Hydrology & Hydraulics Report

for

Curti Ranch 2 -Unit 5
And
Detention Pond

Washoe County, Nevada

Prepared for:

Lewis Operating Corporation
1380 Greg Street, Suite 231
Sparks, Nevada 89431

March 10, 2003

cfa

PLANNERS ENGINEERS SURVEYORS LANDSCAPE ARCHITECTS
1150 CORPORATE BLVD RENO NV (775) 856-1150 FAX (775) 856-1160

Contents

Hydrology Report.....Pages 1-10

Table 1. Estimated Peak Flow Comparison - Spreaders at NW Property Line

Table 2. Flow Spread Structures Peak Flow Comparison - Developed Units 3, 4, 5

Table 3. Detention Pond Peak Flow Estimates

Table 4. Detention Pond Volume/Stage Estimates

Table 5. Estimated Peak Flow Comparison-NW Property Line by Downstream Owner

Table 6. Estimated Peak Flow Comparison-Chandler Ditch

Table 7. Estimated Peak Flow Comparison-Lateral Weir for Chandler Ditch

Hydrology Calculations: Rational Method & Visual HEC-1.....Appendix A

Rational Method Hydrology (Reno IDF Curves)

Proposed 10-yr Storm Event, Visual HEC-1

Proposed 100-yr Storm Event, Visual HEC-1

Blocked Outlet Structure, 10-yr Storm Event, Visual HEC-1

Blocked Outlet Structure, 100-yr Storm Event, Visual HEC-1

Hydraulics.....Appendix B

Normal Depth & Velocity in Circular Pipe

42" SD Calculations, Flowmaster

SD Lines from Offsite Flow, Flowmaster/Culvertmaster

Detention Pond Overflow Ditch Cross Sections and Calculations, Flowmaster

Ditch Flow to NW Spreaders Cross Sections and Calculations, Flowmaster

Onsite Interim Spreader Weir Cross Sections and Calculations, Flowmaster

Drop Inlet Rating Table

Flow Spread & Catch Basin Capacity (Sump Condition) Calculations

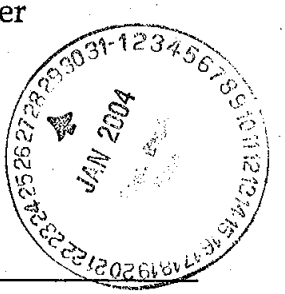
Detention Pond Standpipe Rating Table

Detention Pond Emergency Spillway Rating Table

Spreader Overflow Weir Rating Table & Calculations, Culvertmaster

Spreader Cross Sections & Calculations, Flowmaster

Infiltration Calculations for Spreaders & Detention Pond



Chandler Ditch HEC RAS Calculations.....Appendix C
Output Summary, HEC-RAS
Profile for Chandler Ditch, HEC-RAS
Lateral Weir Output Summary, HEC-RAS
Chandler Ditch Cross Sections, HEC-RAS

Attachments:

Figure 1. Hydrology Map
Figure 2. Plan View
Figure 3. Overall Drainage Map (Visual Hec-1 Analysis)

INTRODUCTION

This report presents hydrologic and hydraulic calculations for Curti Ranch 2 - Unit 5 Subdivision (69 lots), including the detention pond and associated appurtences. This study addresses the following:

1. Estimation of the 10-year and 100-year runoff quantities
2. Hydraulic design of Curti Ranch 2-Unit 5 storm conveyance structures
3. Hydraulic design of the detention pond, flow spread structures, and Chandler Ditch relocation

SITE DESCRIPTION

Curti Ranch 2 Subdivision Unit 5 comprises approximately 12 acres of undeveloped land in the central portion of Phase 2. The site slopes generally toward the northwest at an approximate grade of 2 percent. Native soils consist primarily of silty sands underlain by silty sand and gravelly silty sand. Vegetation consists of alfalfa, grasses and sagebrush.

PROJECT DESCRIPTION

Curti Ranch 2 Subdivision Unit 5 is expected to be marketed as tract home sites, 10,000 to 12,000 square feet in size. The development consists of roadway improvements including curb & gutter, utilities, drainage swales, and an underground storm drain system. A detention pond is planned to be constructed to mitigate increases in discharge due to the development of the entire Curti 2 development. Flow spread structures are also planned to be constructed at the northwest property line to reduce flow concentrations to downstream properties.

PREVIOUS STUDIES

Previous studies analyzing this area are listed below:

1. *Master Drainage Report for Curti Ranch Two Development* by CFA, Inc. January 10, 2003
2. *Hydrology and Hydraulic Report for Curti Ranch 2 – Unit 4* by CFA, Inc. February 6, 2003
3. *Hydrology and Hydraulic Report for Curti Ranch 2 – Unit 3* (Curti 3) by CFA, Inc. February 25, 2002.
4. *Master Drainage Report for Geiger Grade/Toll Road Improvement Project* (Geiger) by Stantec Consulting, Inc., August 1999.
5. *Master Hydrology report for Curti Ranch Two Development* (Curti 2) by Pyramid Engineers, June 1997.
6. *Southeast Truckee Meadows Flood Control Master Plan* (STMFCMP) by Nimbus, September 1995.
7. *Conceptual Drainage Study for the Polo Greens Subdivision* (POLO) by SEA, April 1994.
8. *Hydrology Report for Curti Ranch Unit One* (Curti 1) by Codega and Fricke, December 1992.

FLOOD ZONE

The project site lies within FEMA Flood Zone X "unshaded", indicating minimal flood hazard. The flood zone information for the project is obtained from FEMA Flood Zone Maps 32031C3186 & 32031C3188, effective September 30, 1994.

EXISTING DRAINAGE

The site topography slopes to the northwest at an approximate grade of 2 percent. Ground cover for the site consists primarily of alfalfa fields that are used for cattle grazing. Offsite flows are addressed in the *Master Drainage Report for Curti Ranch Two Development* by CFA, Inc. dated January 10, 2003.

PROPOSED DRAINAGE

Unit 5: ONSITE

A piped storm drain system is proposed for Unit 5. Runoff during a 10-year event is anticipated to be collected into the storm drain system, which is then conveyed to four ditches. Three of the ditches convey flow to weirs that dissipate flow towards the northwest, onsite, and the fourth ditch carries water to the northwesterly Spreaders 3A, 3B, and 4. During the 100-year storm event, runoff that does not get into the storm drain system will flow by overland route. A 42" SD line conveys flow from the detention pond to the ditch that terminates at Spreader 3A. Calculations for this pipe were performed using Culvertmaster and can be viewed in Appendix B.

The roadway alignment, lot layout, storm drain system, and drainage areas are shown on the enclosed Figure 1- Hydrology Map. This system is sized for future flows, which are generated from "Future Subareas" outlined in Figure 1. Onsite channel and storm drain hydraulics were performed using Mannings equation for steady uniform flow.

Detention Pond

Offsite drainage entering the site from Basins East 1C, 2, and 3B is planned to be intercepted by a proposed detention basin constructed near the south property line of Curti Ranch 2. Flows from East 1C and 2 are conveyed to the detention pond via two 24" SD lines, and flow from East 3B via an 18" SD line. The proposed detention pond contains an outlet structure which conveys flow through a 42" SD line running north along Curti Ranch Road, and terminates at flow spreader structures 3A, 3B, and 4.

For maintenance purposes, the detention basin is constructed with two access roads, at the east and west ends, which are connected by a path running along the north side of the low flow channel.

The total volume of the detention pond is 5.18 acre-feet with the top of slope at the elevation of 4583.1'. A 35'-wide broad crested weir, constructed at the west end of the pond, at elevation 4582.1', acts as an emergency spillway in the event the outlet structure becomes obstructed and ceases to function. This would cause the flow to pass through the weir , towards Curti Ranch Road, where there is sufficient conveyance area to convey the flow without the flooding of lot areas.

HYDROLOGY

For the unit 5 proposed storm drain system, approximate peak flows were determined for the 10-year and 100-year storms using the Rational Method (see appendix A). The site was divided into sub-areas as shown in Figure 1, the Hydrology Map (in enclosed pocket). The IDF curves were generated using the Washoe County Hydrologic Criteria and Drainage Design Manual (reference Appendix B). Visual HEC-1 was also used to approximate the affects of increased runoff due to the development of units 3, 4, and 5 (reference Appendix A). A Visual HEC-1 model from the *Master Drainage Report for Curti Ranch Two Development* for undeveloped conditions was compared with a Visual HEC-1 model with developed conditions for units 3, 4, and 5. The results of this analysis are as follows:

Table 1 – Estimated Peak Flow Comparison – Spreaders at NW Property Line

Master Drainage Report, Undeveloped			Curti Ranch 2-Unit 5*		
Discharge Pt	**Q_{10} (cfs)**	**Q_{100} (cfs)**	**Discharge Pt**	**Q_{10} (cfs)**	**Q_{100} (cfs)**
Com-3	15	548	Spreader 1	15	546
Com2-2	11	39	Spreader 2	7	15
Com3-3	40	169	Spreader 3a,b,4	33	119
Com344	33	95	Spreader 5a,b	31	91

*With construction of Units 3, 4, & 5.

As shown in Table 1 above, all estimated developed flows are less than or equal to the undeveloped conditions.

Projected estimates for flows at the spread structures were evaluated using Visual HEC-1 in the Master Drainage Report. Using the same analysis, flows were evaluated for final design of the spreaders. The results are as follows:

As shown in the following Table 3, this has had no adverse impact in flows leaving Curti Ranch due to the large differences in peak timing.

Table 3. Detention Pond Peak Flow Estimates

	Master Drainage Report, Projection		Curti Ranch 2-Unit 5*	
	Q_{10} (cfs)	Q_{100} (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
Inflow	47	189	39	153
Outflow	32	109	23	91

*With construction of Units 3, 4, & 5.

Table 4 shows approximate pond volume and water surface elevations. The peak stage elevations were calculated using Visual-HEC-1. These results can be seen in Appendix A. Elevations for both the 10-year and 100-year storm events are less than 4582.10' (the emergency spillway invert elevation). Therefore, all flow, under normal operating conditions, should exit the pond through the outlet structure.

The detention pond, based on a 24-hour storm (county standard), is a flow through system and should not have standing water in it for more than three days. In the event the outlet becomes blocked, the existing soil will allow an infiltration rate of three inches per hour, draining the pond within approximately 1.5 days (see calculations located in Appendix B, and the Black Eagle Consulting report dated January 24, 2003).

Table 4. Detention Pond Volume/Stage Estimates*

	Q_{10}	Q_{100}
Peak Volume (ac-ft)	0.79	4.66
Peak Stage Elevation (ft)	4577.47'	4581.66'
Peak Stage Elevation (w/ blocked outlet) (ft)	4582.25'	4583.33'

According to the proposed plan, the pond will receive flow from three existing pipes under Western Skies Drive: a 18" diameter pipe, and an 24" diameter pipe adjacent to a

30" diameter pipe. The 18" pipe is sufficient to carry the estimated flow, however the 24"/30" combination is not. The excess flows from the 100-year event, (152 cfs from East 1C and 2), would overtop Western Skies Drive and enter Chandler Ditch. The excess flow in Chandler Ditch would back up the water onto low portions of the Equestrian Road. To alleviate the problem, a 36" culvert is proposed to be added to the existing 24" and 30" culverts to avoid flooding of both roads. Calculations may be viewed in Appendix B.

Flow Spread Structures (at northwesterly property line)

Spreaders 3A, 3B, and 4 water levels are evaluated for the Ultimate Channel Condition using Flowmaster, and appear in Appendix B. As shown in the calculations, the spreader section will be sufficient to convey the ultimate flows after they are converted to a continuous channel.

The culverts between the spreaders were sized using Culvertmaster, as well as a spreadsheet, which calculates water depth passing over the weir. Flow is evenly distributed across the spreader weirs, simulating existing sheet flow conditions and maintaining, if not decreasing, the existing undeveloped flows, which appears in the following table. Complete calculations can be viewed in Appendix B.

Table 5. Estimated Peak Flow Comparison – NW Property Line by Downstream Owner

Owner	Undeveloped		Developed	
	Q_{10} (cfs)	Q_{100} (cfs)	Q_{10} (cfs)	Q_{100} (cfs)
Curti (southwest)	36	148	35	147.4
Washoe County	15	548	2	545
Caramella (NW)	48	155	52	114.6

All projected flows discussed in the *Master Drainage Report* were maintained, except for a slight decrease of flow to Caramella's land to the northwest, which was transferred to Curti's land. 2.4 cfs was moved from Spreader 4 to Spreader 3B for the 100-year storm event. This has no significant affect on either parcels.

Flow spreader basins 3A and 3B are flow-through basins, however, flow spreader 4 is a terminal basin, which will require infiltration for drainage. As shown in the attached

infiltration calculations, the soil infiltration rate is 7.5 inches per hour, which would drain the spreaders within approximately 1.2 days. (Based on a 24-hour storm event).

Onsite Interim Flow Spread Structures

Four interim spreader weirs are proposed in order to control and dissipate onsite flow, which passes through the proposed development of Curti Ranch 2-Unit 5. As shown in the calculations in Appendix B, the flows are dissipated to low velocities approximately equal to or less than 2 fps, which are considered non-erosive.

Catch Basins

The sump calculations for the proposed on-site catch basins, located in Appendix B, are within reasonable ranges for height and width of flow collecting at their entrances. All flow spread widths are less than half the width of the street.

CHANDLER DITCH ANALYSIS

Existing conditions are discussed in the Hydrology & Hydraulics Report for Curti Ranch 2-Unit 3 dated December 17, 2001. For the relocation of Chandler Ditch, approximate peak flows were determined for the 100-year storm event. Because of the complexity of the ditch's components (culverts, lateral weir, and adverse slopes), HEC-RAS was utilized for these calculations (reference Appendix C). The HEC-RAS model for the relocation of the Curti Ranch 2-Unit 5 stretch of Chandler Ditch (Sections 2.0-1.30) was compared with the HEC-RAS model of Curti Ranch 2-Unit 3 stretch of relocated ditch, further upstream (Sections 22.0-2.0). The results of selected stations are displayed in the following Table 6. Stations can be referenced to Figure 2, the Plan View (in the enclosed packet).

As shown in Table 6., all velocities have been slightly lowered from projected velocities. Flows and corresponding water surface elevations also been lowered from the original expectation. This is due to analyzing Chandler Ditch using 42" diameter pipes at all culvert locations. Reducing the pipe size at station 13.5 causes flow to raise slightly upstream, causing more flow to spill through the lateral weir into Geiger Channel, therefore in order to allow for this excess flow, the weir height was lowered to 4582.0'. As a result, the flow is reduced in Chandler Ditch which allows the use of 42" RCP's

throughout the ditch. The revised maximum Chandler Ditch flow capacity of 22.19 cfs immediately downstream of the weir is still greater than the average high irrigation flow requirement of 19 cfs. Therefore, irrigation flows will not be affected adversely.

Table 6. Estimated Peak Flow Comparison - Chandler Ditch

Section	Curti Ranch 2 -Unit 3 Report			Curti Ranch 2 -Unit 5		
	Q_{100} (cfs)	WSE (ft)	V(fps)	Q_{100} (cfs)	WSE (ft)	V(fps)
19.0	51.70	4583.70	0.60	48.42	4583.61	0.59
13.0	27.42	4582.71	0.55	22.19	4582.60	0.40
6.0	39.42	4582.54	1.12	34.19	4582.51	0.90
5.0	39.42	4582.51	0.91	34.19	4582.50	0.80
1.90	-	-	-	34.19	4582.12	0.75
1.55	-	-	-	34.19	4581.53	0.94
1.35	-	-	-	34.19	4581.01	1.21

These sections are displayed due to their qualities. Section 19.0 is located after the lateral weir. Due to more flow spilling into Geiger Channel, the flow in Chandler Ditch reduced by 3.28 cfs. Sections 5.0 and 6.0 are located at a road crossing. The water surface elevations have decreased, indicating that the road should not flood. Sections 1.90, 1.55, and 1.35 are located after proposed culverts A, B, and C. These velocities ranging between 0.40-1.13 are generally not considered erosive. All values are within an acceptable range for their respective cross sections of the proposed relocation of Chandler Ditch. Cross section output from HEC-RAS can be viewed in Appendix C.

The analysis at the lateral weir in Curti Ranch 2-Unit 3 was compared to the analysis at the lateral weir in Curti Ranch 2-Unit 5. The results are as follows:

Table 7. Estimated Peak Flow Comparison - Lateral Weir for Chandler Ditch

Curti Ranch 2 -Unit 3			Curti Ranch 2 -Unit 5		
Q_{100}leaving (cfs)	WSE (ft)	Wtr Flow Area(sf)	Q_{100}leaving (cfs)	WSE (ft)	Wtr Flow Area(sf)
43.53	83.70	11.90	48.49	83.61	12.78

Differences between the previous and current analyses show that there is a slight increase in expected values for flow leaving the ditch via the weir, the water surface

elevation at this location, and the water flow area. This increase is due to reducing culvert crossing sizes in Chandler Ditch, downstream of this weir. The increase is minimal with respect to the Geiger Channel flows, and should have no adverse affect.

CONCLUSION

This report is in substantial compliance with the Master Drainage Report with regard to maintaining existing drainage conditions downstream of the project. Curti Ranch 2 Unit 5 can be developed as planned without adverse impact to downstream properties with respect to storm water drainage.

APPENDIX A

HYDROLOGY CALCULATIONS
RATIONAL METHOD &
VISUAL HEC-1

RATIONAL METHOD HYDROLOGY
WASHOE COUNTY / RENO IDF CURVES
CURTI RANCH TWO - UNIT 5

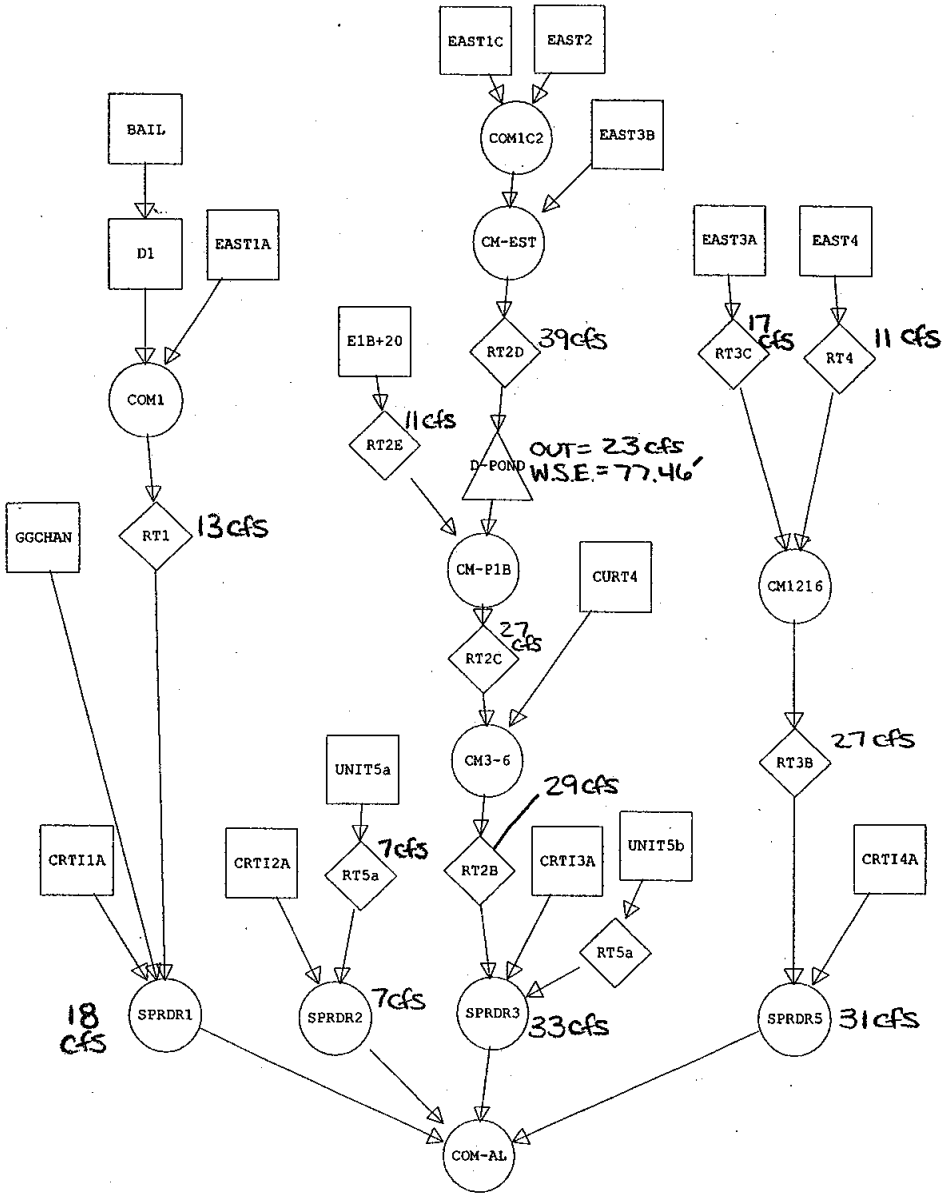
PART A: INDIVIDUAL DRAINAGE AREAS

DESIGN POINT	SUB-AREA	AREA (acres)	% IMPERV. AREA	% REMAINING	RUNOFF COEFF.*	WATERSHED LENGTH (ft)	VELOCITY (ft/sec)	Tc (min)	INTENSITY (in/hr) 10-YR	INTENSITY (in/hr) 100-YR	PEAK RUNOFF (cfs) **10-YR**	PEAK RUNOFF (cfs) **100-YR**
CB #F1	F1	1.04	0.33	0.67	0.50	464	2	14	1.72	3.64	**0.89**	**1.88**
CB #F2	F2	2.35	0.33	0.67	0.50	535	2	14	1.69	3.59	**1.98**	**4.21**
CB #F3	F3	1.53	0.44	0.56	0.56	378	2	13	1.75	3.70	**1.50**	**3.18**
CB #F4	F4	0.64	0.40	0.60	0.54	440	2	14	1.72	3.64	**0.59**	**1.26**
	F5	1.55	0.43	0.57	0.56	670	2	16	1.64	3.48	**1.41**	**3.00**
CB #F5	F6	1.80	0.48	0.52	0.59	665	2	16	1.64	3.48	**1.73**	**3.67**
CB #1	F7	0.26	0.37	0.63	0.52	178	2	11	1.93	4.03	**0.26**	**0.55**
	A1	1.93	0.50	0.50	0.60	758	2	16	1.60	3.40	**1.84**	**3.92**
	A2	0.29	0.46	0.54	0.58	237	2	12	1.88	3.90	**0.31**	**0.65**
CB #2	A3	1.85	0.48	0.52	0.59	740	2	16	1.60	3.40	**1.73**	**3.68**
CB #3	A4	1.59	0.45	0.55	0.57	665	2	16	1.64	3.48	**1.49**	**3.17**
	A5	0.42	0.36	0.64	0.51	259	2	12	1.83	3.84	**0.39**	**0.83**
CB #4	A6	1.67	0.49	0.51	0.59	703	2	16	1.64	3.48	**1.62**	**3.45**
	A7	0.23	0.50	0.50	0.60	127	2	11	1.93	4.03	**0.27**	**0.56**
DI#1	B2	0.56	0.36	0.64	0.52	544	2	15	1.66	3.54	**0.48**	**1.03**
DI#2	B3	0.64	0.26	0.74	0.46	467	2	14	1.72	3.64	**0.50**	**1.07**
CB #5	C1	1.23	0.45	0.55	0.57	518	2	14	1.69	3.59	**1.19**	**2.53**
	C2	0.22	0.52	0.48	0.61	200	2	12	1.88	3.90	**0.25**	**0.53**
DI#3	C3	0.24	0.54	0.46	0.63	220	2	12	1.88	3.90	**0.28**	**0.59**
CB #6	C4	1.39	0.49	0.51	0.60	594	2	15	1.66	3.54	**1.37**	**2.93**
CB #7	C5	1.40	0.50	0.50	0.60	590	2	15	1.66	3.54	**1.40**	**2.98**
	C6	0.31	0.46	0.54	0.57	252	2	12	1.83	3.84	**0.33**	**0.68**
CB #8	C7	1.49	0.49	0.51	0.59	605	2	15	1.64	3.48	**1.45**	**3.07**
	D1	0.29	0.43	0.57	0.56	138	1	12	1.83	3.84	**0.30**	**0.63**
	D2	1.56	0.12	0.88	0.37	582	1	20	1.47	3.11	**0.84**	**1.78**
	D3	1.04	0.00	1.00	0.30	653	1	21	1.43	3.03	**0.45**	**0.95**

*Runoff Coefficient is a weighted calculation. C(impervious)=0.9. C(grass)=0.3.

TABLE A-1: RATIONAL METHOD CALCULATIONS

10-YR PROPOSED
4/9/03



□HEC1 S/N: 1343001909 HMVersion: 6.33 Data File: C:\WINNT\TEMP\~vbh3B13.TMP
98006.10_DOCS\HYDRO\HEC1\CRT510PR.OUT

```
*****************************************          *****************************************
*                                       *          *                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *          *      U.S. ARMY CORPS OF ENGINEERS     *
*           MAY  1991                   *          *   HYDROLOGIC ENGINEERING CENTER       *
*         VERSION 4.0.1E                *          *        609 SECOND STREET              *
*                                       *          *   DAVIS, CALIFORNIA 95616             *
*  RUN DATE  05/08/2003  TIME  15:38:02 *          *         (916) 756-1104                *
*                                       *          *                                       *
*****************************************          *****************************************

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


                ::::::::::::::::::::::::::::::::::::::::::
                ::::::::::::::::::::::::::::::::::::::::::
                :::                                    :::
                ::: Full Microcomputer Implementation  :::
                :::              by                    :::
                :::       Haestad Methods, Inc.        :::
                :::                                    :::
                ::::::::::::::::::::::::::::::::::::::::::
                ::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

□ HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID    100 YEAR STORM
  2       IT   5              450
  3       IO   5
  4       IN   15

  5       KK BAIL
  6       KM  BAILEY CANYON OVERFLOW DRAINAGE FROM NIMBUS COTTONWOOD STUDY
```

```
 7    KO                    22
 8    BA  15.3
 9    PB  1.911
10    PC   0.0  .002  .005  .008  .011  .014  .017  .020  .023  .026
11    PC  .029  .032  .035  .038  .041  .044  .048  .052  .056  .060
12    PC  .064  .068  .072  .076  .080  .085  .090  .095  .100  .105
13    PC  .110  .115  .120  .126  .133  .140  .147  .155  .163  .172
14    PC  .181  .191  .203  .218  .236  .257  .283  .387  .663  .707
15    PC  .735  .758  .776  .791  .804  .815  .825  .834  .842  .849
16    PC  .856  .863  .869  .875  .881  .887  .893  .898  .903  .908
17    PC  .913  .918  .922  .926  .930  .934  .938  .942  .946  .950
18    PC  .953  .956  .959  .962  .965  .968  .971  .974  .977  .980
19    PC  .983  .986  .989  .992  .995  .998 1.000
20    LS       80
21    UD   1.2

22    KK D1
23    KM DIVERT RUNOFF FROM BAILEY FLOW THAT STAYS ON SOUTH SIDE OF GEIGER
24    KO                    22
25    DT D1       3673
26    DI    0   1450
27    DQ    0   3133

28    KK EAST1A
29    KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
30    KO                    22
31    BA  .100
32    PB  1.80
33    LS       77
34    UD  0.34

35    KK COM1
36    KM COMBINE FLOWS FROM GEIGER GRADE OVERTOPPING AND EAST1A
37    KO                    22
38    HC    2

39    KK RT1
40    KM ROUTE TO FROM EAST1 DOWN GEIGER GRADE CHANNEL
41    KO                    22
42    RD  2195  0.017  0.03      TRAP    9    3

43    KK CRTI1A
44    KM RUNOFF FROM UNDEVELOPED PORTION OF CURTI1
45    KO                    22
46    BA 0.0320
47    PB  1.80
48    LS       73
49    UD  0.40
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

50    KK GGCHAN
51    KM RUNOFF IN THE CHANNEL
52    KO                    22
53    BA 0.0108
54    PB  1.8
55    LS       85
56    UD  0.33

57    KK SPRDR1
58    KM COMBINE FLOWS FROM RT1 AND CURT18
59    KO                    22
60    HC    3

61    KK EAST2
62    KM DRAINAGE FROM EAST OFF-SITE FROM NIMBUS DAMONTE STUDY
63    KO                    22
64    BA 0.4944
```

```
65    PB  1.80
66    LS        75
67    UD  0.55

68    KK EAST1C
69    KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
70    KO                      22
71    BA  0.02
72    PB  1.80
73    LS        77
74    UD  0.34

75    KK COM1C2
76    KM COMBINE FLOWS FROM AREAS EAST 1C AND 2
77    KO                      22
78    HC    2

79    KK EAST3B
80    KM RUNOFF FROM EAST3B DRAINING TO NORTH PROPERTY LINE
81    KO                      22
82    BA 0.0078
83    PB  1.80
84    LS        86    0
85    UD  0.14

86    KK CM-EST
87    KM COMBINE FLOWS FROM EAST 1B,1C,2,3 AND CURTI 20A, 20B
88    KO                      22
89    HC    2

90    KK RT2D
91    KM ROUTE FLOW FROM CM-EAST
92    KO                      22
93    RD    50  0.001   0.03        TRAP    4    3
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

94    KK D-POND
95    KM DETENTION POND FOR EAST1B THRU 3 AND CURT 20
96    KO                      22
97    RS     1   ELEV   73.5
98    SV   0.0   0.01   0.08   0.32   0.81   1.47   2.23   3.10   4.07   5.15
99    SV  6.33
100   SE  73.5    74    75    76    77    78    79    80    81    82
101   SE   83
102   SQ   0.0   2.0   5.6   10.2   13.7   16.5   19.0   21.2   23.1   34.9
103   SQ  54.9   61.5   68.2   74.2   79.7   84.7   89.5   94.0   98.3   102.5
104   SE 73.50  74.00  74.50  75.00  75.50  76.00  76.50  77.00  77.50  78.00
105   SE 78.50  79.00  79.50  80.00  80.50  81.00  81.50  82.00  82.50  83.00

106   KK E1B+20
107   KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
108   KO                      22
109   BA 0.0805
110   PB  1.80
111   LS        77
112   UD  0.34

113   KK RT2E
114   KM ROUTE FLOW FROM E1B TO CM3-6
115   KO                      22
116   RD   950  0.015  0.014        CIRC    4    3

117   KK CM-P1B
118   KM COMBINE FLOWS FROM POND AND E1B
119   KO                      22
120   HC    2
```

```
121     KK RT2C
122     KM ROUTE FLOWS FROM DETENTION POND
123     KO                      22
124     RD   1200  0.011  0.014        CIRC     4     3

125     KK CURT4
126     KM RUNOFF FROM CURTI UNITS 3 AND 4
127     KO                      22
128     BA 0.0278
129     PB   1.80
130     LS         74
131     UD   0.69

132     KK CM3-6
133     KM COMBINE FLOWS FROM CURT4 AND RT2C
134     KO                      22
135     HC     2
```

HEC-1 INPUT PAGE 4

```
LINE    ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

136     KK RT2B
137     KM ROUTE FLOWS FROM CM3-6
138     KO                      22
139     RD    750  0.015  0.030        TRAP     5     3

140     KK UNIT5b
141     KM CURTI RANCH UNIT 5b (No. OF CURTI RANCH ROAD)
142     KO                      22
143     BA 0.0113
144     PB   1.80
145     LS         88
146     UD   0.12

147     KK RT5a
148     KM ROUTE FLOWS TO SPREADER 2
149     KO                      22
150     RM     1

151     KK CRTI3A
152     KM RUNOFF FROM UNDEVELOPED PORTION OF CURTI3
153     KO                      22
154     BA 0.0486
155     PB   1.80
156     LS         73
157     UD   0.38

158     KK SPRDR3
159     KM COMBINE FLOWS ALL THE WAY UP TO EAST1B-3
160     KO                      22
161     HC     3

162     KK EAST4
163     KM RUNOFF FROM EAST4 DRAINING TO NORTH PROPERTY LINE
164     KO                      22
165     BA 0.0728
166     PB   1.80
167     LS         81     0
168     UD   0.59

169     KK RT4
170     KM ROUTE FLOWS FROM RT4 TO NORTH CORNER
171     KO                      22
172     RD    640   0.02  0.014        TRAP     2     3

173     KK EAST3A
174     KM RUNOFF FROM EAST3A DRAINING TO NORTH PROPERTY LINE
175     KO                      22
176     BA 0.0975
```

```
177     PB  1.80
178     LS        81     0
179     UD  0.44
```



```
LINE    ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

180     KK RT3C
181     KM PIPE EAST 3A THRU SUBDIVISION
182     KO                      22
183     RD  1190  .015  .014        CIRC   2.5     1

184     KK CM1216
185     KM COMBINE AREAS CURTI 12 AND 16 WITH EAST 3A
186     KO                      22
187     HC    2

188     KK RT3B
189     KM PIPE THRU SUBDIVISION TO SPREADER
190     KO                      22
191     RD  1390  .017 0.030        TRAP   200     50

192     KK CRTI4A
193     KM RUNOFF FROM UNDEVELOPED PORTION OF CURTI4
194     KO                      22
195     BA 0.0763
196     PB  1.80
197     LS        73
198     UD  0.39

199     KK SPRDR5
200     KM COMBINED AND ROUTED FLOWS FROM EAST4 & CURT6
201     KO                      22
202     HC    2

203     KK UNIT5a
204     KM CURTI RANCH UNIT 5a (So. OF CURTI RANCH ROAD)
205     KO                      22
206     BA 0.0166
207     PB  1.80
208     LS        86
209     UD  0.34

210     KK RT5a
211     KM ROUTE FLOWS TO SPREADER 2
212     KO                      22
213     RD  1320 0.015 0.030            300     50

214     KK CRTI2A
215     KM RUNOFF FROM UNDEVELOPED PORTION CURTI2
216     KO                      22
217     BA 0.0171
218     PB  1.80
219     LS        73
220     UD  0.22
```



