Red Mountain Freeway (202L)
(University Drive - Southern Avenue)

Final
DRAINAGE REPORT
Volume 2 of 2

TRACS No. H5783 01C

APRIL 2005

Submitted to:

ADOT

Submitted by:

PB PARSONS BRINCKERHOFF

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(UNIVERSITY DRIVE – SOUTHERN AVENUE)

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APPENDIX B

OFF-SITE HYDROLOGY

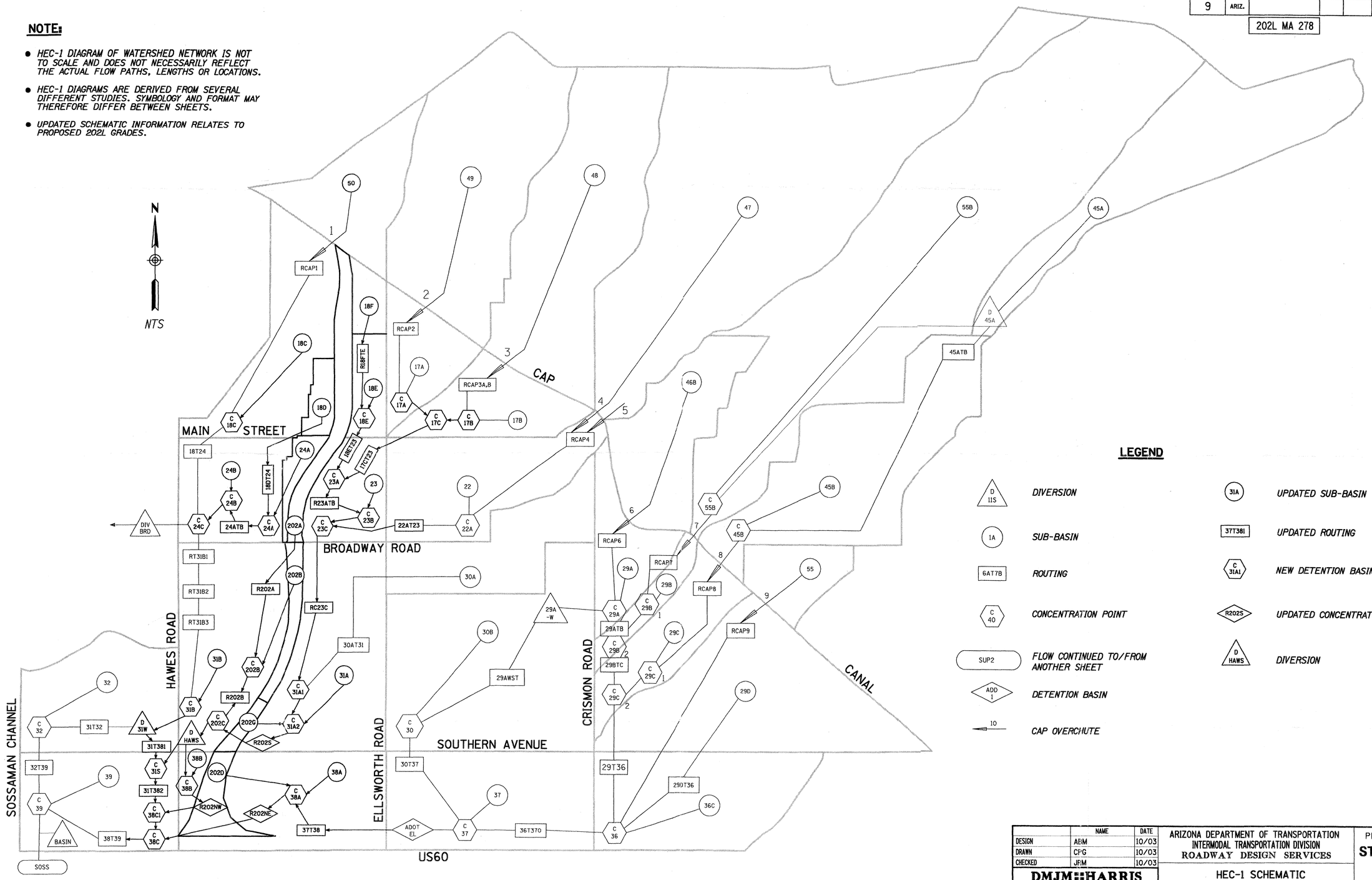
- HEC-1 SCHEMATIC, UPDATE NORTHEAST REGION
- HEC-1 OUTPUT (NE200250)

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.				

202L MA 278

NOTE:

- *HEC-1 DIAGRAM OF WATERSHED NETWORK IS NOT TO SCALE AND DOES NOT NECESSARILY REFLECT THE ACTUAL FLOW PATHS, LENGTHS OR LOCATIONS.*
- *HEC-1 DIAGRAMS ARE DERIVED FROM SEVERAL DIFFERENT STUDIES. SYMBOLOGY AND FORMAT MAY THEREFORE DIFFER BETWEEN SHEETS.*
- *UPDATED SCHEMATIC INFORMATION RELATES TO PROPOSED 202L GRADES.*



LEGEND

D 11S	DIVERSION	31A	UPDATED SUB-BASIN
1A	SUB-BASIN	37T381	UPDATED ROUTING
6AT7B	ROUTING	C 31A1	NEW DETENTION BASIN
C 40	CONCENTRATION POINT	R202S	UPDATED CONCENTRATION POINT
SUP2	FLOW CONTINUED TO/FROM ANOTHER SHEET	D HAWS	DIVERSION
ADD 1	DETENTION BASIN		
10	CAP OVERCHUTE		

	NAME	DATE
DESIGN	ABM	10/03
DRAWN	CFG	10/03
CHECKED	JRM	10/03

DMJM HARRIS
2777 E. CAMELBACK ROAD SUITE 200
PHOENIX, AZ. 85016-4302 (602) 337-2777

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION
ROADWAY DESIGN SERVICES

HEC-1 SCHEMATIC
UPDATED NORTHEAST REGION

PRELIMINARY
STAGE II
Review
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

TRACS NO. H H5783 01C

___ OF ___

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

10/14/2003 J:\Rm12\Prod\Exhibit\hec1_3.dgn

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*              JUN   1998              *
*            VERSION 4.1               *
*                                      *
*  RUN DATE   23APR04  TIME  17:29:48  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         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
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


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

   1          ID
   2          ID  ********************************************************************************
   3          ID  ********************************************************************************
   4          ID  ********************************************************************************
   5          ID   MODEL NAME: NE200250.DAT   Revised by PARSONS BRINCKERHOFF - April 2004
   6          ID
   7          ID   This model includes the following revisions to DMJM+HARRIS model
   8          ID   NE202USR.DAT dated December 2003.
   9          ID
  10          ID    1. The storage volumes for the NE-1, NE-2, NW-1, NW-2 and Southern Avenue
  11          ID       detention basins have been updated per the final basin geometry.
  12          ID
  13          ID    2. The discharge rates for detention basins NW-1 and NW-2 have been revised
  14          ID       to reflect the revisions to the outlet structures and emergency
  15          ID       spillways.
  16          ID
  17          ID    3. The diversion at the box culvert system at Southern Avenue and Hawes
  18          ID       Road was revised to simulate blockage of 2 barrels of the existing 3
  19          ID       barrel box culvert under Southern.
  20          ID
  21          ID    4. The diversion at the lateral weir in the Southern Avenue Channel was
  22          ID       revised to reflect the final weir geometry and rating analysis.
  23          ID
  24          ID    5. The data for Subbasin 31B was revised to reflect future conditions
  25          ID       land use.
  26          ID
  27          ID  ********************************************************************************
  28          ID  ********************************************************************************
  29          ID  ********************************************************************************
  30          ID
  31          ID   MODEL NAME: Ne2002us.DAT          Revised by DMJM+HARRIS - August 2003
  32          ID
  33          ID   This model includes various revisions to incorporate the Red Mountain Freeway
  34          ID   in association with the University Drive to Southern Avenue.
  35          ID
  36          ID   CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:
  37          ID
  38          ID   1. In order to reflect the proposed 202 Freeway Loopand to facilitate design,
  39          ID      drainage basins 18D, 18C and 24 were further subdivided.  Additional
  40          ID      concentration points were added to provide discharges at more locations.
  41          ID
  42          ID   2. Drainage basin areas for 50 and 202A were modified to reflect design
  43          ID      refinements to the Power to University segment of the Red Mountain Freeway
  44          ID
  45          ID  ********************************************************************************
  46          ID  ********************************************************************************
  47          ID
  48          ID   MODEL NAME: Ne200235.DAT          Revised by DMJM+HARRIS - July 2002
  49          ID
  50          ID   This model includes various revisions to incorporate the Red Mountain Freeway
  51          ID   in association with the 202L/US60 Traffic Interchange Design Concept Report.
  52          ID
  53          ID   CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:
  54          ID
  55          ID    1. In order to reflect the proposed 202 Freeway Loop, basin areas for 18C,
```



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

  56          ID       23, 24, 31A and 31B were revised.  Drainage basins 18D, 202A, 202B, and
  57          ID       202D were added.      Basin 38 was split into 38A and 38B due to the 202 Loop
  58          ID
  59          ID    2. Several concentration points have been added and basins have been routed
  60          ID       to reflect the proposed Red Mountain Freeway alignment.
  61          ID
  62          ID    3. Existing detention basins (ADOT) have been removed and new detention
  63          ID       basins are proposed as part of the freeway construction.
  64          ID
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ID    4. Modifications were made to the previous (Ne20030) model per the City of
ID       Mesa to remove the connection of the Southern Ave. Channel from the
ID       structure at Hawes Rd. and instead connect to the Hawes Channel south of
ID       the intersection.
ID
ID  ******************************************************************************
ID  ******************************************************************************
ID   ** Previous ** MODEL NAME: NE2002.DAT
ID
ID   THIS MODEL COVERS THE AREA EAST OF HAWES ROAD AND THE SOSSAMAN CHANNEL
ID   MAJOR CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:
ID
ID    1. OLD SUBBASIN 18A HAS BEEN SPLIT INTO TWO SUBBASINS. SUBBASIN 18C REMAINS
ID       IN THIS MODEL AS PART OF THE HAWES CHANNEL INFRASTRUCTURE
ID    2. OLD SUBBASIN 30 HAS BEEN SPLIT INTO SUBBASIN 30A AND SUBBASIN 30B.
ID       SUBBASIN 30 GETS INTERCEPTED BY A CHANNEL ON THE NORTH SIDE OF CORALBELL
ID       AND GETS ROUTED TO SUBBASIN 31A. SUBBASIN 30B STILL GOES SOUTH ALONG
ID       ELLSWORTH ROAD
ID    3. FOR THE 2002 YEAR CONDITION, ALL CAP DETENTION BASINS HAVE BEEN PLACED IN
ID       THE MODEL. THEIR OUTLET CHANNELS HAVE FOR THE MOST PART NOT BEEN INCLUDED
ID       IN THIS MODEL. THE OUTLET CHANNELS WILL BE IN THE FUTURE MODEL
ID  ******************************************************************************
ID
ID   SOUTHEAST MESA AREA DRAINAGE MASTER PLAN
ID   AREA NORTH OF SUPERSTITION FREEWAY
ID
ID
ID   REVISED BY VALERIE SWICK, OCTOBER-NOVEMBER 1996
ID   TO INCORPORATE THE SUPERSITION STRUCTURES AND COMBINE MODELS
ID
ID   FILENAME:  MESANE.DAT
ID
ID   THIS MODEL REPRESENTS THE EXISTING CONDITION OF THE WATERSHED.
ID   TOTAL DRAINAGE AREA IS APPROXIMATELY 17 SQ. MI.
ID
ID   100-YEAR 24-HOUR FREQUENCY
ID
ID
ID   METHODOLOGY
ID   THE US CORPS OF ENGINEERS FLOOD HYDROLOGY MODEL HEC-1 DATED SEP1990 VER 4.0
ID   SCS TYPE II RAINFALL DISTRIBUTION
ID   S-GRAPH HYDROGRAPH
ID   GREEN AND AMPT INFILTRATION EQUATION USED FOR CALCULATING LOSSES
ID   NORMAL DEPTH STORAGE CHANNEL ROUTING
ID   APPROXIMATE DIRECTION, LOCATION, AND LENGTH OF THE WASHES HAVE BEEN
ID   EVALUATED BASED ON FIELD INVESTIGATION, USGS MAPS, LANDIS AERIAL SURVEYS
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1                                   HEC-1 INPUT

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

ID   DATED 1994
ID   THE NOAA TECHNICAL MEMORANDUM NOAA ATLAS 2 DEPTH AREA RATIOS
ID
ID   INITIAL STUDY PERFORMED BY LISA C. YOUNG
ID   REVIEWED BY VALERIE A. SWICK
ID   HYDROLOGY BRANCH ENGINEERING DIVISION, FLOOD CONTROL
ID   DISTRICT OF MARICOPA COUNTY, DECEMBER - JULY 1995.
ID
ID   ASSUMED VELOCITY OF 1 FT/SEC FOR SHEET FLOW, 2 FT/SEC FOR WASH/NATURAL
ID   CHANNEL, 3 FT/SEC FOR ROAD AND GRASS CHANNEL, 10FT/SEC FOR CONCRETE CHANNEL
ID
ID
ID    LAST UPDATED ON  3/13/98
ID
ID    UPDATE WAS BASED UPON NEW MAG LAND USE DEFINITIONS FOR SINGLE FAMILY HOUSING
ID
ID   DDM MCUHP2 MESA AREA DRAINAGE MASTER PLAN
*DIAGRAM
IT       5  1APR97    0000    1000
IO       5
IN      15
JD   3.600     .01
PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
PC    .983    .986    .989    .992    .995    .998   1.000
JD    3.58     1.0
JD    3.49     5.0
JD    3.38    10.0
JD    3.24    30.0
JD    3.10    60.0
JD    3.05    90.0
JD    3.00   120.0
JD    2.97   150.0
*
* DDM    ***** Updated *****

KK      42
KM   BASIN 42
KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
KM    L=      3.1  Lca=      1.5   S=   60.9  Kn= .043  LAG=  51.6
KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
BA    1.75
LG     .32     .29    5.00     .31   10.00
UI    114.    114.    248.    441.    618.    773.    923.   1018.   1086.   1092.
UI   1041.    954.    806.    673.    573.    485.    415.    340.    290.    242.
UI    212.    175.    147.    121.    109.     78.     78.     78.     38.     28.
UI     28.     28.     28.     28.     28.     28.     28.      0.      0.      0.
UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
*
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                    * DDM    ***** Preserved *****
1                                          HEC-1 INPUT                                                          PAGE  4

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

 162                KK   42T51
 163                RS      10    FLOW      -1
 164                RC    0.08   0.055    0.08    7000   0.011
 165                RX       0     600     700     710     720     730     830    1630
 166                RY      10       5       3       0       0       3       5      10
                    *
                    * DDM    ***** Updated *****

 167                KK      51
 168                KM   BASIN 51
 169                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 170                KM    L=       1.5  Lca=       .8   S=   54.4  Kn= .039  LAG=  27.3
 171                KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 172                BA    1.24
 173                LG     .29     .30    4.60     .37   18.00
 174                UI    153.    416.    885.   1248.   1446.   1410.   1128.    817.    598.    428.
 175                UI    311.    232.    163.    110.     99.     37.     37.     37.     37.     37.
 176                UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 177                UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM    ***** Preserved *****

 178                KK     C51
 179                KM   COMBINE FLOWS FROM 42 AND 51
 180                HC       2
                    *
                    * DDM    ***** Preserved *****

 181                KK   51T53
 182                KM    ROUTE 51 TO 53
 183                RS       9    FLOW      -1
 184                RC    0.08   0.055    0.08    8000    0.01
 185                RX       0     100     200     210     220     230     330     430
 186                RY       7       6       5       0       0       5       6       7
                    *
                    * DDM    ***** Updated *****

 187                KK     44A
 188                KM   BASIN 44A
 189                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 190                KM    L=       2.8  Lca=      1.4   S=   54.5  Kn= .039  LAG=  43.6
 191                KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 192                BA    1.59
 193                LG     .20     .25    4.50     .45   45.00
 194                UI    123.    123.    390.    597.    813.    994.   1114.   1180.   1153.   1063.
 195                UI    881.    716.    588.    484.    397.    320.    259.    219.    189.    131.
 196                UI    126.     84.     84.     75.     30.     30.     30.     30.     30.     30.
 197                UI     30.     30.      0.      0.      0.      0.      0.      0.      0.      0.
 198                UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM    ***** Preserved *****
1                                          HEC-1 INPUT                                                          PAGE  5

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

 199                KK  DIV44A
 200                KM   DIVERT 80% OF THE LOW FLOWS WEST AND SOUTH TO 44B, 70% OF HIGH FLOWS
 201                DT    D44A
 202                DI       0     500    1000    3000
 203                DQ       0     400     750    2100
                    * DDM    ***** Updated *****

 204                KK      43
 205                KM   BASIN 43
 206                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 207                KM    L=       1.9  Lca=       .9   S=   58.2  Kn= .036  LAG=  29.8
 208                KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
 209                BA    1.42
 210                LG     .29     .30    4.70     .35   18.00
 211                UI    161.    376.    827.   1212.   1470.   1531.   1375.   1047.    783.    584.
 212                UI    434.    324.    251.    171.    127.    110.     59.     39.     39.     39.
 213                UI     39.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 214                UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM    ***** Preserved *****

 215                KK     C43
 216                KM     COMBINE 43 WITH DIVERTED FLOWS FROM 45A
 217                HC       2
                    *
                    * DDM    ***** Preserved *****

 218                KK   43T53
 219                RS      12    FLOW      -1
 220                RC    0.08   0.055    0.08   11250   0.009
 221                RX       0     200     300     310     315     325     335     535
 222                RY       6       3       2       0       0       2       3       6
                    *
                    * DDM    ***** Updated *****

 223                KK      53
 224                KM   BASIN 53
 225                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
 226                KM    L=       1.9  Lca=       .9   S=   63.5  Kn= .039  LAG=  31.8
 227                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 228                BA     .78
 229                LG     .29     .30    5.20     .28   20.00
 230                UI     83.    189.    377.    486.    616.    903.    943.    707.    555.    428.
 231                UI    291.    149.    123.     83.     38.     25.     25.     25.      0.      0.
```

```
232          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

233          KK     C53
234          KM     COMBINE 53, 43 AND 51
235          HC       3
             *
             * DDM    ***** Updated *****
```



```
1                                   HEC-1 INPUT

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

236          KK      54
237          KM    BASIN 54
238          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
239          KM     L=       1.5  Lca=       .8   S=   42.8  Kn= .044  LAG=  32.8
240          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
241          BA     .49
242          LG     .30     .29    5.40     .26   17.00
243          UI     50.    107.    221.    287.    359.    502.    603.    449.    358.    278.
244          UI    206.    110.     84.     55.     39.     15.     15.     15.     15.      0.
245          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
246          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

247          KK     C54
248          KM    COMBINE 53 AND 54
249          HC       2
             *
             * DDM    ***** Preserved *****

250          KK   DCAP12
251          KM    FLOWS SPLIT AT CAP AND SOUTHERN AVE, RATING CURVES BASED ON THREE 5X7 CBCs
252          KM    PART OF THE FLOW GOES SOUTH ACRSS SOUTHERN TO CAP 13 +14
253          DT    SOUTH
254          DI       0     450    1000    2500
255          DQ       0       0     275    1025
             *
             * DDM    ***** Preserved *****

256          KK    CAP12
257          RS       1    FLOW      -1
258          SV       0   0.238    2.72   13.37   36.82
259          SE  1563.6    1564    1566    1568    1570
260          SQ       0      30     188     574    1098
             *
             * DDM    ***** Preserved *****

261          KK    DR44A
262          KM    RETRIEVE DIVERTED FLOWS FROM 44A
263          DR     D44A
             *
             * DDM    ***** Preserved *****

264          KK    44ATB
265          KM    ROUTE 44A TO 44B, STREET AND SHEET FLOW THROUGH NEIGHBORHOODS
266          KM    NO CURB AND GUTTER
267          RS      15    FLOW      -1
268          RC   0.055   0.045   0.055    9000   0.008
269          RX       0     500    1010  1012.5  1022.5  1027.5  1532.5  2037.5
270          RY       6     5.5       3       0       0       3     5.5       6
             *
             * DDM    ***** Updated *****
```



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1                                   HEC-1 INPUT

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

271          KK      44B
272          KM    BASIN 44B
273          KM     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
274          KM     L=       1.1  Lca=       .9   S=   64.8  Kn= .041  LAG=  26.2
275          KM     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
276          BA     1.06
277          LG     .26     .24    6.60     .17   30.00
278          UI    136.    426.    715.    947.   1453.   1456.   1057.    775.    520.    251.
279          UI    180.    109.     42.     42.     42.      0.      0.      0.      0.      0.
280          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

281          KK     C44B
282          KM    COMBINE 44A WITH 44B
283          HC       2
             *
             * DDM    ***** Preserved *****

284          KK   CAP10+
285          KM    COMBINED CAP 10 AND 11, SAME CONTRIBUTING AREA AND HYDRAULICALLY CONNECTED
286          KM    STORAGE AND DISCHARGES WERE ADDED AT THE APPROPRIATE ELEVATIONS
287          RS       1    FLOW      -1
288          SV       0    0.43   3.397  11.626   66.53
289          SE  1562.4    1564    1566    1568    1570
290          SQ       0     180     736    1684    2754
             *
             * DDM    ***** Preserved *****

291          KK   RCAP11
292          KM    ROUTE FLOWS FROM CAP OVERCHUTE #10 AND 11 TO ADOT WEST BASIN
293          RK    2400  0.0003   0.013            TRAP      20       3
             *
             * DDM    ***** Preserved *****
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```
294          KK     C12
295          KM   COMBINE ROUTED FLOWS FROM CAP #10 AND 11 WITH CAP #12
296          HC       2
             *
             * DDM    ***** Preserved *****

297          KK  ADOT-W
298          KM   WEST ADOT DETENTION BASIN 4189, WEST OF CAP AND NORTH OF SUPERSITION FREEWAY
299          KM   FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
300          KM        COUNTY
301          KM        AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
302          KM            A-N WEST, INC., FEBRUARY, 1987.
303          RS       1    ELEV      36
304          SV       0   12.35    63.5   210.3   367.5   535.1  667.85  713.55
305          SE      36      38      40      44      48      52      55      56
306          SL    36.0   28.27      .6      .5
307          SS      55     200     2.6     1.5
             *
             * DDM    ***** Preserved *****
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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

308          KK  RADOTW
309          KM   ROUTE FLOWS IN CONCRETE CHANNEL TO CULVERTS UNDER SUPERSTITION FREEWAY
310          RS    1.75    FLOW      -1
311          RC    .035   0.012    .035    4500   .0033
312          RX       0     500    1000    1012    1020    1032    1532    2032
313          RY      13    12.5      12       0       0      12    12.5      13
             *
             * DDM    ***** Updated *****

314          KK     36B
315          KM   BASIN 36B
316          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
317          KM    L=      1.0  Lca=       .5   S=   45.0  Kn= .028  LAG=  15.0
318          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
319          BA     .32
320          LG     .30     .29    7.30     .11   16.00
321          UI    125.    387.    715.    627.    361.    139.     58.     22.      0.      0.
322          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

323          KK    C36B
324          KM   COMBINE FLOWS FROM ADOT BASIN W WITH SUB36
325          HC       2
326          ZW     A=ADOT WEST BASIN  B=AT SUPERSTITION  C=FLOW  E=5MIN F=100YR
             *
             * DDM    ***** Preserved *****

327          KK  RSOUTH
328          KM   RETRIEVE FLOWS CROSSING SOUTHERN AT CAP
329          DR   SOUTH
             *
             * DDM    ***** Updated *****

330          KK      57
331          KM   BASIN 57
332          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
333          KM    L=       .3  Lca=       .1   S=   35.7  Kn= .044  LAG=   9.4
334          KM    DESERT/RANGELAND S-GRAPH WAS USED FOR THE BASIN
335          BA     .18
336          LG     .37     .35    5.40     .25    2.00
337          UI    193.    566.    378.    149.     59.     19.      0.      0.      0.      0.
338          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

339          KK     C57
340          KM   COMBINE FLOWS CROSSING SOUTHERN AT CAP WITH THOSE OF SUBBASIN 57
341          HC       2
             *
             * DDM    ***** Preserved *****
```



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

342          KK  CAP13+
343          KM    CAP OVERCHUTES 13 AND 14 WERE COMBINED SINCE THY HAVE COMMON DRAINAGE
344          KM    STORAGE AND DISCHARGES WERE ADDED AT SPECIFIED ELEVATIONS
345          RS       1    FLOW      -1
346          SV       0   1.198   2.601   5.746
347          SE    1564    1567    1568    1570
348          SQ       0     180     500    1143
             *
             * DDM    ***** Updated *****

349          KK     36A
350          KM   BASIN 36A
351          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
352          KM    L=       .3  Lca=       .2   S=   44.1  Kn= .028  LAG=   6.6
353          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
354          BA     .10
355          LG     .27     .34    6.00     .21   28.00
356          UI    201.    435.    101.      0.      0.      0.      0.      0.      0.      0.
357          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM    ***** Preserved *****

358          KK    C36A
359          KM   COMBINE FLOWS FROM CAP OVERCHUTES INTO ADOT EAST DETENTION BASIN
360          HC       2
             *
```

```
                    * DDM   ***** Preserved *****

361                 KK  ADOT-E
362                 KM   EAST ADOT DETENTION BASIN 4105, WEST OF CAP AND NORTH OF SUPERSTITION
363                 KM   FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
364                 KM        COUNTY
365                 KM        AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
366                 KM            A-N WEST, INC., FEBRUARY, 1987.
367                 RS       1    ELEV    49.5
368                 SV       0     300     340
369                 SE    49.5      60      61
370                 SL    49.5   28.27      .6      .5
371                 SS      60     200     2.6     1.5
372                 ZW    A=ADOT EAST BASIN B=AT SUPERSTITION  C=FLOW  E=5MIN F=100YR
                    *
                    * DDM   ***** Preserved *****

373                 KK   CFAKE
374                 KM   THIS IS JUST A FAKE CONCENTRATION POINT TO ELIMINATE THE ERROR THAT SAYS TO
375                 KM   "COMBINE HYDROGRAPHS MORE OFTEN".
376                 HC       2
                    *
                    * DDM   ***** Updated *****
1                                          HEC-1 INPUT                                          PAGE 10

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

377                 KK      52
378                 KM   BASIN 52
379                 KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
380                 KM    L=      1.6  Lca=       .7   S=   54.9  Kn= .035  LAG=  25.3
381                 KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
382                 BA     .43
383                 LG     .31     .31    6.60     .15   12.00
384                 UI     58.    191.    311.    418.    657.    573.    419.    304.    176.     98.
385                 UI     63.     30.     18.     18.     18.      0.      0.      0.      0.      0.
386                 UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    * DDM   ***** Updated *****

387                 KK      56
388                 KM   BASIN 56
389                 KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
390                 KM    L=       .9  Lca=       .5   S=   57.9  Kn= .040  LAG=  20.2
391                 KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
392                 BA     .55
393                 LG     .31     .24    7.30     .13   20.00
394                 UI    106.    393.    593.    982.    870.    588.    362.    157.     97.     30.
395                 UI     28.     28.      0.      0.      0.      0.      0.      0.      0.      0.
396                 UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM   ***** Preserved *****

397                 KK     C56
398                 KM     COMBINE 52 AND 56 BEHIND THE STOCK POND
399                 KM     ASSUMING STOCK POND IS EFFECTIVE, DIVERTS FLOWS SOUTH ACROSS SUPERSTITION
400                 KM     STORAGE ROUTING WAS NOT PERFORMED, CHANNEL/PIPE CROSSING
401                 HC       2
                    *
                    * DDM   ***** Preserved *****

402                 KK   56T58
403                 RS       3    FLOW      -1
404                 RC    0.08   0.055    0.08    2500   0.004
405                 RX       0     200     300     310     320     330     430     530
406                 RY       6       4       3       0       0       3       4       6
                    *
                    * DDM   ***** Updated *****

407                 KK      58
408                 KM   BASIN 58
409                 KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
410                 KM    L=      1.1  Lca=       .5   S=   50.4  Kn= .033  LAG=  18.3
411                 KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
412                 BA     .95
413                 LG     .34     .36    5.60     .22    4.00
414                 UI    238.    813.   1261.   1998.   1385.    886.    384.    213.     76.     54.
415                 UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
416                 UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * DDM   ***** Preserved *****
1                                          HEC-1 INPUT                                          PAGE 11

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

417                 KK     C58
418                 KM   COMBINE 58 WITH 56
419                 KM   THE VOLUME AT THIS CONCENTRATION POINT WILL BE SPLIT BETWEEN THE OVERCHUTES
420                 KM   CAP1A AND CAP1B. THIS WILL BE MODELED AS FLAT TOP HYDROGRAPHS WITH 217 CFS
421                 KM   VALUES FOR UI CARDS AT THESE OVERCHUTES
422                 KM   NO DATA AVAILABLE ON CAP OVERCHUTE SIZING
423                 ZW     A=CONCENTRATION POINT C58  B=FLOW TO OVERCHUTES  C=FLOW  F=OBSERVED
424                 HC       2
                    *

425                 KK     46B
426                 KM   BASIN 46B
427                 KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
428                 KM    L=      1.4  Lca=       .7   S=   42.9  Kn= .073  LAG=  51.1
429                 KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
430                 BA     .36
431                 LG     .21     .24    4.00     .56   51.00
432                 UI     24.     24.     59.     95.    118.    135.    156.    182.    232.    298.
433                 UI    262.    217.    189.    161.    138.    117.     94.     61.     42.     39.
434                 UI     31.     24.     21.      7.      7.      7.      7.      7.      7.      7.
```

```
435          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
436          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

437          KK    D46B
438          KM    RETAIN 100 YEAR 2 HOUR, (16% FOR FUTURE DEVELOPMENT)
439          DT     D46       5
440          DI       0   10000
441          DQ       0   10000
             *

442          KK    CAP6
443          RS       1    FLOW      -1
444          SV       0   0.236   1.627   8.021
445          SE  1556.2    1558    1560    1562
446          SQ       0      52     180     350
             *

447          KK  RCAP6B
448          KM   CHANNEL PARAMETERS TAKEN FROM PLANS BY AMERICAN ENGINEERING
449          KM   FOR THE SUPERSTITION SKYLINE HIGH SCHOOL
450          KM   FLOW IS ROUTED ALONG THE TRANSMISSION LINE CORRIDOR
451          KM   ROUTE CONCENTRATION POINT CAP#6 TO SUBBASIN 29A (CRISMON CHANNEL)
452          RS       2    FLOW      -1
453          RC    .013    .013    .013    2300    .002
454          RX       0      39      40    45.5    53.5      59      60      99
455          RY     6.5     5.5     5.5       0       0     6.5     6.5     6.5
             *
```



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

456          KK     29A
457          KM   BASIN 29A
458          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
459          KM    L=       .9  Lca=       .4   S=   41.2  Kn= .107  LAG=  49.5
460          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
461          BA     .18
462          LG     .21     .24    4.00     .58   29.00
463          UI     12.     12.     33.     51.     63.     72.     84.     99.    131.    157.
464          UI    127.    107.     93.     78.     66.     56.     40.     24.     21.     19.
465          UI     12.     12.      5.      4.      4.      4.      4.      4.      4.      0.
466          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
467          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

468          KK    D29A
469          KM    RETAIN 100 YEAR 2 HOUR, (73% FOR FUTURE DEVELOPMENT)
470          DT    D29A      9
471          DI       0   10000
472          DQ       0   10000
             *

473          KK    C29A
474          HC       2
             *
             * OVERTOPPING OF CRISMON ROAD CHANNEL REMOVED TO REFLECT FUTURE CHANNEL

475          KK     45A
476          KM   BASIN 45A
477          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
478          KM    L=      2.0  Lca=      1.0   S=   70.4  Kn= .079  LAG=  66.1
479          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
480          BA     .62
481          LG     .21     .25    4.00     .60   19.00
482          UI     31.     31.     31.    101.    126.    150.    171.    187.    210.    238.
483          UI    273.    346.    409.    353.    303.    269.    243.    213.    190.    166.
484          UI    149.    120.     89.     56.     54.     52.     42.     31.     31.     22.
485          UI     10.     10.     10.     10.     10.     10.     10.     10.     10.      0.
486          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
487          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

488          KK    D45A
489          KM    RETAIN 100 YEAR 2 HOUR, (66% FOR FUTURE DEVELOPMENT)
490          DT    D29A     24
491          DI       0   10000
492          DQ       0   10000
             *

493          KK    D45A
494          KM    DIVERT 75% OF THE FLOW SOUTH,THE REMAINDER ALONG UNIVERSITY TO NEXT SUBBASIN
495          KM    CHANNEL ALONG UNIVERSITY, SOME SHEET FLOW IS DIVERTED
496          DT   45ATB
497          DI       0    5000
498          DQ       0    4750
             *
```



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

499          KK     55B
500          KM   BASIN 55B
501          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
502          KM    L=      3.5  Lca=      1.8   S=   48.6  Kn= .058  LAG=  79.5
503          KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
504          BA    1.86
505          LG     .23     .25    4.10     .57   31.00
506          UI     79.     79.     79.    141.    269.    319.    374.    413.    451.    490.
507          UI    542.    600.    670.    821.    973.    999.    852.    753.    682.    628.
508          UI    569.    510.    465.    413.    376.    325.    252.    192.    139.    136.
509          UI    129.    124.     79.     79.     79.     54.     24.     24.     24.     24.
510          UI     24.     24.     24.     24.     24.     24.     24.      0.      0.      0.
511          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
                 *
512              KK    D55B
513              KM    RETAIN 100 YEAR 2 HOUR, (73% FUTURE DEVELOPMENT)
514              DT    D55B      92
515              DI       0   10000
516              DQ       0   10000
                 *

517              KK    C55B
518              KM   COMBINE 55B WITH DIVERTED FLOWS FROM 45A
519              HC       2
                 *

520              KK    CAP7
521              KM   ROUTE THROUGH CAP#7
522              RS       1    FLOW      -1
523              SV       0   0.167   0.309   0.539   24.52   85.75
524              SE  1560.5    1563 1564.27    1566    1568    1570
525              SQ       0       0     225     460     756    1017
                 *
                 *  FOLLOWING ROUTING CHANGED TO REFLECT FUTURE LAND USE CHANGES FOR
                 *  PARKWOOD RANCH

526              KK   RD45A
527              KM   RETURN DIVERTED FLOWS FROM 45A
528              DR   45ATB
                 *

529              KK   45ATB
530              KM   ROUTE REMAINDER OF FLOWS TO 45B
531              KM   STREET FLOW AND SHEET FLOW, NO DEFINED CHANNEL
532              RS      17    FLOW      -1
533              RC   0.055   0.035   0.055   10000   0.001
534              RX       0     500    1010  1012.5  1022.5  1027.5  1532.5  2037.5
535              RY       6     5.5       5       0       0       5     5.5       6
                 *
```



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

536              KK     45B
537              KM   BASIN 45B
538              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
539              KM    L=      1.9  Lca=       .9   S=   45.0  Kn= .052  LAG=  45.2
540              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
541              BA     .66
542              LG     .22     .25    6.00     .22   50.00
543              UI     49.     49.    159.    219.    266.    309.    368.    482.    614.    516.
544              UI    425.    363.    302.    252.    202.    124.     86.     80.     53.     49.
545              UI     22.     15.     15.     15.     15.     15.      0.      0.      0.      0.
546              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *

547              KK    D45B
548              KM    RETAIN 100 YEAR 2 HOUR, (42% FOR FUTURE DEVELOPMENT)
549              DT    D45B      24
550              DI       0   10000
551              DQ       0   10000
                 *

552              KK    C45B
553              KM   COMBINE FLOWS FROM 45A AND 45B
554              HC       2
                 *

555              KK    CAP8
556              KM   ROUTE THROUGH CAP OVERCHUTE #8
557              RS       1    FLOW      -1
558              SV       0   1.449   9.494   43.04
559              SE  1562.1    1564    1566    1568
560              SQ       0     120     436     935
                 *

561              KK    C7+8
562              KM   COMBINE FLOW FROM OVERCHUTES #7 & #8
563              KM   ROUTE FLOW FROM HERE THROUGH PARKWOOD RANCH
564              HC       2
                 *

565              KK  RCAP78
566              KM   ROUTE CAP OVERCHUTE #7 & #8 TO SUBBASIN 29B, A ROUTING OF ABOUT 4000 FT
567              KM   CHANNEL DIMENSIONS FROM PARKWOOD RANCH
568              KM  (ADMP CHANNEL ID CN4)
569              RS       3    FLOW      -1
570              RC    .035    .035    .035    4000   .0033
571              RX       0      12      27      45     125     143     158     170
572              RY     6.5     4.5       3       0       0       3     4.5     6.5
                 *
```



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

573              KK     29B
574              KM   BASIN 29B
575              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
576              KM    L=       .8  Lca=       .5   S=   52.6  Kn= .092  LAG=  42.2
577              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
578              BA     .08
579              LG     .18     .25    4.00     .66   17.00
580              UI      6.      7.     23.     31.     36.     43.     53.     74.     75.     59.
581              UI     50.     41.     34.     27.     16.     11.     10.      6.      6.      2.
582              UI      2.      2.      2.      2.      2.      0.      0.      0.      0.      0.
583              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
                 *
584              KK    D29B
585              KM    RETAIN 100 YEAR 2 HOUR, (98% FOR FUTURE DEVELOPMENT)
586              DT    D29B      5
587              DI       0   10000
588              DQ       0   10000
                 *

589              KK   C29B1
590              KM   COMBINE FLOWS FROM CAP #7 OVERCHUTE AND SUBBASIN 29B
591              HC       2
                 *

592              KK   C29B2
593              KM   COMBINE ROUTED FLOW FROM 29A WITH SUBBASIN 29B
594              HC       2
                 *

595              KK   TRANS
596              KM   ROUTE FLOW ALONG THE TRANSMISSION CORRIDOR
597              KM   ADJACENT TO SCHOOL SITE AND PARKWOOD RANCH
598              KM  (ADMP CHANNEL ID CN3)
599              RS       1    FLOW      -1
600              RC    .013    .013    .013    2600   .0015
601              RX       0      39      40      51      78      89      90     129
602              RY     6.5     5.5     5.5       0       0     5.5     5.5     6.5
                 *

603              KK     29C
604              KM   BASIN 29C
605              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
606              KM    L=        .9  Lca=        .5   S=   58.8  Kn= .074  LAG=  34.7
607              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
608              BA     .23
609              LG     .24     .25    5.70     .27   32.00
610              UI     23.     43.     95.    124.    153.    199.    280.    226.    180.    143.
611              UI    113.     77.     41.     36.     23.     15.      7.      7.      7.      7.
612              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
613              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *
1                                          HEC-1 INPUT                                                PAGE 16

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

614              KK    D29C
615              KM    RETAIN 100 YEAR 2 HOUR, (98% FOR FUTURE DEVELOPMENT)
616              DT     D29      17
617              DI       0   10000
618              DQ       0   10000
                 *

619              KK   C29C2
620              KM   COMBINE ROUTED FLOWS FROM C29B2 AND C29C1
621              HC       2
                 *

622              KK  29CTD1
623              KM   REACH PR-2, PR-3
624              KM   ROUTE FLOW ALONG SOUTH OF SCHOOL AND SOUTH ALONG CRISMON TO SOUTHERN
625              KM   GRASS LINED CHANNEL
626              RS       1    FLOW      -1
627              RC    .045    .045    .045    2500   .0025
628              RX       0      20      40      69     109     139     147     155
629              RY     6.5     5.5     4.9       0       0     4.9     5.5     6.5
                 *

630              KK      55
631              KM   BASIN 55
632              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
633              KM    L=        .5  Lca=        .2   S=   72.3  Kn= .081  LAG=  22.2
634              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
635              BA     .14
636              LG     .24     .24    4.60     .40   29.00
637              UI     21.     85.    128.    192.    243.    167.    116.     63.     35.     20.
638              UI      7.      7.      7.      0.      0.      0.      0.      0.      0.      0.
639              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *

640              KK     D55
641              KM    RETAIN 100 YEAR 2 HOUR, (90% FOR FUTURE DEVELOPMENT)
642              DT     D55       9
643              DI       0   10000
644              DQ       0   10000
                 *

645              KK    CAP9
646              RS       1    FLOW      -1
647              SV       0    2.03  10.075  43.569
648              SE  1562.1    1564    1566    1568
649              SQ       0     120     436     935
                 *

650              KK   RCAP9
651              KM   ROUTE CAP OVERCHUTE #9 TO SUBBASIN 29D
652              KM   UNLINED CHANNEL THROUGH PARKWOOD RANCH
653              KM   DESIGN PLANS BY STANDAGE & TRUITT
654              KM   CHANNEL REVISED BY HOSKIN ENG.
655              KM   CHANNEL ID FOR THAT PART OF THE CHANNEL THAT CUT ACROSS 29D)
                                           HEC-1 INPUT                                                PAGE 17
1

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

656              RS       3    FLOW      -1
657              RC    .035    .035    .035    4700   .0050
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658          RX      0     16     30     40     50     60     74     90
659          RY    7.4    3.4    2.0      0      0    2.0    3.4    7.4
             *

660          KK     29D
661          KM   BASIN 29D
662          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
663          KM    L=      1.2  Lca=       .9   S=   40.7  Kn= .066  LAG=  47.8
664          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
665          BA     .65
666          LG     .21     .25    4.90     .35   43.00
667          UI     46.     46.    133.    196.    239.    275.    325.    390.    532.    552.
668          UI    439.    375.    319.    270.    225.    177.    111.     80.     75.     51.
669          UI     46.     26.     14.     14.     14.     14.     14.     14.      0.      0.
670          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

671          KK    D29D
672          KM    RETAIN 100 YEAR 2 HOUR, (53% FOR FUTURE DEVELOPMENT)
673          DT    D29D      27
674          DI       0   10000
675          DQ       0   10000
             *

676          KK   D29D2
677          KM   DIVERT APPROXIMATLY 2/3 OF SUBBASIN 29D'S FLOW TO THE EAST. THIS HAPPENS
678          KM   BECAUSE CHANNEL CN5 CUTS ACROSS SUBBASIN 29D. ONLY THOSE FLOWS TO THE EAST OF
679          KM   THE CHANNEL GET INTO THE CHANNEL
680          DT   D29DE   10000
681          DI       0     100     200     500     800
682          DQ       0      66     132     330     528
             *
             *       *****KVM*****

683          KK   C29C3
684          KM  COMBINE FLOWS FROM C29C2, D29D2, AND RCAP9
685          HC       3
             *
             * RETENTION BASIN 5, OPTION 2

686          KK  BASIN5
687          KM  WITH 36-INCH OUTFALL
688          RS       1    STOR      -1
689          SA       0     3.9      11    13.7      14      14
690          SE    1518    1521    1523    1524    1528    1531
691          SL    1518   18.00     0.6     0.5
692          SS    1528     200     2.5     1.5
             *
```



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

693          KK   RBAS5
694          KM   REACH PR-1
695          KM   ROUTE FLOWS FORM 29D (WESTERN 1/3) TO SUBBASIN 36.  CRISMON AND SOUTHERN TO
696          KM  THE SUPERSTITION FWY. (PREVIOUSLY CALLED 29DT36)
697          RS       1    FLOW      -1
698          RC   0.025   0.025   0.025    2150  0.0017
699          RX       0      20      25      32      44      60      68      76
700          RY     3.8     3.9       4       0       0       4     3.9     3.8
             *

701          KK   G29DE
702          KM   RECALL THE EASTERN 2/3 OF SUBBASIN 29D. THIS IS RECALLED 2600 FT EAST OF
703          KM   CRISMON RD.
704          DR   D29DE
             *
             *  FOLLOWING ROUTE ADDED BY HOSKIN ENG.*

705          KK   29T36
706          KM   ROUTE FLOW FROM PARKWOOD RANCH THROUGH NEW UNLINED CHANNEL
707          KM   CROSS-SECTION MATCHES PARKWOOD RANCH CHANNEL
708          KM  (ADMP CHANNEL ID CN5)
709          RS       3    FLOW      -1
710          RC    .035    .035    .035    3000   .0050
711          RX       0      16      30      40      50      60      74      90
712          RY     7.4     3.4     2.0       0       0     2.0     3.4     7.4
             *

713          KK     36C
714          KM   BASIN 36C
715          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
716          KM    L=      1.2  Lca=       .6   S=   44.2  Kn= .020  LAG=  12.4
717          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
718          BA     .44
719          LG     .10     .25    4.65     .47   80.00
720          UI    266.    780.   1282.    724.    259.     83.     37.      0.      0.      0.
721          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *

722          KK    D36C
723          KM    RETAIN 100 YEAR 2 HOUR, (87% FOR FUTURE DEVELOPMENT)
724          DT    D36C      38
725          DI       0   10000
726          DQ       0   10000
             *

727          KK     C36
728          KM   COMBINE FLOWS IN CHANNEL ACROSS PARKWOOD RANCH (SUBBASIN 29D) WITH SUBBASIN 3
729          HC       3
             *
             * DDM   ***** Preserved *****
```



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LINE         ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10
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730          KK   36T37
731          KM   ROUTE C36 TO C37 VIA ADOT CONCRETE CHANNEL
732          RS    1.76    FLOW     -1
733          RC   0.035   0.013   0.035    5280  0.0033
734          RX       0     500    1000    1012    1020    1032    1532    2032
735          RY      13    12.5      12       0       0      12    12.5      13
             *
             * DDM   ***** Updated *****

736          KK     30b
737          KM   BASIN 30b
738          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
739          KM    L=      1.5  Lca=       .9   S=   43.3  Kn= .060  LAG=  48.3
740          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
741          BA     .81
742          LG     .27     .27    4.00     .52   25.00
743          UI     57.     57.    161.    241.    296.    339.    400.    475.    645.    703.
744          UI    558.    475.    407.    344.    288.    236.    149.    101.     94.     71.
745          UI     57.     41.     17.     17.     17.     17.     17.     17.      0.      0.
746          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             * DDM   ***** Preserved *****

747          KK   30bT37
748          KM   ROUTE FLOWS FROM S30b TO C37 VIA NATURAL CHANNEL
749          RS     4.4    FLOW     -1
750          RC   0.040   0.035   0.040    2640   0.053
751          RX       0       2       3       4       7       8      28     528
752          RY       6       5       5       0       0       4     4.5       5
             * DDM   ***** Updated *****

753          KK      37
754          KM   BASIN 37
755          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
756          KM    L=      1.0  Lca=       .5   S=   45.0  Kn= .028  LAG=  15.0
757          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
758          BA     .47
759          LG     .31     .33    4.00     .49   14.00
760          UI    184.    569.   1051.    922.    531.    204.     85.     32.      0.      0.
761          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             * DDM   ***** Preserved *****

762          KK     C37
763          KM   COMBINE FLOWS FROM S37, S30, AND C36 AT C37
764          HC       3
             *
             * DDM   ***** Preserved *****

765          KK  ADOTEL
766          KM   ADOT DETENTION BASIN 4313 AT ELLSWORTH RD. AND SUPERSTITION
767          KM   FROM EASTERN MARICOPA COUNTY AREA DRAINAGE MASTER STUDY, FCD OF MARICOPA
768          KM        COUNTY
769          KM        AND SUPERSTITION FREEWAY COMPREHENSIVE OFFSITE DRAINAGE PLAN,
770          KM            A-N WEST, INC., FEBRUARY, 1987.
```

1 HEC-1 INPUT PAGE 20

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

771          RS       1    ELEV      56
772          SV       0     617     650
773          SE      56      74      75
774          SL      56    3.14     0.6     .05
775          SS      74     200     2.6     1.5
             *
             * DDM   ***** Preserved *****
             *
             * ************************************************************************
             * Revised by DMJM to reflect Red Mountain Freeway Design Concepts
             * ************************************************************************
             *

776          KK  37T38A
777          KM   ROUTE FLOWS FROM C37 TO C38A VIA ADOT CONCRETE CHANNEL
778          RS    1.76    FLOW     -1
             *
779          RC   0.035   0.012   0.035    3620  0.0045
780          RX       0     500    1000    1012    1020    1032    1532    2032
781          RY      13    12.5      12       0       0      12    12.5      13
             *
             * Revised by DMJM to reflect Red Mountain Freeway Design Concepts
             *
             * DDM   ***** Inserted *****

782          KK     38A
783          KM   BASIN 38A
784          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
             *     KM  L=      1.1  Lca=       .8   S=   37.0  Kn= .063  LAG=  50.8
785          KM    L=      1.1  Lca=       .8   S=   37.0  Kn= .063  LAG=  43.8
786          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
787          BA   .3275
788          LG     .25     .29    4.25     .44   31.00
789          UI     25.     25.     87.    116.    141.    164.    198.    266.    316.    249.
790          UI    209.    175.    145.    121.     85.     50.     43.     34.     25.     18.
791          UI      8.      8.      8.      8.      8.      8.      0.      0.      0.      0.
792          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
             *
             *    Old Parameters from the Previous Subbbasin 38
             *    BA   .47
             *    LG   .25     .29    4.25     .44   31.00
             *    UI   31.     31.     78.    127.    156.    179.    207.    242.    313.
             *    UI  340.    282.    247.    209.    179.    152.    119.     77.     55.
             *    UI   39.     31.     25.     10.     10.     10.     10.     10.     10.
             *    UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
             *    UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
```

