LETTER OF TRANSMITTAL

Professional Engineering Consultants, P.A.
303 S. TOPEKA • WICHITA, KANSAS 67202 • 316-262-2691 • FAX 316-262-3003
www.pec1.com • designers@pec1.com

TO: City of Wichita
Storm Water Management
7Th Floor - City Hall
455 N. Main
Wichita, KS 67202

ATTENTION: Vicki Huang

FROM: Shawn Bryan

DATE: May 24, 2007

PROJECT NO.: 36-07290-5526

PROJECT: Oak Creek 4th Addition

REFERENCE: Storm Water Drainage Report

WE ARE SENDING YOU: ☒ Attached ☐ Under separate cover via _____ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	05/24/2007	1	Storm Water Drainage Plan & Calculations for Oak Creek 4th Addition

THESE ARE TRANSMITTED as checked below:

☒ For approval ☐ Approved as submitted ☒ Resubmit 1 copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS: Vicki,
Here is the storm water drainage report for Oak Creek 4th Addition that you requested from Rob Hartman with our office. Most of the data is dealing with the whole property (155 ac.) and Oak Creek 3rd Addition since this information was previously submitted with the Oak Creek 3rd Drainage Report. If you have any questions please feel free to contact me.

Thanks.

COPIES TO: File **By:** Shawn R. Bryan

If enclosures are not as noted, kindly notify us at once.

Adopted: February 23, 2007

CITY OF WICHITA

Public Works, Engineering Division
Final Drainage Plan Submittal Checklist

Reviewer: VICKI HUANG Date: 05-24-07

Subdivision Name: OAK CREEK 4TH ADDITION Location: SW CORNER 21ST & GREENWICH

Total Land Area Of Ownership: 154.5 Acres

Type: X Residential ____ Commercial ____ Industrial ____ Recreation ____ Municipal ____ Other

Applicant: SLAWSON COMMERCIAL PROPERTIES Contact: MR. GEORGE SHERMAN Phone #: 316-263-3201

Engineer: PEC Contact: SHAWN BRYAN Phone #: 316-206-1316

Please check the appropriate box: I = Included; NA = Non-Applicable; R= Required prior to development

(If "NA" is checked, an explanation must be entered)

	Applicant			Engr	
Tab 1. Project Narrative	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Site Location Map, using USGS Map			LOOK AT FIS MAP OR 4-CORNER PLAN		
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	X				
C. Discussion of offsite conditions	X				
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	X				
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design		X			
F. Copy of the plat	X				
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)		X			
H. Professional Engineer seal, signature and date on cover of report	X				
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover		X	WILL SUBMIT ONCE IT IS APPROVED		

	Applicant			Engr	
Tab 2. Existing Conditions Runoff Calculations	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)					
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	X		HEC-1 & HEC-RAS		
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	X				
D. Total Site Area and Total Impervious Area (acres)	X				
E. Benchmarks used for site control	X				
F. Streams, creeks, and waterway labeled	X				
G. Predominant soils from USDA soil surveys, and/or on site soil borings	X				
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted		X			
I. Location of existing roads, buildings, parking lots and other impervious areas.	X				

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J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	X		ON PLAT		
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X				
L. Flow paths	X				
M. Location and dimensions of existing channels, bridges or culvert crossings		X			
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	X				
O. Assumed pre-developed runoff curve numbers					
P. Existing time of concentrations used in calculations	X				
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site		X	MEET PRE VS. POST RATE WILL NOT HAVE AN IMPACT ON DOWNSTREAM		
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)		X			
S. Cross-section data for open channels		X			
T. Ground water elevations, if applicable		X			

	Applicant			Engr	
Tab 3. Post-Development Hydrologic Analysis	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	X				
B. Proposed time of concentrations used in calculations		X			
C. Assumed post-developed runoff curve numbers	X				
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)		X	ARE IN HEC1 MODEL		
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration		X			
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities		X			
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary		X			
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)		X			
I. Design water surface elevations and normal pool elevation for ponds.		X			
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.		X			
K. Proposed limits of clearing and grading		X			
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	X				
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	X				
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	X				
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings		X			

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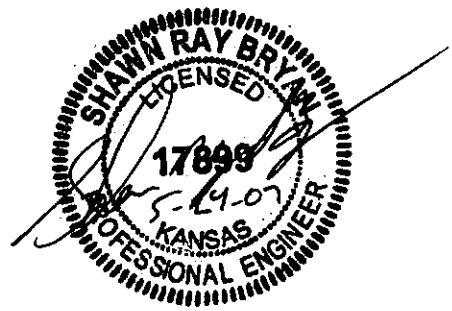
P. Preliminary selection and location of stormwater controls		X			
Q. Emergency overflow structure's flow path		X			
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)		X			
S. The 100-year 24-hour HWL delineated on the plan for detention pond		X			
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds			LOCATED ON 4-CORNER & DRAINAGE PLAN		
U. Stormwater Management Facilities located within a Reserve	X				
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)		X			
W. Off-site drainage easements or agreements required, where necessary		X			

	Applicant			Engr	
Tab 4. Floodplain Submittal	**I**	**NA**	**Explanation / Location in Plan**	**I**	**NA**
A. Provide source of flood profile	X				
B. Nearest base flood elevations	X				
C. Delineation of pre-developed regulatory floodplain/floodway limits		X			
D. Delineation of post-developed regulatory floodplain and floodway limits		X			
E. Floodplain boundary determination per elevation (project limits shown)	X		MAP INCLUDED		
F. Provide source of floodway data table and discharges		X			
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits	X				
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		X			
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		X			
J. Flood plains and floodways located within a Reserve, where necessary	X				

	Applicant			Engr	
Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	**I/R**	**NA**	**Explanation / Location in Plan**	**I/R**	**NA**
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		X			
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		X			
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		X	WILL SUBMIT COLMR FOR DEVELOPMENT AT LATER DATE		
D. Kansas Department of Transportation		X			
E. Sedgwick County Right-of-way Permit		X			

Consulting Engineer Initials



Oak Creek 4rd Addition
Wichita, Sedgwick County, Kansas
05/23/07

Oak Creek 4rd Addition is a 9.50 acre residential development. This development is part of the Oak Creek Development Master Plan. Oak Creek is a 154.5 acre, commercial and residential development on the southwest corner of 21st Street North and Greenwich Road within the city limits of Wichita in Sedgwick County, Kansas. The 5 lot development consists of existing streets and storm sewer. This report contains a drawing of the drainage plan, supporting calculations and data for the Oak Creek 3rd Addition which included all the calculations for whole development. I have also included the Oak Creek 4rd plat and drainage plan in this report.

Hydrology

The proposed plat lies in the NE 1/4, Section 9, T27S, R2E. The soil on-site is comprised primarily of Goessel Silty clay, Irwin silty clay loam and Rosehill silty clay, which are all classified in hydrologic group D. Elandco silt loam is present along the West Fork of Four Mile Creek. The land is currently vacant, with the exception of streets and the storm water system for Oak Creek 2nd and 3rd Additions, and is wooded/ grassland throughout. The site is bordered to the north by 21st Street North, to the south by the Burlington Northern Railroad, to the east by Greenwich Road and to the west by the Remington Place Development. The West Fork of Four Mile Creek cuts through this site from the north property line to the east property line and has approximately 1.60 square miles of contributing area to the north of this site. Existing Basin A drains to the north to the storm sewer system along 21st Street North and eventually to the West Fork of Four Mile Creek. Existing Basin B drains to the south and east into the West Fork of Four Mile Creek. Existing Basin C drains to the south and west to the Remington Place 3rd Addition. Existing Basin D drains to the east Greenwich Road to a 36" RCP under Greenwich Road. Proposed Basin A, B, C, D & E drain through the pond system labeled #2, 3, 4, 5 & 6 on the drainage map and ponds A-E in the HEC-1 output files. These

ponds will drain to the east into the West Fork of Four Mile Creek. Proposed Basin F drains to an existing pond labeled pond #1 on the drainage map and Pond F in the HEC-1 output files. This pond then drains into the West Fork of Four Mile Creek. Proposed Basin G drains directly to the West Fork of Four Mile Creek. Proposed Basin H drains eventually to the southeast corner of the site to the existing 36" RCP under Greenwich. It is important to note that no water will drain west to the Remington 3rd Addition after development and that significant changes will be made to the West Fork of Four Mile Creek on this site as shown on the Drainage Map. The channelization of the West Fork of Four Mile Creek (in the future) will require permits from the Division of Water Resources and a review by the Corps of Engineers. Oak Creek 3rd Addition has large residential lots located next to the West Fork of Four Mile Creek. Oak Creek 4th Addition was originally planned to be commercial property and since has been changed to be residential properties. Oak Creek 4th Addition is located in Post Development Basin G which will drain directly into the West Branch of Four Mile Creek. This concept has been approved previously with Oak Creek, Oak Creek 2 and 3 rd additions. As shown in the drainage plan the overall discharge from the site is less than the pre-development discharge rate. This is the case even though no detention will be placed in the area surrounding the creek. The detention pond system throughout all the Oak Creek Additions (1, 2 & 3) will decrease the discharge rate enough to enable development to occur next to the creek without detention.

Runoff coefficients were estimated based on tables presented in the Design Aids section of this report using fully developed conditions. Time of concentration was based on slope, flow velocity and length of flow through each basin (TR-55 Method) and was not allowed to be less than 15 minutes. The HEC-1 computer program was used for the pre-development runoff rate and also to route the runoff through the ponds and determine the post-development conditions leaving the site.

The analysis was made based on the available site data which includes the following: 1" = 100' topographic map with 2' contours of the site, a Sedgwick County Soil Survey Map and noted references.

Storm Sewer Design

The storm sewer is included in this submittal but was designed and included in the Oak Creek, Oak Creek 2nd and Oak Creek 3rd Addition drainage report submittals. For the storm sewer hydrologic analysis, the Rational Method was used. Runoff coefficients were estimated using the charts in the design aids section of this report. For this development, a uniform assumption of the minimum time of concentration of 10 minutes was deemed appropriate. Travel time for flow through defined channels, pipes, etc, for these basins were estimated on the basis of Manning's Equation.

In the hydraulic analysis, the storm sewers are designed for the minor storm, with major storm overflows to be routed through easements and rights-of-way to an appropriate outlet. The minor storm has a recurrence interval of two years. The major storm evaluated has a recurrence interval of one hundred years. To simplify this analysis, the time of concentration is identical for both the major and minor storms.

For each inlet, street flooding and inlet capacity were checked for the minor storm. Conveyance in the street is based on the Modified Manning's Equation, as expressed in the Design of Urban Highway Drainage – The State of the Art, Equation (5-1), pages 5-9. It has been assumed that Tc for street flow is equal to Tc for pipe flow. This is a simplifying, but conservative, assumption since pipe flow velocities generally exceed street flow velocities. For local streets, curb-deep flow is tolerable for the minor storm. For collector streets, a single eight-foot lane should remain unflooded for the minor storm.

Inlet capacities were determined by the methods described in Drainage of Highway Pavements, Hydraulic Engineering Circular #12, using Chart #12 as found in the Design Aids section. City of Wichita Type 1A inlets and 3/8 inch per foot cross slopes have been assumed. Minimum walk grade has been assumed to be 0.3 feet above the top of

curb, unless otherwise noted. Streets have been assumed to have 6-5/8 inch standard curb, unless otherwise noted.

Hydraulic computation for the storm sewer pipe system was performed using PEC's STORM computer program. This program uses Manning's Equation to calculate friction losses for pipes flowing full. Minor losses are computed by momentum principles at each structure. All pipe area is assumed to be reinforced concrete with a Manning's "n" of 0.012. It is desirable to keep the hydraulic grade line at least one foot below the top of curb for the minor storm. The calculations and the STORM analyses for the storm sewers are included in this report.

Design Aids

This section includes material used to assist in designing the drainage system. A 1" = 100' scale Drainage Plan map (Attachment A) and a 1" = 100' scale Four-Corner Plan map (Attachment B) are enclosed in the pockets.

References

Design of Urban Highway Drainage – The State of the Art, by Reitz & Jens, Inc., April 1980.

Drainage of Highway Pavements, Hydraulic Engineering Circular #12, by Tye Engineering, Inc., March 1984.

Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation, City of Wichita, Kansas, 1985.

Soil Survey of Sedgwick County, Kansas, US Department of Agriculture, Soil Conservation Service, 1979.

TABLE 1

PRE VS. POST-DEVELOPMENT DISCHARGE RATES

A	BOTH	38	68		20	109	
B	BOTH	47	153		20	26	
C	BOTH	39	7		20	57	
D	BOTH	62	52		20	15	
E	POST	N/A	N/A		20	20	
F	POST	N/A	N/A		25	60	
G	POST	N/A	N/A		25	165	
H	POST	N/A	N/A		30	38	
TOTAL DISCHARGE			280			278	

**** Note: Only ponds D, F, G & H discharge in the post-development conditions.

OAK CREEK 3RD ADDITION
FOUR MILE CREEK WATER SURFACE ELEVATIONS

		Water Surface Elevations					
		Existing		Post		Allowable	
Sta		Conditions		Development		1 Foot	
16.37		1359.00		1359.00		0.00	
405.91		1359.29		1359.26		0.03	
828.54		1359.63		1359.68		0.05	
1184.83		1359.88		1360.25		0.37	
1363.99		1359.85		1360.71		0.86	
1550.64		1360.23		1361.09		0.86	
1810.00		1360.58		1361.08		0.50	
2170.00		N/A		N/A			
2176.24		1361.78		1362.43		0.65	

OAK CREEK 4TH ADDITION
PRE. VS. POST RUNOFF CALCULATION

	2 YEAR STORM EVENT DISCHARGE (CFS)				5 YEAR STORM EVENT DISCHARGE (CFS)		
BASIN	**PRE.**		**POST**		**PRE**		**POST**
A	20.00		13.00		30.00		19.00
B	46.00		22.00		68.00		30.00
C	2.00		5.00		3.00		7.00
D	16.00		5.00		23.00		5.00
E	N/A		11.00		N/A		13.00
F	N/A		10.00		N/A		25.00
G	N/A		64.00		N/A		87.00
H	N/A		5.00		N/A		5.00
TOTAL DISCHARGE FROM SITE	**84.00**		**84.00**		**124.00**		**122.00**
Note: Ponds A, B, C & D drain into Pond D in post development							

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1*****************************************
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 *                                       *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
ENGINEERS      *
 *                JUN   1998             *
CENTER     *
 *             VERSION 4.1               *
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*
*     U.S. ARMY CORPS OF
*     HYDROLOGIC ENGINEERING
*          609 SECOND STREET
*        DAVIS, CALIFORNIA 95616
*          (916) 756-1104
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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
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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

1 HEC-1 INPUT PAGE 1

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

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                1  ID      HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
                2  ID      PROPOSED CONDITIONS - DETENTION BASINS ONLY
                3  ID      100-YEAR STORM - POST DEVELOPMENT
*** LIST ***
*** FREE ***
                   *DIAGRAM
                4  IT       15 27SEP06    1200        0 28SEP06    2000
                5  IN       15 27SEP06    1200
                6  IO        0          5
                7  JR     PREC      3.5      4.5      5.3      6.1      7.0      7.8
                   *
                   *

                8  KK        A
                9  KO        5
               10  BA   0.0149
               11  PB     1.00
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               13  PC    0.029    0.032    0.035    0.038    0.042    0.045    0.048    0.052    0.056    0.060
               14  PC    0.064    0.068    0.072    0.076    0.080    0.085    0.090    0.095    0.100    0.105
               15  PC    0.110    0.115    0.120    0.127    0.134    0.140    0.147    0.155    0.163    0.172
               16  PC    0.181    0.193    0.204    0.220    0.235    0.259    0.283    0.387    0.663    0.699
               17  PC    0.735    0.754    0.772    0.786    0.799    0.810    0.820    0.828    0.835    0.843
               18  PC    0.850    0.858    0.865    0.873    0.880    0.885    0.889    0.894    0.898    0.903
               19  PC    0.907    0.912    0.916    0.921    0.925    0.929    0.934    0.938    0.943    0.947
               20  PC    0.952    0.955    0.958    0.961    0.964    0.967    0.970    0.973    0.976    0.979
               21  PC    0.982    0.985    0.988    0.991    0.994    0.997    1.000
               22  LS        0       85       40
               23  UD    0.200
                   *
                   *
                   *

               24  KK    PONDA
               25  KO        5
               26  RS        1     ELEV   1388.0
               27  SA      0.50     0.61     0.72     0.84
               28  SE    1388.0   1389.0   1390.0   1391.0
               29  SQ         0      1.8      5.7     11.5     19.2     29.1     41.1     55.4     72.1     91.3
               30  SQ     113.1
               31  SE    1388.0 1388.25 1388.50 1388.75 1389.00 1389.25 1389.50 1389.75 1390.00 1390.30
               32  SE    1390.5
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               34  KO        5
               35  BA   0.0150
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39          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
40          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
41          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
42          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
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1

HEC-1 INPUT

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44          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
45          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
46          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
47          LS       0      85      20
48          UD   0.200
            *
            *
            *
            *

49          KK   PONDE
50          KO       5
51          RS       1    ELEV  1365.0
52          SA    0.30    0.38    0.47    0.57
53          SE  1373.0  1374.0  1375.0  1376.0
54          SQ       0     3.7     8.2    10.1    11.6    13.0    14.3    15.4    16.5    17.5
55          SQ    18.4    19.3    20.2    21.0    21.8    22.6    23.3
56          SE  1373.0 1373.25 1373.50 1373.75 1374.00 1374.25 1374.50 1374.75 1375.00 1375.30
57          SE  1375.5 1375.75 1376.00 1376.25 1376.50 1376.75 1377.00
            *
            *
            *

58          KK    RTE1
59          KO       5
60          RT       0       0       1
            *
            *
            *

61          KK       B
62          KO       5
63          BA  0.0197
64          PB    1.00
65          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
66          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
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67          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
68          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
69          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
70          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
71          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
72          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
73          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
74          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
75          LS       0      85      50
76          UD   0.200
            *
            *
            *
```


1

HEC-1 INPUT

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

77          KK    PONDB
78          KO        5
79          RS        1    ELEV  1367.0
80          SA     0.25    0.32    0.40    0.49
81          SE   1375.0  1376.0  1377.0  1378.0
82          SQ        0       6      12      18      24      30      36      42      48      54
83          SQ       60
84          SE   1375.0 1375.53 1375.85 1376.11 1376.34 1376.56 1376.76 1376.95 1377.13 1377.30
85          SE   1377.5
            *

86          KK     RTE2
87          KO        5
88          RT        0       0       1
            *

89          KK        C
90          KO        5
91          BA   0.0206
92          PB     1.00
93          PC    0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
94          PC    0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
95          PC    0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
96          PC    0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
97          PC    0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
98          PC    0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
99          PC    0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
100         PC    0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
101         PC    0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
102         PC    0.982   0.985   0.988   0.991   0.994   0.997   1.000
```

```
103          LS       0       85       45
104          UD   0.200
             *
             *

105          KK   PONDC
106          KO       5
107          RS       1     ELEV  1372.0
108          SA    1.41     1.50     1.59     1.69
109          SE  1372.0   1373.0   1374.0   1375.0
110          SQ       0        8       16       24       32       40       48       56       64       72
111          SQ      80
112          SE  1372.0 1373.41 1374.16 1375.06 1376.25 1377.75 1379.89 1385.51 1392.09 1407.23
113          SE  1436.2
             *
             *

114          KK    RTE3
115          KO       5
116          RT       0        0        1
             *
             *
```


1

HEC-1 INPUT

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

117          KK       D
118          KO       5
119          BA  0.0152
120          PB    1.00
121          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
122          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
123          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
124          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
125          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
126          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
127          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
128          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
129          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
130          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
131          LS       0      85      45
132          UD   0.250
             *
             *
             *
             *
             *
```

```
133            KK    PONDD
134            KO        5
135            RS        1     ELEV  1365.0
136            SA     0.53     0.58    0.64    0.69
137            SE   1365.0   1365.0  3167.0  1368.0
138            SQ        0       10      20      30      40      50      60      70      80      90
139            SQ      100
140            SE   1365.0 1366.45 1367.19 1367.87 1368.20 1368.29 1368.37 1368.43 1368.49 1368.55
141            SE   1378.6
                    *
                    *
                    *
                    *
142            ZZ
```

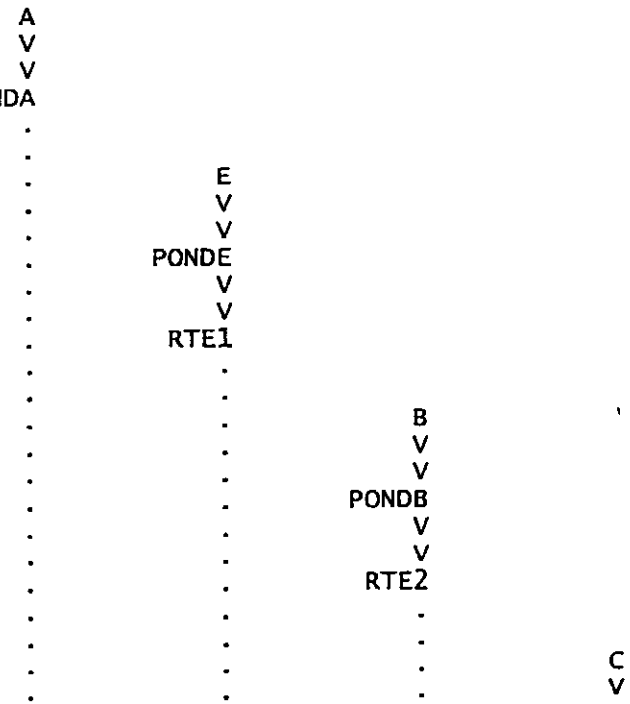
1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING (---->) DIVERSION OR PUMP FLOW

(.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW



```
                                                V
                                               PONDC
   105                                          V
                                                V
                                               RTE3
   114
                                                .
                                                .
   117                                          .          D
                                                .          V
                                                .          V
   133                                          .        PONDD
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*****************************************
 *                                       *
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *                JUN   1998             *
 *             VERSION 4.1               *
 *                                       *
 *                                       *
 *  RUN DATE   28SEP06  TIME  14:14:37   *
 *                                       *
 *                                       *
 *****************************************
*****************************************
```

```
*                                       *
*    U.S. ARMY CORPS OF                 *
*    HYDROLOGIC ENGINEERING             *
*         609 SECOND STREET             *
*       DAVIS, CALIFORNIA 95616         *
*           (916) 756-1104              *
*                                       *
```

HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
PROPOSED CONDITIONS - DETENTION BASINS ONLY
100-YEAR STORM - POST DEVELOPMENT

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

      IT          HYDROGRAPH TIME DATA
                         NMIN         15  MINUTES IN COMPUTATION INTERVAL
                        IDATE     27SEP 6  STARTING DATE
```

```
          ITIME        1200  STARTING TIME
             NQ         129  NUMBER OF HYDROGRAPH ORDINATES
         NDDATE      28SEP 6  ENDING DATE
         NDTIME        2000  ENDING TIME
          ICENT          19  CENTURY MARK

     COMPUTATION INTERVAL    .25 HOURS
          TOTAL TIME BASE  32.00 HOURS

  ENGLISH UNITS
     DRAINAGE AREA          SQUARE MILES
     PRECIPITATION DEPTH    INCHES
     LENGTH, ELEVATION      FEET
     FLOW                   CUBIC FEET PER SECOND
     STORAGE VOLUME         ACRE-FEET
     SURFACE AREA           ACRES
     TEMPERATURE            DEGREES FAHRENHEIT

JP        MULTI-PLAN OPTION
              NPLAN            1  NUMBER OF PLANS

JR        MULTI-RATIO OPTION
            RATIOS OF PRECIPITATION
           3.50      4.50      5.30      6.10      7.00      7.80

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 
*** ***

            **************
            *            *
  8 KK      *          A *
            *            *
            **************

  9 KO        OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          5  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 
*** ***
```

```
                  **************
                  *            *
   24 KK          *    PONDA   *
                  *            *
                  **************

   25 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5   PRINT CONTROL
                         IPLOT             5   PLOT CONTROL
                         QSCAL            0.   HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


                  **************
                  *            *
   33 KK          *        E   *
                  *            *
                  **************

   34 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5   PRINT CONTROL
                         IPLOT             5   PLOT CONTROL
                         QSCAL            0.   HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


                  **************
                  *            *
   49 KK          *    PONDE   *
                  *            *
                  **************

   50 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5   PRINT CONTROL
                         IPLOT             5   PLOT CONTROL
                         QSCAL            0.   HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** ***

          **************
          *            *
  58 KK   *     RTE1   *
          *            *
          **************

  59 KO         OUTPUT CONTROL VARIABLES
                      IPRNT              5  PRINT CONTROL
                      IPLOT              5  PLOT CONTROL
                      QSCAL             0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

          **************
          *            *
  61 KK   *         B  *
          *            *
          **************

  62 KO         OUTPUT CONTROL VARIABLES
                      IPRNT              5  PRINT CONTROL
                      IPLOT              5  PLOT CONTROL
                      QSCAL             0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

          **************
          *            *
  77 KK   *    PONDB   *
          *            *
          **************

  78 KO         OUTPUT CONTROL VARIABLES
                      IPRNT              5  PRINT CONTROL
                      IPLOT              5  PLOT CONTROL
                      QSCAL             0.  HYDROGRAPH PLOT SCALE
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

           **************
           *            *
  86 KK    *      RTE2  *
           *            *
           **************

  87 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

           **************
           *            *
  89 KK    *         C  *
           *            *
           **************

  90 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

           **************
           *            *
 105 KK    *     PONDC  *
           *            *
           **************

 106 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
```

```
              IPLOT              5  PLOT CONTROL
              QSCAL             0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 114 KK  *      RTE3  *
         *            *
         **************

 115 KO        OUTPUT CONTROL VARIABLES
              IPRNT              5  PRINT CONTROL
              IPLOT              5  PLOT CONTROL
              QSCAL             0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 117 KK  *         D  *
         *            *
         **************

 118 KO        OUTPUT CONTROL VARIABLES
              IPRNT              5  PRINT CONTROL
              IPLOT              5  PLOT CONTROL
              QSCAL             0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 133 KK  *     PONDD  *
         *            *
         **************
```

134 KO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	5	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 3.50	RATIO 2 4.50	RATIO 3 5.30	RATIO 4 6.10	RATIO 5 7.00	RATIO 6 7.80
HYDROGRAPH AT										
+	A	.01	1	FLOW	19.	26.	32.	38.	44.	50.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDA	.01	1	FLOW	13.	19.	24.	29.	35.	40.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
			** PEAK STAGES IN FEET **							
			1	STAGE	1388.80	1389.00	1389.13	1389.26	1389.38	1389.48
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
HYDROGRAPH AT										
+	E	.01	1	FLOW	18.	25.	31.	36.	43.	49.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDE	.01	1	FLOW	11.	13.	15.	17.	19.	20.
				TIME	12.25	12.50	12.50	12.50	12.50	12.50
			** PEAK STAGES IN FEET **							
			1	STAGE	1373.88	1374.34	1374.75	1375.15	1375.58	1375.96
				TIME	12.25	12.50	12.50	12.50	12.50	12.50
ROUTED TO										
+	RTE1	.01	1	FLOW	11.	13.	15.	17.	19.	20.
				TIME	12.50	12.75	12.75	12.75	12.75	12.75
HYDROGRAPH AT										
+	B	.02	1	FLOW	27.	36.	43.	51.	59.	67.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00

ROUTED TO										
+	PONDB	.02	1	FLOW	22.	30.	36.	43.	50.	56.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
			** PEAK STAGES IN FEET **							
			1	STAGE	1376.26	1376.55	1376.77	1376.97	1377.18	1377.37
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
ROUTED TO										
+	RTE2	.02	1	FLOW	22.	30.	36.	43.	50.	56.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
HYDROGRAPH AT										
+	C	.02	1	FLOW	27.	37.	45.	53.	62.	69.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDC	.02	1	FLOW	5.	7.	9.	12.	14.	17.
				TIME	12.75	12.75	12.75	12.75	12.75	12.75
			** PEAK STAGES IN FEET **							
			1	STAGE	1372.93	1373.26	1373.51	1373.75	1374.01	1374.23
				TIME	12.75	12.75	12.75	12.75	12.75	12.75
ROUTED TO										
+	RTE3	.02	1	FLOW	5.	7.	9.	12.	14.	17.
				TIME	13.00	13.00	13.00	13.00	13.00	13.00
HYDROGRAPH AT										
+	D	.02	1	FLOW	17.	23.	28.	33.	38.	43.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDD	.02	1	FLOW	8.	11.	15.	18.	22.	26.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
			** PEAK STAGES IN FEET **							
			1	STAGE	1366.13	1366.53	1366.81	1367.07	1367.36	1367.61
				TIME	12.50	12.50	12.50	12.50	12.50	12.50

*** NORMAL END OF HEC-1 ***

```
1*****************************************
*****************************************
 *                                       *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
ENGINEERS      *
 *                JUN   1998             *
CENTER     *
 *             VERSION 4.1               *
      *
 *                                       *
      *
 *  RUN DATE   28SEP06  TIME  15:32:35   *
      *
 *                                       *
      *
 *****************************************
*****************************************
```

```
*
*    U.S. ARMY CORPS OF
*    HYDROLOGIC ENGINEERING
*         609 SECOND STREET
*       DAVIS, CALIFORNIA 95616
*          (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
```

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

1 HEC-1 INPUT PAGE 1

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

```
                1  ID
                2  ID      100-YEAR, 24-HOUR STORM
*** LIST ***
*** FREE ***
                   *DIAGRAM
                3  IT      15 06SEP06    1200        0 06SEP06    2000
                4  IN      15 06SEP06    1200
                5  IO       0         5
                6  JR    PREC      3.5      4.5      5.3      6.1      7.0      7.8
                   *
                   *
                   *
                   *

                7  KK        A
                8  KO        5
                   *
                   *      34.55 ACRES
                   *
                9  BA   0.0540
               10  PB     1.00
               11  PC   0.0000   0.1446   0.2449   0.3146   0.3741   0.4259   0.4694   0.5060   0.5363   0.5638
               12  PC   0.5882   0.6096   0.6293   0.6485   0.6647   0.6803   0.6961   0.7107   0.7219   0.7351
               13  PC   0.7455   0.7560   0.7670   0.7758   0.7823   0.7901   0.7959   0.8036   0.8095   0.8138
               14  PC   0.8206   0.8260   0.8299   0.8372   0.8384   0.8433   0.8520   0.8582   0.8635   0.8678
               15  PC   0.8730   0.8774   0.8810   0.8857   0.8896   0.8929   0.8997   0.9059   0.9116   0.9167
               16  PC   0.9212   0.9252   0.9286   0.9314   0.9337   0.9380   0.9418   0.9452   0.9508   0.9560
               17  PC   0.9609   0.9654   0.9695   0.9732   0.9766   0.9795   0.9821   0.9875   0.9926   0.9974
               18  PC   0.9987   0.9995   1.0000
               19  LS        0       85        0
               20  UD     0.38
                   *
                   *
                   *

               21  KK        B
               22  KO        5
                   *
                   *      87.14 ACRES
                   *
               23  BA   0.1261
               24  PB     1.00
               25  PC   0.0000   0.1446   0.2449   0.3146   0.3741   0.4259   0.4694   0.5060   0.5363   0.5638
               26  PC   0.5882   0.6096   0.6293   0.6485   0.6647   0.6803   0.6961   0.7107   0.7219   0.7351
               27  PC   0.7455   0.7560   0.7670   0.7758   0.7823   0.7901   0.7959   0.8036   0.8095   0.8138
               28  PC   0.8206   0.8260   0.8299   0.8372   0.8384   0.8433   0.8520   0.8582   0.8635   0.8678
               29  PC   0.8730   0.8774   0.8810   0.8857   0.8896   0.8929   0.8997   0.9059   0.9116   0.9167
               30  PC   0.9212   0.9252   0.9286   0.9314   0.9337   0.9380   0.9418   0.9452   0.9508   0.9560
```

```
31        PC  0.9609  0.9654  0.9695  0.9732  0.9766  0.9795  0.9821  0.9875  0.9926  0.9974
32        PC  0.9987  0.9995  1.0000
33        LS       0      85       0
34        UD    0.47
          *
          *
```

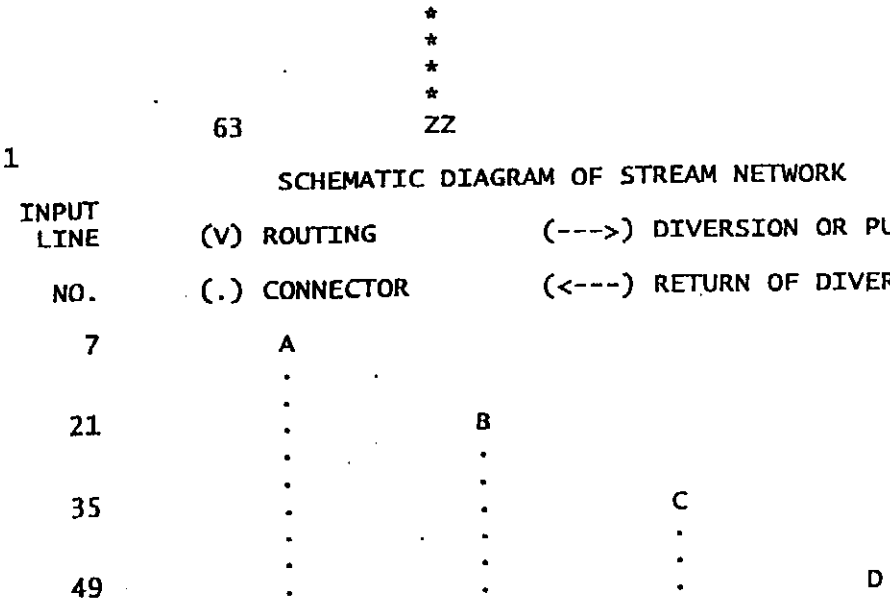

1

HEC-1 INPUT

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

35        KK       C
36        KO       5
          *
          *     3.33 ACRES
          *
37        BA  0.0052
38        PB    1.00
39        PC  0.0000  0.1446  0.2449  0.3146  0.3741  0.4259  0.4694  0.5060  0.5363  0.5638
40        PC  0.5882  0.6096  0.6293  0.6485  0.6647  0.6803  0.6961  0.7107  0.7219  0.7351
41        PC  0.7455  0.7560  0.7670  0.7758  0.7823  0.7901  0.7959  0.8036  0.8095  0.8138
42        PC  0.8206  0.8260  0.8299  0.8372  0.8384  0.8433  0.8520  0.8582  0.8635  0.8678
43        PC  0.8730  0.8774  0.8810  0.8857  0.8896  0.8929  0.8997  0.9059  0.9116  0.9167
44        PC  0.9212  0.9252  0.9286  0.9314  0.9337  0.9380  0.9418  0.9452  0.9508  0.9560
45        PC  0.9609  0.9654  0.9695  0.9732  0.9766  0.9795  0.9821  0.9875  0.9926  0.9974
46        PC  0.9987  0.9995  1.0000
47        LS       0      85       0
48        UD    0.39
          *
          *