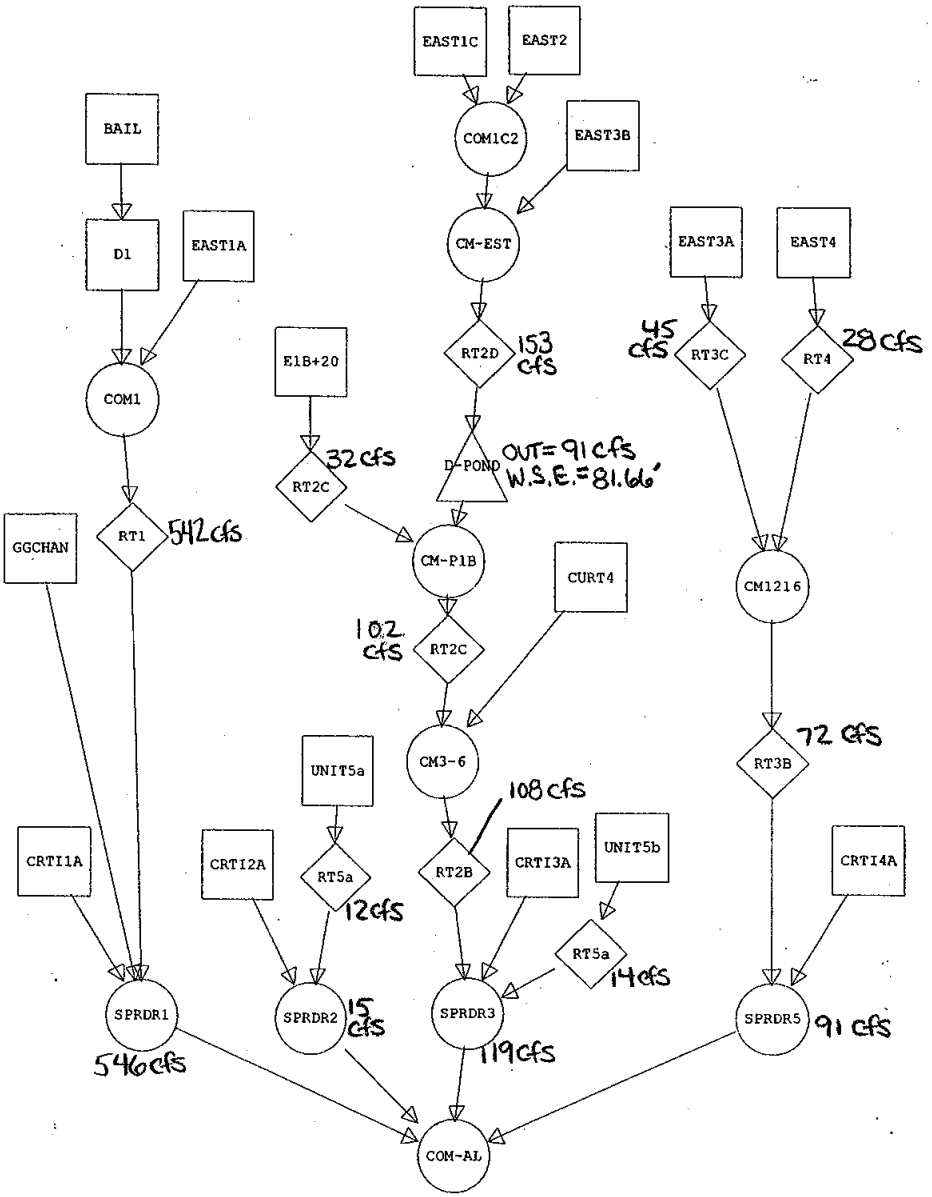
```
LINE    ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

221     KK SPRDR2
222     KM COMBINE FLOWS FROM UNIT 5a AND CRTI2A (EXISTING GROUND)
223     KO                      22
224     HC    2

225     KK COM-AL
226     KM COMBINE ALL FLOWS JUST TO GET HEC-1 TO RUN
227     KO                      22
228     HC    4
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT									
	BAIL	1450.	13.25	642.	209.	134.		15.30	
DIVERSION TO									
	D1	1450.	0.08	642.	209.	134.		15.30	
HYDROGRAPH AT									
	D1	0.	0.08	0.	0.	0.		15.30	
HYDROGRAPH AT									
	EAST1A	13.	12.25	3.	1.	1.		0.10	
2 COMBINED AT									
	COM1	13.	12.25	3.	1.	1.		15.40	
ROUTED TO									
	RT1	13.	12.42	3.	1.	1.		15.40	
HYDROGRAPH AT									
	CRTI1A	2.	12.42	1.	0.	0.		0.03	
HYDROGRAPH AT									
	GGCHAN	3.	12.25	1.	0.	0.		0.01	
3 COMBINED AT									
	SPRDR1	18.	12.42	4.	1.	1.		15.44	
HYDROGRAPH AT									
	EAST2	37.	12.58	12.	4.	2.		0.49	
HYDROGRAPH AT									
	EAST1C	3.	12.25	1.	0.	0.		0.02	
2 COMBINED AT									
	COM1C2	38.	12.58	12.	4.	3.		0.51	
HYDROGRAPH AT									
	EAST3B	4.	12.08	0.	0.	0.		0.01	
2 COMBINED AT									
	CM-EST	39.	12.58	13.	4.	3.		0.52	
ROUTED TO									
	RT2D	39.	12.58	13.	4.	3.		0.52	
ROUTED TO									
	D-POND	23.	13.17	12.	4.	3.		0.52	
							77.46		13.17
HYDROGRAPH AT									
	E1B+20	11.	12.25	2.	1.	0.		0.08	
ROUTED TO									
	RT2E	11.	12.33	2.	1.	0.		0.08	
2 COMBINED AT									
	CM-P1B	27.	12.50	15.	5.	3.		0.60	

ROUTED TO RT2C	27.	12.50	15.	5.	3.	0.60
HYDROGRAPH AT CURT4	2.	12.75	1.	0.	0.	0.03
2 COMBINED AT CM3-6	29.	12.67	15.	5.	3.	0.63
ROUTED TO RT2B	29.	12.67	15.	5.	3.	0.63
HYDROGRAPH AT UNIT5b	7.	12.00	1.	0.	0.	0.01
ROUTED TO RT5a	7.	12.00	1.	0.	0.	0.01
HYDROGRAPH AT CRTI3A	3.	12.42	1.	0.	0.	0.05
3 COMBINED AT SPRDR3	33.	12.50	17.	6.	4.	0.69
HYDROGRAPH AT EAST4	11.	12.58	3.	1.	1.	0.07
ROUTED TO RT4	11.	12.58	3.	1.	1.	0.07
HYDROGRAPH AT EAST3A	17.	12.42	4.	1.	1.	0.10
ROUTED TO RT3C	17.	12.42	4.	1.	1.	0.10
2 COMBINED AT CM1216	27.	12.42	7.	2.	1.	0.17
ROUTED TO RT3B	27.	12.67	7.	2.	1.	0.17
HYDROGRAPH AT CRTI4A	5.	12.42	1.	0.	0.	0.08
2 COMBINED AT SPRDR5	31.	12.58	8.	3.	2.	0.25
HYDROGRAPH AT UNIT5a	6.	12.25	1.	0.	0.	0.02
ROUTED TO RT5a	6.	12.50	1.	0.	0.	0.02
HYDROGRAPH AT CRTI2A	2.	12.17	0.	0.	0.	0.02
2 COMBINED AT SPRDR2	7.	12.50	1.	0.	0.	0.03
4 COMBINED AT COM-AL	86.	12.50	31.	10.	6.	16.41

100-YR PROPOSED
4/9/03



□HEC1 S/N: 1343001909 HMVersion: 6.33 Data File: C:\WINNT\TEMP\~vbh2D68.TMP
98006.10_DOCS\HYDRO\HEC1\CRT5100P.OUT

```
*****************************************          ***************************************
*                   *                   *          *                   *
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *                *  U.S. ARMY CORPS OF ENGINEERS   *
*         MAY  1991         *                      *  HYDROLOGIC ENGINEERING CENTER  *
*       VERSION 4.0.1E        *                    *       609 SECOND STREET         *
*                   *                   *          *  DAVIS, CALIFORNIA 95616        *
* RUN DATE 05/08/2003 TIME 15:43:37 *               *       (916) 756-1104            *
*                   *                   *          *                   *
*****************************************          ***************************************

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

::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
::: Full Microcomputer Implementation  :::
:::              by                      :::
:::       Haestad Methods, Inc.        :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE; NEW FINITE DIFFERENCE ALGORITHM

□ HEC-1 INPUT PAGE 1

```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

  1       ID    100 YEAR STORM
  2       IT  5           450
  3       IO  5   0
  4       IN  15

  5       KK  BAIL
  6       KM  BAILEY CANYON OVERFLOW DRAINAGE FROM NIMBUS COTTONWOOD STUDY
  7       KO                  22
```

```
 8    BA  15.3
 9    PB  2.891
10    PC   0.0  .002  .005  .008  .011  .014  .017  .020  .023  .026
11    PC  .029  .032  .035  .038  .041  .044  .048  .052  .056  .060
12    PC  .064  .068  .072  .076  .080  .085  .090  .095  .100  .105
13    PC  .110  .115  .120  .126  .133  .140  .147  .155  .163  .172
14    PC  .181  .191  .203  .218  .236  .257  .283  .387  .663  .707
15    PC  .735  .758  .776  .791  .804  .815  .825  .834  .842  .849
16    PC  .856  .863  .869  .875  .881  .887  .893  .898  .903  .908
17    PC  .913  .918  .922  .926  .930  .934  .938  .942  .946  .950
18    PC  .953  .956  .959  .962  .965  .968  .971  .974  .977  .980
19    PC  .983  .986  .989  .992  .995  .998 1.000
20    LS        80
21    UD   1.2

22    KK D1
23    KM DIVERT RUNOFF FROM BAILEY FLOW THAT STAYS ON SOUTH SIDE OF GEIGER
24    KO                      22
25    DT D1       3673
26    DI    0  3673
27    DQ    0  3133

28    KK EAST1A
29    KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
30    KO                      22
31    BA  .0309
32    PB  2.78
33    LS        77
34    UD  0.34

35    KK COM1
36    KM COMBINE FLOWS FROM GEIGER GRADE OVERTOPPING AND EAST1A
37    KO                      22
38    HC    2

39    KK RT1
40    KM ROUTE TO FROM EAST1 DOWN GEIGER GRADE CHANNEL
41    KO                      22
42    RD  2170  0.018  0.03       TRAP    9    3

43    KK CRTI1A
44    KM RUNOFF FROM UNDEVELOPED PORTION OF CURTI1
45    KO                      22
46    BA 0.0320
47    PB  2.78
48    LS        73
49    UD  0.40
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

50    KK GGCHAN
51    KM RUNOFF IN THE CHANNEL
52    KO                      22
53    BA 0.0108
54    PB  2.78
55    LS        85
56    UD  0.33

57    KK SPRDR1
58    KM COMBINE FLOWS FROM RT1 AND CURT18
59    KO                      22
60    HC    3

61    KK EAST2
62    KM DRAINAGE FROM EAST OFF-SITE FROM NIMBUS DAMONTE STUDY
63    KO                      22
64    BA 0.4944
65    PB  2.78
```

```
66      LS        75
67      UD  0.55

68      KK EAST1C
69      KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
70      KO                      22
71      BA 0.0584
72      PB  2.78
73      LS        77
74      UD  0.34

75      KK COM1C2
76      KM COMBINE FLOWS FROM AREAS EAST 1C AND 2
77      KO                      22
78      HC    2

79      KK EAST3B
80      KM RUNOFF FROM EAST3B DRAINING TO NORTH PROPERTY LINE
81      KO                      22
82      BA 0.0078
83      PB  2.78
84      LS        86    0
85      UD  0.14

86      KK CM-EST
87      KM COMBINE FLOWS FROM EAST 1B,1C,2,3 AND CURTI 20A, 20B
88      KO                      22
89      HC    2

90      KK RT2D
91      KM ROUTE FLOW FROM CM-EAST
92      KO                      22
93      RD    50  0.001   0.03        TRAP    4    3
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

94      KK D-POND
95      KM DETENTION POND FOR EAST1B THRU 3 AND CURT 20
96      KO                      22
97      RS    1  ELEV  73.5
98      SV   0.0   0.01   0.08   0.32   0.81   1.47   2.23   3.10   4.07   5.15
99      SV  6.33
100     SE  73.5    74    75    76    77    78    79    80    81    82
101     SE   83
102     SQ   0.0   2.0   5.6  10.2  13.7  16.5  19.0  21.2  23.1  34.9
103     SQ  54.9  61.5  68.2  74.2  79.7  84.7  89.5  94.0  98.3  102.5
104     SE 73.50 74.00 74.50 75.00 75.50 76.00 76.50 77.00 77.50 78.00
105     SE 78.50 79.00 79.50 80.00 80.50 81.00 81.50 82.00 82.50 83.00

106     KK E1B+20
107     KM DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
108     KO                      22
109     BA .0755
110     PB  2.78
111     LS        77
112     UD  0.34

113     KK RT2C
114     KM ROUTE FLOWS FROM E1B TO CM-P1B
115     KO                      22
116     RD  1200  0.011  0.014        CIRC    4    3

117     KK CM-P1B
118     KM COMBINE FLOWS FROM E1B AND POND
119     KO                      22
120     HC    2

121     KK RT2C
```

```
122     KM  ROUTE FLOWS FROM DETENTION POND
123     KO                      22
124     RD   1200  0.011  0.014        CIRC     4     3

125     KK  CURT4
126     KM  RUNOFF FROM CURTI UNITS 3 AND 4
127     KO                      22
128     BA  0.0278
129     PB   2.78
130     LS         74
131     UD   0.69

132     KK  CM3-6
133     KM  COMBINE FLOWS FROM CURT4 AND RT2C
134     KO                      22
135     HC     2
```



```
LINE      ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

136     KK  RT2B
137     KM  ROUTE FLOWS FROM CM3-6
138     KO                      22
139     RD    750  0.015  0.030        TRAP     5     3

140     KK  UNIT5b
141     KM  CURTI RANCH UNIT 5b (No. OF CURTI RANCH ROAD)
142     KO                      22
143     BA  0.0113
144     PB   2.78
145     LS         88
146     UD   0.12

147     KK  RT5a
148     KM  ROUTE FLOWS TO SPREADER 2
149     KO                      22
150     RM     1

151     KK  CRTI3A
152     KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI3
153     KO                      22
154     BA  0.0486
155     PB   2.78
156     LS         73
157     UD   0.38

158     KK  SPRDR3
159     KM  COMBINE FLOWS ALL THE WAY UP TO EAST1B-3
160     KO                      22
161     HC     3

162     KK  EAST4
163     KM  RUNOFF FROM EAST4 DRAINING TO NORTH PROPERTY LINE
164     KO                      22
165     BA  0.0728
166     PB   2.78
167     LS         81     0
168     UD   0.59

169     KK  RT4
170     KM  ROUTE FLOWS FROM RT4 TO NORTH CORNER
171     KO                      22
172     RD    640   0.02  0.014        TRAP     2     3

173     KK  EAST3A
174     KM  RUNOFF FROM EAST3A DRAINING TO NORTH PROPERTY LINE
175     KO                      22
176     BA  0.0975
177     PB   2.78
```

```
178     LS        81     0
179     UD  0.44
```



```
LINE    ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

180     KK RT3C
181     KM PIPE EAST 3A THRU SUBDIVISION
182     KO                      22
183     RD  1190  .015  .014        CIRC   2.5    1

184     KK CM1216
185     KM COMBINE AREAS CURTI 12 AND 16 WITH EAST 3A
186     KO                      22
187     HC    2

188     KK RT3B
189     KM PIPE THRU SUBDIVISION TO SPREADER
190     KO                      22
191     RD  1390  .017 0.030        TRAP   200    50

192     KK CRTI4A
193     KM RUNOFF FROM UNDEVELOPED PORTION OF CURTI4
194     KO                      22
195     BA 0.0763
196     PB  2.78
197     LS        73
198     UD  0.39

199     KK SPRDR5
200     KM COMBINED AND ROUTED FLOWS FROM EAST4 & CURT6
201     KO                      22
202     HC    2

203     KK UNIT5a
204     KM CURTI RANCH UNIT 5a (So. OF CURTI RANCH ROAD)
205     KO                      22
206     BA 0.0166
207     PB  2.78
208     LS        86
209     UD  0.34

210     KK RT5a
211     KM ROUTE FLOWS TO SPREADER 2
212     KO                      22
213     RD  1320  0.015  0.030            300    50

214     KK CRTI2A
215     KM RUNOFF FROM UNDEVELOPED PORTION CURTI2
216     KO                      22
217     BA 0.0171
218     PB  2.78
219     LS        73
220     UD  0.22
```



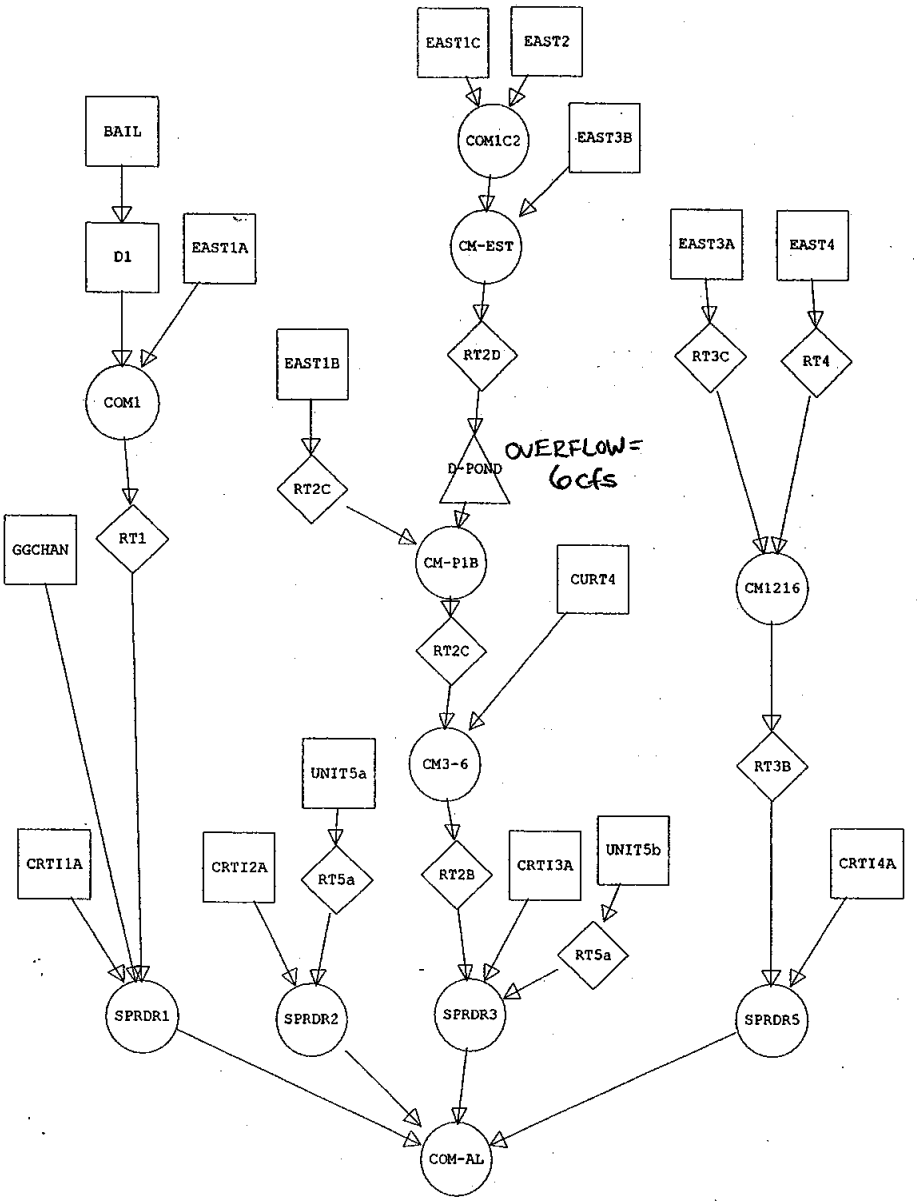
```
LINE    ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

221     KK SPRDR2
222     KM COMBINE FLOWS FROM UNIT 5a AND CRTI2A (EXISTING GROUND)
223     KO                      22
224     HC    2

225     KK COM-AL
226     KM COMBINE ALL FLOWS JUST TO GET HEC-1 TO RUN
227     KO                      22
228     HC    4
229     ZZ
```

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
HYDROGRAPH AT	BAIL	3673.	13.17	1527.	481.	308.		15.30	
DIVERSION TO	D1	3133.	13.17	1303.	410.	263.		15.30	
HYDROGRAPH AT	D1	540.	13.17	225.	71.	45.		15.30	
HYDROGRAPH AT	EAST1A	13.	12.25	2.	1.	0.	0.03		
2 COMBINED AT	COM1	543.	13.17	227.	71.	46.		15.33	
ROUTED TO	RT1	542.	13.25	227.	71.	46.		15.33	
HYDROGRAPH AT	CRTI1A	9.	12.33	2.	1.	0.	0.03		
HYDROGRAPH AT	GGCHAN	8.	12.25	1.	0.	0.	0.01		
3 COMBINED AT	SPRDR1	546.	13.25	230.	72.	46.		15.37	
HYDROGRAPH AT	EAST2	134.	12.50	35.	11.	7.	0.49		
HYDROGRAPH AT	EAST1C	25.	12.25	5.	1.	1.	0.06		
2 COMBINED AT	COM1C2	152.	12.42	40.	12.	8.	0.55		
HYDROGRAPH AT	EAST3B	8.	12.08	1.	0.	0.	0.01		
2 COMBINED AT	CM-EST	154.	12.42	41.	13.	8.	0.56		
ROUTED TO	RT2D	153.	12.42	41.	13.	8.	0.56		
ROUTED TO	D-POND	91.	12.92	40.	13.	8.	0.56		
							81.66	12.92	
HYDROGRAPH AT	E1B+20	32.	12.25	6.	2.	1.	0.08		
ROUTED TO	RT2C	32.	12.25	6.	2.	1.	0.08		
2 COMBINED AT	CM-P1B	102.	12.75	46.	15.	9.	0.64		

ROUTED TO RT2C	102.	12.75	46.	15.	9.	0.64
HYDROGRAPH AT CURT4	6.	12.67	2.	1.	0.	0.03
2 COMBINED AT CM3-6	108.	12.75	48.	15.	10.	0.66
ROUTED TO RT2B	108.	12.75	48.	15.	10.	0.66
HYDROGRAPH AT UNIT5b	14.	12.00	2.	0.	0.	0.01
ROUTED TO RT5a	14.	12.00	2.	0.	0.	0.01
HYDROGRAPH AT CRTI3A	14.	12.33	3.	1.	1.	0.05
3 COMBINED AT SPRDR3	119.	12.58	53.	17.	11.	0.72
HYDROGRAPH AT EAST4	28.	12.50	7.	2.	1.	0.07
ROUTED TO RT4	28.	12.50	7.	2.	1.	0.07
HYDROGRAPH AT EAST3A	46.	12.33	10.	3.	2.	0.10
ROUTED TO RT3C	45.	12.33	10.	3.	2.	0.10
2 COMBINED AT CM1216	72.	12.42	17.	5.	3.	0.17
ROUTED TO RT3B	72.	12.50	17.	5.	3.	0.17
HYDROGRAPH AT CRTI4A	22.	12.33	5.	1.	1.	0.08
2 COMBINED AT SPRDR5	91.	12.50	22.	7.	4.	0.25
HYDROGRAPH AT UNIT5a	12.	12.25	2.	1.	0.	0.02
ROUTED TO RT5a	12.	12.50	2.	1.	0.	0.02
HYDROGRAPH AT CRTI2A	7.	12.17	1.	0.	0.	0.02
2 COMBINED AT SPRDR2	15.	12.42	3.	1.	1.	0.03
4 COMBINED AT COM-AL	697.	13.17	307.	97.	62.	16.38

CURTI RANCH
3/30/03
10-YR PROPOSED
OVERFLOW WEIR,
OUTLET DET. BASIN BLOCKE



CURTI RANCH
3/30/03
10-YR PROPOSED
OVERFLOW WEIR,
OUTLET DET. BASIN
BLOCKED


```
 ****************************************
****************************************
*                                      *                                      *
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                      *   U.S. ARMY CORPS
OF ENGINEERS     *
*               MAY  1991              *                                      *   HYDROLOGIC
ENGINEERING CENTER    *
*            VERSION 4.0.1E            *                                      *        609
SECOND STREET          *
*                                      *                                      *      DAVIS,
CALIFORNIA 95616       *
*  RUN DATE  03/06/2003  TIME  15:25:57 *                                      *          (916)
756-1104           *
*                                      *                                      *
*                                      *
****************************************
****************************************
```

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

```
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
:::                                     :::
:::  Full Microcomputer Implementation  :::
:::                by                   :::
:::        Haestad Methods, Inc.        :::
:::                                     :::
:::::::::::::::::::::::::::::::::::::::::::
:::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
  1           ID         100 YEAR STORM
  2           IT       5                       450
  3           IO       5
  4           IN      15

  5           KK  BAIL
  6           KM  BAILEY CANYON OVERFLOW DRAINAGE FROM NIMBUS COTTONWOOD STUDY
  7           KO                                      22
  8           BA    15.3
  9           PB   1.911
```

```
10          PC     0.0    .002    .005    .008    .011    .014    .017    .020    .023    .026
11          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
12          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
13          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
14          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
15          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
16          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
17          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
18          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
19          PC    .983    .986    .989    .992    .995    .998   1.000
20          LS              80
21          UD     1.2

22          KK  D1
23          KM  DIVERT RUNOFF FROM BAILEY FLOW THAT STAYS ON SOUTH SIDE OF GEIGER
24          KO                                      22
25          DT  D1            3673
26          DI       0    1450
27          DQ       0    3133

28          KK  EAST1A
29          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
30          KO                                      22
31          BA    .100
32          PB    1.80
33          LS              77
34          UD    0.34

35          KK  COM1
36          KM  COMBINE FLOWS FROM GEIGER GRADE OVERTOPPING AND EAST1A
37          KO                                      22
38          HC       2

39          KK  RT1
40          KM  ROUTE TO FROM EAST1 DOWN GEIGER GRADE CHANNEL
41          KO                                      22
42          RD    2195   0.017    0.03            TRAP       9       3

43          KK  CRTI1A
44          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI1
45          KO                                      22
46          BA  0.0320
47          PB    1.80
48          LS              73
49          UD    0.40
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

50          KK  GGCHAN
51          KM  RUNOFF IN THE CHANNEL
52          KO                                      22
53          BA  0.0108
54          PB     1.8
55          LS              85
56          UD    0.33

57          KK  SPRDR1
58          KM  COMBINE FLOWS FROM RT1 AND CURT18
59          KO                                      22
60          HC       3

61          KK  EAST2
62          KM  DRAINAGE FROM EAST OFF-SITE FROM NIMBUS DAMONTE STUDY
63          KO                                      22
64          BA  0.4944
65          PB    1.80
66          LS              75
67          UD    0.55

68          KK  EAST1C
69          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
70          KO                                      22
71          BA    0.02
72          PB    1.80
73          LS              77
74          UD    0.34

75          KK  COM1C2
76          KM  COMBINE FLOWS FROM AREAS EAST 1C AND 2
```

```
 77          KO                                          22
 78          HC       2

 79          KK  EAST3B
 80          KM  RUNOFF FROM EAST3B DRAINING TO NORTH PROPERTY LINE
 81          KO                                          22
 82          BA  0.0078
 83          PB    1.80
 84          LS              86        0
 85          UD    0.14

 86          KK  CM-EST
 87          KM  COMBINE FLOWS FROM EAST 1B,1C,2,3 AND CURTI 20A, 20B
 88          KO                                          22
 89          HC       2

 90          KK  RT2D
 91          KM  ROUTE FLOW FROM CM-EAST
 92          KO                                          22
 93          RD      50   0.001     0.03             TRAP        4        3
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 94          KK  D-POND
 95          KM  DETENTION POND FOR EAST1B THRU 3 AND CURT 20
 96          KO                                          22
 97          RS       1    ELEV    73.5
 98          SV     0.0     0.01     0.08     0.32     0.81     1.47     2.23     3.10     4.07     5.15
 99          SV    6.33
100          SE    73.5       74       75       76       77       78       79       80       81       82
101          SE      83
102          SQ     0.0        0     0.00     2.85     8.05    14.79    22.77    31.82    41.83    52.71
103          SQ   64.40    76.84    90.00
104          SE   73.50    74.00     82.1     82.2     82.3     82.4     82.5     82.6     82.7     82.8
105          SE    82.9       83     83.1

106          KK  EAST1B
107          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
108          KO                                          22
109          BA    0.03
110          PB    1.80
111          LS              77
112          UD    0.34

113          KK  RT2E
114          KM  ROUTE FLOW FROM E1B TO CM3-6
115          KO                                          22
116          RD     950   0.015    0.014             CIRC        4        3

117          KK  CM-P1B
118          KM  COMBINE FLOWS FROM POND AND E1B
119          KO                                          22
120          HC       2

121          KK  RT2C
122          KM  ROUTE FLOWS FROM DETENTION POND
123          KO                                          22
124          RD    1200   0.011    0.014             CIRC        4        3

125          KK  CURT4
126          KM  RUNOFF FROM CURTI UNITS 3 AND 4
127          KO                                          22
128          BA  0.0278
129          PB    1.80
130          LS              74
131          UD    0.69

132          KK  CM3-6
133          KM  COMBINE FLOWS FROM CURT4 AND RT2C
134          KO                                          22
135          HC       2
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

136          KK  RT2B
137          KM  ROUTE FLOWS FROM CM3-6
```

```
138          KO                                        22
139          RD     750   0.015   0.030            TRAP       5       3

140          KK  UNIT5b
141          KM  CURTI RANCH UNIT 5b (No. OF CURTI RANCH ROAD)
142          KO                                        22
143          BA  0.0113
144          PB    1.80
145          LS              88
146          UD    0.12

147          KK  RT5a
148          KM  ROUTE FLOWS TO SPREADER 2
149          KO                                        22
150          RM       1

151          KK  CRTI3A
152          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI3
153          KO                                        22
154          BA  0.0486
155          PB    1.80
156          LS              73
157          UD    0.38

158          KK  SPRDR3
159          KM  COMBINE FLOWS ALL THE WAY UP TO EAST1B-3
160          KO                                        22
161          HC       3

162          KK  EAST4
163          KM  RUNOFF FROM EAST4 DRAINING TO NORTH PROPERTY LINE
164          KO                                        22
165          BA  0.0728
166          PB    1.80
167          LS              81       0
168          UD    0.59

169          KK  RT4
170          KM  ROUTE FLOWS FROM RT4 TO NORTH CORNER
171          KO                                        22
172          RD     640    0.02   0.014            TRAP       2       3

173          KK  EAST3A
174          KM  RUNOFF FROM EAST3A DRAINING TO NORTH PROPERTY LINE
175          KO                                        22
176          BA  0.0975
177          PB    1.80
178          LS              81       0
179          UD    0.44
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

180          KK  RT3C
181          KM  PIPE EAST 3A THRU SUBDIVISION
182          KO                                        22
183          RD    1190    .015    .014            CIRC     2.5       1

184          KK  CM1216
185          KM  COMBINE AREAS CURTI 12 AND 16 WITH EAST 3A
186          KO                                        22
187          HC       2

188          KK  RT3B
189          KM  PIPE THRU SUBDIVISION TO SPREADER
190          KO                                        22
191          RD    1390    .017   0.030            TRAP     200      50

192          KK  CRTI4A
193          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI4
194          KO                                        22
195          BA  0.0763
196          PB    1.80
197          LS              73
198          UD    0.39

199          KK  SPRDR5
200          KM  COMBINED AND ROUTED FLOWS FROM EAST4 & CURT6
201          KO                                        22
202          HC       2
```

```
          203          KK  UNIT5a
          204          KM  CURTI RANCH UNIT 5a (So. OF CURTI RANCH ROAD)
          205          KO                                        22
          206          BA  0.0166
          207          PB    1.80
          208          LS              86
          209          UD    0.34

          210          KK  RT5a
          211          KM  ROUTE FLOWS TO SPREADER 2
          212          KO                                        22
          213          RD    1320   0.015   0.030                        300       50

          214          KK  CRTI2A
          215          KM  RUNOFF FROM UNDEVELOPED PORTION CURTI2
          216          KO                                        22
          217          BA  0.0171
          218          PB    1.80
          219          LS              73
          220          UD    0.22
□                                                HEC-1 INPUT
PAGE  6

          LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

          221          KK  SPRDR2
          222          KM  COMBINE FLOWS FROM UNIT 5a AND CRTI2A (EXISTING GROUND)
          223          KO                                        22
          224          HC       2

          225          KK  COM-AL
          226          KM  COMBINE ALL FLOWS JUST TO GET HEC-1 TO RUN
          227          KO                                        22
          228          HC       4
          229          ZZ
□HEC1 S/N: 1343001909         HMVersion: 6.33    Data File: C:\WINNT\TEMP\~vbh2228.TMP


****************************************
****************************************
*                                      *                                      *
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                      *    U.S. ARMY CORPS
OF ENGINEERS     *
*                MAY   1991            *                                      *    HYDROLOGIC
ENGINEERING CENTER    *
*             VERSION 4.0.1E           *                                      *         609
SECOND STREET          *
*                                      *                                      *       DAVIS,
CALIFORNIA 95616       *
*  RUN DATE  03/06/2003  TIME  15:25:57 *                                      *           (916)
756-1104            *
*                                      *                                      *
*                                      *
****************************************
****************************************
```

100 YEAR STORM

```
    3 IO          OUTPUT CONTROL VARIABLES
                       IPRNT          5  PRINT CONTROL
                       IPLOT          0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                        NMIN          5  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1   0  STARTING DATE
                       ITIME       0000  STARTING TIME
                          NQ        450  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      2   0  ENDING DATE
                      NDTIME       1325  ENDING TIME
                       ICENT         19  CENTURY MARK

                    COMPUTATION INTERVAL     0.08 HOURS
                        TOTAL TIME BASE    37.42 HOURS
```

IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	450	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

TIME OF OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE
HYDROGRAPH AT	BAIL	1450.	13.25	642.	209.	134.	15.30	
DIVERSION TO	D1	1450.	0.08	642.	209.	134.	15.30	
HYDROGRAPH AT	D1	0.	0.08	0.	0.	0.	15.30	
HYDROGRAPH AT	EAST1A	13.	12.25	3.	1.	1.	0.10	
2 COMBINED AT	COM1	13.	12.25	3.	1.	1.	15.40	
ROUTED TO	RT1	13.	12.42	3.	1.	1.	15.40	
HYDROGRAPH AT	CRTI1A	2.	12.42	1.	0.	0.	0.03	
HYDROGRAPH AT	GGCHAN	3.	12.25	1.	0.	0.	0.01	
3 COMBINED AT	SPRDR1	18.	12.42	4.	1.	1.	15.44	
HYDROGRAPH AT	EAST2	37.	12.58	12.	4.	2.	0.49	
HYDROGRAPH AT	EAST1C	3.	12.25	1.	0.	0.	0.02	
2 COMBINED AT	COM1C2	38.	12.58	12.	4.	3.	0.51	
HYDROGRAPH AT	EAST3B	4.	12.08	0.	0.	0.	0.01	
2 COMBINED AT	CM-EST	39.	12.58	13.	4.	3.	0.52	
ROUTED TO	RT2D	39.	12.58	13.	4.	3.	0.52	
ROUTED TO	D-POND	6.	16.92	4.	1.	1.	0.52	82.25
16.92								
HYDROGRAPH AT	EAST1B	4.	12.25	1.	0.	0.	0.03	
ROUTED TO	RT2E	4.	12.33	1.	0.	0.	0.03	
2 COMBINED AT	CM-P1B	6.	16.92	5.	2.	1.	0.55	
ROUTED TO	RT2C	6.	16.92	5.	2.	1.	0.55	
HYDROGRAPH AT	CURT4	2.	12.75	1.	0.	0.	0.03	
2 COMBINED AT								

	CM3-6	6.	16.92	5.	2.	1.	0.58
ROUTED TO							
	RT2B	6.	17.00	5.	2.	1.	0.58
HYDROGRAPH AT							
	UNIT5b	7.	12.00	1.	0.	0.	0.01
ROUTED TO							
	RT5a	7.	12.00	1.	0.	0.	0.01
HYDROGRAPH AT							
	CRTI3A	3.	12.42	1.	0.	0.	0.05
3 COMBINED AT							
	SPRDR3	10.	12.42	5.	3.	2.	0.64
HYDROGRAPH AT							
	EAST4	11.	12.58	3.	1.	1.	0.07
ROUTED TO							
	RT4	11.	12.58	3.	1.	1.	0.07
HYDROGRAPH AT							
	EAST3A	17.	12.42	4.	1.	1.	0.10
ROUTED TO							
	RT3C	17.	12.42	4.	1.	1.	0.10
2 COMBINED AT							
	CM1216	27.	12.42	7.	2.	1.	0.17
ROUTED TO							
	RT3B	27.	12.67	7.	2.	1.	0.17
HYDROGRAPH AT							
	CRTI4A	5.	12.42	1.	0.	0.	0.08
2 COMBINED AT							
	SPRDR5	31.	12.58	8.	3.	2.	0.25
HYDROGRAPH AT							
	UNIT5a	6.	12.25	1.	0.	0.	0.02
ROUTED TO							
	RT5a	6.	12.50	1.	0.	0.	0.02
HYDROGRAPH AT							
	CRTI2A	2.	12.17	0.	0.	0.	0.02
2 COMBINED AT							
	SPRDR2	7.	12.50	1.	0.	0.	0.03
4 COMBINED AT							
	COM-AL	63.	12.50	18.	7.	4.	16.36