```
*
* ****************************************************************************
*    ***** Revisions by DMJM to document original design *****
*
*  ***** Original ADOT On-line Detention Basin per URS Final Drainage Report ***
*
*  KKHDET12
*  KM ONLINE DETENTION POND #12 - UPSTREAM FROM HAWES RD. (STA. 992+00 - 997+00)
*  RS    1.   ELEV  1439.8
*  SV    0.    0.11    1.81    5.73    8.84    9.92   10.78
*  SE1439.8  1441.8  1443.8  1445.8  1447.3  1447.8  1448.2
*  SQ   0.    52.0   100.0   132.0   152.0   209.0   285.0
*
* ***** Original ADOT On-line Detention Basin per URS Final Drainage Report ****
*
*  KKHDET11
*  KM ONLINE DETENTION POND #11 - UPSTREAM FROM HAWES RD. (STA. 977+00 - 972+00)
*  RS    1.   ELEV  1427.8
*  SV    0.    0.11    1.87    5.88    7.10    7.96   10.09
*  SE1427.8  1429.8  1431.8  1433.8  1434.4  1434.8  1435.8
*  SQ   0.    52.0   100.0   132.0   140.0   162.0   279.0
*
* ****************************************************************************
*
*  Revise interval to read hydrograph more accurately
*
```



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

 793          IN       5
              *

 794          KK    202D
 795          KM   BASIN 202D
 796          KM    Hydrograph created from onsite Rational Calulations and SCS Distribution
 797          KM     A = 15.93 acres, C = 0.80, Tc = 15.33 min.
 798          BA   .0249
 799          QI       1       1       1       1       1       1       1       1       1       1
 800          QI       1       1       1       1       1       1       1       1       1       1
 801          QI       1       1       1       1       1       1       1       1       1       1
 802          QI       1       1       1       1       1       1       1       1       1       1
 803          QI       1       1       1       1       1       1       1       1       1       1
 804          QI       1       1       1       1       1       1       1       1       1       1
 805          QI       1       1       1       1       1       1       1       1       1       1
 806          QI       1       1       1       2       2       2       2       2       2       2
 807          QI       2       2       2       2       2       2       2       2       3       3
 808          QI       3       3       3       3       4       4       4       6      10      15
 809          QI      19      26      40      71     100      94      69      48      35      25
 810          QI      17      11       8       6       5       4       4       3       3       3
 811          QI       3       3       3       2       2       2       2       2       2       2
 812          QI       2       2       2       2       2       2       2       2       1       1
 813          QI       1       1       1       1       1       1       1       1       1       1
 814          QI       1       1       1       1       1       1       1       1       1       1
 815          QI       1       1       1       1       1       1       1       1       1       1
 816          QI       1       1       1       1       1       1       1       1       1       1
 817          QI       1       1       1       1       1       1       1       1       1       1
 818          QI       1       1       1       1       1       1       1       1       1       1
 819          QI       1       1       1       1       1       1       1       1       1       1
 820          QI       1
              *

 821          KK    C38A
 822          KM    COMBINE FLOWS FROM BASIN 38A WITH ADOT DETENTION OUTLET AND FREEWAY'S 202D
 823          HC       3
              *
              * **** Revised by DMJM to reflect Red Mountain Freeway 30% Design Concepts ****
              *

 824          KK  202NE1
 825          KM   On-line Detention Basin estimated for 202L/US60 Traffic Interchange DCR
 826          KM   Basin is located Northeast of the 202L/US60 Traffic Interchange - Upper Basin
 827          RS       1    ELEV  1436.2
              *
              * SV   0     0.2     2.3     6.4    14.9    29.2    36.7    44.4    52.3    60.4
              *
              * *** Revised by PB to reflect final basin geometry ****
              *
 828          SV       0     0.4     2.8     6.4    14.3    28.8    36.4    44.1    52.0    60.7
 829          SE  1436.2  1437.0  1438.0 1438.73  1440.0  1442.0  1443.0  1444.0  1445.0  1446.0
              *   ***** Double 30 inch dia. RCP Outlet Pipe *****
 830          SQ       0       0       0       0      43      69      79      88      96     103
              *
              *
```



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

 831          KK  202NE2
 832          KM   On-line Detention Basin estimated for 202L/US60 Traffic Interchange DCR
 833          KM   Basin is located Northeast of the 202L/US60 Traffic Interchange - Lower Basin
 834          RS       1    ELEV  1433.9
              *
              * SV   0     0.7     4.2     8.9    13.9    19.0    24.3    29.7    35.4    41.3
              *
              * *** Revised by PB to reflect final basin geometry ****
              *
 835          SV       0     0.9     3.7     8.1    12.8    17.8    22.8    28.2    33.5    40.1
 836          SE  1433.9  1435.0  1436.0  1437.0  1438.0  1439.0  1440.0  1441.0  1442.0  1443.0
              *   ***** Single 24 inch dia. RCP Outlet Pipe *****
 837          SQ       0     5.0    12.8    20.7    25.1    29.1    32.7    36.0    39.1    42.0
              *
              *
              * DDM   ***** Updated *****
```

```
838          KK     17A
839          KM   BASIN 17A
840          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
841          KM    L=       .7  Lca=       .5   S=   60.6  Kn= .042  LAG=  18.5
842          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
843          BA     .18
844          LG     .26      .28     4.00      .55   33.00
845          UI     44.     151.     233.     375.    265.     171.      77.      42.      16.      10.
846          UI     10.       0.       0.       0.      0.       0.       0.       0.       0.       0.
847          UI      0.       0.       0.       0.      0.       0.       0.       0.       0.       0.
             *
             * DDM   ***** Preserved *****
             * Revised by DMJM to reflect Red Mountain Freeway Design Concepts
             *    KK17AT23
             *    KM ROUTE FLOWS FROM 17 TO 23 VIA DIRT CHANNEL, THEN NATURAL WASH
             *    RS     3    FLOW      -1
             *    RC 0.045   0.032   0.045    2600   0.015
             *    RX     0     100     133     137     142     147     200     300
             *    RY     5       4     3.5       0       0     3.5       4       5
             *
             * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
             *
             * DDM   ***** Updated *****

848          KK      49
849          KM   BASIN 49
850          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
851          KM    L=       1.6  Lca=       .8   S=   73.6  Kn= .040  LAG=  28.4
852          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
853          BA     .79
854          LG     .30      .30     4.15      .48   14.00
855          UI     94.     257.     467.     603.    836.    1129.     839.     643.     482.     296.
856          UI    161.     117.      74.      29.     29.      29.       0.       0.       0.       0.
857          UI      0.       0.       0.       0.      0.       0.       0.       0.       0.       0.
             *
             * DDM   ***** Preserved *****
```



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

858          KK    CAP2
859          RS       1    FLOW      -1
860          SV       0    0.02   0.538   2.545  13.729
861          SE  1565.1    1566    1568    1570    1572
862          SQ       0      60     340     807    1395
             *

863          KK  BASIN2
             * KO     1
864          KM        NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP2
865          KM        WITH 24-INCH OUTFALL      (EH1B)
866          RS       1    STOR      -1
867          SA       0     .54    1.81    4.10    5.14     6.3     6.3     6.3
868          SE      49      51      52      53      54      55      64      67
869          SL      50    3.14     .62      .5
870          SS    56.5     100     2.5     1.5
             *

871          KK  RCAP2A
872          KM   ROUTE BASIN 2 OUTFLOW THROUGH 36-INCH PIPE
873          RK    1370  0.0088   0.012            CIRC       3
             *
             * DDM   ***** Preserved *****

874          KK   RCAP2
             *
875          KM   ROUTE CAP OVERCHUTE #2 South to Broadway Road at C17A
             *
876          RS      10    FLOW      -1
             *
877          RC    .045    .040    .045    1100    .012
             *
878          RX     100     200     300     316     321     329     429     529
879          RY       6       5       3       0       0       3       5       6
             *
             *

880          KK    C17A
881          KM    COMBINE FLOWS FROM CAP OVERCHUTE #2 AND S17A
882          HC       2
             *
             * DDM   ***** Updated *****

883          KK      48
884          KM   BASIN 48
885          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
886          KM    L=       1.6  Lca=       .8   S=   80.2  Kn= .038  LAG=  26.4
887          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
888          BA     .77
889          LG     .31      .31     4.10      .49   12.00
890          UI     98.     305.     517.     682.   1035.    1076.     777.     573.     390.     190.
891          UI    136.      85.      30.      30.     30.       0.       0.       0.       0.       0.
892          UI      0.       0.       0.       0.      0.       0.       0.       0.       0.       0.
             *
             * DDM   ***** Preserved *****
```



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

893          KK    CAP3
894          RS       1    FLOW      -1
895          SV       0   0.934   1.222   4.303   13.13
896          SE  1564.6  1567.5    1568    1570    1572
897          SQ       0       0     143     750    1530
```

```
                 *
898              KK  BASIN3
                 * KO      1       2
899              KM        NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP3
900              KM        WITH 30-INCH OUTFALL     BASIN AE2B (BASIN 3)
901              RS       1    STOR      -1
902              SA       0      .5       1      1.8      3.4       4       6       6
903              SE      55      56      57       58       59      60      62      65
904              SL   56.25    4.91     .62       .5
905              SS      62     100     2.5      1.5
                 *
                 * DDM   ***** Preserved *****

906              KK  RCAP3A
907              KM   ROUTE CAP OVERCHUTE #3 TO APACHE TRAIL (ALONG NATURAL CHANNEL)
908              RS     3.3    FLOW      -1
909              RC    .055    .045    .055     2000     .020
910              RX     100     200     300      305      310     315     415     515
911              RY       7       6       5        0        0       5       6       7
                 *
                 * DDM   ***** Preserved *****

912              KK  RCAP3B
913              KM   ROUTE CAP OVERCHUTE #3 FROM APACHE TRAIL TO 17B
914              RS       1    FLOW      -1
915              RC    .045    .035    .045     2300     .01
916              RX     100     200     300      301      311     312     412     512
917              RY       3       2       1        0        0       1       2       3
                 *
                 * DDM   ***** Updated *****

918              KK     17B
919              KM   BASIN 17B
920              KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
921              KM    L=       .8  LCa=       .6   S=   50.0  Kn= .042  LAG=  21.2
922              KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
923              BA     .22
924              LG     .26     .28    4.00     .54   30.00
925              UI     37.    146.    220.    348.    372.    252.    169.     77.     47.     23.
926              UI     11.     11.      0.      0.      0.      0.      0.      0.      0.      0.
927              UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                 *
                 * DDM   ***** Preserved *****
```



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

928              KK    C17B
929              KM    COMBINE FLOWS FROM CAP OVERCHUTE #3 AND S17B
930              HC       2
                 *
                 *     * DDM   ***** Preserved *****
                 *     KK17BT22
                 *     KM ROUTE FLOWS FROM S17 TO C22 VIA LINED CHANNEL
                 *     RS     3    FLOW      -1
                 *     RC 0.035   0.015   0.035     2700  0.0114
                 *     RX     0       1       3        6      18      21      36      70
                 *     RY  6.25    6.10       6        0       0       3    3.25     3.5
                 *

931              KK    C17C
932              KM    COMBINE FLOWS FROM C17A AND C17B
933              HC       2
                 *

934              KK  17CT23
935              KM   ROUTE FLOWS FROM C17C TO C23A
                 *
936              RS       2    FLOW      -1
937              RC   0.035   0.025   0.035     3000  0.0083
938              RX       0       9      24       54      66      96     111     120
939              RY       8     5.3       5        0       0       5     5.3       8
                 *
                 * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
                 *

940              KK     18F   BASIN
941              KM   BASIN 18F
942              KM    THIS IS THE FUTURE SUBBASIN CREATED BY 202L BISECTING 18C
943              BA   0.048
944              LG    0.14    0.32    4.00    0.43       5
945              UI     119     217      31       0       0       0       0       0       0       0
946              UI       0       0       0       0       0       0       0       0       0       0
                 *

947              KK  R18FTE
948              KM   ROUTE FLOWS FROM 18F TO C18E VIA CHANNEL ON EAST SIDE OF FREEWAY
949              RS       2    FLOW      -1
950              RC   0.035   0.016   0.035     2570  0.0123
951              RX       0       9      24       36      44      56      71      80
952              RY       9     6.3       6        0       0       6     6.3       9
                 *
                 *

953              KK     18E   BASIN
954              KM   BASIN 18E
955              KM    THIS IS THE FUTURE SUBBASIN CREATED BY 202L BISECTING 18C
956              BA   0.082
957              LG    0.11    0.31    4.00    0.49      28
958              UI     203     371      53       0       0       0       0       0       0       0
959              UI       0       0       0       0       0       0       0       0       0       0
                 *
```

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

 960          KK  RET18E
 961          KM    RETAIN THE 100 YEAR 2 HOUR VOLUME (27% OF BASIN HAS RETENTION)
 962          DT    D18E    2.32
 963          DI       0   10000
 964          DQ       0    2700
              *

 965          KK    C18E
 966          KM    COMBINE FLOWS FROM BASIN 18E AND 18F
 967          HC       2
              *
              *

 968          KK  18ET23
 969          KM   ROUTE FLOWS FROM C18E TO C23 VIA CONCRETE CHANNEL ON EAST SIDE OF FREEWAY
 970          RS       1    FLOW      -1
 971          RC   0.035   0.016   0.035    1860  0.0107
 972          RX       0       9      24      36      44      56      71      80
 973          RY       9     6.3       6       0       0       6     6.3       9
              *

 974          KK    C23A
 975          KM    COMBINE FLOWS FROM C17C AND C18E
 976          HC       2
              *

 977          KK  R23ATB
 978          KM   ROUTE FLOWS FROM C23A TO C23B VIA CONCRETE CHANNEL ON EAST SIDE OF FREEWAY
 979          RS       1    FLOW      -1
 980          RC   0.035   0.016   0.035    1120  0.0086
 981          RX       0       9      24      36      44      56      71      80
 982          RY       9     6.3       6       0       0       6     6.3       9
              *

 983          KK      23   BASIN
 984          KM   BASIN 23
 985          BA   0.169
 986          LG    0.22    0.26    4.10    0.54      30
 987          UI      38     137     206     337     257     168      82      43      20       9
 988          UI       9       0       0       0       0       0       0       0       0       0
 989          UI       0       0       0       0       0       0       0       0       0       0
              *   KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
              *   *     KM  L=       1.0  Lca=       .3   S=   65.0  Kn= .038  LAG=  16.2
              *   KM  L=       .6  Lca=       .2   S=   58.6  Kn= .068  LAG=  19.9
              *
              *   KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
              *   BA .1750
              *   LG   .28     .30    4.00     .47   20.00
              *   UI   35.    129.    195.    325.    274.    184.    108.     50.     28.
              *   UI    9.      0.      0.      0.      0.      0.      0.      0.      0.
              *   UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
              *     BA   .28
              *     LG   .28     .30    4.00     .53   20.00
              *     UI   92.    296.    509.    595.    357.    170.     77.     28.     18.
              *     UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
              *     UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 990          KK   RET23
 991          KM    RETAIN THE 100 YEAR 2 HOUR VOLUME (18% OF BASIN HAS RETENTION)
 992          DT     D23    2.79
 993          DI       0   10000
 994          DQ       0    1800
              *

 995          KK    C23B
 996          KM   COMBINE FLOWS FROM C23A AND BASIN 23
 997          HC       2
              *
              * DDM   ***** Updated *****

 998          KK      47
 999          KM   BASIN 47
1000          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1001          KM    L=       3.0  Lca=       1.5   S=   51.2  Kn= .037  LAG=  44.8
1002          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1003          BA    1.67
1004          LG     .32     .32    4.00     .49    8.00
1005          UI    126.    126.    418.    569.    691.    804.    959.   1272.   1579.   1302.
1006          UI   1079.    920.    765.    631.    492.    300.    218.    205.    126.    126.
1007          UI     42.     39.     39.     39.     39.     39.      0.      0.      0.      0.
1008          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *
              * DDM   ***** Preserved *****
              * KKCAP4+5
              * KM ROUTE THROUGH OVERCHUTES 4 AND 5, HUYDRAULICALLY CONNECTED
              * KM STORAGE AND DISCHARGE WERE ADDED AT APPROPRIATE ELEVATIONS
              * RS     1    FLOW      -1
              * SV     0   0.081   0.483   4.779   39.02  121.88
              * SE1568.3    1570    1572    1574    1576    1578
              * SQ     0     170     575    1085    1245    1410
              *

1009          KK  BASIN4
1010          KM   ROUTE THROUGH OVERCHUTES 4 AND 5, HYDRAULICALLY CONNECTED
1011          KM   STORAGE AND DISCHARGE WERE ADDED AT APPROPRIATE ELEVATIONS
1012          KM  OUTFLOW THROUGH ONE 30-INCH PIPE
1013          KM        BASIN4 (BY4B)
1014          RS       1    STOR      -1
```

```
1015    SA       0    0.64     2.3    5.28    6.88    9.41
1016    SE      68      69      70      71      72      76
1017    SL   69.75    4.91     .62      .5
1018    SS      74     200     2.5     1.5
        *
        * DDM   ***** Preserved *****

1019    KK   RCAP4
1020    KM   ROUTE CAP OVERCHUTE #4 AND #5 TO SUBBASIN 22
1021    RS      10    FLOW      -1
1022    RC     .05    .045     .05    6000    .005
1023    RX     100     200     300     304     310     314     414     514
1024    RY       6       5       4       0       0       4       5       6
        *
        * DDM   ***** Updated *****
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1025    KK      22
1026    KM   BASIN 22
1027    KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1028    KM    L=      1.2  Lca=      .3   S=   51.3  Kn= .041  LAG=  19.5
1029    KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1030    BA     .41
1031    LG     .27     .28    4.00     .54   29.00
1032    UI     86.    310.    470.    782.    624.    415.    227.    109.     56.     21.
1033    UI     21.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1034    UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
        * DDM   ***** Preserved *****

1035    KK    C22A
1036    KM   COMBINE FLOWS FROM CAP OVERCHUTES 4 & 5 AND SUBBASIN 22
1037    HC       2
        *
        * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
        *
        *    * DDM   ***** Preserved *****
        *    KK   C22
        *    KM COMBINE S17B AND S22
        *    HC      2
        *    * DDM   ***** Preserved *****

1038    KK  22AT23
1039    KM   ROUTE C22A TO C23 VIA CONCRETE CHANNEL
1040    KM   VELOCITY = 5FT/S
1041    RS       2    FLOW      -1
        *
1042    RC   0.045   0.022   0.042    1600   0.001
        *
1043    RX       0     102     103     106    1021     124     128     270
1044    RY       7     6.5       6       0       0       3       5       7
        *
        * DDM   ***** Preserved *****
        *
        * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
        *

1045    KK    C23C
        *
1046    KM   COMBINE FLOWS FROM C22A AND C23C
1047    HC       2
        *
        *    * DDM   ***** Preserved *****
        *    KK 23T24
        *    KM ROUTE FLOWS FROM C23 TO C24 VIA CONCRETE LINED CHANNEL
        *    RS      2    FLOW      -1
        *    RC 0.045   0.022   0.045    2640  0.0117
        *    RX      0       2       3       6      21      24      26      70
        *    RY      6       6       6       0       0       3       5       6
        *
        * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
        *
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1048    KK   RC23
1049    KM   ROUTE FLOWS FROM C23 TO C31a VIA CONCRETE LINED CHANNEL
1050    RS       3    FLOW      -1
1051    RC   0.035   0.016   0.035    4120  0.0054
1052    RX       0       7      19      33      47      61      73      80
1053    RY       9     7.3       7       0       0       7     7.3       9
        *
        *
        * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
        *
        *
        * DDM   ***** Updated *****

1054    KK     30a
1055    KM   BASIN 30a
1056    KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1057    KM    L=      1.2  Lca=      .7   S=   48.8  Kn= .060  LAG=  38.1
1058    KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1059    BA     .30
1060    LG     .27     .28    3.91     .53   28.00
1061    UI     27.     42.    104.    138.    166.    204.    281.    329.    251.    208.
1062    UI    167.    135.     96.     54.     45.     32.     27.      9.      8.      8.
1063    UI      8.      8.      0.      0.      0.      0.      0.      0.      0.      0.
1064    UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
        *
        * DDM   ***** Preserved *****
```

```
1065        KK  30at31
1066        KM   ROUTE SUBBASIN 30A IN VARIOUS CHANNELS UNTIL IT COMBINES WITH SUBBASIN 31A
1067        KM   AT THE CORNER OF 88TH ST AND SOUTHERN.  IN REALITY THIS ROUTING COULD BE
1068        KM   BROKEN UP INTO POSSIBLY 3 DIFFERENT ROUTINGS DUE TO CHANGES IN HOW THE
1069        KM   ROUTING IS ACCOMPLISHED, IE. CEMENT CHANNEL, EARTH LINED CHANNEL AND OPEN
1070        KM   WASH. THE PARAMETERS WILL TRY TO BE AN AVERAGE FOR THE ENTIRE REACH
1071        RS       4    FLOW      -1
1072        RC    .038    .030    .038    5000    .005
1073        RX       0      15      25      40      60      75      85     100
1074        RY       8       6       3       2       2       3       6       8
            *
            *
            * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
            *   ** Additional Refinements were made with the University to Southern Segment
            *
            * DDM   ***** Preserved *****

1075        KK   C31A1
1076        KM    COMBINE FLOWS FROM SUBBASIN 30A, AND C23
1077        HC       2
            *
            * DDM   ***** Updated *****
```



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

1078        KK     31A
1079        KM   BASIN 31A
1080        KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1081        KM    L=       1.0  Lca=       .5   S=   43.3  Kn= .064  LAG=  22.5
1082        KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1083        BA   .5127
1084        LG     .29     .29    4.15     .46   18.00
1085        UI     77.    299.    454.    675.    882.    614.    430.    249.    130.     78.
1086        UI     27.     24.     24.      0.      0.      0.      0.      0.      0.      0.
1087        UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
            *     BA   .53
            *     LG   .29     .29    4.15     .46   18.00
            *     UI   80.    312.    472.    702.    919.    639.    448.    259.    135.
            *     UI   28.     25.     25.      0.      0.      0.      0.      0.      0.
            *     UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
            *

1088        KK    202C
1089        KM   BASIN 202C
1090        KM    Hydrograph created from onsite Rational Calulations and SCS Distribution
1091        KM     A = 6.66 acres, C = 0.95, Tc = 13.33 min.
1092        BA   .0104
1093        QI       1       1       1       1       1       1       1       1       1       1
1094        QI       1       1       1       1       1       1       1       1       1       1
1095        QI       1       1       1       2       4       5       7       9      14      26
1096        QI      34      30      20      14      10       7       5       3       2       2
1097        QI       1       1       1       1       1       1       1       1       1       1
1098        QI       1       1       1       1       1       1       1       1       1       1
1099        QI       1       1
            *
            *
            * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
            *   ** Additional Refinements were made with the University to Southern Segment
            *
            * DDM   ***** Preserved *****

1100        KK   C31A2
1101        KM    COMBINE FLOWS FROM SUBBASIN 30A, SUBBASIN 31A, C23, AND SUBBASIN 202C
1102        HC       3
            *
            *
            * **** Revised by DMJM to reflect Red Mountain Freeway 30% Design Concepts ****
            *

1103        KK   R202S
1104        KM   On-line Detention Basin estimated for 202L/US60 Traffic Interchange DCR
1105        KM    Basin located on the east side of the 202L Freeway north of Southern Ave.
1106        KM    Principal Outlet Structure consists of 1 - 10'x6' RCB.
            *   RS     1    ELEV  1446.0
            *   SV     0     0.2     1.4     4.3     9.5    17.5    28.6    52.9    78.4
            *   SE1446.0  1447.0  1448.0  1449.0  1450.0  1451.0  1452.0  1454.0  1456.0  14
            *   SQ     0    46.3    92.6   164.1   245.7   333.9   425.9   604.9   804.7   8
            *
            * **** Revised by DMJM to reflect 202L/US60 - Phase 2 - 30% Design Concepts ****
            *
```



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

1107        RS       1    ELEV  1444.0
            * SV   0     0.2     1.4     4.3     9.5    17.5    28.6    52.9    78.4    91.3
            * SE1444.01445.0  1446.0  1447.0  1448.0  1449.0  1450.0  1452.0  1454.0  1455.0
            * SQ   0    46.1    92.2   163.8   245.3   333.3   425.7   604.8   803.6   826.1
            *
            * *** Revised by PB to reflect final culvert geometry and basin geometry ***
            *
1108        SV       0     1.0     2.0     4.6     8.9    16.2    25.7    37.3    49.2    61.6
1109        SV    74.2
1110        SE  1444.0  1445.0  1446.0  1447.0  1448.0  1449.0  1450.0  1451.0  1452.0  1453.0
1111        SE  1454.0
1112        SQ       0    46.1    92.2   163.8   245.0   333.3   425.7   516.7   604.1   685.4
1113        SQ   760.8
            *
            * ***** Onsite 202L Runoff *****
            *

1114        KK    202A
1115        KM   BASIN 202A
1116        KM    Hydrograph created from onsite Rational Calulations and SCS Distribution
```

```
1117    KM     A = 56.9 acres, C = 0.76, Tc = 22.9 min.
1118    BA   .0889
1119    QI       0       0       1       1       2       2       2       3       3       3
1120    QI       3       3       3       3       4       4       4       4       4       4
1121    QI       4       4       5       5       5       5       6       6       6       7
1122    QI       8       9      14      20      28      38      55      90     137     163
1123    QI     155     127      96      73      54      39      27      20      15      12
1124    QI      10       8       7       6       6       5       5       5       5       5
1125    QI       4       4       4       4       4       4       4       3       3       3
1126    QI       3       3       3       3       2       2       1       1
        *

1127    KK   R202A
1128    KM   ROUTE FLOWS FROM Broadway Road to C202B
1129    RK   6000.  0.0016   0.013            CIRC     6.0
        *

1130    KK    202B
1131    KM   BASIN 202B
1132    KM    Hydrograph created from onsite Rational Calulations and SCS Distribution
1133    KM     A = 35.73 acres, C = 0.84, Tc = 17.67 min.
1134    BA   .0558
1135    QI       0       0       1       1       2       2       2       2       2       2
1136    QI       2       2       2       2       2       3       3       3       3       3
1137    QI       3       3       3       3       4       4       4       4       5       5
1138    QI       6       7      12      17      24      32      48      82     121     125
1139    QI     101      73      53      39      27      18      13       9       7       6
1140    QI       5       5       4       4       4       3       3       3       3       3
1141    QI       3       3       3       3       3       2       2       2       2       2
1142    QI       2       2       2       2       1       1
        *
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1143    KK   C202B
1144    KM    COMBINE FLOWS FROM SUBBASIN 202A WITH SUBBASIN 202B
1145    HC       2
        *
        *

1146    KK   R202B
1147    KM   ROUTE FLOWS FROM C202B TO C202C
1148    RK   3200.  0.0010   0.013            CIRC     5.0
        *
        *

1149    KK   C202C
1150    KM    COMBINE FLOWS FROM C202B WITH C31A
        * KO   1
1151    HC       2
        *

1152    KK  RT202C
1153    KM   ROUTE FLOWS ALONG SOUTHERN AVE FROM 202L TO HAWES ROAD.
        * KO   1
1154    RS       1    FLOW      -1
1155    RC    .025    .015    .025     683  0.0010
1156    RX       0       4      16      28      44      56      68      72
1157    RY     7.3     6.3     6.0       0       0     6.0     6.3     7.3
        *
        *   *** REVISED BY DMJM+HARRIS PER CITY OF MESA COMMENTS ***
        *

1158    KK  DSPILL
1159    KM   DIVERT FLOW SW TOWARD HAWES CHANNEL VIA 10x4 RCB
1160    KM   REMAINDER FLOWS SOUTH VIA SIDE CHANNEL WEIR (L=165') TO NW BASINS
1161    DT   DHAWS
        *
        * *** Flow Split rating from HEC-RAS model and channel w/ weir (L=165') ***
        * DI   0     104     185     461     527     579     618     674     719
        * DQ   0     104     140     162     189     208     217     224     225
        *
        * *** Revised by PB to reflect final lateral weir goemetry and lateral ***
        * *** weir rating analysis ***
        *
1162    DI       0      96     185     248     324     480     644     712
1163    DQ       0      96     136     148     160     169     199     230
        *
        *
        * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
        * DDM    ***** Inserted *****
        *
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LINE    ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1164    KK     38B
1165    KM   BASIN 38B
1166    KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
        *     KM  L=      1.1  Lca=       .8   S=   37.0  Kn= .063  LAG=  50.8
1167    KM    L=       .5  Lca=       .4   S=   28.0  Kn= .063  LAG=  25.6
1168    KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1169    BA   .0528
1170    LG     .25     .29    4.25     .44   31.00
1171    UI      7.     23.     37.     50.     78.     71.     52.     38.     23.     12.
1172    UI      8.      4.      2.      2.      2.      0.      0.      0.      0.      0.
1173    UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
        *
        *     LG   .25     .29    4.25     .44   31.00
        *     UI   31.     31.     78.    127.    156.    179.    207.    242.    313.
        *     UI  340.    282.    247.    209.    179.    152.    119.     77.     55.
        *     UI   39.     31.     25.     10.     10.     10.     10.     10.     10.
        *     UI    0.
```

```
                *
                * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
                *

1174            KK    C38B
1175            KM   COMBINE FLOWS FROM D31S with SUBBASIN 38B AT C38B
                *
1176            HC       2
                *
                *

1177            KK  202NW1
1178            KM   Off-line Detention Basin estimated for 202L/US60 Traffic Interchange DCR
1179            KM    Upper Basin of Two in Series
1180            RS       1    ELEV  1433.0
                *  *   ***** Triple 48 Inch dia. RCP Outlet Pipes *****
                *  SV     0     0.4     3.1    11.5    12.6    17.7    23.0    28.4    33.8
                *  SE1433.0  1434.0  1435.0 1436.66  1437.0  1438.0  1439.0  1440.0  1441.0
                *  SQ     0       0       0       0     125     246     343     395     438
                *  **** Triple 48 Inch dia. RCP Outlet Pipes and Emergency Spillway ****
                * SV   0     0.4     3.1    11.5    12.6    17.7    23.0   23.70   32.34
                * SE1433  1434.0  1435.0 1436.66  1437.0  1438.0  1439.0 1439.13 1440.73
                * SQ   0       0       0       0     125     246     343     352    1192
                *
                * *** Revised by PB to reflect final basin geomerty and 2-8'X4" RCBC outlet ****
                *
1181            SV       0     0.7     3.5    10.5    12.9    18.1    20.8    23.4    24.5    25.6
1182            SV    26.7    28.9
1183            SE  1433.0  1434.0  1435.0  1436.5  1437.0  1438.0  1438.5 1439.00 1439.20  1439.4
1184            SE  1439.6  1440.0
1185            SQ       0       0       0       0     266     451     502     551     570     595
1186            SQ     615     650
                *
                *
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LINE            ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1187            KK  202NW2
1188            KM   Off-line Detention Basin for 202L/US60 Traffic Interchange 30% Design
1189            KM    Lower Basin of Two in Series
1190            RS       1    ELEV  1430.4
                *  *   ***** Double 48 inch dia. RCP Outlet Pipe *****
                *  SV     0     0.1     1.4     5.2    10.7    16.6    22.7    29.0    35.3
                *  SE1430.4  1431.0  1432.0  1433.0  1434.0  1435.0  1436.0  1437.0  1438.0
                *  SQ     0      12      35      74     109     160     216     250     280
                *   **** Double 48 inch dia. RCP Outlet Pipe and Emergency Spillway ****
                * SV   0     0.1     1.4     5.2    10.7    16.6    22.7   27.42    47.9
                * SE1430.4 1431.0  1432.0  1433.0  1434.0  1435.0  1436.0 1436.75  1440.0
                * SQ   0      12      35      74     109     160     216     246    1265
                *
                * *** Revised by PB to reflect final basin geometry and 2-36" RCP outlet ****
                *
1191            SV       0     0.2     1.9     6.1    12.5    19.8    23.6    27.3    31.2    35.2
1192            SV    39.2
1193            SE  1430.3  1431.0  1432.0  1433.0  1434.0  1435.0  1435.5  1436.0  1436.5  1437.0
1194            SE  1437.5
1195            SQ       0       5      27      61      96     122     186     304     469     683
1196            SQ     946
                *
                * DDM   ***** Updated *****

1197            KK      50
1198            KM   BASIN 50
1199            KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1200            KM    L=       .9  Lca=       .4   S=   81.4  Kn= .037  LAG=  15.8
1201            KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1202            BA     .28
1203            LG     .33     .31    4.00     .49    5.00
1204            UI     97.    306.    543.    575.    342.    149.     71.     21.     18.      0.
1205            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
1206            UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                *
                * DDM   ***** Preserved *****

1207            KK    CAP1
1208            RS       1    FLOW      -1
1209            SV       0   0.091   0.575   3.319  13.256
1210            SE    1566    1568    1570    1572    1574
1211            SQ       5      90     275     470     610
                *

1212            KK  BASIN1
                * KO     1       2
1213            KM        NEW DETENTION BASIN LOCATED DOWNSTREAM FROM CAP1
1214            KM        WITH 24-INCH OUTFALL
1215            RS       1    STOR      -1
1216            SA    0.01    1.94    3.10    3.49    3.94    4.40    4.85
1217            SE      60      61      62      63      64      65      66
1218            SL    60.2    3.14     .62      .5
1219            SS      64      50     2.5     1.5
                *
                *
                * DDM   ***** Preserved *****
```



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

1220            KK   RCAP1
1221            KM   ROUTE CAP OVERCHUTE #1 TO SUBBASIN 18A
1222            RS      11    FLOW      -1
1223            RC     .05    .045     .05    7000     .02
1224            RX     100     200     300     301     303     304     404     505
1225            RY       6       5       2       0       0       2       5       6
```

```
                    *
                    * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
                    *   ** Additional Refinements were made with the University to Southern Segment
                    *
                    * DDM    ***** Updated *****

1226                KK     18C   BASIN
1227                KM   BASIN 18C
                    *
1228                KM    THIS IS THE FUTURE SUBBASIN     WITH LESS AREA DUE TO 202L FREEWAY
                    *
1229                BA   0.386
1230                LG    0.21    0.27    4.10    0.50      31
1231                UI      50     159     265     349     552     522     383     282     184      88
1232                UI      64      37      15      16      15       0       0       0       0       0
1233                UI       0       0       0       0       0       0       0       0       0       0
                    *
                    *   KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                    *   KM  L=      1.0  Lca=       .5   S=   60.6  Kn= .071  LAG=  24.1
                    *     KM  L=      1.2  Lca=       .7   S=   66.1  Kn= .061  LAG=  37.2
                    *
                    * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
                    *
1234                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    *   BA .4172
                    *   LG   .28     .29    4.10     .48   19.00
                    *   UI   58.    207.    326.    450.    691.    528.    384.    266.    127.
                    *   UI   49.     18.     18.     18.      0.      0.      0.      0.      0.
                    *   UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *     BA   .50
                    *     LG   .22     .25    4.00     .57   44.00
                    *     UI   45.     75.    180.    237.    287.    355.    507.    531.    407.
                    *     UI  268.    214.    140.     80.     72.     45.     34.     14.     14.
                    *     UI   14.     14.      0.      0.      0.      0.      0.      0.      0.
                    *     UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    *   KK  D18c
                    *   KM  RETAIN THE 100 YEAR 2 HOUR VOLUME (53% OF BASIN HAS RETENTION)
                    *   DT  D18c      20
                    *   DI     0   10000
                    *   DQ     0   10000
                    *
```



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

1235                KK  RET18C
1236                KM    RETAIN THE 100 YEAR 2 HOUR VOLUME (16% OF BASIN HAS RETENTION)
1237                DT    D18C    5.00
1238                DI       0   10000
1239                DQ       0    1600
                    *
                    * DDM    ***** Preserved *****

1240                KK    C18C
1241                KM    COMBINE FLOWS FROM ROUTED FLOW OF SUBBASIN 50 WITH FLOW FROM 18C
1242                KM    BEFORE CROSSING UNDERNEATH APACHE BLVD AND GOING INTO THE HAWES CHANNEL
1243                HC       2
                    *
                    * DDM    ***** Preserved *****

1244                KK   18T24
1245                KM   REACH HS-6, HS-7, HS-8
1246                KM   ROUTE FLOWS FROM SUBBASIN 18A TO SUBBASIN 24.
1247                RS       1    FLOW      -1
1248                RC    .025    .015    .025    2730  0.0017
1249                RX       0       8      16      26      46      58      65      73
1250                RY     5.0     5.1     5.2       0       0     5.2     5.1     5.0
                    *  THE ABOVE CHANNEL DIMS ARE BASED ON THE NARROWEST DESIGN REACH.
                    *
                    *

1251                KK     18D   BASIN
1252                KM   BASIN 18D
1253                BA   0.044
1254                LG    0.20    0.27    4.00    0.54      34
1255                UI      33     103     128      53      17       5       0       0       0       0
1256                UI       0       0       0       0       0       0       0       0       0       0
                    *   KM  THIS IS THE FUTURE SUBBASIN CREATED BY 202L BISECTING 18C
                    *   KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                    *     KM  L=      1.2  Lca=       .7   S=   66.1  Kn= .061  LAG=  37.2
                    *   KM  L=       .7  Lca=       .4   S=   50.0  Kn= .071  LAG=  29.7
                    *   KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    *   BA .1367
                    *   LG   .28     .29    4.10     .48   19.00
                    *   UI   16.     40.     75.     96.    127.    188.    152.    117.     89.
                    *   UI   33.     25.     16.      8.      5.      5.      5.      0.      0.
                    *   UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *

1257                KK  18DT24
1258                KM   ROUTE FLOWS FROM SUBBASIN 18D TO C24A
1259                RS       2    FLOW      -1
1260                RC    .035    .025    .035    2820  0.0071
1261                RX       0       5      20      36      44      60      75      80
1262                RY     4.4     4.3     4.0       0       0     4.0     4.3     4.4
                    *
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LINE                ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1263                KK     24A   BASIN
1264                KM   BASIN 24A
1265                BA   0.044
```

```
1266   LG    0.11    0.30    4.00    0.52      36
1267   UI      62     179      79      16       0       0       0       0       0       0
1268   UI       0       0       0       0       0       0       0       0       0       0
       *

1269   KK    C24A
1270   KM   COMBINE FLOWS FROM 18D AND 24A
1271   HC       2
       *

1272   KK   24ATB
1273   KM   ROUTE C24A TO C24B VIA CONCRETE CHANNEL
       *   KM VELOCITY = 5FT/S
1274   RS       2    FLOW      -1
       *
1275   RC   0.045   0.022   0.042    2630  0.0095
       *
1276   RX       0     102     103     106     121     124     128     270
1277   RY       7     6.5       6       0       0       3       5       7
       *
       *
       * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
       *   ** Additional Refinements were made with the University to Southern Segment
       *
       * DDM   ***** Updated *****
       * DDM   ***** Inserted *****
       *

1278   KK     24B   BASIN
1279   KM   BASIN 24B
1280   BA   0.258
1281   LG    0.24    0.26    4.00    0.54      31
1282   UI      67     230     353     549     372     232      97      56      16      15
1283   UI       0       0       0       0       0       0       0       0       0       0
1284   UI       0       0       0       0       0       0       0       0       0       0
       *   KK    24
       *   KM BASIN 24
       *   KM  THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
       *     KM  L=        .9  Lca=       .5   S=   43.5  Kn= .047  LAG=  24.6
       *   KM  L=        .9  Lca=       .5   S=   43.5  Kn= .052  LAG=  30.4
       *   KM  PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
       *   BA .4272
       *   BA .4272
       *   LG   .23     .26    4.00     .56   38.00
       *   UI   47.    117.    223.    286.    373.    562.    484.    372.    285.
       *   UI  116.     80.     53.     34.     15.     15.     15.     15.      0.
       *   UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
       *     BA   .29
       *     LG   .23     .26    4.00     .58   38.00
       *     UI   40.    138.    220.    300.    469.    376.    275.    195.    100.
       *     UI   40.     12.     12.     12.      0.      0.      0.      0.      0.
       *     UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
       *
```



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

1285        KK  RET24B
1286        KM    RETAIN THE 100 YEAR 2 HOUR VOLUME (18% OF BASIN HAS RETENTION)
1287        DT    D24B    3.35
1288        DI       0   10000
1289        DQ       0    1800
            *
            * **** Revised by DMJM+HARRIS to reflect Red Mountain Freeway Design Concepts **
            *   ** Additional Refinements were made with the University to Southern Segment
            *

1290        KK    C24B
1291        KM   COMBINE FLOWS FROM C24A AND BASIN 24B
            *   KK   C24
            *   KM COMBINE FLOWS FROM S18C AND S24
            *   ZW   A=HAWES RD @ BROADWAY RD   B=HAWES CHANNEL PROJECT  C=FLOW   F=HYDROGRA
1292        HC       2
            *

1293        KK    C24C
1294        KM   COMBINE FLOWS FROM C24B AND C18C
            *   KK   C24
            *   KM COMBINE FLOWS FROM S18C AND S24
1295        ZW     A=HAWES RD @ BROADWAY RD   B=HAWES CHANNEL PROJECT  C=FLOW   F=HYDROGRAPH
1296        HC       2
            *
            *
            * DDM   ***** Preserved *****

1297        KK  BRDHAW
1298        KM    DIVERT FLOW OF 360 CFS TO THE WEST PER THE CITY OF MESA FUTURE DRAINAGE
1299        KM    SYSTEM
1300        DT  DIVBRD
1301        DI       0     200     400     500     700    1000
1302        DQ       0       0       0       0       0       0
            * DI     0     200     400     500     700    1000
            * DQ     0     200     360     360     360     360
            *

1303        KK  RT31B1
1304        KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
1305        KM   REACH HS-5 plus culvert HSC-4
1306        KM   ROUTE FLOWS FROM HAWES ROAD AND BROADWAY ROAD (C24) TO CORAL BELL AVENUE.
1307        KO                                   21                                  10
1308        ZW   A=FLOW AFTER 360 CFS DIVERT TO WEST B=HAWES CHANNEL PROJECT C=FLOW  F=HYDRO
1309        RS       1    FLOW      -1
1310        RC    .025    .015    .025    1312  0.0015
1311        RX       0       8      15      28      68      81      89      97
1312        RY     6.2     6.4     6.5       0       0     6.5     6.4     6.2
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 LINE      ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 1313      KK  RT31B2
 1314      KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
 1315      KM   REACH HS-4A AND HS4-B plus culvert HSC-3
 1316      KM   ROUTE FLOWS FROM CORAL BELL AVENUE TO EMELITA AVENUE.
 1317      RS       1    FLOW      -1
 1318      RC    .025    .015    .025    2080  0.0018
 1319      RX       0       8    15.9      16      66    66.1      74      82
 1320      RY     5.8     5.9     6.1       0       0     6.1     5.9     5.8
           *

 1321      KK  RT31B3
 1322      KM   THIS ROUTING STEP HAS BEEN BROKEN OUT OF A LARGER SEQUENCE FOR SIMPLICITY
 1323      KM   REACH HS-3
 1324      KM    THIS REACH IS AN EXISTING CHANNEL FOR THE CRESCENT RUN MOBILE HOME PARK.
 1325      KM    The existing channel 5.6 ft deep has no freeboard.  Overbank flows in street
 1326      KM    Routing values per channel design plans,
 1327      KM    Sheet 2 of 19, City of Mesa Project 97-69.
 1328      KM   ROUTE FLOWS FROM EMELITA AVENUE TO SOUTHERN AVENUE (C31) WITHIN SUBBASIN 31B.
 1329      RS       1    FLOW      -1
 1330      RC    .025    .015    .025    1935  0.0033
 1331      RX       0    35.6    41.6      50    66.7    75.1    81.1    92.0
 1332      RY     5.4     4.7     5.6       0       0     5.6     7.6     7.7
           *
           * DDM   ***** Updated *****
           *

 1333      KK     31B
 1334      KM   BASIN  31B
 1335      KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
           *     KM  L=      1.2  Lca=       .5   S=   29.7  Kn= .049  LAG=  30.8
 1336      KM    L=      1.2  Lca=       .5   S=   29.7  Kn= .077  LAG= 23.2
 1337      KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
           *
 1338      BA     .44
           * LG .31     0.32    4.45    0.35      11
           * UI  31       31      88     132     162     184     218     263     356     375
           * UI 302      254     217     187     152     124      77      54      51      36
           * UI  31       19      10       9       9      10       9      10       0       0
           * UI   0        0       0       0       0       0       0       0       0       0
           *
           * *** Revised by PB to reflect future conditions land use ***
           *
 1339      LG    0.24    0.25    4.45    0.46      37
 1340      UI      52     125     240     309     399     601     544     416     321     243
 1341      UI     141      88      63      44      16      16      16      16       0       0
 1342      UI       0       0       0       0       0       0       0       0       0       0
 1343      UI       0       0       0       0       0       0       0       0       0       0
           *
           *   BA  .720
           *   LG   .31     .32    4.45     .35   11.00
           *   UI  104.    391.    602.    859.   1236.    884.    629.    407.    187.
           *   UI   59.     32.     32.      0.      0.      0.      0.      0.      0.
           *   UI    0.      0.      0.      0.      0.      0.      0.      0.      0.
           *
           *     BA    .47
           *     LG    .24     .25    4.45     .46   37.00
           *     UI    52.    125.    240.    309.    399.    601.    544.    416.    321.
           *     UI   141.     88.     63.     44.     16.     16.     16.     16.      0.
           *     UI     0.      0.      0.      0.      0.      0.      0.      0.      0.
           *
```



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

 1344      KK   D31BS
 1345      KM    RETAIN 100 YEAR 2 HOUR, (66% FOR FUTURE DEVELOPMENT)
 1346      DT   D31BS      23
 1347      DI       0   10000
 1348      DQ       0   10000
           *
           * DDM   ***** Preserved *****
           *
           *
           * ***** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
           *

 1349      KK   C31B
 1350      KM   COMBINE FLOWS FROM C24 AND 31B
 1351      ZW   A=FLOW SOUTHERN AND HAWES BEFORE SPLIT BOX B=HAWES CHANNEL PROJ C=FLOW F=HYDR
 1352      HC       2
           *
           *
           * DDM   ***** Preserved *****
           *      KK  D31W
           *

 1353      KK     D31S
           *
 1354      KM     THIS DIVERT RECORD IS FOR THE BOX CULVERT SYSTEM AT SOUTHERN AVE AND HAWES
 1355      KM     IT IS BASED UPON A HEC-RAS ANALYSIS OF THE FOLLOWING STRUCTURES:
 1356      KM     3-8'X4' CBC SOUTH,  2-10'X6' CBC TO THE WEST
 1357      KM     THE CULVERT TO THE SOUTH HAS THE TWO THAT ARE THERE NOW WITH AN ADDITIONAL
 1358      KM     ONE CONSTRUCTED
           * KO   1
 1359      DT     D31W
           *
           * **** Revised by DMJM to reflect Red Mountain Freeway Design Concepts *****
           *
           *   *  THESE NEW CARDS BASED UPON HEC-RAS ANALYSIS
```

```
*   DI     0     144     182     252     380     454     544     671     758
*   DI   976    1098    1184    1280    1412    1544    1646    1738    1830
*   DQ     0       0       0     220     316     358     400     460     520
*   DQ   640     690     740     800     860     920     980    1030    1080
*
*  THESE CARDS BASED UPON HEC-RAS ANALYSIS *** As Intended ***
*
*  DI     0     144     182     252     380     454     544     671     758
*  DI   976    1098    1184    1280    1412    1544    1646    1738    1830
*  DQ     0     144     182     220     316     358     400     460     520
*  DQ   640     690     740     800     860     920     980    1030    1080
*
*  ** Revised to help allow proper function of NW Detention Basins (Off-line Typ
*  *** Simulating 75% blockage of the Southern Avenue culverts ***
*
* DI   0      62     111     230     309     403     504     611     727     847
* DI 971    1098    1223    1346
* DQ   0      62     111     214     283     362     445     533     629     729
* DQ 834     941    1049    1155
*
* *** Revised by PB to simulate blockage of 2 barrels leaving 1 barrel open ***
* *** of the Southern Avenue Culverts                                        ***
*
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1360          DI       0      62     111     229     306     401     521     636     759     887
1361          DI    1019    1150    1281
1362          DQ       0      62     111     214     283     362     445     533     629     730
1363          DQ     835     941    1049
              *
              *