49        KK       D
50        KO       5
          *
          *     29.45 ACRES
          *
51        BA  0.0460
52        PB    1.00
53        PC  0.0000  0.1446  0.2449  0.3146  0.3741  0.4259  0.4694  0.5060  0.5363  0.5638
54        PC  0.5882  0.6096  0.6293  0.6485  0.6647  0.6803  0.6961  0.7107  0.7219  0.7351
55        PC  0.7455  0.7560  0.7670  0.7758  0.7823  0.7901  0.7959  0.8036  0.8095  0.8138
56        PC  0.8206  0.8260  0.8299  0.8372  0.8384  0.8433  0.8520  0.8582  0.8635  0.8678
57        PC  0.8730  0.8774  0.8810  0.8857  0.8896  0.8929  0.8997  0.9059  0.9116  0.9167
58        PC  0.9212  0.9252  0.9286  0.9314  0.9337  0.9380  0.9418  0.9452  0.9508  0.9560
59        PC  0.9609  0.9654  0.9695  0.9732  0.9766  0.9795  0.9821  0.9875  0.9926  0.9974
60        PC  0.9987  0.9995  1.0000
61        LS       0      85       0
62        UD    0.62
```



1

FLOOD HYDROGRAPH PACKAGE (HEC-1)

JUN 1998

VERSION 4.1

RUN DATE 28SEP06 TIME 15:32:35

U.S. ARMY CORPS OF ENGINEERS

HYDROLOGIC ENGINEERING CENTER

609 SECOND STREET

DAVIS, CALIFORNIA 95616

(916) 756-1104

```
                    100-YEAR, 24-HOUR STORM

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

   IT         HYDROGRAPH TIME DATA
                    NMIN         15  MINUTES IN COMPUTATION INTERVAL
                   IDATE     6SEP 6  STARTING DATE
                   ITIME       1200  STARTING TIME
                      NQ         33  NUMBER OF HYDROGRAPH ORDINATES
                  NDDATE     6SEP 6  ENDING DATE
                  NDTIME       2000  ENDING TIME
                   ICENT         19  CENTURY MARK

               COMPUTATION INTERVAL     .25 HOURS
                    TOTAL TIME BASE    8.00 HOURS

          ENGLISH UNITS
              DRAINAGE AREA          SQUARE MILES
              PRECIPITATION DEPTH    INCHES
              LENGTH, ELEVATION      FEET
              FLOW                   CUBIC FEET PER SECOND
              STORAGE VOLUME         ACRE-FEET
              SURFACE AREA           ACRES
              TEMPERATURE            DEGREES FAHRENHEIT

   JP         MULTI-PLAN OPTION
                   NPLAN          1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                 RATIOS OF PRECIPITATION
                3.50     4.50     5.30     6.10     7.00     7.80

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** 
*** ***

              **************
              *            *
 7 KK         *      A     *
              *            *
              **************

 8 KO         OUTPUT CONTROL VARIABLES
```

```
                IPRNT          5  PRINT CONTROL
                IPLOT          5  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 21 KK   *      B     *
         *            *
         **************

 22 KO       OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          5  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 35 KK   *      C     *
         *            *
         **************

 36 KO       OUTPUT CONTROL VARIABLES
                IPRNT          5  PRINT CONTROL
                IPLOT          5  PLOT CONTROL
                QSCAL         0.  HYDROGRAPH PLOT SCALE

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

         **************
         *            *
 49 KK   *      D     *
         *            *
```

****

50 KO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	5	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6
					3.50	4.50	5.30	6.10	7.00	7.80
HYDROGRAPH AT										
+	A	.05	1	FLOW	20.	30.	39.	48.	58.	68.
				TIME	1.50	1.25	1.25	1.25	1.00	1.00
HYDROGRAPH AT										
+	B	.13	1	FLOW	46.	68.	87.	108.	131.	153.
				TIME	1.50	1.50	1.25	1.25	1.25	1.25
HYDROGRAPH AT										
+	C	.01	1	FLOW	2.	3.	4.	5.	6.	7.
				TIME	1.50	1.25	1.25	1.25	1.00	1.00
HYDROGRAPH AT										
+	D	.05	1	FLOW	16.	23.	30.	37.	45.	52.
				TIME	1.75	1.50	1.50	1.50	1.50	1.50

*** NORMAL END OF HEC-1 ***

```
1*****************************************
*****************************************
 *                                       *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
ENGINEERS      *
 *                JUN   1998             *
CENTER     *
 *              VERSION 4.1              *
      *
 *                                       *
      *
 *   RUN DATE   02OCT06  TIME  09:24:41   *
      *
 *                                       *
      *
 *****************************************
*****************************************
```

```
*
*    U.S. ARMY CORPS OF
*    HYDROLOGIC ENGINEERING
*         609 SECOND STREET
*       DAVIS, CALIFORNIA 95616
*          (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
```

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

1 HEC-1 INPUT PAGE 1

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

```
*** LIST ***
*** FREE ***

             1  ID      HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
             2  ID      PROPOSED CONDITIONS - DETENTION BASINS ONLY
             3  ID      100-YEAR STORM - POST DEVELOPMENT

                *DIAGRAM
             4  IT      15 27SEP06    1200       0 28SEP06    2000
             5  IN      15 27SEP06    1200
             6  IO       0       5
             7  JR    PREC     3.5     4.5     5.3     6.1     7.0     7.8
                *
                *

             8  KK       A
             9  KO       5
            10  BA  0.0149
            11  PB    1.00
            12  PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
            13  PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
            14  PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
            15  PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
            16  PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
            17  PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
            18  PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
            19  PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
            20  PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
            21  PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
            22  LS       0      85      40
            23  UD   0.200
                *
                *
                *

            24  KK   PONDA
            25  KO       5
            26  RS       1    ELEV  1388.0
            27  SA    0.50    0.61    0.72    0.84
            28  SE  1388.0  1389.0  1390.0  1391.0
            29  SQ       0     1.8     5.7    11.5    19.2    29.1    41.1    55.4    72.1    91.3
            30  SQ   113.1
            31  SE  1388.0 1388.25 1388.50 1388.75 1389.00 1389.25 1389.50 1389.75 1390.00 1390.30
            32  SE  1390.5
                *
                *

            33  KK       E
            34  KO       5
            35  BA  0.0150
```

```
36          PB    1.00
37          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
38          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
39          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
40          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
41          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
42          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
```


1

HEC-1 INPUT

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

43          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
44          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
45          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
46          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
47          LS       0      85      50
48          UD   0.250
            *
            *
            *
            *

49          KK   PONDE
50          KO       5
51          RS       1    ELEV  1365.0
52          SA    0.30    0.38    0.47    0.57
53          SE  1373.0  1374.0  1375.0  1376.0
54          SQ       0     3.7     8.2    10.1    11.6    13.0    14.3    15.4    16.5    17.5
55          SQ    18.4    19.3    20.2    21.0    21.8    22.6    23.3
56          SE  1373.0 1373.25 1373.50 1373.75 1374.00 1374.25 1374.50 1374.75 1375.00 1375.30
57          SE  1375.5 1375.75 1376.00 1376.25 1376.50 1376.75 1377.00
            *
            *
            *

58          KK    RTE1
59          KO       5
60          RT       0       0       1
            *
            *
            *

61          KK       B
62          KO       5
63          BA  0.0197
64          PB    1.00
65          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
66          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
```

```
 67          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 68          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
 69          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
 70          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
 71          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
 72          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
 73          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
 74          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
 75          LS       0      85      50
 76          UD   0.200
             *
             *
             *
```



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

 77          KK   PONDB
 78          KO       5
 79          RS       1    ELEV  1367.0
 80          SA    0.25    0.32    0.40    0.49
 81          SE  1375.0  1376.0  1377.0  1378.0
 82          SQ       0       6      12      18      24      30      36      42      48      54
 83          SQ      60
 84          SE  1375.0 1375.53 1375.85 1376.11 1376.34 1376.56 1376.76 1376.95 1377.13 1377.30
 85          SE  1377.5
             *

 86          KK    RTE2
 87          KO       5
 88          RT       0       0       1
             *

 89          KK       C
 90          KO       5
 91          BA  0.0320
 92          PB    1.00
 93          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
 94          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
 95          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
 96          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
 97          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
 98          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
 99          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
100          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
101          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
102          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
```

```
103          LS       0      85       45
104          UD   0.200
             *
             *

105          KK    PONDC
106          KO        5
107          RS        1    ELEV  1372.0
108          SA     1.41    1.50    1.59    1.69
109          SE   1372.0  1373.0  1374.0  1375.0
110          SQ        0       8      16      24      32      40      48      56      64      72
111          SQ       80
112          SE   1372.0 1373.41 1374.16 1375.06 1376.25 1377.75 1379.89 1385.51 1392.09 1407.23
113          SE   1436.2
             *
             *

114          KK     RTE3
115          KO        5
116          RT        0       0       1
             *
             *
```



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

117          KK        D
118          KO        5
119          BA   0.0152
120          PB     1.00
121          PC    0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
122          PC    0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
123          PC    0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
124          PC    0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
125          PC    0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
126          PC    0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
127          PC    0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
128          PC    0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
129          PC    0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
130          PC    0.982   0.985   0.988   0.991   0.994   0.997   1.000
131          LS        0      85      45
132          UD    0.250
             *
             *
             *
             *
             *
```

```
133            KK    PONDD
134            KO        5
135            RS        1     ELEV  1365.0
136            SA     0.53     0.58    0.64    0.69
137            SE   1365.0   1365.0  3167.0  1368.0
138            SQ        0       10      20      30      40      50      60      70      80      90
139            SQ      100
140            SE   1365.0 1366.45 1367.19 1367.87 1368.20 1368.29 1368.37 1368.43 1368.49 1368.55
141            SE   1378.6
               *
               *
               *
               *
142            ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING           (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR         (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8           A
                 V
                 V
    24       PONDA
                 .
                 .
    33           .            E
                 .            V
                 .            V
    49           .        PONDE
                 .            V
                 .            V
    58           .         RTE1
                 .            .
                 .            .
    61           .            .            B
                 .            .            V
                 .            .            V
    77           .            .       PONDB
                 .            .            V
                 .            .            V
    86           .            .        RTE2
                 .            .            .
                 .            .            .
    89           .            .            .            C
                 .            .            .            V
```

```
                .           .           .          V
   105          .           .           .       PONDC
                .           .           .          V
                .           .           .          V
   114          .           .           .       RTE3
                .           .           .          .
                .           .           .          .
   117          .           .           .          .          D
                .           .           .          .          V
                .           .           .          .          V
   133          .           .           .          .       PONDD

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1**************************************
**************************************
 *                                    *                                    *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                    *    U.S. ARMY CORPS OF
ENGINEERS      *
 *                JUN   1998            *                                    *    HYDROLOGIC ENGINEERING
CENTER     *
 *             VERSION 4.1              *                                    *         609 SECOND STREET
      *
 *                                    *                                    *       DAVIS, CALIFORNIA 95616
      *
 *  RUN DATE   02OCT06  TIME  09:24:41   *                                    *          (916) 756-1104
      *
 *                                    *                                    *
      *
 **************************************
**************************************
```

HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
PROPOSED CONDITIONS - DETENTION BASINS ONLY
100-YEAR STORM - POST DEVELOPMENT

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

      IT          HYDROGRAPH TIME DATA
                        NMIN         15  MINUTES IN COMPUTATION INTERVAL
                       IDATE     27SEP 6  STARTING DATE
```

```
                    ITIME        1200  STARTING TIME
                       NQ         129  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      28SEP 6  ENDING DATE
                   NDTIME        2000  ENDING TIME
                    ICENT          19  CENTURY MARK

          COMPUTATION INTERVAL     .25 HOURS
               TOTAL TIME BASE   32.00 HOURS

     ENGLISH UNITS
          DRAINAGE AREA          SQUARE MILES
          PRECIPITATION DEPTH    INCHES
          LENGTH, ELEVATION      FEET
          FLOW                   CUBIC FEET PER SECOND
          STORAGE VOLUME         ACRE-FEET
          SURFACE AREA           ACRES
          TEMPERATURE            DEGREES FAHRENHEIT

 JP          MULTI-PLAN OPTION
                   NPLAN          1  NUMBER OF PLANS

 JR          MULTI-RATIO OPTION
               RATIOS OF PRECIPITATION
               3.50      4.50      5.30      6.10      7.00      7.80


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


         **************
         *            *
  8 KK   *      A     *
         *            *
         **************

  9 KO       OUTPUT CONTROL VARIABLES
                   IPRNT          5  PRINT CONTROL
                   IPLOT          5  PLOT CONTROL
                   QSCAL         0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***
```

```
                 **************
                 *            *
  24 KK          *    PONDA   *
                 *            *
                 **************

  25 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

                 **************
                 *            *
  33 KK          *        E   *
                 *            *
                 **************

  34 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

                 **************
                 *            *
  49 KK          *    PONDE   *
                 *            *
                 **************

  50 KO          OUTPUT CONTROL VARIABLES
                         IPRNT             5  PRINT CONTROL
                         IPLOT             5  PLOT CONTROL
                         QSCAL            0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
*** ***

          **************
          *            *
 58 KK    *      RTE1  *
          *            *
          **************

 59 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5   PRINT CONTROL
                      IPLOT          5   PLOT CONTROL
                      QSCAL         0.   HYDROGRAPH PLOT SCALE

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

          **************
          *            *
 61 KK    *         B  *
          *            *
          **************

 62 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5   PRINT CONTROL
                      IPLOT          5   PLOT CONTROL
                      QSCAL         0.   HYDROGRAPH PLOT SCALE

 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

          **************
          *            *
 77 KK    *     PONDB  *
          *            *
          **************

 78 KO         OUTPUT CONTROL VARIABLES
                      IPRNT          5   PRINT CONTROL
                      IPLOT          5   PLOT CONTROL
                      QSCAL         0.   HYDROGRAPH PLOT SCALE
```

```
 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

               **************
               *            *
  86 KK        *      RTE2  *
               *            *
               **************

  87 KO             OUTPUT CONTROL VARIABLES
                          IPRNT             5  PRINT CONTROL
                          IPLOT             5  PLOT CONTROL
                          QSCAL            0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

               **************
               *            *
  89 KK        *         C  *
               *            *
               **************

  90 KO             OUTPUT CONTROL VARIABLES
                          IPRNT             5  PRINT CONTROL
                          IPLOT             5  PLOT CONTROL
                          QSCAL            0.  HYDROGRAPH PLOT SCALE


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

               **************
               *            *
 105 KK        *     PONDC  *
               *            *
               **************

 106 KO             OUTPUT CONTROL VARIABLES
                          IPRNT             5  PRINT CONTROL
```

```
                    IPLOT               5  PLOT CONTROL
                    QSCAL              0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


              **************
              *            *
 114 KK       *     RTE3   *
              *            *
              **************

 115 KO           OUTPUT CONTROL VARIABLES
                    IPRNT               5  PRINT CONTROL
                    IPLOT               5  PLOT CONTROL
                    QSCAL              0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


              **************
              *            *
 117 KK       *          D *
              *            *
              **************

 118 KO           OUTPUT CONTROL VARIABLES
                    IPRNT               5  PRINT CONTROL
                    IPLOT               5  PLOT CONTROL
                    QSCAL              0.  HYDROGRAPH PLOT SCALE


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***


              **************
              *            *
 133 KK       *    PONDD   *
              *            *
              **************
```

134 KO OUTPUT CONTROL VARIABLES

IPRNT	5	PRINT CONTROL
IPLOT	5	PLOT CONTROL
QSCAL	0.	HYDROGRAPH PLOT SCALE

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1 3.50	RATIO 2 4.50	RATIO 3 5.30	RATIO 4 6.10	RATIO 5 7.00	RATIO 6 7.80
HYDROGRAPH AT										
+	A	.01	1	FLOW	19.	26.	32.	38.	44.	50.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDA	.01	1	FLOW	13.	19.	24.	29.	35.	40.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
			** PEAK STAGES IN FEET **							
			1	STAGE	1388.80	1389.00	1389.13	1389.26	1389.38	1389.48
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
HYDROGRAPH AT										
+	E	.01	1	FLOW	17.	23.	28.	33.	38.	43.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDE	.01	1	FLOW	12.	14.	16.	17.	19.	20.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
			** PEAK STAGES IN FEET **							
			1	STAGE	1373.99	1374.48	1374.87	1375.25	1375.66	1376.01
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
ROUTED TO										
+	RTE1	.01	1	FLOW	12.	14.	16.	17.	19.	20.
				TIME	12.75	12.75	12.75	12.75	12.75	12.75
HYDROGRAPH AT										
+	B	.02	1	FLOW	27.	36.	43.	51.	59.	67.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00

ROUTED TO										
+	PONDB	.02	1	FLOW	22.	30.	36.	43.	50.	56.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
			** PEAK STAGES IN FEET **							
			1	STAGE	1376.26	1376.55	1376.77	1376.97	1377.18	1377.37
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
ROUTED TO										
+	RTE2	.02	1	FLOW	22.	30.	36.	43.	50.	56.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
HYDROGRAPH AT										
+	C	.03	1	FLOW	42.	57.	70.	82.	96.	108.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDC	.03	1	FLOW	8.	13.	17.	20.	23.	26.
				TIME	12.75	12.75	12.75	12.75	12.75	12.75
			** PEAK STAGES IN FEET **							
			1	STAGE	1373.43	1373.87	1374.22	1374.57	1374.96	1375.30
				TIME	12.75	12.75	12.75	12.75	12.75	12.75
ROUTED TO										
+	RTE3	.03	1	FLOW	8.	13.	17.	20.	23.	26.
				TIME	13.00	13.00	13.00	13.00	13.00	13.00
HYDROGRAPH AT										
+	D	.02	1	FLOW	17.	23.	28.	33.	38.	43.
				TIME	12.00	12.00	12.00	12.00	12.00	12.00
ROUTED TO										
+	PONDD	.02	1	FLOW	8.	11.	15.	18.	22.	26.
				TIME	12.50	12.50	12.50	12.50	12.50	12.50
			** PEAK STAGES IN FEET **							
			1	STAGE	1366.13	1366.53	1366.81	1367.07	1367.36	1367.61
				TIME	12.50	12.50	12.50	12.50	12.50	12.50

*** NORMAL END OF HEC-1 ***

```
1****************************************
****************************************
 *                                      *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
ENGINEERS      *
 *                JUN   1998            *
CENTER     *
 *             VERSION 4.1              *
      *
 *                                      *
      *
 *  RUN DATE   28SEP06  TIME  17:27:47  *
      *
 *                                      *
      *
 ****************************************
****************************************
```

```
*
*    U.S. ARMY CORPS OF
*    HYDROLOGIC ENGINEERING
*         609 SECOND STREET
*       DAVIS, CALIFORNIA 95616
*          (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
```

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

1 HEC-1 INPUT PAGE 1

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

```
*** LIST ***
*** FREE ***

*DIAGRAM
ID      HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
ID      PROPOSED CONDITIONS - DETENTION BASIN F ONLY
ID      100-YEAR 24-HOUR STORM - POST DEVELOPMENT
IT      15 27SEP06    1200       0 28SEP06    2000
IN      15 27SEP06    1200
IO       0        4
JR    PREC     3.5     4.5     7.8
*
*
*
*
KK       F
KO       5
BA  0.0330
PB    1.00
PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022    0.02
PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056    0.06
PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100    0.10
PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163    0.17
PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663    0.69
PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835    0.84
PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898    0.90
PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943    0.94
PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976    0.97
PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
LS       0      85      20
UD  0.250
*
*
KK   PONDF
KO       5
RS       1    ELEV  1370.5
SA    0.42    0.45    0.50    0.86    1.00
SE  1370.5  1371.0  1372.0  1374.0  1375.0
SQ       0     5.0    10.0    15.0    20.0    25.0    30.0    35.0    40.0    45.0
SQ    60.0    65.0
SE  1370.5 1370.60 1370.66 1370.74 1370.92 1371.16 1371.45 1371.80 1372.20 1372.65
SE  1373.5 1374.77
*
*
*
ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE NO.

(V) ROUTING
(.) CONNECTOR
(--->) DIVERSION OR PUMP FLOW
(<---) RETURN OF DIVERTED OR PUMPED FLOW

```
    8           F
                V
                V
   24         PONDF
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*****************************************
 *                                       *                                       *
     *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                                       *    U.S. ARMY CORPS OF
ENGINEERS     *
 *                JUN   1998             *                                       *    HYDROLOGIC ENGINEERING
CENTER     *
 *             VERSION 4.1               *                                       *          609 SECOND STREET
     *
 *                                       *                                       *       DAVIS, CALIFORNIA 95616
     *
 *  RUN DATE   28SEP06  TIME  17:27:47   *                                       *           (916) 756-1104
     *
 *                                       *                                       *
     *
 *****************************************
*****************************************
```

HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
PROPOSED CONDITIONS - DETENTION BASIN F ONLY
100-YEAR 24-HOUR STORM - POST DEVELOPMENT

```
   6 IO          OUTPUT CONTROL VARIABLES
                      IPRNT           0  PRINT CONTROL
                      IPLOT           4  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT           HYDROGRAPH TIME DATA
                       NMIN          15  MINUTES IN COMPUTATION INTERVAL
                      IDATE     27SEP 6  STARTING DATE
                      ITIME        1200  STARTING TIME
```

```
                NQ         129  NUMBER OF HYDROGRAPH ORDINATES
            NDDATE     28SEP 6  ENDING DATE
            NDTIME        2000  ENDING TIME
             ICENT          19  CENTURY MARK

          COMPUTATION INTERVAL     .25 HOURS
               TOTAL TIME BASE   32.00 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

  JP          MULTI-PLAN OPTION
                    NPLAN           1  NUMBER OF PLANS

  JR          MULTI-RATIO OPTION
                  RATIOS OF PRECIPITATION
                 3.50      4.50      7.80

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

        **************
        *            *
  8 KK  *          F *
        *            *
        **************

  9 KO        OUTPUT CONTROL VARIABLES
                    IPRNT           5  PRINT CONTROL
                    IPLOT           4  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

        **************
```

```
          *             *
 24 KK    *    PONDF    *
          *             *
          ***************
```

```
 25 KO          OUTPUT CONTROL VARIABLES
                     IPRNT          5  PRINT CONTROL
                     IPLOT          4  PLOT CONTROL
                     QSCAL          0.  HYDROGRAPH PLOT SCALE
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					3.50	4.50	7.80
HYDROGRAPH AT							
+	F	.03	1	FLOW	32.	46.	90.
				TIME	12.00	12.00	12.00
ROUTED TO							
+	PONDF	.03	1	FLOW	28.	35.	60.
				TIME	12.25	12.25	12.50
			** PEAK STAGES IN FEET **				
			1	STAGE	1371.31	1371.82	1373.56
				TIME	12.25	12.25	12.50

*** NORMAL END OF HEC-1 ***

```
1*****************************************
*****************************************
 *                                       *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
ENGINEERS      *
 *                JUN   1998             *
CENTER     *
 *             VERSION 4.1               *
      *
 *                                       *
      *
 *  RUN DATE   28SEP06  TIME  15:23:55   *
      *
 *                                       *
      *
 *****************************************
*****************************************
```

```
*
*    U.S. ARMY CORPS OF
*    HYDROLOGIC ENGINEERING
*         609 SECOND STREET
*       DAVIS, CALIFORNIA 95616
*          (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
```

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

1 HEC-1 INPUT PAGE 1

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

```
                1          ID      HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
                2          ID      PROPOSED CONDITIONS - DETENTION BASIN G ONLY
                3          ID      100-YEAR STORM - POST DEVELOPMENT
*** LIST ***
*** FREE ***
                           *DIAGRAM
                4          IT      15 27SEP06    1200        0 28SEP06    2000
                5          IN      15 27SEP06    1200
                6          IO       0        5
                7          JR    PREC     3.5     4.5     5.3     6.1     7.0     7.8
                           *
                           *
                           *

                8          KK       G
                9          KO       5
               10          BA  0.0580
               11          PB    1.00
               12          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
               13          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
               14          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
               15          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
               16          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
               17          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
               18          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
               19          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
               20          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
               21          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
               22          LS       0      85      46
               23          UD   0.250
                           *
                           *
               24          ZZ
1
                    SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE       (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.       (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8           G

  (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                      *
      *
 *    FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *                                      *    U.S. ARMY CORPS OF
```

```
ENGINEERS      *                                                            *    HYDROLOGIC ENGINEERING
 *          JUN    1998              *
CENTER     *                                                                *        609 SECOND STREET
 *         VERSION 4.1               *
     *                                                                      *      DAVIS, CALIFORNIA 95616
 *                                   *
     *                                                                      *         (916) 756-1104
 *  RUN DATE   28SEP06  TIME  15:23:55  *
     *                                                                      *
 *                                   *
     *
 ******************************************
***************************************
```

```
                         HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
                         PROPOSED CONDITIONS - DETENTION BASIN G ONLY
                         100-YEAR STORM - POST DEVELOPMENT

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

    IT         HYDROGRAPH TIME DATA
                      NMIN          15  MINUTES IN COMPUTATION INTERVAL
                     IDATE     27SEP 6  STARTING DATE
                     ITIME        1200  STARTING TIME
                        NQ         129  NUMBER OF HYDROGRAPH ORDINATES
                    NDDATE     28SEP 6  ENDING DATE
                    NDTIME        2000  ENDING TIME
                     ICENT          19  CENTURY MARK

                COMPUTATION INTERVAL     .25 HOURS
                     TOTAL TIME BASE   32.00 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT
```

```
JP          MULTI-PLAN OPTION
                  NPLAN            1  NUMBER OF PLANS

JR          MULTI-RATIO OPTION
                RATIOS OF PRECIPITATION
               3.50      4.50      5.30      6.10      7.00      7.80


 *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
*** ***

           **************
           *            *
  8 KK     *          G *
           *            *
           **************

  9 KO          OUTPUT CONTROL VARIABLES
                      IPRNT            5  PRINT CONTROL
                      IPLOT            5  PLOT CONTROL
                      QSCAL           0.  HYDROGRAPH PLOT SCALE
1

            PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
                          FLOWS IN CUBIC FEET PER SECOND,  AREA IN SQUARE MILES
                                     TIME TO PEAK IN HOURS

                                                              RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN             RATIO 1  RATIO 2  RATIO 3  RATIO 4  RATIO 5  RATIO 6
                                                         3.50     4.50     5.30     6.10     7.00     7.80

 HYDROGRAPH AT
+                    G        .06      1    FLOW          64.      87.     106.     125.     146.     165.
                                            TIME        12.00    12.00    12.00    12.00    12.00    12.00


 *** NORMAL END OF HEC-1 ***
```

```
1*****************************************
*****************************************
 *                                       *                    *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *                    *    U.S. ARMY CORPS OF
ENGINEERS      *
 *                JUN   1998             *                    *    HYDROLOGIC ENGINEERING
CENTER     *
 *             VERSION 4.1               *                    *         609 SECOND STREET
      *
 *                                       *                    *       DAVIS, CALIFORNIA 95616
      *
 *   RUN DATE   02OCT06  TIME  09:29:59  *                    *          (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
```

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

1 HEC-1 INPUT PAGE 1

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

```
*** LIST ***
*** FREE ***

 1          ID      HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
 2          ID      PROPOSED CONDITIONS - DETENTION BASIN H ONLY
 3          ID      100-YEAR STORM - POST DEVELOPMENT

            *DIAGRAM
 4          IT      15 27SEP06    1200       0 28SEP06    2000
 5          IN      15 27SEP06    1200
 6          IO       0       5
 7          JR    PREC     3.5     4.5     5.3     6.1     7.0     7.8
                  *
                  *
                  *
                  *
                  *

 8          KK       H
 9          KO       5
10          BA  0.0544
11          PB    1.00
12          PC   0.000   0.003   0.006   0.008   0.011   0.014   0.017   0.019   0.022   0.025
13          PC   0.029   0.032   0.035   0.038   0.042   0.045   0.048   0.052   0.056   0.060
14          PC   0.064   0.068   0.072   0.076   0.080   0.085   0.090   0.095   0.100   0.105
15          PC   0.110   0.115   0.120   0.127   0.134   0.140   0.147   0.155   0.163   0.172
16          PC   0.181   0.193   0.204   0.220   0.235   0.259   0.283   0.387   0.663   0.699
17          PC   0.735   0.754   0.772   0.786   0.799   0.810   0.820   0.828   0.835   0.843
18          PC   0.850   0.858   0.865   0.873   0.880   0.885   0.889   0.894   0.898   0.903
19          PC   0.907   0.912   0.916   0.921   0.925   0.929   0.934   0.938   0.943   0.947
20          PC   0.952   0.955   0.958   0.961   0.964   0.967   0.970   0.973   0.976   0.979
21          PC   0.982   0.985   0.988   0.991   0.994   0.997   1.000
22          LS       0      85      45
23          UD   0.300
                  *
                  *
                  *
                  *

24          KK   PONDH
25          KO       5
26          RS       1    ELEV  1365.0
27          SA    0.50    2.00    3.00
28          SE  1365.0  1366.0  1372.0
29          SQ       0       6      12      18      24      30      36      42      48      54
30          SQ      60
31          SE  1364.5 1365.88 1366.92 1368.55 1370.78 1375.05 1375.17 1375.26 1375.33 1375.40
32          SE  1375.5
                  *
                  *
```

```
            33          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW
   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

     8           H
                 V
                 V
    24         PONDH

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                              *
      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                              *    U.S. ARMY CORPS OF
ENGINEERS     *
 *                JUN   1998            *                              *    HYDROLOGIC ENGINEERING
CENTER    *
 *             VERSION 4.1              *                              *         609 SECOND STREET
      *
 *                                      *                              *       DAVIS, CALIFORNIA 95616
      *
 *  RUN DATE   02OCT06  TIME  09:29:59  *                              *           (916) 756-1104
      *
 *                                      *                              *
      *
 ****************************************
****************************************
```

HEC-1 ANALYSIS FOR OAK CREEK W/ 2nd & 3RD ADDITION BASIN
PROPOSED CONDITIONS - DETENTION BASIN H ONLY
100-YEAR STORM - POST DEVELOPMENT

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

      IT          HYDROGRAPH TIME DATA
                         NMIN         15  MINUTES IN COMPUTATION INTERVAL
```

```
                IDATE       27SEP 6  STARTING DATE
                ITIME          1200  STARTING TIME
                   NQ           129  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE       28SEP 6  ENDING DATE
               NDTIME          2000  ENDING TIME
                ICENT            19  CENTURY MARK

          COMPUTATION INTERVAL     .25 HOURS
               TOTAL TIME BASE   32.00 HOURS

      ENGLISH UNITS
           DRAINAGE AREA          SQUARE MILES
           PRECIPITATION DEPTH    INCHES
           LENGTH, ELEVATION      FEET
           FLOW                   CUBIC FEET PER SECOND
           STORAGE VOLUME         ACRE-FEET
           SURFACE AREA           ACRES
           TEMPERATURE            DEGREES FAHRENHEIT

  JP          MULTI-PLAN OPTION
                NPLAN               1  NUMBER OF PLANS

  JR          MULTI-RATIO OPTION
                RATIOS OF PRECIPITATION
                3.50      4.50      5.30      6.10      7.00      7.80

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

          **************
          *            *
  8 KK    *         H  *
          *            *
          **************

  9 KO        OUTPUT CONTROL VARIABLES
                IPRNT               5  PRINT CONTROL
                IPLOT               5  PLOT CONTROL
                QSCAL              0.  HYDROGRAPH PLOT SCALE

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
```

```
          ***************
          *             *
24 KK     *     PONDH   *
          *             *
          ***************

25 KO          OUTPUT CONTROL VARIABLES
                    IPRNT          5  PRINT CONTROL
                    IPLOT          5  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
1
```

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6
					3.50	4.50	5.30	6.10	7.00	7.80
HYDROGRAPH AT										
+	H	.05	1	FLOW	60.	81.	98.	115.	134.	151.
				TIME	12.25	12.25	12.25	12.25	12.25	12.25
ROUTED TO										
+	PONDH	.05	1	FLOW	12.	14.	16.	18.	20.	21.
				TIME	13.00	13.25	13.25	13.25	13.25	13.25
			** PEAK STAGES IN FEET **							
			1	STAGE	1366.96	1367.58	1368.10	1368.62	1369.17	1369.66
				TIME	13.00	13.25	13.25	13.25	13.25	13.25

*** NORMAL END OF HEC-1 ***

Time of concentration (Tc) or travel time (Tt)

Project : Oak Creek Addition - Basin A
Location : Wichita, Kansas

By: SB **Date:** 9/8/2006
Checked: _____ **Date:** _____

Circle One: [Present] Developed

Circle One: [Tc] Tt through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet. Include map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