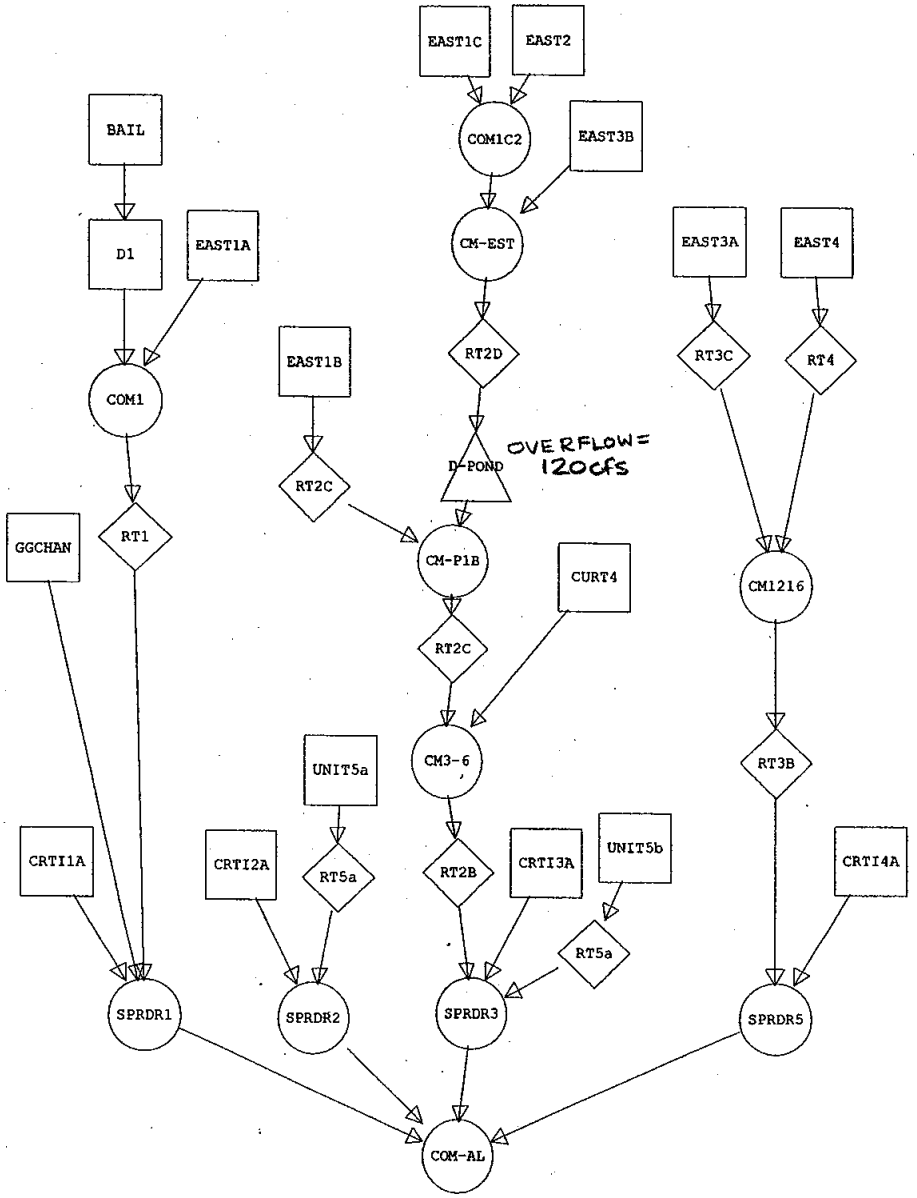
SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING

(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)
RT1	MANE	2.00	13.18	746.00	0.00	5.00	13.12	745.00	0.00

CONTINUITY SUMMARY (AC-FT) - INFLOW=0.1841E+01 EXCESS=0.0000E+00 OUTFLOW=0.1842E+01 BASIN STORAGE=0.1310E-02

CURTIS RANCH
3/5/01
100-YR PROPOSED
OVERFLOW WEIR,
OUTLET DET. BASIN BLOCK



CURTIS RANCH
3/5/01
100-YR PROPOSED
OVERFLOW WEIR,
OUTLET (DET POND) BLOCK

```
 ****************************************
.****************************************
*                                      *
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*                                      *
*             MAY   1991               *
*          VERSION 4.0.1E              *
*                                      *
*                                      *
* RUN DATE  03/05/2003  TIME  14:14:36 *
*                                      *
*                                      *
****************************************
****************************************
```


U.S. ARMY CORPS
HYDROLOGIC
609
DAVIS,
(916)


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

```
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
:::  Full Microcomputer Implementation   :::
:::                  by                  :::
:::        Haestad Methods, Inc.         :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.

THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION

NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,

DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION

KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

HEC-1 INPUT


```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
   1          ID         100 YEAR STORM
   2          IT       5                    450
   3          IO       5
   4          IN      15

   5          KK  BAIL
   6          KM  BAILEY CANYON OVERFLOW DRAINAGE FROM NIMBUS COTTONWOOD STUDY
   7          KO                                      22
   8          BA    15.3
   9          PB   2.891
```

```
10          PC     0.0    .002    .005    .008    .011    .014    .017    .020    .023    .026
11          PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
12          PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
13          PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
14          PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
15          PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
16          PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
17          PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
18          PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
19          PC    .983    .986    .989    .992    .995    .998   1.000
20          LS              80
21          UD     1.2

22          KK  D1
23          KM  DIVERT RUNOFF FROM BAILEY FLOW THAT STAYS ON SOUTH SIDE OF GEIGER
24          KO                                      22
25          DT  D1            3673
26          DI       0    3673
27          DQ       0    3133

28          KK  EAST1A
29          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
30          KO                                      22
31          BA   .0309
32          PB    2.78
33          LS              77
34          UD    0.34

35          KK  COM1
36          KM  COMBINE FLOWS FROM GEIGER GRADE OVERTOPPING AND EAST1A
37          KO                                      22
38          HC       2

39          KK  RT1
40          KM  ROUTE TO FROM EAST1 DOWN GEIGER GRADE CHANNEL
41          KO                                      22
42          RD    2170   0.018    0.03            TRAP       9       3

43          KK  CRTI1A
44          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI1
45          KO                                      22
46          BA  0.0320
47          PB    2.78
48          LS              73
49          UD    0.40
```



```
LINE        ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

50          KK  GGCHAN
51          KM  RUNOFF IN THE CHANNEL
52          KO                                      22
53          BA  0.0108
54          PB    2.78
55          LS              85
56          UD    0.33

57          KK  SPRDR1
58          KM  COMBINE FLOWS FROM RT1 AND CURT18
59          KO                                      22
60          HC       3

61          KK  EAST2
62          KM  DRAINAGE FROM EAST OFF-SITE FROM NIMBUS DAMONTE STUDY
63          KO                                      22
64          BA  0.4944
65          PB    2.78
66          LS              75
67          UD    0.55

68          KK  EAST1C
69          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
70          KO                                      22
71          BA  0.0584
72          PB    2.78
73          LS              77
74          UD    0.34

75          KK  COM1C2
76          KM  COMBINE FLOWS FROM AREAS EAST 1C AND 2
```

```
 77          KO                                          22
 78          HC       2

 79          KK  EAST3B
 80          KM  RUNOFF FROM EAST3B DRAINING TO NORTH PROPERTY LINE
 81          KO                                          22
 82          BA  0.0078
 83          PB    2.78
 84          LS              86        0
 85          UD    0.14

 86          KK  CM-EST
 87          KM  COMBINE FLOWS FROM EAST 1B,1C,2,3 AND CURTI 20A, 20B
 88          KO                                          22
 89          HC       2

 90          KK  RT2D
 91          KM  ROUTE FLOW FROM CM-EAST
 92          KO                                          22
 93          RD      50   0.001     0.03            TRAP        4        3
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10

 94          KK  D-POND
 95          KM  DETENTION POND FOR EAST1B THRU 3 AND CURT 20
 96          KO                                          22
 97          RS       1    ELEV    73.5
 98          SV     0.0     0.01    0.08    0.32    0.81    1.47    2.23    3.10    4.07    5.15
 99          SV    6.33
100          SE    73.5       74      75      76      77      78      79      80      81      82
101          SE      83
102          SQ     0.0        0    0.00    2.85    8.05   14.79   22.77   31.82   41.83   52.71
103          SQ   64.40    76.84   90.00
104          SE   73.50    74.00    82.1    82.2    82.3    82.4    82.5    82.6    82.7    82.8
105          SE    82.9       83    83.1

106          KK  EAST1B
107          KM  DRAINAGE FROM EAST OFF-SITE AREA FROM NIMBUS DAMONTE STUDY
108          KO                                          22
109          BA  0.0607
110          PB    2.78
111          LS              77
112          UD    0.34

113          KK  RT2C
114          KM  ROUTE FLOWS FROM E1B TO CM-P1B
115          KO                                          22
116          RD    1200   0.011   0.014            CIRC        4        3

117          KK  CM-P1B
118          KM  COMBINE FLOWS FROM E1B AND POND
119          KO                                          22
120          HC       2

121          KK  RT2C
122          KM  ROUTE FLOWS FROM DETENTION POND
123          KO                                          22
124          RD    1200   0.011   0.014            CIRC        4        3

125          KK  CURT4
126          KM  RUNOFF FROM CURTI UNITS 3 AND 4
127          KO                                          22
128          BA  0.0278
129          PB    2.78
130          LS              74
131          UD    0.69

132          KK  CM3-6
133          KM  COMBINE FLOWS FROM CURT4 AND RT2C
134          KO                                          22
135          HC       2
```



```
LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9.......10

136          KK  RT2B
137          KM  ROUTE FLOWS FROM CM3-6
```

```
138          KO                                          22
139          RD     750   0.015   0.030            TRAP       5       3

140          KK  UNIT5b
141          KM  CURTI RANCH UNIT 5b (No. OF CURTI RANCH ROAD)
142          KO                                          22
143          BA  0.0113
144          PB    2.78
145          LS              88
146          UD    0.12

147          KK  RT5a
148          KM  ROUTE FLOWS TO SPREADER 2
149          KO                                          22
150          RM       1

151          KK  CRTI3A
152          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI3
153          KO                                          22
154          BA  0.0486
155          PB    2.78
156          LS              73
157          UD    0.38

158          KK  SPRDR3
159          KM  COMBINE FLOWS ALL THE WAY UP TO EAST1B-3
160          KO                                          22
161          HC       3

162          KK  EAST4
163          KM  RUNOFF FROM EAST4 DRAINING TO NORTH PROPERTY LINE
164          KO                                          22
165          BA  0.0728
166          PB    2.78
167          LS              81       0
168          UD    0.59

169          KK  RT4
170          KM  ROUTE FLOWS FROM RT4 TO NORTH CORNER
171          KO                                          22
172          RD     640    0.02   0.014            TRAP       2       3

173          KK  EAST3A
174          KM  RUNOFF FROM EAST3A DRAINING TO NORTH PROPERTY LINE
175          KO                                          22
176          BA  0.0975
177          PB    2.78
178          LS              81       0
179          UD    0.44
```



```
LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

180          KK  RT3C
181          KM  PIPE EAST 3A THRU SUBDIVISION
182          KO                                          22
183          RD    1190    .015    .014            CIRC     2.5       1

184          KK  CM1216
185          KM  COMBINE AREAS CURTI 12 AND 16 WITH EAST 3A
186          KO                                          22
187          HC       2

188          KK  RT3B
189          KM  PIPE THRU SUBDIVISION TO SPREADER
190          KO                                          22
191          RD    1390    .017   0.030            TRAP     200      50

192          KK  CRTI4A
193          KM  RUNOFF FROM UNDEVELOPED PORTION OF CURTI4
194          KO                                          22
195          BA  0.0763
196          PB    2.78
197          LS              73
198          UD    0.39

199          KK  SPRDR5
200          KM  COMBINED AND ROUTED FLOWS FROM EAST4 & CURT6
201          KO                                          22
202          HC       2
```

```
          203          KK  UNIT5a
          204          KM  CURTI RANCH UNIT 5a (So. OF CURTI RANCH ROAD)
          205          KO                                        22
          206          BA  0.0166
          207          PB    2.78
          208          LS              86
          209          UD    0.34

          210          KK  RT5a
          211          KM  ROUTE FLOWS TO SPREADER 2
          212          KO                                        22
          213          RD    1320   0.015   0.030                      300      50

          214          KK  CRTI2A
          215          KM  RUNOFF FROM UNDEVELOPED PORTION CURTI2
          216          KO                                        22
          217          BA  0.0171
          218          PB    2.78
          219          LS              73
          220          UD    0.22
□                                                HEC-1 INPUT
PAGE  6

          LINE         ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

          221          KK  SPRDR2
          222          KM  COMBINE FLOWS FROM UNIT 5a AND CRTI2A (EXISTING GROUND)
          223          KO                                        22
          224          HC       2

          225          KK  COM-AL
          226          KM  COMBINE ALL FLOWS JUST TO GET HEC-1 TO RUN
          227          KO                                        22
          228          HC       4
          229          ZZ
□HEC1 S/N: 1343001909        HMVersion: 6.33    Data File: C:\WINNT\TEMP\~vbh1232.TMP


****************************************
****************************************
*                                      *                                    *
*                                      *                                    *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                    *    U.S. ARMY CORPS
OF ENGINEERS     *
*              MAY   1991              *                                    *    HYDROLOGIC
ENGINEERING CENTER    *
*           VERSION 4.0.1E             *                                    *         609
SECOND STREET          *
*                                      *                                    *       DAVIS,
CALIFORNIA 95616       *
*  RUN DATE  03/05/2003  TIME  14:14:36 *                                    *           (916)
756-1104           *
*                                      *                                    *
*                                      *
****************************************
****************************************
```

100 YEAR STORM

```
   3 IO          OUTPUT CONTROL VARIABLES
                      IPRNT          5  PRINT CONTROL
                      IPLOT          0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE      1   0  STARTING DATE
                      ITIME         0000  STARTING TIME
                         NQ          450  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      2   0  ENDING DATE
                     NDTIME         1325  ENDING TIME
                     ICENT           19  CENTURY MARK