1364          KK  31T381  ROUTED IN TWO STEPS DUE TO CHANNEL DISSIMILARITY.
1365          KM   REACH HS-2 plus culvert HSC-2
1366          KM     ROUTE FLOWS FROM SOUTHERN AVENUE (C31) IN THE HAWES CHANNEL.
1367          KM   REACH HS-2 IS A PROPOSED CHANNEL SOON-TO-BE-CONSTRUCTED.  IT IS 4.5 FEET
1368          KM     DEEP, WITH FREEBOARD. CHANNEL CROSS-SECTION FROM DESIGN PLANS FOR
1369          KM     SOUTHERN AVENUE DRAINAGE IMPROVEMENTS.  SHEET 28 OF 43
1370          KM     CITY OF MESA PROJECT NO. 97-56.1 DESIGN PLANS BY ENTELLUS
1371          KM     DATED 8/8/97 REV. 12/19/97
              * KO   1
1372          RS       1    FLOW      -1
1373          RC   0.025   0.015   0.025    1248   .0022
1374          RX       0      32      37      46      56      65      73      75
1375          RY       5     7.0     4.5       0       0     4.5     9.0     9.5
              *
              *
              * **** Revised by DMJM+HARRIS at request of City of Mesa *****
              *
              *

1376          KK   RHAWS
1377          KM   RETRIEVE DIVERTED HYDROGRAPH FROM CHANNEL ALONG SOUTHERN AVE.
1378          DR   DHAWS
              *
              *

1379          KK  RTHAWS
1380          KM   ROUTE FLOWS FROM SOUTHERN AVENUE TO HAWES CHANNEL.
1381          RS       1    FLOW      -1
1382          RC    .025    .015    .025     513  0.0010
1383          RX       0       4      16      28      38      50      62      66
1384          RY     7.3     6.3     6.0       0       0     6.0     6.3     7.3
              *
              *

1385          KK   C31S
1386          KM   COMBINE FLOWS FROM D31S AND RHAWS
              * KO   1
1387          HC       2
              *

1388          KK  31T382
1389          KM   REACH HS-1 plus culvert HSC-1
1390          KM   ROUTE FLOWS TO SUPERSTITION FREEWAY (C38)
1391          KM   IN THE HAWES CHANNEL.
1392          RS       1    FLOW      -1
1393          RC   0.025   0.015   0.025     810   .0017
1394          RX       0      10      16      26      51      61      77      81
1395          RY     5.3     4.8     4.9       0       0     4.9     4.6     3.6
              *
              *    * DDM   ***** Preserved *****
              *    KK31AT38
              *    KM ROUTE S31A TO 38
              *    RS     6    FLOW      -1
              *    RC   .04     .03     .04    3500    .012
              *    RX   100     200     300     302     307     309     409     509
              *    RY     4       3       2       0       0       2       3       4
              *
              *
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LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

1396          KK   C38C1
1397          KM   COMBINE FLOWS FROM HAWES CHANNEL WITH NW DETENTION BASINS FLOW
1398          HC       2
              *
              *

1399          KK    C38C
1400          KM   COMBINE FLOWS FROM R202NE with R202NW AT C38
1401          HC       2
```

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                    *
                    * DDM   ***** Preserved *****

1402                KK   38T39
1403                KM   ROUTE FLOWS FROM C38C TO C39 VIA CONCRETE CHANNEL
1404                RS    1.32    FLOW     -1
1405                RC   0.035   0.012   0.035    3960  0.0066
1406                RX       0     500    1000    1012    1020    1032    1532    2032
1407                RY      13    12.5      12       0      12    12.5      13
                    *     * ADOT DETENTION BASINS FROM URS REPORT SEPT 1988
                    *     * DDM   ***** Preserved *****
                    *     KK ADD10
                    *     KM  BASIN #10 - OFF-LINE DETENTION POND TO ATTENUATE PEAK FLOWS
                    *     KM   BUT DO NOT DELAY THE PEAK
                    *     DT  DB10
                    *     DI   807     879     961    1070    1190    1320
                    *     DQ     0      29      61     120     190     270
                    *     * DDM   ***** Preserved *****
                    *     KK  ADD9
                    *     KM BASIN #9 - OFF-LINE DETENTION POND
                    *     DT   DB9
                    *     DI   626     660     751     861     987    1128
                    *     DQ     0      10      51     110     189     278
                    *     * DDM   ***** Preserved *****
                    *     KK  ADD8
                    *     KM BASIN #8 - OFF-LINE DETENTION POND
                    *     DT   DB8
                    *      * ORIGINAL DESIGN PER URS FINAL DRAINAGE REPORT
                    *     *     DI   464     521     627     752     898
                    *     DI   464     521     627     752     898          1059    1236
                    *     *     DQ     0      21      77     152     248
                    *     DQ     0      21      77     152     248     359           486
                    *
                    *  ***** Per Original Design and URS Final Drainage Report *****
                    *  ***** These Detention Basins occurred West of Sossaman Channel *****
                    *
                    *     * DDM   ***** Preserved *****
                    *     KK  ADD7
                    *     KM BASIN #7 - OFF-LINE DETENTION POND
                    *     DT   DB7
                    *     DI   770     810     892     988    1093    1207    1331    1462
                    *     DQ     0      10      42      88     143     207     281     362
                    *     * DDM   ***** Preserved *****
                    *     KK  ADD6
                    *     KM BASIN #6 - OFF-LINE DETENTION POND
                    *     DT   DB6
                    *     DI   685     703     781     875     978    1092    1215
                    *     DQ     0       3      31      75     128     192     265
                    *     * DDM   ***** Preserved *****
                    *     KK  ADD5
                    *     KM BASIN #5 - OFF-LINE DETENTION POND
                    *     DT   DB5
                    *     DI  1005    1063    1141    1227    1320    1421    1527
                    *     DQ     0      13      41      77     120     171     227
                    *
                    *
                    * ******************************************************************************
                    * End of Revisions by DMJM to reflect Red Mountain Freeway Design Concepts
                    * ******************************************************************************
                    *
                    *
```



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

1408                KK    R31W
1409                KM   RETURN DIVERTED FLOW AT CORNER OF SOUTHERN AND HAWES
1410                DR    D31W
                    *
                    * DDM   ***** Preserved *****

1411                KK  31WT32
1412                KM   ROUTE FLOWS FROM D31A TO C32
1413                RS    1.76    FLOW     -1
1414                RC    .035    .022    .035    5280   .0027
1415                RX       0    2005    2012    2012    2106    2106    2113    3122
1416                RY     4.5     4.5     3.5       0       0     3.5     4.5     4.5
                    *
                    * DDM   ***** Updated *****

1417                KK      32
1418                KM   BASIN 32
1419                KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1420                KM    L=      .9  Lca=      .5   S=    38.9  Kn= .055  LAG=  29.1
1421                KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1422                BA     .38
1423                LG     .23     .25    4.55     .44   27.00
1424                UI     43.    115.    212.    273.    368.    529.    407.    314.    237.    161.
1425                UI     81.     62.     43.     14.     13.     13.     13.      0.      0.      0.
1426                UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
                    *
                    * KK   D32
                    * KM  RETAIN 100 YEAR 2 HOUR, (FULLY DEVELOPED - NO RETENTION)
                    * DT   D32       0
                    * DI     0   10000
                    * DQ     0   10000
                    *
                    * DDM   ***** Preserved *****

1427                KK     C32
1428                KM    COMBINE SOSSAMAN CHANNEL FLOWS WITH FLOWS FROM 32
1429                HC       2
                    *
                    * DDM   ***** Preserved *****
```

```
1430          KK   32T39
1431          KM   ROUTE FLOWS FROM C32 TO C39
1432          RS    0.88    FLOW      -1
1433          RC   0.012   0.012   0.012    2640   0.004
1434          RX       0       5      10      28      38      60      65      70
1435          RY      14      14      14       0       0      14      14      14
              * DDM   ***** Updated *****

1436          KK      39
1437          KM   BASIN 39
1438          KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
1439          KM    L=       .9  Lca=       .7   S=   38.0  Kn= .060  LAG=  32.4
1440          KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
1441          BA     .36
```



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

1442          LG     .22     .25    4.60     .41   44.00
1443          UI      37      81     165     213     269     383     437     325     258     200
1444          UI     142      76      61      37      24      11      11      11      11       0
1445          UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
              *

1446          KK     D39
1447          KM    RETAIN 100 YEAR 2 HOUR, (13% FOR FUTURE DEVELOPMENT)
1448          DT     D39       4
1449          DI       0   10000
1450          DQ       0   10000
              *
              * DDM   ***** Preserved *****

1451          KK    C39A
1452          KM   COMBINE FLOWS FROM C32, C38 AND S39 AT C39
1453          HC       2
              *
              * DDM   ***** Preserved *****

1454          KK    C39B
1455          KM   COMBINE FLOWS FROM C39A AND ADOT BASINS
1456          HC       2
              *
              * DDM   ***** Preserved *****

1457          KK    SOSS
1458          KM   THIS WAS FORMERLY CALLED CHANNEL
1459          KM   DIVERT FLOWS IN EXCESS OF 1800 CFS TO SOSSAMAN DET. BASIN
1460          KM   IN REALITY, BACKWATER FROM THE ADOT CROSSING DETERMINES THE AMOUNT OF SPILL
1461          KM   SUPERSTITION FREEWAY
1462          ZW    A=SOSSAMAN DRAIN  B=AT SUPERSTITION C=FLOW E=5MIN F=100YR
1463          DT   BASIN
1464          DI       0    1800    2000   10000
1465          DQ       0       0     200    8200
1466          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

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

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

 150          42
              V
              V
 162       42T51
              .
              .
 167          .          51
              .           .
              .           .
 178        C51............
              V
              V
 181       51T53
              .
              .
 187          .         44A
              .           .
              .           .
 201          .           .-------->    D44A
 199          .      DIV44A
              .           .
              .           .
 204          .           .          43
              .           .           .
              .           .           .
 215          .         C43............
              .           V
              .           V
 218          .       43T53
              .           .
              .           .
 223          .           .          53
              .           .           .
              .           .           .
 233        C53........................
              .
              .
 236          .          54
              .           .
              .           .
 247        C54............
              .
              .
 253          .-------->   SOUTH
 250      DCAP12
```

```
                V
                V
256        CAP12
                .
263             .<-------    D44A
261             .      DR44A
                .          V
                .          V
264             .      44ATB
                .          .
271             .          .         44B
                .          .           .
281             .       C44B............
                .          V
                .          V
284             .     CAP10+
                .          V
                .          V
291             .     RCAP11
                .          .
294          C12............
                V
                V
297       ADOT-W
                V
                V
308       RADOTW
                .
314             .        36B
                .          .
323        C36B............
                .
329             .<-------   SOUTH
327             .     RSOUTH
                .          .
330             .          .          57
                .          .           .
339             .        C57............
                .          V
                .          V
342             .     CAP13+
                .          .
349             .          .         36A
                .          .           .
358             .       C36A............
                .          V
                .          V
361             .     ADOT-E
                .          .
373       CFAKE............
                .
377             .         52
                .          .
387             .          .          56
                .          .           .
397             .        C56............
                .          V
                .          V
402             .      56T58
                .          .
407             .          .          58
                .          .           .
417             .        C58............
                .          .
425             .          .         46B
                .          .           .
439             .          .           .-------->     D46
437             .          .       D46B
                .          .          V
                .          .          V
442             .          .       CAP6
                .          .          V
                .          .          V
447             .          .     RCAP6B
                .          .           .
456             .          .           .         29A
                .          .           .           .
470             .          .           .           .-------->    D29A
468             .          .           .       D29A
                .          .           .           .
473             .          .       C29A............
                .          .           .
475             .          .           .         45A
```

```
490                                  .------->    D29A
488                            D45A
                                 .
496                                  .------->   45ATB
493                            D45A
                                 .
499                                        55B
                                 .           .
514                                          .------->    D55B
512                                      D55B
                                 .           .
517                            C55B............
                                 V
                                 V
520                            CAP7
                                 .
528                                          .<-------   45ATB
526                                    RD45A
                                         V
                                         V
529                                    45ATB
                                 .           .
536                                          .         45B
                                 .           .          .
549                                          .          .------->    D45B
547                                          .       D45B
                                 .           .          .
552                                      C45B............
                                 .           V
                                 .           V
555                                      CAP8
                                 .           .
561                            C7+8...........
                                 V
                                 V
565                           RCAP78
                                 .
573                                        29B
                                 .           .
586                                          .------->    D29B
584                                      D29B
                                 .           .
589                            C29B1..........
                                 .
592                       C29B2...........
                             V
                             V
595                       TRANS
                             .
603                            29C
                                 .
616                                  .------->     D29
614                            D29C
                                 .
619                       C29C2...........
                             V
                             V
622                       29CTD1
                             .
630                            55
                                 .
642                                  .------->     D55
640                            D55
                                 V
                                 V
645                           CAP9
                                 V
                                 V
650                           RCAP9
                                 .
660                                        29D
                                 .           .
673                                          .------->    D29D
671                                      D29D
                                 .           .
680                                          .------->   D29DE
676                                      D29D2
                                 .           .
683                       C29C3......................
                             V
                             V
686                       BASIN5
```

```
                                  V
                                  V
693                            RBAS5
                                  .
704                               .<-------   D29DE
701                               .      G29DE
                                  .        V
                                  .        V
705                               .      29T36
                                  .        .
713                               .        .        36C
                                  .        .         .
724                               .        .         .-------->   D36C
722                               .        .       D36C
                                  .        .         .
727                            C36.........................
                                  V
                                  V
730                            36T37
                                  .
736                               .       30b
                                  .        V
                                  .        V
747                               .     30bT3
                                  .        .
753                               .        .          37
                                  .        .           .
762                            C37.........................
                                  V
                                  V
765                            ADOTEL
                                  V
                                  V
776                            37T38A
                                  .
782                               .       38A
                                  .        .
794                               .        .        202D
                                  .        .           .
821                            C38A.........................
                                  V
                                  V
824                            202NE1
                                  V
                                  V
831                            202NE2
                                  .
838                               .       17A
                                  .        .
848                               .        .          49
                                  .        .           V
                                  .        .           V
858                               .        .        CAP2
                                  .        .           V
                                  .        .           V
863                               .        .      BASIN2
                                  .        .           V
                                  .        .           V
871                               .        .      RCAP2A
                                  .        .           V
                                  .        .           V
874                               .        .       RCAP2
                                  .        .           .
880                               .       C17A.........
                                  .        .
883                               .        .          48
                                  .        .           V
                                  .        .           V
893                               .        .        CAP3
                                  .        .           V
                                  .        .           V
898                               .        .      BASIN3
                                  .        .           V
                                  .        .           V
906                               .        .      RCAP3A
                                  .        .           V
                                  .        .           V
912                               .        .      RCAP3B
                                  .        .           .
918                               .        .           .         17B
                                  .        .           .          .
928                               .        .       C17B.........
                                  .        .           .
931                               .       C17C.........
                                  .        V
                                  .        V
934                               .     17CT23
                                  .        .
```

```
940                                  18F
                                      V
                                      V
947                               R18FTE
                                      .
                                      .
953                                   .          18E
                                      .           .
                                      .           .-------->   D18E
962                                   .
960                                   .      RET18E
                                      .           .
                                      .           .
965                                   .     C18E............
                                      .        V
                                      .        V
968                               18ET23       .
                                      .        .
974                           C23A............
                                 V
                                 V
977                           R23ATB
                                 .
                                 .
983                                 .        23
                                    .         .
                                    .         .-------->   D23
992                                 .
990                                 .     RET23
                                    .         .
                                    .         .
995                           C23B............
                                 .
                                 .
998                                 .        47
                                    .         V
                                    .         V
1009                                .     BASIN4
                                    .         V
                                    .         V
1019                                .      RCAP4
                                    .         .
                                    .         .
1025                                .         .          22
                                    .         .           .
                                    .         .           .
1035                                .     C22A............
                                    .         V
                                    .         V
1038                                .     22AT23
                                    .         .
                                    .         .
1045                          C23C............
                                 V
                                 V
1048                          RC23
                                 .
                                 .
1054                                .        30a
                                    .         V
                                    .         V
1065                                .     30at31
                                    .         .
                                    .         .
1075                          C31A1............
                                 .
                                 .
1078                                .        31A
                                    .         .
                                    .         .
1088                                .         .         202C
                                    .         .           .
                                    .         .           .
1100                          C31A2........................
                                 V
                                 V
1103                          R202S
                                 .
                                 .
1114                                .      202A
                                    .         V
                                    .         V
1127                                .     R202A
                                    .         .
                                    .         .
1130                                .         .         202B
                                    .         .           .
                                    .         .           .
1143                                .     C202B............
                                    .         V
                                    .         V
1146                                .     R202B
                                    .         .
                                    .         .
1149                          C202C............
                                 V
                                 V
1152                          RT202C
                                 .
                                 .-------->   DHAWS
1161
1158                          DSPILL
                                 .
                                 .
1164                                .        38B
```

```
1174   C38B............
       V
       V
1177   202NW1
       V
       V
1187   202NW2

1197   50
       V
       V
1207   CAP1
       V
       V
1212   BASIN1
       V
       V
1220   RCAP1

1226                   18C
                        .
                        .-------->   D18C
1237           RET18C
1235                    .
                        .
1240   C18C............
       V
       V
1244   18T24

1251                   18D
                        V
                        V
1257           18DT24
                        .
                        .          24A
1263                    .           .
                        .           .
1269                   C24A............
                        V
                        V
1272           24ATB
                        .
                        .          24B
1278                    .           .
                        .           .
                        .-------->   D24B
1287           RET24B
1285                    .           .
                        .           .
1290                   C24B............
                        .
                        .
1293   C24C............
       .
       .-------->  DIVBRD
1300
1297   BRDHAW
       V
       V
1303   RT31B1
       V
       V
1313   RT31B2
       V
       V
1321   RT31B3

1333                   31B
                        .
                        .-------->   D31BS
1346           D31BS
1344                    .
                        .
1349   C31B ............
       .
       .-------->   D31W
1359
1353   D31S
       V
       V
1364   31T381

1378                    .<--------   DHAWS
1376           RHAWS
                        V
                        V
1379           RTHAWS
                        .
                        .
1385   C31S ............
       V
       V
1388   31T382
```

```
                                                  .
                                                  .
1396                                      C38C1............
                                                  .
                                                  .
1399                                 C38C............
                                        V
                                        V
1402                                 38T39
                                        .
                                        .
1410                                        .<-------    D31W
1408                                     R31W
                                            V
                                            V
1411                                     31WT32
                                            .
                                            .
1417                                            .          32
                                            .              .
                                            .              .
1427                                         C32............
                                            V
                                            V
1430                                     32T39
                                            .
                                            .
1436                                            .          39
                                            .              .
                                            .              .
1448                                            .          .------->     D39
1446                                            .         D39
                                            .              .
                                            .              .
1451                                         C39A............
                                            .
                                            .
1454                                 C39B............
                                            .
                                            .
1463                                        .------->   BASIN
1457                                 SOSS
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN   1998               *
*            VERSION 4.1                *
*                                       *
* RUN DATE   23APR04  TIME  17:29:48    *
*                                       *
*****************************************
```

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

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

MODEL NAME: NE200250.DAT Revised by PARSONS BRINCKERHOFF - April 2004

This model includes the following revisions to DMJM+HARRIS model NE202USR.DAT dated December 2003.

1. The storage volumes for the NE-1, NE-2, NW-1, NW-2 and Southern Avenue detention basins have been updated per the final basin geometry.
2. The discharge rates for detention basins NW-1 and NW-2 have been revised to reflect the revisions to the outlet structures and emergency spillways.
3. The diversion at the box culvert system at Southern Avenue and Hawes Road was revised to simulate blockage of 2 barrels of the existing 3 barrel box culvert under Southern.
4. The diversion at the lateral weir in the Southern Avenue Channel was revised to reflect the final weir geometry and rating analysis.
5. The data for Subbasin 31B was revised to reflect future conditions land use.

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

MODEL NAME: Ne2002us.DAT Revised by DMJM+HARRIS - August 2003

This model includes various revisions to incorporate the Red Mountain Freeway in association with the University Drive to Southern Avenue.

CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:

1. In order to reflect the proposed 202 Freeway Loopand to facilitate design, drainage basins 18D, 18C and 24 were further subdivided. Additional concentration points were added to provide discharges at more locations.
2. Drainage basin areas for 50 and 202A were modified to reflect design refinements to the Power to University segment of the Red Mountain Freeway

****
****

MODEL NAME: Ne200235.DAT Revised by DMJM+HARRIS - July 2002

This model includes various revisions to incorporate the Red Mountain Freeway in association with the 202L/US60 Traffic Interchange Design Concept Report.

CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:

1. In order to reflect the proposed 202 Freeway Loop, basin areas for 18C, 23, 24, 31A and 31B were revised. Drainage basins 18D, 202A, 202B, and 202D were added. Basin 38 was split into 38A and 38B due to the 202 Loop
2. Several concentration points have been added and basins have been routed to reflect the proposed Red Mountain Freeway alignment.
3. Existing detention basins (ADOT) have been removed and new detention basins are proposed as part of the freeway construction.
4. Modifications were made to the previous (Ne20030) model per the City of Mesa to remove the connection of the Southern Ave. Channel from the structure at Hawes Rd. and instead connect to the Hawes Channel south of the intersection.

****
****
.** Previous ** MODEL NAME: NE2002.DAT

THIS MODEL COVERS THE AREA EAST OF HAWES ROAD AND THE SOSSAMAN CHANNEL
MAJOR CHANGES TO THIS MODEL INCLUDE THE FOLLOWING:

1. OLD SUBBASIN 18A HAS BEEN SPLIT INTO TWO SUBBASINS. SUBBASIN 18C REMAINS IN THIS MODEL AS PART OF THE HAWES CHANNEL INFRASTRUCTURE
2. OLD SUBBASIN 30 HAS BEEN SPLIT INTO SUBBASIN 30A AND SUBBASIN 30B. SUBBASIN 30 GETS INTERCEPTED BY A CHANNEL ON THE NORTH SIDE OF CORALBELL AND GETS ROUTED TO SUBBASIN 31A. SUBBASIN 30B STILL GOES SOUTH ALONG ELLSWORTH ROAD
3. FOR THE 2002 YEAR CONDITION, ALL CAP DETENTION BASINS HAVE BEEN PLACED IN THE MODEL. THEIR OUTLET CHANNELS HAVE FOR THE MOST PART NOT BEEN INCLUDED IN THIS MODEL. THE OUTLET CHANNELS WILL BE IN THE FUTURE MODEL

****

SOUTHEAST MESA AREA DRAINAGE MASTER PLAN
AREA NORTH OF SUPERSTITION FREEWAY

REVISED BY VALERIE SWICK, OCTOBER-NOVEMBER 1996
TO INCORPORATE THE SUPERSITION STRUCTURES AND COMBINE MODELS

FILENAME: MESANE.DAT

THIS MODEL REPRESENTS THE EXISTING CONDITION OF THE WATERSHED.
TOTAL DRAINAGE AREA IS APPROXIMATELY 17 SQ. MI.

100-YEAR 24-HOUR FREQUENCY

METHODOLOGY
THE US CORPS OF ENGINEERS FLOOD HYDROLOGY MODEL HEC-1 DATED SEP1990 VER 4.0
SCS TYPE II RAINFALL DISTRIBUTION
S-GRAPH HYDROGRAPH
GREEN AND AMPT INFILTRATION EQUATION USED FOR CALCULATING LOSSES
NORMAL DEPTH STORAGE CHANNEL ROUTING
APPROXIMATE DIRECTION, LOCATION, AND LENGTH OF THE WASHES HAVE BEEN
EVALUATED BASED ON FIELD INVESTIGATION, USGS MAPS, LANDIS AERIAL SURVEYS
DATED 1994
THE NOAA TECHNICAL MEMORANDUM NOAA ATLAS 2 DEPTH AREA RATIOS

INITIAL STUDY PERFORMED BY LISA C. YOUNG
REVIEWED BY VALERIE A. SWICK
HYDROLOGY BRANCH ENGINEERING DIVISION, FLOOD CONTROL
DISTRICT OF MARICOPA COUNTY, DECEMBER - JULY 1995.

ASSUMED VELOCITY OF 1 FT/SEC FOR SHEET FLOW, 2 FT/SEC FOR WASH/NATURAL
CHANNEL, 3 FT/SEC FOR ROAD AND GRASS CHANNEL, 10FT/SEC FOR CONCRETE CHANNEL

LAST UPDATED ON 3/13/98

UPDATE WAS BASED UPON NEW MAG LAND USE DEFINITIONS FOR SINGLE FAMILY HOUSING

DDM MCUHP2 MESA AREA DRAINAGE MASTER PLAN

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

    IT          HYDROGRAPH TIME DATA
                       NMIN          5  MINUTES IN COMPUTATION INTERVAL
                      IDATE     1APR97  STARTING DATE
                      ITIME       0000  STARTING TIME
                         NQ       1000  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE     4APR97  ENDING DATE
                     NDTIME       1115  ENDING TIME
                      ICENT         19  CENTURY MARK

                 COMPUTATION INTERVAL     .08 HOURS
                      TOTAL TIME BASE   83.25 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