		Segment ID: AB	
1.	Surface description (Table 3-1)	Short Grass	
2.	Mannings roughness coeff., n (Table 3-1)	0.15	
3.	Flow length, L (total L < 300 ft.)	300 ft	
4.	Two-yr 24-hr rainfall, P2	3.60 in	
5.	Calculated Land slope, s	0.013 ft/ft	
5a.	Land Elevation For Upper End Of Flow Path	1400.0	
5b.	Land Elevation For Lower End Of Flow Path	1396.0	
6.	Compute Tt	0.44 hr	= 0.44

Shallow concentrated flow

		Segment ID: BC	
7.	Surface description (Paved or Unpaved)	Unpaved	
8.	Flow length, L	944 ft	
9.	Calculated Watercourse slope, s	0.013 ft/ft	
9a.	Land Elevation For Upper End Of Flow Path	1396.0	
9b.	Land Elevation For Lower End Of Flow Path	1383.5	
10.	Average velocity, V (Figure 3-1)	1.86 ft/s	
11.	Tt = L/3600V Compute Tt	0.14 hr	= 0.14

Channel Flow

		Segment ID: CD	
12.	Cross sectional flow area, a	30.00 sf	
13.	Wetted perimeter, Pw	19 ft	
14.	Hydraulic radius, r = a/Pw Compute r	1.579 ft	
15.	Channel slope, s	0.010 ft/ft	
16.	Manning's roughness coeff., n	0.041	
17	V = 1.49(r^0.667)(s^0.50)/n Compute V	4.9 ft/s	
18.	Flow length, L	1000 ft	
19.	Tt = L/3600V Compute Tt	0.056 hr	= 0.06
20.	Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)		0.63 hr

Reference: Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use Time Of Concentration = 38 Minutes

Time of concentration (Tc) or travel time (Tt)

Project : Oak Creek Addition - Basin B
Location : Wichita, Kansas

By: SB Date: 9/8/2006
Checked: Date:

Circle One: Present / Developed

Circle One: Tc / Tt through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet. Include map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

		Segment ID: AB		
1.	Surface description (Table 3-1)	Short Grass		
2.	Mannings roughness coeff., n (Table 3-1)	0.15		
3.	Flow length, L (total L < 300 ft.)	300 ft		
4.	Two-yr 24-hr rainfall, P2	3.60 in		
5.	Calculated Land slope, s	0.023 ft/ft		
5a.	Land Elevation For Upper End Of Flow Path	1380.3		
5b.	Land Elevation For Lower End Of Flow Path	1373.5		
6.	Compute Tt	0.35 hr	=	0.35

Shallow concentrated flow

		Segment ID: BC		
7.	Surface description (Paved or Unpaved)	Unpaved		
8.	Flow length, L	793 ft		
9.	Calculated Watercourse slope, s	0.018 ft/ft		
9a.	Land Elevation For Upper End Of Flow Path	1373.5		
9b.	Land Elevation For Lower End Of Flow Path	1359.0		
10.	Average velocity, V (Figure 3-1)	2.18 ft/s		
11.	Tt = L/3600V Compute Tt	0.10 hr	=	0.10

Channel Flow

		Segment ID: CD		
12.	Cross sectional flow area, a	25.00 sf		
13.	Wetted perimeter, Pw	14 ft		
14.	Hydraulic radius, r = a/Pw Compute r	1.786 ft		
15.	Channel slope, s	0.002 ft/ft		
16.	Manning's roughness coeff., n	0.041		
17	V = 1.49(r^0.667)(s^0.50)/n Compute V	2.4 ft/s		
18.	Flow length, L	2875 ft		
19.	Tt = L/3600V Compute Tt	0.334 hr	=	0.33
20.	Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)			0.79 hr

Reference: Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use Time Of Concentration = 47 Minutes

Time of concentration (Tc) or travel time (Tt)

Project : Oak Creek Addition - Basin C **By:** SB **Date:** 9/8/2006
Location : Wichita, Kansas **Checked:** _____ **Date:** _____

Circle One: [Present] Developed

Circle One: [Tc] Tt through subarea

NOTES: *Space for as many as two segments per flow type can be used for each worksheet. Include map, schematic, or description of flow segments.*

Sheet flow *(Applicable to Tc only)*

		Segment ID		
		AB		
1. Surface description (Table 3-1)		Short Grass		
2. Mannings roughness coeff., n (Table 3-1)		0.15		
3. Flow length, L (total L < 300 ft.)	ft	300		
4. Two-yr 24-hr rainfall, P2	in	3.60		
5. Calculated Land slope, s	ft/ft	0.008		
5a. Land Elevation For Upper End Of Flow Path		1399.6		
5b. Land Elevation For Lower End Of Flow Path		1397.4		
6. Compute Tt	hr	0.55	=	0.55

Shallow concentrated flow

		Segment ID		
		BC		
7. Surface description (Paved or Unpaved)		Unpaved		
8. Flow length, L	ft	697		
9. Calculated Watercourse slope, s	ft/ft	0.015		
9a. Land Elevation For Upper End Of Flow Path		1397.4		
9b. Land Elevation For Lower End Of Flow Path		1387.0		
10. Average velocity, V (Figure 3-1)	ft/s	1.97		
11. Tt = L/3600V Compute Tt	hr	0.10	=	0.10

Channel Flow

		Segment ID		
12. Cross sectional flow area, a	sf			
13. Wetted perimeter, Pw	ft			
14. Hydraulic radius, r = a/Pw Compute r	ft			
15. Channel slope, s	ft/ft			
16. Manning's roughness coeff., n				
17 V = 1.49(r^0.667)(s^0.50)/n Compute V	ft/s			
18. Flow length, L	ft			
19. Tt = L/3600V Compute Tt	hr		=	0.00
20. Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)			hr	0.65

Reference: *Urban Hydrology for Small Watersheds*
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use Time Of Concentration = **39 Minutes**

Time of concentration (Tc) or travel time (Tt)

Project : Oak Creek Addition - Basin D
Location : Wichita, Kansas

By: SB Date: 9/8/2006
Checked: Date:

Circle One: [Present] Developed

Circle One: [Tc] Tt through subarea

NOTES: Space for as many as two segments per flow type can be used for each worksheet. Include map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

	Segment ID			
1. Surface description (Table 3-1)	AB			
2. Mannings roughness coeff., n (Table 3-1)	Short Grass			
3. Flow length, L (total L < 300 ft.)	0.15			
4. Two-yr 24-hr rainfall, P2	300	ft		
5. Calculated Land slope, s	3.60	in		
5a. Land Elevation For Upper End Of Flow Path	0.005	ft/ft		
5b. Land Elevation For Lower End Of Flow Path	1400.0			
6. Compute Tt	1398.5			
	0.65	hr	=	0.65

Shallow concentrated flow

	Segment ID			
7. Surface description (Paved or Unpaved)	BC			
8. Flow length, L	Unpaved			
9. Calculated Watercourse slope, s	1175	ft		
9a. Land Elevation For Upper End Of Flow Path	0.007	ft/ft		
9b. Land Elevation For Lower End Of Flow Path	1398.5			
10. Average velocity, V (Figure 3-1)	1390.0			
11. Tt = L/3600V Compute Tt	1.37	ft/s		
	0.24	hr	=	0.24

Channel Flow

	Segment ID			
12. Cross sectional flow area, a	CD			
13. Wetted perimeter, Pw	150.00	sf		
14. Hydraulic radius, r = a/Pw Compute r	70	ft		
15. Channel slope, s	2.143	ft		
16. Manning's roughness coeff., n	0.004	ft/ft		
17 V = 1.49(r^0.667)(s^0.50)/n Compute V	0.041			
18. Flow length, L	3.8	ft/s		
19. Tt = L/3600V Compute Tt	2025	ft		
20. Watershed or subarea Tc or Tt (add Tt in steps 6,11, and 19)	0.147	hr	=	0.15
				hr 1.03

Reference: Urban Hydrology for Small Watersheds
Technical Release 55, Soil Conservation Service
U.S. Department of Agriculture, June 1986

Use Time Of Concentration = 62 Minutes

Professional Engineering Consultants, P.A.
03 S. TOPEKA • WICHITA, KANSAS 67202
316-262-2691 • FAX 316-262-3003
www.pec1.com • designers@pec1.com

Project OAK CREEK 3rd ADDITION Date 9/28/06
Item STORM WATER Calcs. By SJB

PIPE / ORIFICE SIZING TO MEET 2,5 yr. STORM EVENTS.

POND D:

WILL CUT Q_2 FROM 8 cfs TO 5 cfs

$$Q = 0.6A[(2)(g)(4-D/2)]^{\frac{1}{2}}$$

$$5 = 0.6\left(\tfrac{1}{4}D^2\right)[64.4(4-D/2)]^{\frac{1}{2}}$$

$$D = 0.517 \text{ ft. or } 6.2"$$

USE 6" orifice

WILL USE SAME ORIFICE FOR 5 yr. STORM ALSO $Q_5 = 5$ cfs.

POND H:

WILL CUT Q_2 & Q_5 FROM 10 & 13 TO $Q = 5$ cfs

SAME AS ABOVE $D = 6"$

POND F:

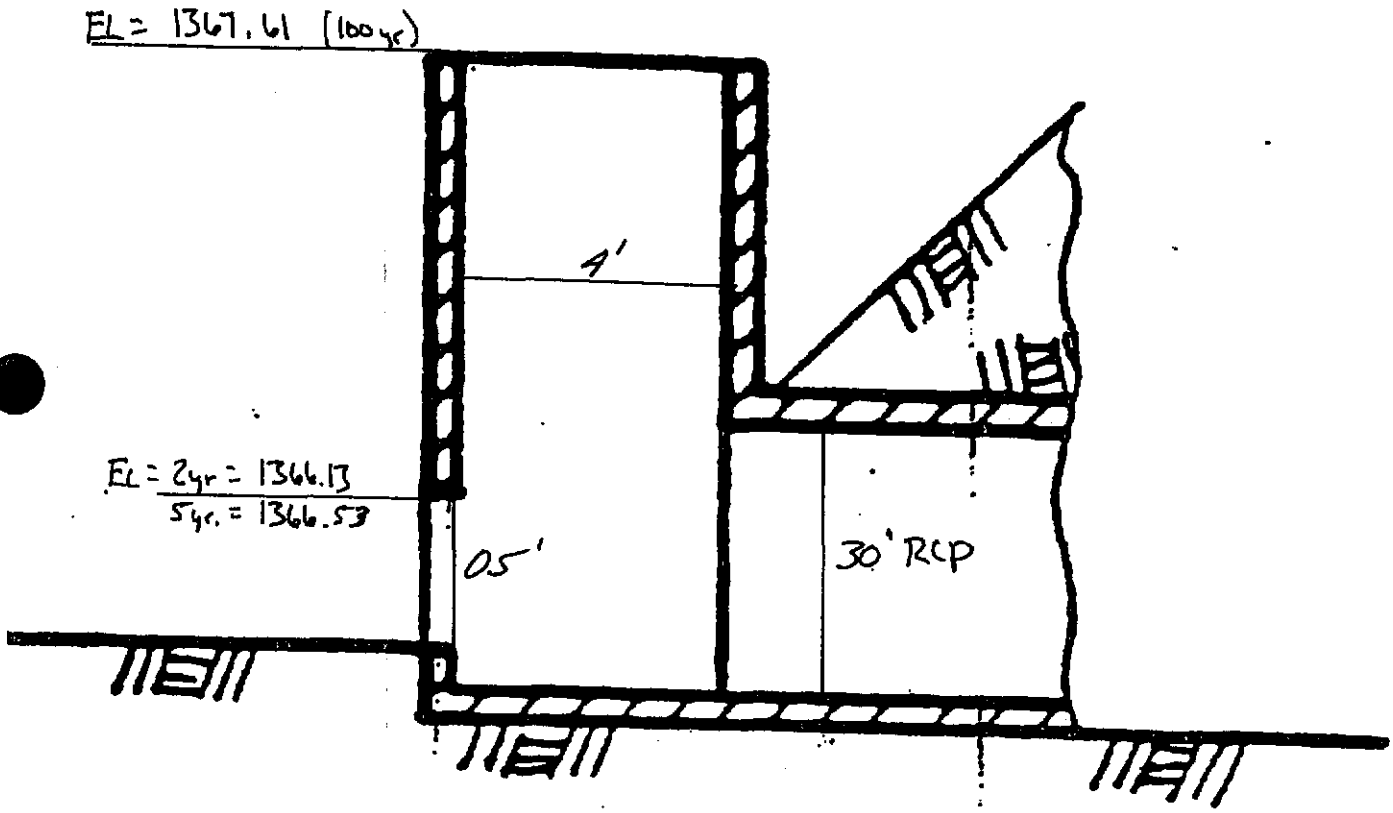
WILL CUT Q_2 from 28 cfs to 1 cfs and Q_5 from 35 cfs to 25 cfs
$Q_2 = 1.0$ cfs
$Q_5 = 25$ cfs

$$Q_2 = 0.6A[(2)(g)(4-D/2)]^{\frac{1}{2}}$$

$$D_2 = 0.568' = 7"$$

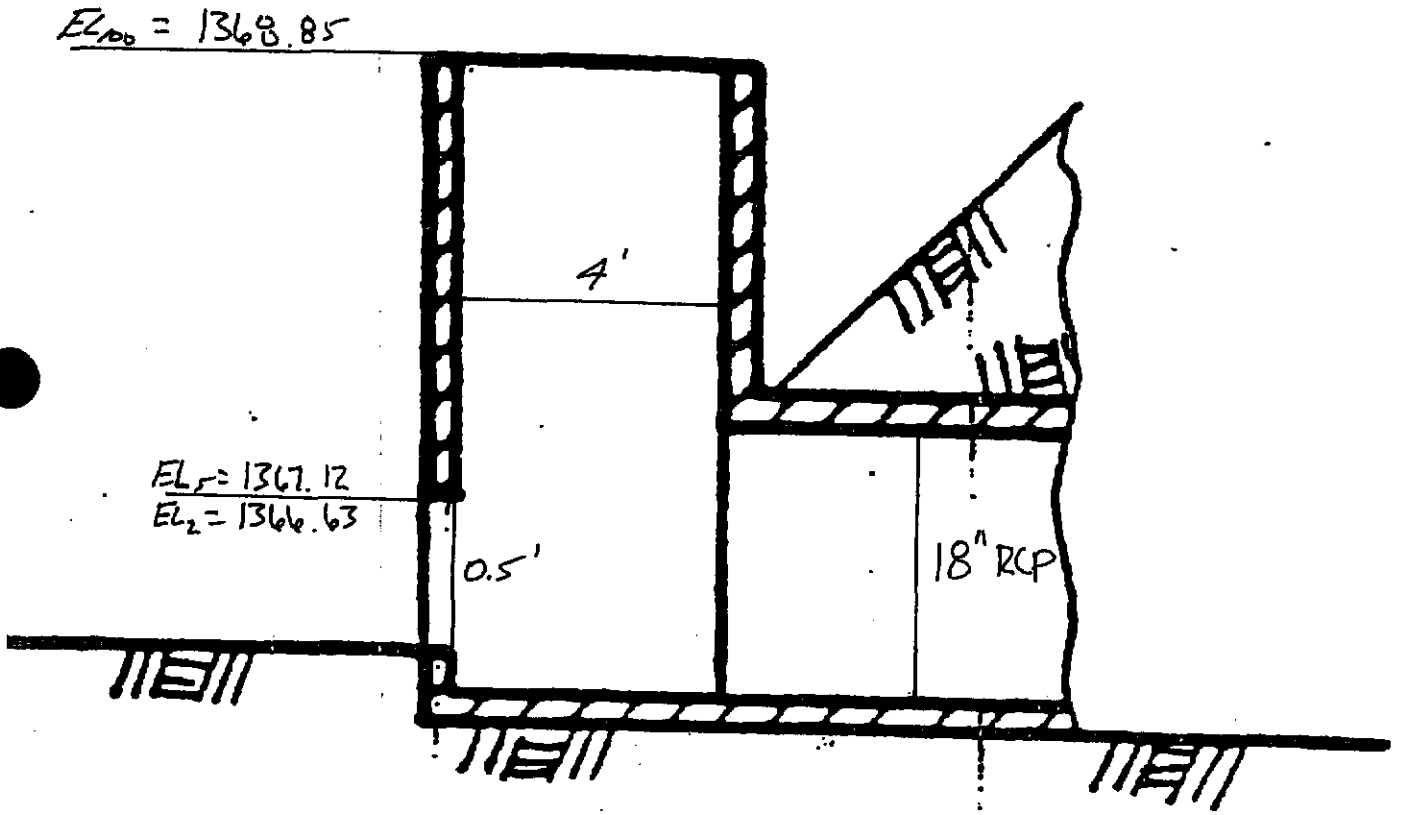
$Q_5 = 11$ ADDITIONAL cfs

$$D = 0.60 \text{ or } 7"$$



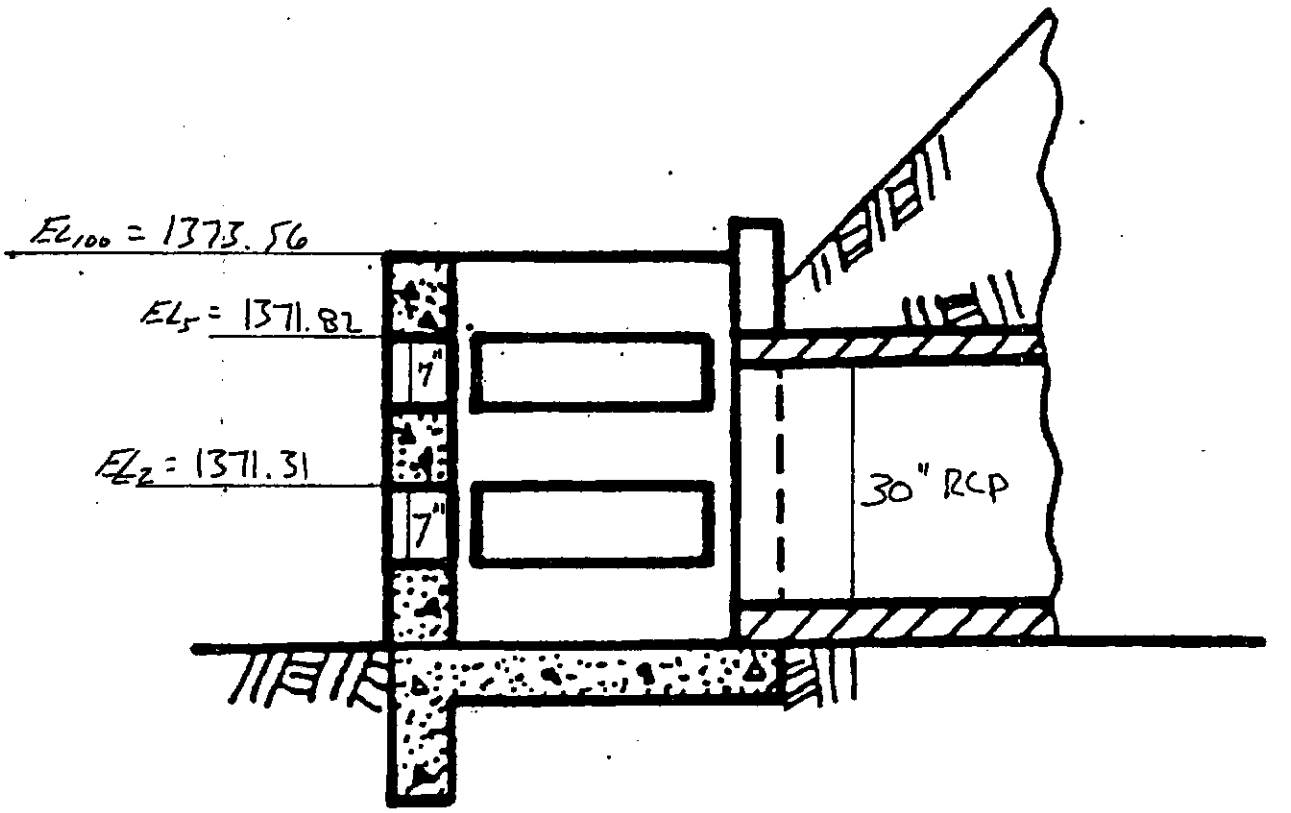
SINGLE STAGE RISER

POND "D" DRAINAGE OUTFALL STRUCTURE



SINGLE STAGE RISER

POND "H" DRAINAGE OUTFALL STRUCTURE



MULTIPLE STAGE CONCRETE INLET

POND "F" DRAINAGE OUTFALL STRUCTURE

9/11/06

Storm Water Pipe Size: 1/2

Basin A

A = 1.02 Ac.

Pavement = 0.98
Grass - Gravel Clay Soil
Slope 2-8% = 0.25

t_c = 15 min

i_2 = 3.83 in

$$C = \frac{(0.62)(0.98) + (0.40)(0.25)}{1.02}$$

C = 0.694

$Q_2 = (0.694)(3.83\ in)(1.02\ Ac.) = \underline{\underline{2.71\ cfs}}$

Basin B

A = 0.91 Ac

t_c = 15 min

i_2 = 3.83 in

$$C = \frac{(0.60)(0.99) + (0.31)(0.25)}{0.91} = 0.731$$

$Q_2 = (0.731)(3.83\ in)(0.91\ Ac) = 2.55\ cfs$

3/11/06

Basin D

$A = 0.16\ Ac$

$T_c = 10$ min

$i_2 = 4.52$ in

$$C = \frac{(0.082)(0.9^{\circ}) + (.078)(0.25)}{0.16} = 0.624$$

$Q_2 = (0.16)(0.624)(4.52) = 0.45$ cfs

Size of pipe:

Manning's Eq: $Q = \frac{1.49}{n} A R^{2/3} S^{\frac{1}{2}}$

$n = 0.012$
$A = \pi r^2$
$S = 1\%$
$R = A/P$
$P = 2\pi r$

$Q = (.1)(124.166)(3.14r^2)(.5r)^{2/3}(.1)$

$Q = 2.71$

$r = 0.476'$ or $D = 0.872' = 10.5''$

Use $D = 15''$ on all systems.

CURRENT DATE: 09-18-2006
CURRENT TIME: 10:39:24

FILE DATE: 09-18-2006
FILE NAME: OAK3P

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

C U L V NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1372.00	1362.00	410.12	1 RCP	2.00	2.00	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: OAK3P DATE: 09-18-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1372.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1373.61	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1374.59	20.0	20.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1375.20	30.0	24.9	0.0	0.0	0.0	0.0	0.0	4.98	6
1375.39	40.0	26.3	0.0	0.0	0.0	0.0	0.0	13.47	4
1375.54	50.0	27.4	0.0	0.0	0.0	0.0	0.0	22.48	4
1375.68	60.0	28.3	0.0	0.0	0.0	0.0	0.0	31.26	3
1375.81	70.0	29.1	0.0	0.0	0.0	0.0	0.0	40.46	3
1375.93	80.0	29.9	0.0	0.0	0.0	0.0	0.0	49.79	3
1376.04	90.0	30.6	0.0	0.0	0.0	0.0	0.0	59.13	3
1376.14	100.0	31.2	0.0	0.0	0.0	0.0	0.0	68.51	3
1375.00	23.4	23.4	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: OAK3P DATE: 09-18-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1372.00	0.000	0.00	0.00	0.00
1373.61	0.000	10.00	0.00	0.00
1374.59	0.000	20.00	0.00	0.00
1375.20	-0.008	30.00	0.11	0.37
1375.39	-0.003	40.00	0.25	0.63
1375.54	-0.007	50.00	0.14	0.28
1375.68	-0.005	60.00	0.44	0.73
1375.81	-0.004	70.00	0.40	0.57
1375.93	-0.003	80.00	0.31	0.39
1376.04	-0.003	90.00	0.28	0.31
1376.14	-0.002	100.00	0.24	0.24

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

CURRENT TIME: 10:39:24 FILE NAME: OAK3P

PERFORMANCE CURVE FOR CULVERT 1 - 1(2.00 (ft) BY 2.00 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1372.00	0.00	0.00	0-NF	0.00	0.00	0.00	%-1362.00	0.00	0.00
10.00	1373.61	1.61	1.61	1-S2n	0.69	1.13	0.63	%-1362.00	11.90	0.00
20.00	1374.59	2.59	2.59	5-S2n	1.02	1.60	0.90	%-1362.00	14.48	0.00
24.91	1375.19	3.19	3.19	5-S2n	1.17	1.75	1.05	%-1362.00	14.92	0.00
26.28	1375.38	3.38	3.38	5-S2n	1.22	1.79	1.09	%-1362.00	15.02	0.00
27.38	1375.54	3.54	3.54	5-S2n	1.25	1.82	1.22	%-1362.00	13.61	0.00
28.29	1375.68	3.68	3.68	5-S2n	1.28	1.85	1.25	%-1362.00	13.69	0.00
29.14	1375.80	3.80	3.80	5-S2n	1.31	1.87	1.30	%-1362.00	13.45	0.00
29.90	1375.92	3.92	3.92	5-S2n	1.33	1.90	1.33	%-1362.00	13.53	0.00
30.60	1376.03	4.03	4.03	5-S2n	1.35	1.92	1.35	%-1362.00	13.61	0.00
31.24	1376.14	4.14	4.14	5-S2n	1.37	1.94	1.37	%-1362.00	13.67	0.00

El. inlet face invert 1372.00 ft El. outlet invert 1362.00 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1372.00 ft
OUTLET STATION	410.00 ft
OUTLET ELEVATION	1362.00 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0244
CULVERT LENGTH ALONG SLOPE	410.12 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	2.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED EDGE (1.5:1)
INLET DEPRESSION	NONE

3

CURRENT DATE: 09-18-2006 FILE DATE: 09-18-2006
CURRENT TIME: 10:39:24 FILE NAME: OAK3P

TAILWATER

CONSTANT WATER SURFACE ELEVATION
0.00

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT 2.80

EMBANKMENT TOP WIDTH	60.00 ft
CREST LENGTH	20.00 ft
OVERTOPPING CREST ELEVATION	1375.00 ft

CURRENT DATE: 09-28-2006
CURRENT TIME: 14:31:01

FILE DATE: 09-28-2006
FILE NAME: OAKRET

FHWA CULVERT ANALYSIS
HY-8, VERSION 6.1

CU LV NO.	SITE DATA: INLET ELEV. (ft)	OUTLET ELEV. (ft)	CULVERT LENGTH (ft)	CULVERT SHAPE, MATERIAL, INLET: BARRELS SHAPE MATERIAL	SPAN (ft)	RISE (ft)	MANNING n	INLET TYPE
1	1364.50	1364.25	35.00	1 RCP	1.50	1.50	.012	CONVENTIONAL
2								
3								
4								
5								
6								

SUMMARY OF CULVERT FLOWS (cfs) FILE: OAKRET DATE: 09-28-2006

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1364.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1365.88	6.0	6.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1366.92	12.0	12.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1368.55	18.0	18.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1370.78	24.0	24.0	0.0	0.0	0.0	0.0	0.0	0.00	1
1375.05	30.0	28.7	0.0	0.0	0.0	0.0	0.0	1.02	22
1375.17	36.0	28.8	0.0	0.0	0.0	0.0	0.0	6.99	6
1375.26	42.0	28.9	0.0	0.0	0.0	0.0	0.0	12.96	5
1375.33	48.0	28.9	0.0	0.0	0.0	0.0	0.0	18.78	4
1375.40	54.0	29.0	0.0	0.0	0.0	0.0	0.0	24.79	4
1375.46	60.0	29.0	0.0	0.0	0.0	0.0	0.0	30.39	3
1375.00	28.7	28.7	0.0	0.0	0.0	0.0	0.0	OVERTOPPING	

SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: OAKRET DATE: 09-28-2006

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1364.50	0.000	0.00	0.00	0.00
1365.88	0.000	6.00	0.00	0.00
1366.92	0.000	12.00	0.00	0.00
1368.55	0.000	18.00	0.00	0.00
1370.78	0.000	24.00	0.00	0.00
1375.05	-0.004	30.00	0.25	0.83
1375.17	-0.004	36.00	0.20	0.56
1375.26	-0.004	42.00	0.17	0.40
1375.33	-0.006	48.00	0.29	0.60
1375.40	-0.005	54.00	0.23	0.43
1375.46	-0.004	60.00	0.59	0.98

<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000

PERFORMANCE CURVE FOR CULVERT 1 - 1(1.50 (ft) BY 1.50 (ft)) RCP

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
0.00	1364.50	0.00	0.00	0-NF	0.00	0.00	0.00	%-1364.25	0.00	0.00
6.00	1365.88	1.38	1.38	1-S2n	0.86	0.94	0.74	%-1364.25	6.87	0.00
12.00	1366.92	2.38	2.42	2-M2c	1.50	1.31	1.31	%-1364.25	7.37	0.00
18.00	1368.55	3.87	4.05	6-FFc	1.50	1.50	1.50	%-1364.25	10.19	0.00
24.00	1370.78	6.28	6.24	6-S2n	1.50	1.50	1.40	%-1364.25	14.07	0.00
28.72	1375.05	10.55	8.39	6-S2n	1.50	1.50	1.40	%-1364.25	16.84	0.00
28.81	1375.16	10.66	8.43	6-S2n	1.50	1.50	1.40	%-1364.25	16.89	0.00
28.87	1375.25	10.75	8.47	6-S2n	1.50	1.50	1.40	%-1364.25	16.93	0.00
28.93	1375.33	10.83	8.49	6-S2n	1.50	1.50	1.40	%-1364.25	16.96	0.00
28.98	1375.39	10.89	8.52	6-S2n	1.50	1.50	1.40	%-1364.25	16.99	0.00
29.02	1375.45	10.95	8.54	6-S2n	1.50	1.50	1.40	%-1364.25	17.01	0.00

El. inlet face invert 1364.50 ft El. outlet invert 1364.25 ft
El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT **********

INLET STATION	0.00 ft
INLET ELEVATION	1364.50 ft
OUTLET STATION	35.00 ft
OUTLET ELEVATION	1364.25 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0071
CULVERT LENGTH ALONG SLOPE	35.00 ft

***** CULVERT DATA SUMMARY **********

BARREL SHAPE	CIRCULAR
BARREL DIAMETER	1.50 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.012
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	BEVELED EDGE (1.5:1)
INLET DEPRESSION	NONE

D

TAILWATER

CONSTANT WATER SURFACE ELEVATION
0.00

ROADWAY OVERTOPPING DATA

WEIR COEFFICIENT 2.80

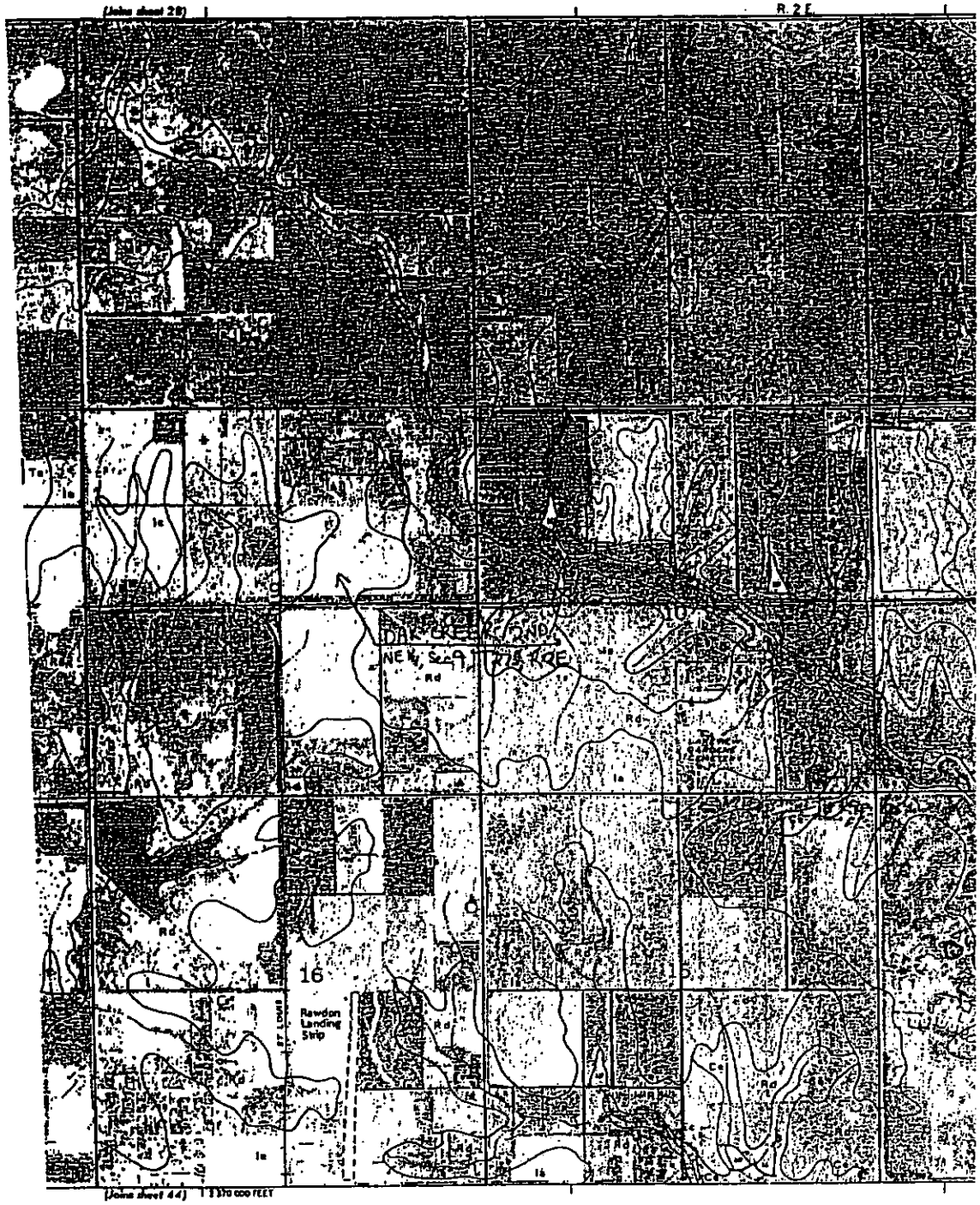
EMBANKMENT TOP WIDTH	30.00 ft
CREST LENGTH	35.00 ft
OVERTOPPING CREST ELEVATION	1375.00 ft