                   COMPUTATION INTERVAL      0.08 HOURS
                        TOTAL TIME BASE     37.42 HOURS
```

```
          **************
          *            *
225 KK    *   COM-AL   *
          *            *
          **************
```

227 KO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	0	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE
IPNCH	0	PUNCH COMPUTED HYDROGRAPH
IOUT	22	SAVE HYDROGRAPH ON THIS UNIT
ISAV1	1	FIRST ORDINATE PUNCHED OR SAVED
ISAV2	450	LAST ORDINATE PUNCHED OR SAVED
TIMINT	0.083	TIME INTERVAL IN HOURS

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

TIME OF OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	MAX STAGE
HYDROGRAPH AT	BAIL	3673.	13.17	1527.	481.	308.	15.30		
DIVERSION TO	D1	3133.	13.17	1303.	410.	263.	15.30		
HYDROGRAPH AT	D1	540.	13.17	225.	71.	45.	15.30		
HYDROGRAPH AT	EAST1A	13.	12.25	2.	1.	0.	0.03		
2 COMBINED AT	COM1	543.	13.17	227.	71.	46.	15.33		
ROUTED TO	RT1	542.	13.25	227.	71.	46.	15.33		
HYDROGRAPH AT	CRTI1A	9.	12.33	2.	1.	0.	0.03		
HYDROGRAPH AT	GGCHAN	8.	12.25	1.	0.	0.	0.01		
3 COMBINED AT	SPRDR1	546.	13.25	230.	72.	46.	15.37		
HYDROGRAPH AT	EAST2	134.	12.50	35.	11.	7.	0.49		
HYDROGRAPH AT	EAST1C	25.	12.25	5.	1.	1.	0.06		
2 COMBINED AT	COM1C2	152.	12.42	40.	12.	8.	0.55		
HYDROGRAPH AT	EAST3B	8.	12.08	1.	0.	0.	0.01		
2 COMBINED AT	CM-EST	154.	12.42	41.	13.	8.	0.56		
ROUTED TO	RT2D	153.	12.42	41.	13.	8.	0.56		
ROUTED TO	D-POND	120.	12.75	31.	10.	6.	0.56	83.33	12.75
HYDROGRAPH AT	EAST1B	26.	12.25	5.	2.	1.	0.06		
ROUTED TO	RT2C	25.	12.25	5.	2.	1.	0.06		

2 COMBINED AT	CM-P1B	131.	12.75	35.	12.	7.	0.62	
ROUTED TO	RT2C	128.	12.75	35.	12.	7.	0.62	
HYDROGRAPH AT	CURT4	6.	12.67	2.	1.	0.	0.03	
2 COMBINED AT	CM3-6	134.	12.75	37.	12.	8.	0.65	
ROUTED TO	RT2B	133.	12.83	37.	12.	8.	0.65	
HYDROGRAPH AT	UNIT5b	14.	12.00	2.	0.	0.	0.01	
ROUTED TO	RT5a	14.	12.00	2.	0.	0.	0.01	
HYDROGRAPH AT	CRTI3A	14.	12.33	3.	1.	1.	0.05	
3 COMBINED AT	SPRDR3	141.	12.83	41.	14.	9.	0.71	
HYDROGRAPH AT	EAST4	28.	12.50	7.	2.	1.	0.07	
ROUTED TO	RT4	28.	12.50	7.	2.	1.	0.07	
HYDROGRAPH AT	EAST3A	46.	12.33	10.	3.	2.	0.10	
ROUTED TO	RT3C	45.	12.33	10.	3.	2.	0.10	
2 COMBINED AT	CM1216	72.	12.42	17.	5.	3.	0.17	
ROUTED TO	RT3B	72.	12.50	17.	5.	3.	0.17	
HYDROGRAPH AT	CRTI4A	22.	12.33	5.	1.	1.	0.08	
2 COMBINED AT	SPRDR5	91.	12.50	22.	7.	4.	0.25	
HYDROGRAPH AT	UNIT5a	12.	12.25	2.	1.	0.	0.02	
ROUTED TO	RT5a	12.	12.50	2.	1.	0.	0.02	
HYDROGRAPH AT	CRTI2A	7.	12.17	1.	0.	0.	0.02	
2 COMBINED AT	SPRDR2	15.	12.42	3.	1.	1.	0.03	
4 COMBINED AT	COM-AL	701.	13.00	295.	94.	60.	16.36	

SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING

(FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)

						INTERPOLATED TO COMPUTATION INTERVAL			
ISTAQ	ELEMENT	DT	PEAK	TIME TO PEAK	VOLUME	DT	PEAK	TIME TO PEAK	VOLUME
		(MIN)	(CFS)	(MIN)	(IN)	(MIN)	(CFS)	(MIN)	(IN)

APPENDIX B

HYDRAULICS

NORMAL DEPTH & VELOCITY IN CIRCULAR PIPE

MANNING'S n = 0.014

CURTI RANCH TWO - UNIT 5

UPSTRM POINT	DNSTRM POINT	Q10 (cfs)	UPSTRM ELEV	DNSTRM ELEV	PIPE LENGTH	SLOPE (ft/ft)	PIPE DIA (in)	FRICTION SLOPE	FLOW TYPE	Dn (in)	Dc (in)	Vn (fps)	Vc (fps)	Qcap (cfs)
FMH #1	FMH #2	2.87	4566.40	4563.20	171.4	0.0187	12	0.0075	PART	6.84	8.64	6.21	4.74	4.52
FMH #2	FMH #3	2.87	4562.85	4562.55	50.5	0.0059	15	0.0023	PART	8.55	8.10	3.97	4.24	4.62
FMH #3	FMH #4	4.37	4562.45	4561.95	68.1	0.0073	15	0.0053	PART	10.50	10.05	4.76	5.00	5.14
FMH #4	FMH #5	4.37	4561.85	4561.25	77.5	0.0077	15	0.0053	PART	10.35	10.05	4.84	5.00	5.28
FMH #5	FMH #6	4.37	4561.15	4560.00	156.2	0.0074	15	0.0053	PART	10.50	10.05	4.76	5.00	5.15
FMH #6	FMH #7	4.37	4559.90	4559.05	112.6	0.0075	15	0.0053	PART	10.50	10.05	4.76	5.00	5.21
FMH #7	FMH #8	8.10	4558.20	4557.60	122.6	0.0049	24	0.0015	PART	12.72	12.00	4.79	5.16	14.70
FMH #8	MH #6	8.10	4557.50	4556.80	140.1	0.0050	24	0.0015	PART	12.48	12.00	4.91	5.16	14.85
MH #6	MH #5	8.10	4556.70	4556.20	93.0	0.0054	24	0.0015	PART	12.24	12.00	5.03	5.16	15.40
MH #5	MH #4	8.10	4556.10	4555.85	46.8	0.0053	24	0.0015	PART	12.24	12.00	5.03	5.16	15.35
MH #4	MH #3	12.24	4555.75	4555.45	58.8	0.0051	24	0.0034	PART	16.32	14.88	5.38	5.98	15.00
MH #3	MH #2	12.24	4555.35	4554.50	194.7	0.0044	24	0.0034	PART	17.28	14.88	5.05	5.98	13.88
MH #2	MH #11	14.10	4554.40	4553.20	210.3	0.0057	24	0.0045	PART	17.52	16.08	5.74	6.30	15.87
MH #11	OUTLET	14.10	4553.10	4552.33	134.8	0.0057	24	0.0045	PART	17.52	16.08	5.74	6.30	15.88
MH#1	OUTLET	2.40	4553.70	4553.60	32.2	0.0031	15	0.0016	PART	9.30	7.35	3.00	4.01	3.34
MH#7	MH#8	3.09	4556.10	4555.30	197.5	0.0041	15	0.0027	PART	10.20	8.40	3.48	4.37	3.82
MH#8	MH#9	3.09	4555.20	4554.90	69.1	0.0043	15	0.0027	PART	9.90	8.40	3.60	4.37	3.95
MH#9	MH#10	6.27	4554.55	4553.60	148.6	0.0064	18	0.0041	PART	12.06	11.34	4.98	5.35	7.80
MH#10	OUTLET	6.27	4553.00	4552.73	127.0	0.0021	24	0.0009	PART	13.92	10.56	3.32	4.71	9.69

TABLE A-2: NORMAL DEPTH and VELOCITY CALCULATIONS

42" SD from OUTLET STRUCTURE to SDMH#13
Worksheet for Circular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\42-inch .fm2
Worksheet	42" SD from OUTLET STRUCTURE - SDMH#13
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.008917	ft/ft
Diameter	42.00	in
Discharge	91.00	cfs

DESIGN FLOW = 91 cfs
Q_{100} = 91 cfs
Q_{10} = 23 cfs

Results		
Depth	2.74	ft
Flow Area	8.09	ft²
Wetted Perimeter	7.61	ft
Top Width	2.88	ft
Critical Depth	2.96	ft
Percent Full	78.42	
Critical Slope	0.007775	ft/ft
Velocity	11.24	ft/s
Velocity Head	1.96	ft
Specific Energy	4.71	ft
Froude Number	1.18	
Maximum Discharge	102.19	cfs
Full Flow Capacity	95.00	cfs
Full Flow Slope	0.008182	ft/ft
Flow is supercritical.		

42" SD from SDMH#13 to SDMH #25
Worksheet for Circular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\42-inch .fm2
Worksheet	42" SD from SDMH# 13 to SDMH #25
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.010700	ft/ft
Diameter	42.00	in
Discharge	100.00	cfs

DESIGN FLOW = 100 cfs
Q_{100} = 100 cfs
Q_{10} = 24 cfs

Results		
Depth	2.75	ft
Flow Area	8.12	ft²
Wetted Perimeter	7.63	ft
Top Width	2.87	ft
Critical Depth	3.07	ft
Percent Full	78.66	
Critical Slope	0.008927	ft/ft
Velocity	12.32	ft/s
Velocity Head	2.36	ft
Specific Energy	5.11	ft
Froude Number	1.29	
Maximum Discharge	111.94	cfs
Full Flow Capacity	104.07	cfs
Full Flow Slope	0.009880	ft/ft
Flow is supercritical.		

42" SD from SDMH #25 to DITCH
Worksheet for Circular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\42-inch .fm2
Worksheet	42" SD from SDMH# 25 to DITCH
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.011700	ft/ft
Diameter	42.00	in
Discharge	105.00	cfs

DESIGN FLOW = 105 cfs
Q_{100} = 105 cfs
Q_{10} = 26 cfs

Results		
Depth	2.76	ft
Flow Area	8.15	ft²
Wetted Perimeter	7.66	ft
Top Width	2.85	ft
Critical Depth	3.12	ft
Percent Full	78.97	
Critical Slope	0.009664	ft/ft
Velocity	12.88	ft/s
Velocity Head	2.58	ft
Specific Energy	5.34	ft
Froude Number	1.34	
Maximum Discharge	117.06	cfs
Full Flow Capacity	108.82	cfs
Full Flow Slope	0.010893	ft/ft
Flow is supercritical.		

PIPE from SDMH #'s 19-20-Ditch 4
Worksheet for Circular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\pipes.fm2
Worksheet	PIPE, sdmh 19-20-ditch4
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Channel Diameter

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.015900	ft/ft
Depth	28.7	in
Discharge	46.00	cfs

DESIGN FLOW = 46 cfs
Q_{100} = 46 cfs
Q_{10} = 17 cfs

Results			
Diameter	28.71	in	← ∴ 30" SD
Flow Area	4.50	ft²	
Wetted Perimeter	7.52	ft	
Top Width	0.00	ft	
Critical Depth	2.22	ft	
Percent Full	100.00		
Critical Slope	0.013767	ft/ft	
Velocity	10.23	ft/s	
Velocity Head	1.63	ft	
Specific Energy	FULL	ft	
Froude Number	FULL		
Maximum Discharge	49.48	cfs	
Full Flow Capacity	46.00	cfs	
Full Flow Slope	0.015900	ft/ft	

PIPE BETWEEN SDMH #18 & DETENTION POND
Worksheet for Circular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\pipes.fm2
Worksheet	PIPE, sdmh #18 - DETENTION POND
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Full Flow Capacity

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.021600	ft/ft
Diameter	18.00	in

DESIGN FLOW = 8 cfs
Q_{100} = 8 cfs
Q_{10} = 4 cfs

Results		
Depth	18.0	in
Discharge	15.44	cfs
Flow Area	1.77	ft²
Wetted Perimeter	4.71	ft
Top Width	0.00	ft
Critical Depth	1.41	ft
Percent Full	100.00	
Critical Slope	0.018673	ft/ft
Velocity	8.74	ft/s
Velocity Head	1.19	ft
Specific Energy	FULL	ft
Froude Number	FULL	
Maximum Discharge	16.61	cfs
Full Flow Capacity	15.44	cfs
Full Flow Slope	0.021600	ft/ft

Culvert Calculator Report
exist 24" to det. pond

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	85.00 ft	Headwater Depth/ Height	2.44
Computed Headwater Elevation	85.00 ft	Discharge	32.43 cfs
Inlet Control HW Elev	84.76 ft	Tailwater Elevation	79.65 ft
Outlet Control HW Elev	85.00 ft	Control Type	Outlet Control

Grades			
Upstream Invert	80.12 ft	Downstream Invert	73.80 ft
Length	163.60 ft	Constructed Slope	0.038631 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.85 ft
Slope Type	N/A	Normal Depth	1.27 ft
Flow Regime	N/A	Critical Depth	1.90 ft
Velocity Downstream	10.32 ft/s	Critical Slope	0.017787 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	85.00 ft	Upstream Velocity Head	1.66 ft
Ke	0.20	Entrance Loss	0.33 ft

Inlet Control Properties			
Inlet Control HW Elev	84.76 ft	Flow Control	N/A
Inlet Type	Beveled ring, 45 ° bevels	Area Full	3.1 ft²
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	1
C	0.03000	Equation Form	1
Y	0.74000		

$Q(24") = 32.43$ cfs

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
exist 30" to det. pond

Solve For: Discharge

Culvert Summary					
Allowable HW Elevation	85.00	ft	Headwater Depth/ Height	1.95	
Computed Headwater Elevation	85.00	ft	Discharge	49.72	cfs
Inlet Control HW Elev	85.00	ft	Tailwater Elevation	79.65	ft
Outlet Control HW Elev	84.49	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	80.12	ft	Downstream Invert	73.80	ft
Length	163.60	ft	Constructed Slope	0.038631	ft/ft

Hydraulic Profile					
Profile	CompositePressureS1S2		Depth, Downstream	1.45	ft
Slope Type	N/A		Normal Depth	1.42	ft
Flow Regime	N/A		Critical Depth	2.30	ft
Velocity Downstream	16.79	ft/s	Critical Slope	0.012769	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev	84.49	ft	Upstream Velocity Head	1.73	ft
Ke	0.20		Entrance Loss	0.35	ft

Inlet Control Properties					
Inlet Control HW Elev	85.00	ft	Flow Control	N/A	
Inlet Type	Beveled ring, 45 ° bevels		Area Full	4.9	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	1	
C	0.03000		Equation Form	1	
Y	0.74000				

Q(30") = 49.72 cfs

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
new 36" pipe to det. pond

Solve For: Section Size

Culvert Summary			
Allowable HW Elevation	85.00 ft	Headwater Depth/ Height	1.70
Computed Headwater Elevation	84.16 ft	Discharge	70.00 cfs
Inlet Control HW Elev	84.16 ft	Tailwater Elevation	79.65 ft
Outlet Control HW Elev	83.80 ft	Control Type	Inlet Control

Grades			
Upstream Invert	79.06 ft	Downstream Invert	73.80 ft
Length	130.00 ft	Constructed Slope	0.040462 ft/ft

Hydraulic Profile			
Profile	CompositePressureS1S2	Depth, Downstream	1.64 ft
Slope Type	N/A	Normal Depth	1.54 ft
Flow Regime	N/A	Critical Depth	2.66 ft
Velocity Downstream	17.73 ft/s	Critical Slope	0.009840 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	3.00 ft
Section Size	36 inch	Rise	3.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	83.80 ft	Upstream Velocity Head	1.74 ft
Ke	0.20	Entrance Loss	0.35 ft

Inlet Control Properties			
Inlet Control HW Elev	84.16 ft	Flow Control	N/A
Inlet Type	Beveled ring, 45 ° bevels	Area Full	7.1 ft²
K	0.00180	HDS 5 Chart	3
M	2.50000	HDS 5 Scale	1
C	0.03000	Equation Form	1
Y	0.74000		

$Q_{DESIGN} = 69.85$ cfs

Q_{100} (TOT*) = 152 cfs

Q_{10} (TOT*) = 38 cfs

* TOT = (24" + 30" + 36")

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
PIPE, sdmh 12-13