131 JD          INDEX STORM NO. 1
```

STRM 3.60 PRECIPITATION DEPTH
TRDA .01 TRANSPOSITION DRAINAGE AREA

132 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

142 JD INDEX STORM NO. 2
STRM 3.58 PRECIPITATION DEPTH
TRDA 1.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

143 JD INDEX STORM NO. 3
STRM 3.49 PRECIPITATION DEPTH
TRDA 5.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

144 JD INDEX STORM NO. 4
STRM 3.38 PRECIPITATION DEPTH

TRDA 10.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

145 JD INDEX STORM NO. 5
STRM 3.24 PRECIPITATION DEPTH
TRDA 30.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

146 JD INDEX STORM NO. 6
STRM 3.10 PRECIPITATION DEPTH
TRDA 60.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

147 JD INDEX STORM NO. 7
STRM 3.05 PRECIPITATION DEPTH
TRDA 90.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

148 JD INDEX STORM NO. 8
STRM 3.00 PRECIPITATION DEPTH
TRDA 120.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

149 JD INDEX STORM NO. 9
STRM 2.97 PRECIPITATION DEPTH
TRDA 150.00 TRANSPOSITION DRAINAGE AREA

0 PI PRECIPITATION PATTERN

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
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.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

WARNING --- ROUTED OUTFLOW (1120.) IS GREATER THAN MAXIMUM OUTFLOW (1098.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (1159.) IS GREATER THAN MAXIMUM OUTFLOW (1098.) IN STORAGE-OUTFLOW TABLE

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WARNING --- ROUTED OUTFLOW (   1192.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1215.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1230.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1235.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1233.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1223.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1207.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1185.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1155.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1115.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1113.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1152.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1184.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1207.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1222.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1227.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1225.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1216.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1200.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1177.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1148.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1108.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1117.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1148.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1171.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1185.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1191.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1189.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1180.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1165.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1143.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1114.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1104.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1126.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1140.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1146.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1145.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1137.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1122.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
WARNING --- ROUTED OUTFLOW (   1101.) IS GREATER THAN MAXIMUM OUTFLOW (   1098.) IN STORAGE-OUTFLOW TABLE
   -----DSS---ZOPEN:  Existing File Opened,  File: NE200250.DSS
                      Unit:  71;  DSS Version: 6-JG
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT WEST BASIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT WEST BASIN/AT SUPERSTITION/FLOW/01APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT WEST BASIN/AT SUPERSTITION/FLOW/02APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT WEST BASIN/AT SUPERSTITION/FLOW/03APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT WEST BASIN/AT SUPERSTITION/FLOW/04APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT EAST BASIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT EAST BASIN/AT SUPERSTITION/FLOW/01APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT EAST BASIN/AT SUPERSTITION/FLOW/02APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT EAST BASIN/AT SUPERSTITION/FLOW/03APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /ADOT EAST BASIN/AT SUPERSTITION/FLOW/04APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /CONCENTRATION POINT C58/FLOW TO OVERCHUTES/FLOW/31MAR1997/5MIN/OBSERVED/
-----DSS---ZWRITE Unit  71; Vers.   17:  /CONCENTRATION POINT C58/FLOW TO OVERCHUTES/FLOW/01APR1997/5MIN/OBSERVED/
-----DSS---ZWRITE Unit  71; Vers.   17:  /CONCENTRATION POINT C58/FLOW TO OVERCHUTES/FLOW/02APR1997/5MIN/OBSERVED/
-----DSS---ZWRITE Unit  71; Vers.   17:  /CONCENTRATION POINT C58/FLOW TO OVERCHUTES/FLOW/03APR1997/5MIN/OBSERVED/
-----DSS---ZWRITE Unit  71; Vers.   17:  /CONCENTRATION POINT C58/FLOW TO OVERCHUTES/FLOW/04APR1997/5MIN/OBSERVED/
        WARNING EXCESS AT PONDING LESS THAN ZERO FOR PERIOD. EXCESS SET TO ZERO

        *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

        *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT
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WARNING --- ROUTED OUTFLOW (    761.) IS GREATER THAN MAXIMUM OUTFLOW (    761.) IN STORAGE-OUTFLOW TABLE

WARNING --- ROUTED OUTFLOW (    761.) IS GREATER THAN MAXIMUM OUTFLOW (    761.) IN STORAGE-OUTFLOW TABLE
-----DSS---ZWRITE Unit  71; Vers.   17:  /HAWES RD @ BROADWAY RD/HAWES CHANNEL PROJECT/FLOW/31MAR1997/5MIN/HYDROGRAPH/
-----DSS---ZWRITE Unit  71; Vers.   17:  /HAWES RD @ BROADWAY RD/HAWES CHANNEL PROJECT/FLOW/01APR1997/5MIN/HYDROGRAPH/
-----DSS---ZWRITE Unit  71; Vers.   17:  /HAWES RD @ BROADWAY RD/HAWES CHANNEL PROJECT/FLOW/02APR1997/5MIN/HYDROGRAPH/
-----DSS---ZWRITE Unit  71; Vers.   17:  /HAWES RD @ BROADWAY RD/HAWES CHANNEL PROJECT/FLOW/03APR1997/5MIN/HYDROGRAPH/
-----DSS---ZWRITE Unit  71; Vers.   17:  /HAWES RD @ BROADWAY RD/HAWES CHANNEL PROJECT/FLOW/04APR1997/5MIN/HYDROGRAPH/


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            *            *
1303 KK     *    RT31B1  *
            *            *
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1307 KO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE
                       IPNCH           0  PUNCH COMPUTED HYDROGRAPH
                        IOUT          21  SAVE HYDROGRAPH ON THIS UNIT
                       ISAV1           1  FIRST ORDINATE PUNCHED OR SAVED
                       ISAV2        1000  LAST ORDINATE PUNCHED OR SAVED
                      TIMINT       1.000  TIME INTERVAL IN HOURS

-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW AFTER 360 CFS DIVERT TO WES/HAWES CHANNEL PROJECT/FLOW/31MAR1997/5MIN/HYD/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW AFTER 360 CFS DIVERT TO WES/HAWES CHANNEL PROJECT/FLOW/01APR1997/5MIN/HYD/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW AFTER 360 CFS DIVERT TO WES/HAWES CHANNEL PROJECT/FLOW/02APR1997/5MIN/HYD/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW AFTER 360 CFS DIVERT TO WES/HAWES CHANNEL PROJECT/FLOW/03APR1997/5MIN/HYD/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW AFTER 360 CFS DIVERT TO WES/HAWES CHANNEL PROJECT/FLOW/04APR1997/5MIN/HYD/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW SOUTHERN AND HAWES BEFORE S/HAWES CHANNEL PROJ/FLOW/31MAR1997/5MIN/HYDR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW SOUTHERN AND HAWES BEFORE S/HAWES CHANNEL PROJ/FLOW/01APR1997/5MIN/HYDR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW SOUTHERN AND HAWES BEFORE S/HAWES CHANNEL PROJ/FLOW/02APR1997/5MIN/HYDR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW SOUTHERN AND HAWES BEFORE S/HAWES CHANNEL PROJ/FLOW/03APR1997/5MIN/HYDR/
-----DSS---ZWRITE Unit  71; Vers.   17:  /FLOW SOUTHERN AND HAWES BEFORE S/HAWES CHANNEL PROJ/FLOW/04APR1997/5MIN/HYDR/
-----DSS---ZWRITE Unit  71; Vers.   33:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   33:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   33:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   33:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   33:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.  113:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  113:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  113:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  113:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  113:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  114:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  114:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  114:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  114:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  114:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  115:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  115:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  115:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  115:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  115:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  116:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  116:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  116:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  116:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  116:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  117:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  117:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  117:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  117:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  117:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  118:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  118:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  118:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  118:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  118:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  119:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  119:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  119:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  119:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.  119:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN//
-----DSS---ZWRITE Unit  71; Vers.   17:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN/
-----DSS---ZWRITE Unit  71; Vers.   17:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN/
-----DSS---ZWRITE Unit  71; Vers.   17:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN/
-----DSS---ZWRITE Unit  71; Vers.   17:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN/
-----DSS---ZWRITE Unit  71; Vers.   34:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/31MAR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   34:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/01APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   34:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/02APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   34:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/03APR1997/5MIN/100YR/
-----DSS---ZWRITE Unit  71; Vers.   34:  /SOSSAMAN DRAIN/AT SUPERSTITION/FLOW/04APR1997/5MIN/100YR/
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RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	42	1048.	12.58	206.	56.	19.	1.75		
+	ROUTED TO	42T51	962.	13.17	206.	56.	19.	1.75		
+	HYDROGRAPH AT	51	1277.	12.25	159.	46.	15.	1.24		
+	2 COMBINED AT	C51	1420.	12.33	359.	100.	34.	2.99		
+	ROUTED TO	51T53	1129.	13.08	359.	100.	34.	2.99		
+	HYDROGRAPH AT	44A	1297.	12.50	277.	89.	30.	1.59		
+	DIVERSION TO	D44A	951.	12.50	213.	69.	23.	1.59		
+	HYDROGRAPH AT	DIV44A	347.	12.50	64.	20.	7.	1.59		
+	HYDROGRAPH AT	43	1365.	12.33	184.	53.	18.	1.42		
+	2 COMBINED AT	C43	1646.	12.33	244.	72.	24.	3.01		
+	ROUTED TO	43T53	1104.	13.42	244.	72.	24.	3.01		
+	HYDROGRAPH AT	53	831.	12.42	108.	31.	11.	.78		
+	3 COMBINED AT	C53	2157.	13.33	684.	196.	66.	6.78		
+	HYDROGRAPH AT	54	512.	12.42	66.	19.	6.	.49		
+	2 COMBINED AT	C54	2173.	13.33	743.	213.	71.	7.27		
+	DIVERSION TO	SOUTH	862.	13.33	235.	59.	20.	7.27		
+	HYDROGRAPH AT	DCAP12	1312.	13.33	508.	154.	52.	7.27		
+	ROUTED TO	CAP12	1166.	13.67	508.	154.	52.	7.27		
+	HYDROGRAPH AT	DR44A	951.	12.50	213.	69.	23.	1.59		
+	ROUTED TO	44ATB	769.	13.58	213.	69.	23.	1.59		
+	HYDROGRAPH AT	44B	1430.	12.25	179.	54.	18.	1.06		
+	2 COMBINED AT	C44B	1606.	12.25	393.	123.	41.	1.06		
+	ROUTED TO	CAP10+	1490.	12.33	393.	123.	41.	1.06		
+	ROUTED TO	RCAP11	1490.	12.42	393.	123.	41.	1.06		
+	2 COMBINED AT	C12	2146.	12.50	874.	269.	90.	8.33		
+	ROUTED TO	ADOT-W	439.	15.17	414.	263.	90.	8.33		
+	ROUTED TO	RADOTW	438.	15.25	414.	263.	90.	8.33		
+	HYDROGRAPH AT	36B	581.	12.08	49.	14.	5.	.32		
+	2 COMBINED AT	C36B	745.	12.08	421.	275.	94.	8.65		
+	HYDROGRAPH AT	RSOUTH	862.	13.33	235.	59.	20.	7.27		
+	HYDROGRAPH AT	57	318.	12.00	19.	5.	2.	.18		
+	2 COMBINED AT	C57	941.	13.33	277.	69.	23.	.18		
	ROUTED TO									

+		CAP13+	931.	13.33	277.	69.	23.	.18
+	HYDROGRAPH AT	36A	215.	12.00	15.	4.	1.	.10
+	2 COMBINED AT	C36A	934.	13.33	292.	74.	25.	.28
+	ROUTED TO	ADOT-E	267.	14.25	200.	73.	25.	.28
+	2 COMBINED AT	CFAKE	771.	12.08	594.	339.	116.	8.93
+	HYDROGRAPH AT	52	572.	12.25	61.	17.	6.	.43
+	HYDROGRAPH AT	56	862.	12.17	88.	25.	8.	.55
+	2 COMBINED AT	C56	1400.	12.25	149.	42.	14.	.98
+	ROUTED TO	56T58	1068.	12.50	149.	42.	14.	.98
+	HYDROGRAPH AT	58	1370.	12.17	107.	28.	9.	.95
+	2 COMBINED AT	C58	1813.	12.25	252.	68.	23.	1.93
+	HYDROGRAPH AT	46B	300.	12.67	65.	21.	7.	.36
+	DIVERSION TO	D46	12.	9.67	8.	3.	1.	.36
+	HYDROGRAPH AT	D46B	300.	12.67	65.	19.	6.	.36
+	ROUTED TO	CAP6	239.	12.92	65.	19.	6.	.36
+	ROUTED TO	RCAP6B	239.	12.92	65.	19.	6.	.36
+	HYDROGRAPH AT	29A	135.	12.67	26.	8.	3.	.18
+	DIVERSION TO	D29A	135.	12.67	17.	5.	2.	.18
+	HYDROGRAPH AT	D29A	95.	12.92	12.	3.	1.	.18
+	2 COMBINED AT	C29A	333.	12.92	76.	22.	7.	.54
+	HYDROGRAPH AT	45A	336.	12.92	74.	22.	7.	.62
+	DIVERSION TO	D29A	336.	12.92	45.	12.	4.	.62
+	HYDROGRAPH AT	D45A	256.	13.17	35.	10.	3.	.62
+	DIVERSION TO	45ATB	243.	13.17	33.	9.	3.	.62
+	HYDROGRAPH AT	D45A	13.	13.17	2.	0.	0.	.62
+	HYDROGRAPH AT	55B	955.	13.17	263.	82.	27.	1.86
+	DIVERSION TO	D55B	955.	13.17	168.	46.	15.	1.86
+	HYDROGRAPH AT	D55B	740.	13.42	124.	36.	12.	1.86
+	2 COMBINED AT	C55B	743.	13.42	124.	36.	12.	2.48
+	ROUTED TO	CAP7	517.	13.75	124.	36.	12.	2.48
+	HYDROGRAPH AT	RD45A	243.	13.17	33.	9.	3.	.62
+	ROUTED TO	45ATB	167.	14.17	31.	9.	3.	.62
+	HYDROGRAPH AT	45B	653.	12.58	128.	41.	14.	.66
+	DIVERSION TO	D45B	358.	12.17	39.	12.	4.	.66
+	HYDROGRAPH AT	D45B	653.	12.58	105.	29.	10.	.66
+	2 COMBINED AT	C45B	653.	12.58	135.	38.	13.	.66

+	ROUTED TO	CAP8	464.	12.83	134.	38.	13.	.66
+	2 COMBINED AT	C7+8	727.	13.42	247.	72.	24.	3.14
+	ROUTED TO	RCAP78	674.	13.83	243.	72.	24.	3.14
+	HYDROGRAPH AT	29B	58.	12.58	9.	3.	1.	.08
+	DIVERSION TO	D29B	58.	12.58	9.	3.	1.	.08
+	HYDROGRAPH AT	D29B	1.	18.58	0.	0.	0.	.08
+	2 COMBINED AT	C29B1	674.	13.83	243.	72.	24.	3.22
+	2 COMBINED AT	C29B2	757.	13.75	307.	93.	31.	3.76
+	ROUTED TO	TRANS	749.	13.83	307.	93.	31.	3.76
+	HYDROGRAPH AT	29C	253.	12.42	38.	12.	4.	.23
+	DIVERSION TO	D29	253.	12.42	32.	9.	3.	.23
+	HYDROGRAPH AT	D29C	94.	12.83	10.	3.	1.	.23
+	2 COMBINED AT	C29C2	765.	13.08	315.	95.	32.	3.99
+	ROUTED TO	29CTD1	734.	14.00	313.	95.	32.	3.99
+	HYDROGRAPH AT	55	190.	12.25	21.	6.	2.	.14
+	DIVERSION TO	D55	190.	12.25	17.	5.	2.	.14
+	HYDROGRAPH AT	D55	75.	12.50	6.	2.	1.	.14
+	ROUTED TO	CAP9	39.	12.58	6.	2.	1.	.14
+	ROUTED TO	RCAP9	23.	13.17	6.	2.	1.	.14
+	HYDROGRAPH AT	29D	573.	12.67	114.	36.	12.	.65
+	DIVERSION TO	D29D	415.	12.42	46.	14.	5.	.65
+	HYDROGRAPH AT	D29D	573.	12.67	82.	23.	8.	.65
+	DIVERSION TO	D29DE	378.	12.67	54.	15.	5.	.65
+	HYDROGRAPH AT	D29D2	195.	12.67	28.	8.	3.	.65
+	3 COMBINED AT	C29C3	771.	13.25	343.	104.	35.	4.78
+	ROUTED TO	BASIN5	273.	15.33	251.	104.	35.	4.78
+	ROUTED TO	RBAS5	272.	15.42	251.	104.	35.	4.78
+	HYDROGRAPH AT	G29DE	378.	12.67	54.	15.	5.	.65
+	ROUTED TO	29T36	357.	12.75	54.	15.	5.	.65
+	HYDROGRAPH AT	36C	929.	12.08	105.	36.	12.	.44
+	DIVERSION TO	D36C	848.	12.00	66.	19.	6.	.44
+	HYDROGRAPH AT	D36C	770.	12.17	57.	17.	6.	.44
+	3 COMBINED AT	C36	763.	12.17	323.	133.	44.	5.22
+	ROUTED TO	36T37	519.	12.92	320.	133.	44.	5.22
+	HYDROGRAPH AT	30b	603.	12.67	109.	33.	11.	.81

+	ROUTED TO	30bT3	574.	12.83	109.	33.	11.	.81
+	HYDROGRAPH AT	37	678.	12.08	51.	15.	5.	.47
+	3 COMBINED AT	C37	1096.	12.25	447.	173.	58.	6.50
+	ROUTED TO	ADOTEL	17.	27.00	17.	17.	17.	6.50
+	ROUTED TO	37T38A	17.	27.17	17.	17.	16.	6.50
+	HYDROGRAPH AT	38A	279.	12.58	49.	15.	5.	.33
+	HYDROGRAPH AT	202D	100.	8.67	10.	3.	2.	.02
+	3 COMBINED AT	C38A	279.	12.58	62.	31.	22.	6.85
+	ROUTED TO	202NE1	60.	13.42	51.	29.	21.	6.85
+	ROUTED TO	202NE2	29.	20.33	28.	26.	21.	6.85
+	HYDROGRAPH AT	17A	257.	12.17	26.	8.	3.	.18
+	HYDROGRAPH AT	49	792.	12.33	89.	25.	8.	.79
+	ROUTED TO	CAP2	760.	12.42	89.	25.	8.	.79
+	ROUTED TO	BASIN2	280.	12.75	59.	25.	8.	.79
+	ROUTED TO	RCAP2A	279.	12.75	59.	25.	8.	.79
+	ROUTED TO	RCAP2	288.	12.75	59.	25.	8.	.79
+	2 COMBINED AT	C17A	308.	12.75	83.	34.	11.	.97
+	HYDROGRAPH AT	48	786.	12.33	83.	23.	8.	.77
+	ROUTED TO	CAP3	757.	12.33	83.	23.	8.	.77
+	ROUTED TO	BASIN3	366.	12.67	75.	23.	8.	.77
+	ROUTED TO	RCAP3A	376.	12.67	75.	23.	8.	.77
+	ROUTED TO	RCAP3B	267.	12.92	75.	23.	8.	.77
+	HYDROGRAPH AT	17B	284.	12.25	31.	10.	3.	.22
+	2 COMBINED AT	C17B	321.	12.25	103.	33.	11.	.99
+	2 COMBINED AT	C17C	589.	12.17	182.	65.	22.	1.96
+	ROUTED TO	17CT23	569.	12.25	182.	65.	22.	1.96
+	HYDROGRAPH AT	18F	96.	12.00	5.	1.	0.	.05
+	ROUTED TO	R18FTE	88.	12.00	5.	1.	0.	.05
+	HYDROGRAPH AT	18E	171.	12.00	12.	4.	1.	.08
+	DIVERSION TO	D18E	46.	12.00	3.	1.	0.	.08
+	HYDROGRAPH AT	RET18E	125.	12.00	8.	3.	1.	.08
+	2 COMBINED AT	C18E	213.	12.00	13.	4.	1.	.13
+	ROUTED TO	18ET23	195.	12.00	13.	4.	1.	.13
+	2 COMBINED AT	C23A	616.	12.25	194.	69.	23.	2.09
+	ROUTED TO	R23ATB	615.	12.25	194.	69.	23.	2.09
	HYDROGRAPH AT							

+		23	237.	12.17	24.	7.	2.	.17
+	DIVERSION TO	D23	43.	12.17	4.	1.	0.	.17
+	HYDROGRAPH AT	RET23	194.	12.17	20.	6.	2.	.17
+	2 COMBINED AT	C23B	792.	12.25	212.	75.	25.	2.26
+	HYDROGRAPH AT	47	1121.	12.58	165.	45.	15.	1.67
+	ROUTED TO	BASIN4	871.	12.75	136.	45.	15.	1.67
+	ROUTED TO	RCAP4	642.	13.50	136.	45.	15.	1.67
+	HYDROGRAPH AT	22	549.	12.17	56.	17.	6.	.41
+	2 COMBINED AT	C22A	650.	13.50	183.	61.	21.	2.08
+	ROUTED TO	22AT23	622.	13.67	182.	61.	21.	2.08
+	2 COMBINED AT	C23C	1187.	12.25	385.	133.	45.	4.34
+	ROUTED TO	RC23	1178.	12.33	385.	133.	45.	4.34
+	HYDROGRAPH AT	30a	270.	12.50	42.	13.	4.	.30
+	ROUTED TO	30at31	244.	12.67	42.	13.	4.	.30
+	2 COMBINED AT	C31A1	1253.	12.33	424.	146.	49.	4.64
+	HYDROGRAPH AT	31A	624.	12.25	63.	18.	6.	.51
+	HYDROGRAPH AT	202C	34.	2.50	3.	2.	1.	.01
+	3 COMBINED AT	C31A2	1775.	12.33	481.	164.	56.	5.16
+	ROUTED TO	R202S	712.	14.00	476.	164.	56.	5.16
+	HYDROGRAPH AT	202A	163.	3.25	19.	6.	3.	.09
+	ROUTED TO	R202A	159.	3.42	19.	6.	3.	.09
+	HYDROGRAPH AT	202B	125.	3.25	13.	4.	2.	.06
+	2 COMBINED AT	C202B	249.	3.33	33.	10.	5.	.14
+	ROUTED TO	R202B	245.	3.42	33.	10.	5.	.14
+	2 COMBINED AT	C202C	712.	14.00	477.	173.	60.	5.31
+	ROUTED TO	RT202C	712.	14.00	477.	173.	60.	5.31
+	DIVERSION TO	DHAWS	230.	14.00	180.	95.	34.	5.31
+	HYDROGRAPH AT	DSPILL	482.	14.00	297.	78.	26.	5.31
+	HYDROGRAPH AT	38B	64.	12.25	8.	2.	1.	.05
+	2 COMBINED AT	C38B	483.	14.00	303.	81.	27.	5.36
+	ROUTED TO	202NW1	474.	14.33	294.	75.	25.	5.36
+	ROUTED TO	202NW2	468.	14.67	267.	75.	25.	5.36
+	HYDROGRAPH AT	50	371.	12.17	26.	7.	2.	.28
+	ROUTED TO	CAP1	325.	12.17	29.	11.	7.	.28
+	ROUTED TO	BASIN1	38.	12.50	25.	11.	7.	.28
+	ROUTED TO	RCAP1	34.	13.08	25.	11.	7.	.28

+	HYDROGRAPH AT	18C	453.	12.25	57.	18.	6.	.39
+	DIVERSION TO	D18C	72.	12.25	9.	3.	1.	.39
+	HYDROGRAPH AT	RET18C	380.	12.25	48.	15.	5.	.39
+	2 COMBINED AT	C18C	393.	12.33	70.	26.	12.	.67
+	ROUTED TO	18T24	371.	12.33	70.	26.	12.	.67
+	HYDROGRAPH AT	18D	80.	12.08	7.	2.	1.	.04
+	ROUTED TO	18DT24	69.	12.17	7.	2.	1.	.04
+	HYDROGRAPH AT	24A	90.	12.00	7.	2.	1.	.04
+	2 COMBINED AT	C24A	135.	12.08	13.	4.	1.	.09
+	ROUTED TO	24ATB	124.	12.17	13.	4.	1.	.09
+	HYDROGRAPH AT	24B	374.	12.17	37.	12.	4.	.26
+	DIVERSION TO	D24B	67.	12.17	6.	2.	1.	.26
+	HYDROGRAPH AT	RET24B	307.	12.17	31.	10.	3.	.26
+	2 COMBINED AT	C24B	430.	12.17	45.	14.	5.	.35
+	2 COMBINED AT	C24C	699.	12.25	113.	40.	17.	1.01
+	DIVERSION TO	DIVBRD	0.	.00	0.	0.	0.	1.01
+	HYDROGRAPH AT	BRDHAW	699.	12.25	113.	40.	17.	1.01
+	ROUTED TO	RT31B1	693.	12.25	113.	40.	17.	1.01
+	ROUTED TO	RT31B2	670.	12.33	113.	40.	17.	1.01
+	ROUTED TO	RT31B3	659.	12.33	113.	40.	17.	1.01
+	HYDROGRAPH AT	31B	523.	12.33	76.	24.	8.	.44
+	DIVERSION TO	D31BS	474.	12.25	41.	12.	4.	.44
+	HYDROGRAPH AT	D31BS	514.	12.42	43.	12.	4.	.44
+	2 COMBINED AT	C31B	1148.	12.42	153.	51.	20.	1.45
+	DIVERSION TO	D31W	939.	12.42	138.	48.	19.	1.45
+	HYDROGRAPH AT	D31S	208.	12.42	15.	4.	1.	1.45
+	ROUTED TO	31T381	195.	12.50	15.	4.	1.	1.45
+	HYDROGRAPH AT	RHAWS	230.	14.00	180.	95.	34.	5.31
+	ROUTED TO	RTHAWS	230.	14.00	180.	95.	34.	5.31
+	2 COMBINED AT	C31S	385.	12.50	202.	101.	36.	1.45
+	ROUTED TO	31T382	385.	12.50	202.	101.	36.	1.45
+	2 COMBINED AT	C38C1	669.	14.33	445.	171.	59.	6.81
+	2 COMBINED AT	C38C	652.	14.42	441.	178.	75.	13.66
+	ROUTED TO	38T39	652.	14.50	440.	178.	75.	13.66
+	HYDROGRAPH AT	R31W	939.	12.42	138.	48.	19.	1.45

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+        ROUTED TO          31WT32     614.   12.58      137.      47.      19.     1.45
+        HYDROGRAPH AT          32     417.   12.33       54.      16.       5.      .38
+        2 COMBINED AT         C32     865.   12.50      189.      64.      25.      .38
+        ROUTED TO           32T39     864.   12.58      189.      64.      25.      .38
+        HYDROGRAPH AT          39     402.   12.42       62.      20.       7.      .36
+        DIVERSION TO          D39      10.    9.00        6.       2.       1.      .36
+        HYDROGRAPH AT         D39     402.   12.42       62.      18.       6.      .36
+        2 COMBINED AT         C39A   1192.   12.50      249.      82.      31.      .74
+        2 COMBINED AT         C39B   1350.   12.58      651.     251.     103.    14.40
+        DIVERSION TO         BASIN      0.     .00        0.       0.       0.    14.40
+        HYDROGRAPH AT         SOSS   1350.   12.58      651.     251.     103.    14.40
1
                        SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                            (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                   INTERPOLATED TO
                                                                 COMPUTATION INTERVAL
   ISTAQ    ELEMENT      DT        PEAK    TIME TO      VOLUME      DT       PEAK    TIME TO      VOLUME
                                           PEAK                                          PEAK
                        (MIN)     (CFS)    (MIN)       (IN)      (MIN)     (CFS)    (MIN)       (IN)
 FOR STORM = 1  STORM AREA (SQ MI) =        .01
   RCAP11  MANE          1.73   1501.14   745.00       4.36       5.00   1501.13   745.00       4.36

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2464E+03 EXCESS= .0000E+00 OUTFLOW= .2466E+03 BASIN STORAGE= .1048E-04 PERCENT ERROR=   -.1

 FOR STORM = 2  STORM AREA (SQ MI) =       1.00
   RCAP11  MANE          1.70   1491.68   743.53       4.33       5.00   1491.61   745.00       4.33

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2448E+03 EXCESS= .0000E+00 OUTFLOW= .2450E+03 BASIN STORAGE= .1177E-04 PERCENT ERROR=   -.1

 FOR STORM = 3  STORM AREA (SQ MI) =       5.00
   RCAP11  MANE          1.66   1448.77   747.19       4.21       5.00   1448.30   745.00       4.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2376E+03 EXCESS= .0000E+00 OUTFLOW= .2379E+03 BASIN STORAGE= .9588E-05 PERCENT ERROR=   -.1

 FOR STORM = 4  STORM AREA (SQ MI) =      10.00
   RCAP11  MANE          1.79   1395.53   746.52       4.05       5.00   1395.02   745.00       4.05

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2289E+03 EXCESS= .0000E+00 OUTFLOW= .2290E+03 BASIN STORAGE= .1252E-04 PERCENT ERROR=   -.1

 FOR STORM = 5  STORM AREA (SQ MI) =      30.00
   RCAP11  MANE          1.76   1327.22   747.52       3.85       5.00   1326.40   745.00       3.85

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2176E+03 EXCESS= .0000E+00 OUTFLOW= .2178E+03 BASIN STORAGE= .1368E-04 PERCENT ERROR=   -.1

 FOR STORM = 6  STORM AREA (SQ MI) =      60.00
   RCAP11  MANE          1.77   1259.23   748.20       3.65       5.00   1256.52   745.00       3.65

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2064E+03 EXCESS= .0000E+00 OUTFLOW= .2065E+03 BASIN STORAGE= .1165E-04 PERCENT ERROR=   -.1

 FOR STORM = 7  STORM AREA (SQ MI) =      90.00
   RCAP11  MANE          1.86   1232.86   746.17       3.58       5.00   1231.24   745.00       3.58

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2023E+03 EXCESS= .0000E+00 OUTFLOW= .2025E+03 BASIN STORAGE= .1310E-04 PERCENT ERROR=   -.1

 FOR STORM = 8  STORM AREA (SQ MI) =     120.00
   RCAP11  MANE          1.83   1208.64   747.50       3.51       5.00   1205.83   745.00       3.51

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1983E+03 EXCESS= .0000E+00 OUTFLOW= .1984E+03 BASIN STORAGE= .1212E-04 PERCENT ERROR=   -.1

 FOR STORM = 9  STORM AREA (SQ MI) =     150.00
   RCAP11  MANE          1.88   1193.21   746.56       3.47       5.00   1190.66   745.00       3.47

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1958E+03 EXCESS= .0000E+00 OUTFLOW= .1960E+03 BASIN STORAGE= .1309E-04 PERCENT ERROR=   -.1

 FOR STORM = 1  STORM AREA (SQ MI) =        .01
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RCAP2A  MANE          .48    288.75    761.36      1.21      5.00    287.78    765.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5079E+02 EXCESS= .0000E+00 OUTFLOW= .5079E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 2  STORM AREA (SQ MI) =       1.00
RCAP2A  MANE          .48    279.04    765.07      1.19      5.00    279.01    765.00        1.20

CONTINUITY SUMMARY (AC-FT) - INFLOW= .5034E+02 EXCESS= .0000E+00 OUTFLOW= .5034E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 3  STORM AREA (SQ MI) =       5.00
RCAP2A  MANE          .51    245.69    765.42      1.15      5.00    244.99    765.00        1.15

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4832E+02 EXCESS= .0000E+00 OUTFLOW= .4832E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 4  STORM AREA (SQ MI) =      10.00
RCAP2A  MANE          .49    199.90    765.88      1.09      5.00    196.87    765.00        1.09

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4584E+02 EXCESS= .0000E+00 OUTFLOW= .4584E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 5  STORM AREA (SQ MI) =      30.00
RCAP2A  MANE          .50    136.81    771.03      1.01      5.00    136.38    770.00        1.01

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4272E+02 EXCESS= .0000E+00 OUTFLOW= .4272E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 6  STORM AREA (SQ MI) =      60.00
RCAP2A  MANE          .62     86.48    775.95       .94      5.00     86.25    775.00         .94

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3976E+02 EXCESS= .0000E+00 OUTFLOW= .3976E+02 BASIN STORAGE= .1230E-07 PERCENT ERROR=    .0

FOR STORM = 7  STORM AREA (SQ MI) =      90.00
RCAP2A  MANE          .54     71.89    776.37       .92      5.00     70.97    775.00         .92

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3875E+02 EXCESS= .0000E+00 OUTFLOW= .3875E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 8  STORM AREA (SQ MI) =     120.00
RCAP2A  MANE          .55     56.76    780.94       .90      5.00     56.52    780.00         .90

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3778E+02 EXCESS= .0000E+00 OUTFLOW= .3777E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 9  STORM AREA (SQ MI) =     150.00
RCAP2A  MANE          .72     47.95    781.16       .88      5.00     47.72    780.00         .88

CONTINUITY SUMMARY (AC-FT) - INFLOW= .3720E+02 EXCESS= .0000E+00 OUTFLOW= .3720E+02 BASIN STORAGE= .1231E-07 PERCENT ERROR=    .0

FOR STORM = 1  STORM AREA (SQ MI) =        .01
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 2  STORM AREA (SQ MI) =       1.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 3  STORM AREA (SQ MI) =       5.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 4  STORM AREA (SQ MI) =      10.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 5  STORM AREA (SQ MI) =      30.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 6  STORM AREA (SQ MI) =      60.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

FOR STORM = 7  STORM AREA (SQ MI) =      90.00
R202A  MANE          3.67    161.55    203.09      3.37      5.00    158.67    205.00        3.37
```

```
CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

          FOR STORM = 8  STORM AREA (SQ MI) =      120.00
             R202A  MANE          3.67    161.55    203.09       3.37       5.00    158.67    205.00         3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

          FOR STORM = 9  STORM AREA (SQ MI) =      150.00
             R202A  MANE          3.67    161.55    203.09       3.37       5.00    158.67    205.00         3.37

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1601E+02 EXCESS= .0000E+00 OUTFLOW= .1599E+02 BASIN STORAGE= .3164E-01 PERCENT ERROR=   -.1

          FOR STORM = 1  STORM AREA (SQ MI) =          .01
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 2  STORM AREA (SQ MI) =         1.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 3  STORM AREA (SQ MI) =         5.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 4  STORM AREA (SQ MI) =        10.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 5  STORM AREA (SQ MI) =        30.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 6  STORM AREA (SQ MI) =        60.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 7  STORM AREA (SQ MI) =        90.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 8  STORM AREA (SQ MI) =       120.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1

          FOR STORM = 9  STORM AREA (SQ MI) =       150.00
             R202B  MANE          2.27    245.65    203.50       3.76       5.00    244.89    205.00         3.76

CONTINUITY SUMMARY (AC-FT) - INFLOW= .2902E+02 EXCESS= .0000E+00 OUTFLOW= .2902E+02 BASIN STORAGE= .3634E-01 PERCENT ERROR=   -.1


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


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             Pointer Utilization:   .30
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             File Size:     89.4  Kbytes
             Percent Inactive:    .0
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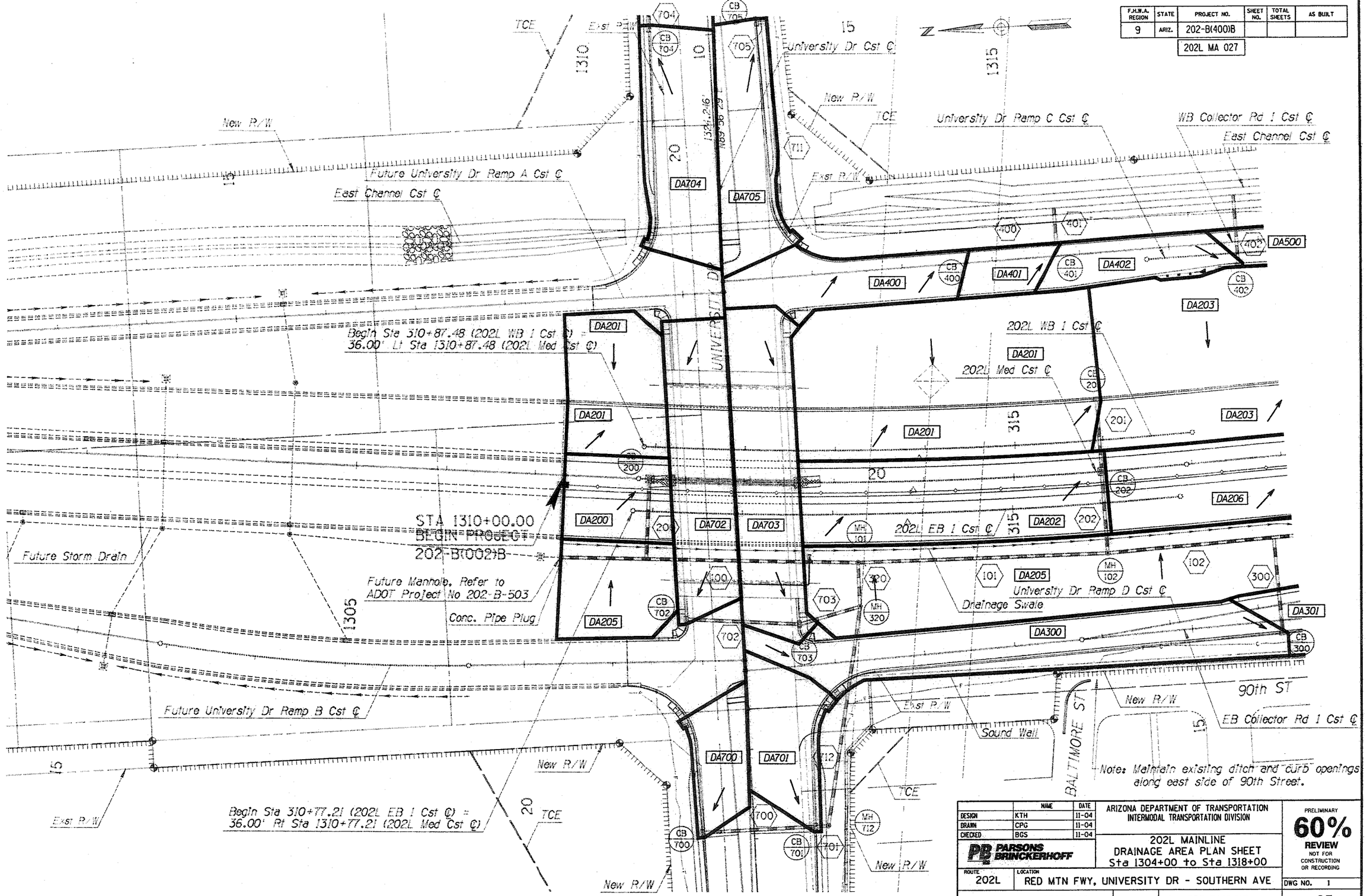
APPENDIX C

ON-SITE DRAINAGE AREA PLANS

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1304+00 to Sta 1318+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 1
___ OF ___

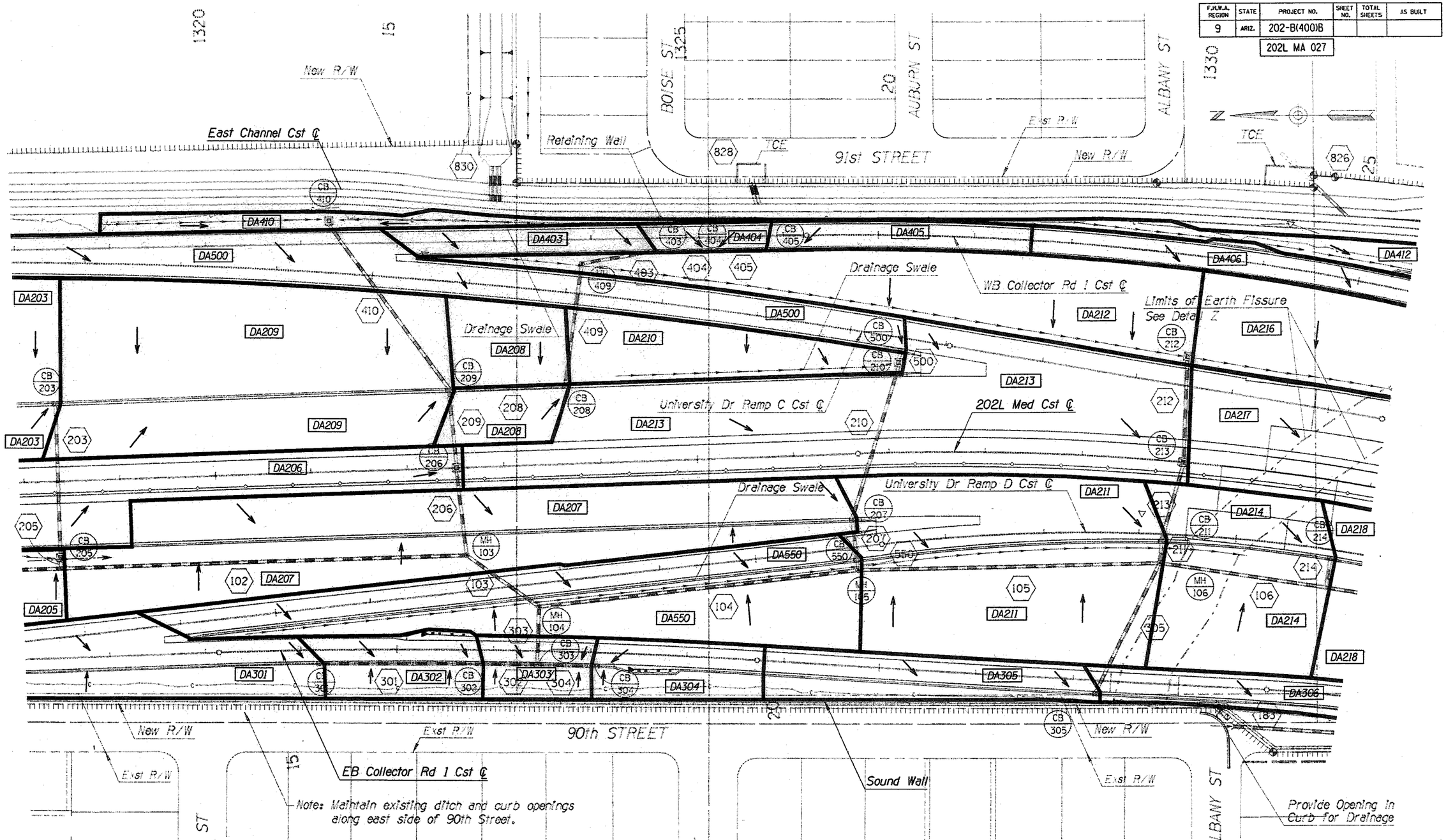
TRACS NO. H 5783 01C
202-B(400)B

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

Wed Mar 30 16:37:20 2005 H:\RedMtn-Univ-Southern\Drng\DrngArea\dap101.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			

202L MA 027



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1318+00 to Sta 1332+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 2

TRACS NO. H 5783 01C

202-B(400)B

___ OF ___

Wed Mar 30 16:43:16 2005

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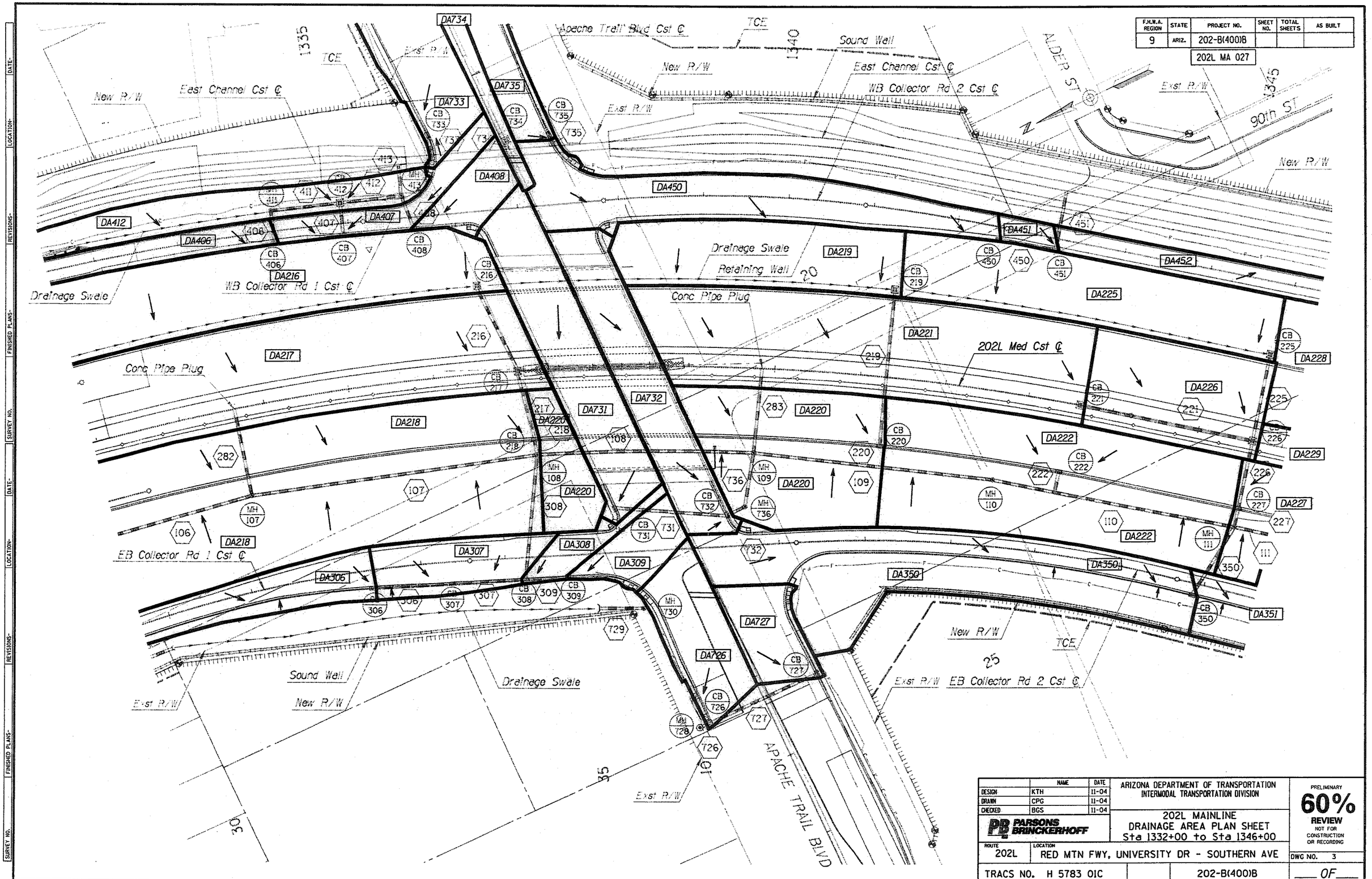
SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			

202L MA 027



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1332+00 to Sta 1346+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 3

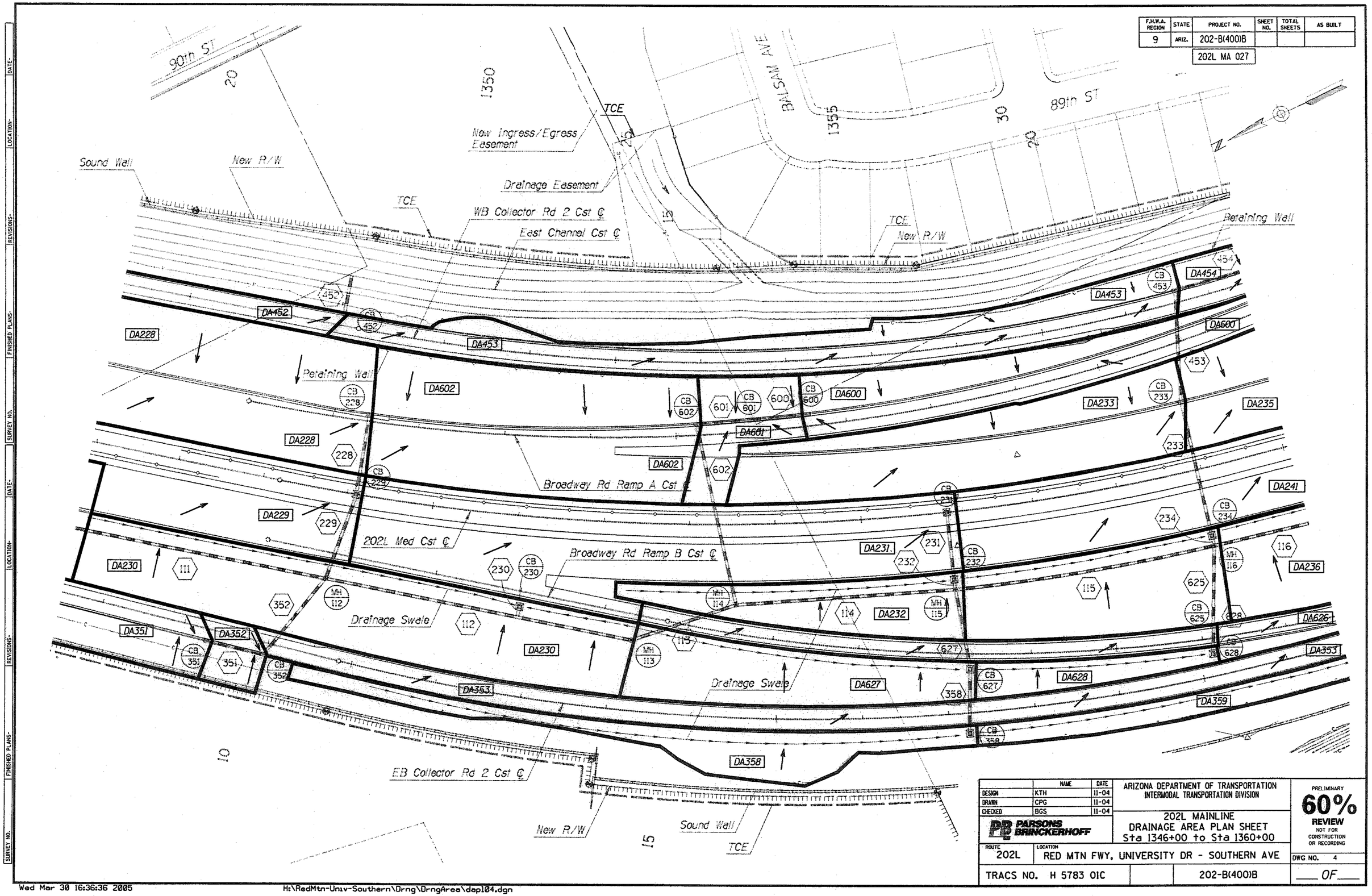
TRACS NO. H 5783 01C | 202-B(400)B | ___ OF ___

Wed Mar 30 16:36:51 2005 H:\RedMtn-Univ-Southern\Drng\DrngArea\dap103.dgn

SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			

202L MA 027



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1346+00 to Sta 1360+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE 202L

LOCATION RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 4

TRACS NO. H 5783 01C

202-B(400)B

___ OF ___

Wed Mar 30 16:36:36 2005

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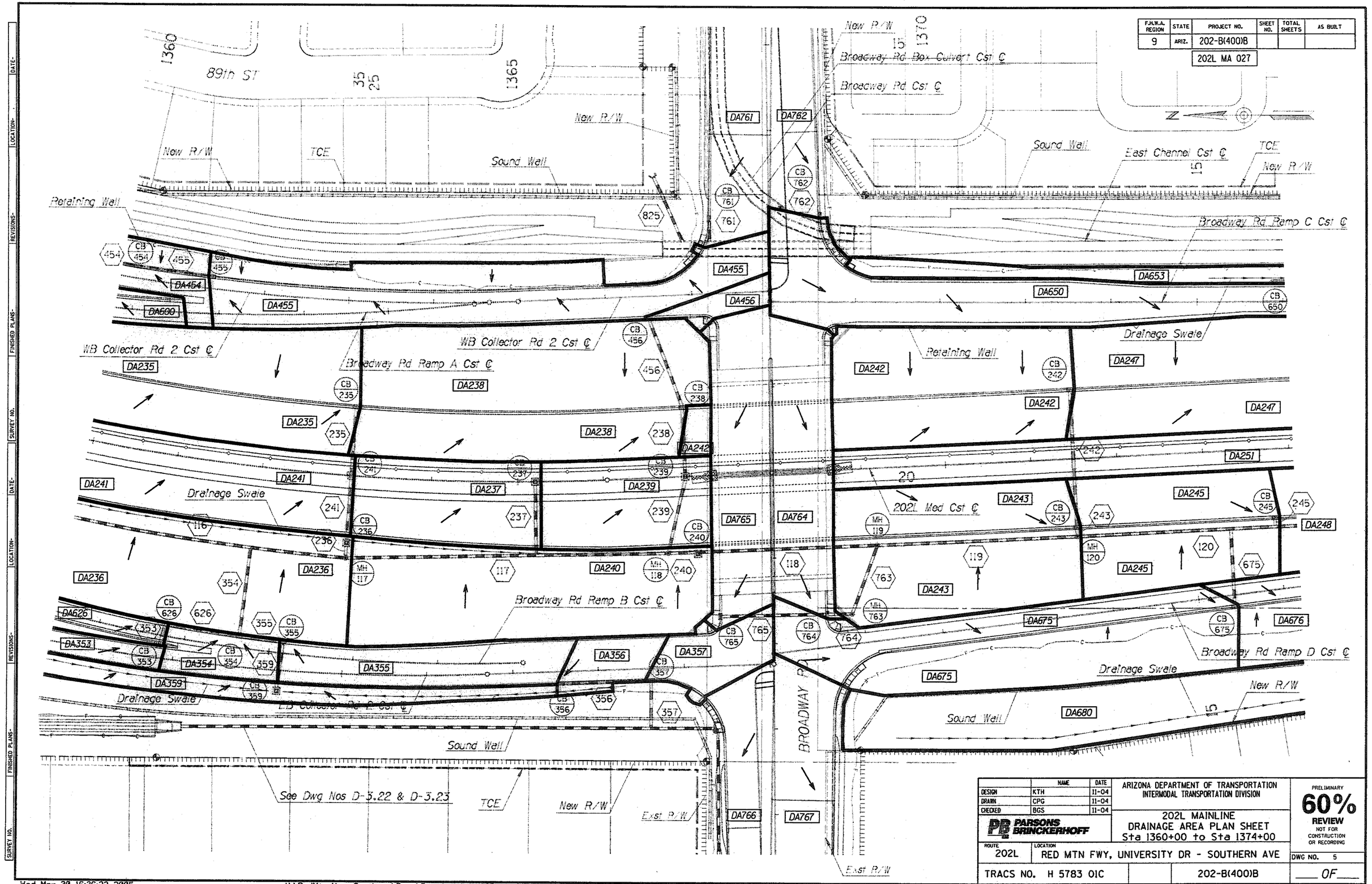
DATE- LOCATION- REVISIONS- FINISHED PLANS- SURVEY NO.

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1360+00 to Sta 1374+00

ROUTE 202L | LOCATION RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

TRACS NO. H 5783 01C | 202-B(400)B

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

DWG NO. 5
___ OF ___

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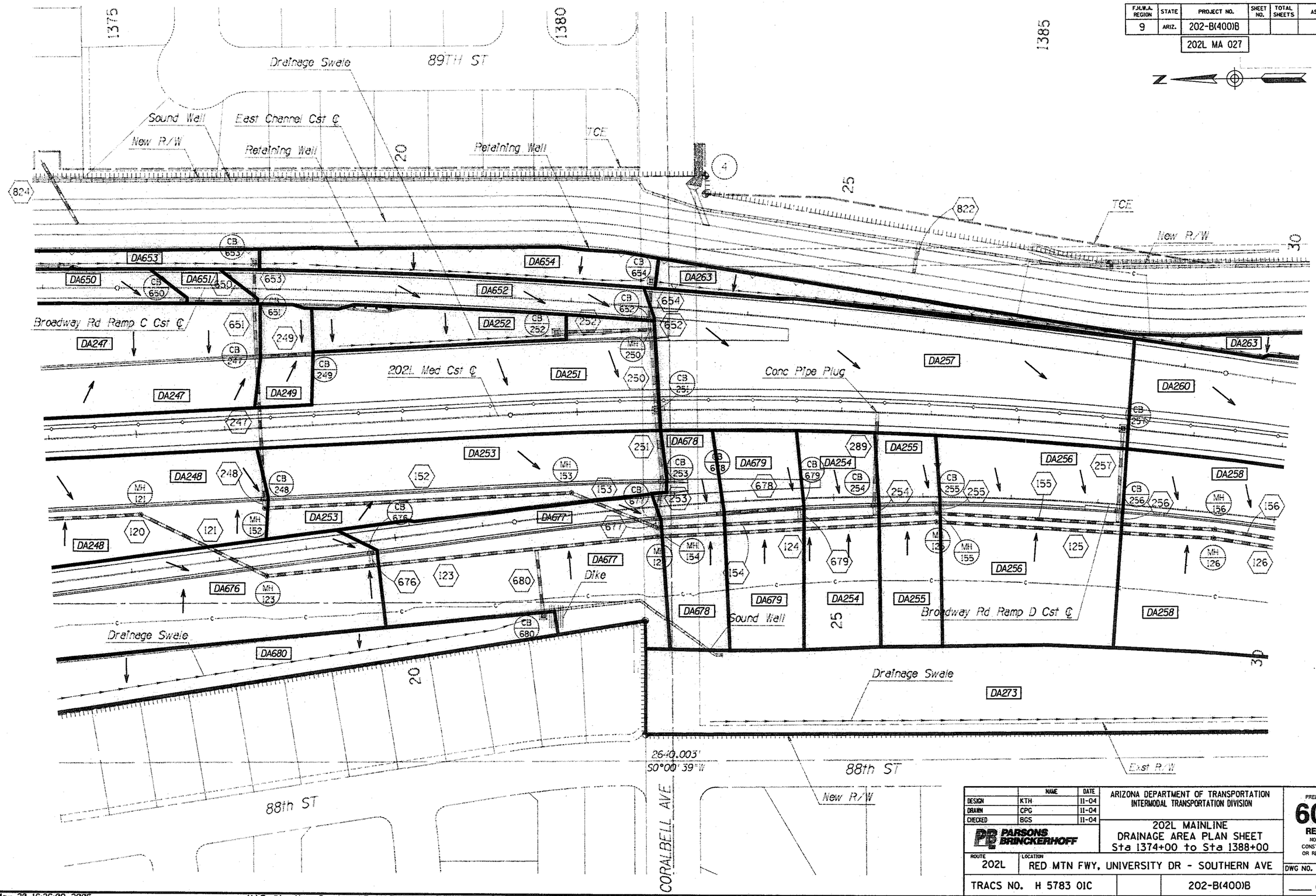
SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1374+00 to Sta 1388+00

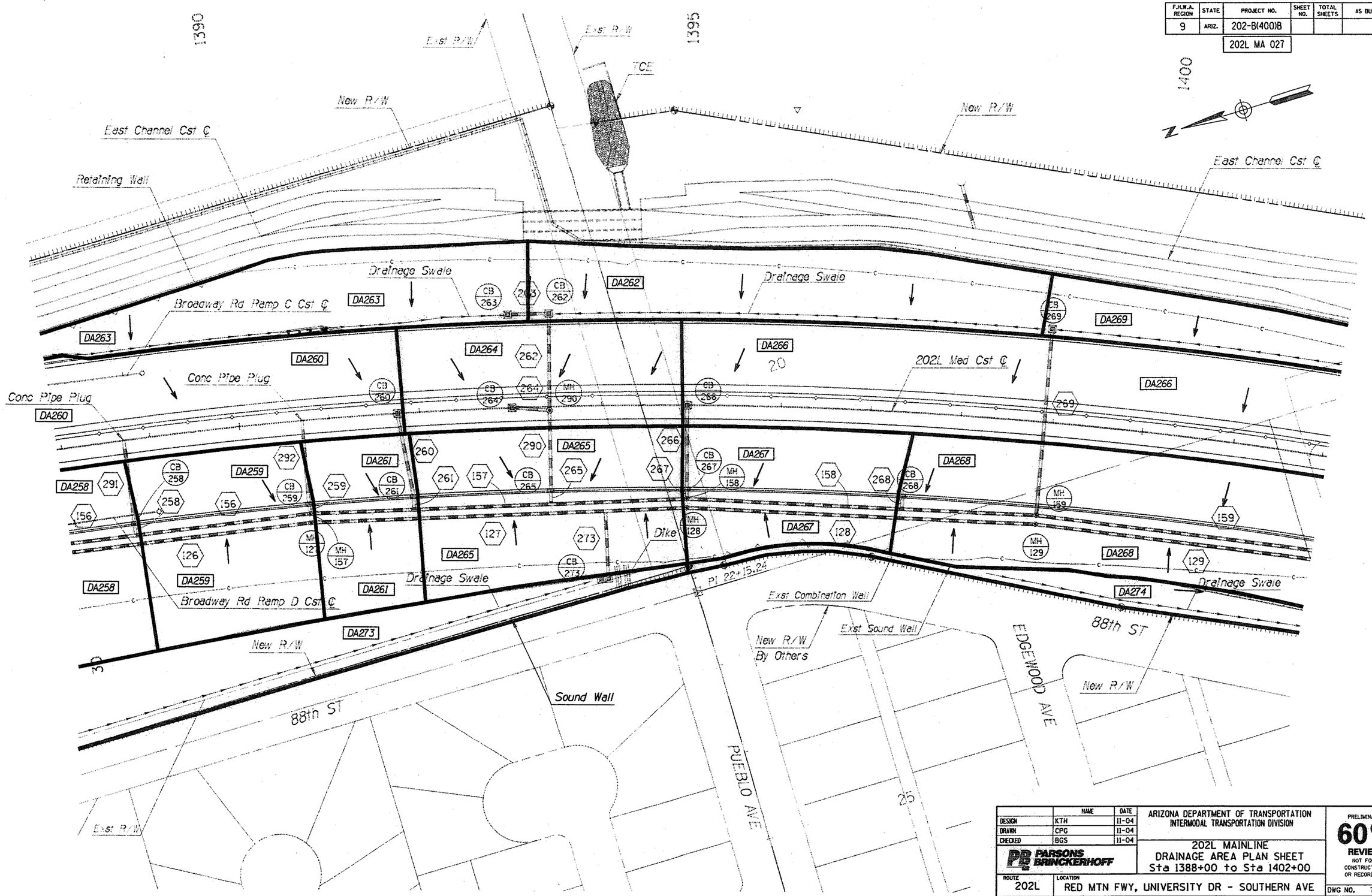
PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE 202L | LOCATION RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE | DWG NO. 6

TRACS NO. H 5783 01C | 202-B(400)B | ___ OF ___

Wed Mar 30 16:36:09 2005 H:\RedMtn-Univ-Southern\Drng\DrngArea\dap106.dgn

F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1388+00 to Sta 1402+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 7

TRACS NO. H 5783 01C

202-B(400)B

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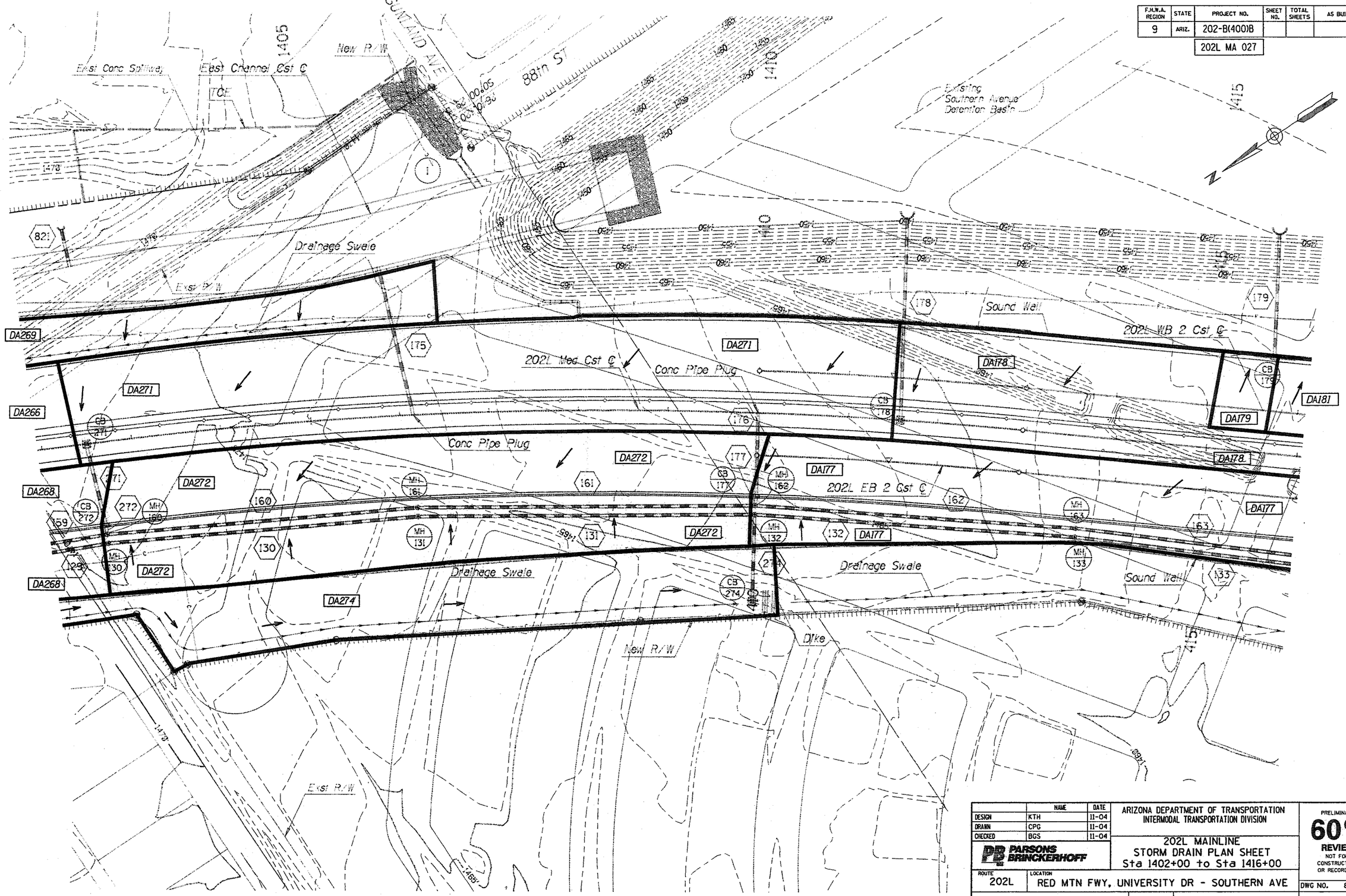
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
STORM DRAIN PLAN SHEET
Sta 1402+00 to Sta 1416+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 8

TRACS NO. H 5783 01C

202-B(400)B

___ OF ___

Wed Mar 30 16:35:36 2005

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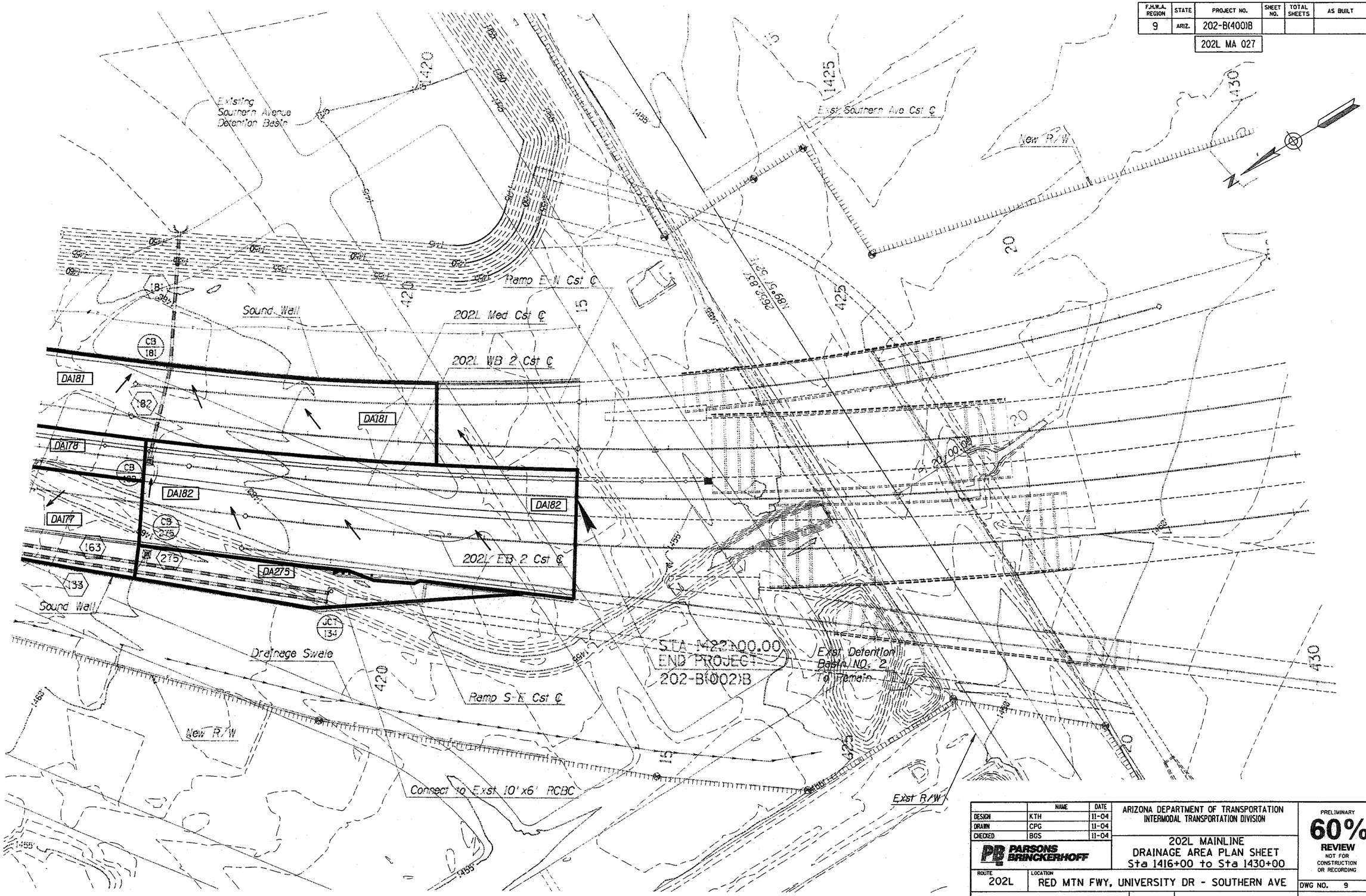
F.H.W.A. REGION	STATE	PROJECT NO.	SHEET NO.	TOTAL SHEETS	AS BUILT
9	ARIZ.	202-B(400)B			
		202L MA 027			



	NAME	DATE
DESIGN	KTH	11-04
DRAWN	CPG	11-04
CHECKED	BGS	11-04

PARSONS BRINCKERHOFF

ARIZONA DEPARTMENT OF TRANSPORTATION
INTERMODAL TRANSPORTATION DIVISION

202L MAINLINE
DRAINAGE AREA PLAN SHEET
Sta 1416+00 to Sta 1430+00

PRELIMINARY
60%
REVIEW
NOT FOR CONSTRUCTION OR RECORDING

ROUTE: 202L
LOCATION: RED MTN FWY, UNIVERSITY DR - SOUTHERN AVE

DWG NO. 9

TRACS NO. H 5783 01C

202-B(400)B

___ OF ___

Wed Mar 30 16:37:33 2005

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SURVEY NO. | FINISHED PLANS- | REVISIONS- | LOCATION- | DATE-

APPENDIX D

ON-SITE DRAINAGE CALCULATIONS

- PAVEMENT DRAINAGE CALCULATIONS
- CURB OPENING HYDRAULICS
- STORM DRAIN HYDRAULICS (STORMCAD)

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:		200		202		280	281
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	11	11	10.1	10.1	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1310+95	1310+95	1316+00	1316+00	1317+60	1317+60	1318+10
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Grate
Pavement Area (ac):	0.118	0.020	0.578	0.020	0.236	0.020	0.080
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	0.118	0.020	0.578	0.020	0.236	0.020	0.080
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.11	0.02	0.55	0.02	0.22	0.02	0.08
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.7	0.1	3.2	0.1	1.3	0.1	0.4
Previous by-pass flow (cfs):	0.3	0.6	0.1	0.2	0.0	0.2	0.1
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	1.0	0.7	3.3	0.4	1.3	0.3	0.5
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0100	0.0100	0.0099	0.0099	0.0099	0.0099	0.0099
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	2	2
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	50%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-15.92
Grate width:	--	2	--	2	--	2	2
Grate length:	--	3.3	--	3.3	--	3.3	3.3
Pavement cross-slope (Sx):	0.032	0.032	0.036	0.036	0.021	0.021	0.014
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.0324	0.0324	0.036	0.036	0.0209	0.0209	0.0137
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.032	0.032	0.036	0.036	0.021	0.021	0.014
Flooded Width from flowline (ft): before inlet	5.2	4.6	7.9	3.4	7.8	4.6	7.1
Depth at flowline (ft): before inlet	0.17	0.15	0.28	0.12	0.16	0.10	0.10
Water cross-area (sq.ft): before inlet	0.45	0.35	1.11	0.21	0.64	0.22	0.34
Velocity V for total discharge (fps): before inlet	2.15	1.98	3.00	1.72	2.08	1.45	1.47
Ratio of gutter depression flow to total Q (Eod):	43.1%	47.5%	30.4%	60.2%	30.4%	48.1%	33.3%
Equivalent cross-slope (Se):	0.032	0.032	0.036	0.036	0.021	0.021	0.014
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	77.7%	---	90.5%	---	78.4%	58.7%
Inlet frontal flow in cfs (Qw):	---	0.54	---	0.33	---	0.25	0.29
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	7.2	---	7.2	7.2
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	100.0%	---	100.0%	100.0%
Side flow in cfs (Qs):	---	0.15	---	0.03	---	0.07	0.21
Effective grate length w/clogging:	---	1.65	---	1.65	---	1.65	1.65
Fraction of side flow interception (Rs):	---	16.7%	---	22.3%	---	18.4%	12.7%
Grate Efficiency (E):	---	81.4%	---	92.6%	---	82.4%	64.0%
Total flow intercepted (cfs):	---	0.56	---	0.33	---	0.26	0.32
Grate flow-by (cfs):	---	0.13	---	0.03	---	0.06	0.18
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	20.7	---	32.7	---	30.9	---	---
Length of inlet provided L (ft):	5		25		20		
Interception for length L (cfs):	0.38	---	3.10	---	1.14	---	---
Efficiency for length L:	0.39	---	0.93	---	0.85	---	---
Slotted drain or curb opening flow-by (cfs):	0.58	---	0.25	---	0.20	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L Inlet Number:	204		207		211		214
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	22	22	14	14	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	1% ⇒	⇒	⇒⇒	⇒	⇒	⇒	⇒
Structure Station:	1318+36	1326+60	1326+60	1330+10	1330+10	1331+70	1331+70
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.044	1.330	0.020	0.711	0.020	0.319	0.020
Sideslope Area (ac):	0.000	0.795	0.000	0.787	0.030	0.478	0.030
Contributing watershed area (acres):	0.044	2.125	0.020	1.498	0.050	0.797	0.050
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.86	0.95	0.82	0.80	0.80	0.80
CA	0.04	1.82	0.02	1.23	0.04	0.64	0.04
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.2	10.7	0.1	7.2	0.2	3.7	0.2
Previous by-pass flow (cfs):	0.2	0.2	2.7	0.8	4.7	0.5	2.1
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	0.4	10.8	2.8	8.0	4.9	4.3	2.3
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0099	0.0168	0.0168	0.0160	0.0160	0.0189	0.0189
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.92	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91
Grate width:	2	--	3	--	3	--	3
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.010	0.043	0.043	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	1.00	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.01	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.010	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	8.1	9.0	5.0	7.1	5.9	5.4	4.2
Depth at flowline (ft): before inlet	0.08	0.45	0.28	0.42	0.35	0.32	0.26
Water cross-area (sq.ft): before inlet	0.33	1.82	0.63	1.40	0.96	0.81	0.50
Velocity V for total discharge (fps): before inlet	1.30	5.95	4.46	5.72	5.11	5.28	4.60
Ratio of gutter depression flow to total Q (Eod):	29.5%	67.5%	89.7%	75.1%	82.8%	86.1%	94.1%
Equivalent cross-slope (Se):	0.010	0.060	0.065	0.064	0.065	0.066	0.067
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	53.0%	---	94.2%	---	88.8%	---	97.7%
Inlet frontal flow in cfs (Qw):	0.23	---	2.63	---	4.35	---	2.27
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.20	---	0.16	---	0.55	---	0.05
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	11.6%	---	5.8%	---	5.6%	---	6.7%
Grate Efficiency (E):	58.5%	---	94.6%	---	89.4%	---	97.9%
Total flow intercepted (cfs):	0.25	---	2.64	---	4.39	---	2.27