ÄÄ
D

EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slo
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent lopes
Wa	C	Waldeck sandy loam
Wb	D	[illegible]


R. 2 E.
DAK CREEK
NE ¼, Sec. 9, T. 25 S., R. 2 E.
16
Rawdon Landing Strip
St. Louis
Rd
(Joins sheet 44)
FEET

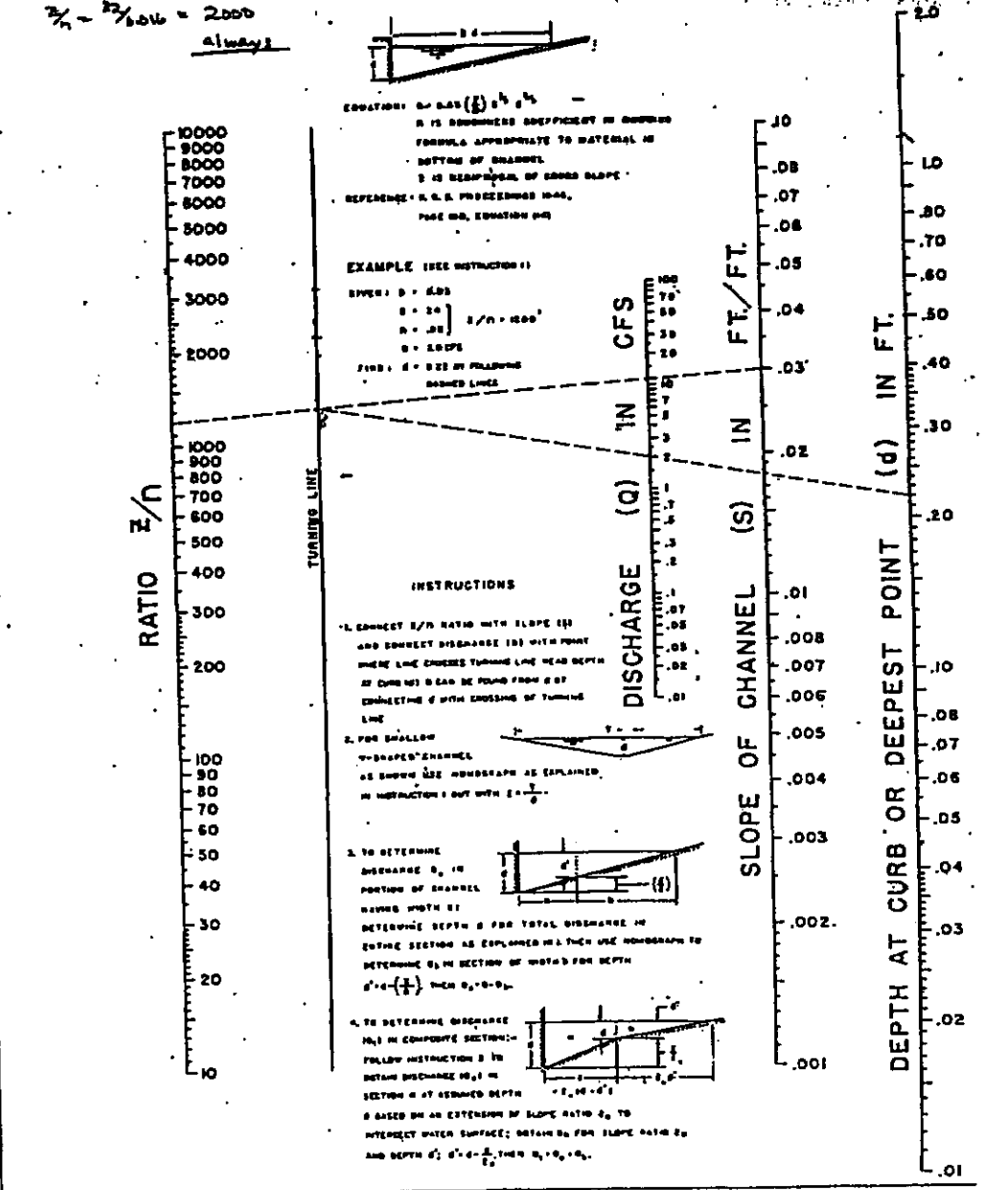
County	Expected 24-hour Storm Rainfall in Inches — Storm Frequency in Years						Normal Annual Precipitation
	100	50	25	10	5	2	Inches
Pawnee	6.6	6.0	5.2	4.5	3.7	2.8	23.3
Phillips	6.0	5.5	4.8	4.1	3.4	2.5	23.6
Pottawatomie	7.5	6.6	5.9	5.1	4.3	3.4	33.6
Pratt	7.2	6.4	5.6	4.8	4.1	3.0	24.6
Rawlins	5.5	5.0	4.3	3.6	3.1	2.3	21.0
Reno	7.4	6.6	5.8	5.0	4.2	3.2	27.7
Republic	6.8	6.0	5.4	4.6	3.9	2.9	28.6
Rice	7.3	6.4	5.6	4.8	4.1	3.0	26.6
Riley	7.4	6.5	5.8	5.1	4.3	3.3	33.5
Rooks	6.1	5.7	4.9	4.1	3.4	2.5	23.9
Rush	6.5	5.9	5.0	4.3	3.6	2.7	23.3
Russell	6.7	5.9	5.2	4.4	3.7	2.8	26.8
Saline	7.3	6.4	5.7	4.9	4.1	3.1	28.4
Scott	5.7	5.3	4.5	3.8	3.2	2.4	20.2
Sedgwick	7.8	7.0	6.1	5.3	4.5	3.5	30.6
Seward	6.0	5.7	4.8	4.2	3.5	2.6	19.8
Shawnee	7.8	6.8	6.1	5.3	4.5	3.5	34.7
Sheridan	5.7	5.3	4.5	3.8	3.2	2.4	21.3
Sherman	5.3	4.8	4.2	3.5	3.0	2.2	16.7
Smith	6.3	5.7	5.0	4.2	3.5	2.6	24.4
Stafford	7.1	6.2	5.5	4.7	4.0	2.9	25.1
Stanton	5.6	5.2	4.5	3.8	3.2	2.4	15.8
Stevens	5.9	5.5	4.7	4.1	3.4	2.5	19.7
Sumner	8.0	7.1	6.2	5.4	4.6	3.6	34.0

x-slope = $3/8 \div 4 = 0.03125$

z = $1/x$-slope = $1/0.03125 = 32$

$n = 0.016$

$z/n = 32/0.016 = 2000$ always



BUREAU OF PUBLIC ROADS
REV. JAN. 1968

NOMOGRAPH FOR FLO
IN TRIANGULAR CHANNE

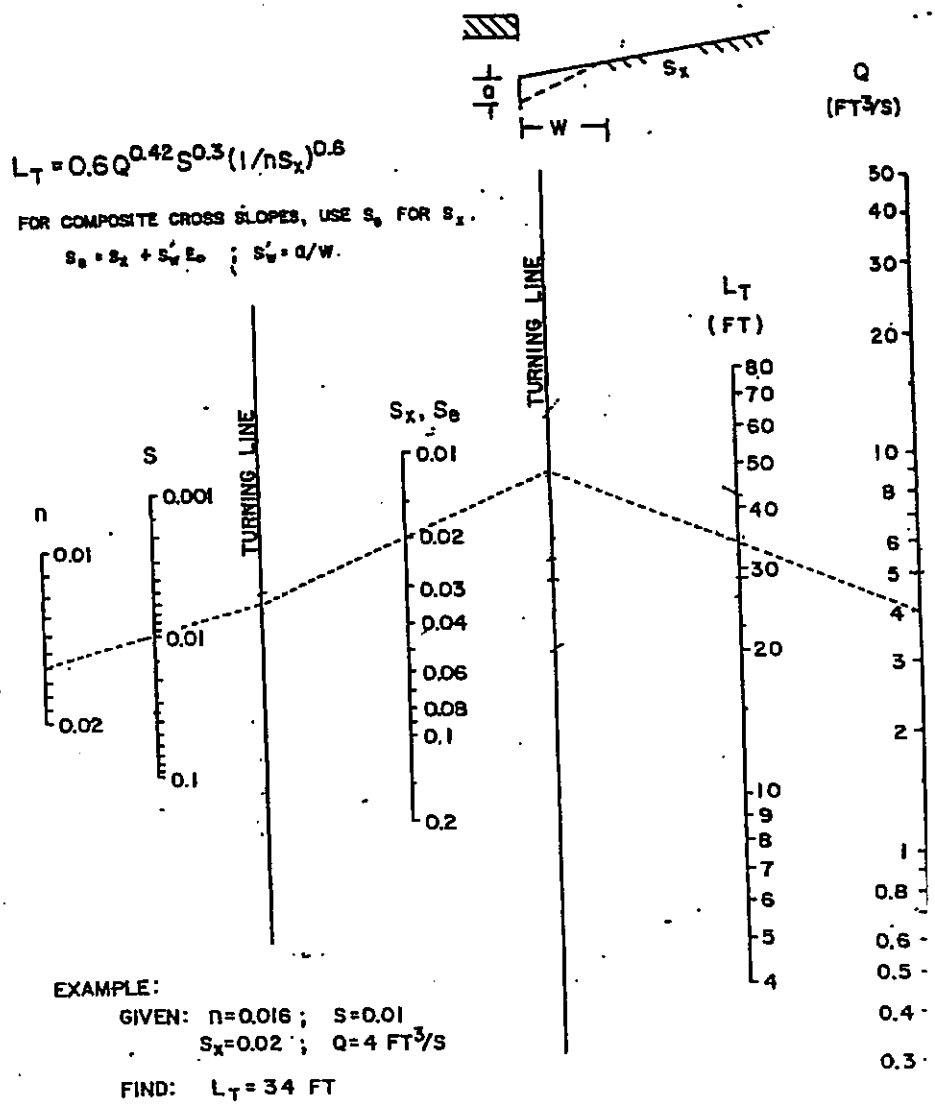


CHART 9. Curb-opening and slotted drain inlet length for total interception.

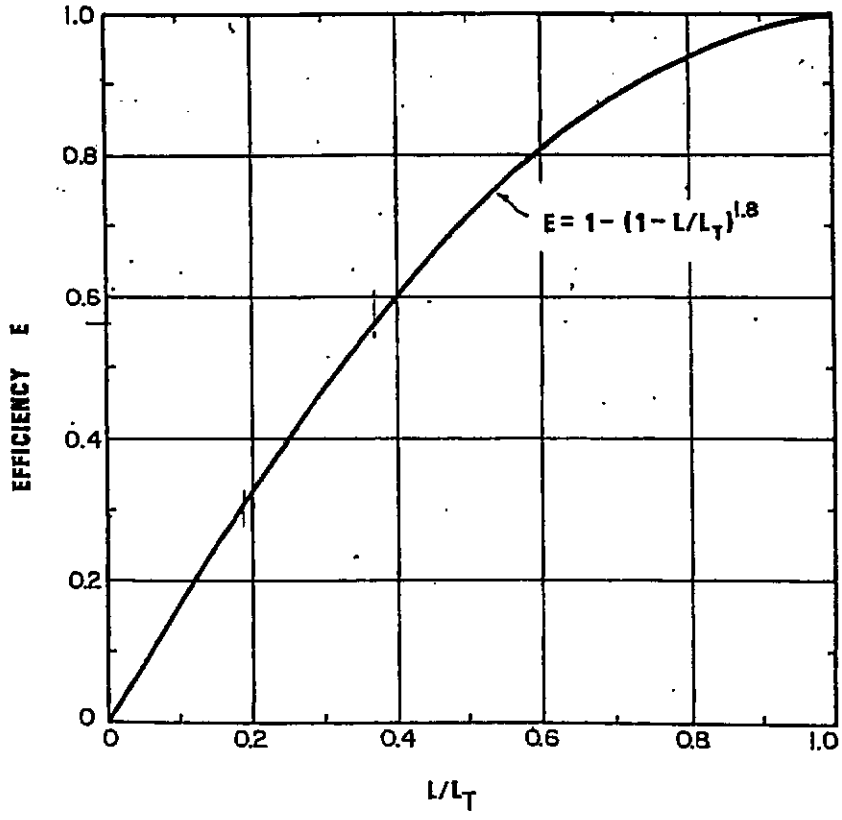


CHART 10. Curb-opening and slotted drain inlet interception efficiency.

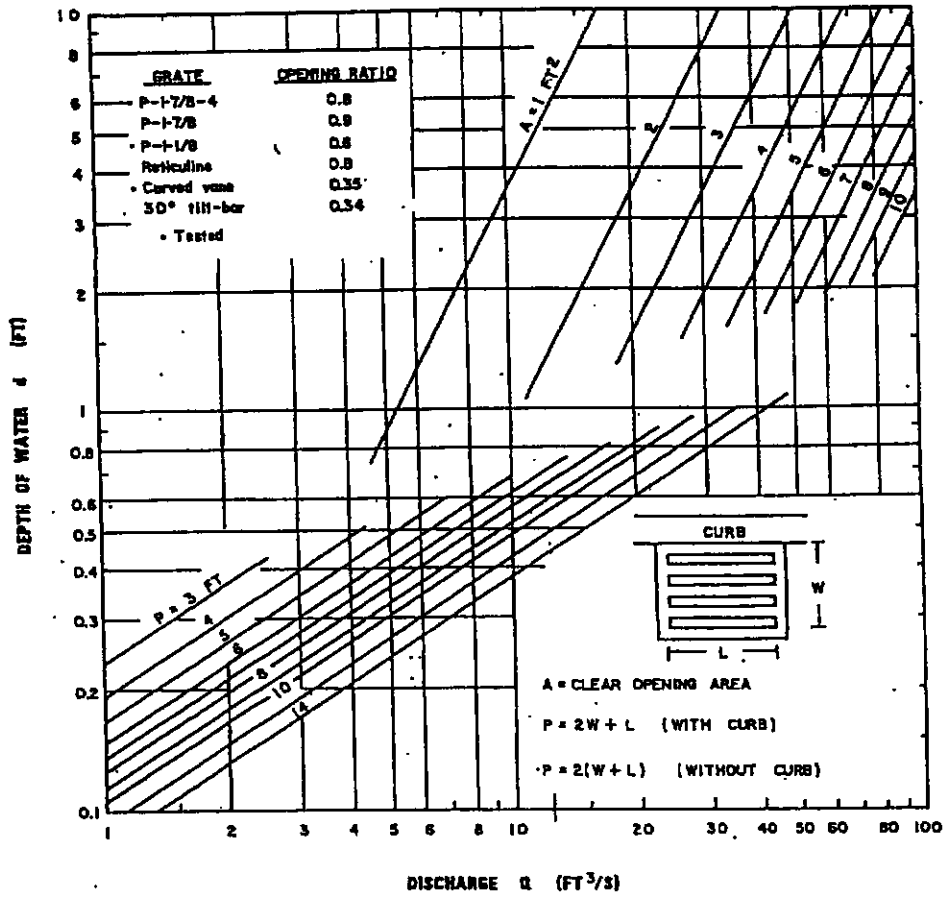


CHART 11. Grate inlet capacity in sump conditions.

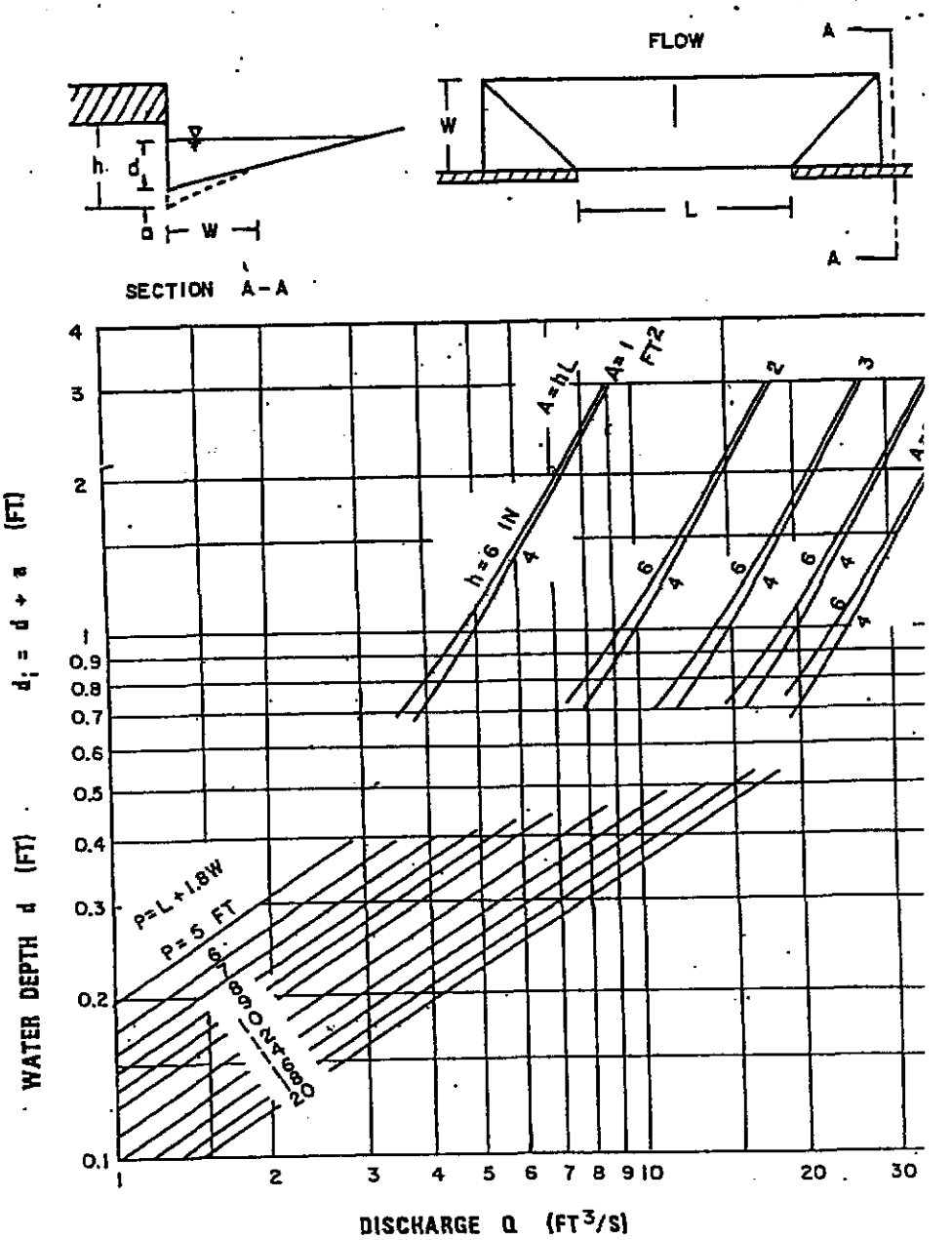


CHART 12. Depressed curb-opening inlet capacity in sump locations.

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

RAINFALL INTENSITY TABLE FOR SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

DURATION IN MINUTES (T_c)	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100
5	i = 4.18	5.57	6.53	7.41	8.52	9.48	10
6	3.99	5.32	6.25	7.09	8.16	9.09	9
7	3.81	5.09	5.99	6.81	7.84	8.74	9
8	3.66	4.89	5.75	6.55	7.55	8.42	9
9	3.52	4.70	5.54	6.31	7.28	8.13	8
10	3.39	4.52	5.34	6.09	7.04	7.86	8
11	3.27	4.36	5.16	5.89	6.81	7.61	8
12	3.18	4.21	4.99	5.71	6.60	7.38	8
13	3.05	4.08	4.84	5.53	6.41	7.17	
14	2.96	3.95	4.69	5.37	6.23	6.97	
15	2.87	3.83	4.56	5.22	6.06	6.78	
16	2.78	3.72	4.43	5.08	5.90	6.60	
17	2.71	3.61	4.31	4.95	5.75	6.44	
18	2.63	3.51	4.20	4.83	5.61	6.29	
19	2.56	3.42	4.10	4.71	5.47	6.14	
20	2.50	3.33	4.00	4.60	5.35	6.00	
21	2.44	3.25	3.90	4.50	5.23	5.87	
22	2.38	3.17	3.81	4.40	5.12	5.75	
23	2.32	3.10	3.73	4.31	5.01	5.63	
24	2.27	3.03	3.65	4.22	4.91	5.52	
25	2.22	2.96	3.57	4.13	4.81	5.41	
26	2.20	2.90	3.50	4.05	4.72	5.31	
27	2.16	2.84	3.43	3.98	4.63	5.21	
28	2.14	2.78	3.37	3.90	4.55	5.12	
29	2.11	2.72	3.30	3.83	4.47	5.03	
30	2.08	2.67	3.24	3.76	4.39	4.94	
31	2.05	2.62	3.19	3.70	4.32	4.86	
32	2.02	2.57	3.10	3.63	4.25	4.79	
33	1.99	2.52	3.05	3.57	4.18	4.71	
34	1.96	2.48	3.01	3.51	4.11	4.63	
35	1.93	2.44	2.98	3.46	4.05	4.56	
36	1.91	2.39	2.93	3.41	3.99	4.50	
37	1.89	2.35	2.88	3.36	3.93	4.43	
38	1.87	2.32	2.84	3.31	3.87	4.37	
39	1.85	2.28	2.80	3.26	3.82	4.31	
40	1.83	2.24	2.76	3.22	3.76	4.25	
41	1.81	2.21	2.72	3.17	3.71	4.19	
42	1.79	2.18	2.68	3.13	3.66	4.13	
43	1.77	2.14	2.64	3.09	3.61	4.08	
44	1.75	2.11	2.61	3.05	3.57	4.03	
45	1.73	2.08	2.57	3.01	3.52	3.98	

ATTACHMENT A CONTINUED
Page 2

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100
46	1.70	2.05	2.54	2.97	3.48	3.93	4
47	1.67	2.02	2.50	2.93	3.44	3.88	4
48	1.66	2.00	2.47	2.90	3.39	3.84	4
49	1.64	1.97	2.44	2.86	3.35	3.79	4
50	1.61	1.95	2.41	2.83	3.32	3.75	4
51	1.59	1.92	2.38	2.79	3.28	3.71	4
52	1.56	1.89	2.35	2.76	3.24	3.67	4
53	1.54	1.86	2.33	2.73	3.20	3.63	4
54	1.52	1.84	2.30	2.70	3.17	3.59	
55	1.50	1.81	2.27	2.67	3.14	3.55	
56	1.47	1.79	2.25	2.64	3.10	3.51	
57	1.45	1.76	2.22	2.61	3.07	3.48	
58	1.43	1.74	2.20	2.59	3.04	3.44	
59	1.42	1.72	2.18	2.56	3.01	3.41	
60	1.40	1.69	2.15	2.53	2.98	3.37	
61	1.38	1.67	2.13	2.51	2.95	3.34	
62	1.36	1.65	2.11	2.48	2.92	3.31	
63	1.34	1.63	2.09	2.46	2.89	3.28	
64	1.33	1.61	2.07	2.44	2.86	3.25	
65	1.31	1.59	2.05	2.41	2.84	3.22	
66	1.30	1.57	2.03	2.39	2.81	3.19	
67	1.28	1.56	2.01	2.37	2.79	3.16	
68	1.26	1.54	1.99	2.35	2.76	3.13	
69	1.25	1.52	1.97	2.33	2.74	3.10	
70	1.24	1.50	1.95	2.31	2.71	3.08	
71	1.22	1.49	1.93	2.28	2.69	3.05	
72	1.21	1.47	1.92	2.26	2.67	3.02	
73	1.20	1.46	1.90	2.25	2.64	3.00	
74	1.18	1.44	1.88	2.23	2.63	2.98	
75	1.17	1.43	1.86	2.21	2.61	2.95	
76	1.16	1.41	1.85	2.19	2.58	2.93	
77	1.15	1.40	1.83	2.17	2.55	2.90	
78	1.13	1.38	1.82	2.15	2.53	2.88	
79	1.12	1.37	1.80	2.14	2.50	2.86	
80	1.11	1.36	1.79	2.12	2.48	2.84	
81	1.10	1.34	1.77	2.10	2.46	2.82	
82	1.09	1.33	1.76	2.08	2.43	2.79	
83	1.08	1.32	1.74	2.06	2.41	2.76	
84	1.07	1.31	1.73	2.04	2.39	2.74	
85	1.06	1.30	1.72	2.02	2.37	2.71	
86	1.05	1.28	1.70	2.00	2.34	2.69	
87	1.04	1.27	1.69	1.99	2.32	2.66	
88	1.03	1.26	1.68	1.97	2.30	2.64	
89	1.02	1.25	1.68	1.95	2.28	2.62	
90	1.01	1.24	1.66	1.93	2.26	2.59	

ATTACHMENT A CONTINUED.
Page 3

DURATION IN MIHUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-
91	1.00	1.23	1.65	1.92	2.24	2.57	2
92	1.00	1.22	1.63	1.90	2.22	2.55	2
93	0.99	1.21	1.62	1.89	2.20	2.53	2
94	0.98	1.20	1.61	1.87	2.19	2.51	2
95	0.97	1.19	1.59	1.85	2.17	2.49	2
96	0.96	1.18	1.58	1.84	2.15	2.46	2
97	0.96	1.17	1.57	1.82	2.13	2.44	2
98	0.95	1.16	1.56	1.81	2.12	2.42	2
99	0.94	1.15	1.54	1.80	2.10	2.41	2
100	0.93	1.14	1.53	1.78	2.08	2.39	2
101	0.93	1.13	1.52	1.77	2.07	2.39	2
102	0.92	1.13	1.51	1.75	2.05	2.35	2
103	0.91	1.12	1.50	1.74	2.04	2.33	2
104	0.90	1.11	1.49	1.73	2.02	2.31	2
105	0.90	1.10	1.47	1.72	2.01	2.30	
106	0.89	1.09	1.46	1.70	1.99	2.28	
107	0.88	1.09	1.45	1.69	1.98	2.26	
108	0.88	1.08	1.44	1.68	1.96	2.25	
109	0.87	1.07	1.43	1.67	1.95	2.23	
110	0.87	1.06	1.42	1.65	1.93	2.21	
111	0.86	1.06	1.41	1.64	1.92	2.20	
112	0.85	1.05	1.40	1.63	1.91	2.18	
113	0.85	1.04	1.39	1.62	1.89	2.17	
114	0.84	1.03	1.38	1.61	1.88	2.15	
115	0.84	1.03	1.37	1.60	1.87	2.14	
116	0.83	1.02	1.36	1.59	1.86	2.12	
117	0.82	1.01	1.36	1.58	1.84	2.11	
118	0.82	1.01	1.35	1.57	1.83	2.09	
119	0.81	1.00	1.34	1.56	1.82	2.08	
120	0.81	0.99	1.33	1.55	1.81	2.07	

DURATION IN HOURS	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	1
2	0.81	0.99	1.33	1.55	1.81	2.07	
3	0.59	0.72	0.97	1.13	1.32	1.51	
4	0.47	0.58	0.78	0.91	1.06	1.21	
5	0.40	0.49	0.66	0.77	0.89	1.02	
6	0.35	0.42	0.57	0.67	0.78	0.89	
8	0.28	0.34	0.46	0.53	0.62	0.71	
10	0.23	0.29	0.39	0.45	0.52	0.60	
12	0.20	0.25	0.33	0.39	0.45	0.52	
18	0.15	0.18	0.24	0.28	0.33	0.38	
24	0.12	0.15	0.20	0.23	0.27	0.31	

ATTACHMENT B

DRAINAGE CRITERIA MANUAL

INCREMENTAL INFILTRATION VALUES IN INCHES

Time Minutes**	SCS Hydrologic Soil Group			
	A	B	C	D
5	.33	.26	.19	.12
10	.25	.17	.09	.04
15	.18	.11	.05	.02
20	.13	.07	.03	.02
25	.10	.05	.03	.02
30	.08	.05	.03	.02
35	.08	.05	.03	.02
40	.08	.05	.03	.02
45	.08	.05	.03	.02
50	.08	.05	.03	.02
55	.08	.05	.03	.02
60	.08	.05	.03	.02
65	.08	.05	.03	.02
70	.08	.05	.03	.02
75	.08	.05	.03	.02
80	.08	.05	.03	.02
85	.08	.05	.03	.02
90	.08	.05	.03	.02
95	.08	.05	.03	.02
100	.08	.05	.03	.02
105	.08	.05	.03	.02
110	.08	.05	.03	.02
115	.08	.05	.03	.02
120	.08	.05	.03	.02

**Time at end of the time increment

NOTE: Values for 125 minutes and additional 5 minute increments shall be the same as those shown for 120 minutes.

ATTACHMENT C

DRAINAGE CITERIA MANUAL

DEPRESSION STORAGE LOSSES

Surface Type	Total Loss (Inches)
Impervious:	
Paved Areas	0.1
Flat Roofs	0.1
Sloped Roofs	0.05
Pervious:	
Lawns and Grass	0.3
Wooded Areas and Open Fields	0.4

ATTACHMENT D.

DRAINAGE CRITERIA

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	1C
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.
Neighborhood Areas	70	0.68	0.69	0.73	0.
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.68	0
1/4 Acre	38	0.50	0.54	0.62	0
1/3 Acre	30	0.46	0.50	0.59	0
1/2 Acre	25	0.42	0.48	0.56	0
3/4 Acre	22	0.42	0.46	0.55	0
1 Acre	20	0.41	0.45	0.54	0
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0
Multi-Unit (attached)	65	0.64	0.68	0.73	0
Apartments	75	0.70	0.73	0.79	0
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0
1/4 Acre	38	0.48	0.51	0.57	0
1/3 Acre	30	0.43	0.46	0.53	0
1/2 Acre	25	0.40	0.43	0.50	0
3/4 Acre	22	0.39	0.42	0.49	0
1 Acre	20	0.37	0.40	0.48	0
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0
Multi-Unit (attached)	65	0.63	0.66	0.71	0
Apartments	75	0.68	0.72	0.77	0
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	
1/4 Acre	38	0.44	0.46	0.52	
1/3 Acre	30	0.39	0.41	0.47	
1/2 Acre	25	0.36	0.38	0.44	
3/4 Acre	22	0.34	0.36	0.42	
1 Acre	20	0.33	0.35	0.40	
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	
Multi-Unit (attached)	65	0.61	0.64	0.68	
Apartments	75	0.67	0.70	0.74	

Land Use or rface Characteristics	Percent Impervious	Frequency 2	5	10	1
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	C
1/4 Acre	38	0.39	0.41	0.45	C
1/3 Acre	30	0.33	0.35	0.39	C
1/2 Acre	25	0.30	0.31	0.35	C
3/4 Acre	22	0.28	0.29	0.33	C
1 Acre	20	0.26	0.28	0.32	C
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	C
Multi-Unit (attached)	65	0.58	0.60	0.64	C
Apartments	75	0.65	0.68	0.72	C
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	I
Heavy Areas	80	0.74	0.76	0.79	I
4. Playgrounds:	15	0.33	0.35	0.42	I
5. Schools:	40	0.49	0.51	0.56	I
6. Railroad Yard Areas:	30	0.43	0.45	0.50	
7. Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	
8. Streets:					
Paved	99	0.87	0.88	0.90	
Gravel	00	0.24	0.26	0.33	
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	
10. Roofs:	90	0.80	0.85	0.90	
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	
Slope 1% to 4%	00	0.12	0.13	0.17	
Slope more than 4%	00	0.16	0.17	0.21	
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	
Slope 1% to 4%	00	0.20	0.22	0.28	
Slope more than 4%	00	0.24	0.26	0.32	
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	
Slope 1% to 4%	00	0.26	0.29	0.37	
Slope more than 4%	00	0.28	0.31	0.39	

Land Use or rface Characteristics	Percent Impervious	Frequency 2	5	10	1(
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.
Slope 1% to 4%	00	0.30	0.35	0.45	0.
Slope more than 4%	00	0.32	0.37	0.47	0.

Note No. 1: Coefficients shown in the above table are for pervious open spa areas with thick turf which includes pervious areas in parks and cemeteri Coefficients shown above must be increased 0.02 for use with agricultur pasture areas. Coefficients shown above must be reduced by 0.04 for use wi agricultural cultivated areas. Group A soils are well-drained, coarse textur sands with high infiltration rates. Group B soils are moderately well-draine moderately coarse textured soils with moderate infiltration rates. Group soils are moderately poor-drained, moderately fine textured soils with sl infiltration rates. Group D soils are poor-drained, fine textured soils wi very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basi 320 acres or larger.

ATTACHMENT E

DRAINAGE CRITERIA

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																		
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.83	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

ATTACHMENT F

DETERMINATION OF DIMENSIONLESS WATERSHED CONVEYANCE FACTOR (ø)

$$ø = ø_1 + ø_2$$

$ø_1$	Classification
0.6	Extensive channel improvement and storm sewer system, closed conduit channel system
0.7	Moderate channel improvement and storm sewer system.
0.8	Some channel improvement and storm sewers, mainly cleaning and enlargement of existing channel.
0.9	Little channel improvement and storm sewers.
1.0	Natural channel conditions.

$ø_2$	Classification
0.0	No channel vegetation.
0.1	Light channel vegetation.
0.2	Moderate channel vegetation.
0.3	Heavy channel vegetation.