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	85.00 ft	Headwater Depth/ Height	1.91
Computed Headwater Elevation	83.93 ft	Discharge	25.00 cfs
Inlet Control HW Elev	83.93 ft	Tailwater Elevation	74.40 ft
Outlet Control HW Elev	83.58 ft	Control Type	Inlet Control

Grades			
Upstream Invert	80.12 ft	Downstream Invert	71.64 ft
Length	180.00 ft	Constructed Slope	0.047111 ft/ft

Hydraulic Profile			
Profile	CompositePressureS1S2	Depth, Downstream	1.01 ft
Slope Type	N/A	Normal Depth	1.01 ft
Flow Regime	N/A	Critical Depth	1.76 ft
Velocity Downstream	15.70 ft/s	Critical Slope	0.010976 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	83.58 ft	Upstream Velocity Head	1.13 ft
Ke	0.50	Entrance Loss	0.57 ft

Inlet Control Properties			
Inlet Control HW Elev	83.93 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	3.1 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

$Q_{DESIGN} = 25$ cfs
$Q_{100} = 25$ cfs
$Q_{10} = 4$ cfs

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

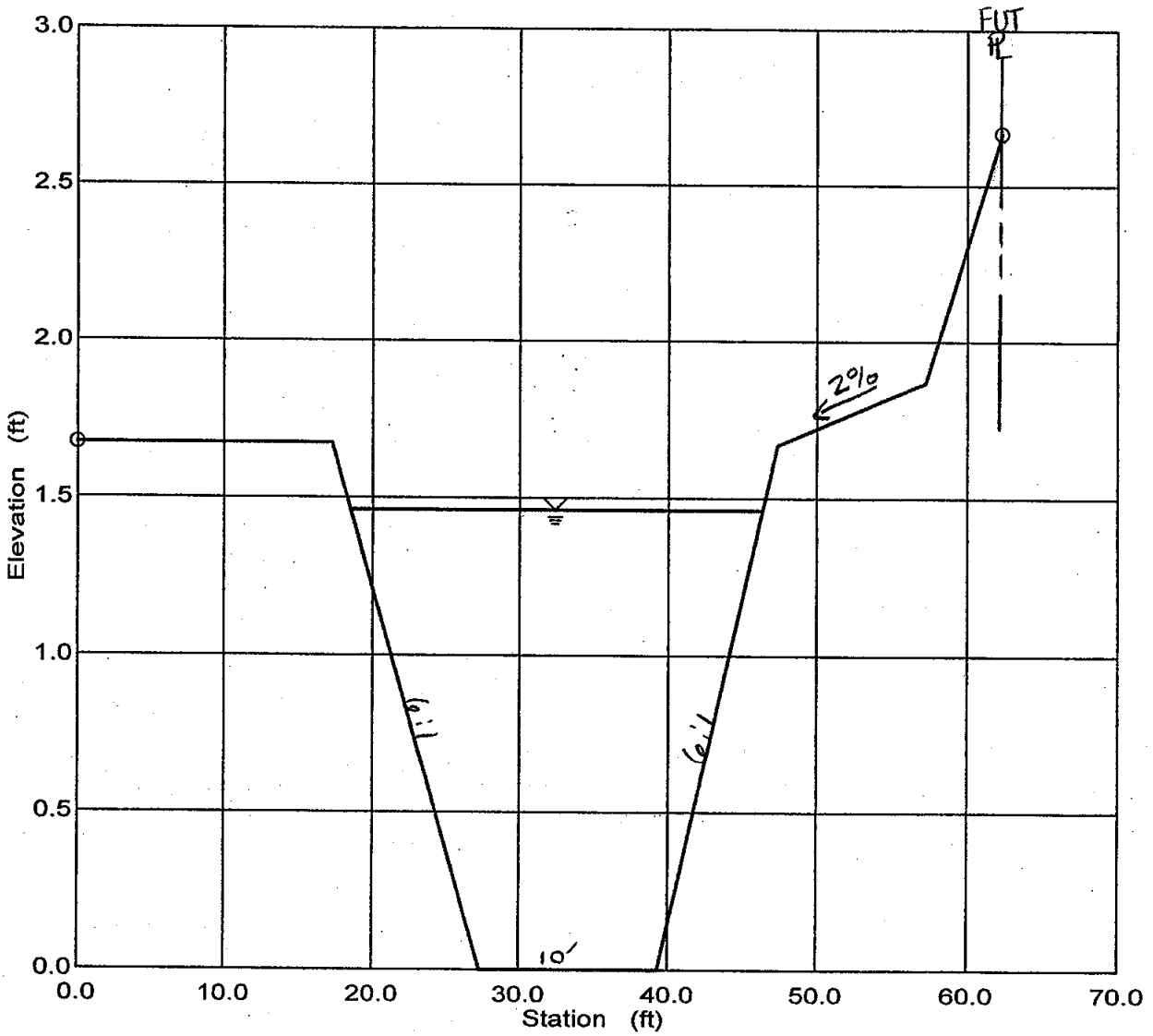
EMERGENCY

DETENTION POND OVERFLOW DITCH

Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	OUTLET STRUCTURE to SDMH #13
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.006600	ft/ft
Water Surface Elevation	1.46	ft
Discharge	120.00	cfs



DETENTION POND OVERFLOW DITCH
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	OUTLET STRUCTURE to SDMH #13
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006600	ft/ft
Elevation range: 0.00 ft to 2.67 ft.		
Discharge	120.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.67	0.00	62.29	0.030
17.29	1.67			
27.29	0.00			
39.29	0.00			
47.29	1.67			
57.29	1.87			
62.29	2.67			

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	1.46	ft
Flow Area	29.10	ft²
Wetted Perimeter	28.06	ft
Top Width	27.78	ft
Height	1.46	ft
Critical Depth	1.21	ft
Critical Slope	0.013778	ft/ft
Velocity	4.12	ft/s
Velocity Head	0.26	ft
Specific Energy	1.73	ft
Froude Number	0.71	
Flow is subcritical.		

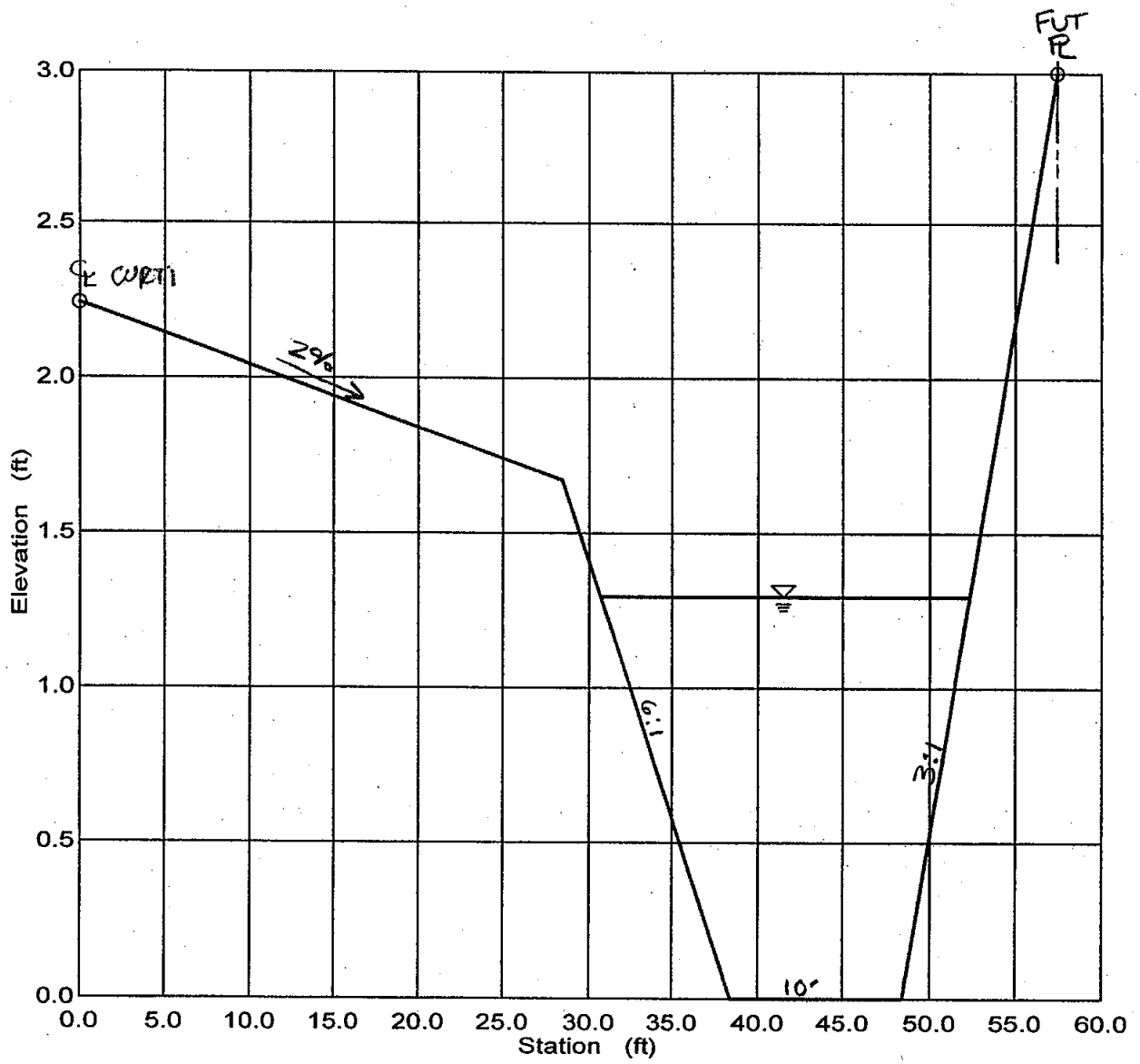
EMERGENCY

DETENTION POND OVERFLOW DITCH

Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	SDMH #13 to SDMH #25
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.015500	ft/ft
Water Surface Elevation	1.29	ft
Discharge	120.00	cfs



DETENTION POND OVERFLOW DITCH
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	SDMH #13 to SDMH #25
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.015500	ft/ft
Elevation range: 0.00 ft to 3.00 ft.		
Discharge	120.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	2.24	0.00	57.50	0.030
28.50	1.67			
38.50	0.00			
48.50	0.00			
57.50	3.00			

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	1.29	ft
Flow Area	20.41	ft²
Wetted Perimeter	21.92	ft
Top Width	21.61	ft
Height	1.29	ft
Critical Depth	1.34	ft
Critical Slope	0.013497	ft/ft
Velocity	5.88	ft/s
Velocity Head	0.54	ft
Specific Energy	1.83	ft
Froude Number	1.07	
Flow is supercritical.		

EMERGENCY

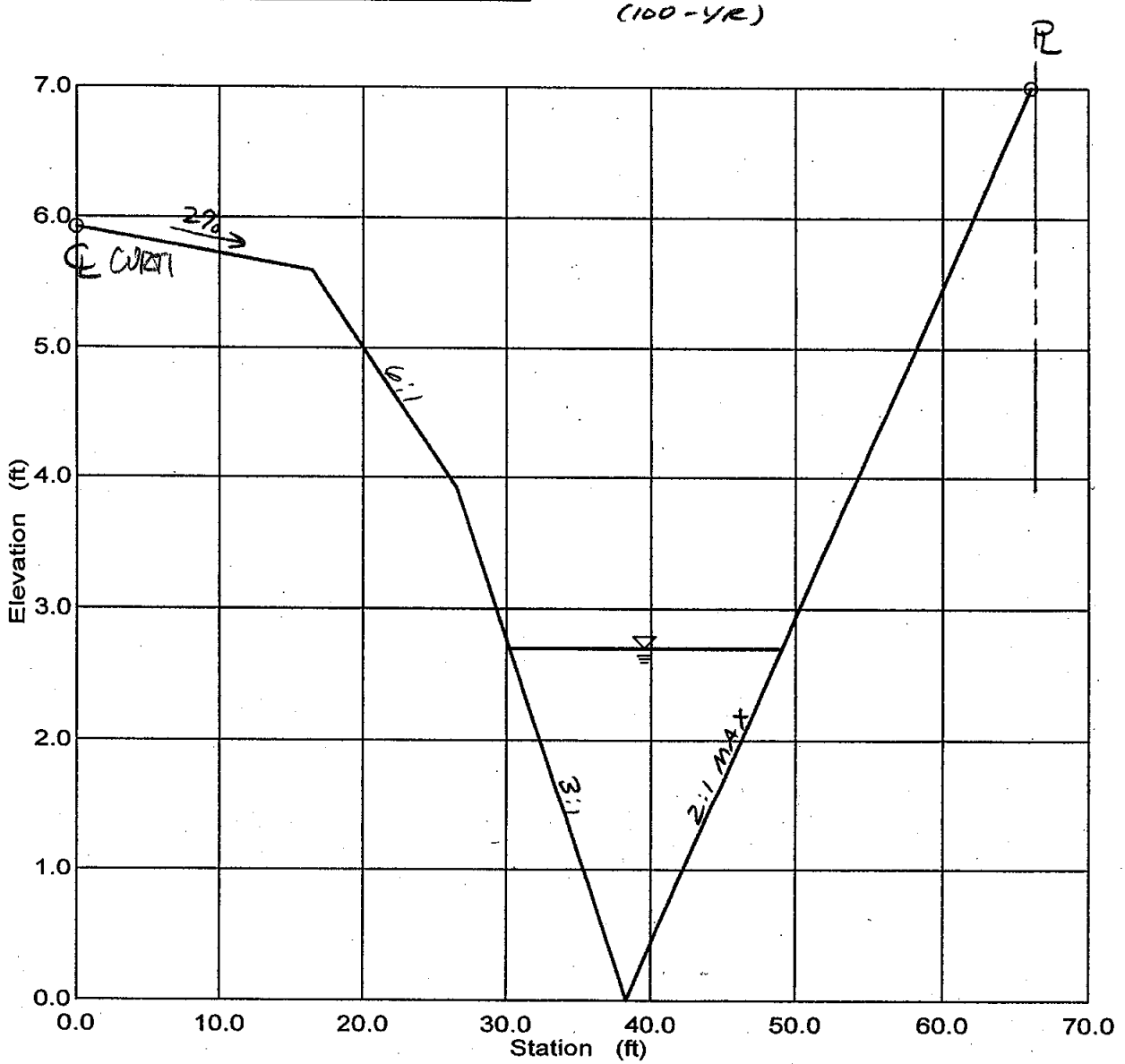
DETENTION POND OVERFLOW DITCH

Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	BEGINNING OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.006500	ft/ft
Water Surface Elevation	2.69	ft
Discharge	120.00	cfs

EMERGENCY OVERFLOW (100-YR)



DETENTION POND OVERFLOW DITCH
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	BEGINNING OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006500	ft/ft
Elevation range: 0.00 ft to 7.00 ft.		
Discharge	120.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.92	0.00	66.10	0.030
16.50	5.59			
26.50	3.92			
38.26	0.00			
66.10	7.00			

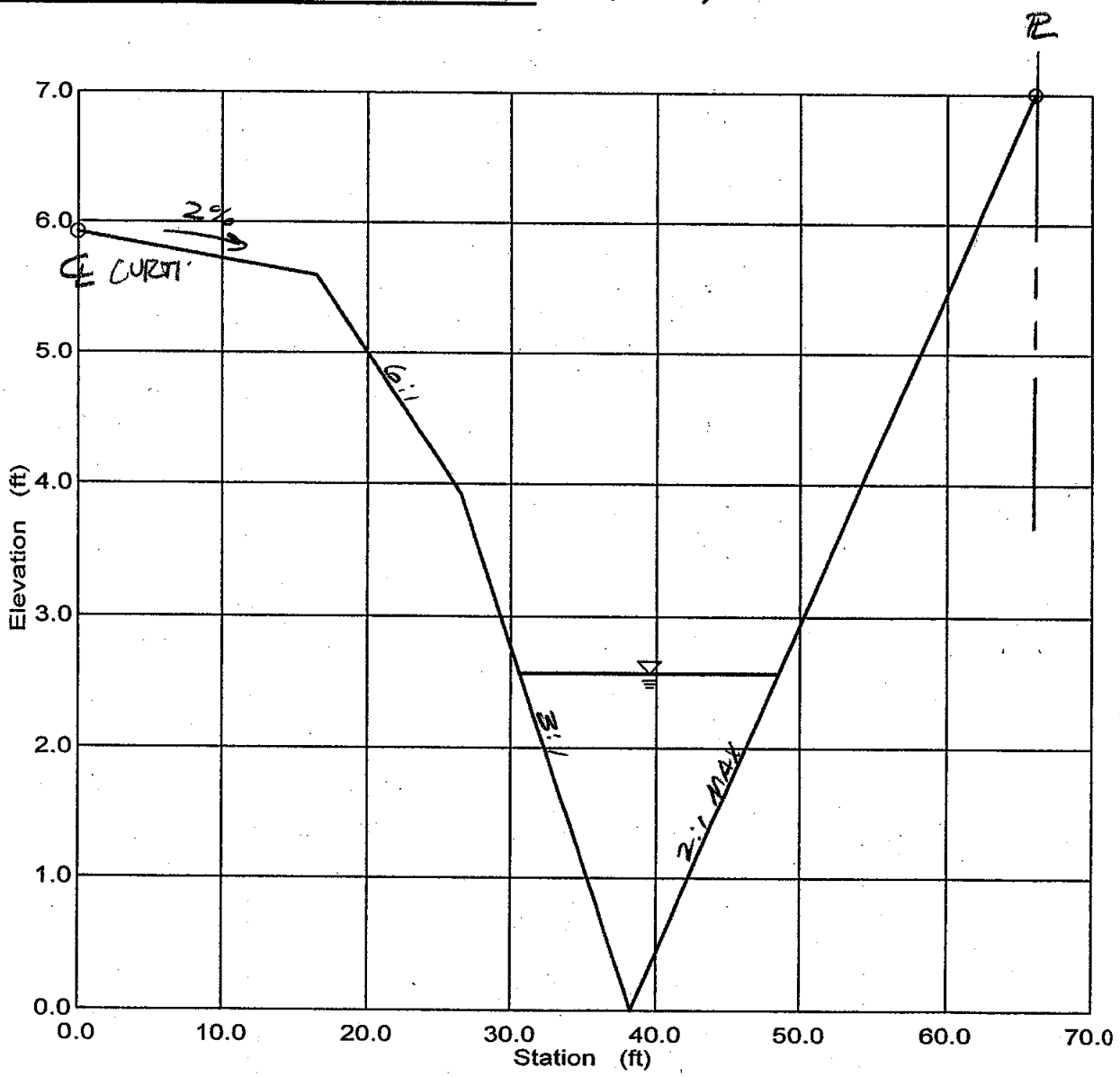
Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.69	ft
Flow Area	25.31	ft²
Wetted Perimeter	19.56	ft
Top Width	18.79	ft
Height	2.69	ft
Critical Depth	2.36	ft
Critical Slope	0.013090	ft/ft
Velocity	4.74	ft/s
Velocity Head	0.35	ft
Specific Energy	3.04	ft
Froude Number	0.72	
Flow is subcritical.		

DITCH FLOW TO SPREADERS
Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	BEGINNING OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.006500	ft/ft
Water Surface Elevation	2.56	ft
Discharge	105.00	cfs

NORMAL 100-YR FLOW



DITCH FLOW TO SPREADERS
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	BEGINNING OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006500	ft/ft
Discharge	105.00	cfs

Elevation range: 0.00 ft to 7.00 ft.

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	5.92	0.00	66.10	0.030
16.50	5.59			
26.50	3.92			
38.26	0.00			
66.10	7.00			

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.56	ft
Flow Area	22.90	ft²
Wetted Perimeter	18.61	ft
Top Width	17.88	ft
Height	2.56	ft
Critical Depth	2.24	ft
Critical Slope	0.013325	ft/ft
Velocity	4.59	ft/s
Velocity Head	0.33	ft
Specific Energy	2.89	ft
Froude Number	0.71	
Flow is subcritical.		

EMERGENCY

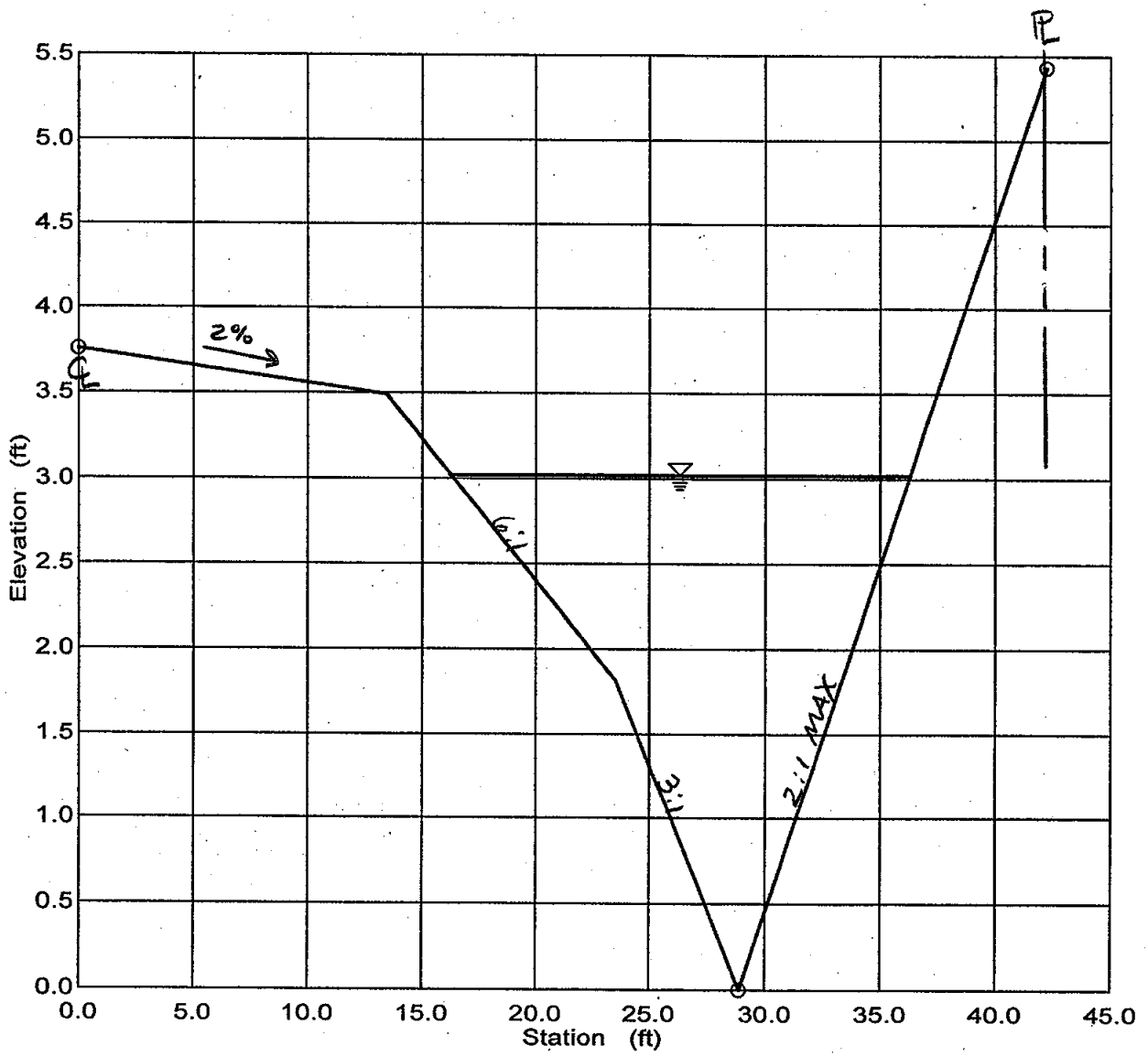
DETENTION POND OVERFLOW DITCH

Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	END OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.032	
Channel Slope	0.006500	ft/ft
Water Surface Elevation	3.02	ft
Discharge	120.00	cfs

EMERGENCY OVERFLOW (100-YR)



DETENTION POND OVERFLOW DITCH
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	END OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data				
Channel Slope	0.006500 ft/ft			
Elevation range: 0.00 ft to 5.42 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	3.75	0.00	28.93	0.030
13.50	3.48	28.93	42.23	0.035
23.50	1.81			
28.93	0.00			
42.23	5.42			
Discharge	120.00 cfs			

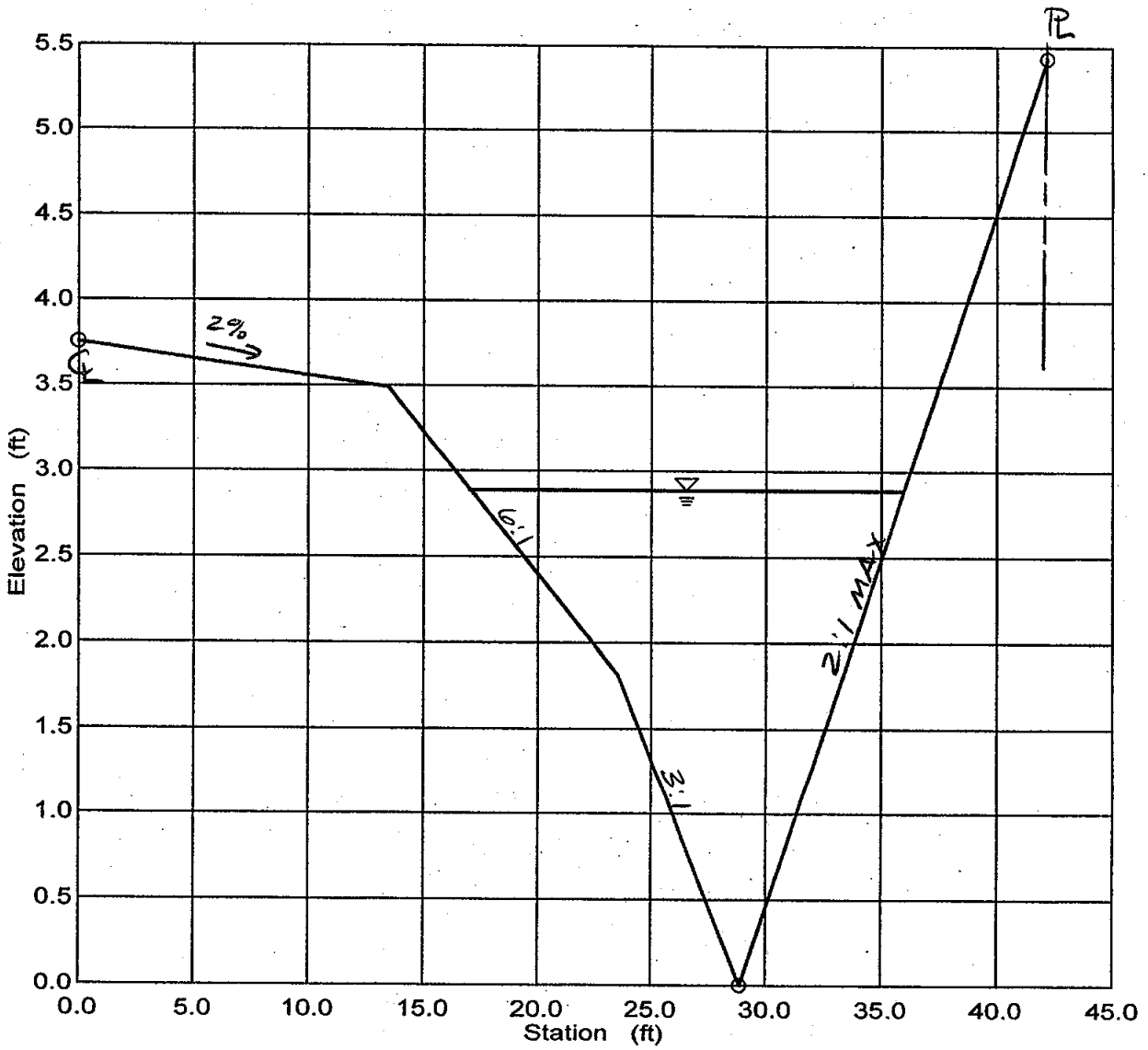
Results		
Wtd. Mannings Coefficient	0.032	
Water Surface Elevation	3.02	ft
Flow Area	27.06	ft²
Wetted Perimeter	21.07	ft
Top Width	20.09	ft
Height	3.02	ft
Critical Depth	2.61	ft
Critical Slope	0.015123	ft/ft
Velocity	4.44	ft/s
Velocity Head	0.31	ft
Specific Energy	3.33	ft
Froude Number	0.67	
Flow is subcritical.		

DITCH FLOW TO SPREADERS
Cross Section for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	END OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.032	
Channel Slope	0.006500	ft/ft
Water Surface Elevation	2.88	ft
Discharge	105.00	cfs

NORMAL 100-YR FLOW



DITCH FLOW TO SPREADERS
Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\overflow.fm2
Worksheet	END OF DITCH
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.006500	ft/ft
Elevation range: 0.00 ft to 5.42 ft.		
Discharge	105.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	3.75	0.00	28.93	0.030
13.50	3.48	28.93	42.23	0.035
23.50	1.81			
28.93	0.00			
42.23	5.42			

Results		
Wtd. Mannings Coefficient	0.032	
Water Surface Elevation	2.88	ft
Flow Area	24.41	ft²
Wetted Perimeter	19.89	ft
Top Width	18.94	ft
Height	2.88	ft
Critical Depth	2.48	ft
Critical Slope	0.015397	ft/ft
Velocity	4.30	ft/s
Velocity Head	0.29	ft
Specific Energy	3.17	ft
Froude Number	0.67	
Flow is subcritical.		

Curti Ranch Road Earthen Swale
Worksheet for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowma~1\crr-ditc.fm2
Worksheet	Curti Ranch Road Earthen Swale
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	0.024000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	1.03	cfs

Results		
Depth	0.38	ft
Flow Area	0.42	ft²
Wetted Perimeter	2.38	ft
Top Width	2.26	ft
Critical Depth	0.37	ft
Critical Slope	0.024599	ft/ft
Velocity	2.43	ft/s
Velocity Head	0.09	ft
Specific Energy	0.47	ft
Froude Number	0.99	
Flow is subcritical.		

Pond Overflow Ditch Section 8/D1
Worksheet for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowma~1\crr-ditc.fm2
Worksheet	Pond Overflow Ditch by Curti Ranch Road
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.030	
Channel Slope	0.024000	ft/ft
Left Side Slope	5.000000	H : V
Right Side Slope	5.000000	H : V
Discharge	1.28	cfs

Results		
Depth	0.33	ft
Flow Area	0.56	ft²
Wetted Perimeter	3.41	ft
Top Width	3.34	ft
Critical Depth	0.33	ft
Critical Slope	0.024477	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energy	0.42	ft
Froude Number	0.99	
Flow is subcritical.		

INTERIM SPREADER WEIR

DITCH #1
Worksheet for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

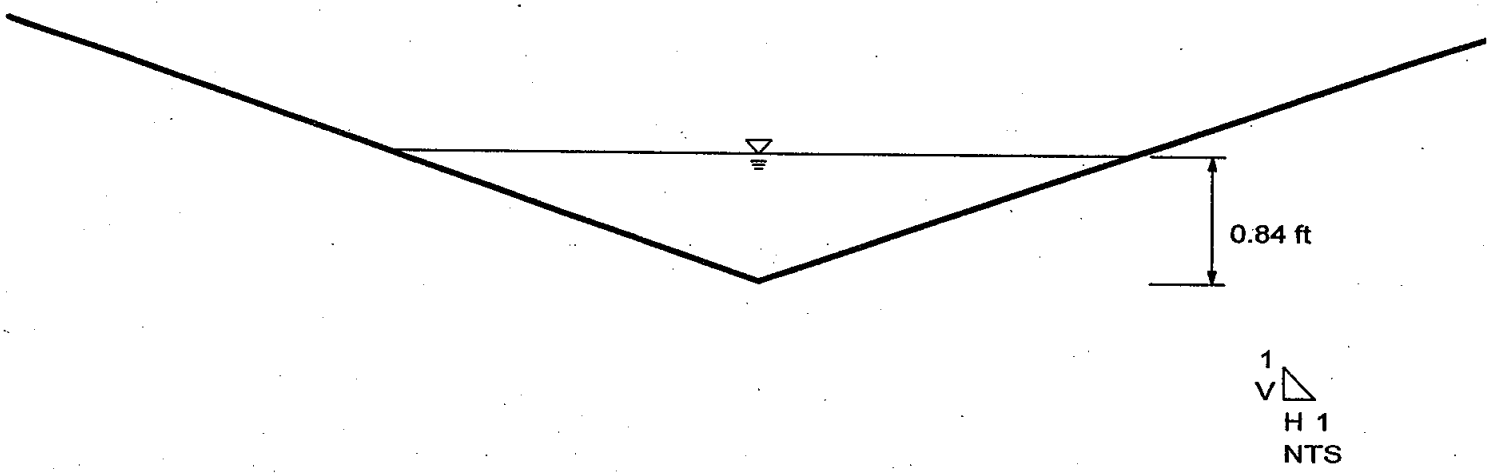
Input Data		
Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	4.80	cfs

Results		
Depth	0.84	ft
Flow Area	2.11	ft^2
Wetted Perimeter	5.31	ft
Top Width	5.03	ft
Critical Depth	0.69	ft
Critical Slope	0.013915	ft/ft
Velocity	2.27	ft/s
Velocity Head	0.08	ft
Specific Energy	0.92	ft
Froude Number	0.62	
Flow is subcritical.		

DITCH #1
Cross Section for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #1
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Depth	0.84	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	4.80	cfs



Broad Crested Weir at Ditch #1

Formula (1303) of The Washoe County Drainage Design Manual

$$Q = C L H^{2/3}$$

Q = Flow (cfs)

C = 2.65 for Broad Crested Weir

L = Width of Weir

H = Head

From analysis: Q = 4.8 cfs

Assume L = 23.5'

$$\Rightarrow H = \left(\frac{Q}{2.65L}\right)^{2/3} = \left(\frac{4.8}{2.65 \times 23.5}\right)^{2/3} = 0.18'$$

Top of Weir = 4556.00

Tailwater = 4556.18

$$\text{Velocity over Weir} = \frac{Q}{A} = \frac{Q}{H \times L}$$

$$= \frac{4.8}{0.18 \times 23.5}$$

$$= 1.13 \text{ fps}$$

INTERIM SPREADER WEIR

Ditch #2
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	Ditch #2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

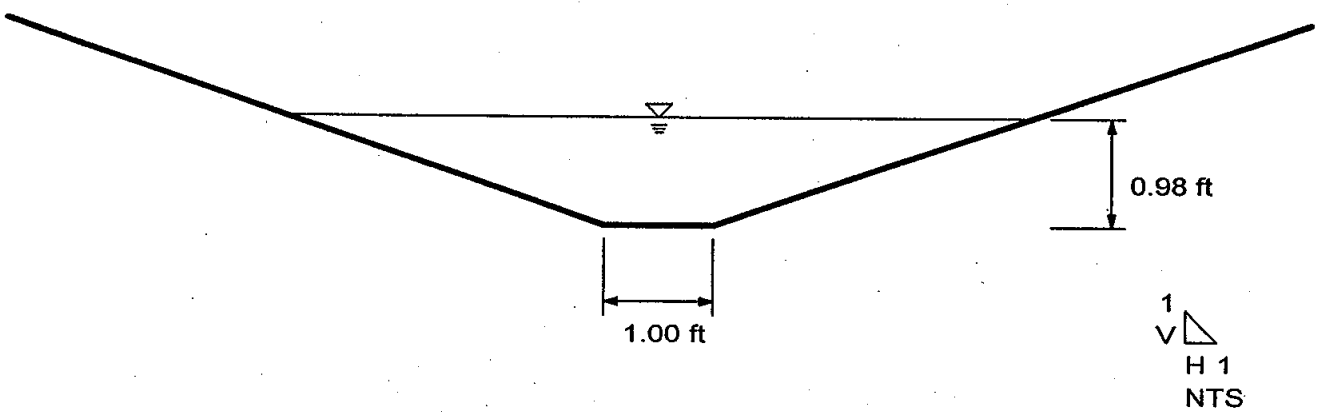
Input Data		
Mannings Coefficient	0.025	
Channel Slope	0.009400	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	1.00	ft
Discharge	14.70	cfs

Results		
Depth	0.98	ft
Flow Area	3.86	ft²
Wetted Perimeter	7.20	ft
Top Width	6.88	ft
Critical Depth	0.93	ft
Critical Slope	0.011898	ft/ft
Velocity	3.81	ft/s
Velocity Head	0.23	ft
Specific Energy	1.21	ft
Froude Number	0.90	
Flow is subcritical.		

Ditch #2
Cross Section for Trapezoidal Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	Ditch #2
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Channel Slope	0.009400	ft/ft
Depth	0.98	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	1.00	ft
Discharge	14.70	cfs



Broad Crested Weir at Ditch #2

Formula (1303) of The Washoe County Drainage Design Manual

$$Q = CLH^{3/2}$$

Q = Flow (cfs)

C = 2.65 for Broad Crested Weir

L = Width of Weir

H = Head

From analysis : Q = 2.41 cfs

Assume L = 5

$$\Rightarrow H = \left(\frac{Q}{2.65L}\right)^{2/3} = \left(\frac{2.41}{2.65 \times 5}\right)^{2/3} = 0.32'$$

Top of Weir = 4556.90

Tailwater = 4557.22

$$\text{Velocity over weir} = \frac{Q}{A} = \frac{Q}{H \times L}$$

$$= \frac{2.41}{0.32 \times 5}$$

$$= 1.50 \text{ fps}$$

INTERIM SPREADER WEIR

DITCH #3
Worksheet for Trapezoidal Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

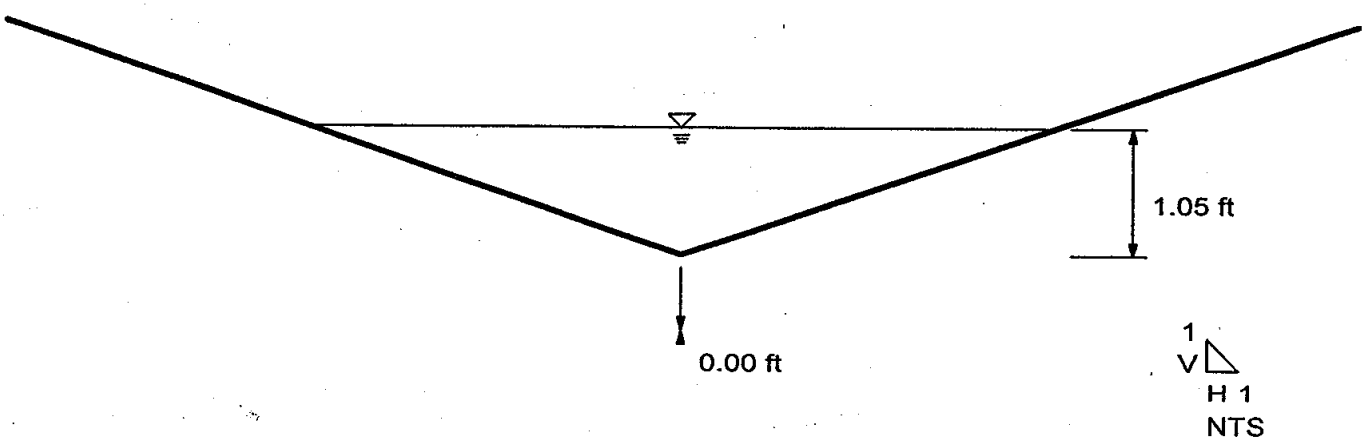
Input Data		
Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	0.00	ft
Discharge	8.70	cfs

Results		
Depth	1.05	ft
Flow Area	3.30	ft²
Wetted Perimeter	6.63	ft
Top Width	6.29	ft
Critical Depth	0.88	ft
Critical Slope	0.012854	ft/ft
Velocity	2.64	ft/s
Velocity Head	0.11	ft
Specific Energy	1.16	ft
Froude Number	0.64	
Flow is subcritical.		

DITCH #3
Cross Section for Trapezoidal Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #3
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Channel Slope	0.005000	ft/ft
Depth	1.05	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Bottom Width	0.00	ft
Discharge	8.70	cfs



Broad Crested Weir at Ditch #3

Formula (1303) of The Washoe County Drainage Design Manual

$Q = CLH^{2/3}$

Q = Flow (cfs)

C = 2.65 for Broad Crested Weir

L = Width of Weir

H = Head

From analysis @ Q = 8.7 cfs

Assume L = 21.6'

$$\Rightarrow H = \left(\frac{Q}{2.65L}\right)^{2/3} = \left(\frac{8.7}{2.65 \times 21.6}\right)^{2/3} = 0.28'$$

Top of weir = 4554.00

Tailwater = 4554.28

$$\text{Velocity over weir} = \frac{Q}{A} = \frac{Q}{H \times L}$$

$$= \frac{8.7}{0.28 \times 21.6}$$