Grate flow-by (cfs):	0.18	---	0.15	---	0.52	---	0.05
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	46.3	---	38.5	---	30.6	---
Length of inlet provided L (ft):		25		10		10	
Interception for length L (cfs):	---	8.16	---	3.35	---	2.17	---
Efficiency for length L:	---	0.75	---	0.42	---	0.51	---
Slotted drain or curb opening flow-by (cfs):	---	2.68	---	4.67	---	2.09	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L							
Inlet Number:		218		220		222	
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	LOW PT ⇓	⇐
Structure Station:	1337+15	1337+15	1341+30	1341+30	1343+50	1343+50	1343+50
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	1.010	0.020	0.501	0.020	0.385	0.040	0.370
Sideslope Area (ac):	1.290	0.030	0.557	0.030	0.381	0.040	0.341
Contributing watershed area (acres):	2.300	0.050	1.058	0.050	0.766	0.080	0.711
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.80	0.82	0.80	0.83	0.83	0.83
CA	1.86	0.04	0.87	0.04	0.63	0.07	0.59
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	10.9	0.2	5.1	0.2	3.7	0.4	3.5
Previous by-pass flow (cfs):	0.0	4.7	0.6	0.8	0.0	0.4	0.1
Discharge added by operator:	---	.	---	---	---	---	---
Total discharge Q (cfs):	11.0	4.9	5.7	1.0	3.7	0.8	3.6
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0110	0.0110	0.0041	0.0041	0.0041	0.0041	0.0041
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	2	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60
Grate width:	--	3	--	3	--	3	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.053	0.053	0.053	0.053	0.049	0.049	0.049
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	8.7	6.3	8.2	4.0	7.3	NA	7.1
Depth at flowline (ft): before inlet	0.50	0.37	0.47	0.25	0.40	0.00	0.40
Water cross-area (sq.ft): before inlet	2.06	1.11	1.83	0.48	1.34	0.00	1.30
Velocity V for total discharge (fps): before inlet	5.33	4.42	3.12	2.10	2.77	0.00	2.75
Ratio of gutter depression flow to total Q (Eod):	67.4%	79.9%	69.8%	94.9%	75.1%	100.0%	75.8%
Equivalent cross-slope (Se):	0.063	0.065	0.063	0.067	0.063	0.068	0.063
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	86.2%	---	98.2%	---	---	---
Inlet frontal flow in cfs (Qw):	---	4.22	---	0.98	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	7.2	---	---	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	100.0%	---	---	---
Side flow in cfs (Qs):	---	0.68	---	0.02	---	---	---
Effective grate length w/clogging:	---	1.65	---	1.65	---	---	---
Fraction of side flow interception (Rs):	---	7.1%	---	22.8%	---	---	---
Grate Efficiency (E):	---	87.2%	---	98.6%	---	---	---
Total flow intercepted (cfs):	---	4.27	---	0.98	---	---	---
Grate flow-by (cfs):	---	0.63	---	0.01	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	39.7	---	22.3	---	18.7	---	18.3
Length of inlet provided L (ft):	15		15		15		15
Interception for length L (cfs):	6.30	---	4.94	---	3.52	---	3.40
Efficiency for length L:	0.57	---	0.87	---	0.95	---	0.95
Slotted drain or curb opening flow-by (cfs):	4.67	---	0.76	---	0.20	---	0.17
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):						0.35	
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	2.89	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	3.9	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):						na	
approach grade #2 (%):						na	
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	0.00	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	#DIV/0!	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	#DIV/0!	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L Inlet Number:	227		229		231		241
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1345+64	1349+10	1349+10	1356+00	1356+00	1363+05	1363+05
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.103	0.552	0.020	1.300	0.020	1.140	0.020
Sideslope Area (ac):	0.094	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.197**	**0.552**	**0.020**	**1.300**	**0.020**	**1.140**	**0.020**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.83	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.16	0.52	0.02	1.24	0.02	1.08	0.02
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.0	3.1	0.1	7.2	0.1	6.3	0.1
Previous by-pass flow (cfs):	0.0	0.0	0.8	0.1	3.0	0.9	3.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**1.0**	**3.1**	**1.0**	**7.4**	**3.1**	**7.2**	**3.1**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0041	0.0042	0.0042	0.0116	0.0116	0.0127	0.0127
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	2	2	2	2	2	2
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.91	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92
Grate width:	3	--	2	--	2	--	2
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.010	0.052	0.052	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	2.50	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.17	0.0521	0.0521	0.053	0.053	0.053	0.053
Gutter cross-slope Sw: (Sw=Sw-Sx)	0.068	0.052	0.052	0.053	0.053	0.053	0.053
Flooded Width from flowline (ft): before inlet	**9.0**	**7.1**	**4.6**	**8.1**	**5.8**	**7.9**	**5.7**
Depth at flowline (ft): before inlet	0.23	0.37	0.24	0.43	0.31	0.42	0.30
Water cross-area (sq.ft): before inlet	0.59	1.32	0.55	1.73	0.90	1.65	0.87
Velocity V for total discharge (fps): before inlet	1.64	2.33	1.74	4.28	3.44	4.40	3.56
Ratio of gutter depression flow to total Q (Eod):	84.2%	33.2%	48.0%	29.7%	39.5%	30.4%	40.0%
Equivalent cross-slope (Se):	0.059	0.052	0.052	0.053	0.053	0.053	0.053
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	87.2%	---	78.2%	---	67.4%	---	68.1%
Inlet frontal flow in cfs (Qw):	0.84	---	0.75	---	2.09	---	2.11
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.12	---	0.21	---	1.01	---	0.99
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	8.0%	---	28.9%	---	10.8%	---	10.2%
Grate Efficiency (E):	88.3%	---	84.5%	---	70.9%	---	71.4%
Total flow intercepted (cfs):	0.85	---	0.81	---	2.20	---	2.22
Grate flow-by (cfs):	**0.11**	**---**	**0.15**	**---**	**0.90**	**---**	**0.89**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	19.5	---	37.9	---	38.6	---
Length of inlet provided L (ft):		10		15		15	
Interception for length L (cfs):	---	2.23	---	4.40	---	4.25	---
Efficiency for length L:	---	0.73	---	0.60	---	0.59	---
Slotted drain or curb opening flow-by (cfs):	**---**	**0.84**	**---**	**2.99**	**---**	**2.99**	**---**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L							
Inlet Number:		237		239		243	
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	10	10	10	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒⇒	⇒	⇒	⇒
Structure Station:	1365+20	1365+20	1366+95	1366+95	1371+50	1371+50	1373+80
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.354	0.020	0.306	0.020	0.574	0.020	0.424
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.602	0.020	0.369
Contributing watershed area (acres):	0.354	0.020	0.306	0.020	1.176	0.040	0.793
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.82	0.83	0.83
CA	0.34	0.02	0.29	0.02	0.97	0.03	0.66
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	2.0	0.1	1.7	0.1	5.7	0.2	3.9
Previous by-pass flow (cfs):	0.9	1.2	0.2	0.5	0.1	2.6	0.7
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	2.9	1.3	1.9	0.6	5.8	2.8	4.6
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0114	0.0114	0.0095	0.0095	0.0046	0.0046	0.0040
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.91	C-13.60
Grate width:	--	2	--	2	--	3	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.053	0.053	0.029	0.029	0.020	0.020	0.020
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.053	0.053	0.029	0.029	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.053	0.053	0.029	0.029	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	5.7	4.2	7.3	4.8	14.6	10.5	13.5
Depth at flowline (ft): before inlet	0.30	0.22	0.21	0.14	0.41	0.33	0.39
Water cross-area (sq.ft): before inlet	0.85	0.46	0.78	0.34	2.27	1.26	1.97
Velocity V for total discharge (fps): before inlet	3.35	2.73	2.43	1.83	2.55	2.24	2.32
Ratio of gutter depression flow to total Q (Eod):	40.4%	51.7%	32.3%	46.1%	54.0%	68.1%	57.2%
Equivalent cross-slope (Se):	0.053	0.053	0.029	0.029	0.046	0.053	0.047
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	82.3%	---	76.0%	---	73.1%	---
Inlet frontal flow in cfs (Qw):	---	1.04	---	0.47	---	2.06	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	7.2	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	100.0%	---	100.0%	---
Side flow in cfs (Qs):	---	0.22	---	0.15	---	0.76	---
Effective grate length w/clogging:	---	1.65	---	1.65	---	1.65	---
Fraction of side flow interception (Rs):	---	15.5%	---	17.0%	---	9.0%	---
Grate Efficiency (E):	---	85.1%	---	80.0%	---	75.5%	---
Total flow intercepted (cfs):	---	1.08	---	0.50	---	2.13	---
Grate flow-by (cfs):	---	0.19	---	0.12	---	0.69	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	25.3	---	28.9	---	28.2	---	24.1
Length of inlet provided L (ft):	10		15		10		10
Interception for length L (cfs):	1.70	---	1.38	---	3.16	---	2.83
Efficiency for length L:	0.60	---	0.73	---	0.55	---	0.62
Slotted drain or curb opening flow-by (cfs):	1.16	---	0.51	---	2.63	---	1.74
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L							
Inlet Number:	245		248		253		254
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒⇒	⇒	⇒
Structure Station:	1373+80	1376+40	1376+40	1380+96	1380+96	1383+40	1383+40
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.020	0.470	0.020	0.840	0.020	0.200	0.020
Sideslope Area (ac):	0.020	0.310	0.010	0.279	0.010	0.273	0.040
Contributing watershed area (acres):	0.040	0.780	0.030	1.119	0.030	0.473	0.060
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.83	0.85	0.87	0.89	0.87	0.81	0.78
CA	0.03	0.66	0.03	0.99	0.03	0.38	0.05
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.2	3.9	0.2	5.8	0.2	2.2	0.3
Previous by-pass flow (cfs):	1.7	0.3	1.5	0.3	1.1	0.1	0.9
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	1.9	4.2	1.7	6.1	1.3	2.3	1.2
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0040	0.0040	0.0040	0.0040	0.0040	0.0017	0.0017
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91
Grate width:	3	--	3	--	3	--	3
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	9.0	13.1	8.4	10.6	5.3	8.4	6.3
Depth at flowline (ft): before inlet	0.30	0.38	0.29	0.46	0.27	0.38	0.31
Water cross-area (sq.ft): before inlet	0.96	1.86	0.86	2.12	0.61	1.38	0.81
Velocity V for total discharge (fps): before inlet	2.00	2.28	1.97	2.86	2.10	1.66	1.46
Ratio of gutter depression flow to total Q (Eod):	74.9%	58.6%	77.9%	62.1%	89.3%	71.4%	83.5%
Equivalent cross-slope (Se):	0.056	0.048	0.057	0.056	0.065	0.059	0.063
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	79.7%	---	82.6%	---	93.6%	---	88.7%
Inlet frontal flow in cfs (Qw):	1.54	---	1.39	---	1.19	---	1.04
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.39	---	0.29	---	0.08	---	0.13
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	10.8%	---	11.1%	---	16.7%	---	27.9%
Grate Efficiency (E):	81.9%	---	84.5%	---	94.7%	---	91.9%
Total flow intercepted (cfs):	1.58	---	1.42	---	1.21	---	1.08
Grate flow-by (cfs):	0.35	---	0.26	---	0.07	---	0.10
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	23.1	---	24.6	---	12.3	---
Length of inlet provided L (ft):		10		15		5	
Interception for length L (cfs):	---	2.71	---	4.96	---	1.40	---
Efficiency for length L:	---	0.64	---	0.82	---	0.61	---
Slotted drain or curb opening flow-by (cfs):	---	1.53	---	1.12	---	0.90	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L Inlet Number:	255		256		258		259
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1384+10	1386+23	1386+23	1388+70	1388+70	1390+70	1390+70
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.163	0.457	0.020	0.504	0.030	0.428	0.020
Sideslope Area (ac):	0.250	0.704	0.040	0.784	0.050	0.563	0.030
Contributing watershed area (acres):	**0.413**	**1.161**	**0.060**	**1.288**	**0.080**	**0.991**	**0.050**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.80	0.80	0.78	0.80	0.79	0.81	0.80
CA	0.33	0.93	0.05	1.03	0.06	0.80	0.04
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.9	5.4	0.3	6.0	0.4	4.7	0.2
Previous by-pass flow (cfs):	0.1	0.3	2.2	0.3	2.6	0.5	3.3
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**2.0**	**5.7**	**2.4**	**6.4**	**2.9**	**5.2**	**3.6**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0019	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91
Grate width:	3	--	3	--	3	--	3
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (Sw=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**7.8**	**10.4**	**7.2**	**10.8**	**7.8**	**9.9**	**8.5**
Depth at flowline (ft): before inlet	0.36	0.45	0.34	0.47	0.36	0.44	0.38
Water cross-area (sq.ft): before inlet	1.20	2.03	1.03	2.20	1.19	1.87	1.39
Velocity V for total discharge (fps): before inlet	1.69	2.83	2.37	2.89	2.46	2.77	2.56
Ratio of gutter depression flow to total Q (Eod):	74.7%	63.1%	78.0%	61.4%	74.8%	64.8%	71.3%
Equivalent cross-slope (Se):	0.060	0.056	0.061	0.056	0.060	0.057	0.059
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	80.6%	---	83.7%	---	80.7%	---	77.3%
Inlet frontal flow in cfs (Qw):	1.63	---	2.05	---	2.36	---	2.75
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.39	---	0.40	---	0.57	---	0.81
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	22.7%	---	13.8%	---	13.1%	---	12.3%
Grate Efficiency (E):	85.0%	---	86.0%	---	83.2%	---	80.1%
Total flow intercepted (cfs):	1.72	---	2.10	---	2.44	---	2.85
Grate flow-by (cfs):	**0.30**	**---**	**0.34**	**---**	**0.49**	**---**	**0.71**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	24.0	---	25.2	---	22.8	---
Length of inlet provided L (ft):		10		10		5	
Interception for length L (cfs):	---	3.57	---	3.81	---	1.86	---
Efficiency for length L:	---	0.62	---	0.60	---	0.36	---
Slotted drain or curb opening flow-by (cfs):	**---**	**2.17**	**---**	**2.56**	**---**	**3.32**	**---**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L Inlet Number:		261		265			267
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	Flkr ⇒	⇓	SAG ⇓	⇓	Flkr ⇐	⇐
Structure Station:	1391+88	1391+88	1393+42	1393+42	1393+42	1394+95	1394+95
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.237	0.020	0.278	0.100	0.274	0.020	0.518
Sideslope Area (ac):	0.297	0.020	0.264	0.120	0.253	0.020	0.361
Contributing watershed area (acres):	**0.534**	**0.040**	**0.542**	**0.220**	**0.527**	**0.040**	**0.879**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.83	0.83	0.81	0.83	0.83	0.85
CA	0.43	0.03	0.45	0.18	0.44	0.03	0.74
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	2.5	0.2	2.6	1.0	2.6	0.2	4.4
Previous by-pass flow (cfs):	0.7	0.6	0.0	0.0	0.0	0.5	0.8
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**3.2**	**0.8**	**2.7**	**1.0**	**2.6**	**0.7**	**5.2**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0028	0.0028	0.0005	0.0000	0.0005	0.0028	0.0028
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	2	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60
Grate width:	--	3	--	3	--	3	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**8.8**	**4.6**	**11.6**	**NA**	**11.4**	**4.3**	**10.7**
Depth at flowline (ft): before inlet	0.40	0.25	0.50	0.00	0.49	0.23	0.47
Water cross-area (sq.ft): before inlet	1.50	0.48	2.50	0.00	2.45	0.43	2.16
Velocity V for total discharge (fps): before inlet	2.17	1.66	1.06	0.00	1.05	1.62	2.39
Ratio of gutter depression flow to total Q (Eod):	69.7%	93.4%	58.7%	100.0%	59.2%	95.2%	61.7%
Equivalent cross-slope (Se):	0.058	0.066	0.055	0.068	0.055	0.066	0.056
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	96.8%	---	---	---	98.0%	---
Inlet frontal flow in cfs (Qw):	---	0.78	---	---	---	0.68	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	---	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	---	---	100.0%	---
Side flow in cfs (Qs):	---	0.03	---	---	---	0.01	---
Effective grate length w/clogging:	---	1.65	---	---	---	1.65	---
Fraction of side flow interception (Rs):	---	23.3%	---	---	---	24.2%	---
Grate Efficiency (E):	---	97.5%	---	---	---	98.5%	---
Total flow intercepted (cfs):	---	0.78	---	---	---	0.68	---
Grate flow-by (cfs):	---	**0.02**	---	---	---	**0.01**	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	16.5	---	9.4	---	9.3	---	20.6
Length of inlet provided L (ft):	10		10		10		15
Interception for length L (cfs):	2.64	---	2.65	---	2.57	---	4.67
Efficiency for length L:	0.81	---	1.00	---	1.00	---	0.90
Slotted drain or curb opening flow-by (cfs):	**0.61**	---	**0.00**	---	**0.00**	---	**0.50**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):				0.3			
Capacity of grate in a sag (3-sided weir):	---	---	---	2.29	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	3.1	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):				0.401			
approach grade #2 (%):				1.046			
ABS (algebraic diff. in approach grades) (%):	---	---	---	1.45	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	0	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	0	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L							
Inlet Number:		268		272		177	182
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	22	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐	⇐	⇐	⇐	1% ⇐
Structure Station:	1397+40	1397+40	1402+60	1402+60	1410+00	1410+00	1417+64
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.040	1.090	0.060	1.500	0.030	1.520	0.087
Sideslope Area (ac):	0.040	0.842	0.060	0.990	0.020	0.563	0.000
Contributing watershed area (acres):	0.080	1.932	0.120	2.490	0.050	2.083	0.087
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.83	0.84	0.83	0.85	0.85	0.88	0.95
CA	0.07	1.62	0.10	2.12	0.04	1.84	0.08
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.4	9.5	0.6	12.4	0.2	10.8	0.5
Previous by-pass flow (cfs):	3.9	0.5	2.9	0.0	1.2	0.1	0.5
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	4.2	10.0	3.5	12.4	1.4	10.9	1.0
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0072	0.0072	0.0105	0.0105	0.0105	0.0105	0.0057
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.92
Grate width:	3	--	3	--	3	--	2
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.010
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	8.1	11.5	6.8	11.8	4.4	11.1	8.1
Depth at flowline (ft): before inlet	0.37	0.49	0.32	0.50	0.24	0.48	0.23
Water cross-area (sq.ft): before inlet	1.27	2.49	0.93	2.56	0.45	2.31	0.51
Velocity V for total discharge (fps): before inlet	3.35	4.01	3.74	4.85	3.17	4.73	1.95
Ratio of gutter depression flow to total Q (Eod):	73.4%	58.9%	80.3%	58.1%	94.5%	60.4%	87.8%
Equivalent cross-slope (Se):	0.059	0.055	0.062	0.054	0.066	0.055	0.061
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	79.3%	---	85.8%	---	97.6%	---	84.7%
Inlet frontal flow in cfs (Qw):	3.37	---	2.99	---	1.39	---	0.84
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.88	---	0.49	---	0.03	---	0.15
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	7.9%	---	6.6%	---	8.7%	---	6.0%
Grate Efficiency (E):	80.9%	---	86.8%	---	97.8%	---	85.6%
Total flow intercepted (cfs):	3.44	---	3.02	---	1.39	---	0.85
Grate flow-by (cfs):	0.81	---	0.46	---	0.03	---	0.14
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	36.6	---	45.1	---	42.2	---
Length of inlet provided L (ft):		15		25		30	
Interception for length L (cfs):	---	6.12	---	9.54	---	9.74	---
Efficiency for length L:	---	0.61	---	0.77	---	0.89	---
Slotted drain or curb opening flow-by (cfs):	---	3.86	---	2.90	---	1.17	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB 202L

JOB: RMF - University to Southern - EB 202L			
Inlet Number:	183		184
Return Period:	50	50	50
Allowable Spread:	11.2	15.3	15.3
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐
Structure Station:	1417+64	1418+93	1418+93
Location Description:	Grate	Grate	Slotted
Pavement Area (ac):	0.288	0.020	0.795
Sideslope Area (ac):	0.000	0.000	0.000
Contributing watershed area (acres):	**0.288**	**0.020**	**0.795**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95
CA	0.27	0.02	0.76
Precipitation intensity (in/hr):	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.6	0.1	4.4
Previous by-pass flow (cfs):	0.3	1.5	0.0
Discharge added by operator:	---	---	0.3
Total discharge Q (cfs):	**1.9**	**1.6**	**4.7**
SHOULDER AND GUTTER CONFIGURATION:			
Manning's n:	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0053	0.0036	0.0038
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3
Capture Ratio Used:	50%	50%	67%
Inlet ADOT Std:	C-15.92	C-15.92	C-13.60
Grate width:	2	2	--
Grate length:	3.3	3.3	--
Pavement cross-slope (Sx):	0.017	0.036	0.036
Width of gutter from flowline (ft):	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**9.2**	**6.1**	**9.7**
Depth at flowline (ft): before inlet	0.28	0.30	0.43
Water cross-area (sq.ft): before inlet	0.88	0.77	1.78
Velocity V for total discharge (fps): before inlet	2.17	2.15	2.66
Ratio of gutter depression flow to total Q (Eod):	76.2%	84.6%	65.9%
Equivalent cross-slope (Se):	0.056	0.063	0.057
GRATE INLETS ON-GRADE:			
Ratio of grate frontal flow to total flow:	71.1%	78.1%	----
Inlet frontal flow in cfs (Qw):	1.36	1.29	----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	7.2	----
Fraction of frontal flow intercepted (Rf):	100.0%	100.0%	----
Side flow in cfs (Qs):	0.55	0.36	----
Effective grate length w/clogging:	1.65	1.65	----
Fraction of side flow interception (Rs):	8.2%	16.1%	----
Grate Efficiency (E):	73.5%	81.6%	----
Total flow intercepted (cfs):	1.40	1.34	----
Grate flow-by (cfs):	**0.51**	**0.30**	----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:			
Length required for total interception (ft): w/clogging	----	----	21.5
Length of inlet provided L (ft):			10
Interception for length L (cfs):	----	----	3.19
Efficiency for length L:	----	----	0.68
Slotted drain or curb opening flow-by (cfs):	----	----	**1.53**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:			
Head available for weir flow at sag (ft):			
Capacity of grate in a sag (3-sided weir):	----	----	----
Capacity of grate in a sag (4-sided weir):	----	----	----
Length provided of curb-opening or slotted drain at sag:			
Capacity of curb-opening or slotted drain in a sag (weir):	----	----	----
Length of the vertical curve (ft x 100):			
approach grade #1 (%):			
approach grade #2 (%):			
ABS (algebraic diff. in approach grades) (%):	----	----	----
K = Min(Lc/A,167) (Table 5, HEC-12):	----	----	----
Flanking inlets maximum distance (ft):	----	----	----

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:		201		203		209	
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1316+00	1316+00	1318+36	1318+36	1322+45	1322+45	1323+66
Location Description:	Slotted	Grate	Slotted	Grate	Grate	Grate	Slotted
Pavement Area (ac):	0.836	0.020	0.416	0.020	0.748	0.020	0.211
Sideslope Area (ac):	1.110	0.030	0.667	0.030	1.030	0.030	0.215
Contributing watershed area (acres):	1.946	0.050	1.083	0.050	1.778	0.050	0.426
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.80	0.80	0.80	0.81	0.80	0.82
CA	1.57	0.04	0.86	0.04	1.43	0.04	0.35
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	9.2	0.2	5.1	0.2	8.4	0.2	2.1
Previous by-pass flow (cfs):	0.3	3.4	0.6	2.7	0.7	4.0	1.2
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	9.5	3.6	5.7	3.0	9.1	4.3	3.2
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0062	0.0062	0.0062	0.0062	0.0083	0.0083	0.0101
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60
Grate width:	--	3	--	3	--	3	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.036	0.036	0.020	0.020	0.020	0.020	0.010
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	11.6	7.8	13.5	10.0	15.5	11.1	14.3
Depth at flowline (ft): before inlet	0.50	0.36	0.39	0.32	0.43	0.34	0.29
Water cross-area (sq.ft): before inlet	2.54	1.18	1.97	1.16	2.56	1.39	1.20
Velocity V for total discharge (fps): before inlet	3.74	3.05	2.88	2.57	3.55	3.09	2.71
Ratio of gutter depression flow to total Q (Eod):	58.4%	74.9%	57.2%	70.2%	51.4%	65.7%	64.0%
Equivalent cross-slope (Se):	0.055	0.060	0.047	0.054	0.045	0.052	0.047
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	—	80.8%	—	75.2%	—	70.7%	—
Inlet frontal flow in cfs (Qw):	—	2.92	—	2.24	—	3.03	—
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	—	7.2	—	7.2	—	7.2	—
Fraction of frontal flow intercepted (Rf):	—	100.0%	—	100.0%	—	100.0%	—
Side flow in cfs (Qs):	—	0.69	—	0.74	—	1.25	—
Effective grate length w/clogging:	—	1.65	—	1.65	—	1.65	—
Fraction of side flow interception (Rs):	—	9.3%	—	7.1%	—	5.2%	—
Grate Efficiency (E):	—	82.6%	—	77.0%	—	72.3%	—
Total flow intercepted (cfs):	—	2.98	—	2.29	—	3.09	—
Grate flow-by (cfs):	—	0.63	—	0.69	—	1.19	—
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	34.3	—	30.1	—	41.5	—	27.7
Length of inlet provided L (ft):	15		10		15		15
Interception for length L (cfs):	6.13	—	2.94	—	5.03	—	2.45
Efficiency for length L:	0.64	—	0.52	—	0.55	—	0.76
Slotted drain or curb opening flow-by (cfs):	3.38	—	2.75	—	4.05	—	0.79
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	—	—	—	—	—	—	—
Capacity of grate in a sag (4-sided weir):	—	—	—	—	—	—	—
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	—	—	—	—	—	—	—
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	—	—	—	—	—	—	—
K = Min(Lc/A,167) (Table 5, HEC-12):	—	—	—	—	—	—	—
Flanking inlets maximum distance (ft):	—	—	—	—	—	—	—

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:	208		213		282		217
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	1% ⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1323+66	1330+05	1330+05	1333+65	1333+65	1337+00	1337+00
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.020	1.460	0.020	0.803	0.020	0.714	0.020
Sideslope Area (ac):	0.030	0.091	0.030	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.050**	**1.551**	**0.050**	**0.803**	**0.020**	**0.714**	**0.020**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.80	0.94	0.80	0.95	0.95	0.95	0.95
CA	0.04	1.45	0.04	0.76	0.02	0.68	0.02
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.2	8.5	0.2	4.5	0.1	4.0	0.1
Previous by-pass flow (cfs):	0.8	0.3	3.3	1.0	2.3	0.5	2.2
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**1.0**	**8.8**	**3.6**	**5.5**	**2.4**	**4.5**	**2.3**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0101	0.0196	0.0196	0.0187	0.0187	0.0118	0.0118
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	2	2	2	2	2	2
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.91	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92
Grate width:	3	--	2	--	2	--	2
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.010	0.053	0.053	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	2.50	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.17	0.053	0.053	0.053	0.053	0.053	0.053
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.053	0.053	0.053	0.053	0.053	0.053
Flooded Width from flowline (ft): before inlet	**6.5**	**7.8**	**5.6**	**6.6**	**4.8**	**6.7**	**5.2**
Depth at flowline (ft): before inlet	0.21	0.41	0.30	0.35	0.26	0.35	0.28
Water cross-area (sq.ft): before inlet	0.39	1.62	0.82	1.15	0.62	1.18	0.72
Velocity V for total discharge (fps): before inlet	2.62	5.45	4.34	4.75	3.85	3.80	3.23
Ratio of gutter depression flow to total Q (Eod):	93.6%	30.6%	41.0%	35.5%	46.2%	35.1%	43.2%
Equivalent cross-slope (Se):	0.064	0.053	0.053	0.053	0.053	0.053	0.053
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	95.5%	---	69.5%	---	76.0%	---	72.4%
Inlet frontal flow in cfs (Qw):	0.98	---	2.48	---	1.80	---	1.69
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.05	---	1.09	---	0.57	---	0.65
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	3.6%	---	7.4%	---	9.0%	---	11.9%
Grate Efficiency (E):	95.7%	---	71.7%	---	78.2%	---	75.7%
Total flow intercepted (cfs):	0.98	---	2.56	---	1.85	---	1.77
Grate flow-by (cfs):	**0.04**	**---**	**1.01**	**---**	**0.52**	**---**	**0.57**
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	47.9	---	38.6	---	30.9	---
Length of inlet provided L (ft):		20		15		10	
Interception for length L (cfs):	---	5.49	---	3.22	---	2.27	---
Efficiency for length L:	---	0.62	---	0.59	---	0.50	---
Slotted drain or curb opening flow-by (cfs):	**---**	**3.33**	**---**	**2.26**	**---**	**2.22**	**---**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:		283		221		284	
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1339+85	1339+85	1343+60	1343+60	1344+65	1344+65	1345+64
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.323	0.020	0.804	0.020	0.213	0.020	0.165
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.323**	**0.020**	**0.804**	**0.020**	**0.213**	**0.020**	**0.165**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.31	0.02	0.76	0.02	0.20	0.02	0.16
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.8	0.1	4.5	0.1	1.2	0.1	0.9
Previous by-pass flow (cfs):	0.6	1.4	0.3	0.3	0.0	0.3	0.1
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**2.4**	**1.5**	**4.8**	**0.4**	**1.2**	**0.5**	**1.0**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0060	0.0060	0.0047	0.0047	0.0047	0.0047	0.0047
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60
Grate width:	--	2	--	2	--	2	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.053	0.053	0.047	0.047	0.028	0.028	0.015
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.053	0.053	0.047	0.047	0.028	0.028	0.015
Gutter cross-slope Sw: (Sw=Sw-Sx)	0.053	0.053	0.047	0.047	0.028	0.028	0.015
Flooded Width from flowline (ft): before inlet	**6.0**	**5.0**	**8.8**	**3.6**	**7.0**	**4.9**	**9.8**
Depth at flowline (ft): before inlet	0.32	0.27	0.41	0.17	0.20	0.14	0.15
Water cross-area (sq.ft): before inlet	0.94	0.66	1.80	0.30	0.69	0.33	0.72
Velocity V for total discharge (fps): before inlet	2.52	2.24	2.66	1.47	1.76	1.38	1.39
Ratio of gutter depression flow to total Q (Eod):	38.7%	44.8%	27.6%	57.9%	38.7%	49.8%	28.2%
Equivalent cross-slope (Se):	0.053	0.053	0.047	0.047	0.028	0.028	0.015
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	—	74.3%	—	88.5%	—	77.3%	—
Inlet frontal flow in cfs (Qw):	—	1.11	—	0.39	—	0.36	—
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	—	7.2	—	7.2	—	7.2	—
Fraction of frontal flow intercepted (Rf):	—	100.0%	—	100.0%	—	100.0%	—
Side flow in cfs (Qs):	—	0.38	—	0.05	—	0.10	—
Effective grate length w/clogging:	—	1.65	—	1.65	—	1.65	—
Fraction of side flow interception (Rs):	—	20.7%	—	33.2%	—	24.9%	—
Grate Efficiency (E):	—	79.6%	—	92.3%	—	83.0%	—
Total flow intercepted (cfs):	—	1.19	—	0.41	—	0.38	—
Grate flow-by (cfs):	—	**0.30**	—	**0.03**	—	**0.08**	—
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	19.3	—	25.9	—	19.9	—	26.6
Length of inlet provided L (ft):	5		20		10		25
Interception for length L (cfs):	0.99	—	4.45	—	0.87	—	0.99
Efficiency for length L:	0.42	—	0.93	—	0.71	—	0.99
Slotted drain or curb opening flow-by (cfs):	**1.38**	—	**0.33**	—	**0.35**	—	**0.01**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	—	—	—	—	—	—	—
Capacity of grate in a sag (4-sided weir):	—	—	—	—	—	—	—
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	—	—	—	—	—	—	—
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	—	—	—	—	—	—	—
K = Min(Lc/A,167) (Table 5, HEC-12):	—	—	—	—	—	—	—
Flanking inlets maximum distance (ft):	—	—	—	—	—	—	—

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L Inlet Number:	226		228		233		235
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	1% ⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1345+64	1349+10	1349+10	1358+95	1358+95	1363+05	1363+05
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.050	0.711	0.020	1.010	0.020	0.746	0.020
Sideslope Area (ac):	0.000	0.591	0.020	0.321	0.010	0.597	0.020
Contributing watershed area (acres):	0.050	1.302	0.040	1.331	0.030	1.343	0.040
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.84	0.83	0.89	0.87	0.84	0.83
CA	0.05	1.09	0.03	1.18	0.03	1.13	0.03
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.3	6.4	0.2	6.9	0.2	6.6	0.2
Previous by-pass flow (cfs):	0.0	0.0	4.5	0.7	5.7	0.9	5.6
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	0.3	6.4	4.7	7.6	5.9	7.5	5.8
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0049	0.0080	0.0080	0.0118	0.0118	0.0103	0.0103
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.92	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91
Grate width:	2	--	3	--	3	--	3
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.010	0.052	0.052	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	1.00	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.01	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.010	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	7.9	7.6	6.7	7.4	6.7	7.6	6.8
Depth at flowline (ft): before inlet	0.08	0.43	0.39	0.43	0.39	0.44	0.40
Water cross-area (sq.ft): before inlet	0.31	1.54	1.22	1.51	1.24	1.57	1.29
Velocity V for total discharge (fps): before inlet	0.92	4.14	3.86	5.03	4.74	4.76	4.48
Ratio of gutter depression flow to total Q (Eod):	32.3%	73.0%	77.8%	73.6%	77.6%	72.8%	76.9%
Equivalent cross-slope (Se):	0.010	0.064	0.064	0.064	0.065	0.064	0.065
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	55.5%	---	84.1%	---	84.0%	---	83.3%
Inlet frontal flow in cfs (Qw):	0.16	---	3.96	---	4.95	---	4.80
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.13	---	0.75	---	0.95	---	0.96
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	19.6%	---	8.8%	---	6.4%	---	7.0%
Grate Efficiency (E):	64.2%	---	85.5%	---	85.0%	---	84.5%
Total flow intercepted (cfs):	0.18	---	4.03	---	5.01	---	4.87
Grate flow-by (cfs):	0.10	---	0.68	---	0.89	---	0.89
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	28.6	---	34.5	---	32.9	---
Length of inlet provided L (ft):		5		5		5	
Interception for length L (cfs):	---	1.87	---	1.87	---	1.92	---
Efficiency for length L:	---	0.29	---	0.25	---	0.26	---
Slotted drain or curb opening flow-by (cfs):	---	4.52	---	5.75	---	5.57	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L Inlet Number:		238		242		247	249
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	22	22	22	22	22	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	1% ⇒
Structure Station:	1366+95	1366+95	1371+50	1371+50	1376+40	1376+40	1377+00
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Grate
Pavement Area (ac):	0.709	0.020	0.502	0.020	0.911	0.020	0.121
Sideslope Area (ac):	0.894	0.030	0.485	0.020	0.751	0.020	0.075
Contributing watershed area (acres):	1.603	0.050	0.987	0.040	1.662	0.040	0.196
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.80	0.83	0.83	0.84	0.83	0.85
CA	1.30	0.04	0.82	0.03	1.39	0.03	0.17
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	7.6	0.2	4.8	0.2	8.2	0.2	1.0
Previous by-pass flow (cfs):	0.9	3.1	0.6	2.3	0.6	0.8	0.1
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	8.5	3.3	5.4	2.5	8.7	1.0	1.0
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0065	0.0065	0.0040	0.0040	0.0040	0.0040	0.0040
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	50%
Inlet ADOT Std:	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-15.91
Grate width:	--	3	--	3	--	3	3
Grate length:	--	3.3	--	3.3	--	3.3	3.3
Pavement cross-slope (Sx):	0.029	0.029	0.020	0.020	0.020	0.020	0.010
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	12.6	8.3	14.5	10.2	17.8	6.2	9.6
Depth at flowline (ft): before inlet	0.46	0.34	0.41	0.32	0.48	0.24	0.24
Water cross-area (sq.ft): before inlet	2.42	1.13	2.25	1.19	3.30	0.53	0.64
Velocity V for total discharge (fps): before inlet	3.51	2.91	2.40	2.09	2.64	1.86	1.64
Ratio of gutter depression flow to total Q (Eod):	56.8%	74.0%	54.2%	69.5%	46.2%	89.2%	81.9%
Equivalent cross-slope (Se):	0.051	0.058	0.046	0.053	0.042	0.063	0.057
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	79.6%	---	74.5%	---	92.7%	85.1%
Inlet frontal flow in cfs (Qw):	---	2.62	---	1.85	---	0.92	0.89
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	7.2	---	7.2	7.2
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	100.0%	---	100.0%	100.0%
Side flow in cfs (Qs):	---	0.67	---	0.63	---	0.07	0.16
Effective grate length w/clogging:	---	1.65	---	1.65	---	1.65	1.65
Fraction of side flow interception (Rs):	---	8.2%	---	10.1%	---	12.2%	8.0%
Grate Efficiency (E):	---	81.2%	---	77.1%	---	93.6%	86.3%
Total flow intercepted (cfs):	---	2.67	---	1.92	---	0.93	0.90
Grate flow-by (cfs):	---	0.62	---	0.57	---	0.06	0.14
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	34.6	---	26.4	---	34.0	---	---
Length of inlet provided L (ft):	15		10		25		
Interception for length L (cfs):	5.45	---	3.11	---	7.93	---	---
Efficiency for length L:	0.64	---	0.58	---	0.91	---	---
Slotted drain or curb opening flow-by (cfs):	3.06	---	2.29	---	0.80	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:		251		289		257	
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	1380+91	1380+91	1382+15	1382+15	1386+20	1386+20	1388+70
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.685	0.050	0.680	0.070	0.707	0.020	0.547
Sideslope Area (ac):	0.022	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	0.707	0.050	0.680	0.070	0.707	0.020	0.547
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.94	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.67	0.05	0.65	0.07	0.67	0.02	0.52
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	3.9	0.3	3.8	0.4	3.9	0.1	3.0
Previous by-pass flow (cfs):	0.1	0.0	0.0	0.1	0.1	0.9	0.3
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	4.0	0.3	3.8	0.5	4.0	1.0	3.3
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040	0.0040
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	2	2
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60
Grate width:	--	2	--	2	--	2	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Flooded Width from flowline (ft): before inlet	10.0	3.9	9.8	4.5	10.0	6.0	9.3
Depth at flowline (ft): before inlet	0.36	0.14	0.35	0.16	0.36	0.22	0.33
Water cross-area (sq.ft): before inlet	1.80	0.27	1.72	0.37	1.79	0.65	1.55
Velocity V for total discharge (fps): before inlet	2.25	1.19	2.22	1.33	2.24	1.60	2.14
Ratio of gutter depression flow to total Q (Eod):	24.5%	55.0%	25.0%	48.4%	24.6%	38.4%	26.2%
Equivalent cross-slope (Se):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	—	85.7%	—	78.7%	—	66.0%	—
Inlet frontal flow in cfs (Qw):	—	0.27	—	0.39	—	0.69	—
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	—	7.2	—	7.2	—	7.2	—
Fraction of frontal flow intercepted (Rf):	—	100.0%	—	100.0%	—	100.0%	—
Side flow in cfs (Qs):	—	0.05	—	0.10	—	0.35	—
Effective grate length w/clogging:	—	1.65	—	1.65	—	1.65	—
Fraction of side flow interception (Rs):	—	35.7%	—	31.4%	—	24.6%	—
Grate Efficiency (E):	—	90.8%	—	85.4%	—	74.4%	—
Total flow intercepted (cfs):	—	0.29	—	0.42	—	0.77	—
Grate flow-by (cfs):	—	0.03	—	0.07	—	0.27	—
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	27.1	—	26.4	—	27.0	—	24.9
Length of inlet provided L (ft):	25		25		15		10
Interception for length L (cfs):	4.01	—	3.80	—	3.08	—	2.00
Efficiency for length L:	0.99	—	0.99	—	0.77	—	0.60
Slotted drain or curb opening flow-by (cfs):	0.04	—	0.02	—	0.93	—	1.31
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	—	—	—	—	—	—	—
Capacity of grate in a sag (4-sided weir):	—	—	—	—	—	—	—
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	—	—	—	—	—	—	—
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	—	—	—	—	—	—	—
K = Min(Lc/A,167) (Table 5, HEC-12):	—	—	—	—	—	—	—
Flanking inlets maximum distance (ft):	—	—	—	—	—	—	—

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:	291		292		260		264
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	10	10	10	10	10	22	22
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	Flkr ⇒	⇓	SAG ⇓
Structure Station:	1388+70	1390+70	1390+70	1391+76	1391+76	1388+70	1388+70
Location Description:	Grate	Slotted	Grate	Grate	Grate	Slotted	Grate
Pavement Area (ac):	0.020	0.415	0.020	0.216	0.020	0.234	0.080
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.020**	**0.415**	**0.020**	**0.216**	**0.020**	**0.234**	**0.080**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.02	0.39	0.02	0.21	0.02	0.22	0.08
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	0.1	2.3	0.1	1.2	0.1	1.3	0.4
Previous by-pass flow (cfs):	1.3	0.4	1.0	0.3	0.2	0.0	0.1
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**1.4**	**2.7**	**1.1**	**1.5**	**0.3**	**1.3**	**0.5**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0040	0.0039	0.0039	0.0021	0.0021	0.0040	0.0040
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92
Grate width:	2	--	2	--	2	--	2
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Flooded Width from flowline (ft): before inlet	**6.8**	**8.7**	**6.1**	**7.8**	**4.3**	**6.3**	**NA**
Depth at flowline (ft): before inlet	0.24	0.31	0.22	0.28	0.15	0.23	0.00
Water cross-area (sq.ft): before inlet	0.82	1.36	0.68	1.09	0.33	0.73	0.00