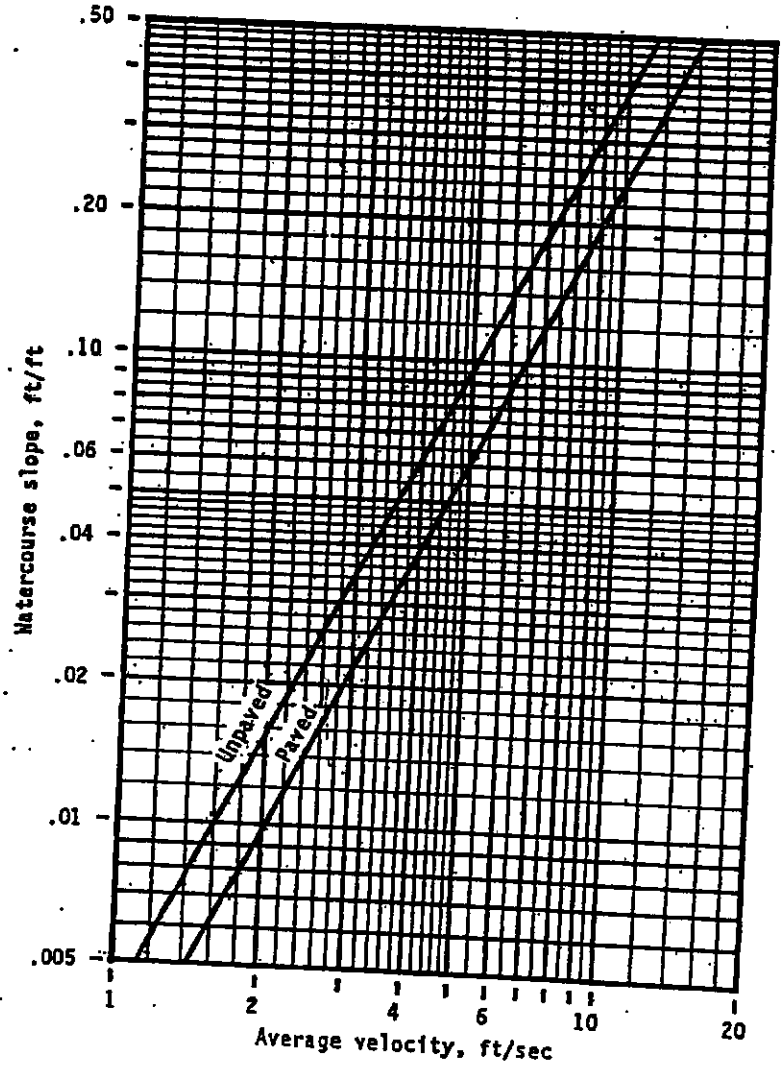
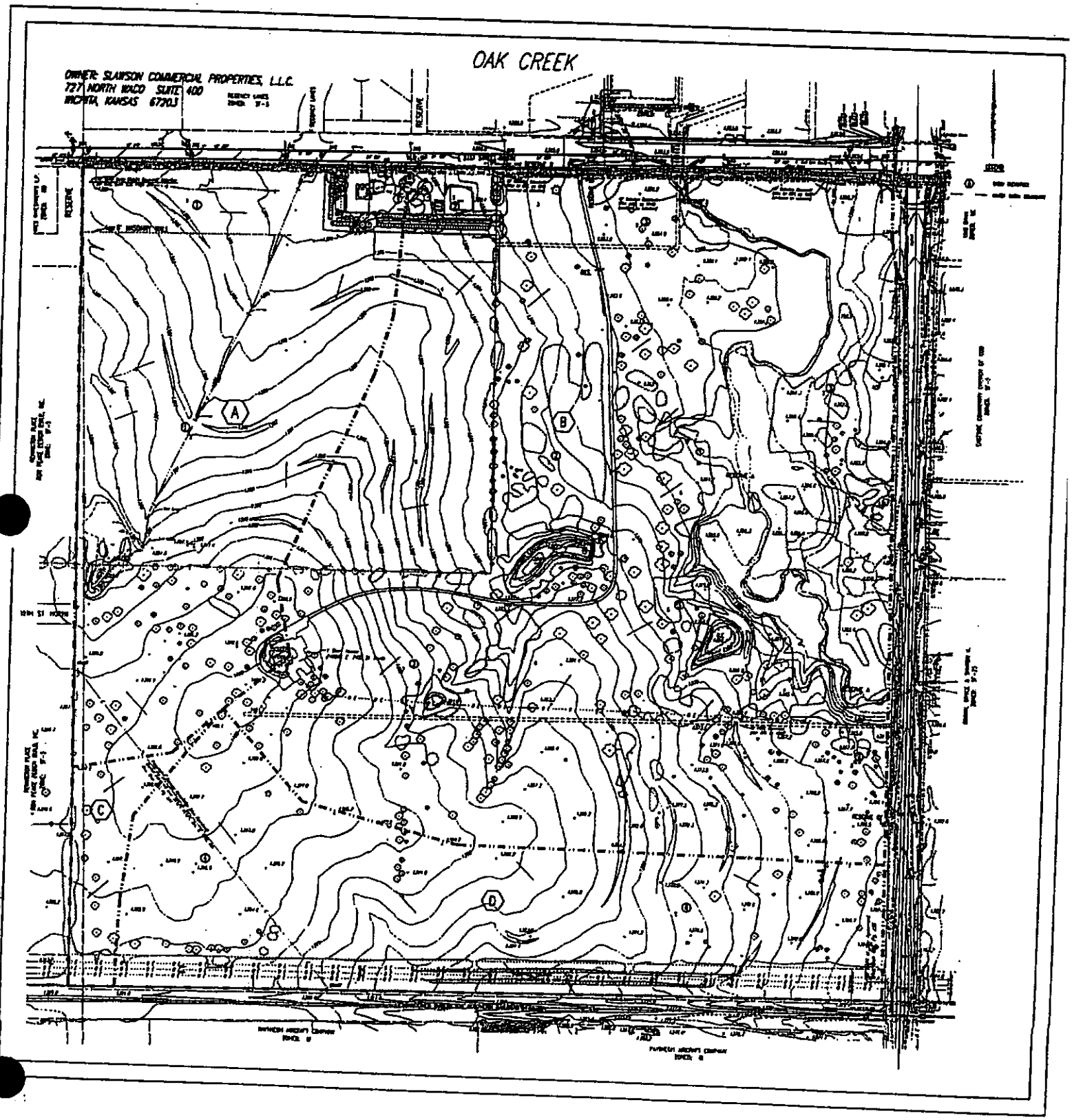
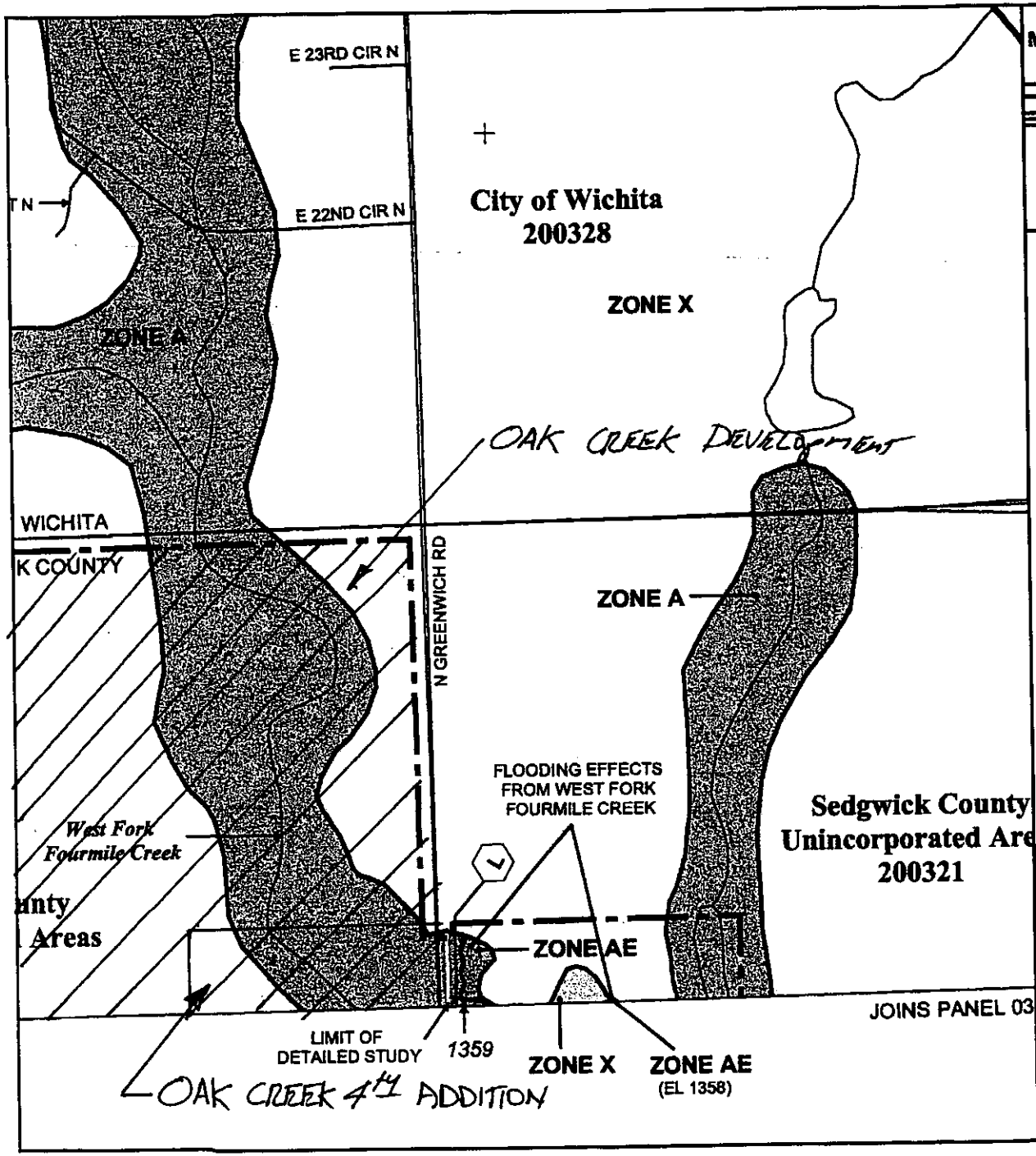


Figure 3-1.—Average velocities for estimating travel time for shallow concentrated flow.


OAK CREEK
OWNER: SLAWSON COMMERCIAL PROPERTIES, L.L.C.
727 NORTH WACO SUITE 400
WICHITA, KANSAS 67203
A
B
C
D



MAP SCALE 1" = 500'

500 1000 FEET

METERS

0 150 300

PANEL 0377E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 377 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

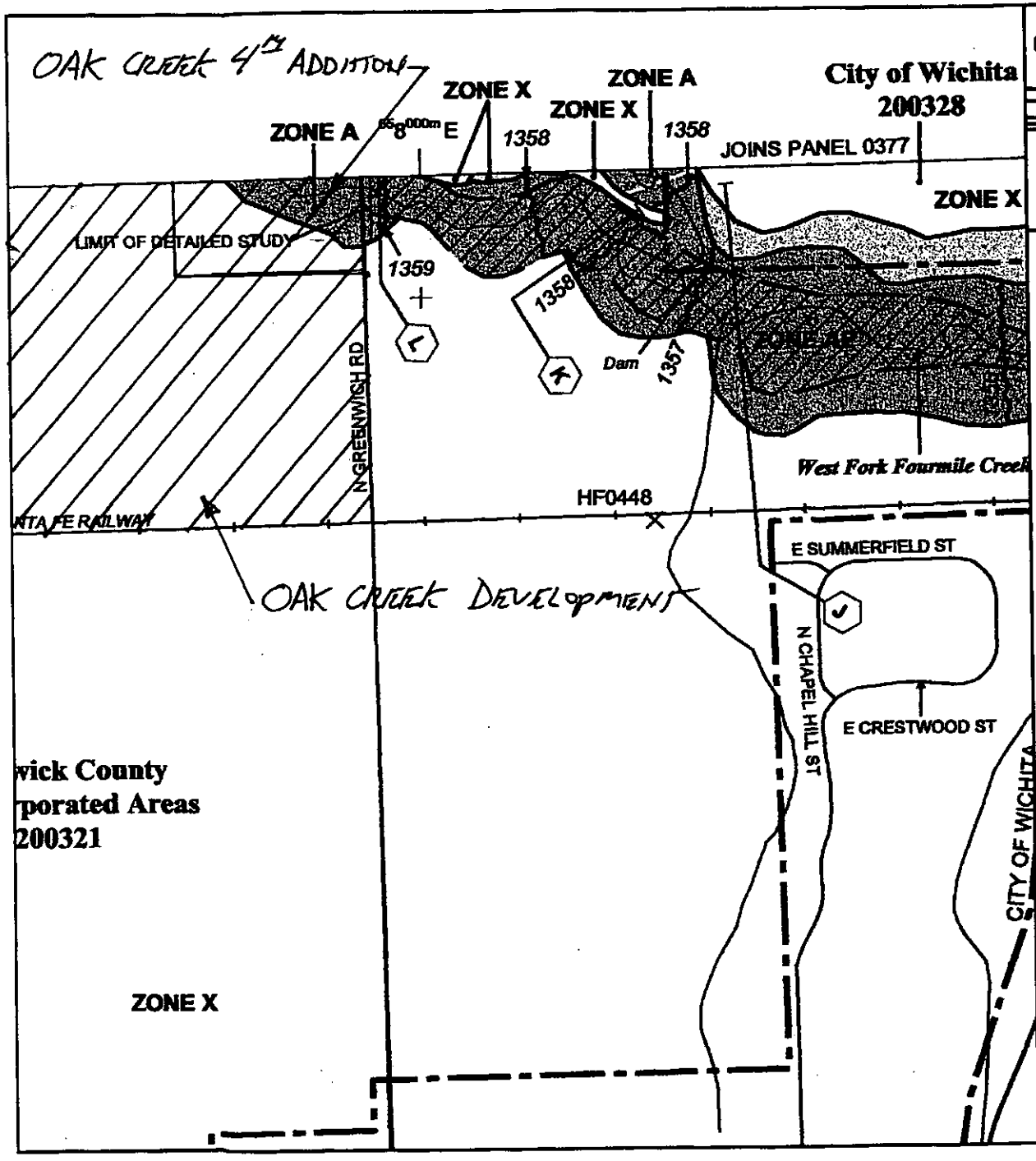
COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0377	E
WICHITA, CITY OF	200328	0377	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
20173C0377E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency



MAP SCALE 1" = 500'

500 1000 FEET

METERS

0 150 300

PANEL 0379E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS
AND INCORPORATED AREAS

PANEL 379 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0379	E
WICHITA, CITY OF	200328	0379	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

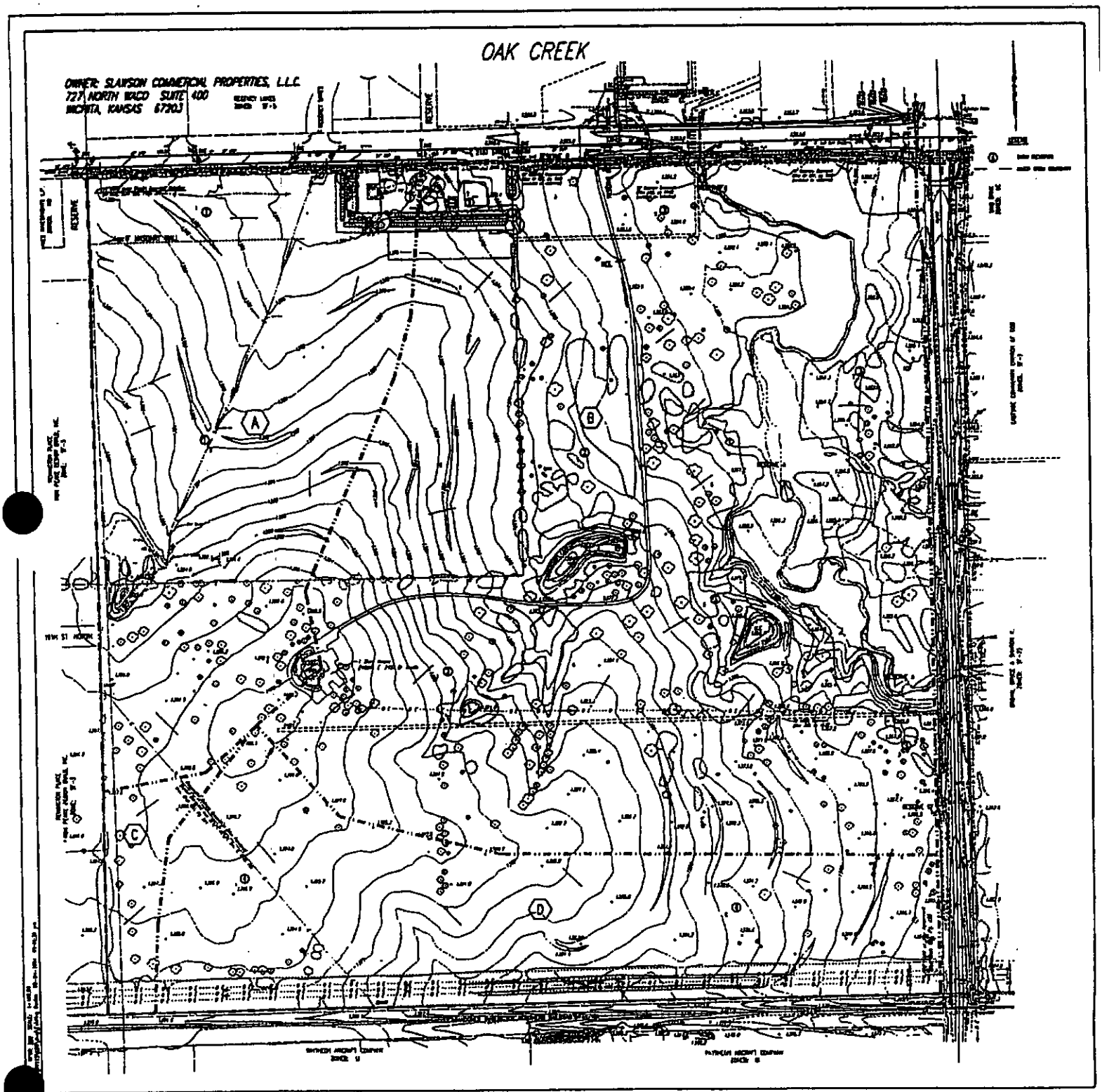
MAP NUMBER
20173C0379E

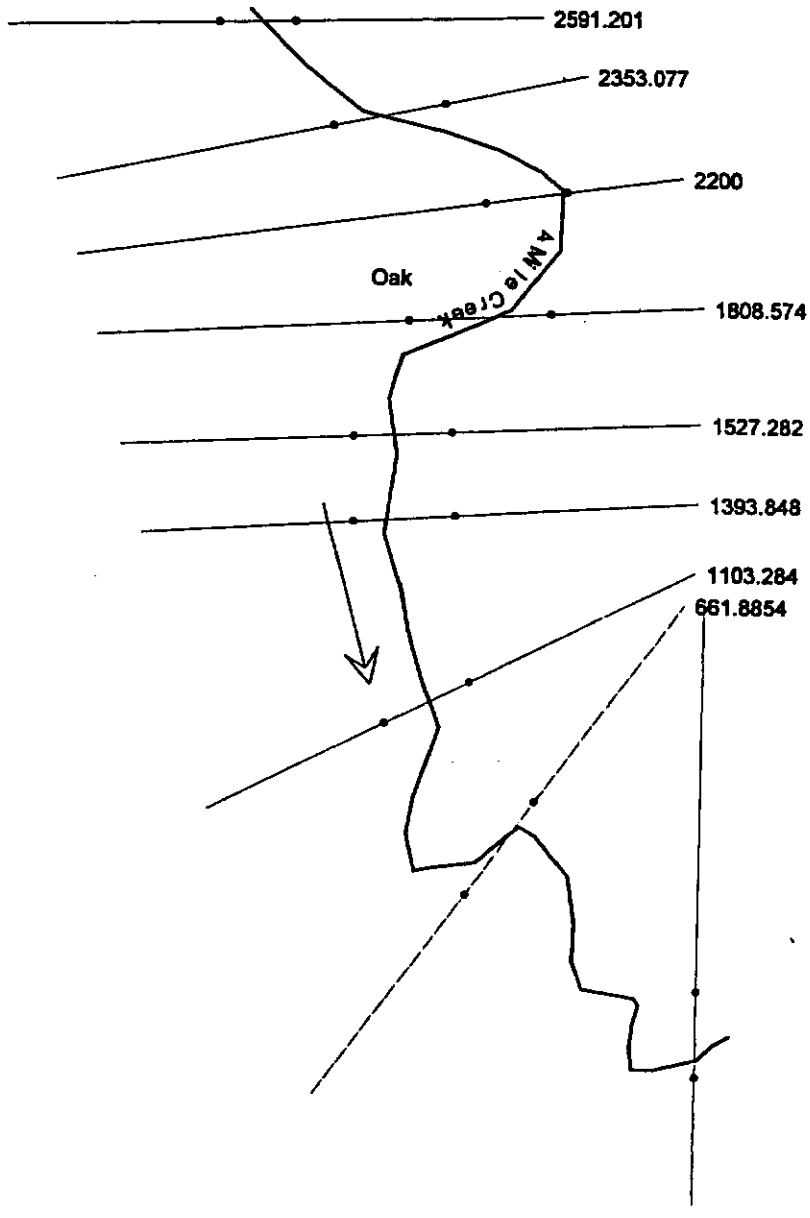
EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

TABLE 2 - SUMMARY OF DISCHARGES (Continued)

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
MIDDLE BRANCH GYPSUM CREEK					
At 13th Street	2.3	740	1,090	1,240	1,590
FOURMILE CREEK					
At county boundary	27.2	11,680	17,390	20,100	26,800
Upstream of confluence of Brookhaven Creek	8.4	3,220	4,760	5,500	7,100
Upstream of confluence of West Fork Fourmile Creek	2.2	1,410	2,070	2,400	3,130
WEST FORK FOURMILE CREEK					
At mouth at Fourmile Creek	4.2	2,110	3,120	3,600	4,770
At 13th Street North	3.2	2,200	3,270	3,780	4,850
BROOKHAVEN CREEK					
At mouth at Fourmile Creek	4.0	2,470	3,620	4,180	5,420
At Interstate 35	1.8	2,190	3,190	3,780	5,170
MIDDLE FORK CHISHOLM CREEK					
Upstream of confluence of Tributary M1	11.7	2,990	5,280	6,190	8,920
At 53rd Street North	9.5	2,580	4,570	5,360	7,720
EAST FORK CHISHOLM CREEK					
At 45th Street North	1.6	860	1,270	1,545	2,240
CENTER DRAIN EAST TRIBUTARY					
At City of Wichita corporate limits	1.5	630	1,010	1,190	1,600


OAK CREEK
OWNER: SLAWSON COMMERCIAL PROPERTIES, L.L.C.
727 NORTH WACO SUITE 400
WICHITA, KANSAS 67203
RESERVE
A
B
C
D


2591.201
2353.077
2200
Oak
Mile Creek
1808.574
1527.282
1393.848
1103.284
661.8854

HEC-RAS Plan: Plan 01 River: 4 Mile Creek Reach: Oak Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Oak	2591.201	PF 1	1817.00	1357.59	1361.80		1361.85	0.003083	2.20	1211.88	846.97	0.26
Oak	2353.077	PF 1	1817.00	1357.60	1361.34		1361.36	0.001417	1.58	1526.97	853.77	0.18
Oak	2200	PF 1	1817.00	1357.32	1360.87		1360.90	0.001552	1.97	1461.17	834.01	0.19
Oak	1808.574	PF 1	1817.00	1356.21	1360.58		1360.59	0.000473	1.27	1960.04	811.42	0.11
Oak	1527.262	PF 1	1817.00	1355.50	1360.20		1360.33	0.004294	3.18	715.64	306.50	0.32
Oak	1393.945	PF 1	1817.00	1354.84	1359.99		1360.03	0.001233	2.02	1310.09	506.84	0.18
Oak	1103.264	PF 1	1817.00	1353.60	1359.84		1359.85	0.000327	1.17	2141.68	491.34	0.09
Oak	861.8854	PF 1	1817.00	1352.56	1359.51		1359.58	0.001390	2.21	1001.80	409.13	0.19
Oak	54.06447	PF 1	2049.00	1351.33	1359.00	1355.55	1359.03	0.000658	1.74	1656.43	409.08	0.14

Plan: Plan 01 4 Mile Creek Oak RS: 2591.201 Profile: PF 1

E.G. Elev (ft)	1361.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1361.80	Reach Len. (ft)	238.12	238.12	238.00
Crit W.S. (ft)		Flow Area (sq ft)	828.01	269.23	114.64
E.G. Slope (ft/ft)	0.003083	Area (sq ft)	828.01	269.23	114.64
Q Total (cfs)	1817.00	Flow (cfs)	1145.69	592.39	78.92
Top Width (ft)	646.97	Top Width (ft)	379.18	117.40	150.39
Vel Total (ft/s)	1.50	Avg. Vel. (ft/s)	1.38	2.20	0.69
Max Chl Dpth (ft)	4.21	Hydr. Depth (ft)	2.18	2.29	0.76
Conv. Total (cfs)	32724.8	Conv. (cfs)	20634.2	10669.1	1421.5
Length Wtd. (ft)	238.11	Wetted Per. (ft)	381.24	117.96	150.40
Min Ch El (ft)	1357.59	Shear (lb/sq ft)	0.42	0.44	0.15
Alpha	1.25	Stream Power (lb/ft s)	0.58	0.97	0.10
Frctn Loss (ft)	0.48	Cum Volume (acre-ft)	29.76	37.32	22.27
C & E Loss (ft)	0.01	Cum SA (acres)	11.48	9.55	9.82

Plan: Plan 01 4 Mile Creek Oak RS: 2353.077 Profile: PF 1

E.G. Elev (ft)	1361.36	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1361.34	Reach Len. (ft)	300.00	309.31	320.00
Crit W.S. (ft)		Flow Area (sq ft)	712.30	432.15	382.52
E.G. Slope (ft/ft)	0.001417	Area (sq ft)	712.30	432.15	382.52
Q Total (cfs)	1817.00	Flow (cfs)	854.52	683.18	279.31
Top Width (ft)	653.77	Top Width (ft)	224.43	172.83	256.51
Vel Total (ft/s)	1.19	Avg. Vel. (ft/s)	1.20	1.58	0.73
Max Chl Dpth (ft)	3.73	Hydr. Depth (ft)	3.17	2.50	1.49
Conv. Total (cfs)	48261.9	Conv. (cfs)	22697.1	18146.0	7418.7
Length Wtd. (ft)	310.77	Wetted Per. (ft)	226.83	173.59	256.53
Min Ch El (ft)	1357.60	Shear (lb/sq ft)	0.28	0.22	0.13
Alpha	1.20	Stream Power (lb/ft s)	0.33	0.35	0.10
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	25.55	35.41	20.91
C & E Loss (ft)	0.00	Cum SA (acres)	9.83	8.76	8.70

Plan: Plan 01 4 Mile Creek Oak RS: 2200 Profile: PF 1

E.G. Elev (ft)	1360.90	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1360.87	Reach Len. (ft)	412.00	391.43	370.00
Crit W.S. (ft)		Flow Area (sq ft)	102.54	364.04	1014.58
E.G. Slope (ft/ft)	0.001552	Area (sq ft)	102.54	364.04	1014.58
Q Total (cfs)	1817.00	Flow (cfs)	73.91	716.57	1026.52
Top Width (ft)	634.01	Top Width (ft)	75.01	112.58	446.42
Vel Total (ft/s)	1.23	Avg. Vel. (ft/s)	0.72	1.97	1.01
Max Chl Dpth (ft)	3.55	Hydr. Depth (ft)	1.37	3.23	2.27
Conv. Total (cfs)	46125.1	Conv. (cfs)	1876.2	18190.3	26058.6
Length Wtd. (ft)	386.13	Wetted Per. (ft)	75.05	112.65	446.46
Min Ch El (ft)	1357.32	Shear (lb/sq ft)	0.13	0.31	0.22
Alpha	1.41	Stream Power (lb/ft s)	0.10	0.62	0.22
Frctn Loss (ft)	0.30	Cum Volume (acre-ft)	22.75	32.58	15.78
C & E Loss (ft)	0.00	Cum SA (acres)	8.80	7.75	6.12

Plan: Plan 01 4 Mile Creek Oak RS: 1808.574 Profile: PF 1

E.G. Elev (ft)	1360.59	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.02	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1360.58	Reach Len. (ft)	234.91	234.91	234.00
Crit W.S. (ft)		Flow Area (sq ft)	536.83	898.76	524.45
E.G. Slope (ft/ft)	0.000473	Area (sq ft)	536.83	898.76	524.45
Q Total (cfs)	1817.00	Flow (cfs)	373.45	1142.44	301.11
Top Width (ft)	611.42	Top Width (ft)	169.94	219.98	221.50
Vel Total (ft/s)	0.93	Avg. Vel. (ft/s)	0.70	1.27	0.57
Max Chl Dpth (ft)	4.37	Hydr. Depth (ft)	3.16	4.09	2.37
Conv. Total (cfs)	83509.9	Conv. (cfs)	17163.9	52507.0	13839.0
Length Wtd. (ft)	234.83	Wetted Per. (ft)	170.08	219.99	221.61
Min Ch El (ft)	1356.21	Shear (lb/sq ft)	0.09	0.12	0.07
Alpha	1.36	Stream Power (lb/ft s)	0.06	0.15	0.04
Frctn Loss (ft)	0.25	Cum Volume (acre-ft)	19.72	26.90	9.24
C & E Loss (ft)	0.01	Cum SA (acres)	7.64	6.25	3.28

Plan: Plan 01 4 Mile Creek Oak RS: 1527.282 Profile: PF 1

E.G. Elev (ft)	1360.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.13	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1360.20	Reach Len. (ft)	135.00	133.43	131.00
Crit W.S. (ft)		Flow Area (sq ft)	241.90	465.76	7.99
E.G. Slope (ft/ft)	0.004294	Area (sq ft)	241.90	465.76	7.99
Q Total (cfs)	1817.00	Flow (cfs)	326.99	1482.86	7.15
Top Width (ft)	306.50	Top Width (ft)	147.85	149.77	8.88
Vel Total (ft/s)	2.54	Avg. Vel. (ft/s)	1.35	3.18	0.90
Max Chl Dpth (ft)	4.70	Hydr. Depth (ft)	1.64	3.11	0.90
Conv. Total (cfs)	27728.4	Conv. (cfs)	4990.1	22629.2	109.1
Length Wtd. (ft)	133.49	Wetted Per. (ft)	147.88	150.32	9.05
Min Ch El (ft)	1355.50	Shear (lb/sq ft)	0.44	0.83	0.24
Alpha	1.33	Stream Power (lb/ft s)	0.59	2.64	0.21
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	17.63	23.23	7.81
C & E Loss (ft)	0.03	Cum SA (acres)	6.78	5.26	2.67

Plan: Plan 01 4 Mile Creek Oak RS: 1393.848 Profile: PF 1

E.G. Elev (ft)	1360.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.98	Reach Len. (ft)	290.57	290.57	290.57
Crit W.S. (ft)		Flow Area (sq ft)	336.47	621.14	352.49
E.G. Slope (ft/ft)	0.001233	Area (sq ft)	336.47	621.14	352.49
Q Total (cfs)	1817.00	Flow (cfs)	273.39	1254.40	289.20
Top Width (ft)	506.84	Top Width (ft)	173.06	155.19	178.59
Vel Total (ft/s)	1.39	Avg. Vel. (ft/s)	0.81	2.02	0.82
Max Chl Dpth (ft)	5.14	Hydr. Depth (ft)	1.94	4.00	1.97
Conv. Total (cfs)	51750.6	Conv. (cfs)	7786.6	35727.1	8236.9
Length Wtd. (ft)	290.57	Wetted Per. (ft)	173.11	155.63	178.73
Min Ch El (ft)	1354.84	Shear (lb/sq ft)	0.15	0.31	0.15
Alpha	1.57	Stream Power (lb/ft s)	0.12	0.62	0.12
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	16.73	21.56	7.27
C & E Loss (ft)	0.01	Cum SA (acres)	6.28	4.79	2.38