$$= 1.44 \text{ fps}$$

DITCH #4
Worksheet for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #4
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Discharge

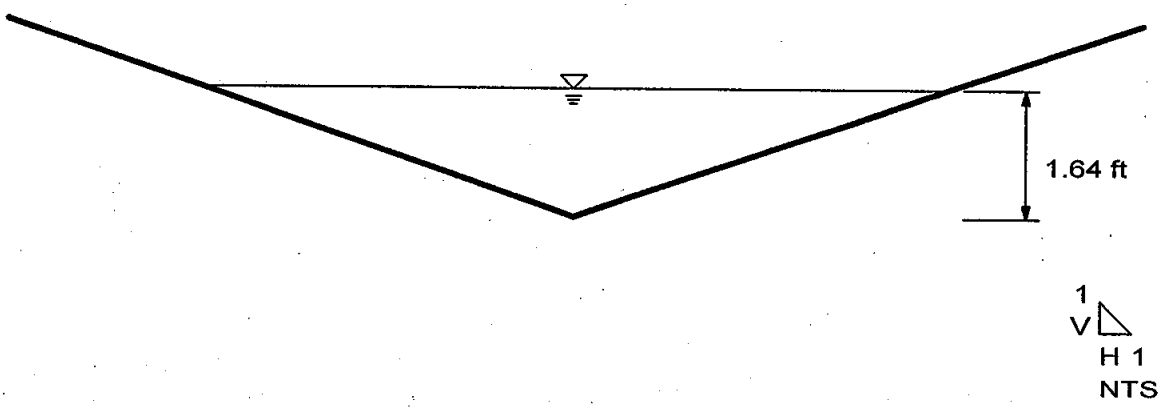
Input Data		
Mannings Coefficient	0.025	
Channel Slope	0.008000	ft/ft
Depth	2.00	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V

Results		
Discharge	61.59	cfs
Flow Area	12.00	ft^2
Wetted Perimeter	12.65	ft
Top Width	12.00	ft
Critical Depth	1.92	ft
Critical Slope	0.009901	ft/ft
Velocity	5.13	ft/s
Velocity Head	0.41	ft
Specific Energy	2.41	ft
Froude Number	0.90	
Flow is subcritical.		

DITCH #4
Cross Section for Triangular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\ditch#2.fm2
Worksheet	DITCH #4
Flow Element	Triangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Section Data		
Mannings Coefficient	0.025	
Channel Slope	0.008000	ft/ft
Depth	1.64	ft
Left Side Slope	3.000000	H : V
Right Side Slope	3.000000	H : V
Discharge	36.00	cfs



Broad Crested Weir at Ditch #4

Formula (1303) of The Washoe County Drainage Design Manual

$Q = CLH^{3/2}$

Q = Flow (cfs)

C = 2.65 for Broad Crested Weir

L = Width of Weir

H = Head

From analysis: Existing 36"ø SD at a minimum slope of 0.34% ⇒ Q ~ 36 cfs

Assume L = 30'

$$\Rightarrow H = \left(\frac{Q}{2.65L}\right)^{2/3} = \left(\frac{36}{2.65 \times 30}\right)^{2/3} = 0.59'$$

Daylight Weir at Elevation 4573.00

Tailwater = 4573.59

$$\text{Velocity over Weir} = \frac{Q}{A} = \frac{Q}{HL}$$

$$= \frac{36}{0.59 \times 30}$$

$$= 2.03 \text{ fps}$$

Rating Table - Type 1A Drop Inlet

INPUT DATA (Horizontal Grate)

Barrel diameter, ft	2
Height above flowline, ft	1.25
Clear opening, %	80
Weir coefficient	3.0
Orifice coefficient	0.6

INPUT DATA (Vertical Opening)

Width, ft	1.5
Height, ft	1
Clear opening, %	80
Weir coefficient	3.0
Orifice coefficient	0.6

FORMULAS:

Q weir = CLH^1.5

Q orifice = CA*(2gH)^0.5

(For vertical orifice, H is measured to center of flow)

RATING TABLE

	Vertical opening		Horizontal opening		
H to flowln	Weir/Orifice	Q vert	Weir/Orifice	Q horiz	**Q total**
0.000	Weir	0.0	---	0.0	**0.00**
0.025	Weir	0.0	---	0.0	**0.02**
0.050	Weir	0.1	---	0.0	**0.05**
0.075	Weir	0.1	---	0.0	**0.09**
0.100	Weir	0.1	---	0.0	**0.14**
0.125	Weir	0.2	---	0.0	**0.20**
0.150	Weir	0.3	---	0.0	**0.26** ← DI#3-Q_{10}=0.25
0.175	Weir	0.3	---	0.0	**0.33**
0.200	Weir	0.4	---	0.0	**0.40**
0.225	Weir	0.5	---	0.0	**0.48**
0.250	Weir	0.6	---	0.0	**0.56** ← DI#1-Q_{10}=0.51 DI#3-Q_{100}=0.51
0.275	Weir	0.6	---	0.0	**0.65** ← DI#2-Q_{10}=0.61
0.300	Weir	0.7	---	0.0	**0.74**
0.325	Weir	0.8	---	0.0	**0.83**
0.350	Weir	0.9	---	0.0	**0.93**
0.375	Weir	1.0	---	0.0	**1.03**
0.400	Weir	1.1	---	0.0	**1.14** ← DI#1-Q_{100}=1.09
0.425	Weir	1.2	---	0.0	**1.25**
0.450	Weir	1.4	---	0.0	**1.36** ← DI#2-Q_{100}=1.28
0.475	Weir	1.5	---	0.0	**1.47**
0.500	Weir	1.6	---	0.0	**1.59**

FLOW SPREAD AND CATCH BASIN CAPACITY CALCULATIONS

TYPE 4R CATCH BASINS (Neenah R3067-LL) - SUMP CONDITION

CURTI RANCH TWO - UNIT 5

CB #	Q10yr (cfs)	Qupstrm (cfs)	Qtotal (cfs)	Strans (%)	Hweir (ft)	Horifice (ft)	Dsprd (ft)	Wsprd (ft)
1	2.41	0.00	2.41	2.00	0.25	0.10	0.11	5.57
2	1.73	0.00	1.73	2.00	0.20	0.05	0.06	3.11
3	1.88	0.00	1.88	2.00	0.21	0.06	0.07	3.67
4	1.55	0.00	1.55	2.00	0.19	0.04	0.05	2.40
5	0.21	0.00	0.21	2.00	0.05	0.00	0.00	1.50
6	1.44	0.00	1.44	2.00	0.18	0.03	0.04	1.96
7	1.37	0.00	1.37	2.00	0.17	0.03	0.03	1.67
8	1.75	0.00	1.75	2.00	0.20	0.05	0.06	3.18
9	1.49	0.00	1.49	2.00	0.18	0.04	0.04	2.16

Q	Tributary flow from hydrology map	Hweir	Computed head using weir equation
Qupstrm	Flow bypass from upstream CB	Horifice	Computed head using orifice equation
Qtotal	Q plus Qupstrm	Wsprd	Width of flow from face of curb
Dsprd	Depth of flow from lip		

Rating Table - Detetion Pond Standpipe

INPUT DATA (Horizontal Grate)

Inlet diameter, ft	3
Height above flowline, ft	4
Clear opening, %	80
Weir coefficient	3.0
Orifice coefficient	0.6

INPUT DATA (Vertical Opening)

Width, ft	1.85
Height, ft	1.85
Clear opening, %	80
Weir coefficient	3.0
Orifice coefficient	0.6

FORMULAS:

Q weir = CLH^1.5

Q orifice = CA*(2gH)^0.5

(For vertical orifice, H is measured to center of flow)

RATING TABLE

	Vertical opening		Horizontal opening		
H to flowln	Weir/Orifice	Q vert	Weir/Orifice	Q horiz	**Q total**
0.00	Weir	0.0	---	0.0	**0.0**
0.50	Weir	2.0	---	0.0	**2.0**
1.00	Weir	5.6	---	0.0	**5.6**
1.50	Weir	10.2	---	0.0	**10.2**
2.00	Orifice	13.7	---	0.0	**13.7**
2.50	Orifice	16.5	---	0.0	**16.5**
3.00	Orifice	19.0	---	0.0	**19.0**
3.50	Orifice	21.2	---	0.0	**21.2**
4.00	Orifice	23.1	Weir	0.0	**23.1**
4.50	Orifice	24.9	Weir	10.0	**34.9**
5.00	Orifice	26.6	Weir	28.3	**54.9**
5.50	Orifice	28.2	Orifice	33.3	**61.5**
6.00	Orifice	29.7	Orifice	38.5	**68.2**
6.50	Orifice	31.1	Orifice	43.1	**74.2**
7.00	Orifice	32.5	Orifice	47.2	**79.7**
7.50	Orifice	33.8	Orifice	50.9	**84.7**
8.00	Orifice	35.1	Orifice	54.5	**89.5**
8.50	Orifice	36.3	Orifice	57.8	**94.0**
9.00	Orifice	37.5	Orifice	60.9	**98.3**
9.50	Orifice	38.6	Orifice	63.9	**102.5**

Rating Table - Detention Pond Spillway

INPUT DATA

Weir Length, ft	35
Weir Coefficient	3

FORMULAS:

Q weir = CLH^1.5

RATING TABLE

ELEV	H	Q
82.1	0	0.00
82.2	0.1	3.32
82.3	0.2	9.39
82.4	0.3	17.25
82.5	0.4	26.56
82.6	0.5	37.12
82.7	0.6	48.80
82.8	0.7	61.49
82.9	0.8	75.13
83	0.9	89.65
83.1	1	105.00
83.2	1.1	121.14
83.3	1.2	138.03

CURTI RANCH MASTER HYDROLOGY

Spreader Overflow Weir

SPREADER 3A

BOT WIDTH (ft)	355.00
LEFT SS (Z:1)	3.00
RIGHT SS (Z:1)	3.00

WEIR COEFFICIENT	3.00
INCREMENT (ft)	0.005

Weir Base Elev.=552.6

DEPTH (ft)	AREA (sq ft)	TOP W (ft)	Davg (ft)	Q (cfs)	V (fps)
0.000	0.00	355.00	0.00	0.00	0.00
0.005	1.78	355.03	0.00	0.38	0.21
0.010	3.55	355.06	0.01	1.07	0.30
0.015	5.33	355.09	0.01	1.96	0.37
0.020	7.10	355.12	0.02	3.01	0.42
0.025	8.88	355.15	0.02	4.21	0.47
0.030	10.65	355.18	0.03	5.53	0.52
0.035	12.43	355.21	0.03	6.97	0.56
0.040	14.20	355.24	0.04	8.52	0.60
0.045	15.98	355.27	0.04	10.17	0.64
0.050	17.76	355.30	0.05	11.91	0.67
0.055	19.53	355.33	0.05	13.74	0.70
0.060	21.31	355.36	0.06	15.66	0.73
0.065	23.09	355.39	0.06	17.65	0.76
0.070	24.86	355.42	0.07	19.73	0.79
0.075	26.64	355.45	0.07	21.88	0.82
0.080	28.42	355.48	0.08	24.11	0.85
0.085	30.20	355.51	0.08	26.40	0.87
0.090	31.97	355.54	0.09	28.77	0.90
0.095	33.75	355.57	0.09	31.20	0.92
0.100	35.53	355.60	0.10	33.69	0.95
0.105	37.31	355.63	0.10	36.25	0.97
0.110	39.09	355.66	0.11	38.87	0.99
0.115	40.86	355.69	0.11	41.55	1.02
0.120	42.64	355.72	0.12	44.29	1.04
0.125	44.42	355.75	0.12	47.09	1.06
0.130	46.20	355.78	0.13	49.95	1.08
0.135	47.98	355.81	0.13	52.86	1.10
0.140	49.76	355.84	0.14	55.82	1.12
0.145	51.54	355.87	0.14	58.84	1.14
0.150	53.32	355.90	0.15	61.91	1.16
0.155	55.10	355.93	0.15	65.03	1.18
0.160	56.88	355.96	0.16	68.21	1.20

WS ELEV
= TW + 0.15
= 52.65 + 0.15
= 52.80

Q_{100} = 60 CFS

Culvert Calculator Report
Spreader 3A to 3B 100YR

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	52.80 ft	Headwater Depth/ Height	2.19
Computed Headwater Elevation	52.78 ft	Discharge	50.50 cfs
Inlet Control HW Elev	50.94 ft	Tailwater Elevation	50.94 ft
Outlet Control HW Elev	52.78 ft	Control Type	Outlet Control

Grades			
Upstream Invert	46.75 ft	Downstream Invert	46.31 ft
Length	53.80 ft	Constructed Slope	0.008178 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	4.63 ft
Slope Type	N/A	Normal Depth	2.43 ft
Flow Regime	N/A	Critical Depth	2.34 ft
Velocity Downstream	8.50 ft/s	Critical Slope	0.008590 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.75 ft
Section Size	33 inch	Rise	2.75 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	52.78 ft	Upstream Velocity Head	1.12 ft
Ke	0.20	Entrance Loss	0.22 ft

Inlet Control Properties			
Inlet Control HW Elev	50.94 ft	Flow Control	N/A
Inlet Type	Groove end projecting	Area Full	5.9 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

CURTI RANCH MASTER HYDROLOGY

Spreader Overflow Weir

SPREADER 3B

BOT WIDTH (ft)	340.00
LEFT SS (Z:1)	3.00
RIGHT SS (Z:1)	3.00

WEIR COEFFICIENT	3.00
INCREMENT (ft)	0.005

Weir Base Elev.=551.6

DEPTH (ft)	AREA (sq ft)	TOP W (ft)	Davg (ft)	Q (cfs)	V (fps)
0.000	0.00	340.00	0.00	0.00	0.00
0.005	1.70	340.03	0.00	0.36	0.21
0.010	3.40	340.06	0.01	1.02	0.30
0.015	5.10	340.09	0.01	1.87	0.37
0.020	6.80	340.12	0.02	2.89	0.42
0.025	8.50	340.15	0.02	4.03	0.47
0.030	10.20	340.18	0.03	5.30	0.52
0.035	11.90	340.21	0.03	6.68	0.56
0.040	13.60	340.24	0.04	8.16	0.60
0.045	15.31	340.27	0.04	9.74	0.64
0.050	17.01	340.30	0.05	11.41	0.67
0.055	18.71	340.33	0.05	13.16	0.70
0.060	20.41	340.36	0.06	14.99	0.73
0.065	22.11	340.39	0.06	16.91	0.76
0.070	23.81	340.42	0.07	18.90	0.79
0.075	25.52	340.45	0.07	20.96	0.82
0.080	27.22	340.48	0.08	23.09	0.85
0.085	28.92	340.51	0.08	25.29	0.87
0.090	30.62	340.54	0.09	27.55	0.90
0.095	32.33	340.57	0.09	29.88	0.92
0.100	34.03	340.60	0.10	32.27	0.95
0.105	35.73	340.63	0.10	34.72	0.97
0.110	37.44	340.66	0.11	37.23	0.99
0.115	39.14	340.69	0.11	39.80	1.02
0.120	40.84	340.72	0.12	42.42	1.04
0.125	42.55	340.75	0.12	45.10	1.06
0.130	44.25	340.78	0.13	47.84	1.08
0.135	45.95	340.81	0.13	50.62	1.10
0.140	47.66	340.84	0.14	53.46	1.12
0.145	49.36	340.87	0.14	56.35	1.14
0.150	51.07	340.90	0.15	59.30	1.16
0.155	52.77	340.93	0.15	62.29	1.18
0.160	54.48	340.96	0.16	65.33	1.20

W.S. ELEV = TW + 0.08 = 50.81 + 0.08 = 50.89 ← (0.080)

Q_{10} = 24 CFS ← (0.085)

W.S. ELEV = TW + 0.13 = 50.81 + 0.13 = 50.94 ← (0.130)

Q_{100} = 48 CFS ← (0.130)

Culvert Calculator Report
Spreader 3B to 4 100YR (culvert 1)

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	50.94 ft	Headwater Depth/ Height	2.72
Computed Headwater Elevation	50.94 ft	Discharge	12.58 cfs
Inlet Control HW Elev	50.26 ft	Tailwater Elevation	50.26 ft
Outlet Control HW Elev	50.94 ft	Control Type	Outlet Control

Grades			
Upstream Invert	45.50 ft	Downstream Invert	45.17 ft
Length	123.30 ft	Constructed Slope	0.002676 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.09 ft
Slope Type	N/A	Normal Depth	1.85 ft
Flow Regime	N/A	Critical Depth	1.28 ft
Velocity Downstream	4.00 ft/s	Critical Slope	0.005707 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	50.94 ft	Upstream Velocity Head	0.25 ft
Ke	0.20	Entrance Loss	0.05 ft

Inlet Control Properties			
Inlet Control HW Elev	50.26 ft	Flow Control	Unsubmerged
Inlet Type	Groove end projecting	Area Full	3.1 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Spreader 3B to 4 100YR (culvert 2)

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	50.94 ft	Headwater Depth/ Height	4.35
Computed Headwater Elevation	50.94 ft	Discharge	4.03 cfs
Inlet Control HW Elev	50.26 ft	Tailwater Elevation	50.26 ft
Outlet Control HW Elev	50.94 ft	Control Type	Outlet Control

Grades			
Upstream Invert	45.50 ft	Downstream Invert	45.17 ft
Length	123.30 ft	Constructed Slope	0.002676 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.09 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	0.81 ft
Velocity Downstream	3.28 ft/s	Critical Slope	0.006798 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.25 ft
Section Size	15 inch	Rise	1.25 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	50.94 ft	Upstream Velocity Head	0.17 ft
Ke	0.20	Entrance Loss	0.03 ft

Inlet Control Properties			
Inlet Control HW Elev	50.26 ft	Flow Control	Unsubmerged
Inlet Type	Groove end projecting	Area Full	1.2 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Spreader 3B to 4 10YR (culvert 1)

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	50.89 ft	Headwater Depth/ Height	2.70
Computed Headwater Elevation	50.89 ft	Discharge	12.20 cfs
Inlet Control HW Elev	50.25 ft	Tailwater Elevation	50.25 ft
Outlet Control HW Elev	50.89 ft	Control Type	Outlet Control

Grades			
Upstream Invert	45.50 ft	Downstream Invert	45.17 ft
Length	123.30 ft	Constructed Slope	0.002676 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.08 ft