Velocity V for total discharge (fps): before inlet	1.73	2.02	1.60	1.37	0.92	1.83	0.00
Ratio of gutter depression flow to total Q (Eod):	34.7%	27.8%	37.7%	30.7%	50.9%	42.8%	100.0%
Equivalent cross-slope (Se):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	60.7%	---	65.1%	---	81.6%	---	---
Inlet frontal flow in cfs (Qw):	0.87	---	0.70	---	0.24	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	---
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	---
Side flow in cfs (Qs):	0.56	---	0.38	---	0.06	---	---
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	---
Fraction of side flow interception (Rs):	22.0%	---	24.7%	---	47.1%	---	---
Grate Efficiency (E):	69.4%	---	73.7%	---	90.2%	---	---
Total flow intercepted (cfs):	0.99	---	0.80	---	0.27	---	---
Grate flow-by (cfs):	**0.44**	---	**0.28**	---	**0.03**	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	22.8	---	14.6	---	16.9	---
Length of inlet provided L (ft):		10		10		15	
Interception for length L (cfs):	---	1.78	---	1.30	---	1.30	---
Efficiency for length L:	---	0.65	---	0.87	---	0.98	---
Slotted drain or curb opening flow-by (cfs):	---	**0.97**	---	**0.19**	---	**0.03**	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							0.3
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	1.80
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	2.6
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							0.4035
approach grade #2 (%):							0.9328
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	1.34
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	0
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	0

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:			293		266		294
Return Period:	50	10	10	10	10	10	10
Allowable Spread:	22	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇓	Flkr ⇐	⇐	⇐	⇐	⇐	⇐
Structure Station:	1388+70	1394+28	1394+28	1394+95	1394+95	1396+20	1396+20
Location Description:	Slotted	Slotted	Grate	Slotted	Grate	Grate	Slotted
Pavement Area (ac):	0.229	0.040	0.353	0.040	0.242	0.040	0.561
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.229**	**0.040**	**0.353**	**0.040**	**0.242**	**0.040**	**0.561**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.22	0.04	0.34	0.04	0.23	0.04	0.53
Precipitation intensity (in/hr):	5.86	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.3	0.2	1.4	0.2	1.0	0.2	2.2
Previous by-pass flow (cfs):	0.0	0.2	0.0	0.1	0.1	0.4	0.3
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**1.3**	**0.3**	**1.4**	**0.3**	**1.1**	**0.6**	**2.5**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0040	0.0021	0.0021	0.0032	0.0032	0.0053	0.0053
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60
Grate width:	--	2	--	2	--	2	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Flooded Width from flowline (ft): before inlet	**6.3**	**4.3**	**7.4**	**3.7**	**6.1**	**4.5**	**7.6**
Depth at flowline (ft): before inlet	0.23	0.15	0.27	0.13	0.22	0.16	0.27
Water cross-area (sq.ft): before inlet	0.72	0.33	0.98	0.25	0.66	0.36	1.05
Velocity V for total discharge (fps): before inlet	1.83	1.02	1.47	1.15	1.60	1.67	2.39
Ratio of gutter depression flow to total Q (Eod):	43.0%	55.7%	38.8%	60.8%	44.2%	54.1%	37.9%
Equivalent cross-slope (Se):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	83.3%	---	88.5%	---	81.6%	---
Inlet frontal flow in cfs (Qw):	---	0.28	---	0.25	---	0.48	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	7.2	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	100.0%	---	100.0%	---
Side flow in cfs (Qs):	---	0.06	---	0.03	---	0.11	---
Effective grate length w/clogging:	---	1.65	---	1.65	---	1.65	---
Fraction of side flow interception (Rs):	---	42.4%	---	37.2%	---	23.2%	---
Grate Efficiency (E):	---	90.4%	---	92.8%	---	85.9%	---
Total flow intercepted (cfs):	---	0.30	---	0.26	---	0.51	---
Grate flow-by (cfs):	---	**0.03**	---	**0.02**	---	**0.08**	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	16.8	---	14.4	---	14.4	---	24.1
Length of inlet provided L (ft):	15		10		10		15
Interception for length L (cfs):	1.28	---	1.26	---	0.93	---	2.08
Efficiency for length L:	0.98	---	0.88	---	0.88	---	0.83
Slotted drain or curb opening flow-by (cfs):	**0.02**	---	**0.17**	---	**0.12**	---	**0.43**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:		270		271		175	
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	10	10	10	10	10	10	10
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐	⇐	⇐	⇐	⇐
Structure Station:	1398+90	1398+90	1402+50	1402+50	1406+15	1406+15	1410+00
Location Description:	Grate	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.040	0.752	0.040	0.792	0.040	0.890	0.040
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	0.040	0.752	0.040	0.792	0.040	0.890	0.040
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.04	0.71	0.04	0.75	0.04	0.85	0.04
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	0.2	3.0	0.2	3.2	0.2	3.6	0.2
Previous by-pass flow (cfs):	1.0	0.3	1.1	0.2	0.8	0.4	1.3
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	1.2	3.3	1.2	3.4	1.0	3.9	1.5
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	50%	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92
Grate width:	2	--	2	--	2	--	2
Grate length:	3.3	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Width of gutter from flowline (ft):	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Gutter depression from horizontal (ft):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.036	0.036	0.036	0.036	0.036	0.036	0.036
Flooded Width from flowline (ft): before inlet	5.2	7.6	5.3	7.7	4.8	8.1	5.7
Depth at flowline (ft): before inlet	0.19	0.27	0.19	0.28	0.17	0.29	0.20
Water cross-area (sq.ft): before inlet	0.49	1.04	0.50	1.06	0.42	1.19	0.58
Velocity V for total discharge (fps): before inlet	2.45	3.16	2.47	3.17	2.33	3.30	2.59
Ratio of gutter depression flow to total Q (Eod):	48.7%	38.0%	48.4%	37.8%	51.3%	36.3%	46.2%
Equivalent cross-slope (Se):	0.036	0.036	0.036	0.036	0.036	0.036	0.036
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	75.0%	---	74.6%	---	78.2%	---	71.7%
Inlet frontal flow in cfs (Qw):	0.91	---	0.93	---	0.77	---	1.08
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2	---	7.2	---	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%	---	100.0%	---	100.0%
Side flow in cfs (Qs):	0.30	---	0.32	---	0.21	---	0.43
Effective grate length w/clogging:	1.65	---	1.65	---	1.65	---	1.65
Fraction of side flow interception (Rs):	13.1%	---	12.9%	---	14.2%	---	12.0%
Grate Efficiency (E):	78.3%	---	77.9%	---	81.3%	---	75.1%
Total flow intercepted (cfs):	0.95	---	0.97	---	0.80	---	1.13
Grate flow-by (cfs):	0.26	---	0.28	---	0.18	---	0.38
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	---	31.9	---	32.2	---	34.4	---
Length of inlet provided L (ft):		15		15		20	
Interception for length L (cfs):	---	2.24	---	2.27	---	3.12	---
Efficiency for length L:	---	0.68	---	0.68	---	0.79	---
Slotted drain or curb opening flow-by (cfs):	---	1.05	---	1.08	---	0.82	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):	0.3						
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):	0.401						
approach grade #2 (%):	1.046						
ABS (algebraic diff. in approach grades) (%):	1.45	---	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	0	---	---	---	---	---	---
Flanking inlets maximum distance (ft):	0	---	---	---	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L							
Inlet Number:	176		178		179		
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	10	10	10	12	12	12	12
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐	⇒	⇒	⇒	LOW PT ⇓
Structure Station:	1410+00	1411+58	1411+58	1415+65	1415+65	1417+35	1417+35
Location Description:	Slotted	Grate	Slotted	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.364	0.040	0.830	0.090	0.040	0.389	0.060
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.364**	**0.040**	**0.830**	**0.090**	**0.040**	**0.389**	**0.060**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.35	0.04	0.79	0.09	0.04	0.37	0.06
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.5	0.2	3.3	0.4	0.2	1.6	0.2
Previous by-pass flow (cfs):	0.5	1.7	0.0	0.0	0.0	0.0	0.2
Discharge added by operator:	---	---	---	---	---		---
Total discharge Q (cfs):	**2.0**	**1.9**	**3.3**	**0.4**	**0.2**	**1.6**	**0.4**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0093	0.0093	0.0093	0.0072	0.0072	0.0032	0.0005
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	2	2	2	2
Capture Ratio Used:	67%	50%	67%	67%	50%	67%	50%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-13.60	C-15.92	C-13.60	C-15.92
Grate width:	--	2	--	--	2	--	2
Grate length:	--	3.3	--	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.010	0.010	0.036	0.036
Width of gutter from flowline (ft):	1.00	1.00	1.00	4.50	4.50	4.50	4.50
Gutter depression from horizontal (ft):	0.036	0.036	0.036	0.167	0.167	0.167	0.167
Gutter cross-slope Sw; (S'w=Sw-Sx)	0.036	0.036	0.036	0.037	0.037	0.037	0.037
Flooded Width from flowline (ft): before inlet	**6.3**	**6.1**	**7.6**	**3.6**	**2.6**	**7.2**	**NA**
Depth at flowline (ft): before inlet	0.23	0.22	0.28	0.13	0.10	0.27	0.00
Water cross-area (sq.ft): before inlet	0.71	0.68	1.05	0.23	0.13	0.96	0.00
Velocity V for total discharge (fps): before inlet	2.78	2.73	3.16	1.54	1.26	1.63	0.00
Ratio of gutter depression flow to total Q (Eod):	43.1%	43.8%	37.9%	100.0%	100.0%	92.7%	100.0%
Equivalent cross-slope (Se):	0.036	0.036	0.036	0.037	0.037	0.037	0.037
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	68.4%	---	---	99.8%	---	---
Inlet frontal flow in cfs (Qw):	---	1.27	---	---	0.16	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	---	7.2	---	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	---	100.0%	---	---
Side flow in cfs (Qs):	---	0.59	---	---	0.00	---	---
Effective grate length w/clogging:	---	1.65	---	---	1.65	---	---
Fraction of side flow interception (Rs):	---	11.0%	---	---	12.2%	---	---
Grate Efficiency (E):	---	71.9%	---	---	99.8%	---	---
Total flow intercepted (cfs):	---	1.34	---	---	0.16	---	---
Grate flow-by (cfs):	---	**0.52**	---	---	**0.00**	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	25.8	---	32.0	11.5	---	16.6	---
Length of inlet provided L (ft):	5		10	15		20	
Interception for length L (cfs):	0.64	---	1.63	0.36	---	1.56	---
Efficiency for length L:	0.32	---	0.49	1.00	---	1.00	---
Slotted drain or curb opening flow-by (cfs):	**1.34**	---	**1.70**	**0.00**	---	**0.00**	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							0.2
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	0.98
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	1.4
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							0.0032
approach grade #2 (%):							0.0045
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	0.01
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	0
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	10

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB 202L

JOB: RMF - University to Southern - WB 202L	
Inlet Number:	181
Return Period:	10
Allowable Spread:	12
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐
Structure Station:	1417+35
Location Description:	Slotted
Pavement Area (ac):	0.750
Sideslope Area (ac):	0.000
Contributing watershed area (acres):	**0.750**
Pavement Runoff Coefficient "C":	0.95
Sideslope Runoff Coefficient "C":	0.70
Composite Runoff Coefficient "C":	0.95
CA	0.71
Precipitation intensity (in/hr):	4.22
Subarea discharge Q (cfs):	3.0
Previous by-pass flow (cfs):	0.0
Discharge added by operator:	0.3
Total discharge Q (cfs):	**3.3**
SHOULDER AND GUTTER CONFIGURATION:	
Manning's n:	0.016
Longitudinal slope S (ft/ft):	0.0045
Inlet type (1=grate, 2=curb opening, 3=slotted):	3
Longitudinal profile (1=on-grade, 2=sag):	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2
Capture Ratio Used:	67%
inlet ADOT Std:	C-13.60
Grate width:	--
Grate length:	--
Pavement cross-slope (Sx):	0.036
Width of gutter from flowline (ft):	4.50
Gutter depression from horizontal (ft):	0.167
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.037
Flooded Width from flowline (ft): before inlet	**9.0**
Depth at flowline (ft): before inlet	0.33
Water cross-area (sq.ft): before inlet	1.48
Velocity V for total discharge (fps): before inlet	2.24
Ratio of gutter depression flow to total Q (Eod):	84.3%
Equivalent cross-slope (Se):	0.037
GRATE INLETS ON-GRADE:	
Ratio of grate frontal flow to total flow:	----
Inlet frontal flow in cfs (Qw):	----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	----
Fraction of frontal flow intercepted (Rf):	----
Side flow in cfs (Qs):	----
Effective grate length w/clogging:	----
Fraction of side flow interception (Rs):	----
Grate Efficiency (E):	----
Total flow intercepted (cfs):	----
Grate flow-by (cfs):	----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:	
Length required for total interception (ft): w/clogging	25.3
Length of inlet provided L (ft):	20
Interception for length L (cfs):	3.11
Efficiency for length L:	0.94
Slotted drain or curb opening flow-by (cfs):	**0.20**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:	
Head available for weir flow at sag (ft):	
Capacity of grate in a sag (3-sided weir):	----
Capacity of grate in a sag (4-sided weir):	----
Length provided of curb-opening or slotted drain at sag:	
Capacity of curb-opening or slotted drain in a sag (weir):	----
Length of the vertical curve (ft x 100):	
approach grade #1 (%):	
approach grade #2 (%):	
ABS (algebraic diff. in approach grades) (%):	----
K = Min(Lc/A,167) (Table 5, HEC-12):	----
Flanking inlets maximum distance (ft):	----

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB Collector Road 1

JOB: RMF - University to Southern - EB Collect Road #1	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:	300	301	302	303	304	305	306
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	8	8	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	Flkr ⇒	SAG ⇓	Flkr ⇐	⇒	Flkr ⇒
Structure Station:	16+00	19+20	20+84	21+45	22+05	28+05	32+40
Location Description:	Curb Opening	Curb Opening	Curb Opening	Curb Opening-D	Curb Opening	Curb Opening	Curb Opening
Pavement Area (ac):	0.570	0.338	0.127	0.082	0.122	0.235	0.398
Sideslope Area (ac):	0.176	0.223	0.136	0.090	0.123	0.124	0.118
Contributing watershed area (acres):	**0.746**	**0.561**	**0.263**	**0.172**	**0.245**	**0.359**	**0.516**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.89	0.85	0.82	0.82	0.82	0.86	0.89
CA	0.66	0.48	0.22	0.14	0.20	0.31	0.46
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	2.8	2.0	0.9	0.6	0.9	1.3	1.9
Previous by-pass flow (cfs):	0.0	0.1	0.3	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**2.8**	**2.2**	**1.2**	**0.6**	**0.9**	**1.3**	**1.9**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0300	0.0196	0.0053	0.0004	0.0048	0.0146	0.0069
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	2	2	2	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	2	1	1	1
Gutter Configuration (1=roli, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	2	2
Capture Ratio Used:	80%	80%	80%	80%	80%	80%	80%
Inlet ADOT Std:	C-15.20	C-15.20	C-15.20	C-15.20	C-15.20	C-15.20	C-15.20
Grate width:	--	--	--	--	--	--	--
Grate length:	--	--	--	--	--	--	--
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.020	0.020	0.020	0.052
Width of gutter from flowline (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.135	0.135	0.135	0.135	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**7.6**	**7.4**	**7.7**	**NA**	**6.7**	**6.2**	**5.3**
Depth at flowline (ft): before inlet	0.25	0.24	0.25	0.00	0.23	0.22	0.31
Water cross-area (sq.ft): before inlet	0.68	0.65	0.68	0.00	0.54	0.48	0.76
Velocity V for total discharge (fps): before inlet	4.14	3.32	1.74	0.00	1.58	2.70	2.57
Ratio of gutter depression flow to total Q (Eod):	68.0%	69.2%	67.7%	100.0%	74.6%	77.6%	74.1%
Equivalent cross-slope (Se):	0.052	0.053	0.052	0.068	0.055	0.057	0.063
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	28.4	22.2	11.8	---	9.6	15.8	13.9
Length of inlet provided L (ft):	23	15	15		11	15	15
Interception for length L (cfs):	2.67	1.87	1.19	---	0.85	1.30	1.95
Efficiency for length L:	0.95	0.87	1.00	---	1.00	1.00	1.00
Slotted drain or curb opening flow-by (cfs):	**0.14**	**0.28**	**0.00**	---	**0.00**	**0.01**	**0.00**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):				0.295			
Capacity of grate in a sag (3-sided weir):	---	---	---	0.00	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	0.0	---	---	---
Length provided of curb-opening or slotted drain at sag:				11.0			
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	3.2	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):				3			
approach grade #2 (%):				0.4813			
ABS (algebraic diff. in approach grades) (%):	---	---	---	3.48	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	0	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	0	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB Collector Road 1

JOB: RMF - University to Southern - EB Collect Road #1			
Inlet Number:	307	308	309
Return Period:	10	10	10
Allowable Spread:	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	SAG ⇓	Flkr ⇐	⇐
Structure Station:	33+35	34+23	34+75
Location Description:	Curb Opening-D	Curb Opening	Curb Opening
Pavement Area (ac):	0.242	0.105	0.167
Sideslope Area (ac):	0.041	0.000	0.000
Contributing watershed area (acres):	**0.283**	**0.105**	**0.167**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.91	0.95	0.95
CA	0.26	0.10	0.16
Precipitation intensity (in/hr):	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.1	0.4	0.7
Previous by-pass flow (cfs):	0.0	0.0	0.0
Discharge added by operator:	---	---	---
Total discharge Q (cfs):	**1.1**	**0.4**	**0.7**
SHOULDER AND GUTTER CONFIGURATION:			
Manning's n:	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0001	0.0064	0.0102
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	2
Longitudinal profile (1=on-grade, 2=sag):	2	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2
Capture Ratio Used:	80%	80%	80%
Inlet ADOT Std:	C-15.20	C-15.20	C-15.20
Grate width:	--	--	--
Grate length:	--	--	--
Pavement cross-slope (Sx):	0.044	0.008	0.008
Width of gutter from flowline (ft):	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**NA**	**6.5**	**7.9**
Depth at flowline (ft): before inlet	0.00	0.17	0.18
Water cross-area (sq.ft): before inlet	0.00	0.29	0.37
Velocity V for total discharge (fps): before inlet	0.00	1.45	1.83
Ratio of gutter depression flow to total Q (Eod):	100.0%	88.0%	81.1%
Equivalent cross-slope (Se):	0.068	0.060	0.056
GRATE INLETS ON-GRADE:			
Ratio of grate frontal flow to total flow:	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---
Side flow in cfs (Qs):	---	---	---
Effective grate length w/clogging:	---	---	---
Fraction of side flow interception (Rs):	---	---	---
Grate Efficiency (E):	---	---	---
Total flow intercepted (cfs):	---	---	---
Grate flow-by (cfs):	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:			
Length required for total interception (ft): w/clogging	---	7.4	10.8
Length of inlet provided L (ft):		7	11
Interception for length L (cfs):	---	0.42	0.67
Efficiency for length L:	---	1.00	1.00
Slotted drain or curb opening flow-by (cfs):	---	**0.00**	**0.00**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:			
Head available for weir flow at sag (ft):	0.484		
Capacity of grate in a sag (3-sided weir):	0.00	---	---
Capacity of grate in a sag (4-sided weir):	0.0	---	---
Length provided of curb-opening or slotted drain at sag:	11.0		
Capacity of curb-opening or slotted drain in a sag (weir):	6.8	---	---
Length of the vertical curve (ft x 100):			
approach grade #1 (%):	1.4595		
approach grade #2 (%):	1.4544		
ABS (algebraic diff. in approach grades) (%):	2.91	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	0	---	---
Flanking inlets maximum distance (ft):	0	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB Collector Road 1

JOB: RMF - University to Southern - WB Collect Road #1	Capture Ratios:	50%			67%	80%	50%
Inlet Number:	400	401		402	403	404	405
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	8	8	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	I% ⇒	⇒	⇒	Flkr ⇒	SAG ⇓	Flkr ⇐
Structure Station:	12+70	13+75	15+75	15+75	22+62	23+25	23+87
Location Description:	Curb Opening	Curb Opening	Slotted	Grate	Grate	Grate	Grate
Pavement Area (ac):	0.344	0.119	0.263	0.020	0.177	0.088	0.188
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	0.344	0.119	0.263	0.020	0.177	0.088	0.188
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.33	0.11	0.25	0.02	0.17	0.08	0.18
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.4	0.5	1.1	0.1	0.7	0.4	0.8
Previous by-pass flow (cfs):	0.3	0.3	0.0	0.6	0.0	0.1	0.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	1.7	0.8	1.1	0.7	0.7	0.5	0.8
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0177	0.0177	0.0243	0.0243	0.0057	0.0004	0.0057
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	3	1	2	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	2	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	4	4	2	2	2
Capture Ratio Used:	80%	80%	67%	50%	80%	80%	80%
Inlet ADOT Std:	C-15.20	C-15.20	C-13.60	C-15.91	C-15.20	C-15.20	C-15.20
Grate width:	--	--	--	3	--	--	--
Grate length:	--	--	--	3.3	--	--	--
Pavement cross-slope (Sx):	0.020	0.010	0.023	0.023	0.023	0.023	0.023
Width of gutter from flowline (ft):	2.00	2.00	2.50	2.50	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.135	0.135	0.052	0.052	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.021	0.021	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	6.8	6.6	5.6	4.8	5.4	NA	5.5
Depth at flowline (ft): before inlet	0.23	0.18	0.12	0.10	0.21	0.00	0.22
Water cross-area (sq.ft): before inlet	0.55	0.33	0.36	0.25	0.42	0.00	0.44
Velocity V for total discharge (fps): before inlet	3.05	2.50	3.08	2.74	1.69	0.00	1.71
Ratio of gutter depression flow to total Q (Eod):	73.9%	85.0%	80.9%	87.1%	82.5%	100.0%	81.2%
Equivalent cross-slope (Se):	0.055	0.059	0.021	0.021	0.060	0.068	0.059
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	---	---	93.4%	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	0.65	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	7.2	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	100.0%	---	---	---
Side flow in cfs (Qs):	---	---	---	0.05	---	---	---
Effective grate length w/clogging:	---	---	---	1.65	---	---	---
Fraction of side flow interception (Rs):	---	---	---	7.3%	---	---	---
Grate Efficiency (E):	---	---	---	93.8%	---	---	---
Total flow intercepted (cfs):	---	---	---	0.66	---	---	---
Grate flow-by (cfs):	---	---	---	0.04	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	18.9	13.5	36.8	---	8.9	---	9.2
Length of inlet provided L (ft):	11	11	10		7		7
Interception for length L (cfs):	1.33	0.79	0.48	---	0.66	---	0.70
Efficiency for length L:	0.79	0.95	0.44	---	0.94	---	0.92
Slotted drain or curb opening flow-by (cfs):	0.35	0.04	0.62	---	0.05	---	0.06
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):						0.319	
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	0.00	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	0.0	---
Length provided of curb-opening or slotted drain at sag:						11.0	
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	3.6	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):						2.9693	
approach grade #2 (%):						0.6867	
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	3.66	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	0	---
Flanking inlets maximum distance (ft):	---	---	---	---	---	0	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB Collector Road 1

JOB: RMF - University to Southern - WB Collect Road #1							
Inlet Number:		406		407		408	
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	8	8	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	Flkr ⇒	Flkr ⇒	⇒	SAG ⇓	⇐	Flkr ⇐	Flkr ⇐
Structure Station:	33+12	33+12	33+93	33+93	33+93	34+75	34+75
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.460	0.003	0.056	0.003	0.142	0.048	0.105
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	**0.460**	**0.003**	**0.056**	**0.003**	**0.142**	**0.048**	**0.105**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
CA	0.44	0.00	0.05	0.00	0.13	0.05	0.10
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.8	0.0	0.2	0.0	0.6	0.2	0.4
Previous by-pass flow (cfs):	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	**1.8**	**0.2**	**0.2**	**0.0**	**0.6**	**0.2**	**0.4**
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0063	0.0063	0.0006	0.0001	0.0013	0.0067	0.008
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	2	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	2	2
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60
Grate width:	--	1.5	--	1.5	--	1.5	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.036	0.036	0.036	0.033	0.026	0.008	0.008
Width of gutter from flowline (ft):	4.50	4.50	2.00	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.170	0.170	0.135	0.135	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.038	0.038	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	**6.7**	**3.1**	**4.5**	**NA**	**6.5**	**2.0**	**5.9**
Depth at flowline (ft): before inlet	0.25	0.12	0.22	0.00	0.25	0.13	0.17
Water cross-area (sq.ft): before inlet	0.84	0.18	0.42	0.00	0.63	0.13	0.26
Velocity V for total discharge (fps): before inlet	2.20	1.32	0.60	0.00	0.90	1.49	1.62
Ratio of gutter depression flow to total Q (Eod):	94.9%	100.0%	85.4%	100.0%	72.3%	100.0%	90.9%
Equivalent cross-slope (Se):	0.038	0.038	0.063	0.068	0.056	0.068	0.062
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	84.8%	---	---	---	99.9%	---
Inlet frontal flow in cfs (Qw):	---	0.20	---	---	---	0.19	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	---	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	---	---	100.0%	---
Side flow in cfs (Qs):	---	0.04	---	---	---	0.00	---
Effective grate length w/clogging:	---	1.65	---	---	---	1.65	---
Fraction of side flow interception (Rs):	---	31.6%	---	---	---	7.6%	---
Grate Efficiency (E):	---	89.6%	---	---	---	99.9%	---
Total flow intercepted (cfs):	---	0.21	---	---	---	0.19	---
Grate flow-by (cfs):	---	**0.02**	---	---	---	**0.00**	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	21.6	---	3.4	---	6.5	---	9.2
Length of inlet provided L (ft):	15		15		15		20
Interception for length L (cfs):	1.62	---	0.25	---	0.57	---	0.42
Efficiency for length L:	0.88	---	1.00	---	1.00	---	1.00
Slotted drain or curb opening flow-by (cfs):	**0.22**	---	**0.00**	---	**0.00**	---	**0.00**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):				0.397			
Capacity of grate in a sag (3-sided weir):	---	---	---	2.36	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	3.6	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):				1.87			
approach grade #2 (%):				1.2036			
ABS (algebraic diff. in approach grades) (%):	---	---	---	3.07	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	0	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	0	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB Collector Road 2

JOB: RMF - University to Southern - EB Collect Road #2	Capture Ratios:	.50%	67%	80%	50%		
Inlet Number:	350	351	352	353	354	355	
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	8	8	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	1% ⇒	⇒	SAG ⇓	Flkr ⇐	Flkr ⇐
Structure Station:	15+90	18+30	18+98	32+73	33+75	34+28	34+28
Location Description:	Curb Opening	Curb Opening	Curb Opening	Curb Opening	Grate	Grate	Slotted
Pavement Area (ac):	0.496	0.164	0.044	0.943	0.167	0.010	0.385
Sideslope Area (ac):	0.610	0.246	0.069	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	1.106	0.410	0.113	0.943	0.167	0.010	0.385
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.80	0.80	0.95	0.95	0.95	0.95
CA	0.90	0.33	0.09	0.90	0.16	0.01	0.37
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	3.8	1.4	0.4	3.8	0.7	0.0	1.5
Previous by-pass flow (cfs):	0.0	0.1	0.2	0.0	0.0	0.4	0.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	3.8	1.5	0.6	3.8	0.7	0.5	1.5
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0165	0.0165	0.0165	0.0074	0.0002	0.0032	0.0032
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	2	2	1	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	2	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	4	4	4
Capture Ratio Used:	80%	80%	80%	80%	50%	50%	67%
Inlet ADOT Std:	C-15.20	C-15.20	C-15.20	C-15.20	C-15.91	C-15.91	C-13.60
Grate width:	--	--	--	--	3	3	--
Grate length:	--	--	--	--	3.3	3.3	--
Pavement cross-slope (Sx):	0.030	0.020	0.010	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	2.00	2.00	2.00	2.00	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.135	0.135	0.135	0.135	0.052	0.052	0.052
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.021	0.021	0.021
Flooded Width from flowline (ft): before inlet	7.9	6.5	5.4	6.7	NA	4.1	5.9
Depth at flowline (ft): before inlet	0.31	0.22	0.17	0.32	0.00	0.14	0.23
Water cross-area (sq.ft): before inlet	1.01	0.51	0.26	1.22	0.00	0.35	0.81
Velocity V for total discharge (fps): before inlet	3.76	2.91	2.41	3.10	0.00	1.31	1.91
Ratio of gutter depression flow to total Q (Eod):	61.2%	75.9%	91.3%	63.0%	100.0%	88.3%	75.8%
Equivalent cross-slope (Se):	0.053	0.056	0.063	0.062	0.021	0.025	0.029
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	---	---	---	---	95.6%	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	0.44	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	100.0%	---
Side flow in cfs (Qs):	---	---	---	---	---	0.02	---
Effective grate length w/clogging:	---	---	---	---	---	1.65	---
Fraction of side flow interception (Rs):	---	---	---	---	---	40.7%	---
Grate Efficiency (E):	---	---	---	---	---	97.4%	---
Total flow intercepted (cfs):	---	---	---	---	---	0.45	---
Grate flow-by (cfs):	---	---	---	---	---	0.01	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	26.7	17.4	11.4	19.1	---	---	19.4
Length of inlet provided L (ft):	23	11	11	23			10
Interception for length L (cfs):	3.68	1.24	0.63	3.78	---	---	1.13
Efficiency for length L:	0.97	0.83	1.00	1.00	---	---	0.73
Slotted drain or curb opening flow-by (cfs):	0.11	0.25	0.00	0.00	---	---	0.42
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):					0.48		
Capacity of grate in a sag (3-sided weir):	---	---	---	---	4.64	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	6.3	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):					0.0032		
approach grade #2 (%):					0.00018		
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	0.00	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	0	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	0	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - EB Collector Road 2

JOB: RMF - University to Southern - EB Collect Road #2		
Inlet Number:	356	357
Return Period:	10	10
Allowable Spread:	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐
Structure Station:	37+55	38+61
Location Description:	Curb Opening	Curb Opening
Pavement Area (ac):	0.129	0.214
Sideslope Area (ac):	0.018	0.000
Contributing watershed area (acres):	**0.147**	**0.214**
Pavement Runoff Coefficient "C":	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70
Composite Runoff Coefficient "C":	0.92	0.95
CA	0.14	0.20
Precipitation intensity (in/hr):	4.22	4.22
Subarea discharge Q (cfs):	0.6	0.9
Previous by-pass flow (cfs):	0.2	0.0
Discharge added by operator:	---	---
Total discharge Q (cfs):	**0.8**	**0.9**
SHOULDER AND GUTTER CONFIGURATION:		
Manning's n:	0.016	0.016
Longitudinal slope S (ft/ft):	0.0108	0.0108
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2
Capture Ratio Used:	80%	80%
Inlet ADOT Std:	C-15.20	C-15.20
Grate width:	--	--
Grate length:	--	--
Pavement cross-slope (Sx):	0.010	0.010
Width of gutter from flowline (ft):	2.00	2.00
Gutter depression from horizontal (ft):	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068
Flooded Width from flowline (ft): before inlet	**7.4**	**8.0**
Depth at flowline (ft): before inlet	0.19	0.19
Water cross-area (sq.ft): before inlet	0.39	0.43
Velocity V for total discharge (fps): before inlet	1.96	1.98
Ratio of gutter depression flow to total Q (Eod):	80.2%	76.8%
Equivalent cross-slope (Se):	0.056	0.054
GRATE INLETS ON-GRADE:		
Ratio of grate frontal flow to total flow:	----	----
Inlet frontal flow in cfs (Qw):	----	----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	----	----
Fraction of frontal flow intercepted (Rf):	----	----
Side flow in cfs (Qs):	----	----
Effective grate length w/clogging:	----	----
Fraction of side flow interception (Rs):	----	----
Grate Efficiency (E):	----	----
Total flow intercepted (cfs):	----	----
Grate flow-by (cfs):	----	----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:		
Length required for total interception (ft): w/clogging	11.6	12.4
Length of inlet provided L (ft):	11	7
Interception for length L (cfs):	0.76	0.66
Efficiency for length L:	1.00	0.77
Slotted drain or curb opening flow-by (cfs):	**0.00**	**0.19**
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:		
Head available for weir flow at sag (ft):		
Capacity of grate in a sag (3-sided weir):	----	----
Capacity of grate in a sag (4-sided weir):	----	----
Length provided of curb-opening or slotted drain at sag:		
Capacity of curb-opening or slotted drain in a sag (weir):	----	----
Length of the vertical curve (ft x 100):		
approach grade #1 (%):		
approach grade #2 (%):		
ABS (algebraic diff. in approach grades) (%):	----	----
K = Min(Lc/A,167) (Table 5, HEC-12):	----	----
Flanking inlets maximum distance (ft):	----	----

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB Collector Road 2

JOB: RMF - University to Southern - WB Collect Road #2	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:		450	451	452	453		454
Return Period:	10	10	10	10	10	10	10
Allowable Spread:	8	8	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	1% ⇒	⇒	⇒	⇓	SAG ⇓
Structure Station:	15+50	15+50	16+19	21+80	31+62	32+50	32+50
Location Description:	Slotted	Grate	Grate	Curb Opening	Curb Opening	CO Wing	Curb Opening
Pavement Area (ac):	0.674	0.020	0.048	0.385	0.709	0.059	0.003
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.351	0.058	0.003
Contributing watershed area (acres):	0.674	0.020	0.048	0.385	1.060	0.117	0.006
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.87	0.83	0.83
CA	0.64	0.02	0.05	0.37	0.92	0.10	0.00
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	2.7	0.1	0.2	1.5	3.9	0.4	0.0
Previous by-pass flow (cfs):	0.0	1.3	0.4	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	2.7	1.4	0.6	1.6	3.9	0.4	0.0
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0116	0.0116	0.0116	0.0143	0.0075	0.0008	0.0001
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	1	2	2	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2	2	2
Capture Ratio Used:	67%	50%	50%	80%	80%	80%	80%
Inlet ADOT Std:	C-13.60	C-15.92	C-15.92	C-15.20	C-15.20	C-15.20	C-15.20
Grate width:	--	2	2	--	--	--	--
Grate length:	--	3.3	3.3	--	--	--	--
Pavement cross-slope (Sx):	0.039	0.039	0.011	0.021	0.041	0.041	0.041
Width of gutter from flowline (ft):	4.50	4.50	4.50	2.00	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.135	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.038	0.038	0.038	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	6.7	5.3	3.8	6.7	7.8	4.9	NA
Depth at flowline (ft): before inlet	0.26	0.20	0.14	0.23	0.37	0.25	0.00
Water cross-area (sq.ft): before inlet	0.88	0.54	0.27	0.56	1.31	0.54	0.00
Velocity V for total discharge (fps): before inlet	3.07	2.60	2.06	2.77	2.98	0.75	0.00
Ratio of gutter depression flow to total Q (Eod):	94.5%	99.3%	100.0%	73.8%	58.2%	80.2%	100.0%
Equivalent cross-slope (Se):	0.038	0.038	0.038	0.055	0.056	0.062	0.068
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	70.1%	98.4%	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	0.98	0.55	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	7.2	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	100.0%	---	---	---	---
Side flow in cfs (Qs):	---	0.42	0.01	---	---	---	---
Effective grate length w/clogging:	---	1.65	1.65	---	---	---	---
Fraction of side flow interception (Rs):	---	13.0%	5.7%	---	---	---	---
Grate Efficiency (E):	---	74.0%	98.5%	---	---	---	---
Total flow intercepted (cfs):	---	1.03	0.55	---	---	---	---
Grate flow-by (cfs):	---	0.36	0.01	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	30.4	---	---	17.1	20.6	3.8	---
Length of inlet provided L (ft):	10			15	23	3.5	
Interception for length L (cfs):	1.38	---	---	1.52	3.92	0.40	---
Efficiency for length L:	0.51	---	---	0.98	1.00	0.99	---
Slotted drain or curb opening flow-by (cfs):	1.32	---	---	0.04	0.00	0.00	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							0.33
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---	---	0.00
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---	---	0.0
Length provided of curb-opening or slotted drain at sag:							4.0
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	1.4
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							2.4756
approach grade #2 (%):							0.9484
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---	---	3.42
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---	---	0
Flanking inlets maximum distance (ft):	---	---	---	---	---	---	0

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - WB Collector Road 2

JOB: RMF - University to Southern - WB Collect Road #2			
Inlet Number:		455	456
Return Period:	10	10	10
Allowable Spread:	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇓	⇐	⇐
Structure Station:	32+50	33+37	38+50
Location Description:	CO Wing	Curb Opening	Grate
Pavement Area (ac):	0.080	0.700	0.088
Sideslope Area (ac):	0.052	0.300	0.000
Contributing watershed area (acres):	0.132	1.000	0.088
Pavement Runoff Coefficient "C":	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.85	0.88	0.95
CA	0.11	0.88	0.08
Precipitation intensity (in/hr):	4.22	4.22	4.22
Subarea discharge Q (cfs):	0.5	3.7	0.4
Previous by-pass flow (cfs):	0.0	0.0	0.0
Discharge added by operator:	---	---	---
Total discharge Q (cfs):	0.5	3.7	0.4
SHOULDER AND GUTTER CONFIGURATION:			
Manning's n:	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0009	0.0075	0.010
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2
Capture Ratio Used:	80%	80%	50%
Inlet ADOT Std:	C-15.20	C-15.20	C-15.92
Grate width:	--	--	1.5
Grate length:	--	--	3.3
Pavement cross-slope (Sx):	0.041	0.041	0.005
Width of gutter from flowline (ft):	2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.135	0.135	0.135
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	5.1	7.7	5.6
Depth at flowline (ft): before inlet	0.26	0.37	0.15
Water cross-area (sq.ft): before inlet	0.58	1.26	0.20
Velocity V for total discharge (fps): before inlet	0.82	2.94	1.74
Ratio of gutter depression flow to total Q (Eod):	78.4%	59.2%	95.8%
Equivalent cross-slope (Se):	0.062	0.057	0.065
GRATE INLETS ON-GRADE:			
Ratio of grate frontal flow to total flow:	---	---	94.0%
Inlet frontal flow in cfs (Qw):	---	---	0.33
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	7.2
Fraction of frontal flow intercepted (Rf):	---	---	100.0%
Side flow in cfs (Qs):	---	---	0.02
Effective grate length w/clogging:	---	---	1.65
Fraction of side flow interception (Rs):	---	---	3.8%
Grate Efficiency (E):	---	---	94.2%
Total flow intercepted (cfs):	---	---	0.33
Grate flow-by (cfs):	---	---	0.02
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:			
Length required for total interception (ft): w/clogging	4.2	20.1	---
Length of inlet provided L (ft):	3.5	23	
Interception for length L (cfs):	0.45	3.71	---
Efficiency for length L:	0.96	1.00	---
Slotted drain or curb opening flow-by (cfs):	0.02	0.00	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:			
Head available for weir flow at sag (ft):	0.397		
Capacity of grate in a sag (3-sided weir):	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---
Length provided of curb-opening or slotted drain at sag:			
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---
Length of the vertical curve (ft x 100):			
approach grade #1 (%):	1.87		
approach grade #2 (%):	1.2036		
ABS (algebraic diff. in approach grades) (%):	3.07	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	0	---	---
Flanking inlets maximum distance (ft):	0	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - University Drive

JOB: RMF - University to Southern - University Drive	Capture Ratios:	50%	67%	80%	50%	
Inlet Number:	702	700		703	701	705
Return Period:	10	10		10	10	10
Allowable Spread:	11.5	11.5		11.5	10.5	11.7