Plan: Plan 01 4 Mile Creek Oak RS: 1103.284 Profile: PF 1

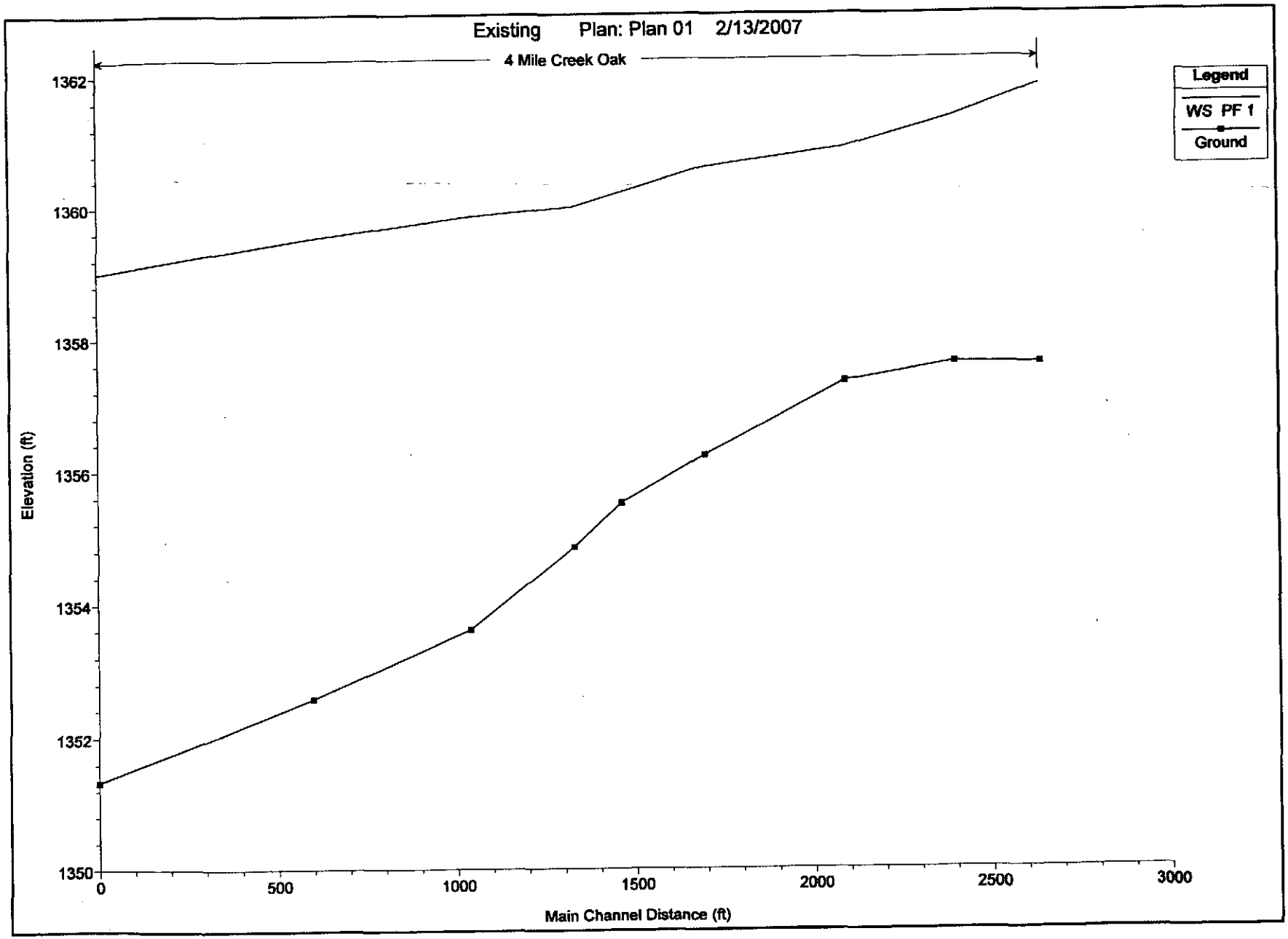
E.G. Elev (ft)	1359.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.01	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.84	Reach Len. (ft)	434.00	441.40	446.00
Crit W.S. (ft)		Flow Area (sq ft)	870.71	688.44	582.53
E.G. Slope (ft/ft)	0.000327	Area (sq ft)	870.71	688.44	582.53
Q Total (cfs)	1817.00	Flow (cfs)	596.29	803.12	417.58
Top Width (ft)	491.34	Top Width (ft)	213.52	144.56	133.27
Vel Total (ft/s)	0.85	Avg. Vel. (ft/s)	0.68	1.17	0.72
Max Chl Dpth (ft)	6.24	Hydr. Depth (ft)	4.08	4.76	4.37
Conv. Total (cfs)	100494.9	Conv. (cfs)	32979.9	44419.3	23095.6
Length Wtd. (ft)	440.50	Wetted Per. (ft)	213.94	145.19	133.66
Min Ch El (ft)	1353.60	Shear (lb/sq ft)	0.08	0.10	0.09
Alpha	1.21	Stream Power (lb/ft s)	0.06	0.11	0.06
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)	12.70	17.19	4.15
C & E Loss (ft)	0.01	Cum SA (acres)	4.99	3.79	1.34

Plan: Plan 01 4 Mile Creek Oak RS: 661.8854 Profile: PF 1

E.G. Elev (ft)	1359.58	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.51	Reach Len. (ft)	592.00	597.80	605.00
Crit W.S. (ft)		Flow Area (sq ft)	206.91	759.07	35.83
E.G. Slope (ft/ft)	0.001390	Area (sq ft)	206.91	759.07	35.83
Q Total (cfs)	1817.00	Flow (cfs)	118.36	1677.25	21.39
Top Width (ft)	409.13	Top Width (ft)	197.04	180.14	31.95
Vel Total (ft/s)	1.81	Avg. Vel. (ft/s)	0.57	2.21	0.60
Max Chl Dpth (ft)	6.95	Hydr. Depth (ft)	1.05	4.21	1.12
Conv. Total (cfs)	48732.3	Conv. (cfs)	3174.4	44984.2	573.8
Length Wtd. (ft)	596.62	Wetted Per. (ft)	197.21	181.86	32.02
Min Ch El (ft)	1352.56	Shear (lb/sq ft)	0.09	0.36	0.10
Alpha	1.38	Stream Power (lb/ft s)	0.05	0.80	0.06
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	7.33	9.86	0.99
C & E Loss (ft)	0.01	Cum SA (acres)	2.95	2.14	0.50

Plan: Plan 01 4 Mile Creek Oak RS: 64.08447 Profile: PF 1

E.G. Elev (ft)	1359.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.00	Reach Len. (ft)			
Crit W.S. (ft)	1355.55	Flow Area (sq ft)	872.42	677.77	106.24
E.G. Slope (ft/ft)	0.000658	Area (sq ft)	872.42	677.77	106.24
Q Total (cfs)	2049.00	Flow (cfs)	792.47	1179.03	77.50
Top Width (ft)	409.08	Top Width (ft)	237.01	132.26	39.80
Vel Total (ft/s)	1.24	Avg. Vel. (ft/s)	0.91	1.74	0.73
Max Chl Dpth (ft)	7.67	Hydr. Depth (ft)	3.68	5.12	2.67
Conv. Total (cfs)	79879.2	Conv. (cfs)	30894.1	45963.9	3021.2
Length Wtd. (ft)		Wetted Per. (ft)	237.13	132.65	40.13
Min Ch El (ft)	1351.33	Shear (lb/sq ft)	0.15	0.21	0.11
Alpha	1.36	Stream Power (lb/ft s)	0.14	0.37	0.08
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			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4 Mile Creek Oak
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1352
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1500
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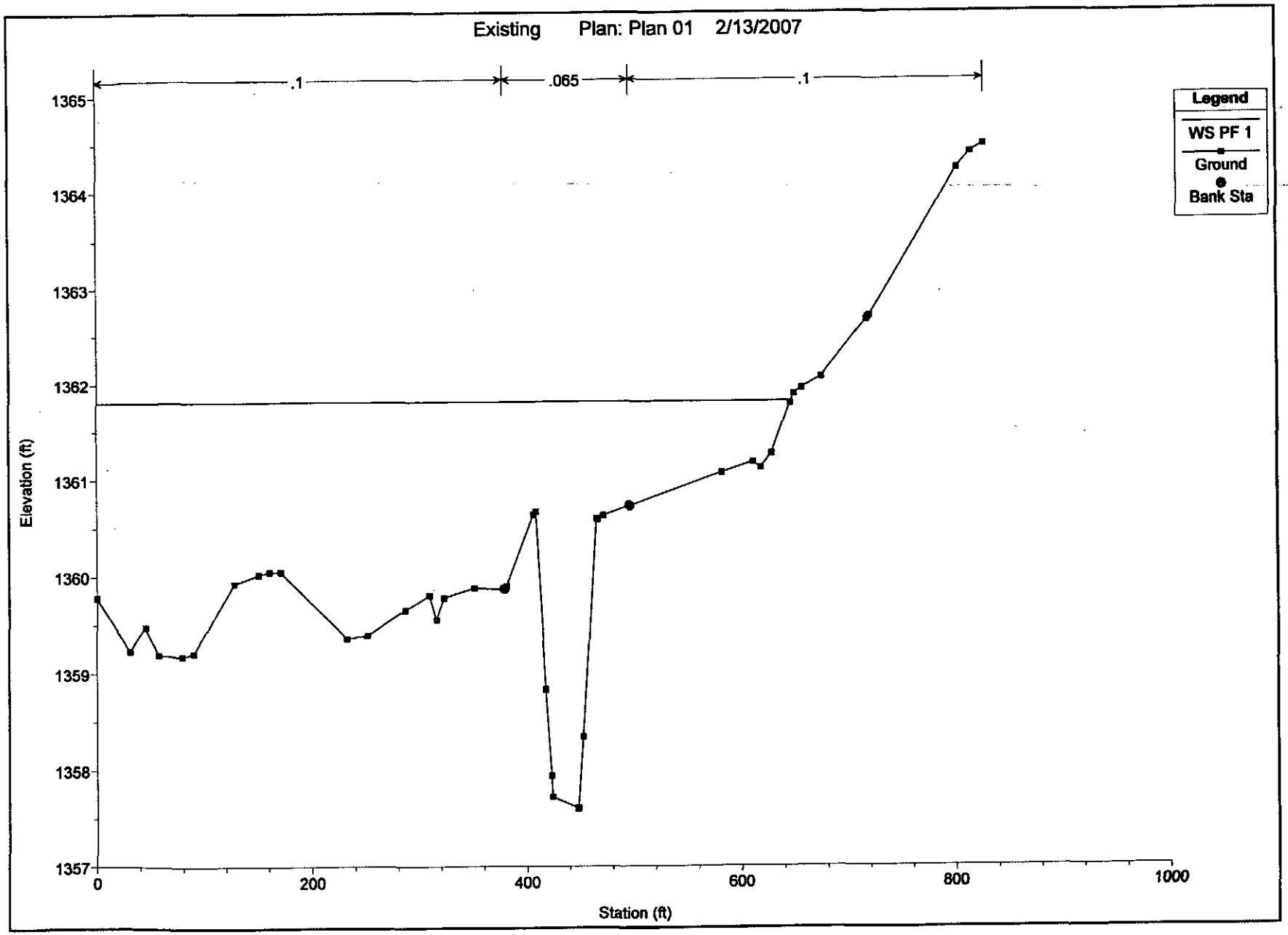
2500
3000
Main Channel Distance (ft)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Legend
WS PF 1
Ground
Bank Sta
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Elevation (ft)
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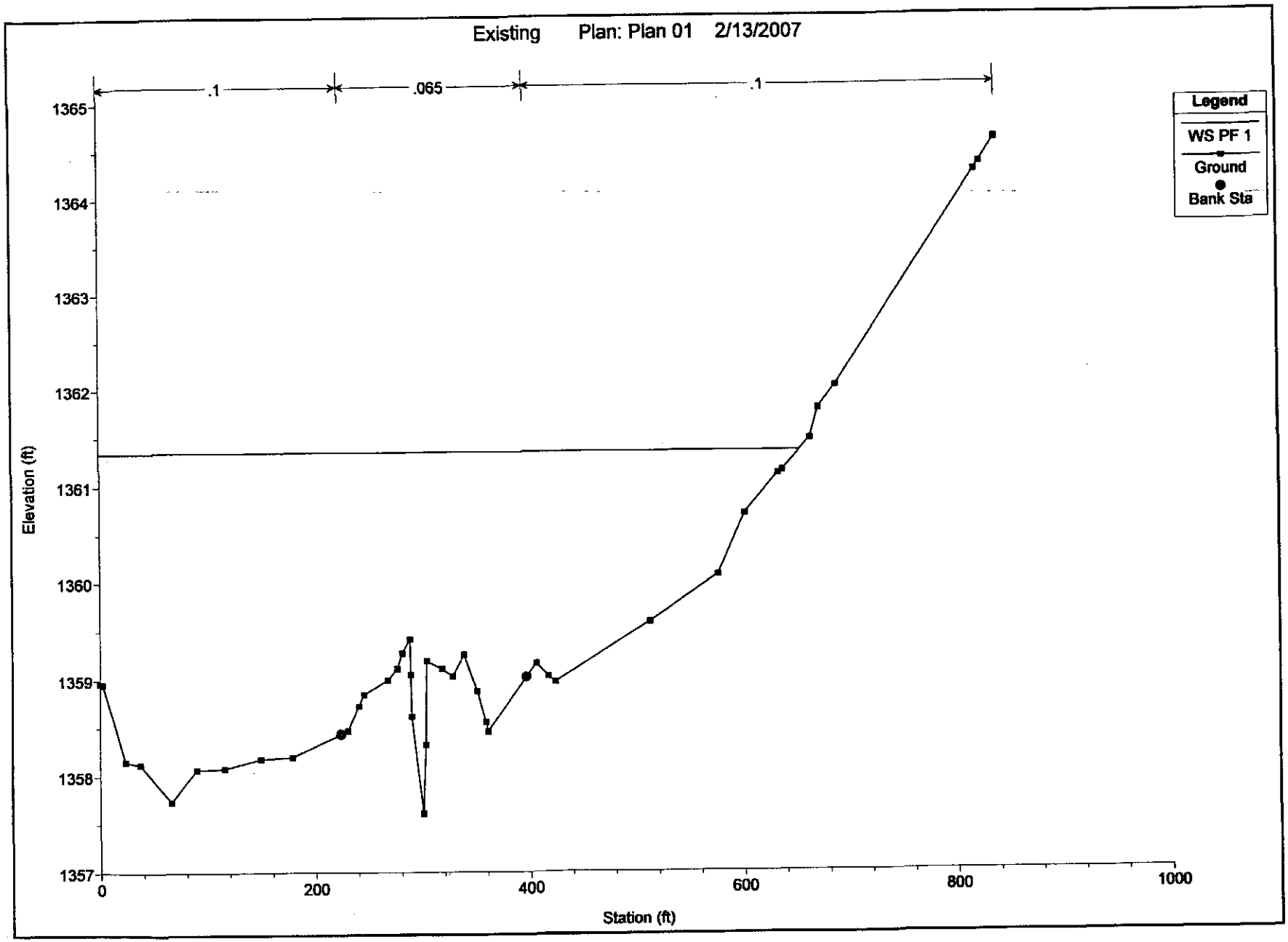
Station (ft)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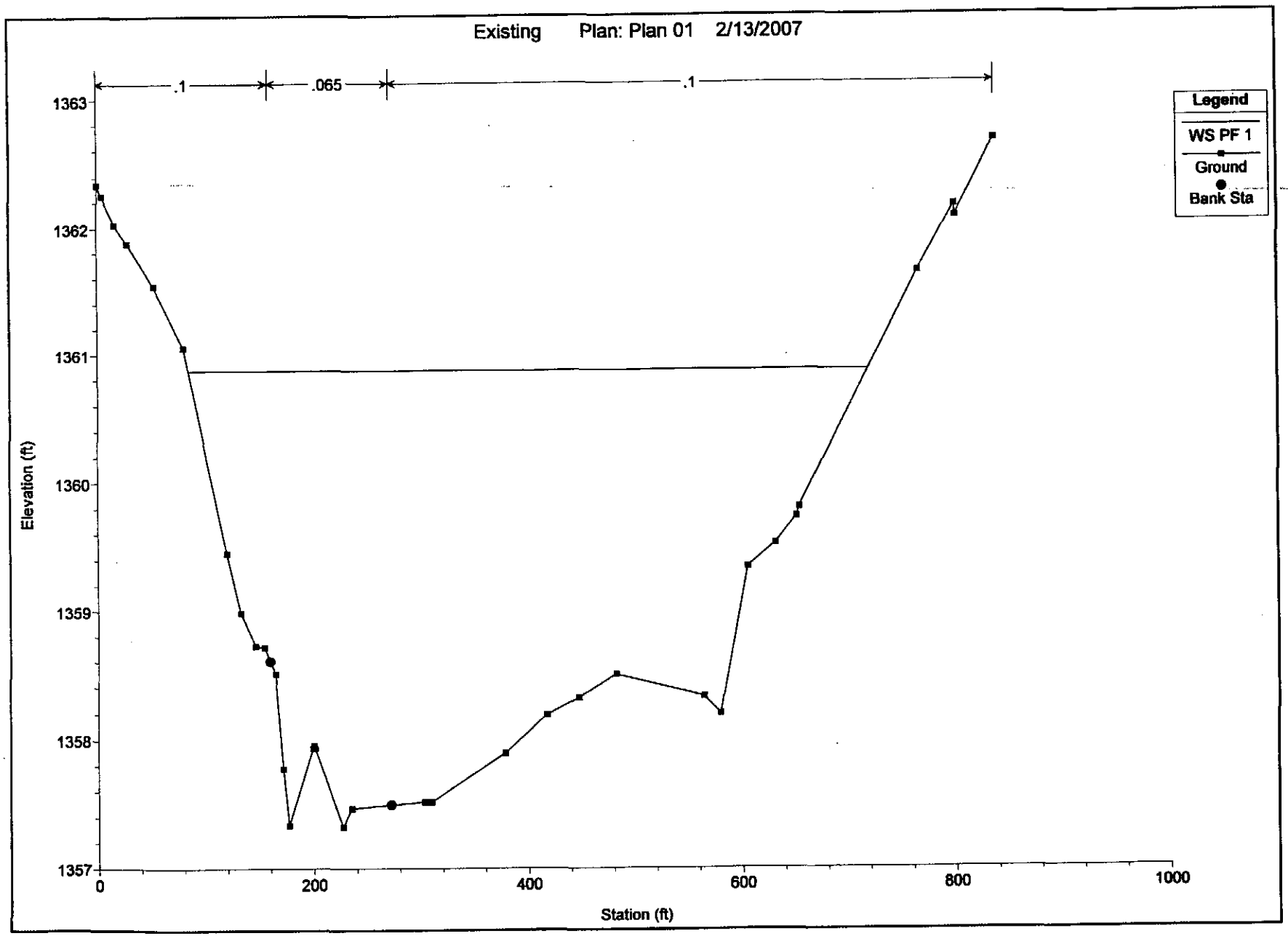
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Elevation (ft)
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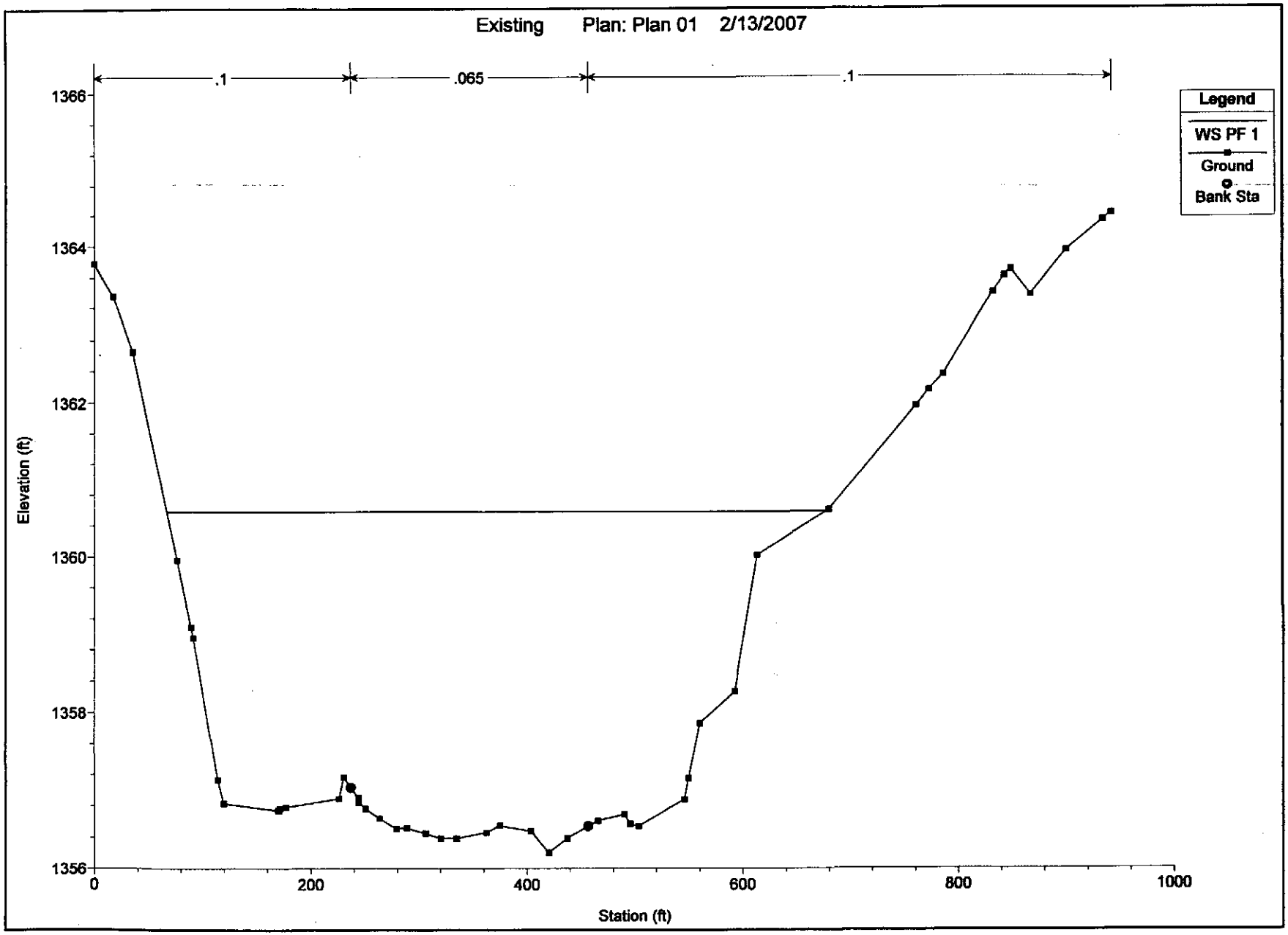
Station (ft)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Elevation (ft)
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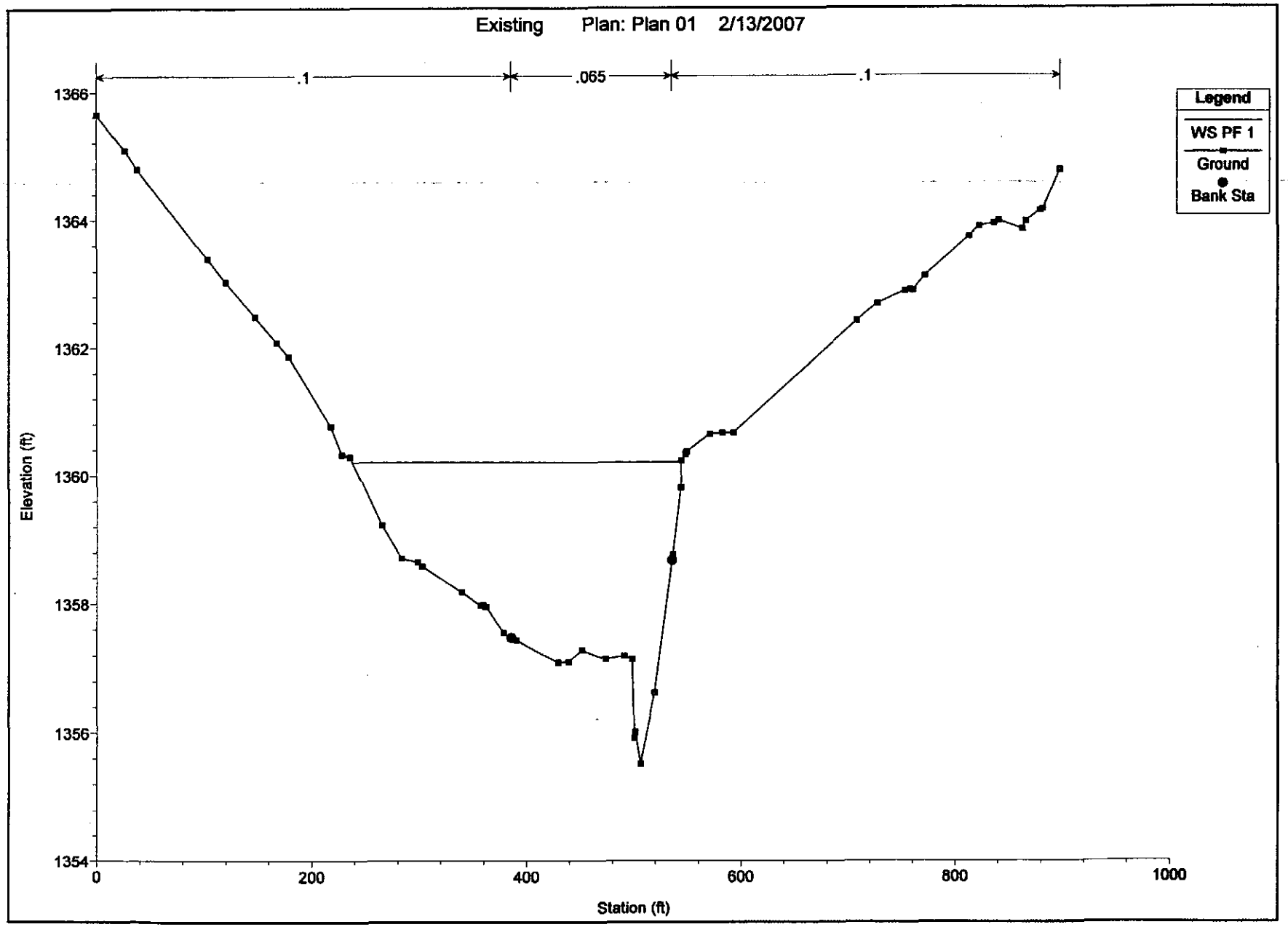
Station (ft)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Elevation (ft)
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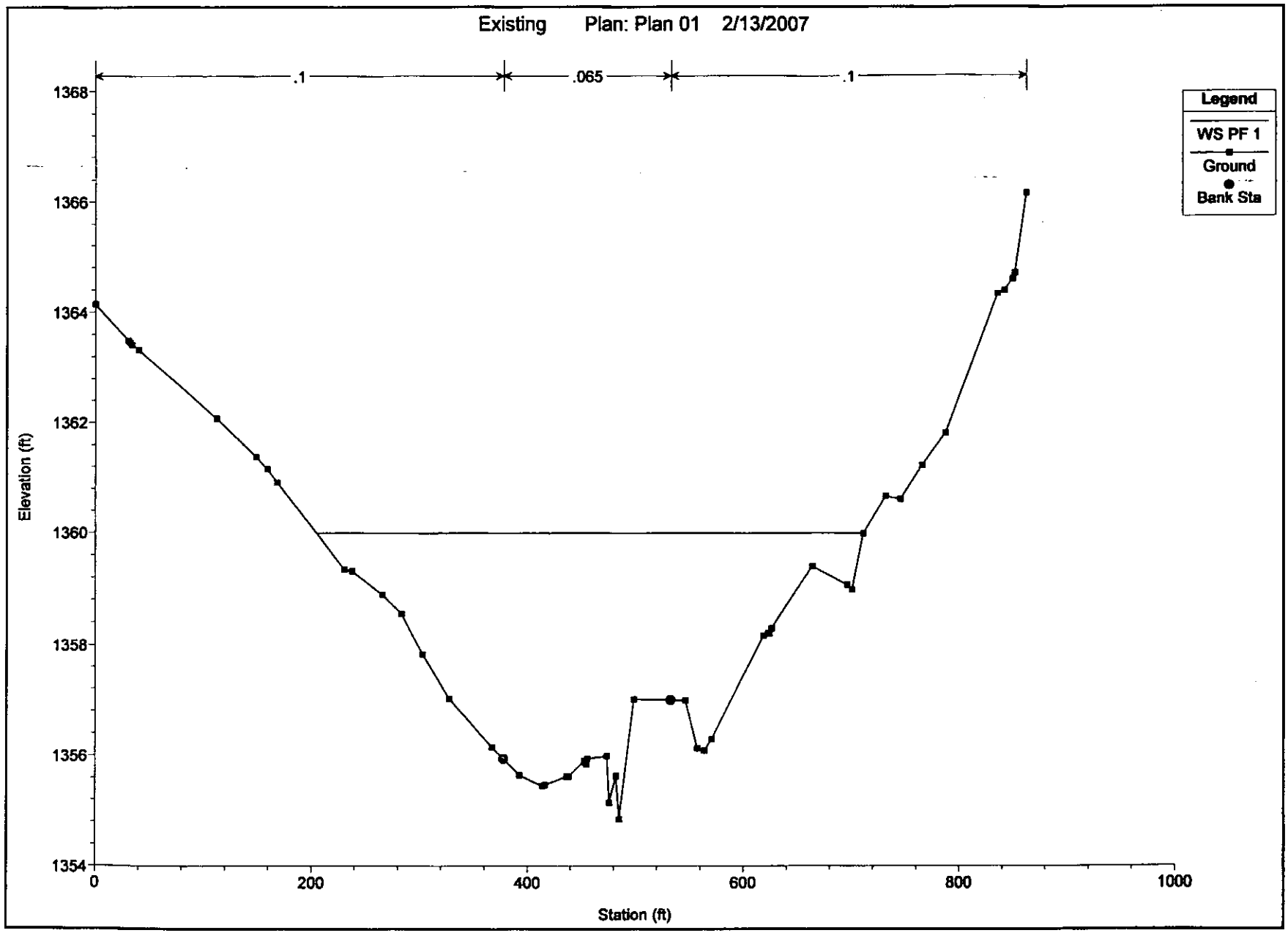
Station (ft)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WS PF 1
Ground
Bank Sta
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600
800
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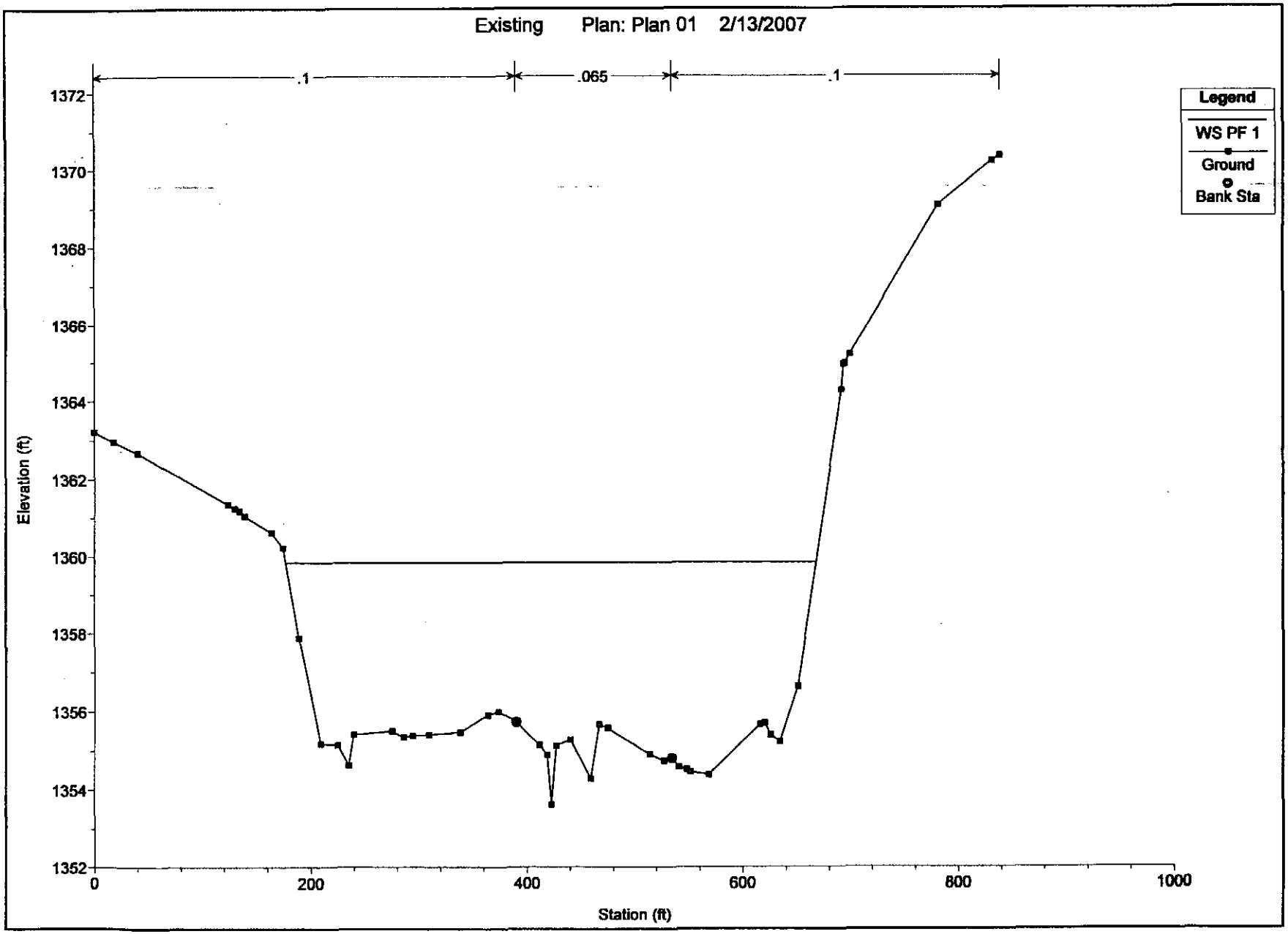
Station (ft)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Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
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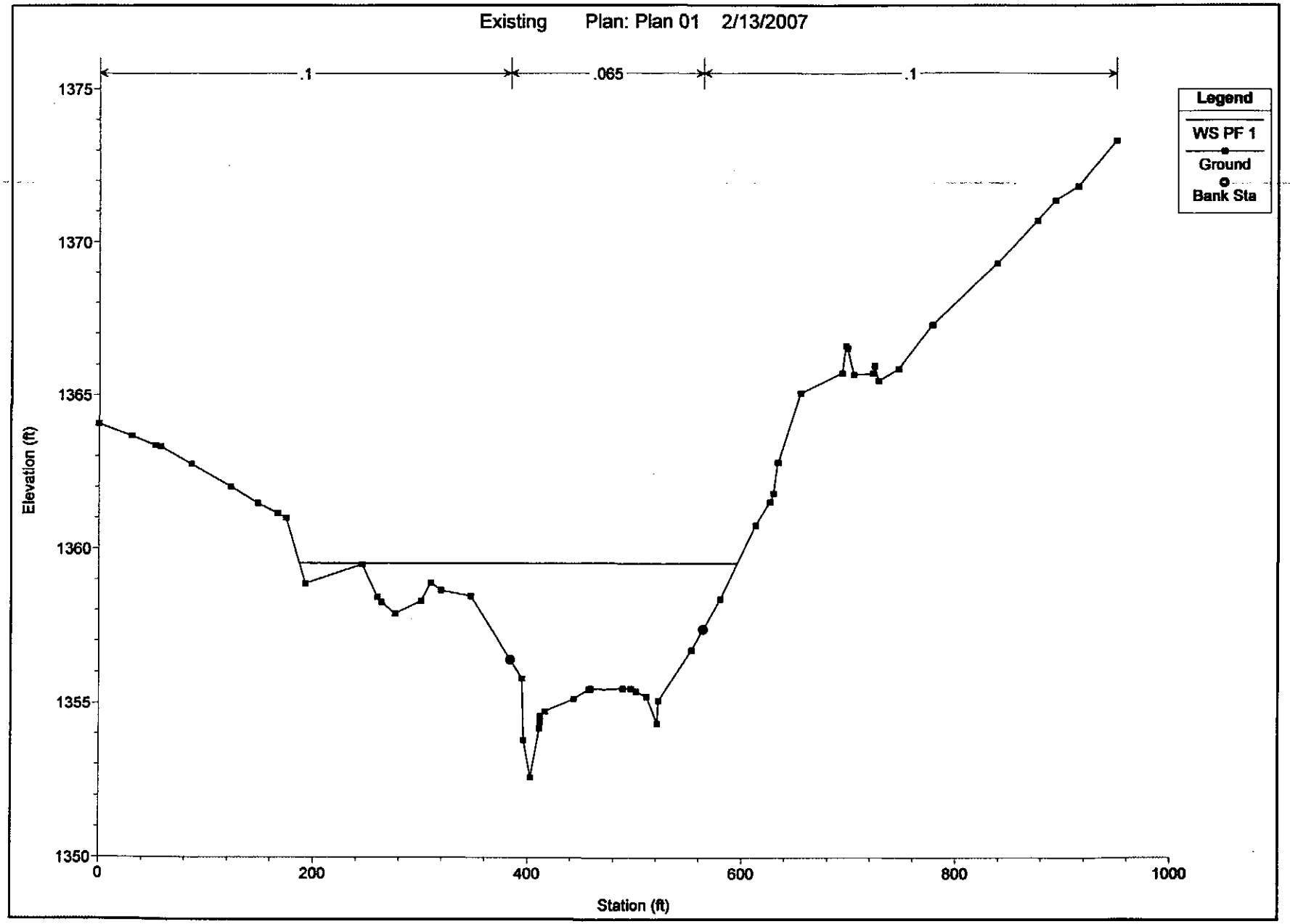
Station (ft)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Legend
WS PF 1
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Bank Sta
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1350
Elevation (ft)
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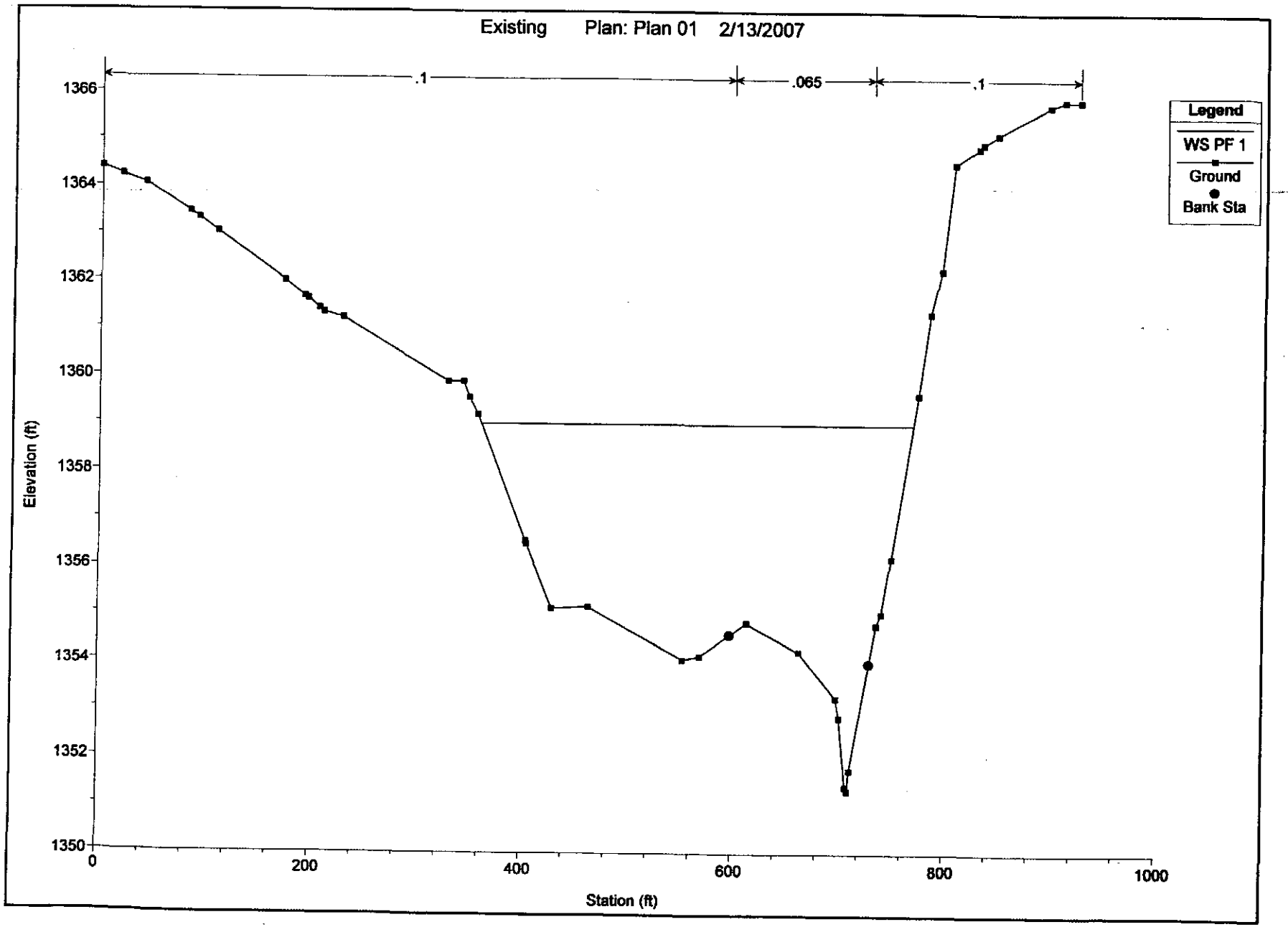
Station (ft)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WS PF 1
Ground
Bank Sta
Elevation (ft)
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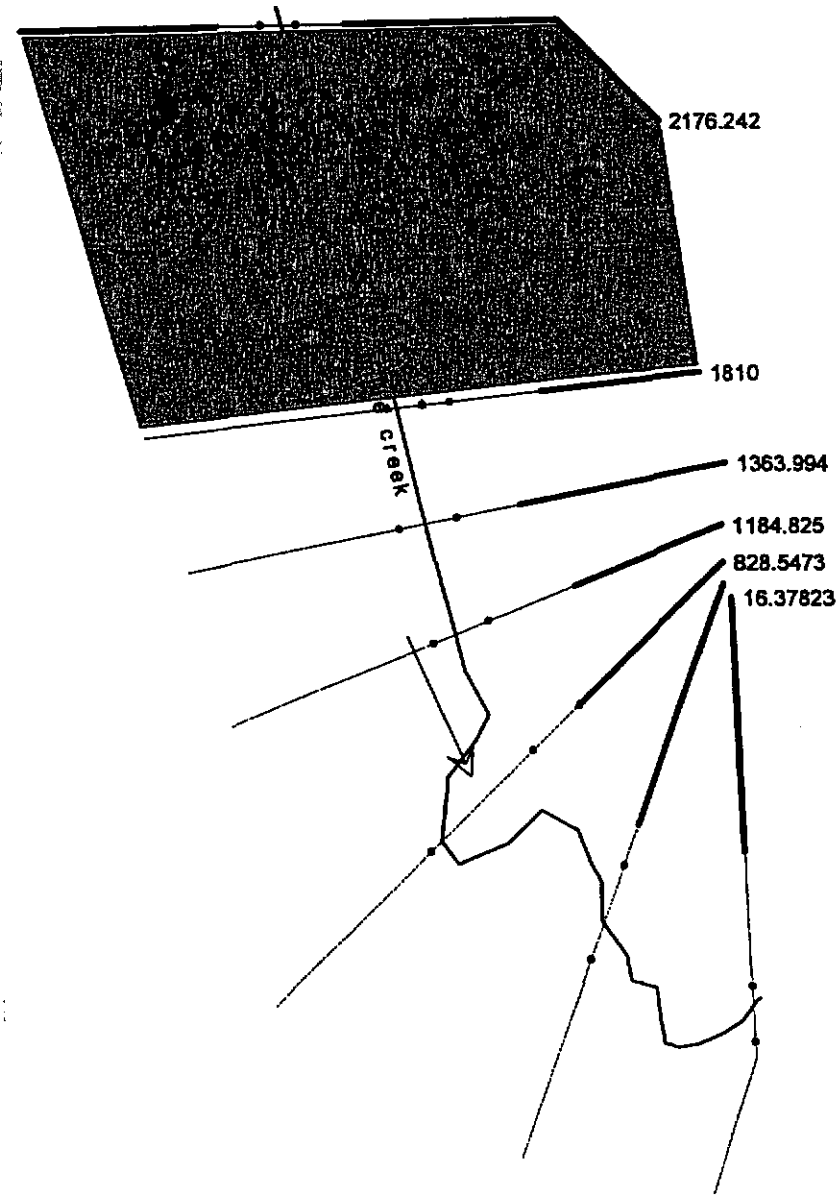
Station (ft)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1810
creek
1363.994
1184.825
828.5473
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HEC-RAS Plan: nproposal4 River: 4 mile creek Reach: oak Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
oak	2178.242	PF 1	1817.00	1357.00	1362.43	1360.38	1362.67	0.003911	4.42	609.09	200.00	0.33
oak	2170		Culvert									
oak	1810	PF 1	1817.00	1355.50	1361.08	1358.71	1361.60	0.006573	5.83	311.79	489.70	0.43
oak	1650.543	PF 1	1817.00	1355.20	1361.09	1358.83	1361.13	0.000605	1.84	1278.84	350.00	0.15
oak	1363.994	PF 1	1817.00	1355.00	1360.71	1358.54	1360.79	0.002435	2.72	696.09	250.00	0.25
oak	1184.825	PF 1	1817.00	1354.70	1360.25	1357.83	1360.33	0.002715	2.65	851.81	233.00	0.25
oak	828.5473	PF 1	1817.00	1353.88	1359.68	1357.03	1359.73	0.001119	1.90	1085.49	344.40	0.17
oak	405.9100	PF 1	1817.00	1352.53	1359.28	1355.61	1359.32	0.000880	2.00	1092.08	290.00	0.16
oak	16.37823	PF 1	2049.00	1351.48	1359.00	1355.37	1359.03	0.000622	1.87	1650.08	383.32	0.13

