90				10003.85				
50 to 60	50.476	0.88	126.70	20.99	9963.85	40.00	10003.85	86.70	10090.55	21.13	126.70
50 to 60	50.537		550.54				9998.95				
50 to 60	50.537	0.95	167.84	15.84	9952.31	46.64	9998.95	121.20	10120.15	20.55	167.84
50 to 60	60		594.93				9997.15				
50 to 60	60	0.87	129.26	8.01	9971.40	25.75	9997.15	103.51	10100.66	40.78	129.26

APPENDIX G



SEE FCD CONTRACT NO. 99-03 FOR SURVEY CONTROL AND AERIAL MAPPING DATA. BASE MAPPING FOR THIS MAP IS PER THAT STUDY

SECTION CORNERS, LINES, AND CADASTRAL INFORMATION SHOWN HEREON ARE APPROXIMATE ONLY AND HAVE NOT BEEN ESTABLISHED BY PROPERTY SURVEY METHODS.

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

T1N–R6W–S05
SECTIONS 50 TO 60

FLOOD DELINEATION STUDY OF
FCD NO. 2000C005–TASK4

LEGEND

100–YR FLOODPLAIN BOUNDARY

FLOODWAY BOUNDARY

CROSS SECTION — 0.10 — FP= 1888.74 / FW= 1889.54 / Q = 2080 CFS

TEMPORARY BENCH MARK — TBM #1

BASE FLOOD ELEVATIONS — 1221

ZONE DESIGNATIONS — ZONE AE

SECTION LINE

SECTION CORNER — 6 5 / 7 8

TEMPORARY BENCH MARKS (TBM)

NOTE: ALL ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988.

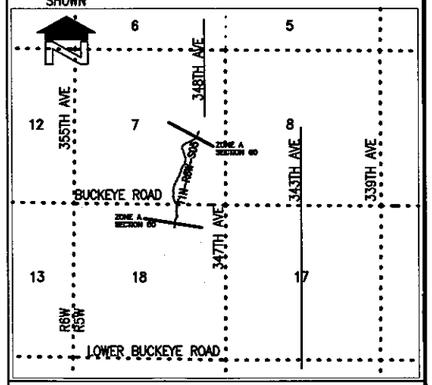
NGVD29 + 1.97 FEET = NAVD88

I.D. NUMBER	ELEVATION (FT)	DESCRIPTION/LOCATION
TBM #1	1023.45	SET COTTON SPINDLE IN W. SIDE OF POWER POLE #1253585 AT THE NS CORNER OF 350TH AVENUE AND BUCKEYE ROAD. N: 887215.78 E: 428940.06
TBM #2	1034.34	SET COTTON SPINDLE IN W. SIDE OF POWER POLE #1253636. (8TH POWER POLE NORTH OF BUCKEYE ROAD ON THE E. SIDE OF 350TH AVE. N: 889158.53 E: 428954.39

NOTES

1– THE HYDRAULIC BASE LINE IS THE THALWEG AND IS SET AT STATION 10,000 UNLESS NOTED OTHERWISE.

2– FLOODPLAIN AND FLOODWAY SHARE A COMMON BOUNDARY WHERE NO SEPARATE FLOODWAY LINE IS SHOWN SHOWN



JE FULLER
HYDROLOGY & GEOMORPHOLOGY, INC
8101 SOUTH RURAL RD, STE 110, TEMPE, AZ 85283 PH#: 480-752-2124, FAX: 480-839-2193

EXHIBIT 1

	BY	DATE
DESIGN	–	–
DESIGN CHK.	–	–
PLANS	–	–
PLANS CHK.	–	–

SHEET 1 OF 1

APPENDIX H

APPENDIX I