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒		⇒	⇒	⇒
Structure Station:	21+51	23+90		21+63	23+90	14+90
Location Description:	Curb Opening	Curb Opening		Curb Opening	Curb Opening	Curb Opening
Pavement Area (ac):	0.540	0.206		0.609	0.307	0.414
Sideslope Area (ac):	0.000	0.000		0.000	0.000	0.000
Contributing watershed area (acres):	0.540	0.206		0.609	0.307	0.414
Pavement Runoff Coefficient "C":	0.95	0.95		0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70		0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95		0.95	0.95	0.95
CA	0.51	0.20		0.58	0.29	0.39
Precipitation intensity (in/hr):	4.22	4.22		4.22	4.22	4.22
Subarea discharge Q (cfs):	2.2	0.8		2.4	1.2	1.7
Previous by-pass flow (cfs):	0.0	0.0		0.0	0.0	0.0
Discharge added by operator:	---	---		---	---	---
Total discharge Q (cfs):	2.2	0.8		2.4	1.2	1.7
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016		0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0086	0.0146		0.0089	0.0146	0.0022
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2		2	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1		1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2		2	2	2
Capture Ratio Used:	80%	80%		80%	80%	80%
Inlet ADOT Std:	C-15.20	C-15.20		C-15.20	C-15.20	MAG 532
Grate width:	--	--		--	--	--
Grate length:	--	--		--	--	--
Pavement cross-slope (Sx):	0.020	0.020		0.020	0.020	0.020
Width of gutter from flowline (ft):	2.00	2.00		2.00	2.00	1.40
Gutter depression from horizontal (ft):	0.22	0.22		0.22	0.22	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.110	0.110		0.110	0.110	0.121
Flooded Width from flowline (ft): before inlet	8.1	2.8		8.6	4.5	10.8
Depth at flowline (ft): before inlet	0.34	0.24		0.35	0.27	0.36
Water cross-area (sq.ft): before inlet	0.83	0.26		0.91	0.38	1.26
Velocity V for total discharge (fps): before inlet	2.60	3.18		2.68	3.22	1.32
Ratio of gutter depression flow to total Q (Eod):	72.8%	99.6%		70.0%	94.2%	43.1%
Equivalent cross-slope (Se):	0.086	0.110		0.083	0.105	0.064
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---		---	---	---
Inlet frontal flow in cfs (Qw):	---	---		---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---		---	---	---
Fraction of frontal flow intercepted (Rf):	---	---		---	---	---
Side flow in cfs (Qs):	---	---		---	---	---
Effective grate length w/clogging:	---	---		---	---	---
Fraction of side flow interception (Rs):	---	---		---	---	---
Grate Efficiency (E):	---	---		---	---	---
Total flow intercepted (cfs):	---	---		---	---	---
Grate flow-by (cfs):	---	---		---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	13.0	8.8		14.1	10.7	9.2
Length of inlet provided L (ft):	15	11		15	15	8
Interception for length L (cfs):	2.16	0.83		2.44	1.23	1.62
Efficiency for length L:	1.00	1.00		1.00	1.00	0.97
Slotted drain or curb opening flow-by (cfs):	0.00	0.00		0.00	0.00	0.04
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):						
Capacity of grate in a sag (3-sided weir):	---	---		---	---	---
Capacity of grate in a sag (4-sided weir):	---	---		---	---	---
Length provided of curb-opening or slotted drain at sag:						
Capacity of curb-opening or slotted drain in a sag (weir):	---	---		---	---	---
Length of the vertical curve (ft x 100):						
approach grade #1 (%):						
approach grade #2 (%):						
ABS (algebraic diff. in approach grades) (%):	---	---		---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---		---	---	---
Flanking inlets maximum distance (ft):	---	---		---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - University Drive

JOB: RMF - University to Southern - University Drive					
Inlet Number:	707	709	704	706	708
Return Period:	10	10	10	10	10
Allowable Spread:	11.7	11.7	16	15.3	13.4
RATIONAL METHOD HYDROLOGY COMPUTATION:	SAG ⇓	⇐	⇒	SAG ⇓	⇐
Structure Station:	14+10	13+50	14+90	14+30	13+75
Location Description:	Curb Opening	Curb Opening	Curb Opening	Curb Opening	Curb Opening
Pavement Area (ac):	0.180	0.571	0.493	0.215	0.530
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.000
Contributing watershed area (acres):	0.180	0.571	0.493	0.215	0.530
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95
CA	0.17	0.54	0.47	0.20	0.50
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	0.7	2.3	2.0	0.9	2.1
Previous by-pass flow (cfs):	0.4	0.0	0.0	0.4	0.0
Discharge added by operator:	---	---	---	---	---
Total discharge Q (cfs):	1.1	2.3	2.0	1.3	2.1
SHOULDER AND GUTTER CONFIGURATION:					
Manning's n:	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0001	0.0034	0.0022	0.0001	0.0034
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	2	2	2
Longitudinal profile (1=on-grade, 2=sag):	2	1	1	2	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	2
Capture Ratio Used:	80%	80%	80%	80%	80%
Inlet ADOT Std:	MAG 532	MAG 532	MAG 532	MAG 532	MAG 532
Grate width:	--	--	--	--	--
Grate length:	--	--	--	--	--
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.020	0.020
Width of gutter from flowline (ft):	1.40	1.40	1.40	1.40	1.40
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (Sw=Sw-Sx)	0.121	0.121	0.121	0.121	0.121
Flooded Width from flowline (ft): before inlet	NA	11.3	11.6	NA	10.9
Depth at flowline (ft): before inlet	0.00	0.37	0.37	0.00	0.36
Water cross-area (sq.ft): before inlet	0.00	1.37	1.45	0.00	1.29
Velocity V for total discharge (fps): before inlet	0.00	1.67	1.36	0.00	1.65
Ratio of gutter depression flow to total Q (Eod):	100.0%	41.2%	39.9%	100.0%	42.5%
Equivalent cross-slope (Se):	0.121	0.062	0.060	0.121	0.063
GRATE INLETS ON-GRADE:					
Ratio of grate frontal flow to total flow:	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:					
Length required for total interception (ft): w/clogging	---	12.3	10.2	---	11.7
Length of inlet provided L (ft):		8	8		8
Interception for length L (cfs):	---	1.95	1.85	---	1.85
Efficiency for length L:	---	0.85	0.93	---	0.87
Slotted drain or curb opening flow-by (cfs):	---	0.34	0.13	---	0.27
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:					
Head available for weir flow at sag (ft):	0.23			0.23	
Capacity of grate in a sag (3-sided weir):	0.00	---	---	0.00	---
Capacity of grate in a sag (4-sided weir):	0.0	---	---	0.0	---
Length provided of curb-opening or slotted drain at sag:	8.0			8.0	
Capacity of curb-opening or slotted drain in a sag (weir):	1.6	---	---	1.6	---
Length of the vertical curve (ft x 100):	2.0			2.0	
approach grade #1 (%):	0.7058			0.7058	
approach grade #2 (%):	0.2673			0.2673	
ABS (algebraic diff. in approach grades) (%):	0.97	---	---	0.97	---
K = Min(Lc/A,167) (Table 5, HEC-12):	167	---	---	167	---
Flanking inlets maximum distance (ft):	32	---	---	32	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - University Dr Ramp D

JOB: RMF - University to Southern - University Dr Ramp D	Capture Ratios:	50%	67%	80%	50%
Inlet Number:		550			
Return Period:	50	50			
Allowable Spread:	14	14			
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒			
Structure Station:	21+06	21+06			
Location Description:	Slotted	Grate			
Pavement Area (ac):	0.521	0.010			
Sideslope Area (ac):	0.627	0.030			
Contributing watershed area (acres):	1.148	0.040			
Pavement Runoff Coefficient "C":	0.95	0.95			
Sideslope Runoff Coefficient "C":	0.70	0.70			
Composite Runoff Coefficient "C":	0.81	0.76			
CA	0.93	0.03			
Precipitation intensity (in/hr):	5.86	5.86			
Subarea discharge Q (cfs):	5.5	0.2			
Previous by-pass flow (cfs):	0.0	4.3			
Discharge added by operator:	---	---			
Total discharge Q (cfs):	5.5	4.5			
SHOULDER AND GUTTER CONFIGURATION:					
Manning's n:	0.016	0.016			
Longitudinal slope S (ft/ft):	0.0230	0.0230			
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1			
Longitudinal profile (1=on-grade, 2=sag):	1	1			
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3			
Capture Ratio Used:	67%	50%			
Inlet ADOT Std:	C-13.60	C-15.91			
Grate width:	--	3			
Grate length:	--	3.3			
Pavement cross-slope (Sx):	0.026	0.026			
Width of gutter from flowline (ft):	2.50	2.50			
Gutter depression from horizontal (ft):	0.17	0.17			
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068			
Flooded Width from flowline (ft): before inlet	8.4	7.6			
Depth at flowline (ft): before inlet	0.32	0.30			
Water cross-area (sq.ft): before inlet	1.05	0.88			
Velocity V for total discharge (fps): before inlet	5.24	5.06			
Ratio of gutter depression flow to total Q (Eod):	75.0%	79.1%			
Equivalent cross-slope (Se):	0.058	0.059			
GRATE INLETS ON-GRADE:					
Ratio of grate frontal flow to total flow:	---	84.2%			
Inlet frontal flow in cfs (Qw):	---	3.75			
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2			
Fraction of frontal flow intercepted (Rf):	---	100.0%			
Side flow in cfs (Qs):	---	0.70			
Effective grate length w/clogging:	---	1.65			
Fraction of side flow interception (Rs):	---	2.9%			
Grate Efficiency (E):	---	84.7%			
Total flow intercepted (cfs):	---	3.77			
Grate flow-by (cfs):	---	0.68			
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:					
Length required for total interception (ft): w/clogging	39.1	---			
Length of inlet provided L (ft):	5				
Interception for length L (cfs):	1.19	---			
Efficiency for length L:	0.22	---			
Slotted drain or curb opening flow-by (cfs):	4.28	---			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:					
Head available for weir flow at sag (ft):					
Capacity of grate in a sag (3-sided weir):	---	---			
Capacity of grate in a sag (4-sided weir):	---	---			
Length provided of curb-opening or slotted drain at sag:					
Capacity of curb-opening or slotted drain in a sag (weir):	---	---			
Length of the vertical curve (ft x 100):					
approach grade #1 (%):					
approach grade #2 (%):					
ABS (algebraic diff. in approach grades) (%):	---	---			
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---			
Flanking inlets maximum distance (ft):	---	---			

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - University Dr Ramp C

JOB: RMF - University to Southern - University Dr Ramp C	Capture Ratios:	50%	67%	80%	50%
Inlet Number:	**500**	**500**			
Return Period:	50	50			
Allowable Spread:	14	14			
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒			
Structure Station:	**20+55**	**20+55**			
Location Description:	Slotted	Grate			
Pavement Area (ac):	0.967	0.010			
Sideslope Area (ac):	0.000	0.000			
Contributing watershed area (acres):	**0.967**	**0.010**			
Pavement Runoff Coefficient "C":	0.95	0.95			
Sideslope Runoff Coefficient "C":	0.70	0.70			
Composite Runoff Coefficient "C":	0.95	0.95			
CA	0.92	0.01			
Precipitation intensity (in/hr):	5.86	5.86			
Subarea discharge Q (cfs):	5.4	0.1			
Previous by-pass flow (cfs):	0.0	1.6			
Discharge added by operator:	---	---			
Total discharge Q (cfs):	**5.4**	**1.7**			
SHOULDER AND GUTTER CONFIGURATION:					
Manning's n:	0.016	0.016			
Longitudinal slope S (ft/ft):	0.0246	0.0246			
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1			
Longitudinal profile (1=on-grade, 2=sag):	1	1			
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	4	4			
Capture Ratio Used:	67%	50%			
Inlet ADOT Std:	C-13.60	C-15.91			
Grate width:	--	3			
Grate length:	--	3.3			
Pavement cross-slope (Sx):	0.023	0.023			
Width of gutter from flowline (ft):	2.50	2.50			
Gutter depression from horizontal (ft):	0.052	0.052			
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.021	0.021			
Flooded Width from flowline (ft): before inlet	**10.1**	**6.5**			
Depth at flowline (ft): before inlet	0.23	0.14			
Water cross-area (sq.ft): before inlet	1.16	0.48			
Velocity V for total discharge (fps): before inlet	4.66	3.45			
Ratio of gutter depression flow to total Q (Eod):	58.1%	74.8%			
Equivalent cross-slope (Se):	0.022	0.021			
GRATE INLETS ON-GRADE:					
Ratio of grate frontal flow to total flow:	---	82.3%			
Inlet frontal flow in cfs (Qw):	---	1.37			
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2			
Fraction of frontal flow intercepted (Rf):	---	100.0%			
Side flow in cfs (Qs):	---	0.29			
Effective grate length w/clogging:	---	1.65			
Fraction of side flow interception (Rs):	---	5.0%			
Grate Efficiency (E):	---	83.2%			
Total flow intercepted (cfs):	---	1.39			
Grate flow-by (cfs):	**---**	**0.28**			
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:					
Length required for total interception (ft): w/clogging	71.3	---			
Length of inlet provided L (ft):	35				
Interception for length L (cfs):	3.82	---			
Efficiency for length L:	0.70	---			
Slotted drain or curb opening flow-by (cfs):	**1.61**	**---**			
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:					
Head available for weir flow at sag (ft):					
Capacity of grate in a sag (3-sided weir):	---	---			
Capacity of grate in a sag (4-sided weir):	---	---			
Length provided of curb-opening or slotted drain at sag:					
Capacity of curb-opening or slotted drain in a sag (weir):	---	---			
Length of the vertical curve (ft x 100):					
approach grade #1 (%):					
approach grade #2 (%):					
ABS (algebraic diff. in approach grades) (%):	---	---			
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---			
Flanking inlets maximum distance (ft):	---	---			

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - Apache Blvd

JOB: RMF - University to Southern - Apache Blvd	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:	726	731	733		727	732	735
Return Period:	10	10	10		10	10	10
Allowable Spread:	10.5	11.5	11.5		10.5	11.5	11.5
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇐	⇐	⇐		⇐	⇐	⇐
Structure Station:	24+27	21+53	16+65		24+27	22+15	17+25
Location Description:	Curb Opening	Curb Opening	Curb Opening		Curb Opening	Curb Opening	Curb Opening
Pavement Area (ac):	0.327	0.612	0.746		0.212	0.524	0.622
Sideslope Area (ac):	0.000	0.000	0.000		0.000	0.000	0.000
Contributing watershed area (acres):	0.327	0.612	0.746		0.212	0.524	0.622
Pavement Runoff Coefficient "C":	0.95	0.95	0.95		0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70		0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95		0.95	0.95	0.95
CA	0.31	0.58	0.71		0.20	0.50	0.59
Precipitation intensity (in/hr):	4.22	4.22	4.22		4.22	4.22	4.22
Subarea discharge Q (cfs):	1.3	2.5	3.0		0.8	2.1	2.5
Previous by-pass flow (cfs):	0.0	0.0	0.0		0.0	0.0	0.0
Discharge added by operator:	---	---	---		---	---	---
Total discharge Q (cfs):	1.3	2.5	3.0		0.8	2.1	2.5
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016		0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0070	0.0082	0.0070		0.0070	0.0082	0.0082
Inlet type (1=grate, 2=curb opening, 3=slotted):	2	2	2		2	2	2
Longitudinal profile (1=on-grade, 2=sag):	1	1	1		1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2		2	2	2
Capture Ratio Used:	80%	80%	80%		80%	80%	80%
Inlet ADOT Std:	MAG 532	C-15.20	C-15.20		C-15.20	C-15.20	C-15.20
Grate width:	--	--	--		--	--	--
Grate length:	--	--	--		--	--	--
Pavement cross-slope (Sx):	0.020	0.020	0.020		0.020	0.020	0.020
Width of gutter from flowline (ft):	1.40	2.00	2.00		2.00	2.00	2.00
Gutter depression from horizontal (ft):	0.17	0.22	0.22		0.22	0.22	0.22
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.121	0.110	0.110		0.110	0.110	0.110
Flooded Width from flowline (ft): before inlet	7.4	8.8	10.1		4.5	8.0	8.8
Depth at flowline (ft): before inlet	0.29	0.36	0.38		0.27	0.34	0.36
Water cross-area (sq.ft): before inlet	0.64	0.95	1.20		0.38	0.83	0.96
Velocity V for total discharge (fps): before inlet	2.04	2.59	2.48		2.23	2.54	2.60
Ratio of gutter depression flow to total Q (Eod):	61.2%	68.9%	61.6%		94.2%	73.1%	68.4%
Equivalent cross-slope (Se):	0.082	0.082	0.075		0.105	0.086	0.082
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	---	---		---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---		---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---		---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---		---	---	---
Side flow in cfs (Qs):	---	---	---		---	---	---
Effective grate length w/clogging:	---	---	---		---	---	---
Fraction of side flow interception (Rs):	---	---	---		---	---	---
Grate Efficiency (E):	---	---	---		---	---	---
Total flow intercepted (cfs):	---	---	---		---	---	---
Grate flow-by (cfs):	---	---	---		---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	10.2	13.9	15.1		7.3	12.7	14.0
Length of inlet provided L (ft):	7	15	23		7	15	15
Interception for length L (cfs):	1.15	2.45	2.99		0.85	2.10	2.49
Efficiency for length L:	0.88	1.00	1.00		1.00	1.00	1.00
Slotted drain or curb opening flow-by (cfs):	0.16	0.00	0.00		0.00	0.00	0.00
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):							
Capacity of grate in a sag (3-sided weir):	---	---	---		---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---		---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---		---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):							
approach grade #2 (%):							
ABS (algebraic diff. in approach grades) (%):	---	---	---		---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---		---	---	---
Flanking inlets maximum distance (ft):	---	---	---		---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - Broadway Rd Ramp B

JOB: RMF - University to Southern - Broadway Road Ramp B	Capture Ratios:	50%	67%	80%	50%
Inlet Number:	625		626		
Return Period:	50	50	50		
Allowable Spread:	7.5	7.5	7.5		
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	Flkr ⇒	Flkr ⇒		
Structure Station:	21+15	23+75	23+75		
Location Description:	Grate	Slotted	Grate		
Pavement Area (ac):	0.387	0.150	0.010		
Sideslope Area (ac):	0.000	0.065	0.000		
Contributing watershed area (acres):	0.387	0.215	0.010		
Pavement Runoff Coefficient "C":	0.95	0.95	0.95		
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70		
Composite Runoff Coefficient "C":	0.95	0.87	0.95		
CA	0.37	0.19	0.01		
Precipitation intensity (in/hr):	5.86	5.86	5.86		
Subarea discharge Q (cfs):	2.2	1.1	0.1		
Previous by-pass flow (cfs):	0.0	0.3	0.8		
Discharge added by operator:	---	---	---		
Total discharge Q (cfs):	2.2	1.4	0.8		
SHOULDER AND GUTTER CONFIGURATION:					
Manning's n:	0.016	0.016	0.016		
Longitudinal slope S (ft/ft):	0.0053	0.0026	0.0026		
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	3	1		
Longitudinal profile (1=on-grade, 2=sag):	1	1	1		
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	4	4	4		
Capture Ratio Used:	50%	67%	50%		
Inlet ADOT Std:	C-15.91	C-13.60	C-15.91		
Grate width:	3	--	3		
Grate length:	3.3	--	3.3		
Pavement cross-slope (Sx):	0.053	0.053	0.053		
Width of gutter from flowline (ft):	2.50	2.50	2.50		
Gutter depression from horizontal (ft):	0.052	0.052	0.052		
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.021	0.021	0.021		
Flooded Width from flowline (ft): before inlet	6.0	5.9	5.0		
Depth at flowline (ft): before inlet	0.24	0.23	0.18		
Water cross-area (sq.ft): before inlet	0.86	0.81	0.56		
Velocity V for total discharge (fps): before inlet	2.52	1.72	1.46		
Ratio of gutter depression flow to total Q (Eod):	74.9%	75.7%	81.5%		
Equivalent cross-slope (Se):	0.029	0.029	0.027		
GRATE INLETS ON-GRADE:					
Ratio of grate frontal flow to total flow:	83.4%	---	89.9%		
Inlet frontal flow in cfs (Qw):	1.80	---	0.73		
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	---	7.2		
Fraction of frontal flow intercepted (Rf):	100.0%	---	100.0%		
Side flow in cfs (Qs):	0.36	---	0.08		
Effective grate length w/clogging:	1.65	---	1.65		
Fraction of side flow interception (Rs):	17.5%	---	36.0%		
Grate Efficiency (E):	86.3%	---	93.5%		
Total flow intercepted (cfs):	1.86	---	0.76		
Grate flow-by (cfs):	0.30	---	0.05		
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:					
Length required for total interception (ft): w/clogging	---	17.4	---		
Length of inlet provided L (ft):		5			
Interception for length L (cfs):	---	0.64	---		
Efficiency for length L:	---	0.46	---		
Slotted drain or curb opening flow-by (cfs):	---	0.76	---		
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:					
Head available for weir flow at sag (ft):					
Capacity of grate in a sag (3-sided weir):	---	---	---		
Capacity of grate in a sag (4-sided weir):	---	---	---		
Length provided of curb-opening or slotted drain at sag:					
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---		
Length of the vertical curve (ft x 100):					
approach grade #1 (%):					
approach grade #2 (%):					
ABS (algebraic diff. in approach grades) (%):	---	---	---		
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---		
Flanking inlets maximum distance (ft):	---	---	---		

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - Broadway Rd Ramp A

JOB: RMF - University to Southern - Broadway Road Ramp A	Capture Ratios:	50%	67%	80%	50%		
Inlet Number:	600	600		601		602	602
Return Period:	50	50	50	50	50	50	50
Allowable Spread:	13.5	13.5	13.5	13.5	13.5	12.5	12.5
RATIONAL METHOD HYDROLOGY COMPUTATION:	Flkr ⇒	Flkr ⇒	⇓	SAG ⇓	⇓	Flkr ⇐	Flkr ⇐
Structure Station:	16+55	16+55	15+90	15+90	15+90	15+25	15+25
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate	Slotted
Pavement Area (ac):	0.441	0.010	0.034	0.020	0.143	0.030	0.908
Sideslope Area (ac):	0.315	0.010	0.045	0.040	0.049	0.020	0.562
Contributing watershed area (acres):	0.756	0.020	0.079	0.060	0.192	0.050	1.470
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.85	0.83	0.81	0.78	0.89	0.85	0.85
CA	0.64	0.02	0.06	0.05	0.17	0.04	1.26
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	3.7	0.1	0.4	0.3	1.0	0.2	7.4
Previous by-pass flow (cfs):	0.0	2.2	0.2	0.0	0.0	1.0	0.7
Discharge added by operator:	---	---	---	---	---	---	---
Total discharge Q (cfs):	3.7	2.3	0.6	0.3	1.0	1.3	8.0
SHOULDER AND GUTTER CONFIGURATION:							
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0048	0.0048	0.0004	0.0000	0.0008	0.0048	0.0063
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1	3
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	2	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3
Capture Ratio Used:	67%	50%	67%	50%	67%	50%	67%
Inlet ADOT Std:	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60	C-15.91	C-13.60
Grate width:	--	3	--	3	--	3	--
Grate length:	--	3.3	--	3.3	--	3.3	--
Pavement cross-slope (Sx):	0.053	0.053	0.053	0.053	0.053	0.053	0.053
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	6.7	5.5	5.1	NA	5.7	4.3	8.6
Depth at flowline (ft): before inlet	0.39	0.33	0.31	0.00	0.34	0.27	0.49
Water cross-area (sq.ft): before inlet	1.24	0.85	0.74	0.00	0.91	0.54	2.01
Velocity V for total discharge (fps): before inlet	3.02	2.70	0.75	0.00	1.13	2.37	4.01
Ratio of gutter depression flow to total Q (Eod):	77.6%	85.2%	87.9%	100.0%	83.8%	92.9%	67.9%
Equivalent cross-slope (Se):	0.065	0.066	0.066	0.068	0.066	0.067	0.063
GRATE INLETS ON-GRADE:							
Ratio of grate frontal flow to total flow:	---	90.9%	---	---	---	97.0%	---
Inlet frontal flow in cfs (Qw):	---	2.08	---	---	---	1.25	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	7.2	---	---	---	7.2	---
Fraction of frontal flow intercepted (Rf):	---	100.0%	---	---	---	100.0%	---
Side flow in cfs (Qs):	---	0.21	---	---	---	0.04	---
Effective grate length w/clogging:	---	1.65	---	---	---	1.65	---
Fraction of side flow interception (Rs):	---	15.8%	---	---	---	19.1%	---
Grate Efficiency (E):	---	92.3%	---	---	---	97.6%	---
Total flow intercepted (cfs):	---	2.11	---	---	---	1.26	---
Grate flow-by (cfs):	---	0.18	---	---	---	0.03	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:							
Length required for total interception (ft): w/clogging	19.4	---	4.1	---	6.5	---	29.5
Length of inlet provided L (ft):	5		5		5		20
Interception for length L (cfs):	1.55	---	0.55	---	0.95	---	7.00
Efficiency for length L:	0.41	---	1.00	---	0.93	---	0.87
Slotted drain or curb opening flow-by (cfs):	2.19	---	0.00	---	0.08	---	1.04
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:							
Head available for weir flow at sag (ft):				0.28			
Capacity of grate in a sag (3-sided weir):	---	---	---	2.07	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	2.8	---	---	---
Length provided of curb-opening or slotted drain at sag:							
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---	---	---
Length of the vertical curve (ft x 100):							
approach grade #1 (%):				1.18			
approach grade #2 (%):				1.77			
ABS (algebraic diff. in approach grades) (%):	---	---	---	2.95	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	0	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	0	---	---	---

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - Broadway Rd Ramp C

JOB: RMF - University to Southern - Broadway Road Ramp C	Capture Ratios:	50%	67%	80%	50%	
Inlet Number:		650		651		652
Return Period:	10	10	10	10	10	10
Allowable Spread:	10	10	10	10	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒	⇒
Structure Station:	17+60	17+60	18+40	18+40	22+91	22+91
Location Description:	Slotted	Grate	Slotted	Grate	Slotted	Grate
Pavement Area (ac):	0.966	0.020	0.051	0.020	0.384	0.020
Sideslope Area (ac):	0.000	0.000	0.000	0.000	0.027	0.000
Contributing watershed area (acres):	0.966	0.020	0.051	0.020	0.411	0.020
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.93	0.95
CA	0.92	0.02	0.05	0.02	0.38	0.02
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	3.9	0.1	0.2	0.1	1.6	0.1
Previous by-pass flow (cfs):	0.1	1.7	0.7	0.1	0.0	0.9
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	4.0	1.8	0.9	0.2	1.6	0.9
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0266	0.0266	0.0266	0.0266	0.0121	0.0121
Inlet type (1=grate, 2=curb opening, 3=slotted):	3	1	3	1	3	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	2	2	2	2	4	4
Capture Ratio Used:	67%	50%	67%	50%	67%	50%
Inlet ADOT Std:	C-13.60	C-15.92	C-13.60	C-15.92	C-13.60	C-15.91
Grate width:	--	2	--	2	--	3
Grate length:	--	3.3	--	3.3	--	3.3
Pavement cross-slope (Sx):	0.020	0.020	0.020	0.020	0.032	0.032
Width of gutter from flowline (ft):	4.50	4.50	4.50	4.50	2.50	2.50
Gutter depression from horizontal (ft):	0.094	0.094	0.094	0.094	0.052	0.052
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.021	0.021	0.021	0.021	0.021	0.021
Flooded Width from flowline (ft): before inlet	10.0	7.3	5.7	3.0	6.2	5.1
Depth at flowline (ft): before inlet	0.20	0.15	0.12	0.06	0.17	0.14
Water cross-area (sq.ft): before inlet	1.01	0.55	0.33	0.10	0.58	0.39
Velocity V for total discharge (fps): before inlet	3.94	3.22	2.73	1.82	2.82	2.41
Ratio of gutter depression flow to total Q (Eod):	80.1%	92.3%	98.6%	100.0%	75.2%	82.4%
Equivalent cross-slope (Se):	0.021	0.021	0.021	0.021	0.024	0.023
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	—	58.5%	—	94.6%	—	90.0%
Inlet frontal flow in cfs (Qw):	—	1.03	—	0.17	—	0.84
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	—	7.2	—	7.2	—	7.2
Fraction of frontal flow intercepted (Rf):	—	100.0%	—	100.0%	—	100.0%
Side flow in cfs (Qs):	—	0.73	—	0.01	—	0.09
Effective grate length w/clogging:	—	1.65	—	1.65	—	1.65
Fraction of side flow interception (Rs):	—	4.9%	—	12.5%	—	12.1%
Grate Efficiency (E):	—	60.5%	—	95.3%	—	91.2%
Total flow intercepted (cfs):	—	1.07	—	0.17	—	0.85
Grate flow-by (cfs):	—	0.70	—	0.01	—	0.08
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	65.9	—	35.2	—	33.1	—
Length of inlet provided L (ft):	25		25		10	
Interception for length L (cfs):	2.29	—	0.80	—	0.78	—
Efficiency for length L:	0.58	—	0.89	—	0.48	—
Slotted drain or curb opening flow-by (cfs):	1.68	—	0.10	—	0.85	—
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):						
Capacity of grate in a sag (3-sided weir):	—	—	—	—	—	—
Capacity of grate in a sag (4-sided weir):	—	—	—	—	—	—
Length provided of curb-opening or slotted drain at sag:						
Capacity of curb-opening or slotted drain in a sag (weir):	—	—	—	—	—	—
Length of the vertical curve (ft x 100):						
approach grade #1 (%):						
approach grade #2 (%):						
ABS (algebraic diff. in approach grades) (%):	—	—	—	—	—	—
K = Min(Lc/A,167) (Table 5, HEC-12):	—	—	—	—	—	—
Flanking inlets maximum distance (ft):	—	—	—	—	—	—

ADOT - Ultimate Condition
HEC-12 Analysis
Pavement Drainage
RMF - Broadway Rd Ramp D

JOB: RMF - University to Southern - Broadway Road Ramp D	Capture Ratios:	50%	67%	80%	50%
Inlet Number:	675	676	677	678	679
Return Period:	10	10	10	10	10
Allowable Spread:	8	8	8	8	8
RATIONAL METHOD HYDROLOGY COMPUTATION:	⇒	⇒	⇒	⇒	⇒
Structure Station:	15+40	19+70	23+00	23+70	24+60
Location Description:	Grate	Grate	Grate	Grate	Grate
Pavement Area (ac):	0.481	0.326	0.246	0.181	0.248
Sideslope Area (ac):	0.628	0.772	0.748	0.236	0.313
Contributing watershed area (acres):	1.109	1.098	0.994	0.417	0.561
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.81	0.77	0.76	0.81	0.81
CA	0.90	0.85	0.76	0.34	0.45
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	3.8	3.6	3.2	1.4	1.9
Previous by-pass flow (cfs):	0.0	0.5	0.6	0.7	0.2
Discharge added by operator:	---	---	---	---	---
Total discharge Q (cfs):	3.8	4.1	3.8	2.1	2.2
SHOULDER AND GUTTER CONFIGURATION:					
Manning's n:	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0288	0.0288	0.0089	0.0043	0.0023
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	1	1	1	1	1
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.91	C-15.91	C-15.91	C-15.91	C-15.91
Grate width:	3	3	3	3	3
Grate length:	3.3	3.3	3.3	3.3	3.3
Pavement cross-slope (Sx):	0.020	0.020	0.036	0.036	0.036
Width of gutter from flowline (ft):	2.50	2.50	2.50	2.50	2.50
Gutter depression from horizontal (ft):	0.17	0.17	0.17	0.17	0.17
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.068	0.068	0.068	0.068	0.068
Flooded Width from flowline (ft): before inlet	7.6	8.0	7.3	6.6	7.7
Depth at flowline (ft): before inlet	0.27	0.28	0.34	0.32	0.36
Water cross-area (sq.ft): before inlet	0.73	0.79	1.07	0.89	1.16
Velocity V for total discharge (fps): before inlet	5.15	5.20	3.57	2.37	1.85
Ratio of gutter depression flow to total Q (Eod):	81.7%	80.0%	77.2%	81.4%	75.3%
Equivalent cross-slope (Se):	0.059	0.058	0.061	0.062	0.060
GRATE INLETS ON-GRADE:					
Ratio of grate frontal flow to total flow:	86.1%	84.5%	82.9%	86.9%	81.2%
Inlet frontal flow in cfs (Qw):	3.26	3.47	3.17	1.82	1.75
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	7.2	7.2	7.2	7.2	7.2
Fraction of frontal flow intercepted (Rf):	100.0%	100.0%	100.0%	100.0%	100.0%
Side flow in cfs (Qs):	0.53	0.64	0.65	0.28	0.41
Effective grate length w/clogging:	1.65	1.65	1.65	1.65	1.65
Fraction of side flow interception (Rs):	2.2%	2.1%	7.2%	13.9%	20.0%
Grate Efficiency (E):	86.4%	84.8%	84.2%	88.7%	84.9%
Total flow intercepted (cfs):	3.27	3.48	3.21	1.86	1.83
Grate flow-by (cfs):	0.51	0.62	0.60	0.24	0.32
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:					
Length required for total interception (ft): w/clogging	---	---	---	---	---
Length of inlet provided L (ft):					
Interception for length L (cfs):	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:					
Head available for weir flow at sag (ft):					
Capacity of grate in a sag (3-sided weir):	---	---	---	---	---
Capacity of grate in a sag (4-sided weir):	---	---	---	---	---
Length provided of curb-opening or slotted drain at sag:					
Capacity of curb-opening or slotted drain in a sag (weir):	---	---	---	---	---
Length of the vertical curve (ft x 100):					
approach grade #1 (%):					
approach grade #2 (%):					
ABS (algebraic diff. in approach grades) (%):	---	---	---	---	---
K = Min(Lc/A,167) (Table 5, HEC-12):	---	---	---	---	---
Flanking inlets maximum distance (ft):	---	---	---	---	---

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 10 YR

JOB: RMF - University to Southern - Median	Capture Ratios:	50%	67%	80%	50%	
Inlet Number:	**200**	**202**	**206**	**213**	**217**	**221**
Return Period:	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1310+95**	**1316+00**	**1322+50**	**1330+05**	**1337+00**	**1343+60**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.176	0.502	0.570	1.330	1.460	1.050
Sideslope Area (ac):	0.086	0.244	0.450	0.519	0.493	0.340
Contributing watershed area (acres):	**0.262**	**0.746**	**1.020**	**1.849**	**1.953**	**1.390**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.87	0.87	0.84	0.88	0.89	0.89
CA	0.23	0.65	0.86	1.63	1.73	1.24
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.0	2.7	3.6	6.9	7.3	5.2
Previous by-pass flow (cfs):	1.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**2.0**	**2.7**	**3.6**	**6.9**	**7.3**	**5.2**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0125	0.0042	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.37	0.48	0.55	0.75	0.80	0.62
Capacity of grate in a sag (3-sided weir):	2.36	3.49	4.28	6.82	7.51	5.13
Capacity of grate in a sag (4-sided weir):	**3.4**	**5.0**	**6.1**	**9.7**	**10.7**	**7.3**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 10 YR

JOB: RMF - University to Southern - Median Inlet Number:	226	229	231	241	237	239
Return Period:	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1345+64**	**1349+10**	**1356+00**	**1363+05**	**1365+20**	**1366+95**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.419	0.628	1.200	1.030	0.340	0.340
Sideslope Area (ac):	0.142	0.238	0.479	0.480	0.150	0.136
Contributing watershed area (acres):	**0.561**	**0.866**	**1.679**	**1.510**	**0.490**	**0.476**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.89	0.88	0.88	0.87	0.87	0.88
CA	0.50	0.76	1.48	1.31	0.43	0.42
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	2.1	3.2	6.2	5.5	1.8	1.8
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**2.1**	**3.2**	**6.2**	**5.5**	**1.8**	**1.8**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.50	0.58	0.70	0.65	0.40	0.49
Capacity of grate in a sag (3-sided weir):	3.71	4.64	6.15	5.50	2.66	3.60
Capacity of grate in a sag (4-sided weir):	**5.3**	**6.6**	**8.8**	**7.9**	**3.8**	**5.1**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 10 YR

JOB: RMF - University to Southern - Median	SAG					
Inlet Number:	251	257	260	264	266	271
Return Period:	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1380+91**	**1386+20**	**1391+76**	**1393+02**	**1394+95**	**1402+50**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.970	1.390	1.150	0.625	1.520	2.030
Sideslope Area (ac):	0.850	0.360	0.383	0.212	0.516	0.628
Contributing watershed area (acres):	**1.820**	**1.750**	**1.533**	**0.837**	**2.036**	**2.658**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.83	0.90	0.89	0.89	0.89	0.89
CA	1.52	1.57	1.36	0.74	1.81	2.37
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	6.4	6.6	5.7	3.1	7.6	10.0
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**6.4**	**6.6**	**5.7**	**3.1**	**7.6**	**10.0**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.73	0.83	0.79	0.82	1.02	0.95
Capacity of grate in a sag (3-sided weir):	6.55	7.94	7.37	7.80	10.82	9.72
Capacity of grate in a sag (4-sided weir):	**9.4**	**11.3**	**10.5**	**11.1**	**15.5**	**13.9**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 10 YR

JOB: RMF - University to Southern - Median Inlet Number:	178	182
Return Period:	10	10
Allowable Spread:	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:		
Structure Station:	**1411+58**	**1417+25**
Location Description:	Area Inlet	Area Inlet
Pavement Area (ac):	0.907	1.020
Sideslope Area (ac):	0.391	0.400
Contributing watershed area (acres):	**1.298**	**1.420**
Pavement Runoff Coefficient "C":	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70
Composite Runoff Coefficient "C":	0.87	0.88
CA	1.14	1.25
Precipitation intensity (in/hr):	4.22	4.22
Subarea discharge Q (cfs):	4.8	5.3
Previous by-pass flow (cfs):	0.0	0.0
Discharge added by operator:	---	---
Total discharge Q (cfs):	**4.8**	**5.3**
SHOULDER AND GUTTER CONFIGURATION:		
Manning's n:	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3
Capture Ratio Used:	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80
Grate width:	2	2
Grate length:	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000
GRATE INLETS ON-GRADE:		
Ratio of grate frontal flow to total flow:	---	---
Inlet frontal flow in cfs (Qw):	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---
Fraction of frontal flow intercepted (Rf):	---	---
Side flow in cfs (Qs):	---	---
Effective grate length w/clogging:	---	---
Fraction of side flow interception (Rs):	---	---
Grate Efficiency (E):	---	---
Total flow intercepted (cfs):	---	---
Grate flow-by (cfs):	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:		
Length required for total interception (ft): w/clogging	---	---
Length of inlet provided L (ft):		
Interception for length L (cfs):	---	---
Efficiency for length L:	---	---
Slotted drain or curb opening flow-by (cfs):	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:		
Head available for weir flow at sag (ft):	1.00	1.00
Capacity of grate in a sag (3-sided weir):	10.50	10.50
Capacity of grate in a sag (4-sided weir):	**15.0**	**15.0**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 50 YR

JOB: RMF - University to Southern - Median	Capture Ratios:	50%	67%	80%	50%	
Inlet Number:	200	202	207	213	217	221
Return Period:	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1310+95**	**1316+00**	**1322+50**	**1330+05**	**1337+00**	**1343+60**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.176	0.502	0.570	1.330	1.460	1.050
Sideslope Area (ac):	0.086	0.244	0.450	0.519	0.493	0.340
Contributing watershed area (acres):	**0.262**	**0.746**	**1.020**	**1.849**	**1.953**	**1.390**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.87	0.87	0.84	0.88	0.89	0.89
CA	0.23	0.65	0.86	1.63	1.73	1.24
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.3	3.8	5.0	9.5	10.2	7.2
Previous by-pass flow (cfs):	1.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**2.3**	**3.8**	**5.0**	**9.5**	**10.2**	**7.2**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0125	0.0042	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.38	0.49	0.57	1.00	1.00	0.66
Capacity of grate in a sag (3-sided weir):	2.46	3.60	4.52	10.50	10.50	5.63
Capacity of grate in a sag (4-sided weir):	**3.5**	**5.1**	**6.5**	**15.0**	**15.0**	**8.0**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 50 YR

JOB: RMF - University to Southern - Median Inlet Number:	226	229	231	241	237	239
Return Period:	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1345+64**	**1349+10**	**1356+00**	**1363+05**	**1365+20**	**1366+95**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.419	0.628	1.200	1.030	0.346	0.340
Sideslope Area (ac):	0.142	0.238	0.479	0.480	0.151	0.136
Contributing watershed area (acres):	**0.561**	**0.866**	**1.679**	**1.510**	**0.497**	**0.476**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.89	0.88	0.88	0.87	0.87	0.88
CA	0.50	0.76	1.48	1.31	0.43	0.42
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	2.9	4.5	8.6	7.7	2.5	2.5
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**2.9**	**4.5**	**8.6**	**7.7**	**2.5**	**2.5**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.52	0.60	0.75	0.70	0.43	0.51
Capacity of grate in a sag (3-sided weir):	3.94	4.88	6.82	6.15	2.96	3.82
Capacity of grate in a sag (4-sided weir):	**5.6**	**7.0**	**9.7**	**8.8**	**4.2**	**5.5**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 50 YR

JOB: RMF - University to Southern - Median	SAG					
Inlet Number:	251	257	260	264	266	271
Return Period:	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:						
Structure Station:	**1380+91**	**1386+20**	**1391+76**	**1393+02**	**1394+95**	**1402+50**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.970	1.390	1.150	0.625	1.520	2.030
Sideslope Area (ac):	0.850	0.360	0.383	0.212	0.516	0.628
Contributing watershed area (acres):	**1.820**	**1.750**	**1.533**	**0.837**	**2.036**	**2.658**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.83	0.90	0.89	0.89	0.89	0.89
CA	1.52	1.57	1.36	0.74	1.81	2.37
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	8.9	9.2	8.0	4.3	10.6	13.9
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---
Total discharge Q (cfs):	**8.9**	**9.2**	**8.0**	**4.3**	**10.6**	**13.9**
SHOULDER AND GUTTER CONFIGURATION:						
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80	C-15.80
Grate width:	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:						
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:						
Length required for total interception (ft): w/clogging	---	---	---	---	---	---
Length of inlet provided L (ft):						
Interception for length L (cfs):	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:						
Head available for weir flow at sag (ft):	0.76	0.86	0.82	0.85	1.06	1.05
Capacity of grate in a sag (3-sided weir):	6.96	8.37	7.80	8.23	11.46	11.30
Capacity of grate in a sag (4-sided weir):	**9.9**	**12.0**	**11.1**	**11.8**	**16.4**	**16.1**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Median Drainage