Slope Type	N/A	Normal Depth	1.73 ft
Flow Regime	N/A	Critical Depth	1.26 ft
Velocity Downstream	3.88 ft/s	Critical Slope	0.005628 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.00 ft
Section Size	24 inch	Rise	2.00 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	50.89 ft	Upstream Velocity Head	0.23 ft
Ke	0.20	Entrance Loss	0.05 ft

Inlet Control Properties			
Inlet Control HW Elev	50.25 ft	Flow Control	Unsubmerged
Inlet Type	Groove end projecting	Area Full	3.1 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Culvert Calculator Report
Spreader 3B to 4 10YR (culvert 2)

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	50.89 ft	Headwater Depth/ Height	4.31
Computed Headwater Elevation	50.89 ft	Discharge	3.91 cfs
Inlet Control HW Elev	50.25 ft	Tailwater Elevation	50.25 ft
Outlet Control HW Elev	50.89 ft	Control Type	Outlet Control

Grades			
Upstream Invert	45.50 ft	Downstream Invert	45.17 ft
Length	123.30 ft	Constructed Slope	0.002676 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	5.08 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	0.80 ft
Velocity Downstream	3.18 ft/s	Critical Slope	0.006693 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.25 ft
Section Size	15 inch	Rise	1.25 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev	50.89 ft	Upstream Velocity Head	0.16 ft
Ke	0.20	Entrance Loss	0.03 ft

Inlet Control Properties			
Inlet Control HW Elev	50.25 ft	Flow Control	Unsubmerged
Inlet Type	Groove end projecting	Area Full	1.2 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

CFA Inc
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

CURTI RANCH MASTER HYDROLOGY

Spreader Overflow Weir

SPREADER 4

BOT WIDTH (ft)	500.00
LEFT SS (Z:1)	3.00
RIGHT SS (Z:1)	3.00

WEIR COEFFICIENT	3.00
INCREMENT (ft)	0.005

Weir Base Elev.=550.6

DEPTH (ft)	AREA (sq ft)	TOP W (ft)	Davg (ft)	Q (cfs)	V (fps)
0.000	0.00	500.00	0.00	0.00	0.00
0.005	2.50	500.03	0.00	0.53	0.21
0.010	5.00	500.06	0.01	1.50	0.30
0.015	7.50	500.09	0.01	2.76	0.37
0.020	10.00	500.12	0.02	4.24	0.42
0.025	12.50	500.15	0.02	5.93	0.47
0.030	15.00	500.18	0.03	7.79	0.52
0.035	17.50	500.21	0.03	9.82	0.56
0.040	20.00	500.24	0.04	12.00	0.60
0.045	22.51	500.27	0.04	14.32	0.64
0.050	25.01	500.30	0.05	16.77	0.67
0.055	27.51	500.33	0.05	19.35	0.70
0.060	30.01	500.36	0.06	22.05	0.73
0.065	32.51	500.39	0.06	24.86	0.76
0.070	35.01	500.42	0.07	27.79	0.79
0.075	37.52	500.45	0.07	30.82	0.82
0.080	40.02	500.48	0.08	33.95	0.85
0.085	42.52	500.51	0.08	37.18	0.87
0.090	45.02	500.54	0.09	40.51	0.90
0.095	47.53	500.57	0.09	43.93	0.92
0.100	50.03	500.60	0.10	47.45	0.95
0.105	52.53	500.63	0.10	51.05	0.97
0.110	55.04	500.66	0.11	54.74	0.99
0.115	57.54	500.69	0.11	58.52	1.02
0.120	60.04	500.72	0.12	62.38	1.04
0.125	62.55	500.75	0.12	66.32	1.06
0.130	65.05	500.78	0.13	70.34	1.08
0.135	67.55	500.81	0.13	74.43	1.10
0.140	70.06	500.84	0.14	78.61	1.12
0.145	72.56	500.87	0.14	82.86	1.14
0.150	75.07	500.90	0.15	87.18	1.16
0.155	77.57	500.93	0.15	91.58	1.18
0.160	80.08	500.96	0.16	96.05	1.20

W.S. ELEV = TW + 0.05
50.20 + 0.05
= 50.25

100.S. ELEV = TW + 0.06
50.20 + 0.06
= 50.26

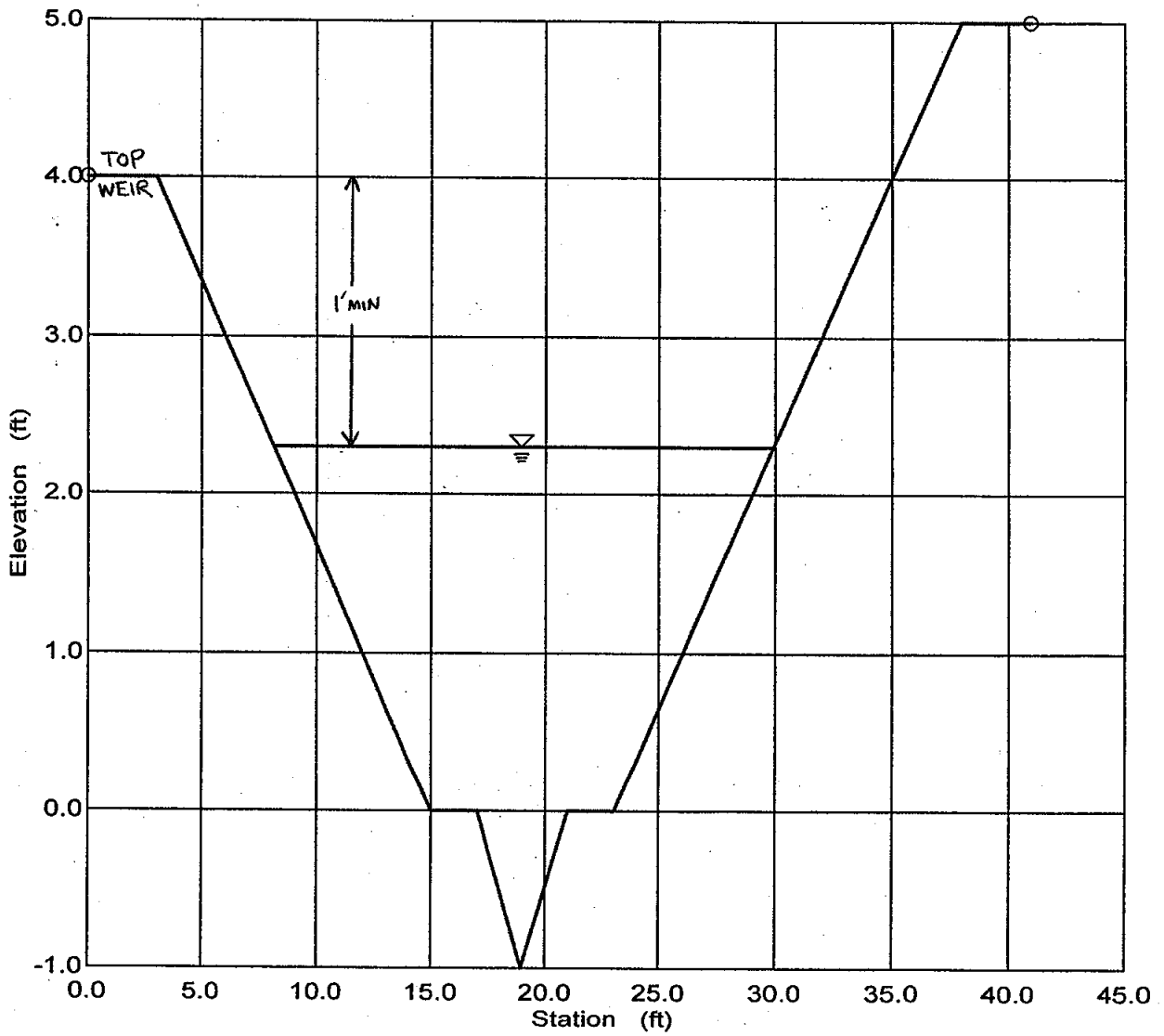
Q10 = 16 CFS

Q100 = 19 CFS

Spreader 3A, BEGINNING
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3A, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data			
Wtd. Mannings Coefficient	0.030		
Channel Slope	0.002700	ft/ft	
Water Surface Elevation	2.30	ft	
Discharge	126.00	cfs	(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3A, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.30 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
5.10	3.30	5.10	32.90	0.030
15.00	0.00			
17.00	0.00			
19.00	-1.00			
21.00	0.00			
23.00	0.00			
32.90	3.30			

Discharge	126.00	cfs

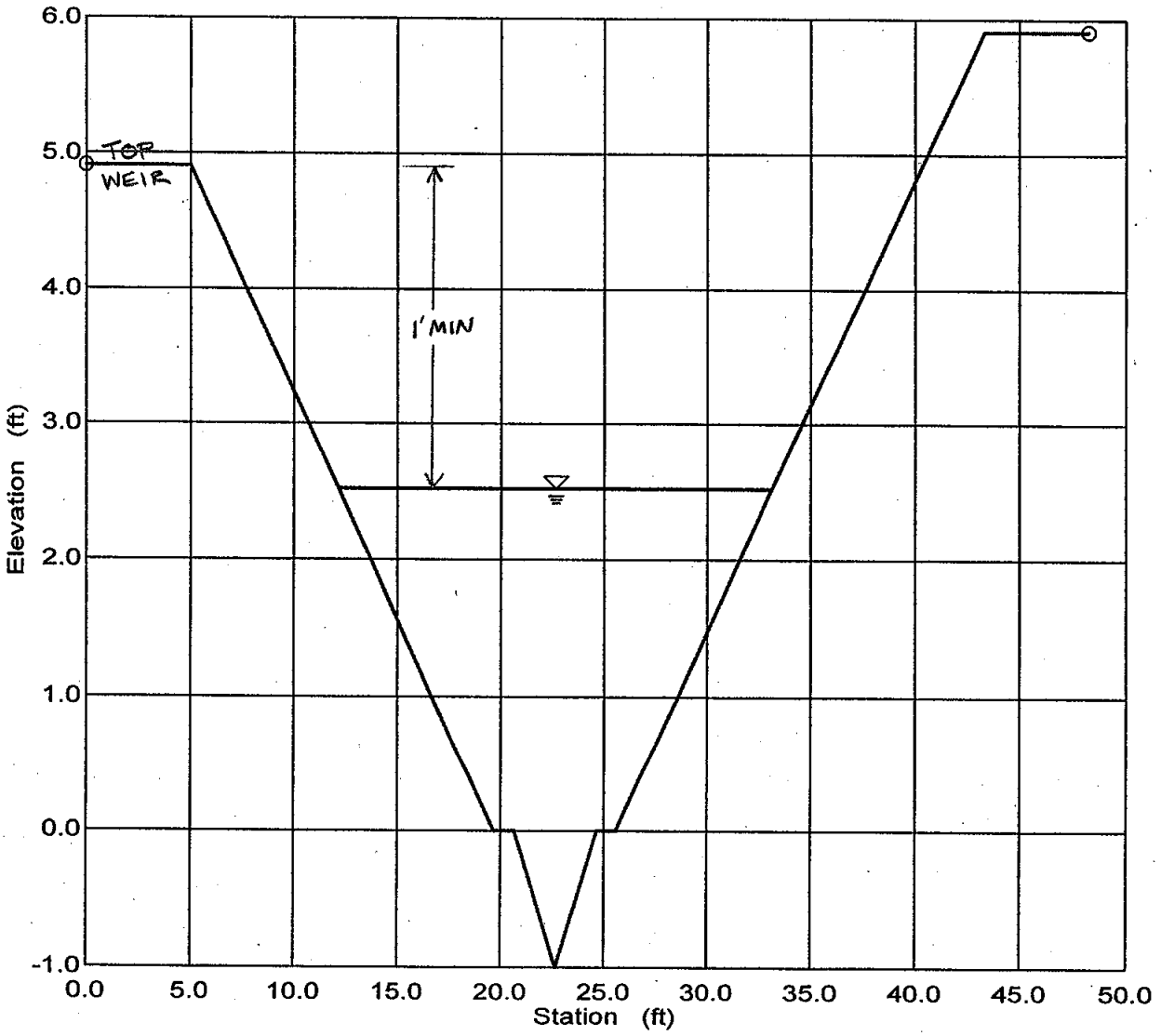
Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.30	ft
Flow Area	36.19	ft²
Wetted Perimeter	22.99	ft
Top Width	21.78	ft
Height	3.30	ft
Critical Depth	1.47	ft
Critical Slope	0.013265	ft/ft
Velocity	3.48	ft/s
Velocity Head	0.19	ft
Specific Energy	2.48	ft
Froude Number	0.48	
Flow is subcritical.		

Spreader 3A, END
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3A, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.030	
Channel Slope	0.002700	ft/ft
Water Surface Elevation	2.51	ft
Discharge	126.00	cfs

(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3A, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.51 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
4.47	3.51	4.47	31.43	0.030
15.00	0.00			
15.95	0.00			
17.95	-1.00			
19.95	0.00			
20.90	0.00			
31.43	3.51			

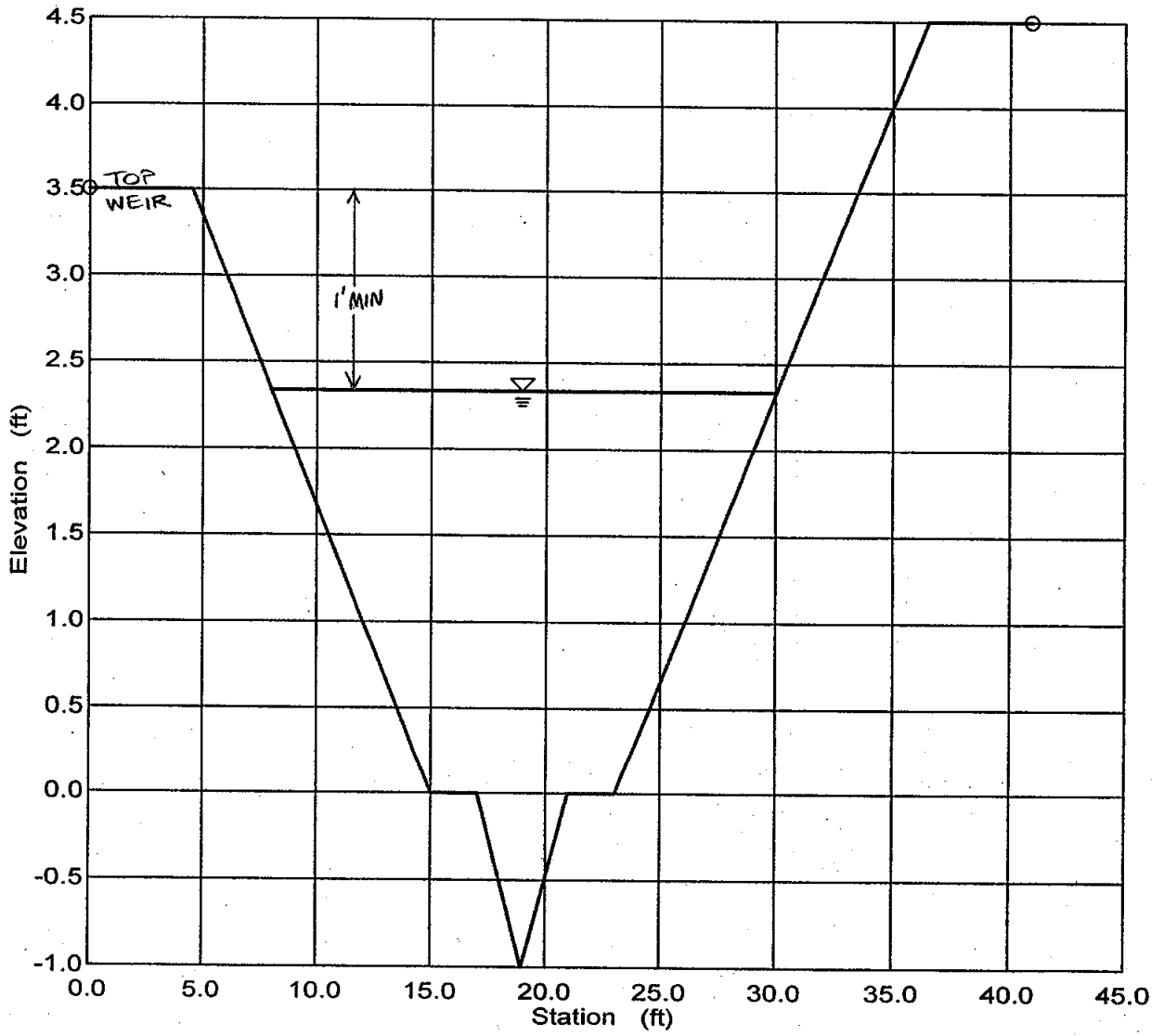
Discharge	126.00	cfs

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.51	ft
Flow Area	35.71	ft²
Wetted Perimeter	22.25	ft
Top Width	20.96	ft
Height	3.51	ft
Critical Depth	1.64	ft
Critical Slope	0.013197	ft/ft
Velocity	3.53	ft/s
Velocity Head	0.19	ft
Specific Energy	2.70	ft
Froude Number	0.48	
Flow is subcritical.		

Spreader 3B, BEGINNING
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3B, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data			
Wtd. Mannings Coefficient	0.030		
Channel Slope	0.002700	ft/ft	
Water Surface Elevation	2.33	ft	
Discharge	130.00	cfs	(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3B, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.33 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
5.01	3.33	5.01	32.99	0.030
15.00	0.00			
17.00	0.00			
19.00	-1.00			
21.00	0.00			
23.00	0.00			
32.99	3.33			

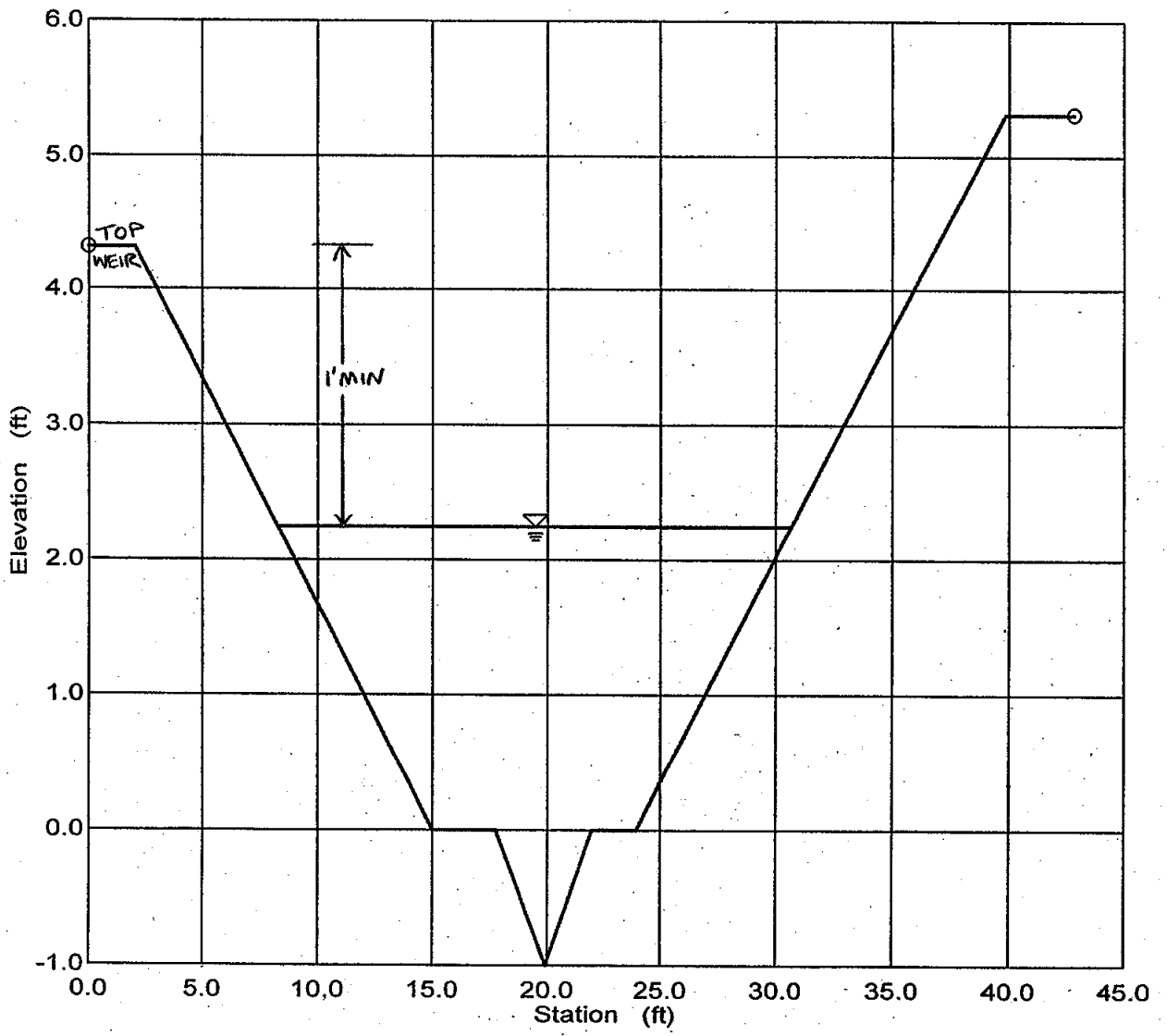
Discharge	130.00	cfs

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.33	ft
Flow Area	37.03	ft²
Wetted Perimeter	23.24	ft
Top Width	22.01	ft
Height	3.33	ft
Critical Depth	1.50	ft
Critical Slope	0.013204	ft/ft
Velocity	3.51	ft/s
Velocity Head	0.19	ft
Specific Energy	2.53	ft
Froude Number	0.48	
Flow is subcritical.		

Spreader 3B, END
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3B, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data			
Wtd. Mannings Coefficient	0.030		
Channel Slope	0.002700	ft/ft	
Water Surface Elevation	2.24	ft	
Discharge	130.00	cfs	(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 3B, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.24 ft.		
Discharge	130.00	cfs

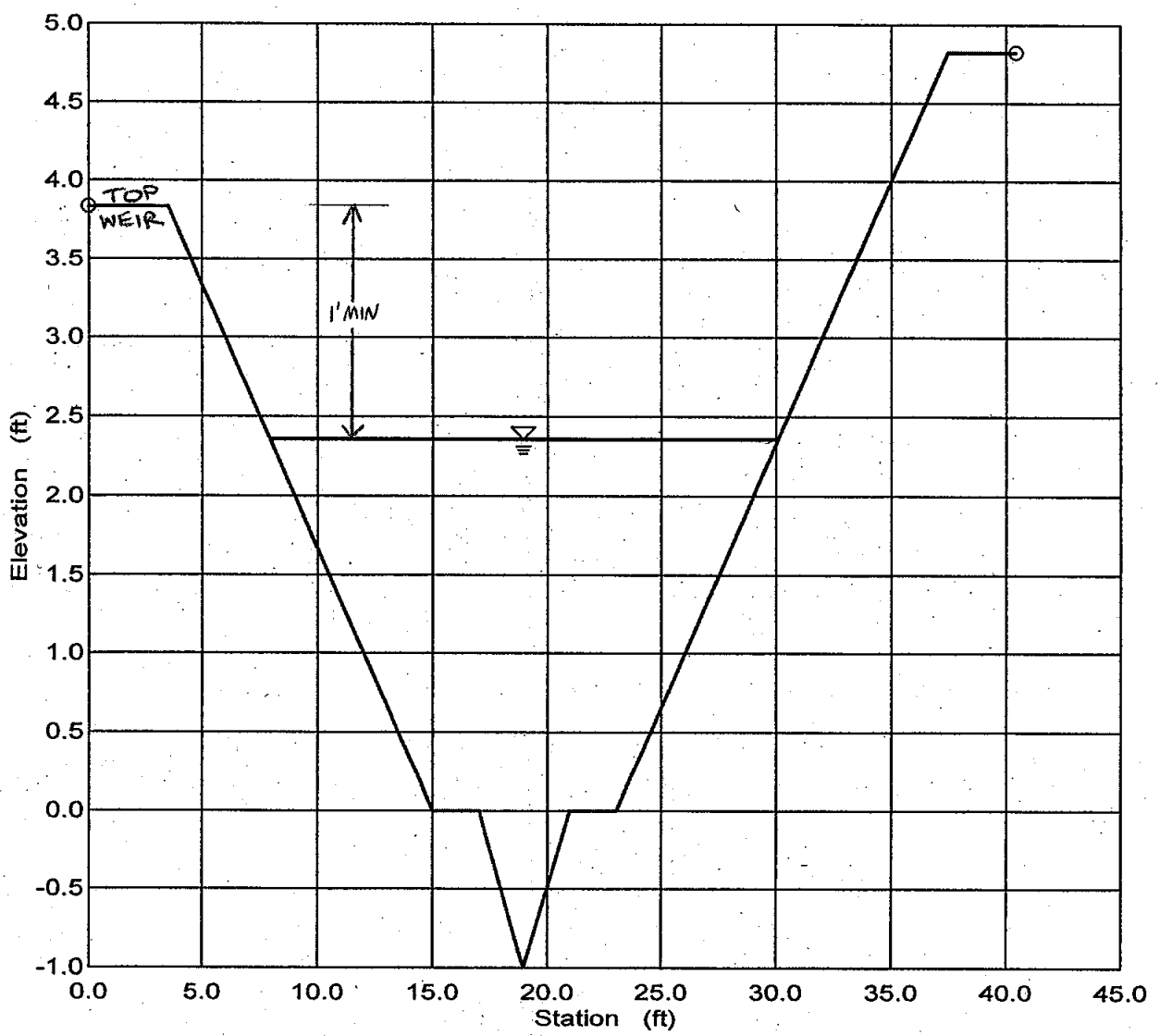
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
5.28	3.24	5.28	33.67	0.030
15.00	0.00			
17.75	0.00			
19.95	-1.00			
21.95	0.00			
23.95	0.00			
33.67	3.24			

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.24	ft
Flow Area	37.24	ft²
Wetted Perimeter	23.58	ft
Top Width	22.40	ft
Height	3.24	ft
Critical Depth	1.43	ft
Critical Slope	0.013220	ft/ft
Velocity	3.49	ft/s
Velocity Head	0.19	ft
Specific Energy	2.43	ft
Froude Number	0.48	
Flow is subcritical.		

Spreader 4, BEGINNING
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 4, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data			
Wtd. Mannings Coefficient	0.030		
Channel Slope	0.002700	ft/ft	
Water Surface Elevation	2.35	ft	
Discharge	132.00	cfs	(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 4, Beginning (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.35 ft.		

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
4.95	3.35	4.95	33.05	0.030
15.00	0.00			
17.00	0.00			
19.00	-1.00			
21.00	0.00			
23.00	0.00			
33.05	3.35			

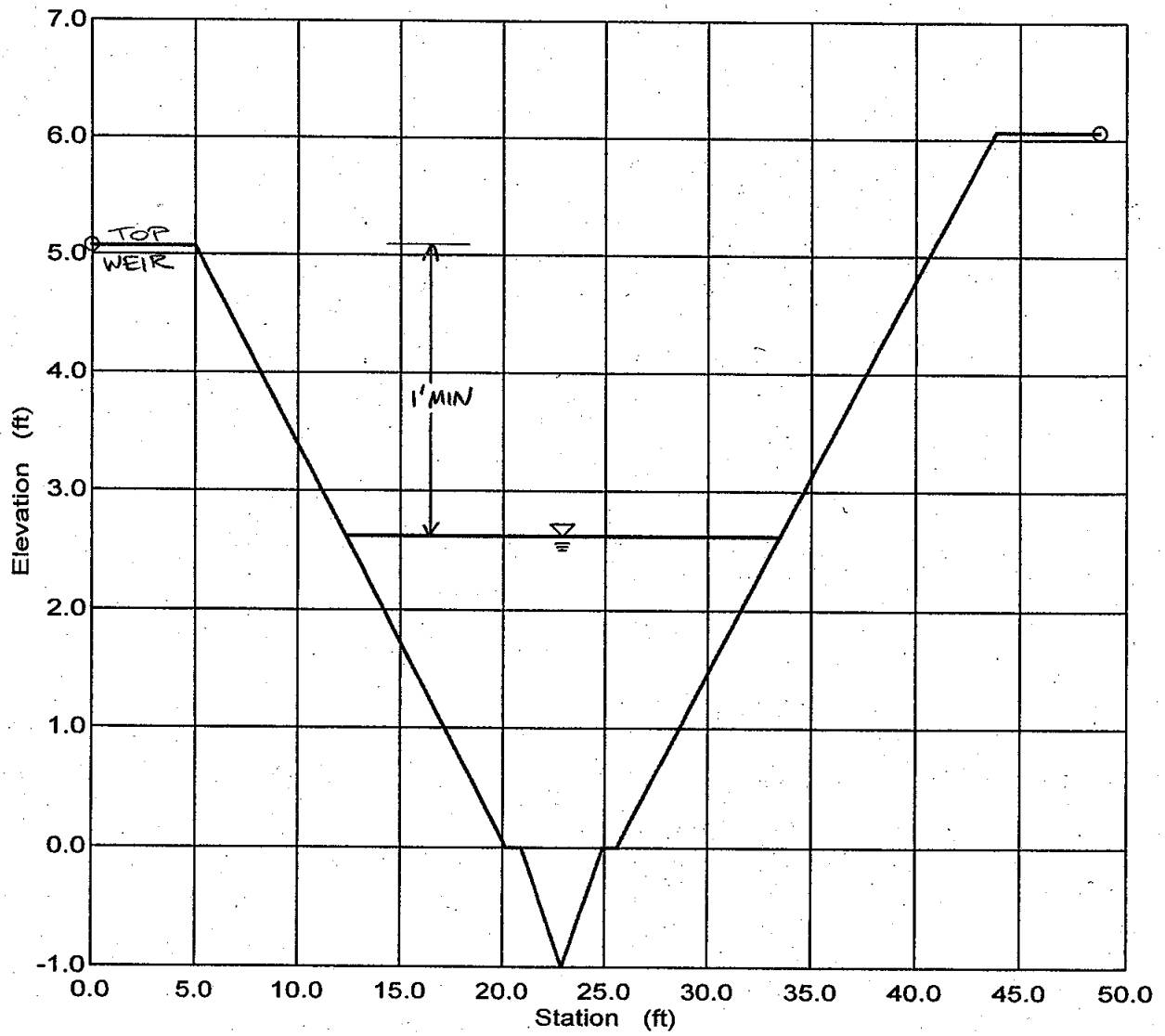
Discharge	132.00	cfs

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.35	ft
Flow Area	37.44	ft²
Wetted Perimeter	23.36	ft
Top Width	22.12	ft
Height	3.35	ft
Critical Depth	1.51	ft
Critical Slope	0.013174	ft/ft
Velocity	3.53	ft/s
Velocity Head	0.19	ft
Specific Energy	2.55	ft
Froude Number	0.48	
Flow is subcritical.		

Spreader 4, END
Cross Section for Irregular Channel
ULTIMATE CHANNEL CONDITION

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 4, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data			
Wtd. Mannings Coefficient	0.030		
Channel Slope	0.002700	ft/ft	
Water Surface Elevation	2.63	ft	
Discharge	132.00	cfs	(ULTIMATE FLOW)



Worksheet for Irregular Channel

Project Description	
Project File	x:\projects\98006.10_docs\hydro\flowmaster\spreader.fm2
Worksheet	Spreader 4, End (depth)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Input Data		
Channel Slope	0.002700	ft/ft
Elevation range: -1.00 ft to 3.63 ft.		
Discharge	132.00	cfs

Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
4.11	3.63	4.11	31.29	0.030
15.00	0.00			
15.70	0.00			
17.70	-1.00			
19.70	0.00			
20.40	0.00			
31.29	3.63			

Results		
Wtd. Mannings Coefficient	0.030	
Water Surface Elevation	2.63	ft
Flow Area	36.88	ft²
Wetted Perimeter	22.48	ft
Top Width	21.16	ft
Height	3.63	ft
Critical Depth	1.74	ft
Critical Slope	0.013102	ft/ft
Velocity	3.58	ft/s
Velocity Head	0.20	ft
Specific Energy	2.83	ft
Froude Number	0.48	
Flow is subcritical.		

1/24/03 | INFILTRATION CALCULATIONS | 98006.11

FROM THE MASTER DRAINAGE REPORT FOR CURTI RANCH TWO DEVELOPMENT —

- APPROX. WATER VOLUME DETAINED IN SPREADERS:

SPREADERS 5A & 5B = 49,784 ft³

SPREADERS 2-4 = 69,304 ft³

SPREADER 1 = 57,499 ft³

- APPROX. SURFACE AREA FOR WATER TO INFILTRATE:

SPREADER 5B = 3,200 SF

SPREADER 4 = 4,000 SF

SPREADER 1 = 13,444 SF

FROM BLACK EAGLE CONSULTING —

- SOIL INFILTRATION RATES:

SPREADER 5B = 11 MIN/IN = 5.45 IN/HR = 0.45 ft/hr

SPREADER 4 = 8 MIN/IN = 7.5 IN/HR = 0.625 ft/hr

SPREADER 1 = 4 MIN/IN = 15 IN/HR = 1.25 ft/hr

PERMEATION TIME: $\frac{\text{VOLUME}}{(\text{AREA})(\text{INFILTRATION})}$

SPREADER

5B → $\frac{49{,}784\ ft^3}{(3200\ ft^2)(0.45\ ft/hr)}$ = 34.57 hrs ≈ 1.44 days

4 → $\frac{69{,}304\ ft^3}{(4000\ ft^2)(0.625\ ft/hr)}$ = 27.72 hrs ≈ 1.16 days

1 → $\frac{57{,}499\ ft^3}{(13{,}444\ ft^2)(1.25\ ft/hr)}$ = 3.42 hrs ≈ 0.15 days

ALL < 7 days

DETENTION POND

- FROM THE MASTER DRAINAGE REPORT FOR CURTI RANCH TWO DEVELOPMENT—

- IF DETENTION POND OUTLET WAS PLUGGED WITH DEBRI, TOTAL VOLUME TO SPILLWAY ELEVATION = 6.04 ac-ft = 263,102 ft³

- APPROX. SURFACE AREA FOR WATER TO INFILTRATE: 29,824 SF

- FROM BLACK EAGLE CONSULTING:
  SOIL INFILTRATION RATE: 3 IN/HR = 0.25 FT/HR

PERMEATION TIME:

$$\frac{263{,}102\ \cancel{ft^3}}{(29{,}824\ \cancel{ft^2} \times 0.25\ \cancel{ft}/HR)} = 35.3\ hrs \approx 1.5\ days$$

APPENDIX C

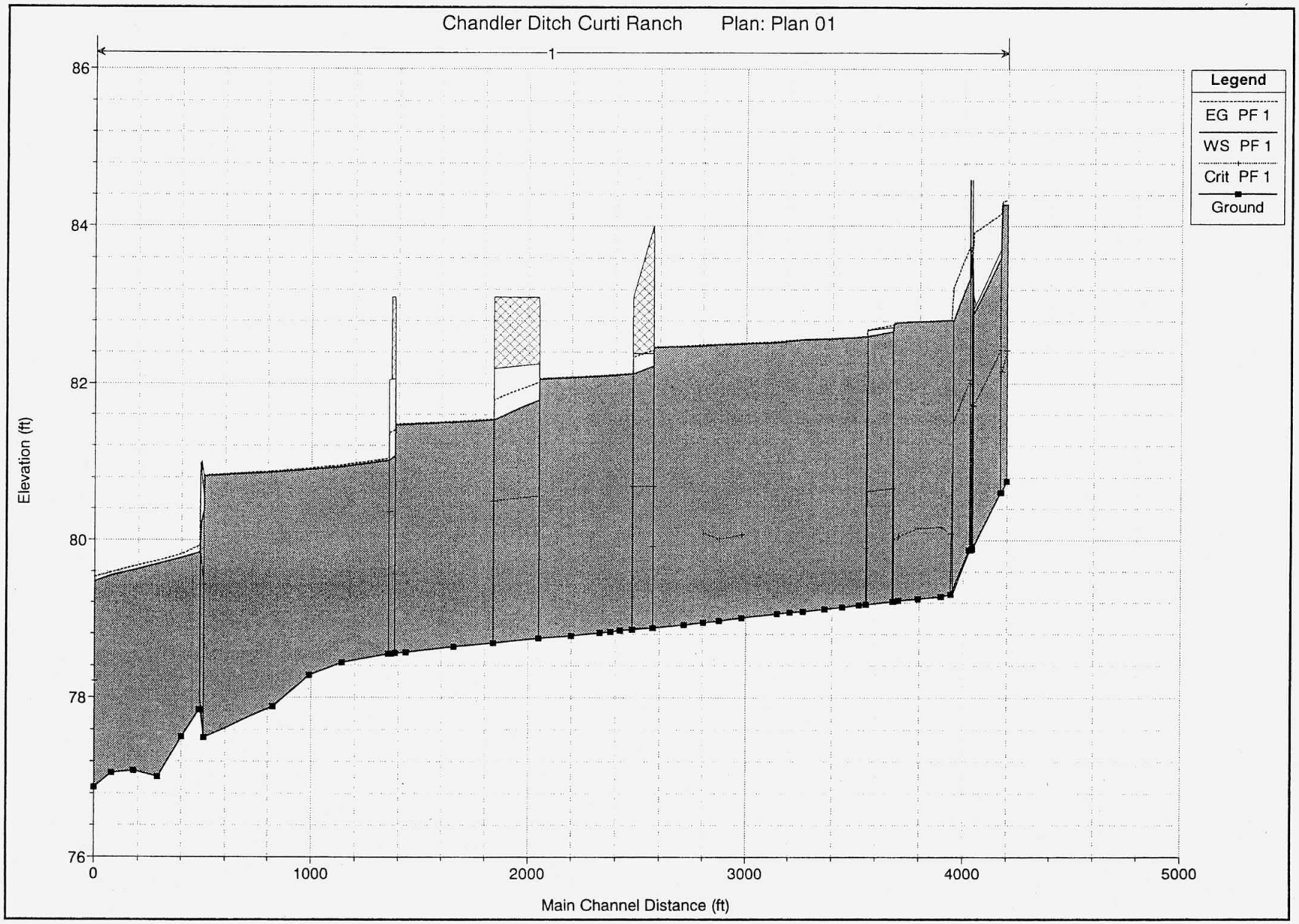
CHANDLER DITCH CALCULATIONS
HEC RAS

HEC-RAS Plan: Plan 01 River: chandler ditch Reach: 1 Profile: PF 1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Max Chl Dpth	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)
1	22.0	71.00	80.76	84.27	3.51	82.42	84.34	0.000658	1.99	35.68	19.16	0.24	0.08
1	21.0	71.00	80.61	84.28	3.67	82.15	84.32	0.000388	1.59	44.67	19.74	0.19	0.05
1	20.5	Culvert											
1	20.0	71.00	79.89	83.61	3.72	81.26	83.63	0.000234	1.27	55.89	24.31	0.15	0.03
1	19.9	Lat. Weir											
1	19.0	49.42	79.88	83.61	3.73	80.49	83.62	0.000038	0.59	84.05	27.19	0.06	0.01
1	18.5	Culvert											
1	18.0	22.19	79.31	82.81	3.50	80.08	82.82	0.000022	0.38	60.40	33.54	0.05	0.00
1	17.0	22.19	79.28	82.80	3.52	80.17	82.81	0.000039	0.47	46.82	23.58	0.06	0.00
1	16.0	22.19	79.25	82.79	3.54	80.15	82.80	0.000043	0.50	44.67	22.22	0.06	0.01
1	15.0	22.19	79.23	82.78	3.55	80.05	82.79	0.000039	0.49	45.60	21.68	0.06	0.00
1	14.0	22.19	79.22	82.77	3.55	80.00	82.78	0.000064	0.63	35.37	14.92	0.07	0.01
1	13.5	Culvert											
1	13.0	22.19	79.18	82.60	3.42	79.90	82.61	0.000024	0.40	67.39	60.56	0.05	0.00
1	12.0	22.19	79.17	82.59	3.42		82.60	0.000043	0.53	62.39	81.97	0.06	0.01
1	11.0	22.19	79.15	82.58	3.44		82.59	0.000046	0.51	43.42	21.26	0.06	0.01
1	10.0	22.19	79.12	82.57	3.45		82.58	0.000056	0.58	38.31	19.07	0.07	0.01
1	9.0	22.19	79.09	82.56	3.47		82.57	0.000070	0.66	35.42	21.85	0.08	0.01
1	8.0	34.19	79.08	82.54	3.46		82.56	0.000127	0.93	37.53	20.79	0.10	0.02