Plan: nproposal4 4 mile creek oak RS: 2176.242 Profile: PF 1

E.G. Elev (ft)	1362.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.24	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1362.43	Reach Len. (ft)	356.00	366.24	376.00
Crit W.S. (ft)	1360.38	Flow Area (sq ft)	179.87	312.31	116.91
E.G. Slope (ft/ft)	0.003911	Area (sq ft)	179.87	312.31	116.91
Q Total (cfs)	1817.00	Flow (cfs)	289.38	1379.57	148.05
Top Width (ft)	200.00	Top Width (ft)	74.04	57.50	68.46
Vel Total (ft/s)	2.98	Avg. Vel. (ft/s)	1.61	4.42	1.27
Max Chl Dpth (ft)	5.43	Hydr. Depth (ft)	2.43	5.43	1.71
Conv. Total (cfs)	29055.6	Conv. (cfs)	4627.4	22060.7	2367.5
Length Wtd. (ft)	366.24	Wetted Per. (ft)	78.96	57.50	73.49
Min Ch El (ft)	1357.00	Shear (lb/sq ft)	0.56	1.33	0.39
Alpha	1.73	Stream Power (lb/ft s)	0.89	5.86	0.49
Frctn Loss (ft)		Cum Volume (acre-ft)	23.63	27.13	4.91
C & E Loss (ft)		Cum SA (acres)	6.78	5.97	3.01

Plan: nproposal4 4 mile creek oak RS: 1810 Profile: PF 1

E.G. Elev (ft)	1361.60	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.53	Wt. n-Val.		0.065	
W.S. Elev (ft)	1361.08	Reach Len. (ft)	185.00	186.65	187.00
Crit W.S. (ft)	1358.71	Flow Area (sq ft)		311.79	
E.G. Slope (ft/ft)	0.006573	Area (sq ft)	948.25	311.79	65.25
Q Total (cfs)	1817.00	Flow (cfs)		1817.00	
Top Width (ft)	489.70	Top Width (ft)	324.49	55.92	109.29
Vel Total (ft/s)	5.83	Avg. Vel. (ft/s)		5.83	
Max Chl Dpth (ft)	5.58	Hydr. Depth (ft)		5.58	
Conv. Total (cfs)	22411.1	Conv. (cfs)		22411.1	
Length Wtd. (ft)	186.23	Wetted Per. (ft)		55.92	
Min Ch El (ft)	1355.50	Shear (lb/sq ft)		2.29	
Alpha	1.00	Stream Power (lb/ft s)		13.33	
Frctn Loss (ft)	0.33	Cum Volume (acre-ft)	19.02	24.51	4.13
C & E Loss (ft)	0.15	Cum SA (acres)	5.15	5.50	2.24

Plan: nproposal4 4 mile creek oak RS: 1550.643 Profile: PF 1

E.G. Elev (ft)	1361.13	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.04	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1361.09	Reach Len. (ft)	255.00	259.36	264.00
Crit W.S. (ft)	1356.83	Flow Area (sq ft)	746.00	475.81	57.03
E.G. Slope (ft/ft)	0.000805	Area (sq ft)	746.00	475.81	57.03
Q Total (cfs)	1817.00	Flow (cfs)	924.30	876.81	15.88
Top Width (ft)	350.00	Top Width (ft)	145.02	99.00	105.98
Vel Total (ft/s)	1.42	Avg. Vel. (ft/s)	1.24	1.84	0.28
Max Chl Dpth (ft)	5.89	Hydr. Depth (ft)	5.14	4.81	0.54
Conv. Total (cfs)	64037.2	Conv. (cfs)	32575.6	30901.9	559.8
Length Wtd. (ft)	258.08	Wetted Per. (ft)	148.08	99.37	106.21
Min Ch El (ft)	1355.20	Shear (lb/sq ft)	0.25	0.24	0.03
Alpha	1.20	Stream Power (lb/ft s)	0.31	0.44	0.01
Frctn Loss (ft)	0.34	Cum Volume (acre-ft)	15.43	22.82	3.87
C & E Loss (ft)	0.00	Cum SA (acres)	4.15	5.16	1.78

Plan: nproposal4 4 mile creek oak RS: 1363.994 Profile: PF 1

E.G. Elev (ft)	1360.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1360.71	Reach Len. (ft)	179.00	179.17	179.00
Crit W.S. (ft)	1358.54	Flow Area (sq ft)	328.87	351.18	216.04
E.G. Slope (ft/ft)	0.002435	Area (sq ft)	328.87	351.18	216.04
Q Total (cfs)	1817.00	Flow (cfs)	522.37	955.64	338.99
Top Width (ft)	260.00	Top Width (ft)	101.05	92.76	66.19
Vel Total (ft/s)	2.03	Avg. Vel. (ft/s)	1.59	2.72	1.57
Max Chl Dpth (ft)	5.71	Hydr. Depth (ft)	3.25	3.79	3.26
Conv. Total (cfs)	36819.4	Conv. (cfs)	10585.3	19364.9	6869.3
Length Wtd. (ft)	179.08	Wetted Per. (ft)	103.16	93.74	69.02
Min Ch El (ft)	1355.00	Shear (lb/sq ft)	0.48	0.57	0.48
Alpha	1.24	Stream Power (lb/ft s)	0.77	1.55	0.75
Frctn Loss (ft)	0.46	Cum Volume (acre-ft)	12.28	20.36	3.04
C & E Loss (ft)	0.00	Cum SA (acres)	3.43	4.59	1.26

Plan: nproposal4 4 mile creek oak RS: 1184.825 Profile: PF 1

E.G. Elev (ft)	1360.33	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.08	Wt. n-Val.	0.100	0.065	
W.S. Elev (ft)	1360.25	Reach Len. (ft)	350.00	356.28	362.00
Crit W.S. (ft)	1357.83	Flow Area (sq ft)	549.21	302.60	
E.G. Slope (ft/ft)	0.002715	Area (sq ft)	549.21	302.60	
Q Total (cfs)	1817.00	Flow (cfs)	1016.36	800.64	
Top Width (ft)	233.00	Top Width (ft)	146.26	86.74	
Vel Total (ft/s)	2.13	Avg. Vel. (ft/s)	1.85	2.65	
Max Chl Dpth (ft)	5.55	Hydr. Depth (ft)	3.75	3.49	
Conv. Total (cfs)	34869.6	Conv. (cfs)	19504.8	15364.9	
Length Wtd. (ft)	354.36	Wetted Per. (ft)	148.63	91.42	
Min Ch El (ft)	1354.70	Shear (lb/sq ft)	0.63	0.56	
Alpha	1.10	Stream Power (lb/ft s)	1.16	1.48	
Frctn Loss (ft)	0.59	Cum Volume (acre-ft)	10.48	19.01	2.59
C & E Loss (ft)	0.01	Cum SA (acres)	2.92	4.22	1.12

Plan: nproposal4 4 mile creek oak RS: 828.5473 Profile: PF 1

E.G. Elev (ft)	1359.73	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.68	Reach Len. (ft)	380.00	422.64	460.00
Crit W.S. (ft)	1357.03	Flow Area (sq ft)	167.83	884.46	33.19
E.G. Slope (ft/ft)	0.001119	Area (sq ft)	357.55	884.53	33.19
Q Total (cfs)	1817.00	Flow (cfs)	115.21	1677.77	24.02
Top Width (ft)	344.40	Top Width (ft)	99.97	225.88	18.55
Vel Total (ft/s)	1.67	Avg. Vel. (ft/s)	0.69	1.90	0.72
Max Chl Dpth (ft)	5.80	Hydr. Depth (ft)	1.68	3.92	1.79
Conv. Total (cfs)	54312.1	Conv. (cfs)	3443.7	50150.3	718.1
Length Wtd. (ft)	421.36	Wetted Per. (ft)	103.43	226.42	18.89
Min Ch El (ft)	1353.88	Shear (lb/sq ft)	0.11	0.27	0.12
Alpha	1.20	Stream Power (lb/ft s)	0.08	0.52	0.09
Frctn Loss (ft)	0.41	Cum Volume (acre-ft)	6.83	14.16	2.46
C & E Loss (ft)	0.00	Cum SA (acres)	1.93	2.94	1.05

Plan: nproposal4 4 mile creek oak RS: 405.9100 Profile: PF 1

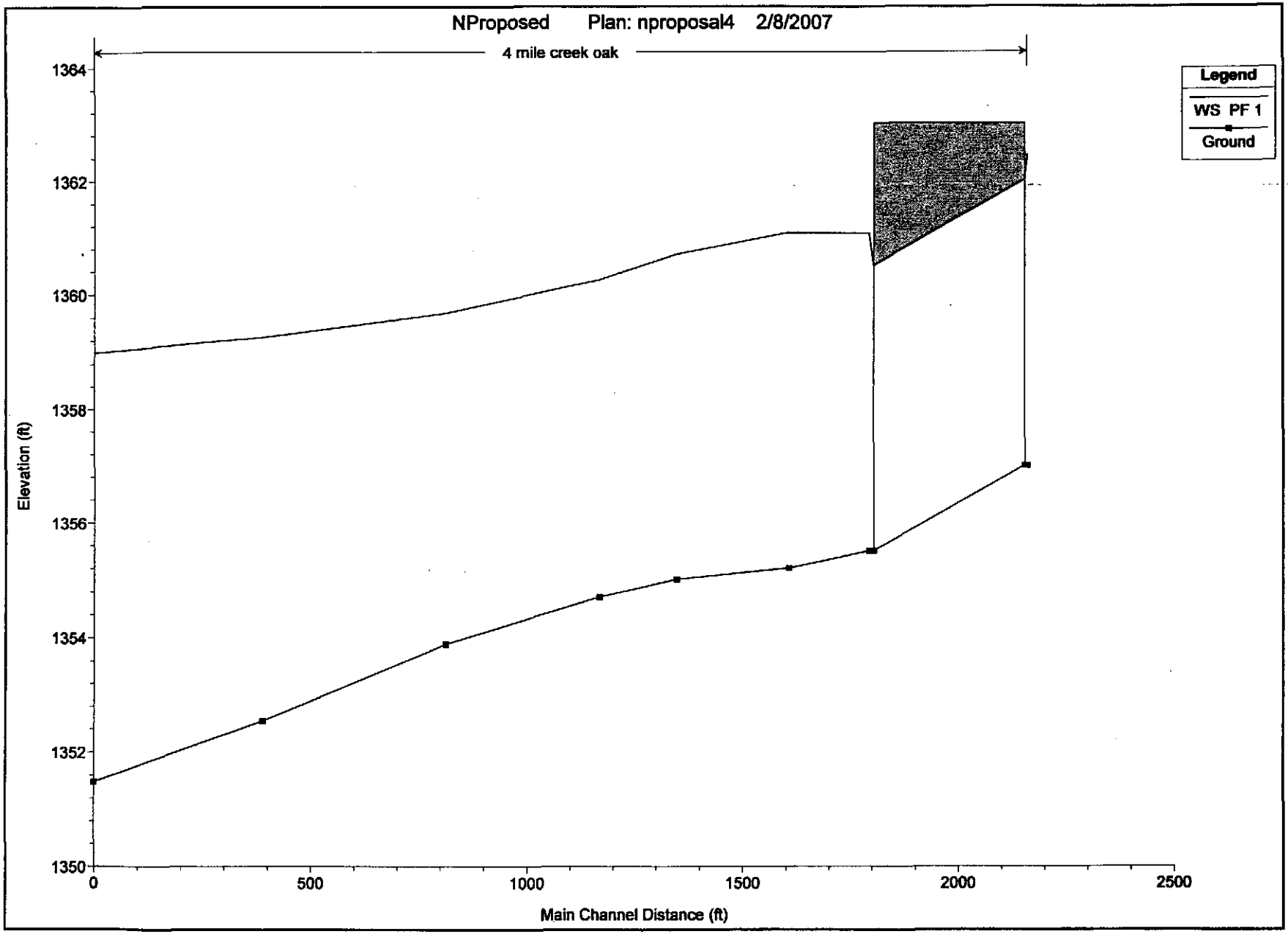
E.G. Elev (ft)	1359.32	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.26	Reach Len. (ft)	375.00	389.53	403.00
Crit W.S. (ft)	1355.61	Flow Area (sq ft)	144.28	808.20	139.60
E.G. Slope (ft/ft)	0.000860	Area (sq ft)	144.28	808.20	139.60
Q Total (cfs)	1817.00	Flow (cfs)	102.29	1614.57	100.15
Top Width (ft)	290.00	Top Width (ft)	68.06	156.56	65.38
Vel Total (ft/s)	1.66	Avg. Vel. (ft/s)	0.71	2.00	0.72
Max Chl Dpth (ft)	6.73	Hydr. Depth (ft)	2.12	5.16	2.14
Conv. Total (cfs)	61951.2	Conv. (cfs)	3487.5	55049.2	3414.5
Length Wtd. (ft)	386.53	Wetted Per. (ft)	69.54	157.14	66.10
Min Ch El (ft)	1352.53	Shear (lb/sq ft)	0.11	0.28	0.11
Alpha	1.30	Stream Power (lb/ft s)	0.08	0.55	0.08
Frctn Loss (ft)	0.28	Cum Volume (acre-ft)	4.64	5.94	1.54
C & E Loss (ft)	0.01	Cum SA (acres)	1.20	1.09	0.60

Plan: nproposal4 4 mile creek oak RS: 16.37823 Profile: PF 1

E.G. Elev (ft)	1359.03	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.03	Wt. n-Val.	0.100	0.065	0.100
W.S. Elev (ft)	1359.00	Reach Len. (ft)			
Crit W.S. (ft)	1355.37	Flow Area (sq ft)	934.57	521.36	194.13
E.G. Slope (ft/ft)	0.000622	Area (sq ft)	934.57	521.36	194.13
Q Total (cfs)	2049.00	Flow (cfs)	926.51	973.74	148.75
Top Width (ft)	363.32	Top Width (ft)	211.17	87.10	65.05
Vel Total (ft/s)	1.24	Avg. Vel. (ft/s)	0.99	1.87	0.77
Max Chl Dpth (ft)	7.52	Hydr. Depth (ft)	4.43	5.99	2.98
Conv. Total (cfs)	82172.9	Conv. (cfs)	37156.6	39050.6	5965.6
Length Wtd. (ft)		Wetted Per. (ft)	213.53	87.91	65.27
Min Ch El (ft)	1351.46	Shear (lb/sq ft)	0.17	0.23	0.12
Alpha	1.39	Stream Power (lb/ft s)	0.17	0.43	0.09
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