1	7.0	34.19	79.06	82.52	3.46		82.54	0.000158	0.97	35.26	18.48	0.12	0.02
1	6.0	34.19	79.01	82.51	3.50	80.07	82.52	0.000123	0.90	38.61	18.84	0.10	0.02
1	5.0	34.19	78.97	82.50	3.53	80.02	82.50	0.000083	0.80	67.30	64.17	0.09	0.01
1	4.0	34.19	78.95	82.48	3.53	80.09	82.50	0.000203	1.10	31.06	13.61	0.13	0.02
1	3.0	34.19	78.92	82.47	3.55		82.48	0.000102	0.79	43.31	20.41	0.10	0.01
1	2.0	34.19	78.88	82.46	3.58	79.92	82.47	0.000085	0.72	47.26	22.40	0.09	0.01
1	1.99	Culvert											
1	1.90	34.19	78.86	82.12	3.26		82.13	0.000104	0.75	45.44	23.86	0.10	0.01
1	1.85	34.19	78.85	82.11	3.26		82.12	0.000104	0.75	45.43	23.85	0.10	0.01
1	1.80	34.19	78.83	82.10	3.27		82.11	0.000102	0.75	45.60	23.86	0.10	0.01
1	1.75	34.19	78.82	82.09	3.27		82.10	0.000102	0.75	45.60	23.85	0.10	0.01
1	1.70	34.19	78.78	82.08	3.30		82.08	0.000100	0.74	45.98	23.90	0.09	0.01
1	1.65	34.19	78.75	82.06	3.31	79.76	82.06	0.000094	0.72	47.33	24.63	0.09	0.01
1	1.64	Culvert											
1	1.55	34.19	78.69	81.53	2.84		81.54	0.000192	0.94	36.23	21.54	0.13	0.02
1	1.50	34.19	78.64	81.50	2.86		81.51	0.000169	0.89	38.54	22.98	0.12	0.02
1	1.45	34.19	78.57	81.47	2.90		81.48	0.000174	0.91	37.52	21.90	0.12	0.02
1	1.40	34.19	78.56	81.46	2.90	79.57	81.47	0.000181	0.93	36.78	21.39	0.12	0.02
1	1.39	Culvert											
1	1.35	34.19	78.55	81.01	2.46		81.04	0.000371	1.21	28.22	18.92	0.17	0.03
1	1.30	34.19	78.44	80.94	2.50		80.96	0.000355	1.20	28.61	18.92	0.17	0.03
1	1.25	34.19	78.28	80.90	2.62		80.92	0.000260	1.08	31.62	19.11	0.15	0.03
1	1.20	34.19	77.89	80.87	2.98		80.88	0.000140	0.90	38.03	18.40	0.11	0.02
1	1.15	34.19	77.50	80.82	3.32	78.62	80.83	0.000136	0.88	38.99	19.31	0.11	0.02
1	1.14	Culvert											
1	1.10	34.19	77.85	79.84	1.99		79.93	0.001681	2.37	14.41	10.12	0.35	0.13

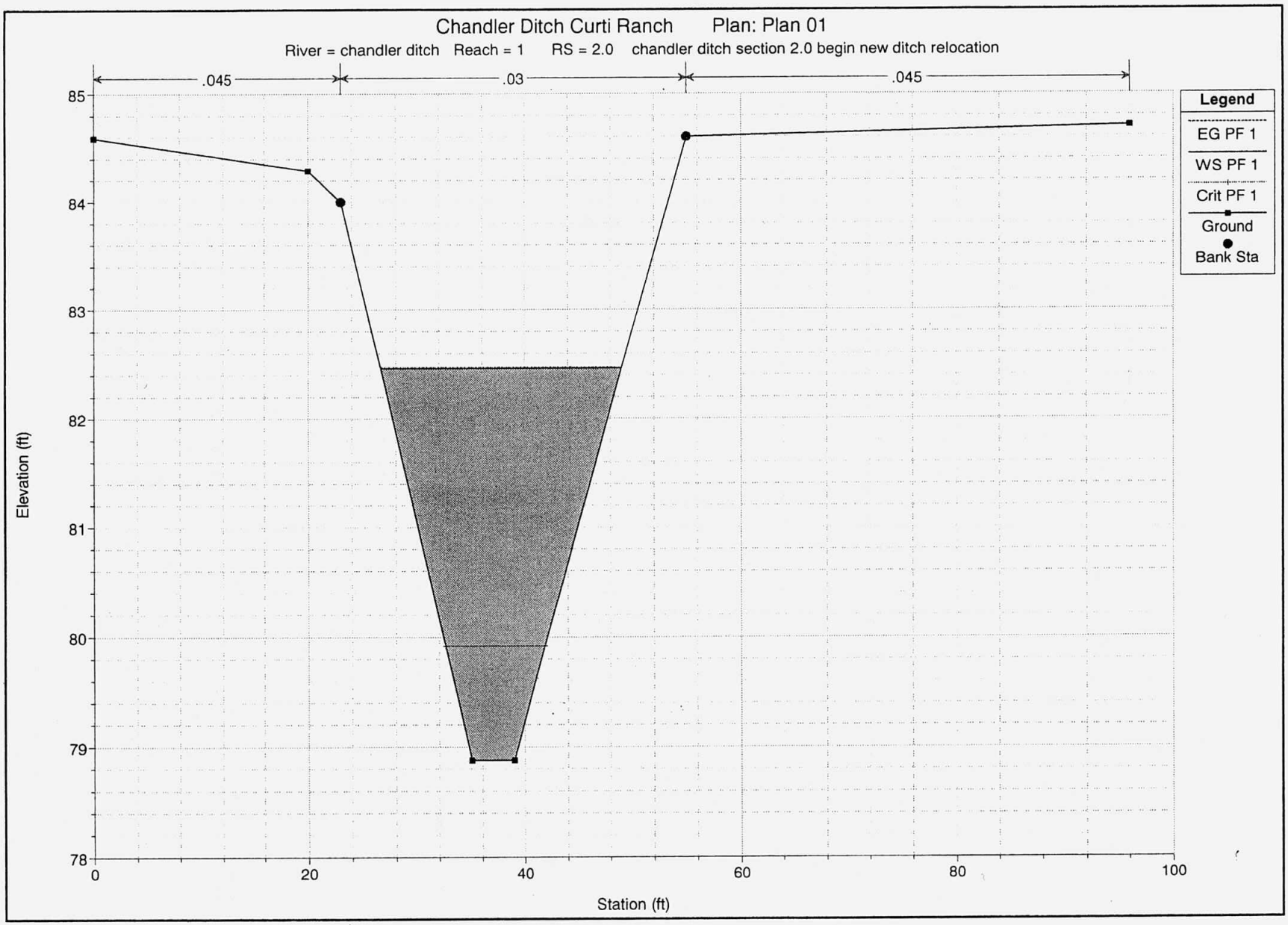
HEC-RAS Plan: Plan 01 River: chandler ditch Reach: 1 Profile: PF 1 (Continued)

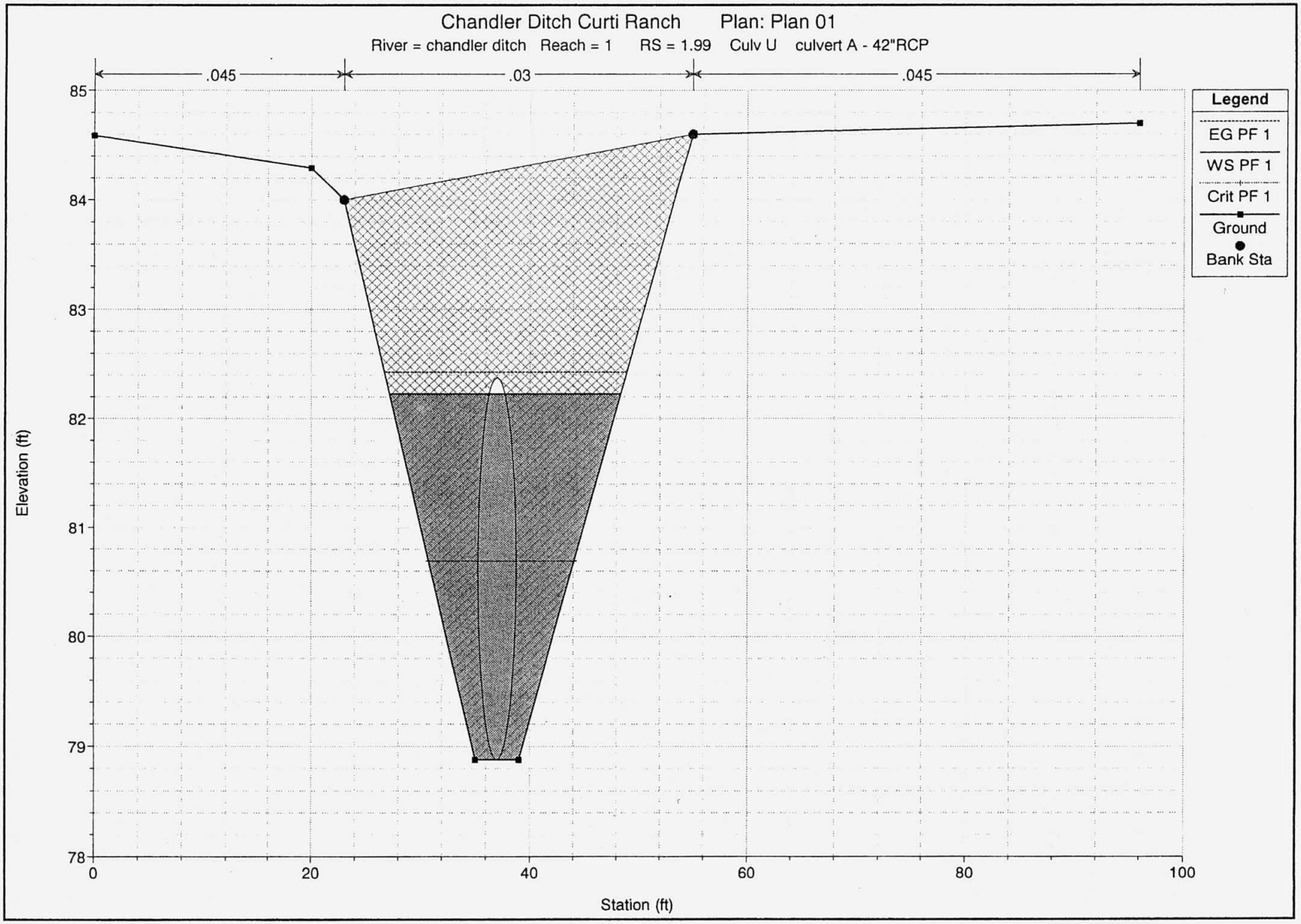
Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Max Chl Dpth	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl	Shear Chan
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)		(lb/sq ft)
1	1.05	34.19	77.51	79.78	2.27		79.82	0.000785	1.71	20.04	13.63	0.25	0.07
1	1.00	34.19	77.01	79.70	2.69		79.74	0.000658	1.66	20.61	12.42	0.23	0.06
1	0.95	34.19	77.09	79.62	2.53		79.67	0.000780	1.78	19.26	11.72	0.24	0.07
1	0.90	34.19	77.06	79.55	2.49		79.59	0.000550	1.54	22.22	13.06	0.21	0.05
1	0.85	34.19	76.88	79.47	2.59	78.21	79.53	0.001000	1.97	17.32	10.58	0.27	0.09

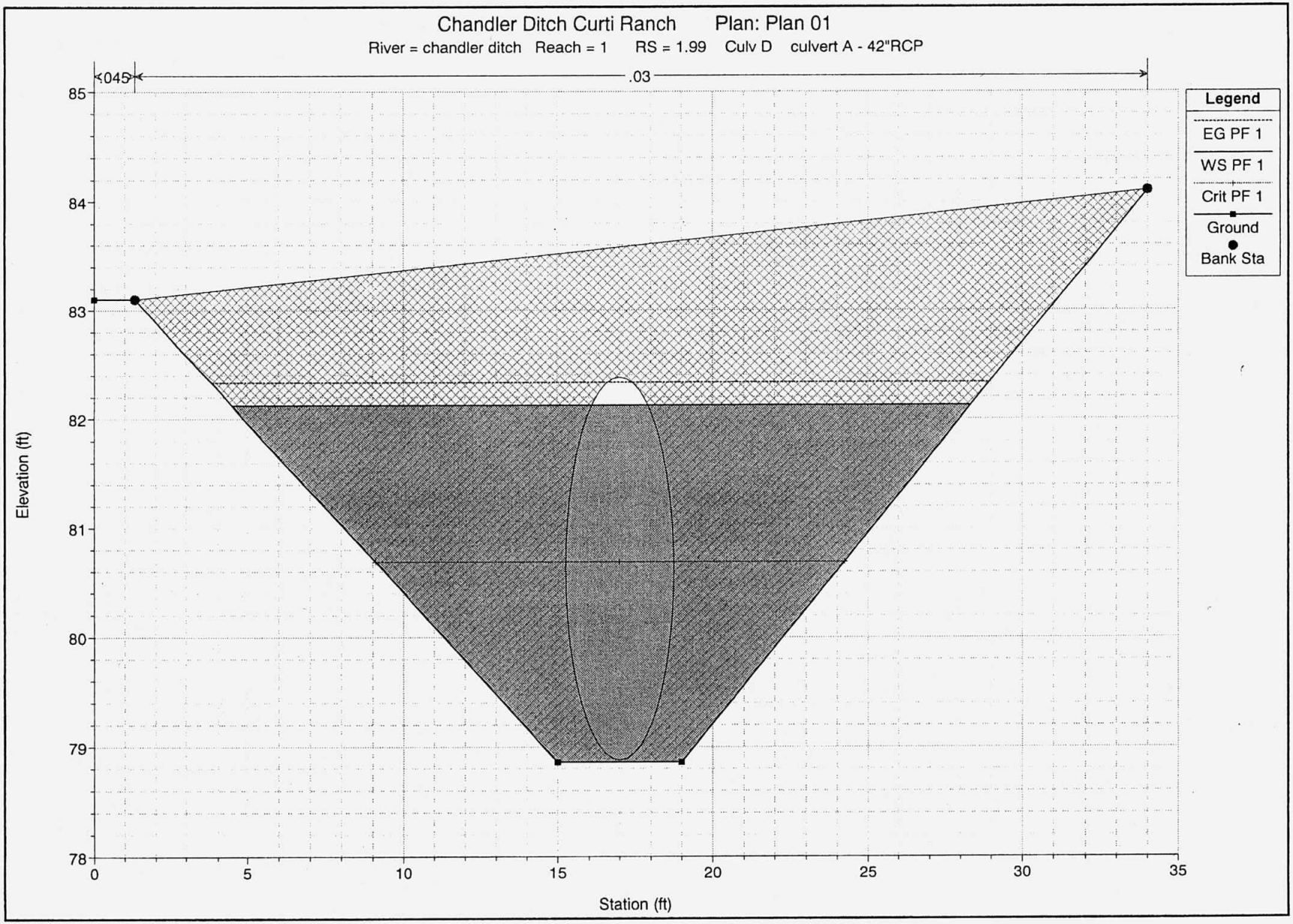

Chandler Ditch Curti Ranch Plan: Plan 01
1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
86
84
82
80
78
76
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

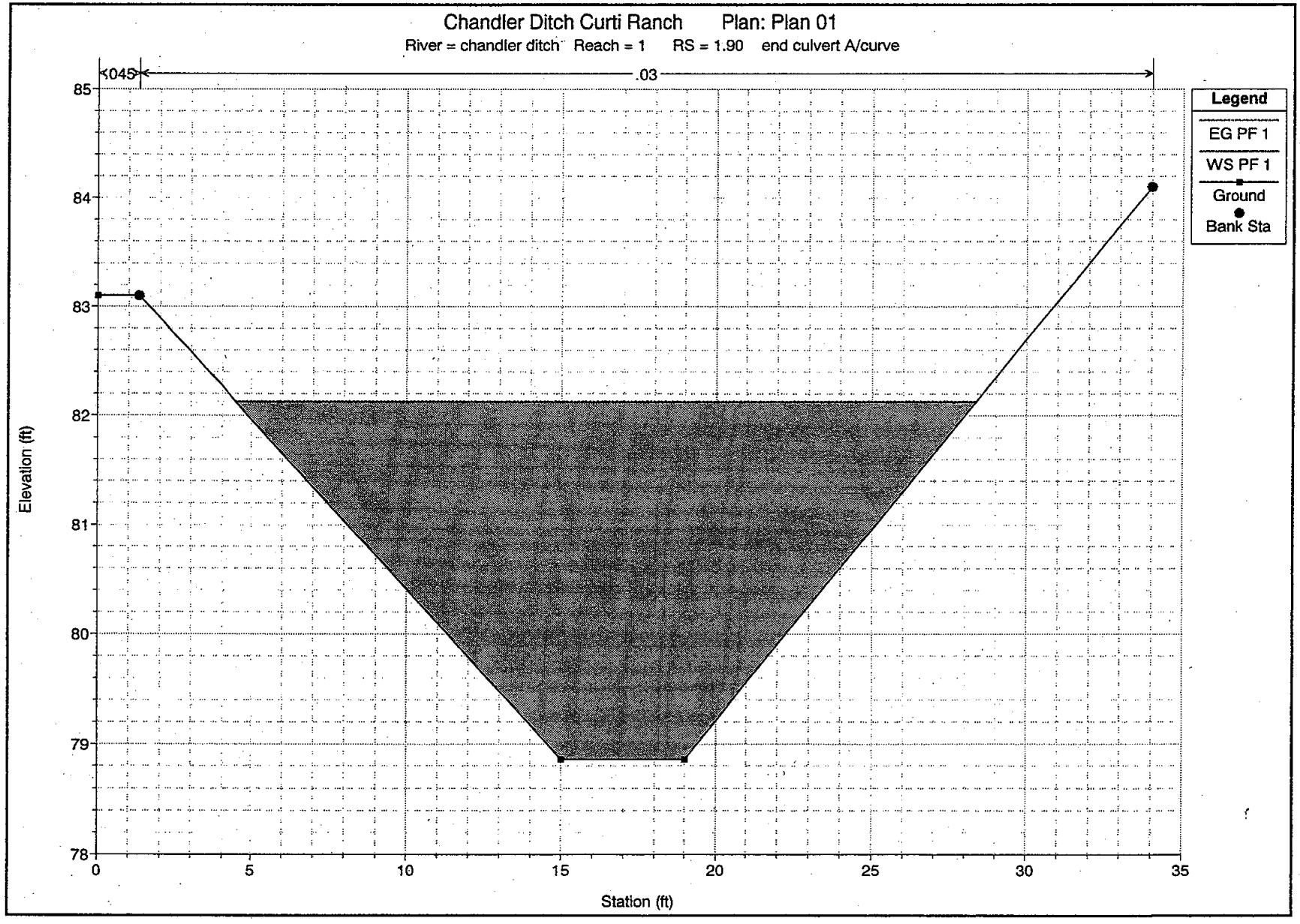
Plan: Plan 01 chandler ditch 1 RS: 19.9 Profile: PF 1 Gate ID:

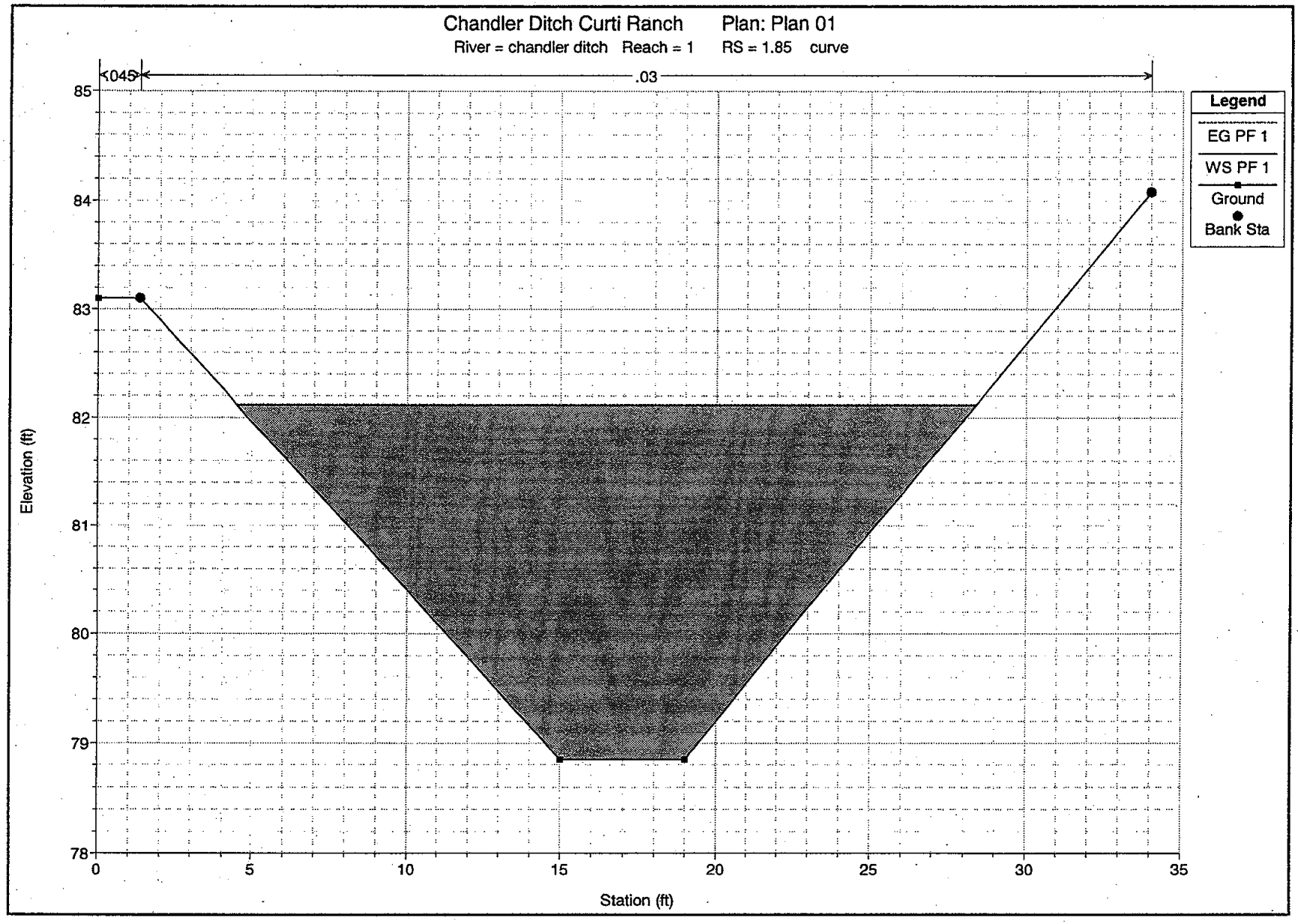
E.G. US. (ft)	83.63	Weir Max Depth (ft)	1.61
W.S. US. (ft)	83.61	Weir Avg Depth (ft)	1.60
E.G. DS (ft)	83.55	Weir Submerg	0.00
W.S. DS (ft)	83.54	Min El Weir Flow (ft)	82.00
Q US (cfs)	71.00	Wr Top Wdth (ft)	8.00
Q Leaving Total (cfs)	48.49	Total Gate Flow (cfs)	
Q DS (cfs)	22.19	Gate Group Q (cfs)	
Perc Q Leaving	68.74	Gate Open Ht (ft)	
Q Weir (cfs)	48.49	Gate #Open	
Wr Flw Area (sq ft)	12.78	Gate Area (sq ft)	
Weir Sta US (ft)	101.00	Gate Submerg	
Weir Sta DS (ft)	109.00	Gate Invert (ft)	

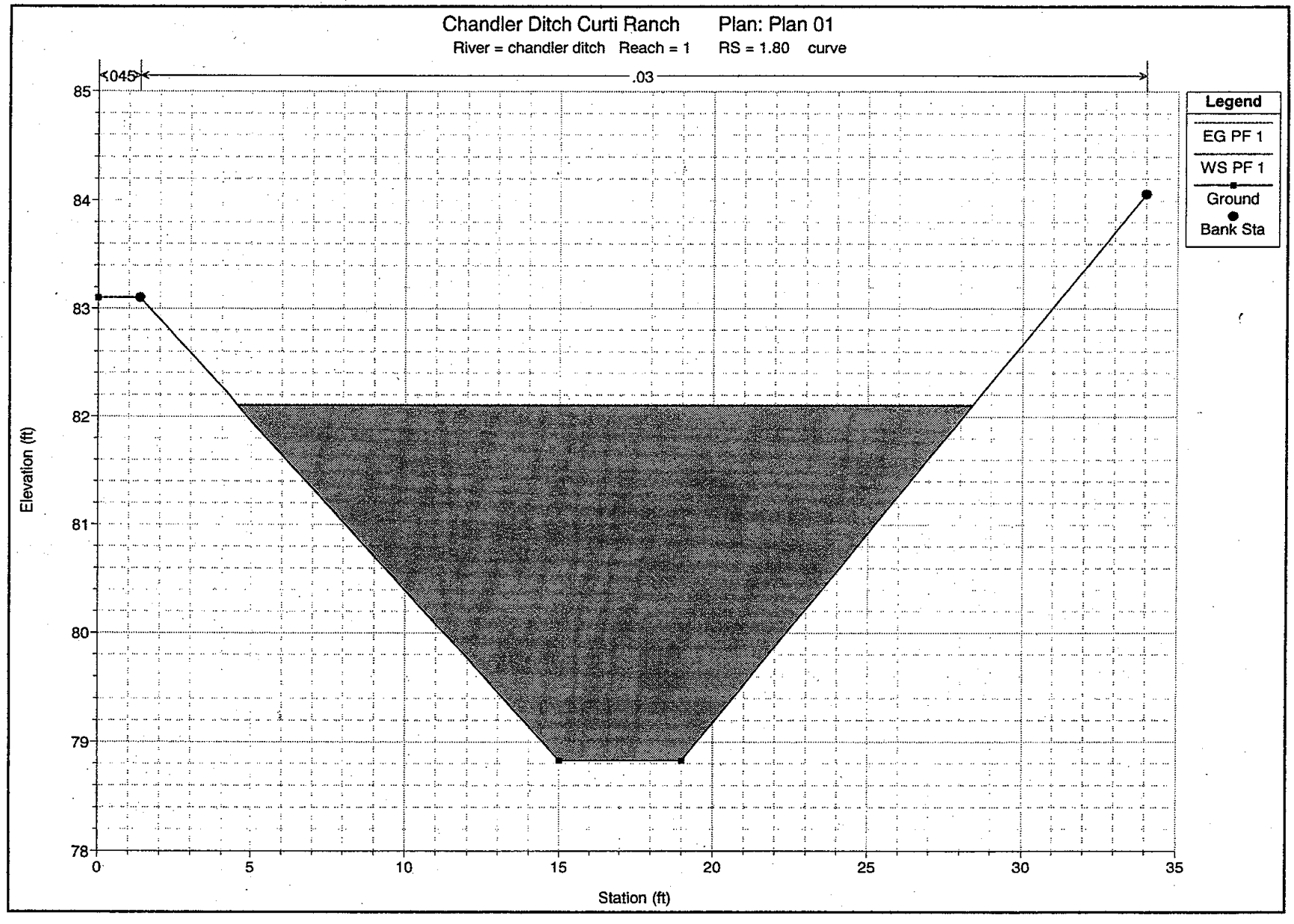

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 2.0 chandler ditch section 2.0 begin new ditch relocation
.045
.03
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
85
84
83
82
81
80
79
78
0
20
40
60
80
100
Station (ft)

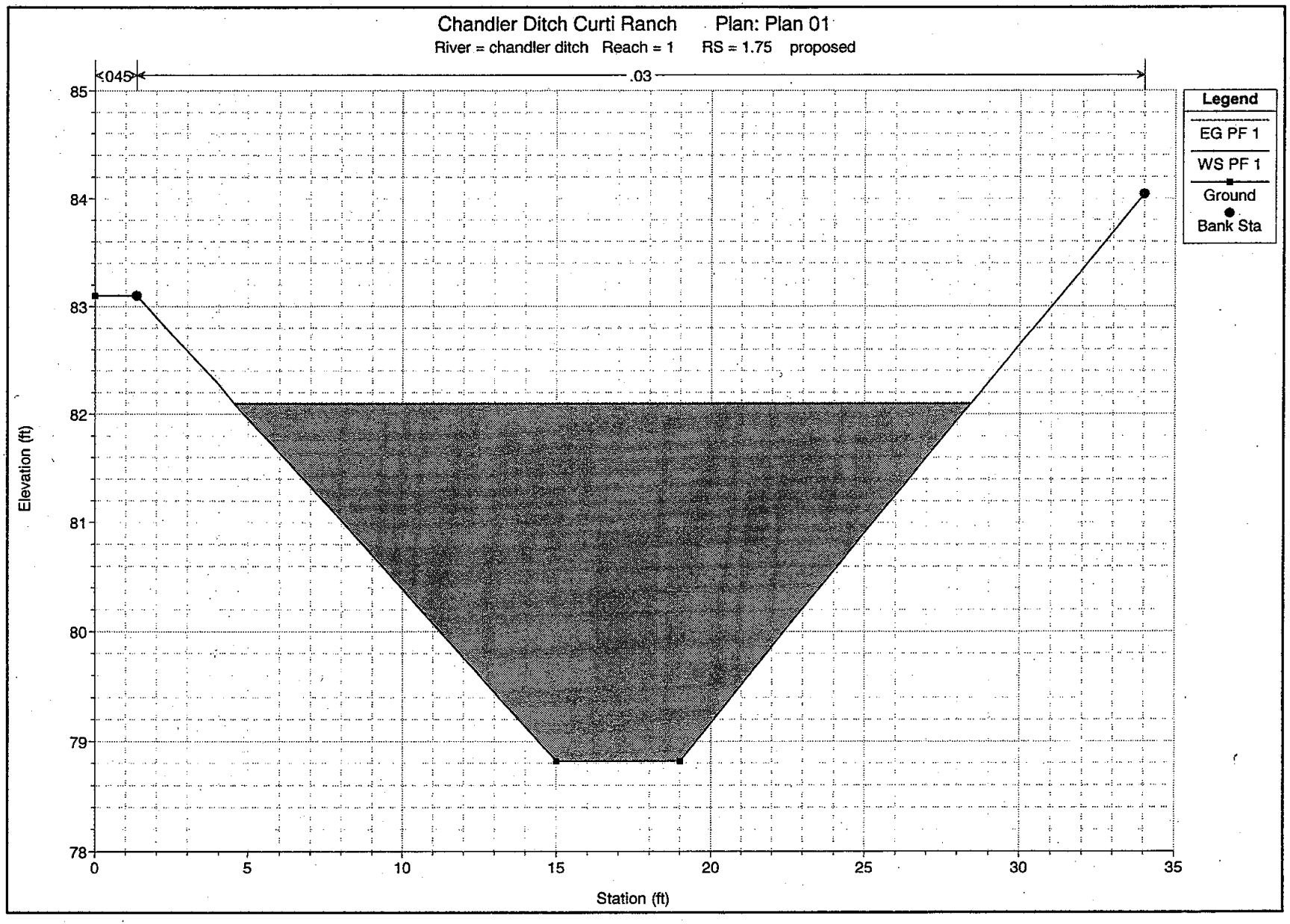

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.99 Culv U culvert A - 42"RCP
.045
.03
.045
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
85
84
83
82
81
80
79
78
0
20
40
60
80
100
Station (ft)

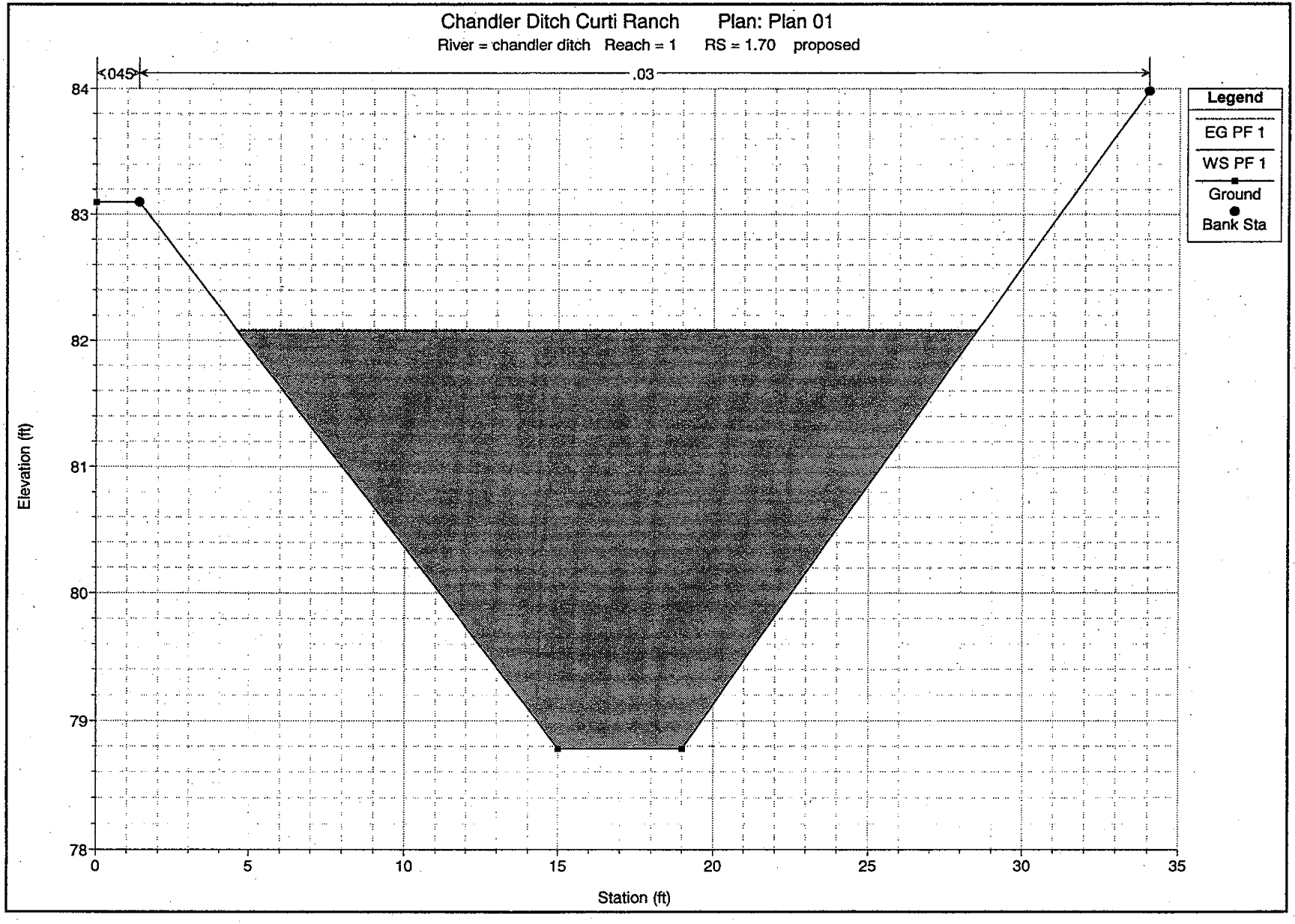

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.99 Culv D culvert A - 42"RCP
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
85
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

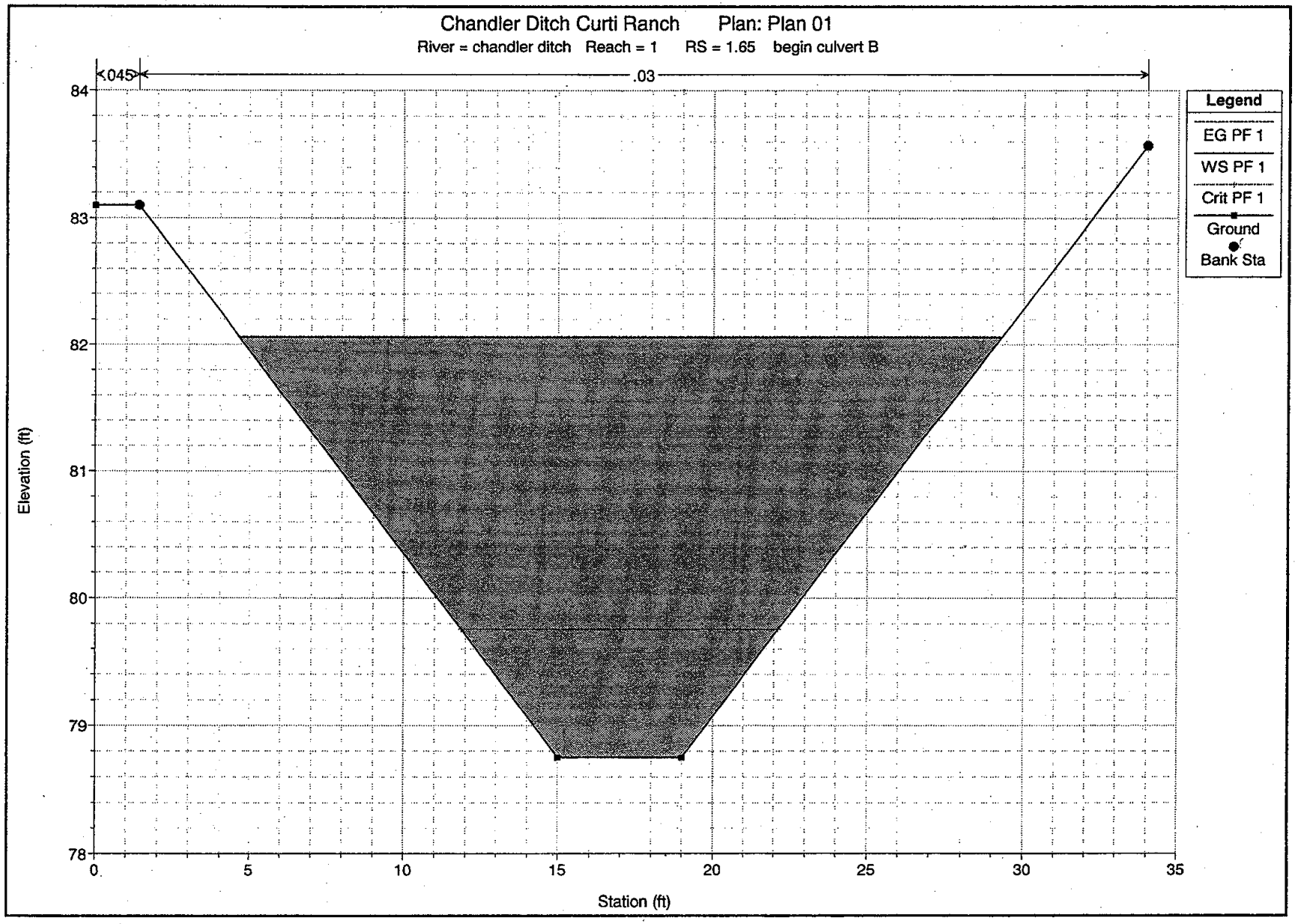

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.90 end culvert A/curve
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
85
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

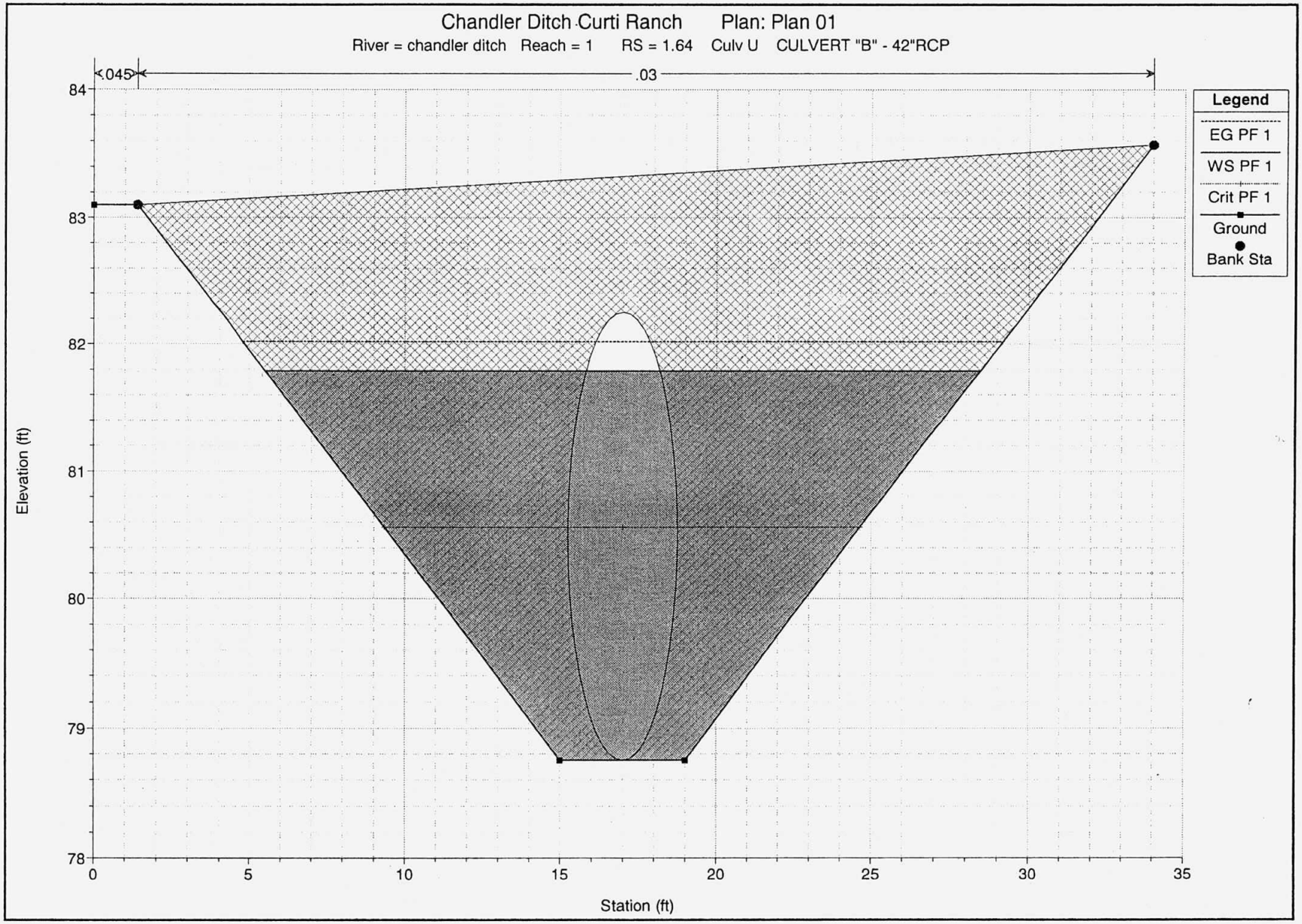

Chandler Ditch Curti Ranch
Plan: Plan 01
River = chandler ditch Reach = 1
RS = 1.85 curve
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
85
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

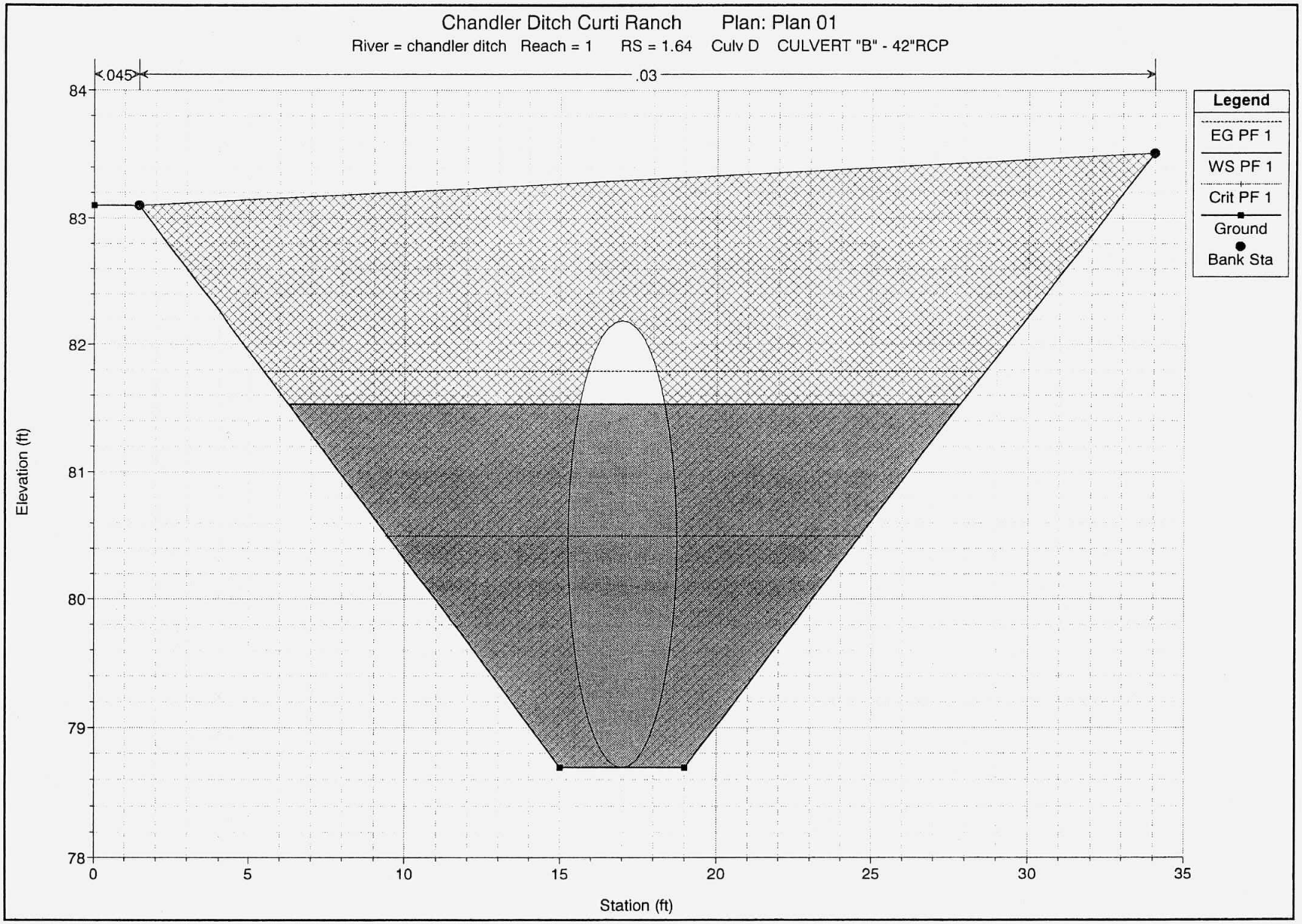

Chandler Ditch Curti Ranch
Plan: Plan 01
River = chandler ditch Reach = 1
RS = 1.80 curve
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
85
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

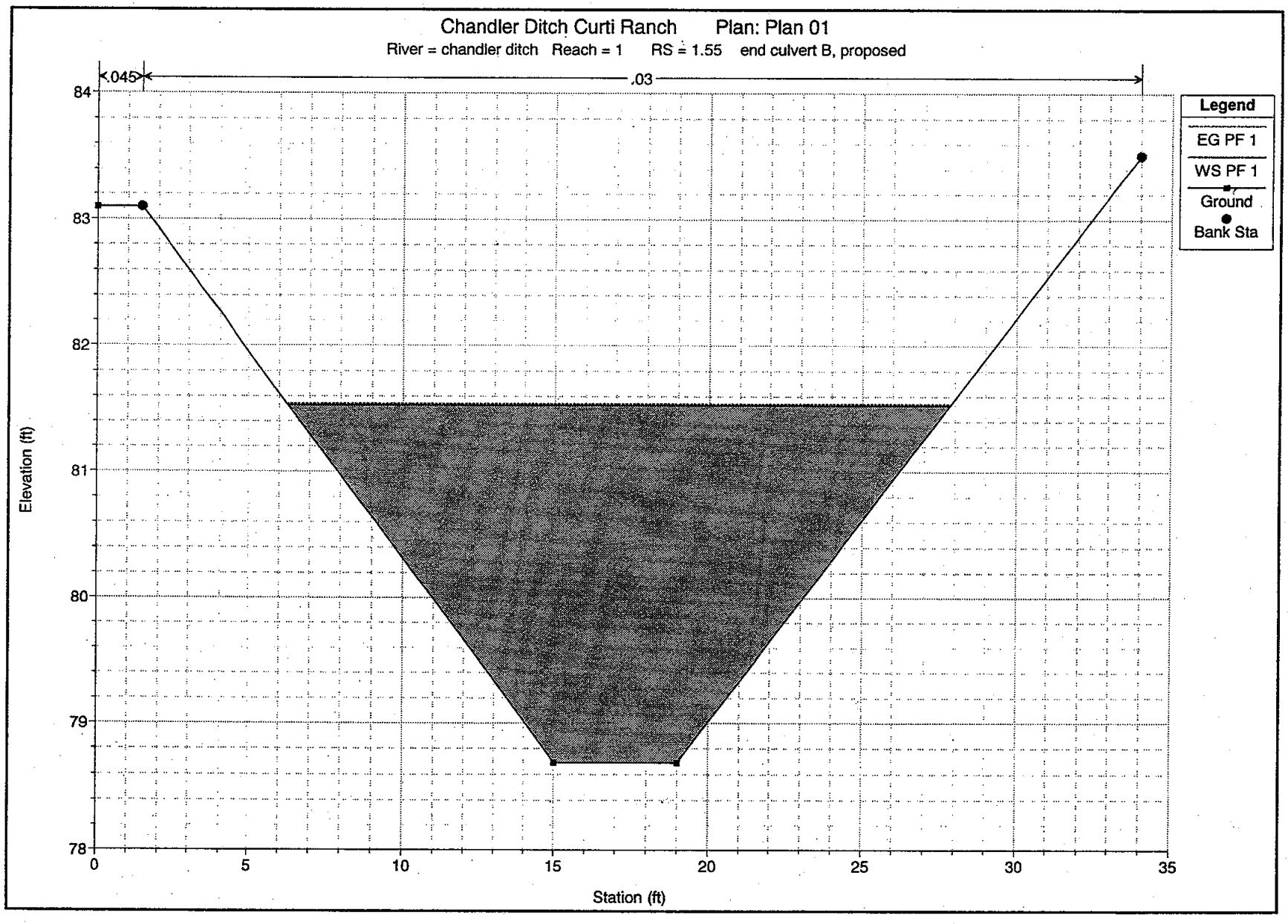

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.75 proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
85
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

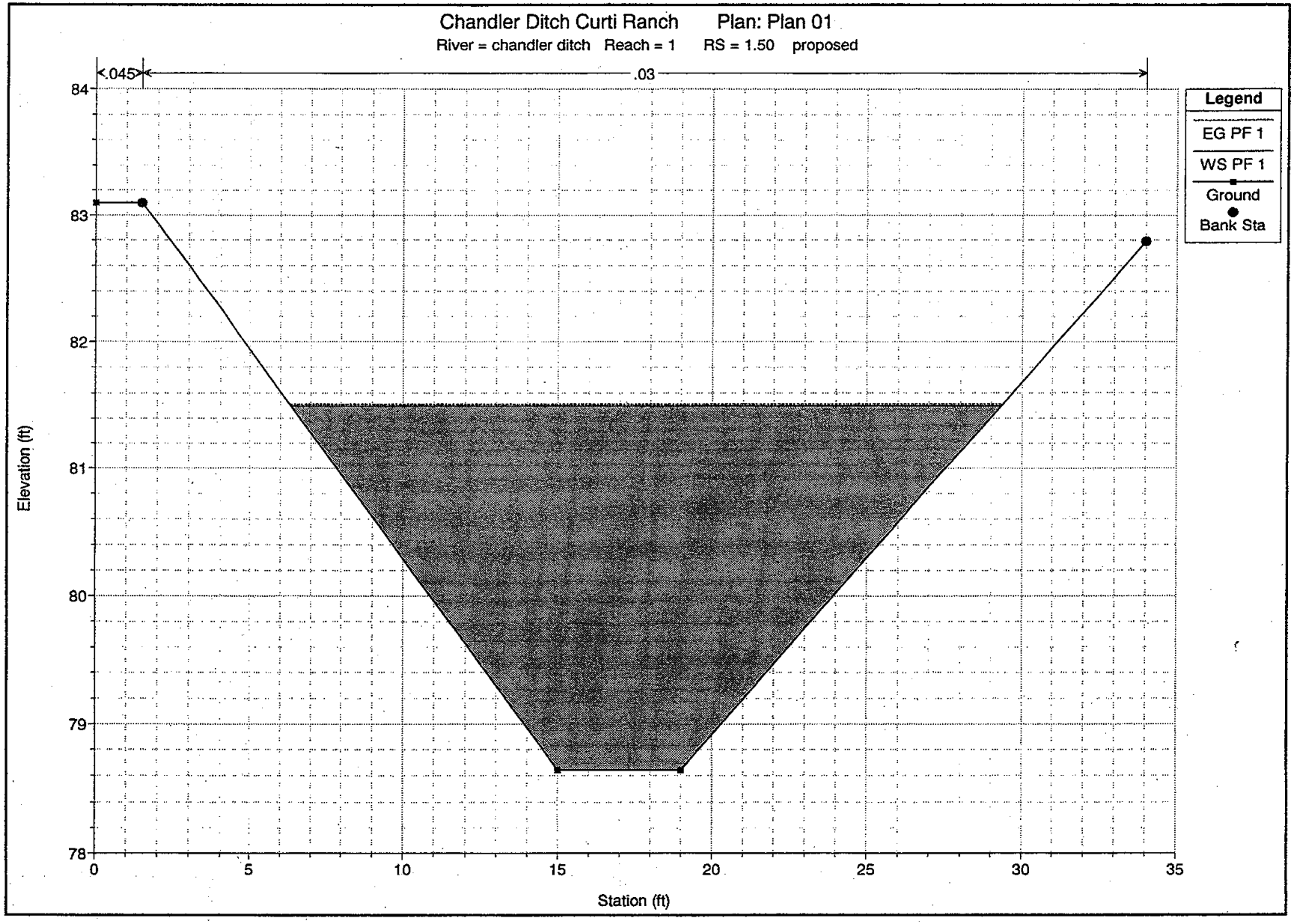

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.70 proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

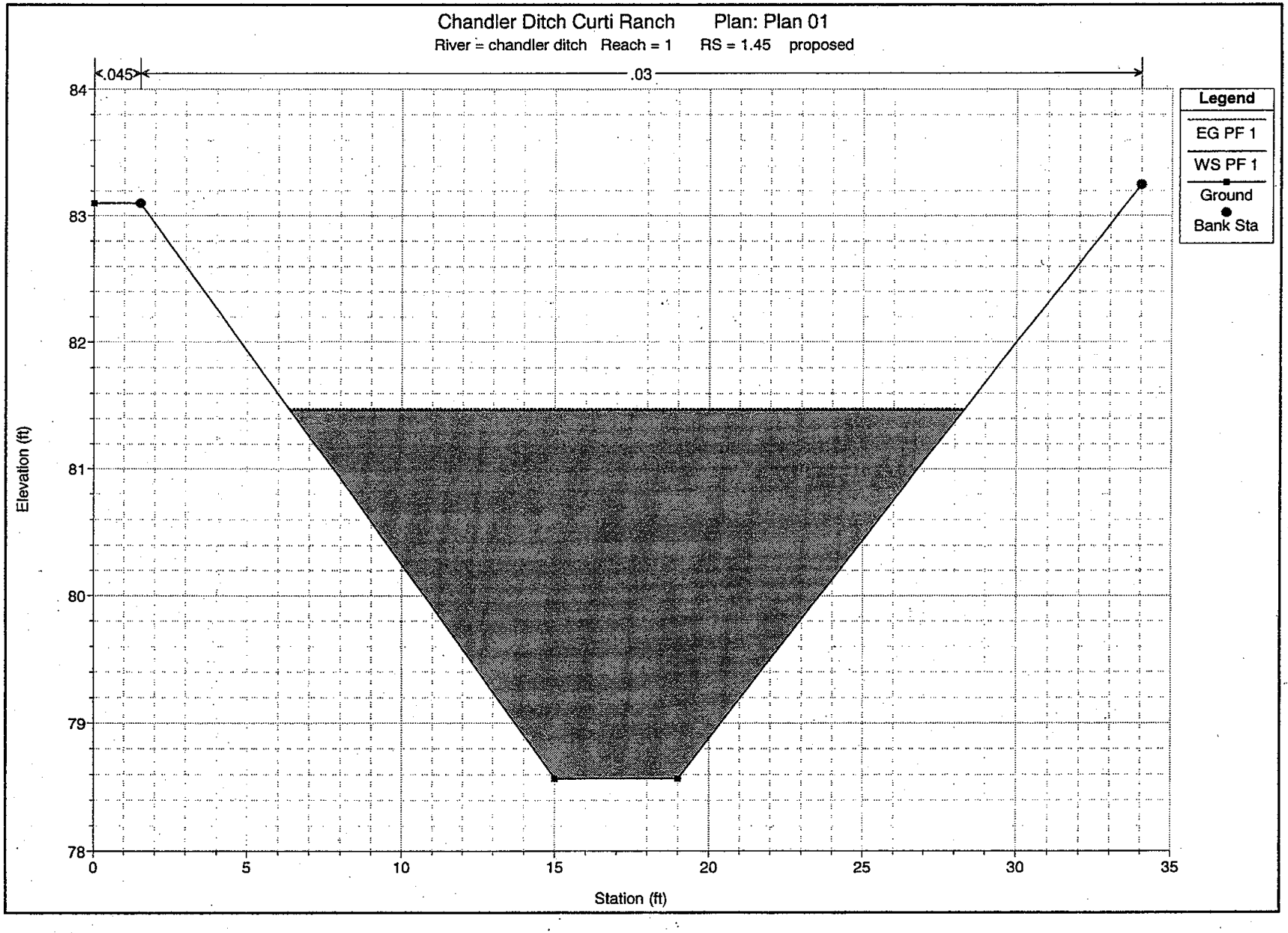

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.65 begin culvert B
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

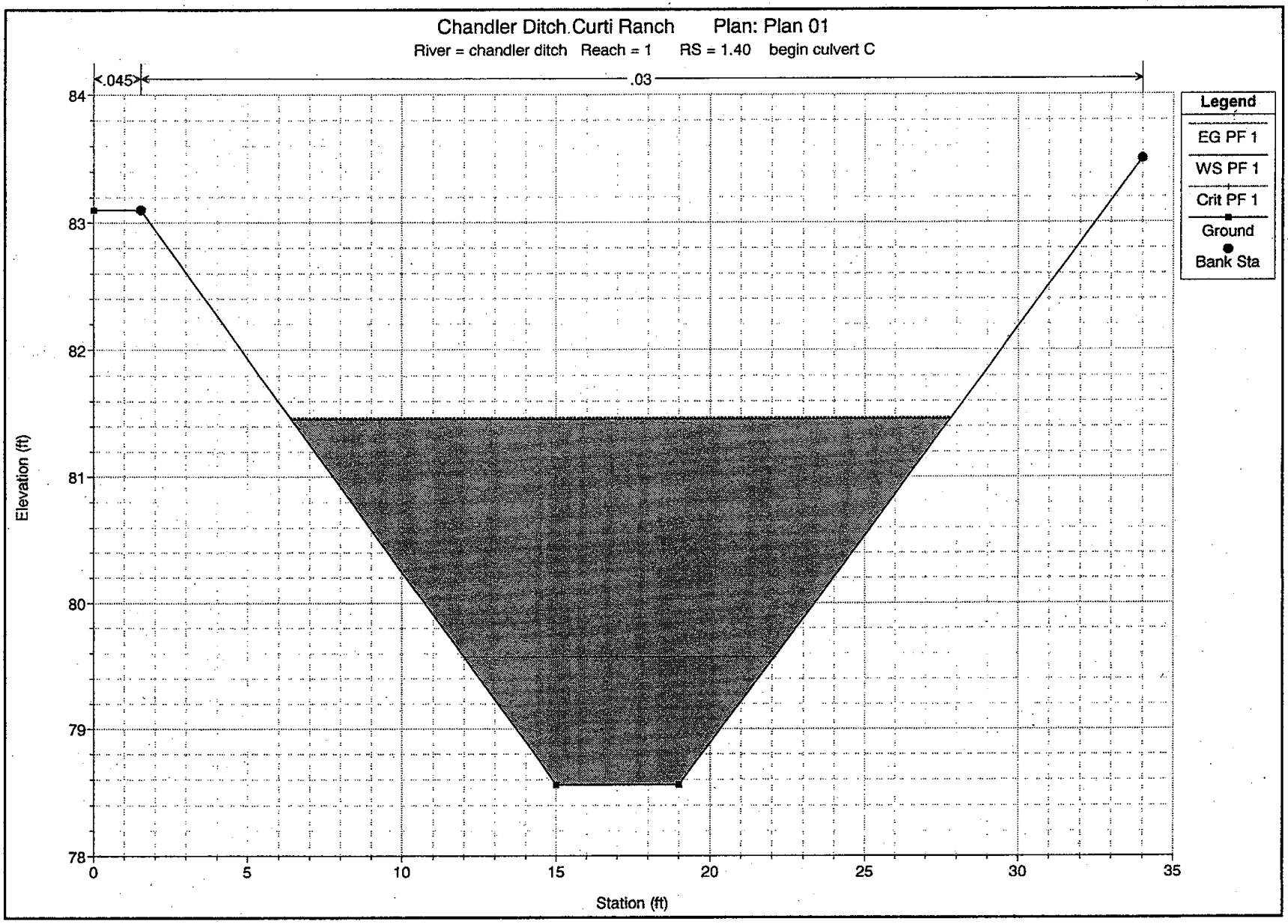

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.64 Culv U CULVERT "B" - 42"RCP
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

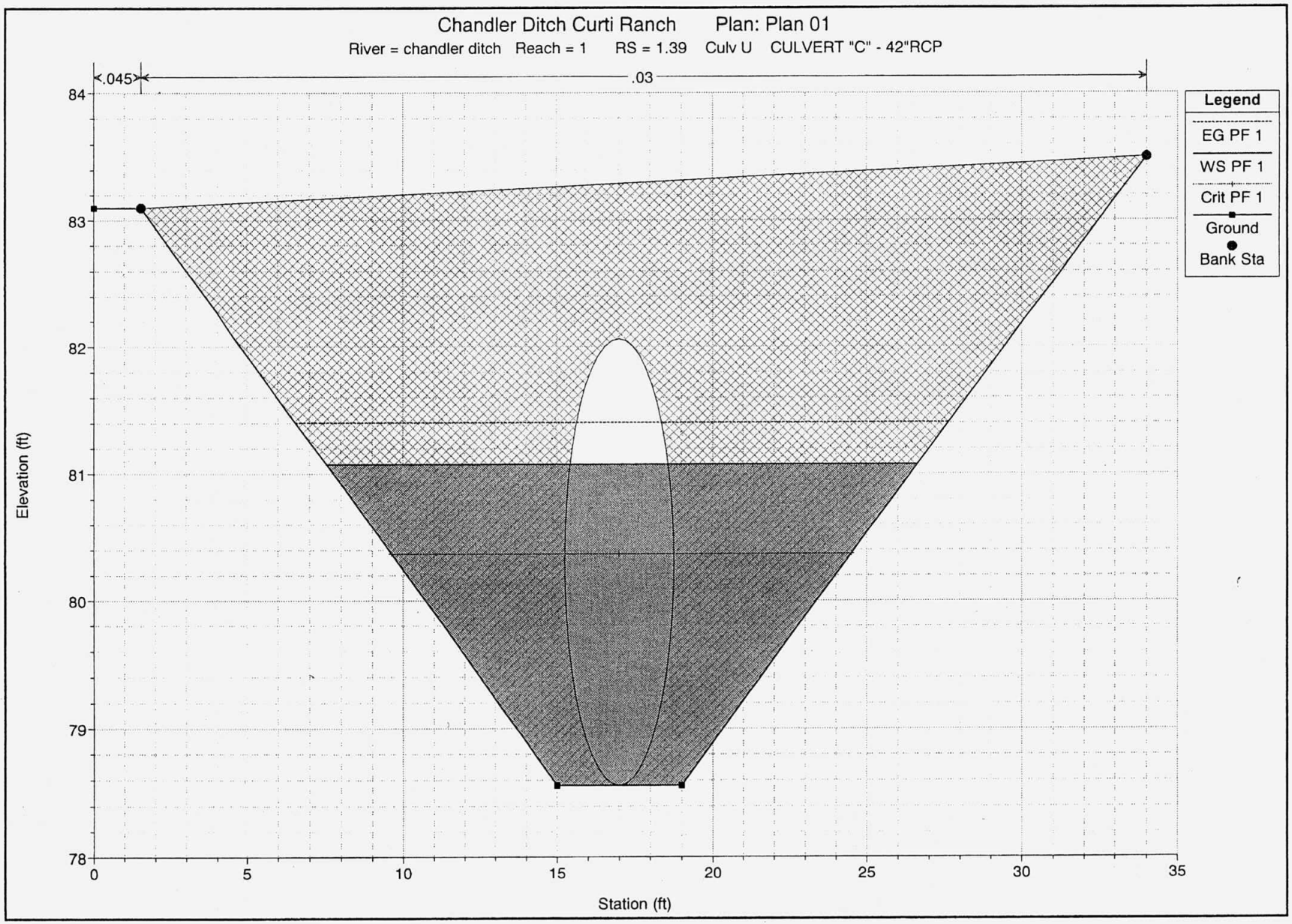

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.64 Culv D CULVERT "B" - 42"RCP
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

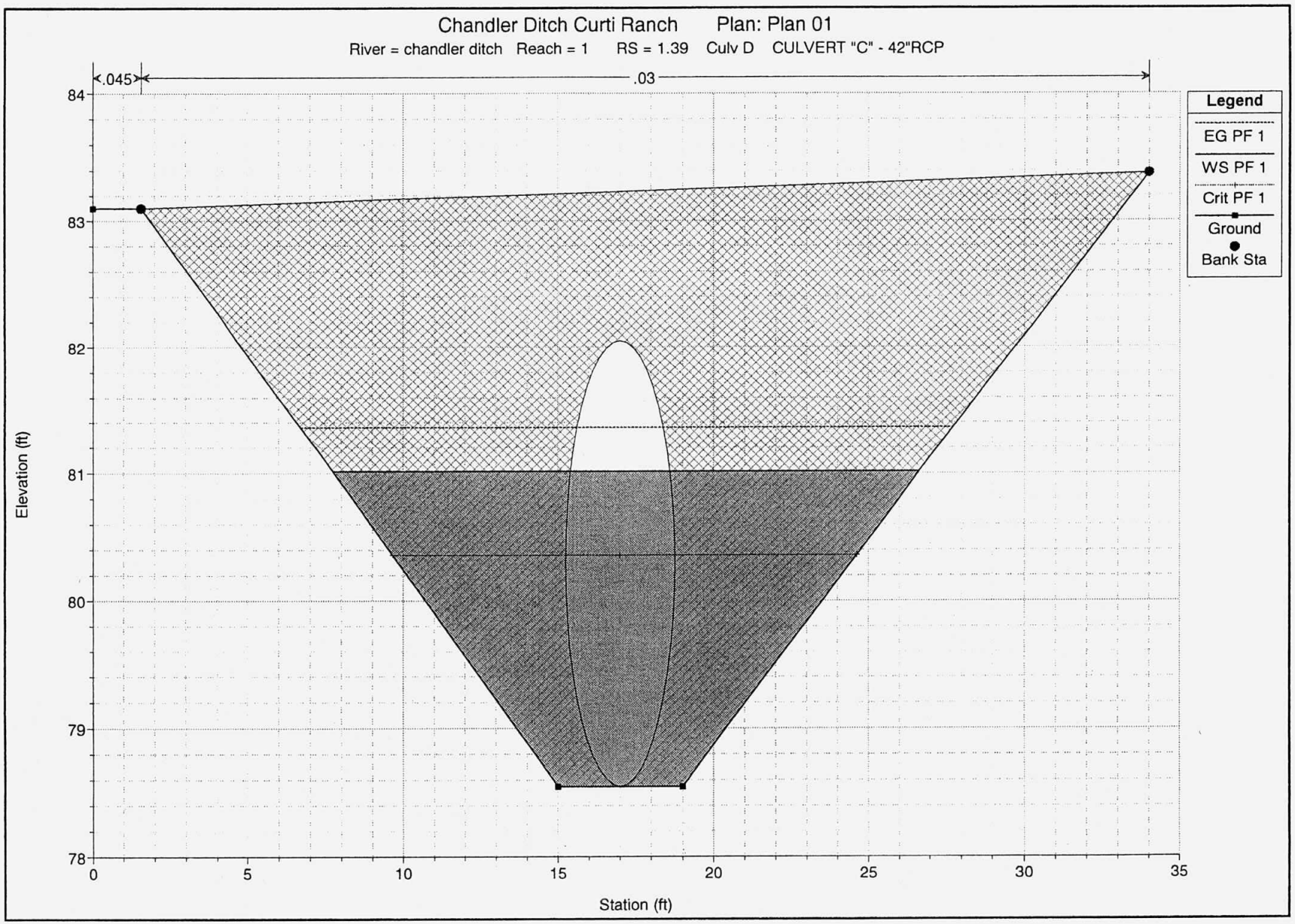

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.55 end culvert B, proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

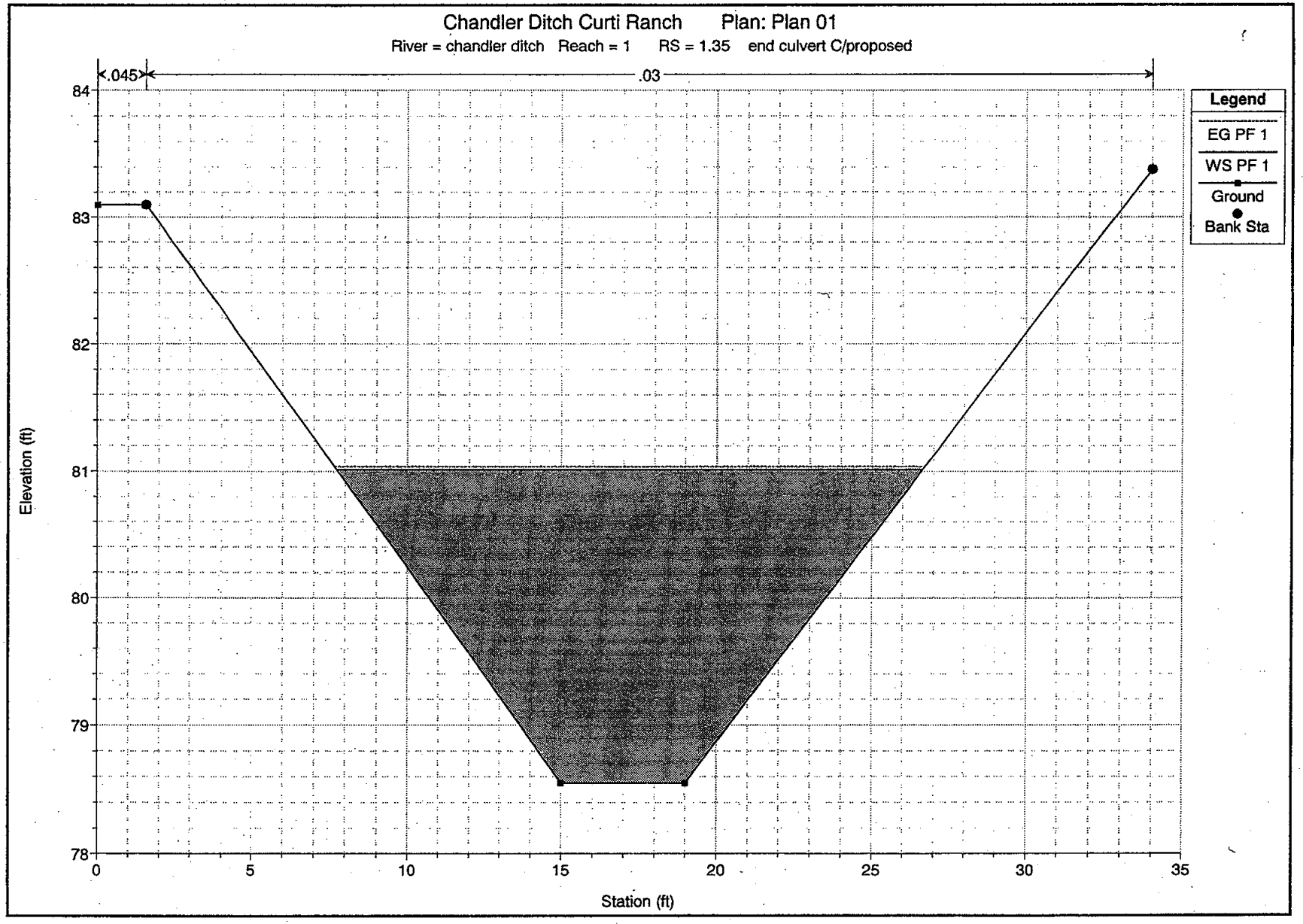

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.50 proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

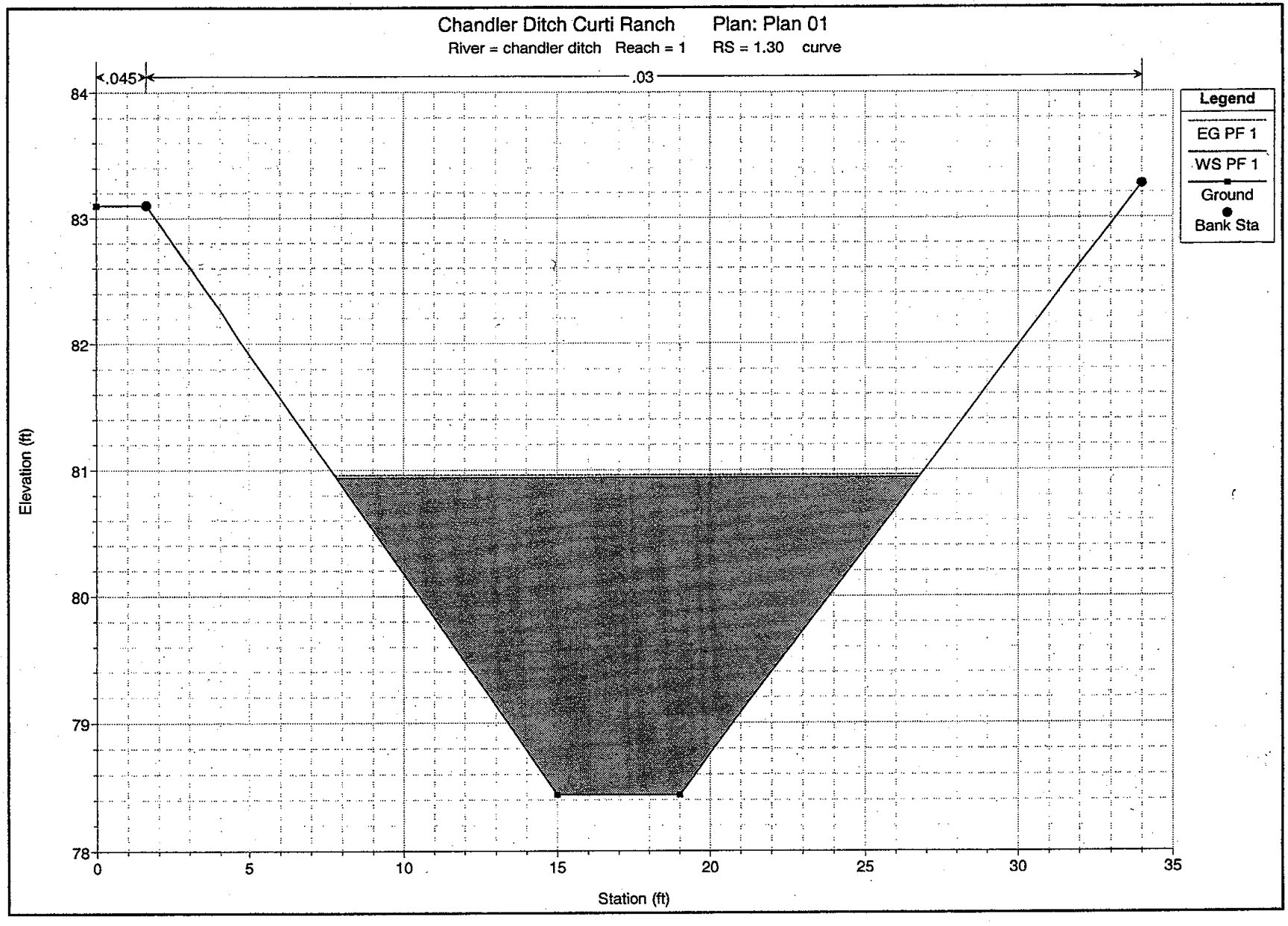

Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.45 proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35


Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.40 begin culvert C
<.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35


Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.39 Culv U CULVERT "C" - 42"RCP
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35


Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.39 Culv D CULVERT "C" - 42"RCP
.045
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35


Chandler Ditch Curti Ranch Plan: Plan 01
River = chandler ditch Reach = 1 RS = 1.35 end culvert C/proposed
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

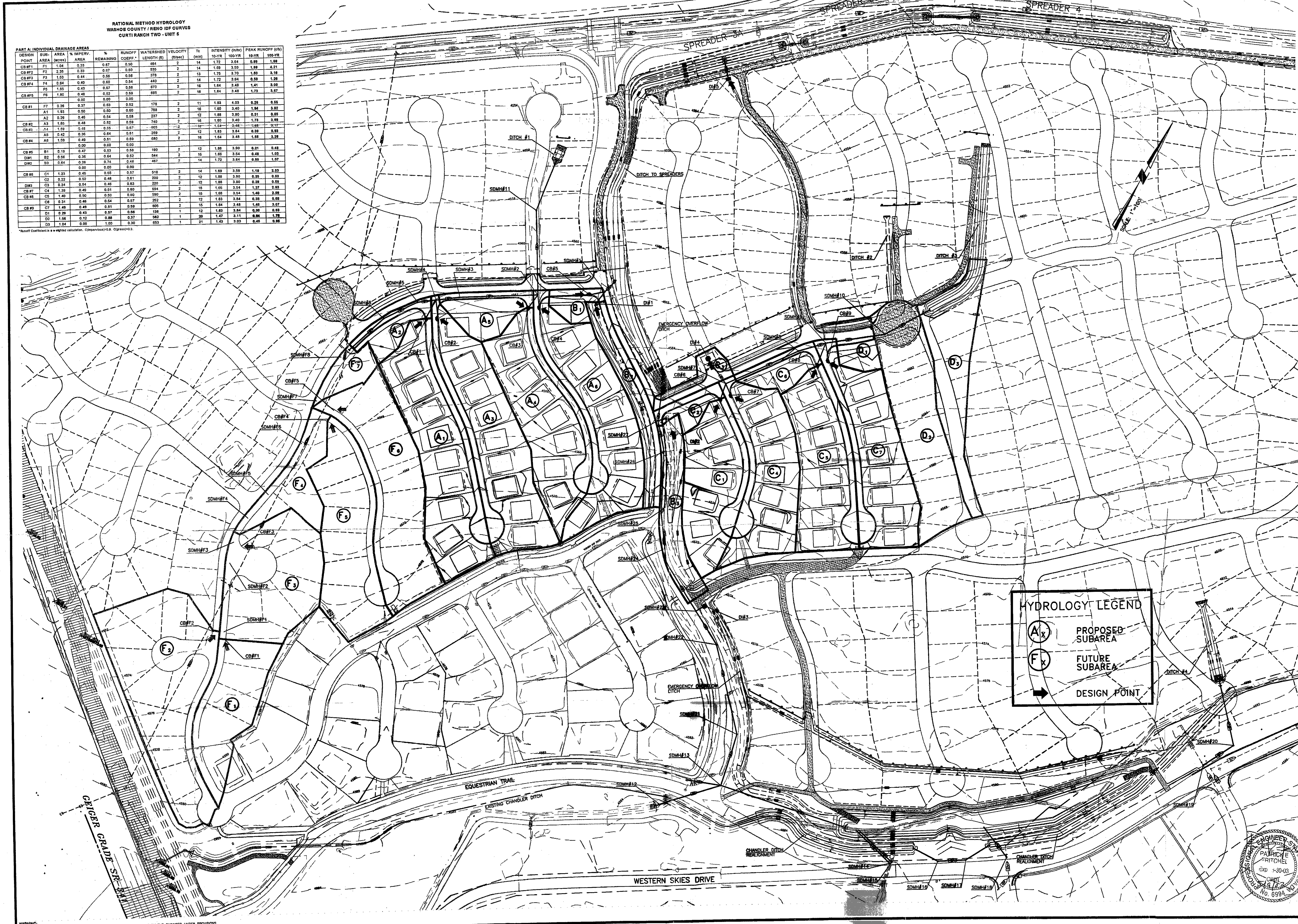

Chandler Ditch Curti Ranch
Plan: Plan 01
River = chandler ditch Reach = 1
RS = 1.30 curve
.045
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
84
83
82
81
80
79
78
0
5
10
15
20
25
30
35

RATIONAL METHOD HYDROLOGY
WASHOE COUNTY / RENO IDF CURVES
CURTI RANCH TWO - UNIT 5

PART A: INDIVIDUAL DRAINAGE AREAS

DESIGN POINT	SUB-AREA	AREA (acres)	% IMPERV. AREA	% REMAINING	RUNOFF COEFF.*	WATERSHED LENGTH (ft)	VELOCITY (ft/sec)	Tc (min)	INTENSITY (in/hr) 10-YR	INTENSITY (in/hr) 100-YR	PEAK RUNOFF (cfs) 10-YR	PEAK RUNOFF (cfs) 100-YR
CB #F1	F1	1.04	0.33	0.67	0.50	464	2	14	1.72	3.64	0.89	1.88
CB #F2	F2	2.35	0.33	0.67	0.50	535	2	14	1.69	3.59	1.99	4.21
CB #F3	F3	1.63	0.44	0.56	0.56	378	2	13	1.75	3.70	1.60	3.16
CB #F4	F4	0.64	0.40	0.60	0.54	440	2	14	1.72	3.64	0.58	1.26
	F5	1.55	0.43	0.57	0.56	670	2	16	1.64	3.48	1.41	3.00
CB #F5	F6	1.80	0.48	0.52	0.59	665	2	16	1.64	3.48	1.73	3.67
			0.00	0.00	0.00							
CB #1	F7	0.26	0.37	0.63	0.52	178	2	11	1.93	4.03	0.26	0.55
	A1	1.93	0.50	0.50	0.60	758	2	16	1.60	3.40	1.84	3.92
	A2	0.29	0.46	0.54	0.58	237	2	12	1.88	3.90	0.31	0.65
CB #2	A3	1.85	0.48	0.52	0.59	740	2	16	1.60	3.40	1.73	3.69
CB #3	A4	1.59	0.45	0.55	0.57	665	2	16	1.64	3.48	1.46	3.17
	A5	0.42	0.36	0.64	0.51	259	2	12	1.83	3.84	0.39	0.83
CB #4	A6	1.59	0.49	0.51	0.59	680	2	16	1.64	3.48	1.56	3.26
			0.00	0.00	0.00							
CB #5	B1	0.19	0.47	0.53	0.58	190	2	12	1.88	3.90	0.21	0.43
DI#1	B2	0.56	0.36	0.64	0.52	544	2	15	1.66	3.54	0.48	1.03
DI#2	B3	0.64	0.26	0.74	0.46	467	2	14	1.72	3.64	0.50	1.07
			0.00	0.00	0.00							
CB #6	C1	1.23	0.45	0.55	0.57	518	2	14	1.69	3.59	1.19	2.53
	C2	0.22	0.52	0.48	0.61	200	2	12	1.88	3.90	0.25	0.53
DI#3	C3	0.24	0.54	0.46	0.63	220	2	12	1.88	3.90	0.28	0.59
CB #7	C4	1.39	0.49	0.51	0.60	594	2	15	1.66	3.54	1.37	2.93
CB #8	C5	1.40	0.50	0.50	0.60	590	2	15	1.66	3.54	1.40	2.98
	C6	0.31	0.46	0.54	0.57	252	2	12	1.83	3.84	0.33	0.68
CB #9	C7	1.49	0.49	0.51	0.59	605	2	15	1.64	3.48	1.45	3.07
	D1	0.29	0.43	0.57	0.56	136	1	12	1.83	3.84	0.30	0.63
	D2	1.56	0.12	0.88	0.37	562	1	20	1.47	3.11	0.84	1.78
	D3	1.04	0.00	1.00	0.30	653	1	21	1.43	3.03	0.45	0.95

*Runoff Coefficient is a weighted calculation. C(impervious)=0.9, C(grass)=0.3.



STATUS OF PLANS

- ☐ PRELIMINARY DATE:
- ☒ INITIAL SUBMITTAL DATE: 3/10/03
- ☐ FINAL SUBMITTAL DATE:

PLANS ARE PRELIMINARY AND SUBJECT TO CHANGE UNTIL STAMPED AND SIGNED APPROVED BY ALL APPROPRIATE GOVERNING AGENCIES.

cfa
PLANNERS • ENGINEERS • SURVEYORS
LANDSCAPE ARCHITECTS
1150 CORPORATE BLVD. RENO, NV 89502
(775) 856-1150 FAX: (775) 856-1160

CURTI RANCH TWO - UNIT 5
HYDROLOGY MAP
FIGURE 1

WASHOE COUNTY NEVADA

JOB NO. 98-006.10
DESIGNED BY MBA
DRAWN BY MBA

SHEET 1 OF 1

File: X:\Projects\98006.10\Dwg_HEC-RAS-CH2.dwg
<vgallo> Mon, 12 May 2003 - 11:26am

REVISIONS		
DATE	MARK	BY

STATUS OF PLANS

- ☐ PRELIMINARY DATE:
- ☐ INITIAL SUBMITTAL DATE: 3/10/03
- ☐ FINAL SUBMITTAL DATE:

PLANS ARE PRELIMINARY AND SUBJECT TO CHANGE UNTIL STAMPED AND SIGNED APPROVED BY ALL APPROPRIATE GOVERNING AGENCIES.

cfa
PLANNERS • ENGINEERS • SURVEYORS
LANDSCAPE ARCHITECTS
1150 CORPORATE BLVD. RENO, NV 89502
(775) 856-1150 FAX: (775) 856-1160

CHANDLER DITCH AND DETENTION POND
PROPOSED CONDITION
CURTI RANCH 2 - UNIT 5
FIGURE 2

WASHOE COUNTY NEVADA

JOB NO. 98006.04
DESIGNED BY DCP
DRAWN BY VI

SHEET 1 OF 1


UNDEVELOPED
Q10 = 11 cfs
Q100 = 39 cfs
DEVELOPED (SPRDR2)
Q10 = 7 cfs
Q100 = 15 cfs
UNDEVELOPED
Q10 = 40 cfs
Q100 = 169 cfs
DEVELOPED (SPRDR3)
Q10 = 33 cfs
Q100 = 119 cfs
Q10 = 24 cfs
Q100 = 48 cfs
SPREADER 3B
Q10 = 0 cfs
Q100 = 60 cfs
SPREADER 3A
Q10 = 16 cfs
Q100 = 19 cfs
SPREADER 4
UNDEVELOPED
Q10 = 33 cfs
Q100 = 95 cfs
DEVELOPED (SPRDR5)
Q10 = 31 cfs
Q100 = 91 cfs
DEVELOPED (SPRDR1)
Q10 = 15 cfs
Q100 = 546 cfs
UNDEVELOPED
Q10 = 15 cfs
Q100 = 548 cfs
CRTI 2A
Q10 = 2 cfs
Q100 = 7 cfs
CRTI 3A
Q10 = 3 cfs
Q100 = 14 cfs
CRTI 4A
Q10 = 5 cfs
Q100 = 22 cfs
CURTI 5a
Q10 = 6 cfs
Q100 = 12 cfs
CURTI 5b
Q10 = 7 cfs
Q100 = 14 cfs
UNIT5a
UNIT5b
GGCHAN
Q10 = 3 cfs
Q100 = 8 cfs
CRTI 1A
Q10 = 2 cfs
Q100 = 9 cfs
CURTI 4
Q10 = ±2 cfs
Q100 = ±6 cfs
CRTI 4
CURTI RANCH ROAD
EMERGENCY OVERFLOW DITCH
EQUESTRIAN ROAD
EXISTING CHANDLER DITCH
CRTI 20
EAST1B+CURTI 20
Q10 = ±11 cfs
Q100 = ±32 cfs
DETENTION POND
Q10 = ±23 cfs (OUT)
Q100 = ±91 cfs (OUT)
WESTERN SKIES DRIVE
EAST4
Q10 = ±11 cfs
Q100 = ±28 cfs
EAST3A
Q10 = ±17 cfs
Q100 = ±46 cfs
EAST4
BAILEY CANYON OVERTOPPING
Q10 = ±0 cfs
Q100 = ±540 cfs
(D1)
(PER GEIGER REPORT BY STANTEC)
GEIGER GRADE SR 341
EAST1C + 2
Q10 = ±38 cfs
Q100 = ±152 cfs
EAST3B
Q10 = ±4 cfs
Q100 = ±8 cfs
EAST2
Q10 = ±37 cfs
Q100 = ±134 cfs
EAST3B
EAST3A
EAST1C
Q10 = 3 cfs
Q100 = ±25 cfs
EAST1A
Q10 = ±13 cfs
Q100 = ±13 cfs
EAST1A,B,C
EAST2
CURTI RANCH TWO - UNIT 5
OVERALL DRAINAGE MAP (VISUAL HEC-1 ANALYSIS)
FIGURE 3
PLANNERS • ENGINEERS • LANDSCAPE ARCHITECTS
SURVEYORS • CONSTRUCTION INSPECTION
1150 CORPORATE BLVD. RENO, NV 89502
(775) 856-1150 FAX (775) 856-1160
WASHOE COUNTY
NEVADA
STATUS OF PLANS
JOB NO. 98-006.10
DESIGNED BY: VAG
DRAWN BY: VAG
SHEET 1 OF 1