HEC-RAS Plan: nproposal4 River: 4 mile creek Reach: oak Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev.	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
oak	2176.242	PF 1	1817.00	1357.00	1362.43	1360.38	1362.67	0.003911	4.42	609.09	200.00	0.33
oak	2170		Culvert									
oak	1810	PF 1	1817.00	1355.50	1361.08	1358.71	1361.60	0.006573	5.83	311.79	489.70	0.43
oak	1550.643	PF 1	1817.00	1355.20	1361.09	1356.83	1361.13	0.000805	1.84	1278.84	350.00	0.15
oak	1363.994	PF 1	1817.00	1355.00	1360.71	1358.54	1360.79	0.002435	2.72	896.09	260.00	0.25
oak	1184.825	PF 1	1817.00	1354.70	1360.25	1357.83	1360.33	0.002715	2.65	851.81	233.00	0.25
oak	828.5473	PF 1	1817.00	1353.88	1359.68	1357.03	1359.73	0.001119	1.90	1085.49	344.40	0.17
oak	405.9100	PF 1	1817.00	1352.53	1359.26	1355.61	1359.32	0.000860	2.00	1092.08	290.00	0.15
oak	16.37823	PF 1	2049.00	1351.48	1359.00	1355.37	1359.03	0.000622	1.87	1650.06	363.32	0.13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4 mile creek oak
Legend
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Ground
Elevation (ft)
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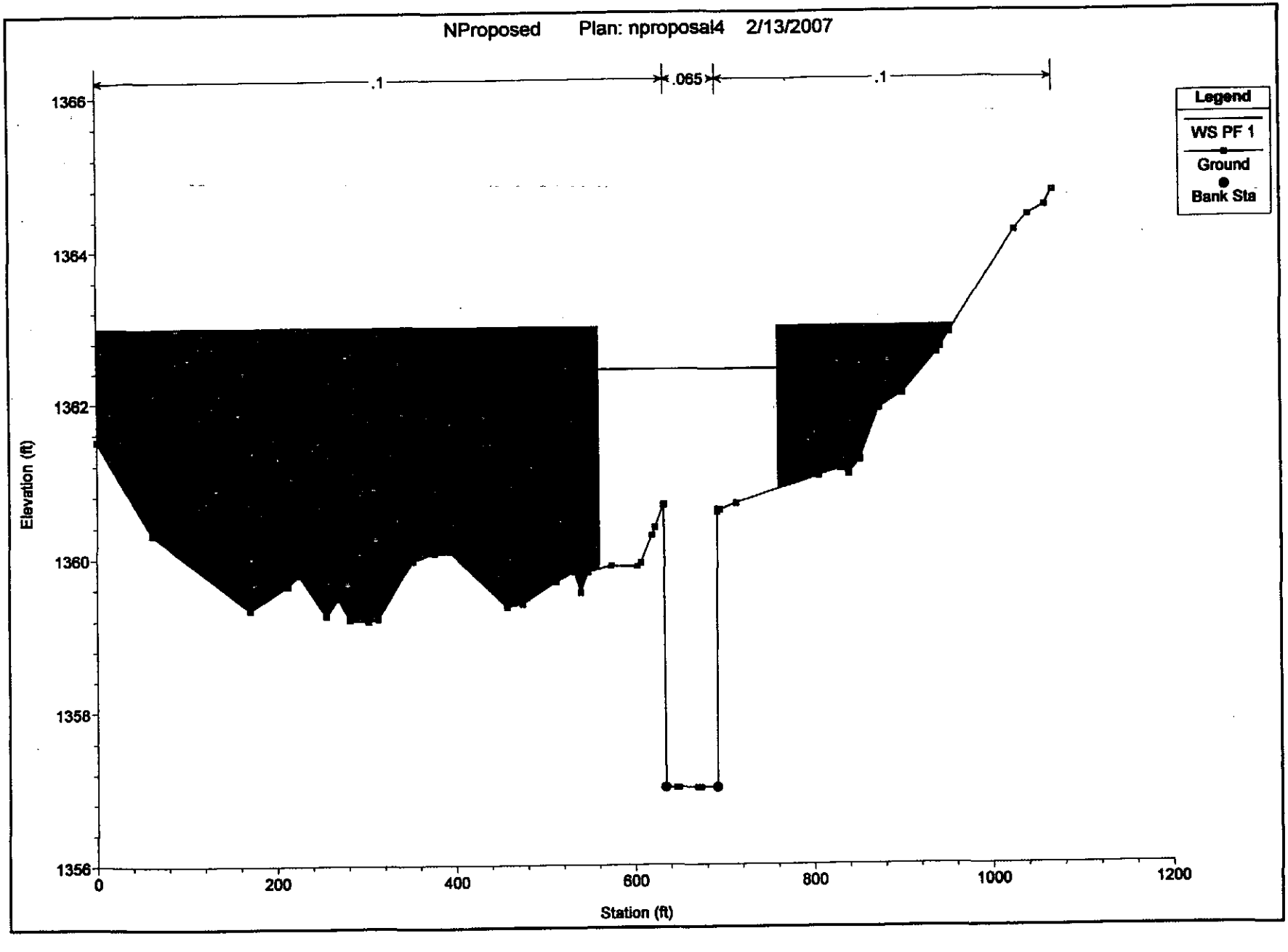
Main Channel Distance (ft)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Ground
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Elevation (ft)
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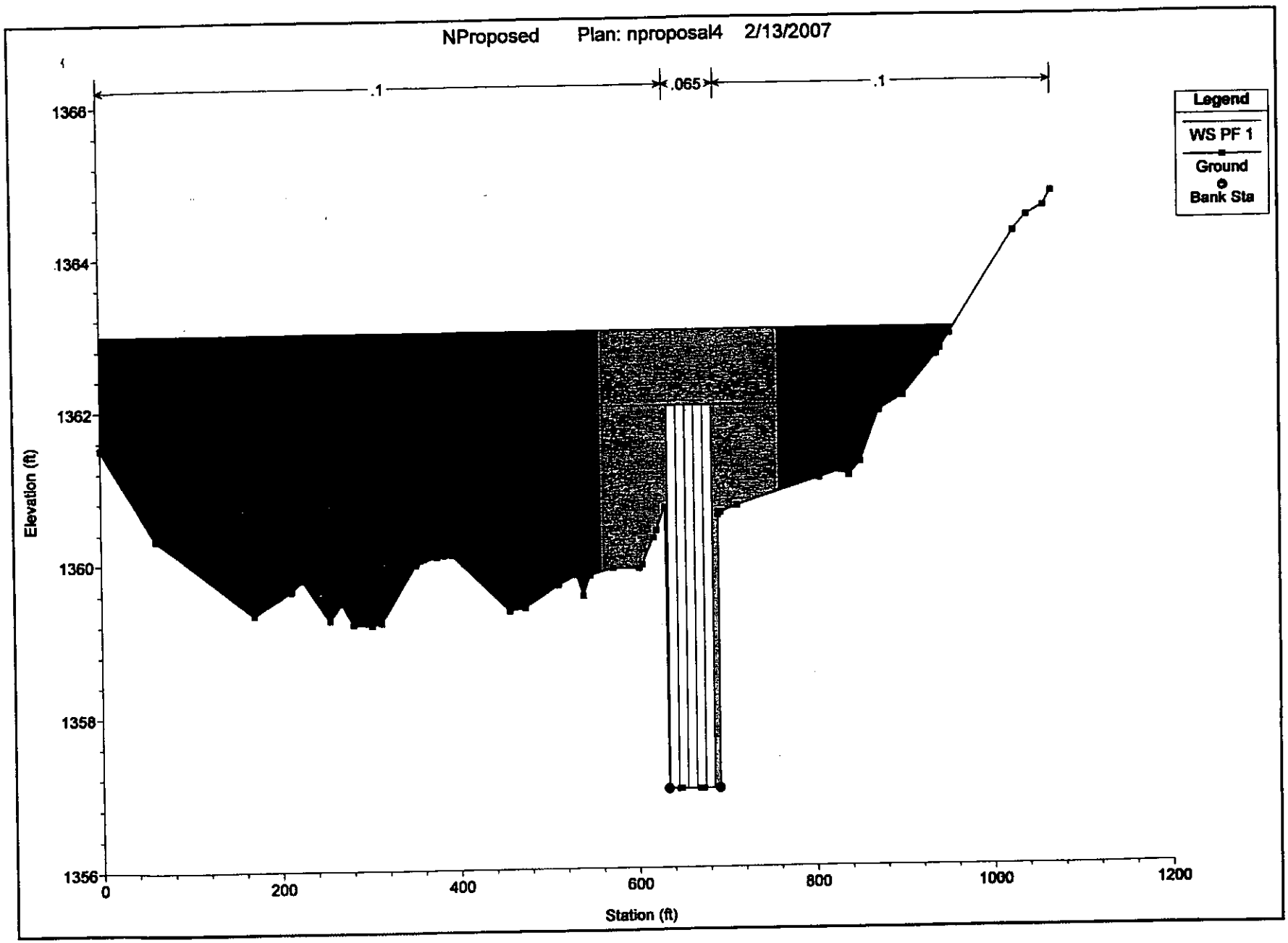
Station (ft)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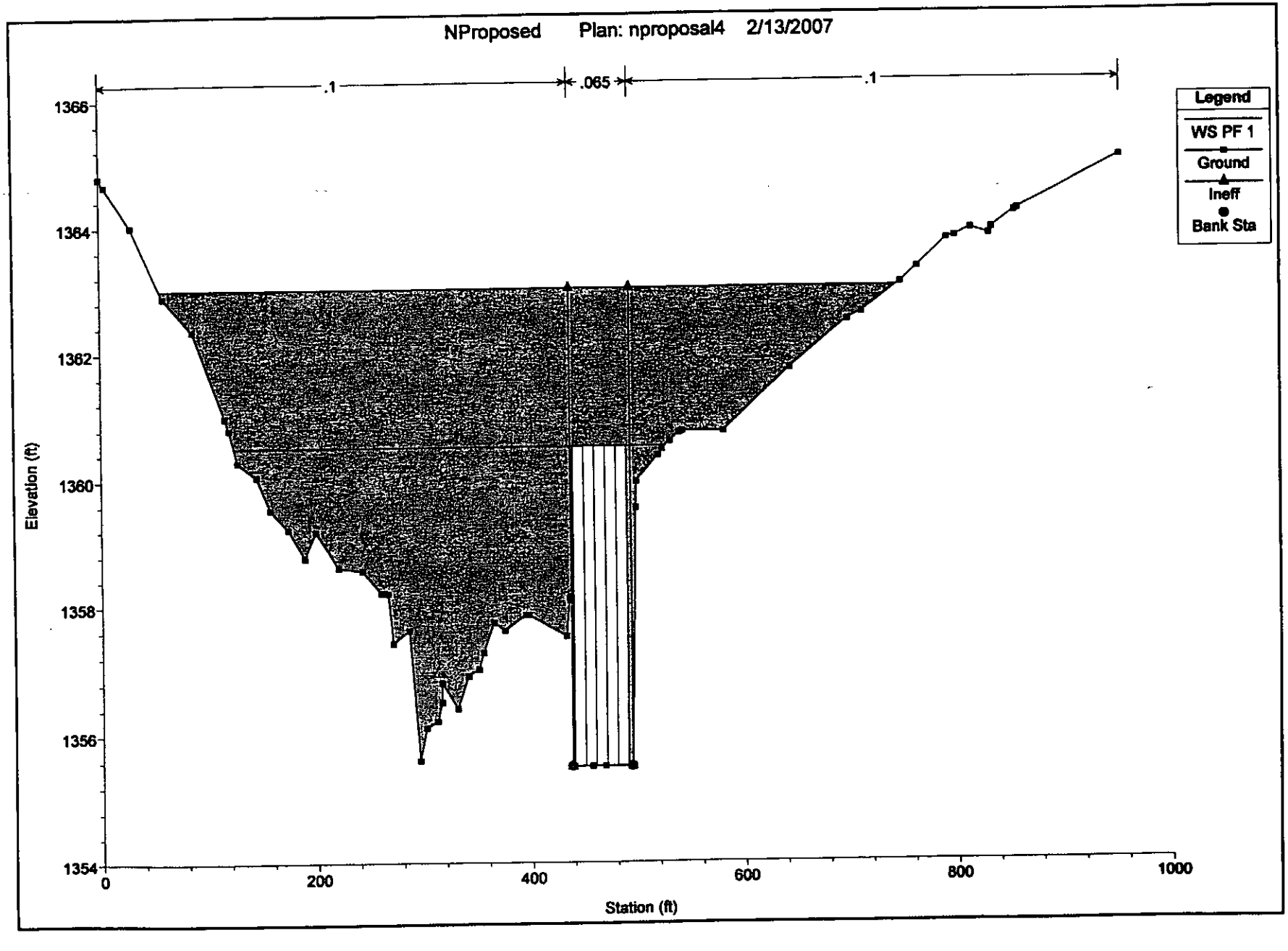
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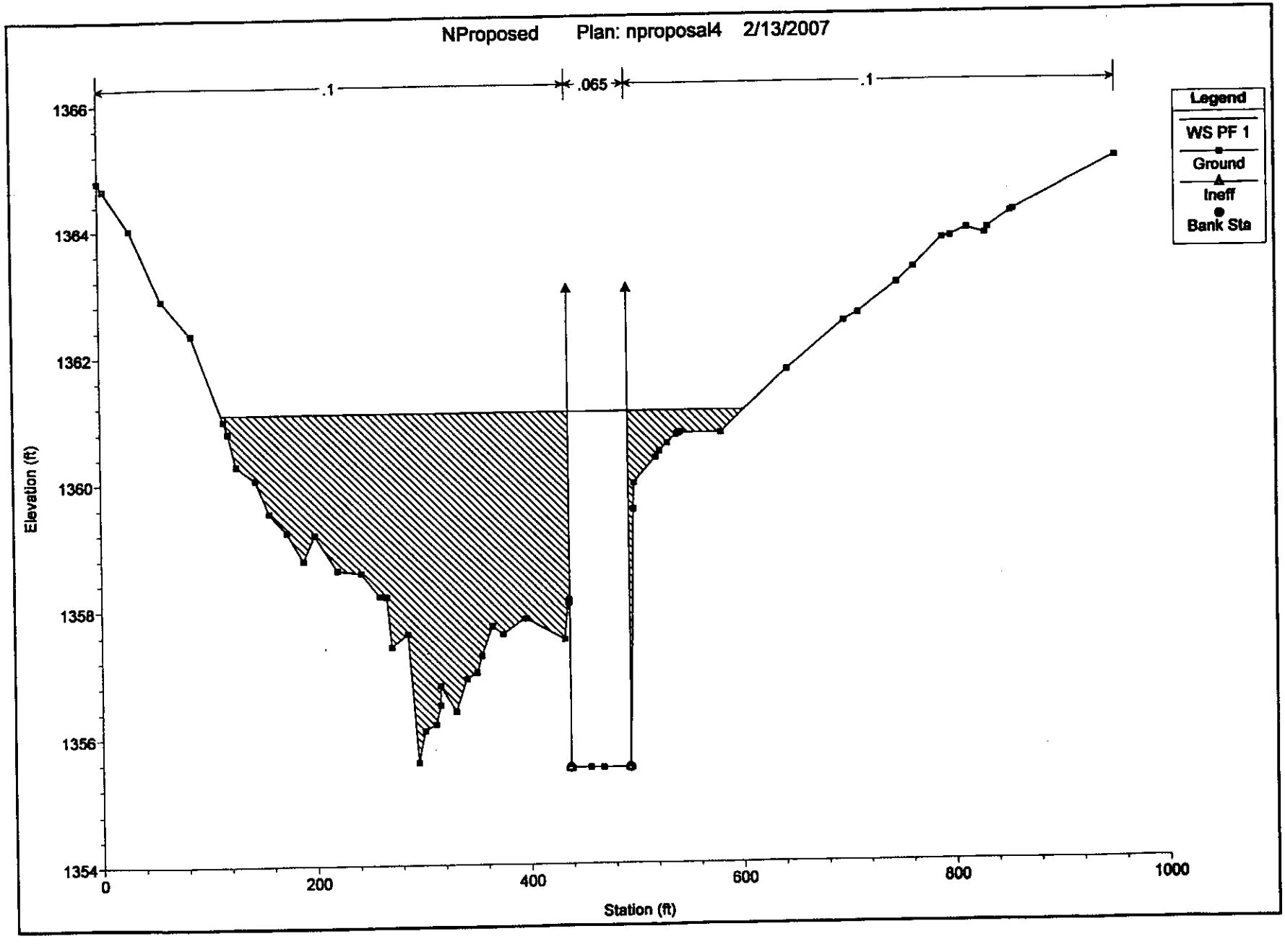
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Elevation (ft)
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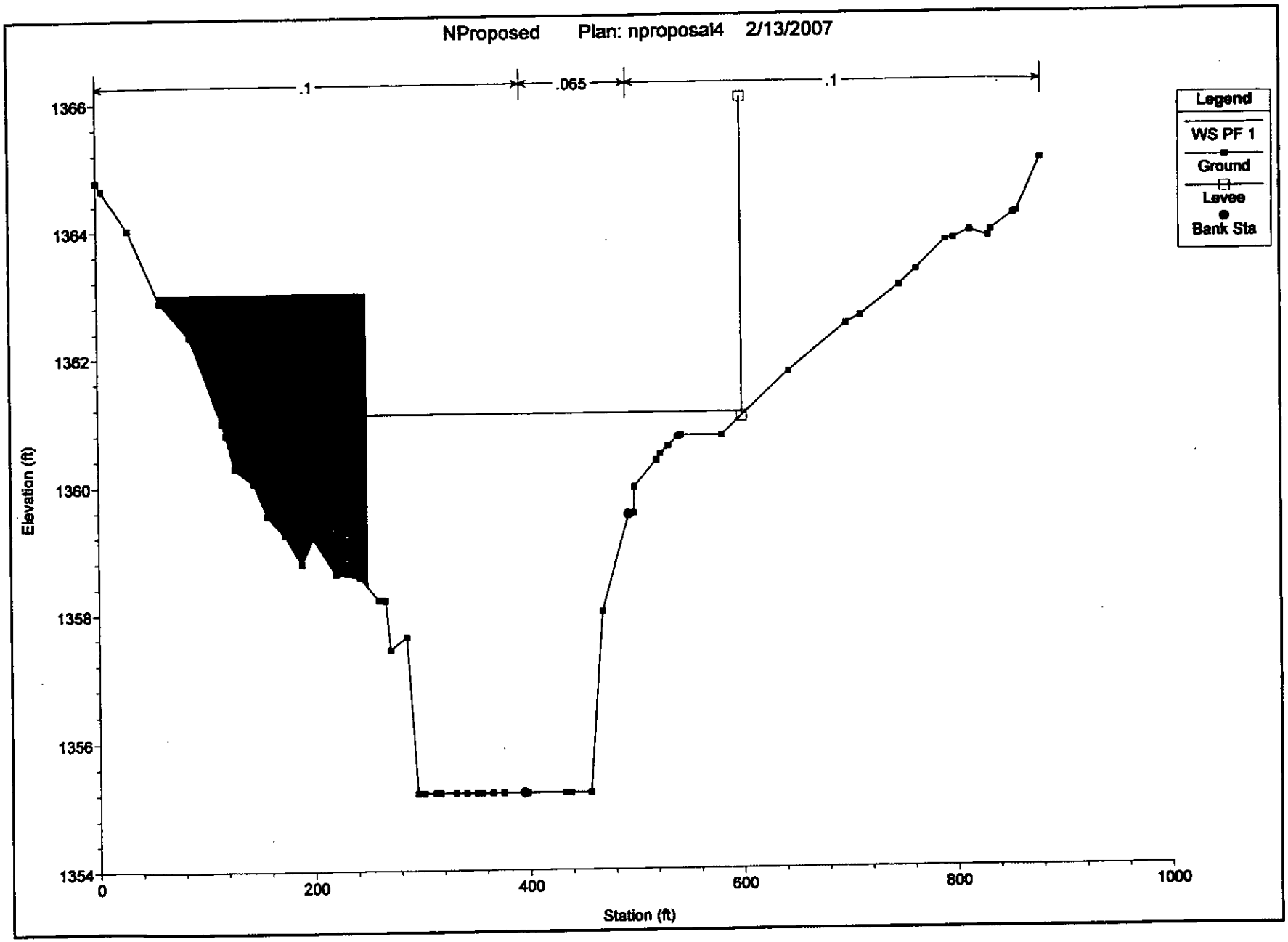
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Elevation (ft)
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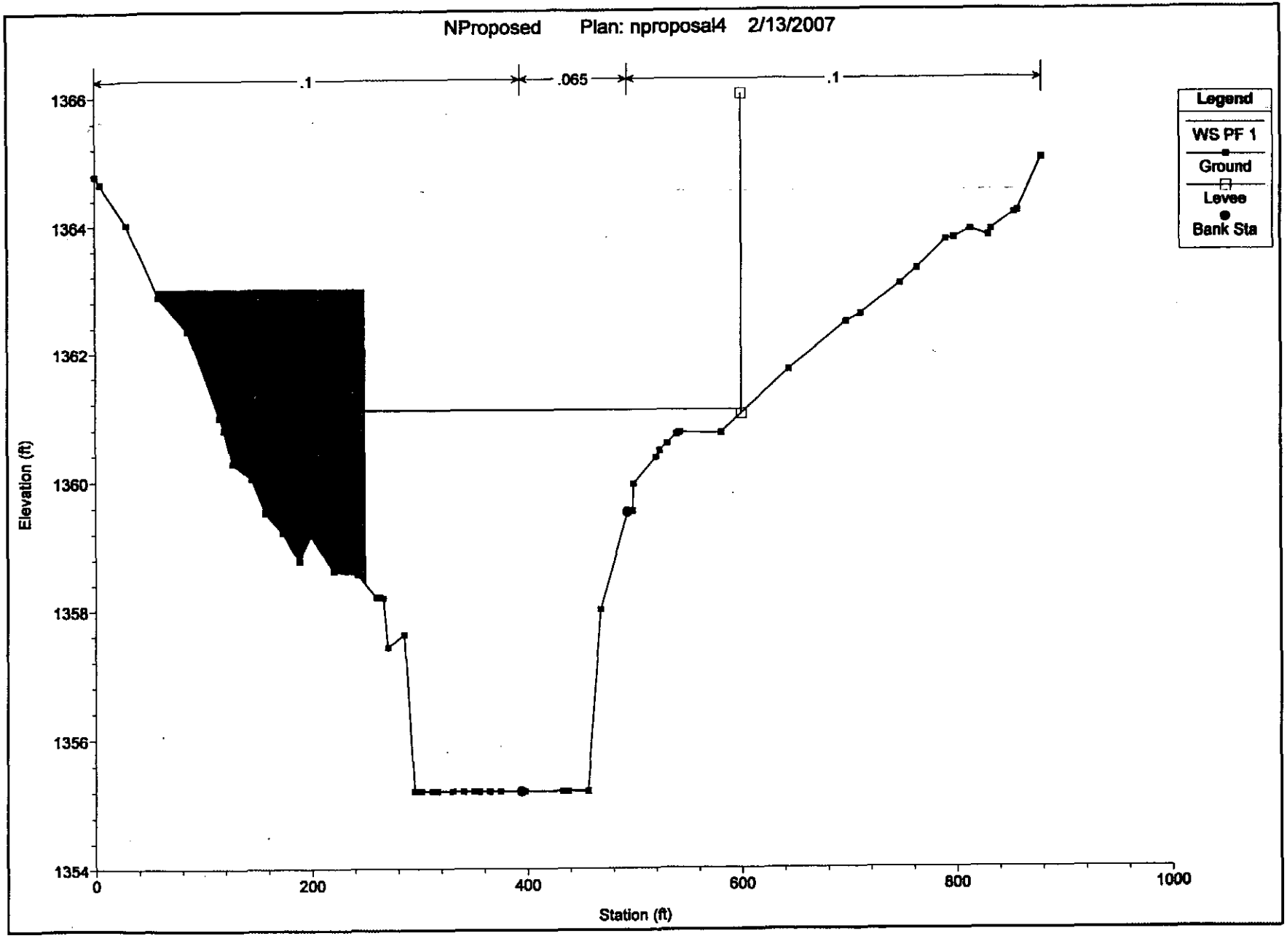
Station (ft)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Elevation (ft)
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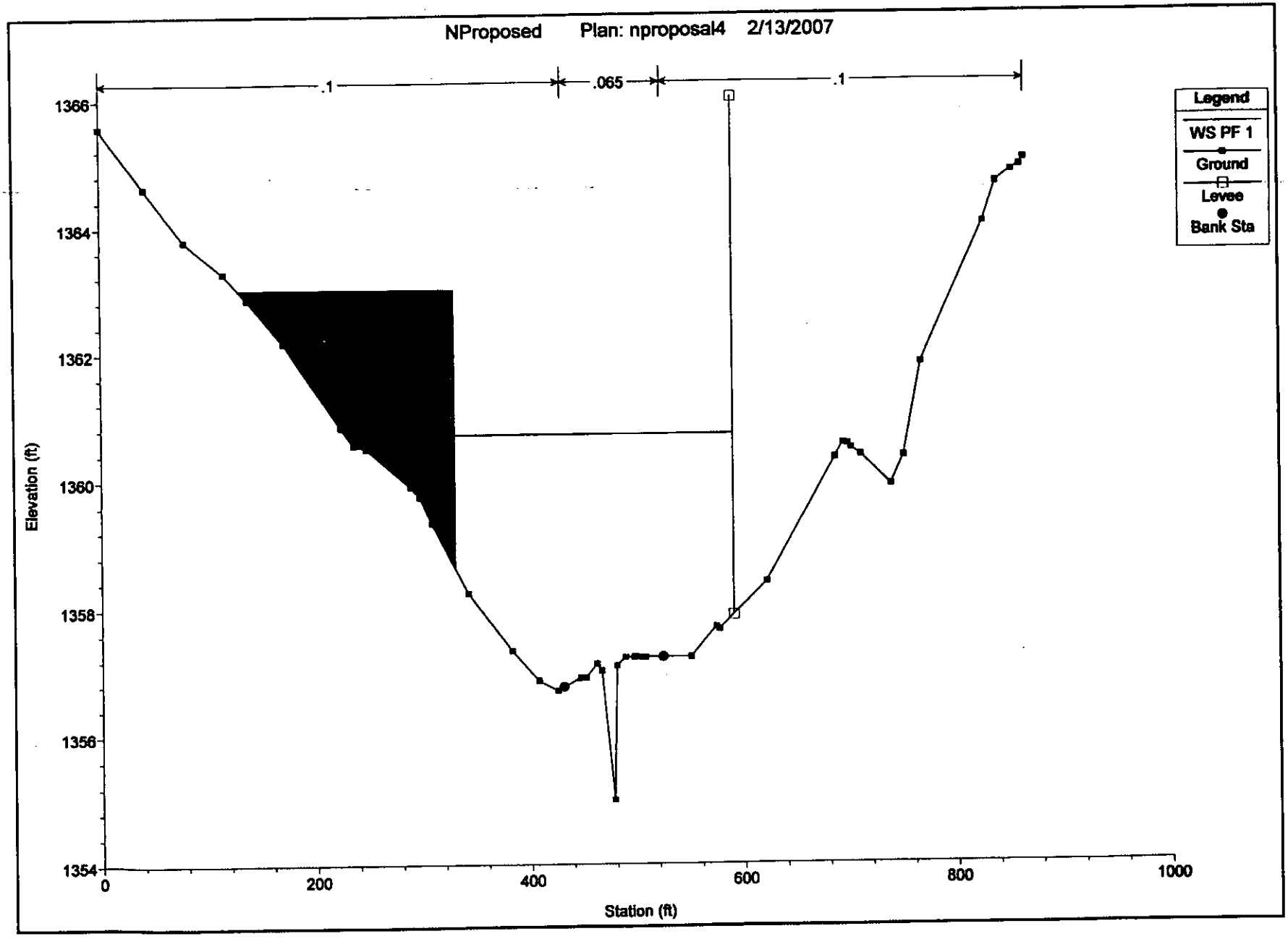
Station (ft)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Elevation (ft)
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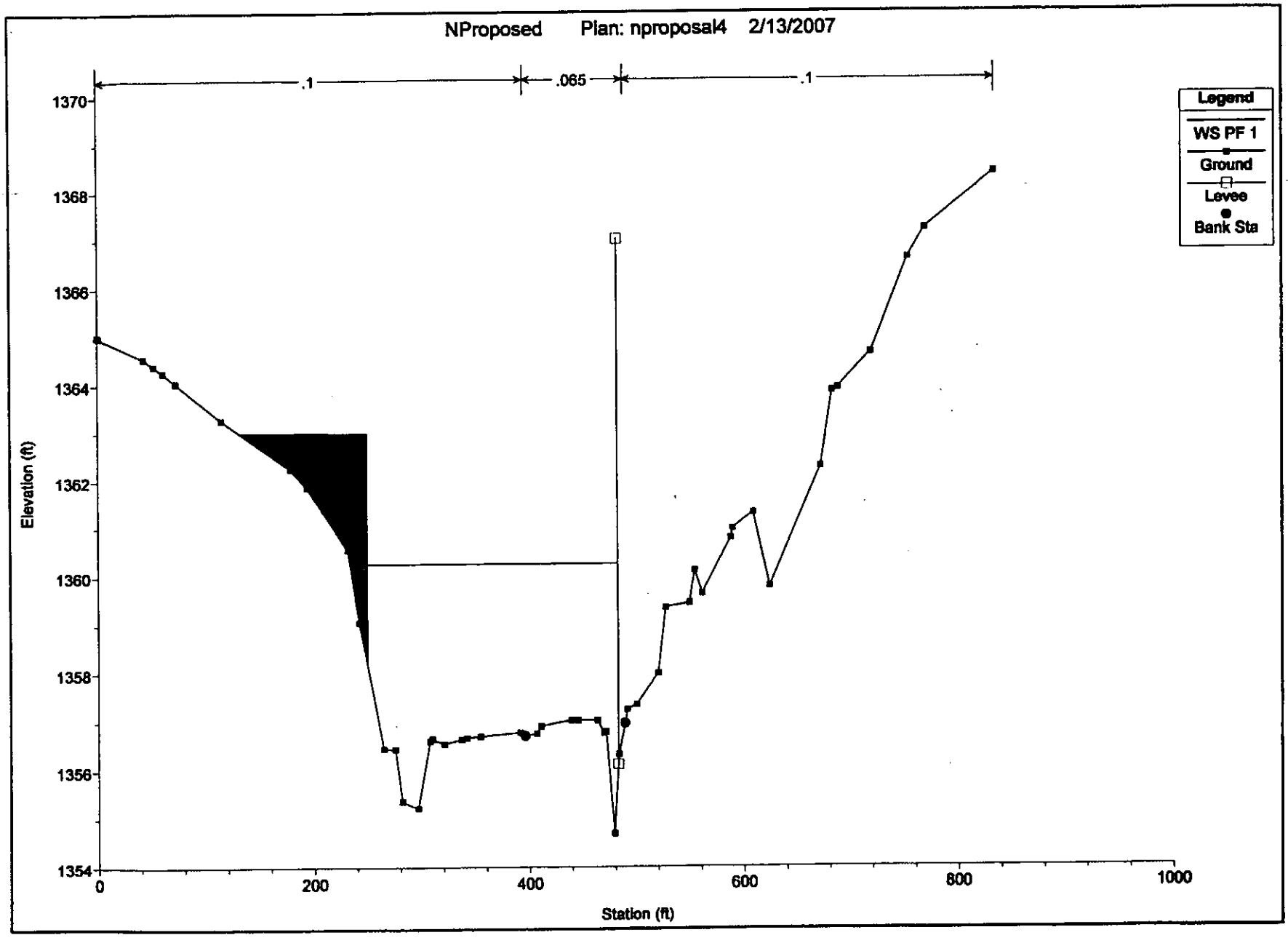
Station (ft)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Elevation (ft)
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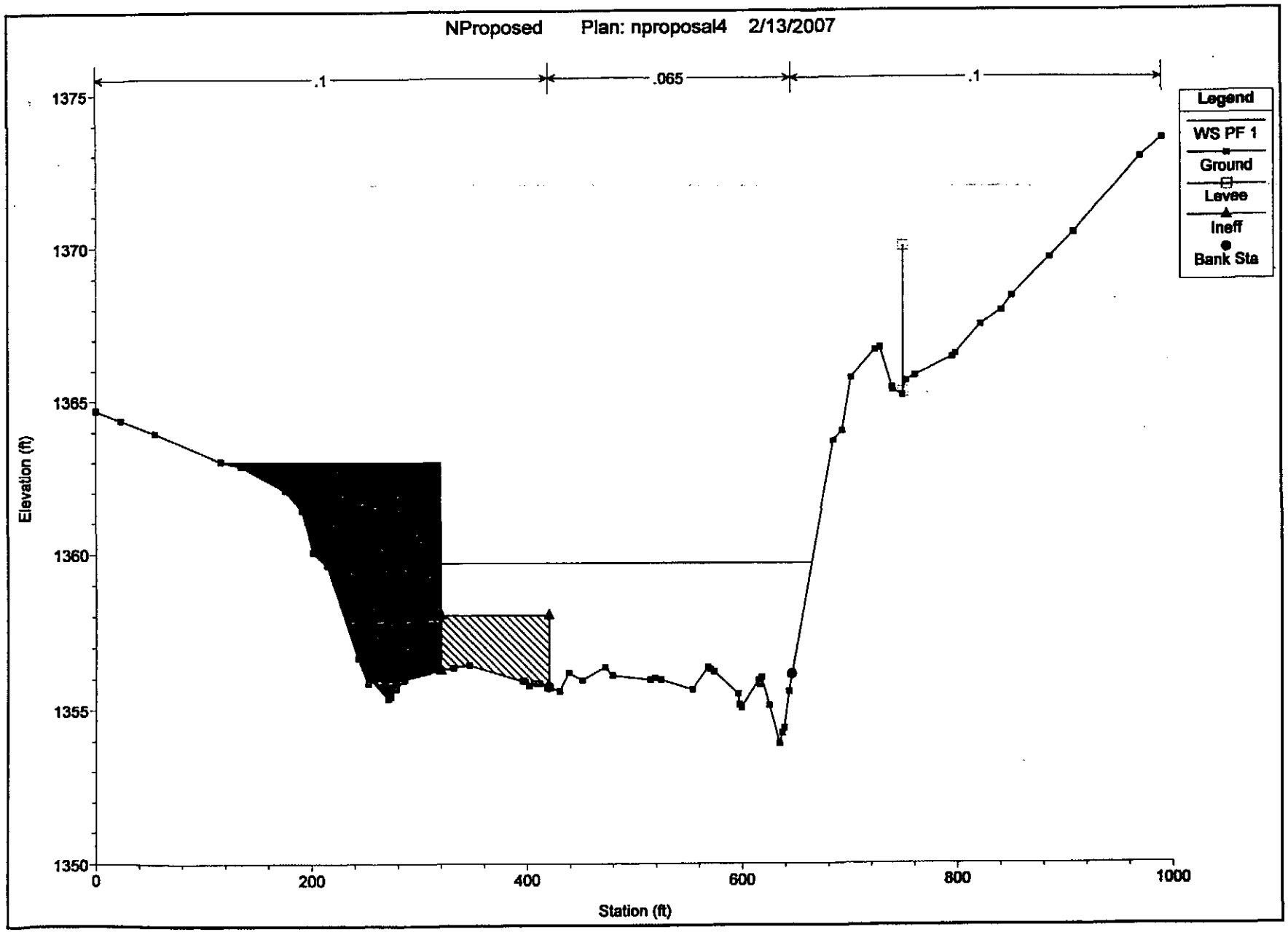
Station (ft)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Elevation (ft)
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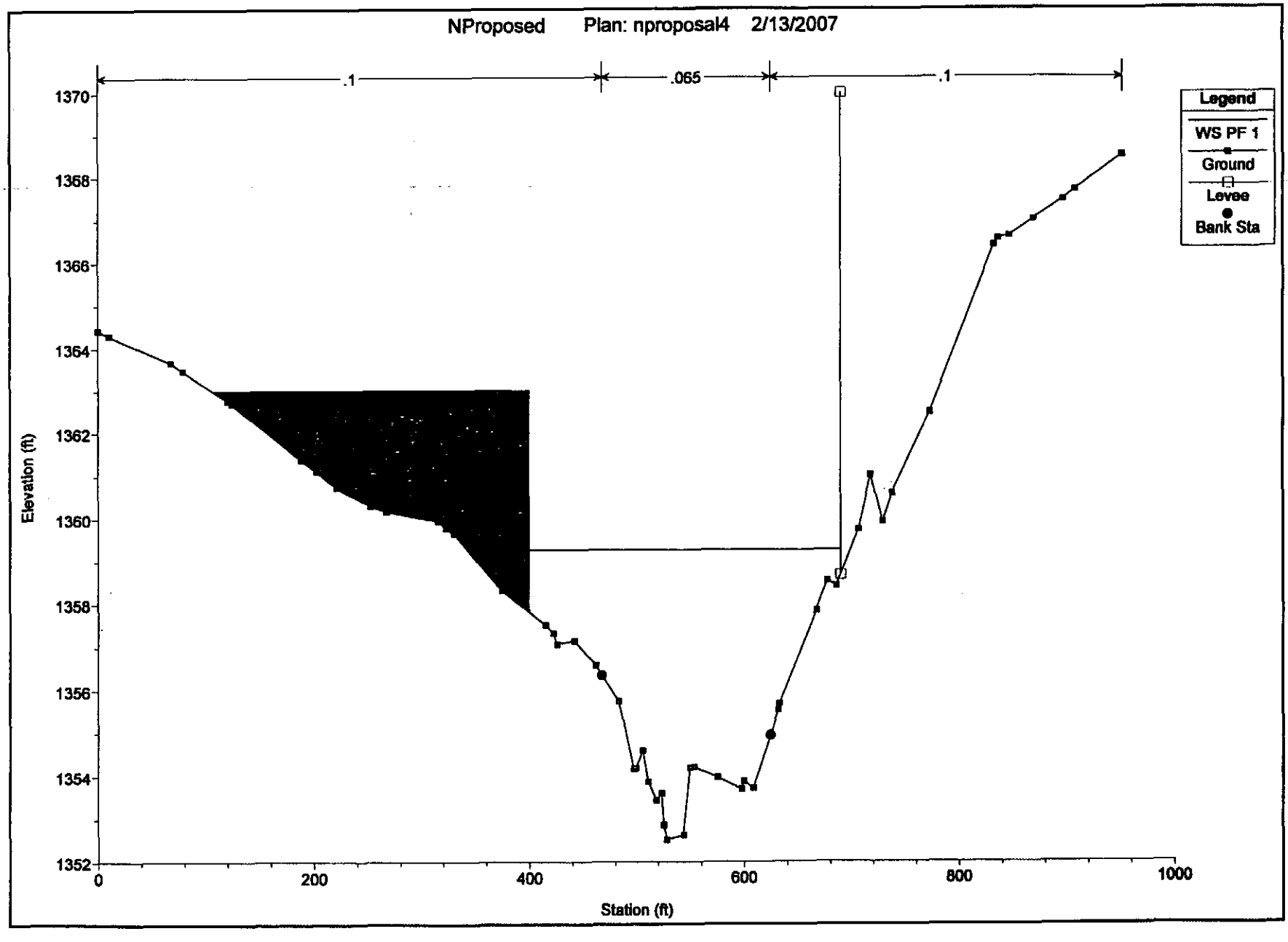
Station (ft)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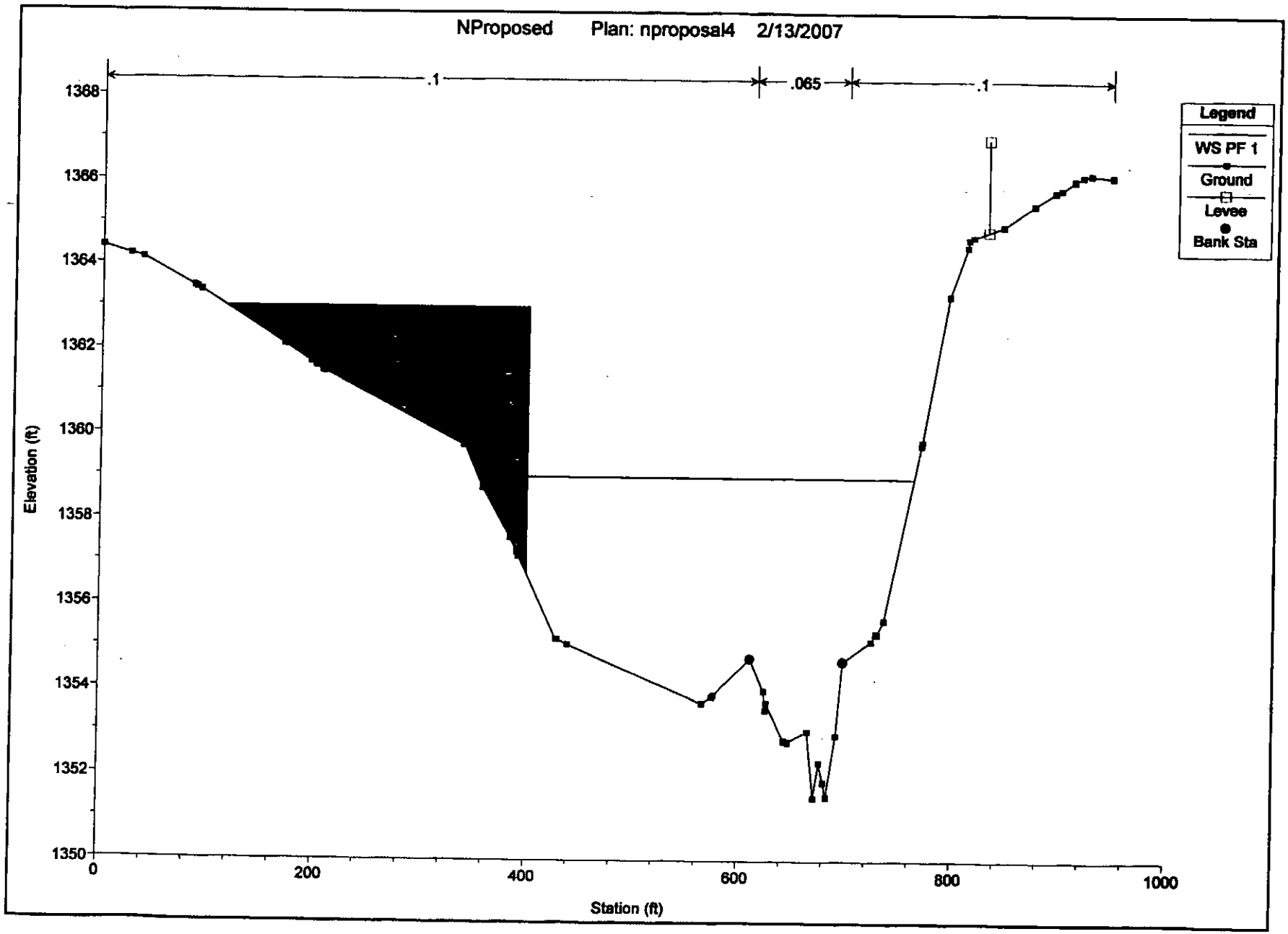
Station (ft)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