RMF - 202L Median - 50 YR

JOB: RMF - University to Southern - Median Inlet Number:	178	182
Return Period:	50	50
Allowable Spread:	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:		
Structure Station:	**1411+58**	**1417+25**
Location Description:	Area Inlet	Area Inlet
Pavement Area (ac):	0.907	1.020
Sideslope Area (ac):	0.391	0.400
Contributing watershed area (acres):	**1.298**	**1.420**
Pavement Runoff Coefficient "C":	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70
Composite Runoff Coefficient "C":	0.87	0.88
CA	1.14	1.25
Precipitation intensity (in/hr):	5.86	5.86
Subarea discharge Q (cfs):	6.7	7.3
Previous by-pass flow (cfs):	0.0	0.0
Discharge added by operator:	---	---
Total discharge Q (cfs):	**6.7**	**7.3**
SHOULDER AND GUTTER CONFIGURATION:		
Manning's n:	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3
Capture Ratio Used:	50%	50%
Inlet ADOT Std:	C-15.80	C-15.80
Grate width:	2	2
Grate length:	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000
GRATE INLETS ON-GRADE:		
Ratio of grate frontal flow to total flow:	---	---
Inlet frontal flow in cfs (Qw):	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---
Fraction of frontal flow intercepted (Rf):	---	---
Side flow in cfs (Qs):	---	---
Effective grate length w/clogging:	---	---
Fraction of side flow interception (Rs):	---	---
Grate Efficiency (E):	---	---
Total flow intercepted (cfs):	---	---
Grate flow-by (cfs):	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:		
Length required for total interception (ft): w/clogging	---	---
Length of inlet provided L (ft):		
Interception for length L (cfs):	---	---
Efficiency for length L:	---	---
Slotted drain or curb opening flow-by (cfs):	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:		
Head available for weir flow at sag (ft):	1.00	1.00
Capacity of grate in a sag (3-sided weir):	10.50	10.50
Capacity of grate in a sag (4-sided weir):	**15.0**	**15.0**

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 10 YR

JOB: RMF - University to Southern - Roadside	Capture Ratios:	50%	67%	80%	50%			
Inlet Number:	205	210	212	216	219	225	230	232
Return Period:	10	10	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	1318+36	1327+12	1330+00	1336+60	1341+30	1345+64	1351+10	1356+00
	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	1.500	0.324	1.000	1.450	0.595	0.794	1.120	0.470
Contributing watershed area (acres):	1.500	0.324	1.000	1.450	0.595	0.794	1.120	0.470
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	1.05	0.23	0.70	1.02	0.42	0.56	0.78	0.33
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	4.4	1.0	3.0	4.3	1.8	2.3	3.3	1.4
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	4.4	1.0	3.0	4.3	1.8	2.3	3.3	1.4
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0125	0.0042	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	---	---	---	---	---	---	---	---
Length of inlet provided L (ft):								
Interception for length L (cfs):	---	---	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	0.67	0.42	0.67	0.67	0.67	0.67	0.67	0.67
Capacity of grate in a sag (3-sided weir):	5.76	2.86	5.76	5.76	5.76	5.76	5.76	5.76
Capacity of grate in a sag (4-sided weir):	8.2	4.1	8.2	8.2	8.2	8.2	8.2	8.2

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 10 YR

JOB: RMF - University to Southern - Roadside Inlet Number:	234	236	240	252	262	263	269	273
Return Period:	10	10	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	**1358+95**	**1363+05**	**1367+05**	**1379+80**	**1393+45**	**1393+01**	**1398+90**	**1394+05**
	202 Med CL	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	0.686	1.230	1.060	0.221	1.070	1.200	0.977	2.310
Contributing watershed area (acres):	**0.686**	**1.230**	**1.060**	**0.221**	**1.070**	**1.200**	**0.977**	**2.310**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	0.48	0.86	0.74	0.15	0.75	0.84	0.68	1.62
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	2.0	3.6	3.1	0.7	3.2	3.5	2.9	6.8
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	**2.0**	**3.6**	**3.1**	**0.7**	**3.2**	**3.5**	**2.9**	**6.8**
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	---	---	---	---	---	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---	---	---	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---	---	---	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---	---	---	---	---	---
Side flow in cfs (Qs):	---	---	---	---	---	---	---	---
Effective grate length w/clogging:	---	---	---	---	---	---	---	---
Fraction of side flow interception (Rs):	---	---	---	---	---	---	---	---
Grate Efficiency (E):	---	---	---	---	---	---	---	---
Total flow intercepted (cfs):	---	---	---	---	---	---	---	---
Grate flow-by (cfs):	---	---	---	---	---	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	---	---	---	---	---	---	---	---
Length of inlet provided L (ft):								
Interception for length L (cfs):	---	---	---	---	---	---	---	---
Efficiency for length L:	---	---	---	---	---	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---	---	---	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	0.67	0.67	0.67	0.42	0.67	0.67	0.67	1.10
Capacity of grate in a sag (3-sided weir):	**5.76**	**5.76**	**5.76**	**2.86**	**5.76**	**5.76**	**5.76**	**12.11**
Capacity of grate in a sag (4-sided weir):	8.2	8.2	8.2	4.1	8.2	8.2	8.2	17.3

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 10 YR

JOB: RMF - University to Southern - Roadside Inlet Number:	274	275	358	359	410	411	627	628
Return Period:	10	10	10	10	10	10	10	10
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	**1410+00**	**1417+35**	**27+23**	**34+24**	**20+35**	**33+93**	**18+30**	**21+10**
	202 Med CL	**202 Med CL**	**EBCR2**	**EBCR2**	**WBCR1**	**WBCR1**	**Bwy Ramp-B**	**Bwy Ramp-B**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	1.490	0.303	0.526	0.550	0.208	0.560	0.883	0.203
Contributing watershed area (acres):	**1.490**	**0.303**	**0.526**	**0.550**	**0.208**	**0.560**	**0.883**	**0.203**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	1.04	0.21	0.37	0.39	0.15	0.39	0.62	0.14
Precipitation intensity (in/hr):	4.22	4.22	4.22	4.22	4.22	4.22	4.22	4.22
Subarea discharge Q (cfs):	4.4	0.9	1.6	1.6	0.6	1.7	2.6	0.6
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	**4.4**	**0.9**	**1.6**	**1.6**	**0.6**	**1.7**	**2.6**	**0.6**
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	----	----	----	----	----	----	----	----
Inlet frontal flow in cfs (Qw):	----	----	----	----	----	----	----	----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	----	----	----	----	----	----	----	----
Fraction of frontal flow intercepted (Rf):	----	----	----	----	----	----	----	----
Side flow in cfs (Qs):	----	----	----	----	----	----	----	----
Effective grate length w/clogging:	----	----	----	----	----	----	----	----
Fraction of side flow interception (Rs):	----	----	----	----	----	----	----	----
Grate Efficiency (E):	----	----	----	----	----	----	----	----
Total flow intercepted (cfs):	----	----	----	----	----	----	----	----
Grate flow-by (cfs):	----	----	----	----	----	----	----	----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	----	----	----	----	----	----	----	----
Length of inlet provided L (ft):								
Interception for length L (cfs):	----	----	----	----	----	----	----	----
Efficiency for length L:	----	----	----	----	----	----	----	----
Slotted drain or curb opening flow-by (cfs):	----	----	----	----	----	----	----	----
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	1.10	0.67	0.67	0.67	0.67	0.67	0.67	0.42
Capacity of grate in a sag (3-sided weir):	**12.11**	**5.76**	**5.76**	**5.76**	**5.76**	**5.76**	**5.76**	**2.86**
Capacity of grate in a sag (4-sided weir):	17.3	8.2	8.2	8.2	8.2	8.2	8.2	4.1

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 10 YR

JOB: RMF - University to Southern - Roadside			
Inlet Number:	653	654	680
Return Period:	10	10	10
Allowable Spread:	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:			
Structure Station:	18+40	22+90	21+55
	Bwy Ramp-C	Bwy Ramp-C	Bwy Ramp-D
Location Description:	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000
Sideslope Area (ac):	0.338	0.333	1.380
Contributing watershed area (acres):	0.338	0.333	1.380
Pavement Runoff Coefficient "C":	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70
CA	0.24	0.23	0.97
Precipitation intensity (in/hr):	4.22	4.22	4.22
Subarea discharge Q (cfs):	1.0	1.0	4.1
Previous by-pass flow (cfs):	0.0	0.0	0.0
Discharge added by operator:	---	---	---
Total discharge Q (cfs):	1.0	1.0	4.1
SHOULDER AND GUTTER CONFIGURATION:			
Manning's n:	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3
Capture Ratio Used:	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2
Grate length:	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000
GRATE INLETS ON-GRADE:			
Ratio of grate frontal flow to total flow:	---	---	---
Inlet frontal flow in cfs (Qw):	---	---	---
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	---	---	---
Fraction of frontal flow intercepted (Rf):	---	---	---
Side flow in cfs (Qs):	---	---	---
Effective grate length w/clogging:	---	---	---
Fraction of side flow interception (Rs):	---	---	---
Grate Efficiency (E):	---	---	---
Total flow intercepted (cfs):	---	---	---
Grate flow-by (cfs):	---	---	---
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:			
Length required for total interception (ft): w/clogging	---	---	---
Length of inlet provided L (ft):			
Interception for length L (cfs):	---	---	---
Efficiency for length L:	---	---	---
Slotted drain or curb opening flow-by (cfs):	---	---	---
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:			
Head available for weir flow at sag (ft):	0.67	0.67	1.00
Capacity of grate in a sag (3-sided weir):	5.76	5.76	10.50
Capacity of grate in a sag (4-sided weir):	8.2	8.2	15.0

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 50 YR

JOB: RMF - University to Southern - Roadside	Capture Ratios:	50%	67%	80%	50%			
Inlet Number:	205	210	212	216	219	225	230	232
Return Period:	50	50	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	1318+36	1327+12	1330+00	1336+60	1341+30	1345+64	1351+10	1356+00
	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL	202 Med CL
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	1.500	0.324	1.000	1.450	0.595	0.794	1.120	0.470
Contributing watershed area (acres):	1.500	0.324	1.000	1.450	0.595	0.794	1.120	0.470
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	1.05	0.23	0.70	1.02	0.42	0.56	0.78	0.33
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	6.2	1.3	4.1	5.9	2.4	3.3	4.6	1.9
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	6.2	1.3	4.1	5.9	2.4	3.3	4.6	1.9
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0125	0.0042	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	-----	-----	-----	-----	-----	-----	-----	-----
Inlet frontal flow in cfs (Qw):	-----	-----	-----	-----	-----	-----	-----	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of frontal flow intercepted (Rf):	-----	-----	-----	-----	-----	-----	-----	-----
Side flow in cfs (Qs):	-----	-----	-----	-----	-----	-----	-----	-----
Effective grate length w/clogging:	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of side flow interception (Rs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate Efficiency (E):	-----	-----	-----	-----	-----	-----	-----	-----
Total flow intercepted (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	-----	-----	-----	-----	-----	-----	-----	-----
Length of inlet provided L (ft):								
Interception for length L (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Efficiency for length L:	-----	-----	-----	-----	-----	-----	-----	-----
Slotted drain or curb opening flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	0.67	0.42	0.67	0.67	0.67	0.67	0.67	0.67
Capacity of grate in a sag (3-sided weir):	5.76	2.86	5.76	5.76	5.76	5.76	5.76	5.76
Capacity of grate in a sag (4-sided weir):	8.2	4.1	8.2	8.2	8.2	8.2	8.2	8.2

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 50 YR

JOB: RMF - University to Southern - Roadside Inlet Number:	234	236	240	252	262	263	269	273
Return Period:	50	50	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	**1358+95**	**1363+05**	**1367+05**	**1379+80**	**1393+45**	**1393+01**	**1398+90**	**1394+05**
	202 Med CL	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**	**202 Med CL**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	0.686	1.230	1.060	0.221	1.070	1.200	0.977	2.310
Contributing watershed area (acres):	**0.686**	**1.230**	**1.060**	**0.221**	**1.070**	**1.200**	**0.977**	**2.310**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	0.48	0.86	0.74	0.15	0.75	0.84	0.68	1.62
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	2.8	5.0	4.3	0.9	4.4	4.9	4.0	9.5
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	**2.8**	**5.0**	**4.3**	**0.9**	**4.4**	**4.9**	**4.0**	**9.5**
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	-----	-----	-----	-----	-----	-----	-----	-----
Inlet frontal flow in cfs (Qw):	-----	-----	-----	-----	-----	-----	-----	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of frontal flow intercepted (Rf):	-----	-----	-----	-----	-----	-----	-----	-----
Side flow in cfs (Qs):	-----	-----	-----	-----	-----	-----	-----	-----
Effective grate length w/clogging:	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of side flow interception (Rs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate Efficiency (E):	-----	-----	-----	-----	-----	-----	-----	-----
Total flow intercepted (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	-----	-----	-----	-----	-----	-----	-----	-----
Length of inlet provided L (ft):								
Interception for length L (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Efficiency for length L:	-----	-----	-----	-----	-----	-----	-----	-----
Slotted drain or curb opening flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	0.67	0.67	0.67	0.42	0.67	0.67	0.67	1.10
Capacity of grate in a sag (3-sided weir):	**5.76**	**5.76**	**5.76**	**2.86**	**5.76**	**5.76**	**5.76**	**12.11**
Capacity of grate in a sag (4-sided weir):	8.2	8.2	8.2	4.1	8.2	8.2	8.2	17.3

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 50 YR

JOB: RMF - University to Southern - Roadside Inlet Number:	274	275	358	359	410	411	627	628
Return Period:	50	50	50	50	50	50	50	50
Allowable Spread:	na	na	na	na	na	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:								
Structure Station:	**1410+00**	**1417+35**	**27+23**	**34+24**	**20+35**	**33+93**	**18+30**	**21+10**
	202 Med CL	**202 Med CL**	**EBCR2**	**EBCR2**	**WBCR1**	**WBCR1**	**Bwy Ramp-B**	**Bwy Ramp-B**
Location Description:	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sideslope Area (ac):	1.490	0.303	0.526	0.550	0.208	0.560	0.883	0.203
Contributing watershed area (acres):	**1.490**	**0.303**	**0.526**	**0.550**	**0.208**	**0.560**	**0.883**	**0.203**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
CA	1.04	0.21	0.37	0.39	0.15	0.39	0.62	0.14
Precipitation intensity (in/hr):	5.86	5.86	5.86	5.86	5.86	5.86	5.86	5.86
Subarea discharge Q (cfs):	6.1	1.2	2.2	2.3	0.9	2.3	3.6	0.8
Previous by-pass flow (cfs):	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Discharge added by operator:	---	---	---	---	---	---	---	---
Total discharge Q (cfs):	**6.1**	**1.2**	**2.2**	**2.3**	**0.9**	**2.3**	**3.6**	**0.8**
SHOULDER AND GUTTER CONFIGURATION:								
Manning's n:	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1	1	1	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2	2	2	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3	3	3	3	3	3
Capture Ratio Used:	50%	50%	50%	50%	50%	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2	2	2	2	2	2
Grate length:	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA	NA	NA	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GRATE INLETS ON-GRADE:								
Ratio of grate frontal flow to total flow:	-----	-----	-----	-----	-----	-----	-----	-----
Inlet frontal flow in cfs (Qw):	-----	-----	-----	-----	-----	-----	-----	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of frontal flow intercepted (Rf):	-----	-----	-----	-----	-----	-----	-----	-----
Side flow in cfs (Qs):	-----	-----	-----	-----	-----	-----	-----	-----
Effective grate length w/clogging:	-----	-----	-----	-----	-----	-----	-----	-----
Fraction of side flow interception (Rs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate Efficiency (E):	-----	-----	-----	-----	-----	-----	-----	-----
Total flow intercepted (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Grate flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:								
Length required for total interception (ft): w/clogging	-----	-----	-----	-----	-----	-----	-----	-----
Length of inlet provided L (ft):								
Interception for length L (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
Efficiency for length L:	-----	-----	-----	-----	-----	-----	-----	-----
Slotted drain or curb opening flow-by (cfs):	-----	-----	-----	-----	-----	-----	-----	-----
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:								
Head available for weir flow at sag (ft):	1.10	0.67	0.67	0.67	0.67	0.67	0.67	0.42
Capacity of grate in a sag (3-sided weir):	**12.11**	**5.76**	**5.76**	**5.76**	**5.76**	**5.76**	**5.76**	**2.86**
Capacity of grate in a sag (4-sided weir):	17.3	8.2	8.2	8.2	8.2	8.2	8.2	4.1

ADOT - ULTIMATE
Area Inlet Capacity Analysis
Roadside Drainage
RMF - Roadside - 50 YR

JOB: RMF - University to Southern - Roadside			
Inlet Number:	653	654	680
Return Period:	50	50	50
Allowable Spread:	na	na	na
RATIONAL METHOD HYDROLOGY COMPUTATION:			
Structure Station:	18+40	22+90	21+55
	Bwy Ramp-C	Bwy Ramp-C	Bwy Ramp-D
Location Description:	Area Inlet	Area Inlet	Area Inlet
Pavement Area (ac):	0.000	0.000	0.000
Sideslope Area (ac):	0.338	0.333	1.380
Contributing watershed area (acres):	**0.338**	**0.333**	**1.380**
Pavement Runoff Coefficient "C":	0.95	0.95	0.95
Sideslope Runoff Coefficient "C":	0.70	0.70	0.70
Composite Runoff Coefficient "C":	0.70	0.70	0.70
CA	0.24	0.23	0.97
Precipitation intensity (in/hr):	5.86	5.86	5.86
Subarea discharge Q (cfs):	1.4	1.4	5.7
Previous by-pass flow (cfs):	0.0	0.0	0.0
Discharge added by operator:	---	---	---
Total discharge Q (cfs):	**1.4**	**1.4**	**5.7**
SHOULDER AND GUTTER CONFIGURATION:			
Manning's n:	0.016	0.016	0.016
Longitudinal slope S (ft/ft):	0.0006	0.0006	0.0006
Inlet type (1=grate, 2=curb opening, 3=slotted):	1	1	1
Longitudinal profile (1=on-grade, 2=sag):	2	2	2
Gutter Configuration (1=roll, 2=Type D vertical, 3=6" Type B, 4=3" Type C):	3	3	3
Capture Ratio Used:	50%	50%	50%
Inlet ADOT Std:	C-15.81	C-15.81	C-15.81
Grate width:	2	2	2
Grate length:	3.0	3.0	3.0
Pavement cross-slope (Sx):	0.000	0.000	0.000
Width of gutter from flowline (ft):	0.00	0.00	0.00
Gutter depression from horizontal (ft):	0.00	0.00	0.00
Gutter cross-slope Sw: (S'w=Sw-Sx)	0.000	0.000	0.000
Flooded Width from flowline (ft): before inlet	NA	NA	NA
Depth at flowline (ft): before inlet	0.00	0.00	0.00
Water cross-area (sq.ft): before inlet	0.00	0.00	0.00
Velocity V for total discharge (fps): before inlet	0.00	0.00	0.00
Ratio of gutter depression flow to total Q (Eod):	100.0%	100.0%	100.0%
Equivalent cross-slope (Se):	0.000	0.000	0.000
GRATE INLETS ON-GRADE:			
Ratio of grate frontal flow to total flow:	-----	-----	-----
Inlet frontal flow in cfs (Qw):	-----	-----	-----
Vo for effective length (P-1-7/8, Chart 7 HEC 12):	-----	-----	-----
Fraction of frontal flow intercepted (Rf):	-----	-----	-----
Side flow in cfs (Qs):	-----	-----	-----
Effective grate length w/clogging:	-----	-----	-----
Fraction of side flow interception (Rs):	-----	-----	-----
Grate Efficiency (E):	-----	-----	-----
Total flow intercepted (cfs):	-----	-----	-----
Grate flow-by (cfs):	-----	-----	-----
SLOTTED DRAINS AND CURB OPENING INLETS ON-GRADE:			
Length required for total interception (ft): w/clogging	-----	-----	-----
Length of inlet provided L (ft):			
Interception for length L (cfs):	-----	-----	-----
Efficiency for length L:	-----	-----	-----
Slotted drain or curb opening flow-by (cfs):	-----	-----	-----
INTERCEPTION CAPACITY OF INLETS IN SAG LOCATION:			
Head available for weir flow at sag (ft):	0.67	0.67	1.00
Capacity of grate in a sag (3-sided weir):	**5.76**	**5.76**	**10.50**
Capacity of grate in a sag (4-sided weir):	8.2	8.2	15.0

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 759	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	10+85 (north side of Broadway Rd)	Project No.:	40024

Notes: Flow is based on curb full flow.
Basin Area is from Ellsworth Road to Broadway road station 10+85.00.
There are no catch basins within this reach. Used conservative approach and sized inlet for street full flow to curb heigth.

Gutter Flow Hydraulics

Input :

Q10=	17.80	cfs
Q50=	0.00	cfs
Sl =	0.0075	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	'ft/ft
Sw =	0.0588	'ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	22.248	ft	#VALUE!	ft
Average V =	3.568	fps	#VALUE!	fps
Gutter Flow =	3.132	cfs	#VALUE!	cfs
% Gutter Flow =	17.59	%	#VALUE!	%
Gutter Vel.=	4.812	fps	#VALUE!	fps
Depth @ Curb =	6.001	inches	#VALUE!	inches

Inlet Hydraulics

Curb Opening On-Grade

Input :

Capture Ratio =	0.8	
L (curb opening length) =	42.48	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	4.271	#VALUE!	cfs
% Shoulder	24.0	#VALUE!	%
Qgutter @ inlet	3.576	#VALUE!	
% in Gutter	20.09	#VALUE!	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.040	#VALUE!	ft/ft
Lt (w/ Capture Ratio)	48.06	#VALUE!	ft
E=	**97.93%**	**#VALUE!**	
Qi =	**17.43**	**#VALUE!**	cfs
Qbypass =	**0.37**	**#VALUE!**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 760	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	12+75 (South side of Broadway Rd)	Project No.:	40024

Notes: Flow is based on curb full flow
Basin Area is from Ellsworth Road to Broadway road station 12+75.00.
There are no catch basins within this reach. Used conservative approach and sized inlet for street full flow to curb heigth.

Gutter Flow Hydraulics

Input:			Output: Q10			Output: Q50		
Q10=	13.96	cfs						
Q50=		cfs	Spread =	22.245	ft	Spread =	#VALUE!	ft
Sl =	0.004616	ft/ft	Average V =	2.799	fps	Average V =	#VALUE!	fps
Sx =	0.0200	ft/ft	Gutter Flow =	2.456	cfs	Gutter Flow =	#VALUE!	cfs
Ss =	0.0200	ft/ft	% Gutter Flow =	17.60	%	% Gutter Flow =	#VALUE!	%
Sw =	0.0588	ft/ft	Gutter Vel.=	3.775	fps	Gutter Vel.=	#VALUE!	fps
Ws =	4.00	ft	Depth @ Curb =	6.000	inches	Depth @ Curb =	#VALUE!	inches
Ww =	1.42	ft						
n =	0.016							

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	42.48	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	3.350	#VALUE!	cfs
% Shoulder	24.0	#VALUE!	%
Qgutter @ inlet	2.805	#VALUE!	
% in Gutter	20.09	#VALUE!	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.040	#VALUE!	ft/ft
Lt (w/ Capture Ratio)	37.51	#VALUE!	ft
E=	100.00%	#VALUE!	
Qi =	13.96	#VALUE!	cfs
Qbypass =	0.00	#VALUE!	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 761	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Rd	Checked:	
Station:	13+50 to 16+80 (north side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.89 ac
ADOT Curb type D (C-05.10)
Upstream - CB 760

Gutter Flow Hydraulics

Input:

Q10=	3.75	cfs
Q50=	5.59	cfs
Sl =	0.00563	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	ft/ft
Sw =	0.0680	ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	12.858	ft	15.040	ft
Average V =	2.203	fps	2.422	fps
Gutter Flow =	1.177	cfs	1.500	cfs
% Gutter Flow =	31.42	%	26.82	%
Gutter Vel.=	2.993	fps	3.295	fps
Depth @ Curb =	3.904	inches	4.427	inches

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	22.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.82	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	1.180	1.669	cfs
% Shoulder	31.5	29.8	%
Qgutter @ inlet	1.433	1.199	
% in Gutter	38.24	32.00	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.061	0.043	ft/ft
Lt (w/ Capture Ratio)	17.72	25.85	ft
E=	**100.00%**	**98.08%**	
Qi =	**3.75**	**5.49**	cfs
Qbypass =	**0.00**	**0.11**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 762 (16+90)	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	12+75 to 16+90 (South side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.47 ac
ADOT Curb type D (C-05.10)
Upstream - CB 760

Gutter Flow Hydraulics

Input :			Output: Q10			Output: Q50		
Q10=	2.08	cfs						
Q50=	3.29	cfs	Spread =	10.194	ft	Spread =	12.369	ft
Sl =	0.004616	ft/ft	Average V =	1.836	fps	Average V =	2.021	fps
Sx =	0.0200	ft/ft	Gutter Flow =	1.128	cfs	Gutter Flow =	1.495	cfs
Ss =	0.0200	'ft/ft	% Gutter Flow =	54.11	%	% Gutter Flow =	45.49	%
Sw =	0.0680	'ft/ft	Gutter Vel.=	2.432	fps	Gutter Vel.=	2.715	fps
Ws =	4.00	ft	Depth @ Curb =	3.599	inches	Depth @ Curb =	4.121	inches
Ww =	2.00	ft						
n =	0.016							

Inlet Hydraulics

Curb Opening On-Grade

Input :

Capture Ratio =	0.8	
L (curb opening length) =	14.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	2.15	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.411	0.691	cfs
% Shoulder	19.7	21.0	%
Qgutter @ inlet	1.363	1.131	
% in Gutter	65.39	54.27	%
S'w (@ opening)=	0.042	0.042	ft/ft
Se =	0.079	0.051	ft/ft
Lt (w/ Capture Ratio)	11.18	17.58	ft
E=	**100.00%**	**96.79%**	
Qi =	**2.08**	**3.18**	cfs
Qbypass =	**0.00**	**0.11**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 764	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	17+88 to 21+74 (south side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.56 ac

Gutter Flow Hydraulics

Input:			Output: Q10			Output: Q50		
Q10=	2.25	cfs						
Q50=	3.12	cfs	Spread =	9.719	ft	Spread =	11.077	ft
Sl =	0.00854	ft/ft	Average V =	2.282	fps	Average V =	2.462	fps
Sx =	0.0200	ft/ft	Gutter Flow =	0.899	cfs	Gutter Flow =	1.102	cfs
Ss =	0.0200	ft/ft	% Gutter Flow =	40.05	%	% Gutter Flow =	35.34	%
Sw =	0.0588	ft/ft	Gutter Vel.=	3.048	fps	Gutter Vel.=	3.303	fps
Ws =	4.00	ft	Depth @ Curb =	2.994	inches	Depth @ Curb =	3.320	inches
Ww =	1.42	ft						
n =	0.016							

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	14.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.732	1.023	cfs
% Shoulder	32.6	32.8	%
Qgutter @ inlet	1.141	0.990	
% in Gutter	50.83	44.09	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.070	0.051	ft/ft
Lt (w/ Capture Ratio)	14.93	20.66	ft
E=	**100.00%**	**90.22%**	
Qi =	**2.25**	**2.81**	cfs
Qbypass =	**0.00**	**0.31**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 765	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	17+88 to 21+74 (north side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.56 ac

Gutter Flow Hydraulics

Input :

Q10=	2.25	cfs
Q50=	3.12	cfs
Sl =	0.00854	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	'ft/ft
Sw =	0.0588	'ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	9.719	ft	11.077	ft
Average V =	2.282	fps	2.462	fps
Gutter Flow =	0.899	cfs	1.102	cfs
% Gutter Flow =	40.05	%	35.34	%
Gutter Vel.=	3.048	fps	3.303	fps
Depth @ Curb =	2.994	inches	3.320	inches

Inlet Hydraulics

Curb Opening On-Grade

Input :

Capture Ratio =	0.8	
L (curb opening length) =	14.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.732	1.023	cfs
% Shoulder	32.6	32.8	%
Qgutter @ inlet	1.141	0.990	
% in Gutter	50.83	44.09	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.070	0.051	ft/ft
Lt (w/ Capture Ratio)	14.93	20.66	ft
E=	**100.00%**	**90.22%**	
Qi =	**2.25**	**2.81**	cfs
Qbypass =	**0.00**	**0.31**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 766	By:	JJP
Project:	RRFUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	21+74 to 24+61 (north side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.34 ac

Gutter Flow Hydraulics

Input:

Q10=	1.36	cfs
Q50=	1.89	cfs
Sl =	0.01102	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	ft/ft
Sw =	0.0588	ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	7.521	ft	8.614	ft
Average V =	2.254	fps	2.423	fps
Gutter Flow =	0.690	cfs	0.848	cfs
% Gutter Flow =	50.64	%	44.82	%
Gutter Vel.=	2.968	fps	3.219	fps
Depth @ Curb =	2.466	inches	2.729	inches

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	6.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.384	0.592	cfs
% Shoulder	28.2	31.3	%
Qgutter @ inlet	0.901	0.787	
% in Gutter	66.07	57.71	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.084	0.061	ft/ft
Lt (w/ Capture Ratio)	11.64	16.31	ft
E=	**80.76%**	**63.40%**	
Qi =	**1.10**	**1.20**	cfs
Qbypass =	**0.26**	**0.69**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 767	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	22+12 to 25+00 (South side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.51 ac

Gutter Flow Hydraulics

Input :			Output: Q10			Output: Q50		
Q10=	2.04	cfs						
Q50=	2.84	cfs	Spread =	8.889	ft	Spread =	10.146	ft
SI =	0.01102	ft/ft	Average V =	2.465	fps	Average V =	2.657	fps
Sx =	0.0200	ft/ft	Gutter Flow =	0.890	cfs	Gutter Flow =	1.092	cfs
Ss =	0.0200	ft/ft	% Gutter Flow =	43.54	%	% Gutter Flow =	38.45	%
Sw =	0.0588	ft/ft	Gutter Vel.=	3.280	fps	Gutter Vel.=	3.555	fps
Ws =	4.00	ft	Depth @ Curb =	2.795	inches	Depth @ Curb =	3.096	inches
Ww =	1.42	ft						
n =	0.016							

Inlet Hydraulics

Curb Opening On-Grade

Input :

Capture Ratio =	0.8	
L (curb opening length) =	10.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*SI^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.649	0.931	cfs
% Shoulder	31.7	32.8	%
Qgutter @ inlet	1.142	0.992	
% in Gutter	55.86	48.53	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.074	0.054	ft/ft
Lt (w/ Capture Ratio)	14.88	20.69	ft
E=	**91.03%**	**74.37%**	
Qi =	**1.86**	**2.11**	cfs
Qbypass =	**0.18**	**0.73**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 768	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	24+61 to 28+33 (north side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.38 ac

Gutter Flow Hydraulics

Input:

Q10=	1.71	cfs
Q50=	2.72	cfs
Sl =	0.00558	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	'ft/ft
Sw =	0.0588	'ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	9.497	ft	11.409	ft
Average V =	1.821	fps	2.025	fps
Gutter Flow =	0.701	cfs	0.932	cfs
% Gutter Flow =	40.93	%	34.34	%
Gutter Vel.=	2.430	fps	2.719	fps
Depth @ Curb =	2.941	inches	3.399	inches

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	6.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.556	0.888	cfs
% Shoulder	32.4	32.7	%
Qgutter @ inlet	0.893	0.731	
% in Gutter	52.10	42.68	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.071	0.046	ft/ft
Lt (w/ Capture Ratio)	11.61	18.18	ft
E=	**80.89%**	**58.17%**	
Qi =	**1.39**	**1.58**	cfs
Qbypass =	**0.33**	**1.14**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 769	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	25+00 to 28+33 (South side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.47 ac

Gutter Flow Hydraulics

Input:

Q10=	1.97	cfs
Q50=	3.19	cfs
Sl =	0.00563	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	'ft/ft
Sw =	0.0588	'ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	10.035	ft	12.128	ft
Average V =	1.887	fps	2.110	fps
Gutter Flow =	0.767	cfs	1.031	cfs
% Gutter Flow =	38.85	%	32.35	%
Gutter Vel.=	2.524	fps	2.837	fps
Depth @ Curb =	3.070	inches	3.572	inches

Inlet Hydraulics

Curb Opening On-Grade

Input:

Capture Ratio =	0.8	
L (curb opening length) =	10.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.647	1.032	cfs
% Shoulder	32.8	32.4	%
Qgutter @ inlet	0.970	0.787	
% in Gutter	49.11	39.88	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.068	0.044	ft/ft
Lt (w/ Capture Ratio)	12.67	20.07	ft
E=	**97.34%**	**75.96%**	
Qi =	**1.92**	**2.42**	cfs
Qbypass =	**0.05**	**0.77**	cfs

J2 Engineering and Environmental Design

Curb Opening Hydraulics
HEC-22 Methodology

Structure:	CB 770	By:	JJP
Project:	RMUS	Date:	Mar-05
Align:	Broadway Raod	Checked:	
Station:	28+33 to 33+12 (north side of Broadway Rd)	Project No.:	40024

Notes: Basin Area = 0.52 ac

Gutter Flow Hydraulics

Input :

Q10=	2.31	cfs
Q50=	3.90	cfs
Sl =	0.008	ft/ft
Sx =	0.0200	ft/ft
Ss =	0.0200	ft/ft
Sw =	0.0588	ft/ft
Ws =	4.00	ft
Ww =	1.42	ft
n =	0.016	

Output:

	Q10		Q50	
Spread =	9.969	ft	12.260	ft
Average V =	2.241	fps	2.532	fps
Gutter Flow =	0.905	cfs	1.250	cfs
% Gutter Flow =	39.10	%	32.01	%
Gutter Vel.=	2.996	fps	3.405	fps
Depth @ Curb =	3.054	inches	3.604	inches

Inlet Hydraulics

Curb Opening On-Grade

Input :

Capture Ratio =	0.8	
L (curb opening length) =	14.98	ft
Local Gutter Depression a'=	1	inches
HEC-22 a =	1.66	inches

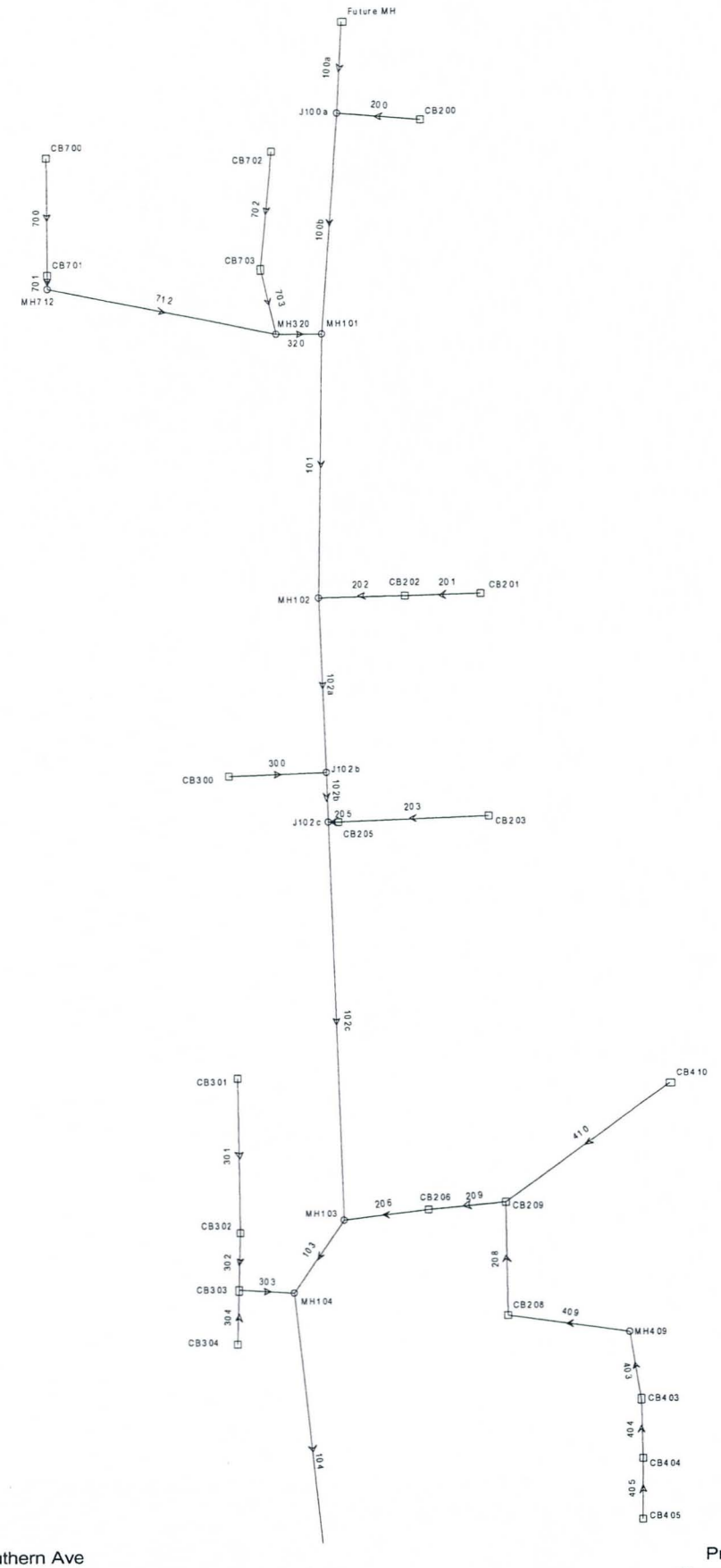
Note: The local depression at the inlet ,a', is measured from the beginning gutter to curb opening. The local depresion is measured from the US Sw. HEC-22 a is measured from the cross slope adjacent to the gutter.

Therefore:
S'w = Ss+a/w/12 and
Se = (Qg / Q) * (S'w - Sx) + (Qs / Q) * (Ss - Sx) + Sx
Lt =(0.6*Q^0.42*Sl^0.3*(1/n/Se)^0.6)/Capture Ratio

Output:

	Q10	Q50	
Qshoulder @ inlet	0.758	1.262	cfs
% Shoulder	32.7	32.3	%
Qgutter @ inlet	1.145	0.912	
% in Gutter	49.46	39.40	%
S'w (@ opening)=	0.059	0.059	ft/ft
Se =	0.068	0.043	ft/ft
Lt (w/ Capture Ratio)	15.01	24.74	ft
E=	**100.00%**	**81.26%**	
Qi =	**2.31**	**3.17**	cfs
Qbypass =	**0.00**	**0.73**	cfs

Scenario: RMFUS - 95% - Final Analysis



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03/28/05 10:39:36 AM © Haestad Methods, Inc.

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Project Engineer: PB
StormCAD v5.0 [5.0010]
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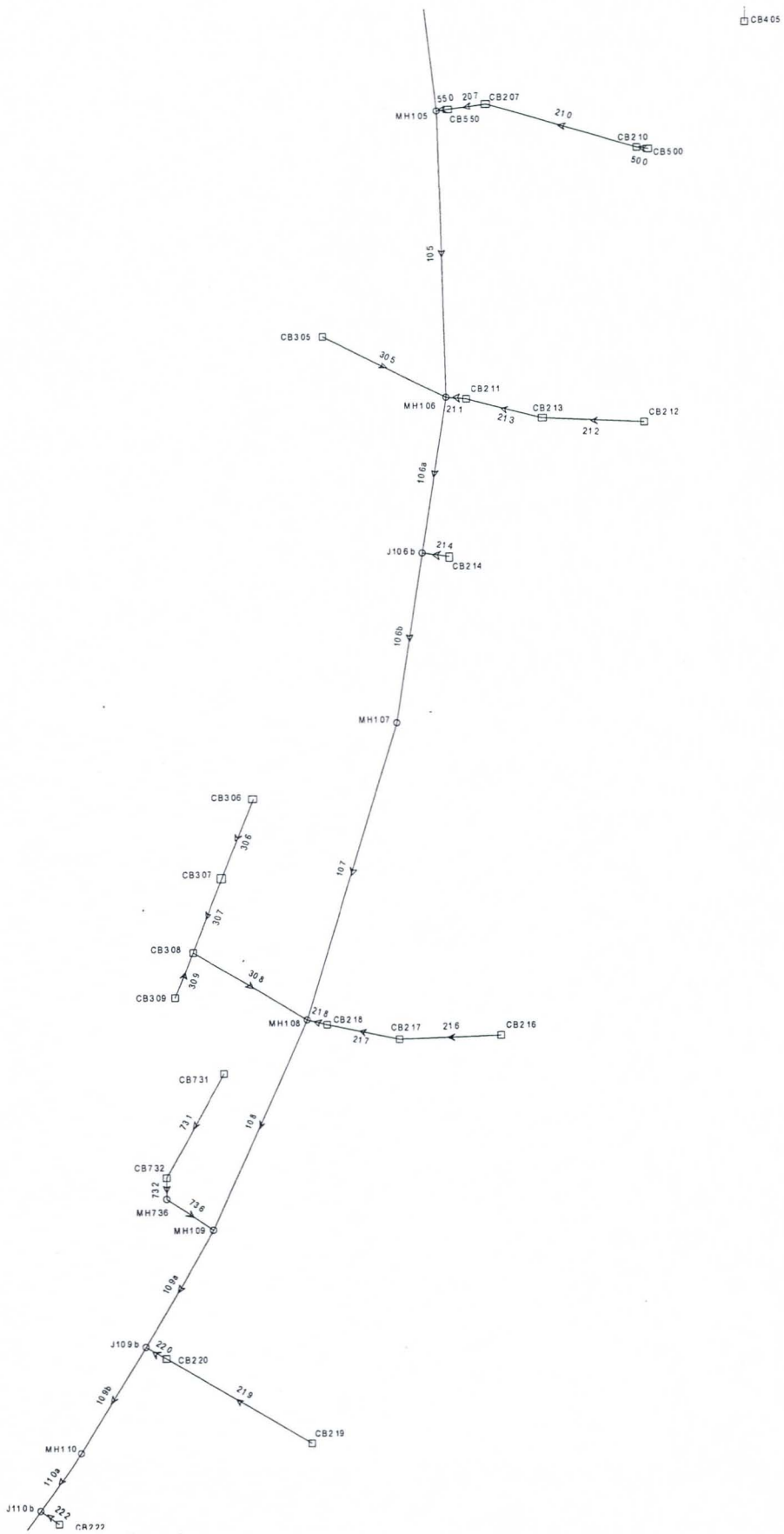
Scenario: RMFUS - 95% - Final Analysis



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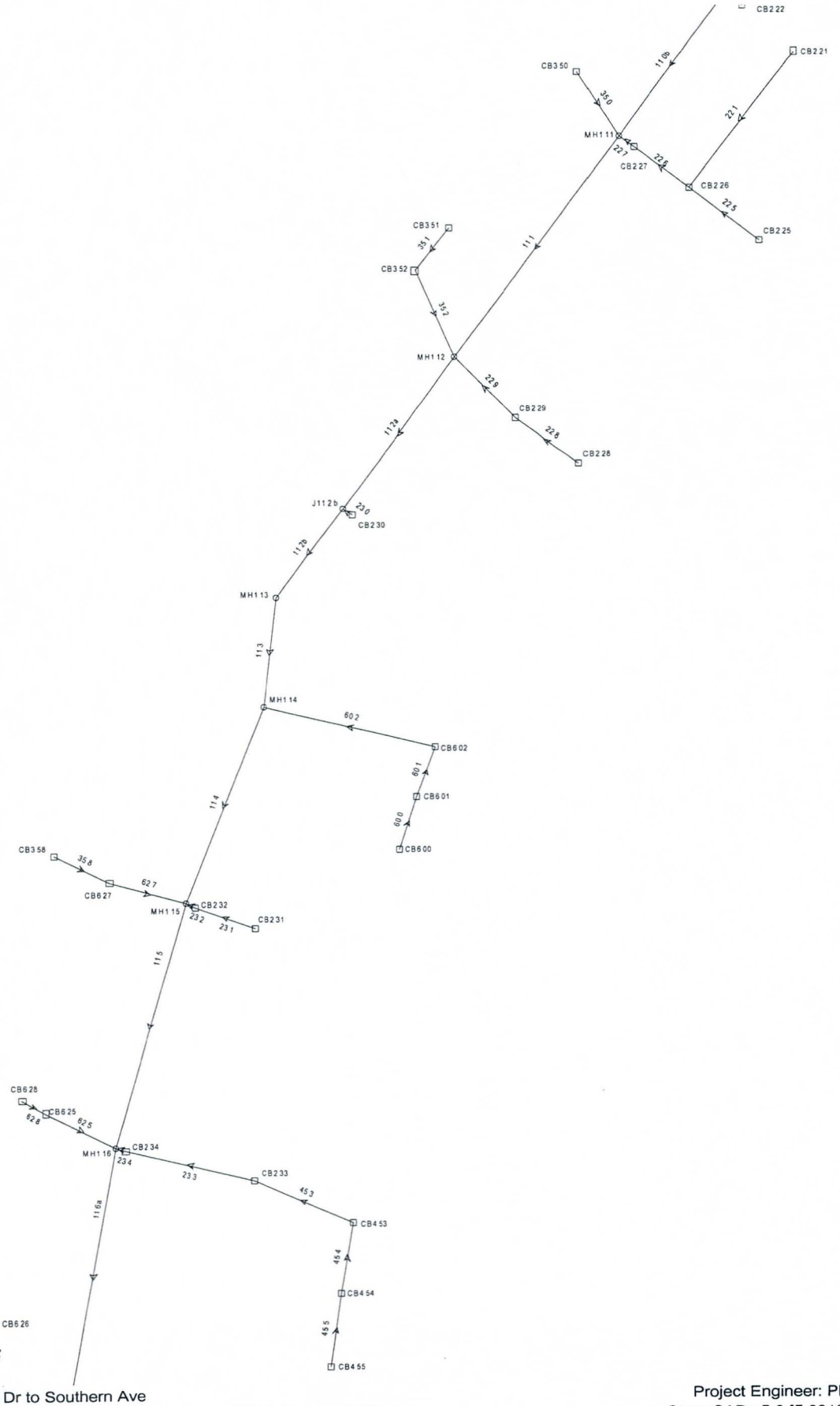
Scenario: RMFUS - 95% - Final Analysis



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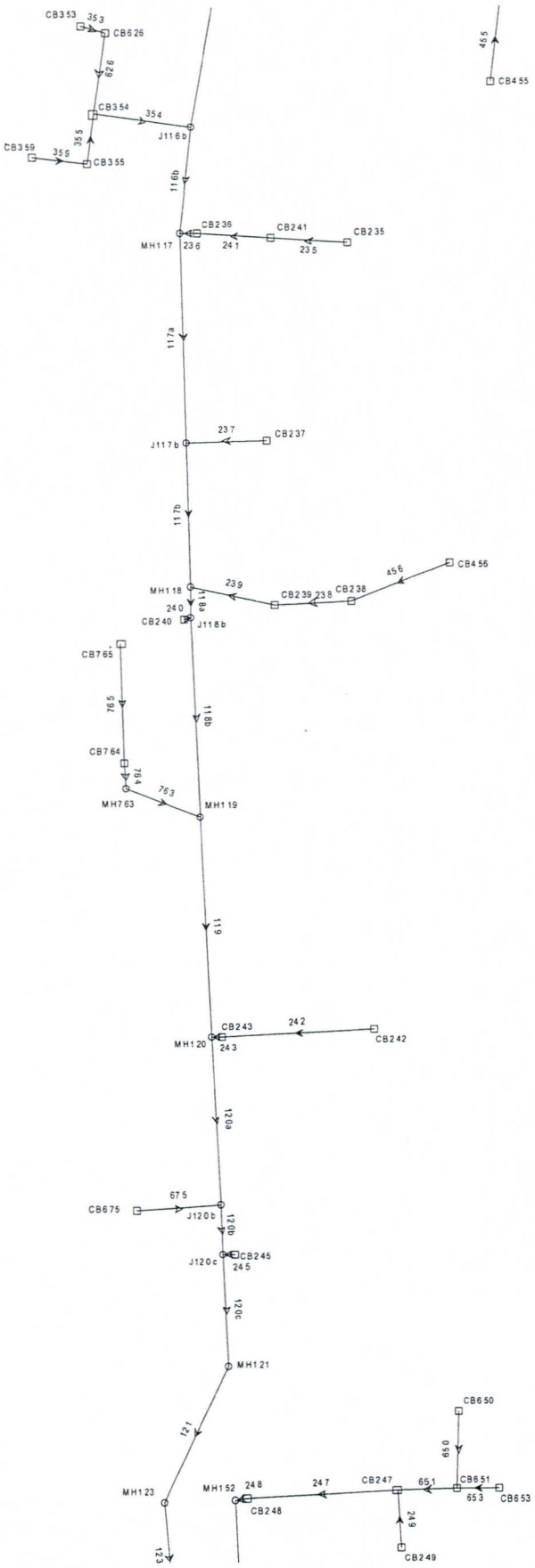
Scenario: RMFUS - 95% - Final Analysis



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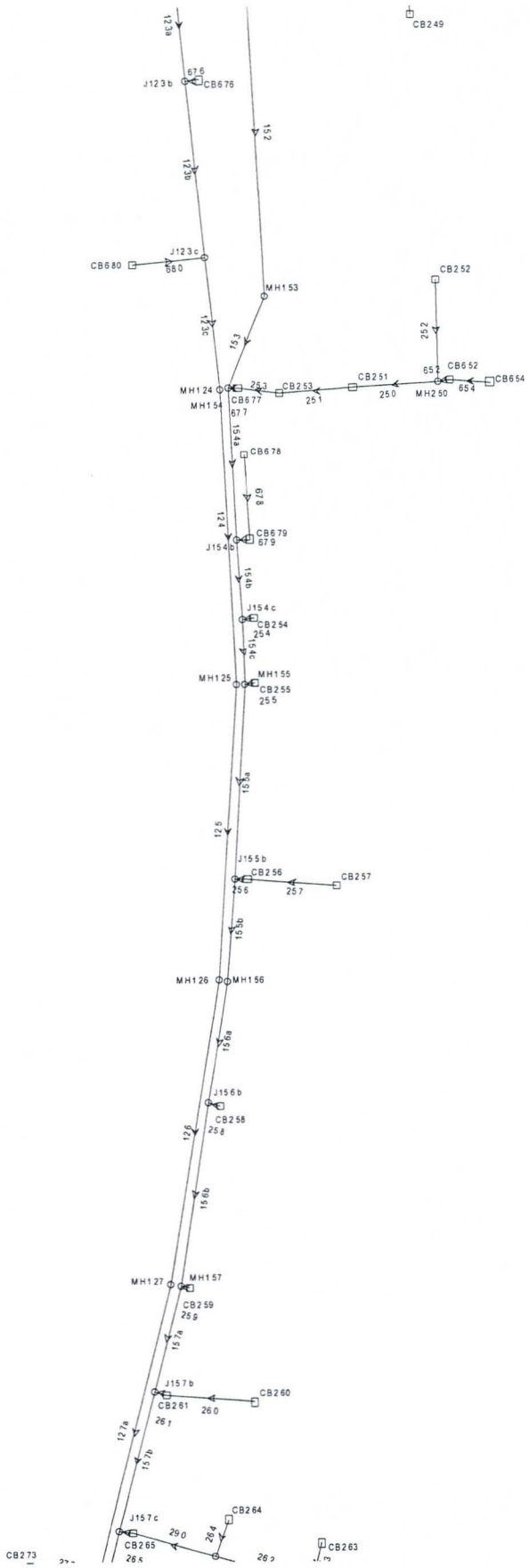
Scenario: RMFUS - 95% - Final Analysis



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Project Engineer: PB
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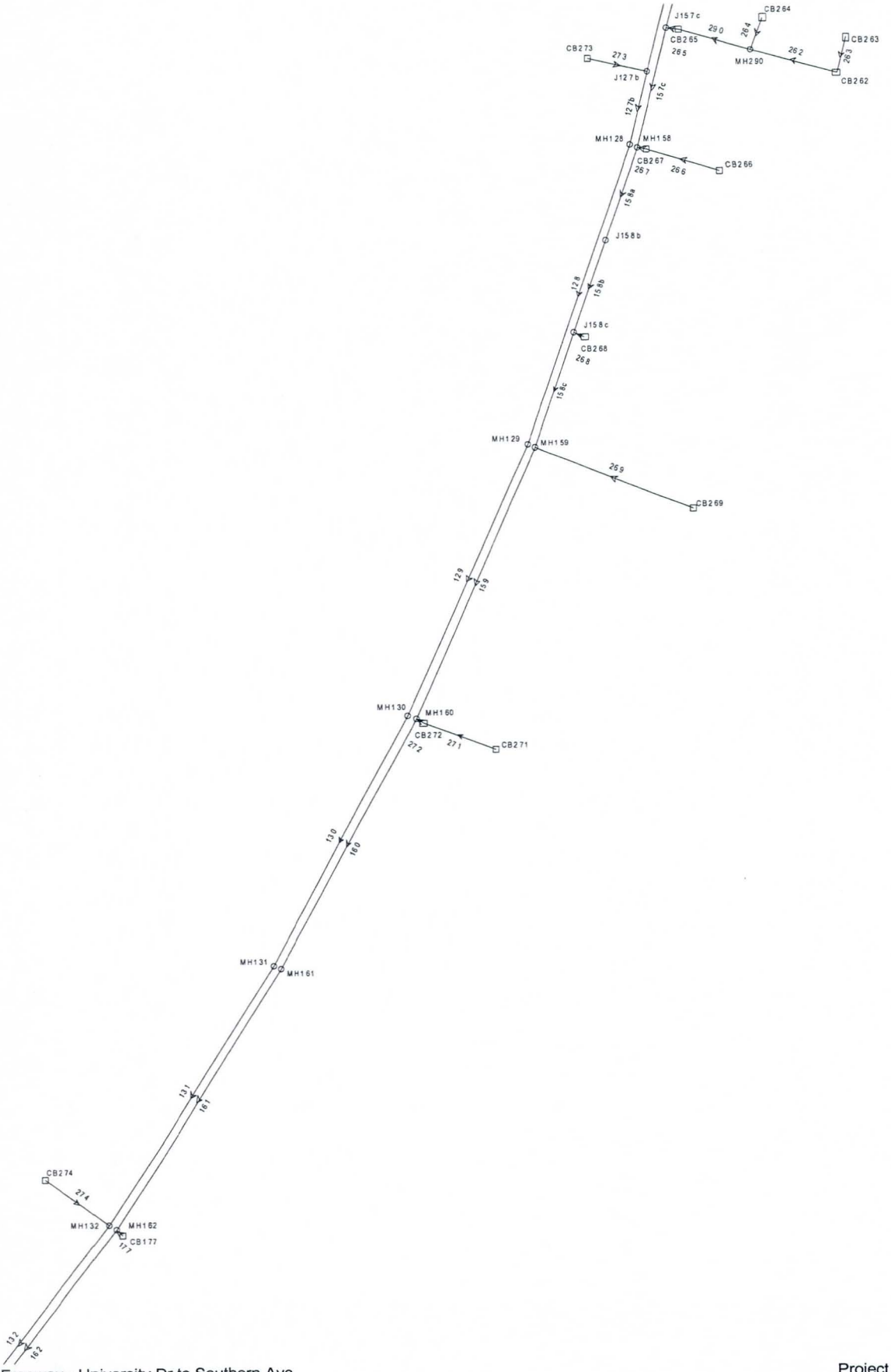
Scenario: RMFUS - 95% - Final Analysis



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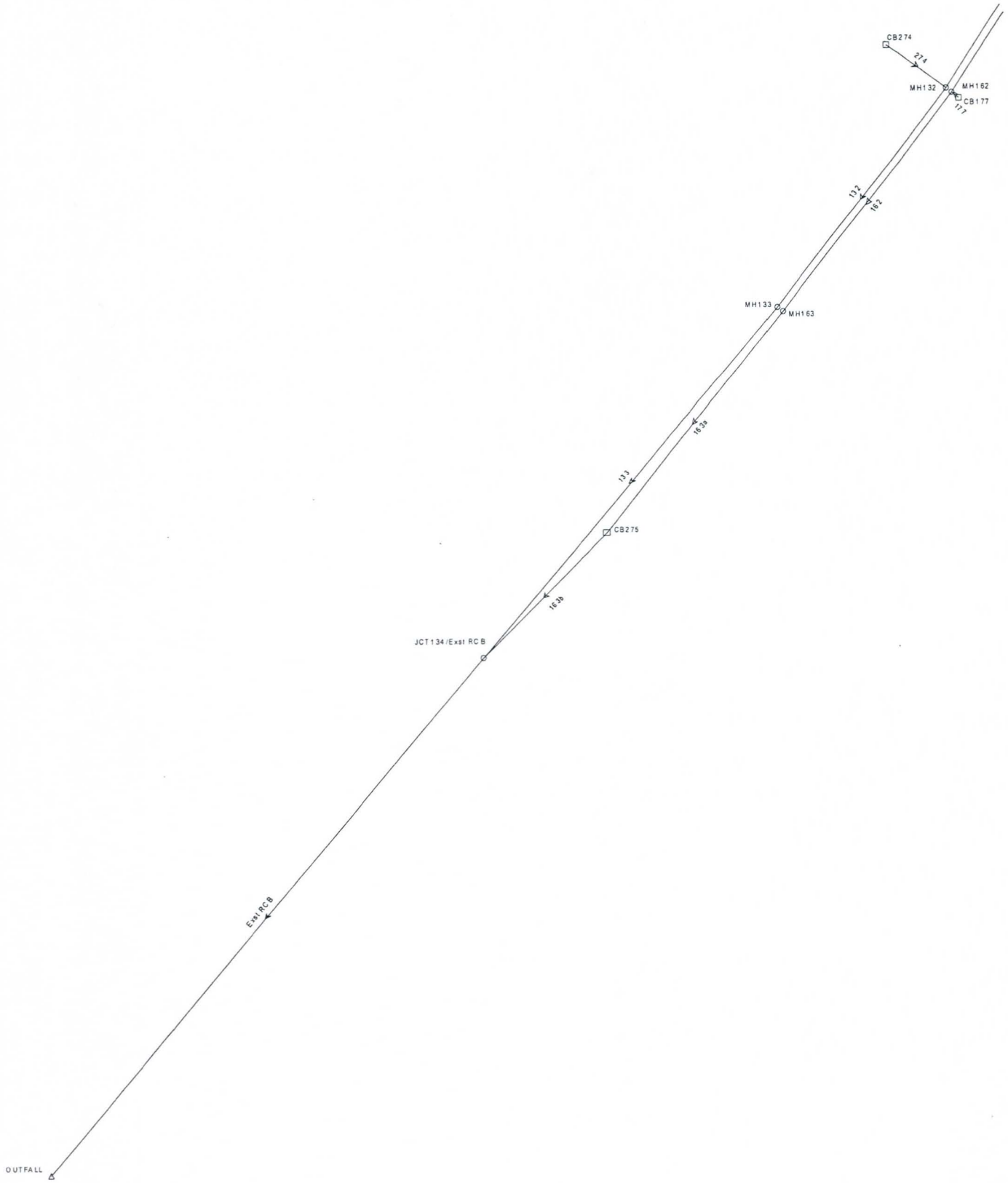
Scenario: RMFUS - 95% - Final Analysis



Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Node Report

Label	Total Inlet CA (acres)	Time of Concentration (min)	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	System Intensity (in/hr)	System Flow Time (min)	Total System Flow (cfs)
CB177	1.881	10.00	1,468.00	1,468.00	1,463.26	1,464.46	1,464.46	5.86	10.00	11.11
CB200	0.227	10.00	1,525.50	1,525.50	1,521.80	1,522.20	1,522.20	5.86	10.00	1.34
CB201	1.611	10.00	1,519.36	1,519.36	1,514.91	1,516.01	1,516.01	5.86	10.00	9.52
CB202	0.648	10.00	1,520.58	1,520.58	1,513.98	1,515.39	1,515.29	5.83	10.17	13.28
CB203	0.902	10.00	1,518.60	1,518.60	1,514.20	1,515.01	1,515.01	5.86	10.00	5.33
CB205	0.735	10.00	1,521.47	1,521.47	1,513.37	1,514.54	1,514.45	5.77	10.53	9.52
CB206	0.857	10.00	1,515.16	1,515.16	1,509.06	1,510.94	1,510.81	5.64	11.26	18.74
CB207	1.334	10.00	1,508.82	1,508.82	1,504.07	1,505.73	1,505.44	5.80	10.33	14.56
CB208	0.391	10.00	1,515.24	1,515.24	1,510.29	1,511.44	1,511.18	5.74	10.68	4.75
CB209	1.472	10.00	1,515.92	1,515.92	1,509.47	1,511.24	1,511.08	5.68	11.05	13.96
CB210	0.227	10.00	1,513.50	1,513.50	1,507.50	1,508.45	1,508.43	5.86	10.01	6.82
CB211	1.349	10.00	1,501.72	1,501.72	1,496.47	1,498.52	1,498.13	5.81	10.29	21.53
CB212	0.700	10.00	1,509.75	1,509.75	1,504.75	1,505.46	1,505.46	5.86	10.00	4.13
CB213	1.627	10.00	1,503.30	1,503.30	1,498.30	1,499.84	1,499.63	5.83	10.16	13.68
CB214	0.603	10.00	1,498.47	1,498.47	1,493.72	1,494.38	1,494.38	5.86	10.00	3.56
CB216	1.015	10.00	1,497.30	1,497.30	1,491.30	1,492.17	1,492.17	5.86	10.00	6.00
CB217	1.732	10.00	1,491.75	1,491.75	1,486.75	1,488.42	1,488.20	5.83	10.17	16.15
CB218	1.902	10.00	1,489.84	1,489.84	1,485.09	1,487.41	1,487.03	5.81	10.29	27.23
CB219	0.417	10.00	1,493.60	1,493.60	1,487.20	1,487.75	1,487.75	5.86	10.00	2.46
CB220	0.906	10.00	1,486.82	1,486.82	1,481.77	1,485.04	1,485.02	5.79	10.41	7.72
CB221	1.236	10.00	1,487.68	1,487.68	1,482.68	1,484.01	1,484.01	5.86	10.00	7.30
CB222	1.289	10.00	1,486.14	1,486.14	1,481.39	1,483.48	1,483.48	5.86	10.00	7.61
CB225	0.556	10.00	1,489.20	1,489.20	1,484.20	1,484.83	1,484.83	5.86	10.00	3.28
CB226	0.497	10.00	1,486.39	1,486.39	1,482.00	1,483.79	1,483.70	5.73	10.73	13.22
CB227	0.164	10.00	1,486.96	1,486.96	1,481.61	1,483.56	1,483.50	5.69	10.95	14.08
CB228	1.122	10.00	1,483.22	1,483.22	1,478.17	1,481.87	1,481.87	5.86	10.00	6.63
CB229	0.763	10.00	1,484.28	1,484.28	1,477.58	1,481.80	1,481.72	5.73	10.73	10.90
CB230	0.784	10.00	1,487.95	1,487.95	1,480.95	1,481.71	1,481.71	5.86	10.00	4.63
CB231	1.475	10.00	1,478.62	1,478.62	1,474.17	1,475.22	1,475.22	5.86	10.00	8.71
CB232	0.329	10.00	1,482.42	1,482.42	1,473.77	1,475.04	1,474.93	5.82	10.22	10.59
CB233	1.210	10.00	1,473.09	1,473.09	1,468.34	1,472.83	1,472.61	5.74	10.70	18.62
CB234	0.480	10.00	1,478.74	1,478.74	1,467.54	1,471.70	1,471.57	5.66	11.14	21.11
CB235	1.160	10.00	1,468.39	1,468.39	1,463.64	1,464.57	1,464.57	5.86	10.00	6.85
CB236	0.861	10.00	1,473.50	1,473.50	1,462.70	1,464.43	1,464.28	5.79	10.42	19.45
CB237	0.428	10.00	1,467.55	1,467.55	1,462.55	1,463.10	1,463.10	5.86	10.00	2.53
CB238	1.339	10.00	1,466.17	1,466.17	1,461.72	1,462.94	1,462.75	5.82	10.20	8.35
CB239	0.418	10.00	1,465.79	1,465.79	1,461.29	1,462.72	1,462.46	5.78	10.43	10.74
CB240	0.742	10.00	1,468.50	1,468.50	1,463.50	1,464.24	1,464.24	5.86	10.00	4.38
CB241	1.314	10.00	1,469.75	1,469.75	1,463.15	1,464.63	1,464.52	5.82	10.23	14.51
CB242	0.849	10.00	1,464.41	1,464.41	1,459.46	1,460.25	1,460.25	5.86	10.00	5.02
CB243	1.003	10.00	1,463.15	1,463.15	1,457.90	1,460.00	1,459.96	5.78	10.43	10.80
CB245	0.713	10.00	1,462.22	1,462.22	1,457.47	1,459.07	1,459.07	5.86	10.00	4.21
CB247	1.424	10.00	1,462.43	1,462.43	1,457.38	1,458.87	1,458.85	5.81	10.31	16.58
CB248	0.689	10.00	1,461.17	1,461.17	1,455.92	1,457.65	1,457.54	5.75	10.64	20.41
CB249	0.167	10.00	1,462.63	1,462.63	1,457.68	1,458.87	1,458.87	5.86	10.00	0.99
CB251	1.516	10.00	1,460.00	1,460.00	1,455.00	1,457.32	1,457.29	5.73	10.75	13.33
CB252	0.155	10.00	1,463.70	1,463.70	1,459.10	1,459.43	1,459.43	5.86	10.00	0.91
CB253	1.019	10.00	1,458.65	1,458.65	1,453.40	1,457.05	1,456.84	5.68	11.06	19.03
CB254	0.428	10.00	1,456.80	1,456.80	1,452.05	1,454.57	1,454.57	5.86	10.00	2.53
CB255	0.330	10.00	1,456.67	1,456.67	1,451.92	1,454.06	1,454.06	5.86	10.00	1.95
CB256	0.974	0.00	1,456.06	1,456.06	1,451.31	1,453.74	1,453.68	5.82	10.22	14.94

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Node Report

Label	Total Inlet CA (acres)	Time of Concentration (min)	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	System Intensity (in/hr)	System Flow Time (min)	Total System Flow (cfs)
CB257	1.572	10.00	1,457.63	1,457.63	1,452.13	1,453.84	1,453.84	5.86	10.00	9.29
CB258	1.091	10.00	1,455.11	1,455.11	1,450.36	1,452.39	1,452.39	5.86	10.00	6.44
CB259	0.841	10.00	1,454.31	1,454.31	1,449.56	1,451.26	1,451.26	5.86	10.00	4.97
CB260	1.361	10.00	1,455.43	1,455.43	1,449.93	1,451.11	1,451.11	5.86	10.00	8.04
CB261	0.466	10.00	1,453.88	1,453.88	1,449.13	1,451.16	1,451.08	5.82	10.23	10.72
CB262	0.749	10.00	1,459.28	1,459.28	1,454.78	1,456.11	1,455.87	5.84	10.11	9.36
CB263	0.840	10.00	1,459.25	1,459.25	1,455.25	1,456.03	1,456.03	5.86	10.00	4.96
CB264	0.742	10.00	1,455.17	1,455.17	1,450.67	1,451.57	1,451.57	5.86	10.00	4.38
CB265	1.065	10.00	1,453.66	1,453.66	1,449.21	1,451.01	1,450.80	5.79	10.43	19.81
CB266	1.805	10.00	1,455.39	1,455.39	1,450.39	1,451.56	1,451.56	5.86	10.00	10.66
CB267	0.778	10.00	1,453.88	1,453.88	1,449.13	1,450.65	1,450.53	5.83	10.18	15.18
CB268	1.691	10.00	1,455.10	1,455.10	1,450.35	1,451.48	1,451.48	5.86	10.00	9.99
CB269	0.684	10.00	1,462.20	1,462.20	1,456.45	1,457.16	1,457.16	5.86	10.00	4.04
CB271	2.368	10.00	1,461.20	1,461.20	1,456.20	1,457.75	1,457.75	5.86	10.00	13.99
CB272	2.217	10.00	1,460.25	1,460.25	1,455.50	1,457.60	1,457.36	5.82	10.21	26.92
CB273	1.617	10.00	1,476.40	1,476.40	1,470.40	1,471.50	1,471.50	5.86	10.00	9.55
CB274	1.043	10.00	1,462.75	1,462.75	1,457.75	1,458.63	1,458.63	5.86	10.00	6.16
CB275	0.212	10.00	1,476.42	1,476.42	1,439.40	1,444.44	1,444.42	4.46	19.94	137.07
CB300	0.665	10.00	1,536.23	1,536.23	1,531.87	1,532.56	1,532.56	5.86	10.00	3.93
CB301	0.477	10.00	1,527.26	1,527.26	1,521.90	1,522.49	1,522.49	5.86	10.00	2.82
CB302	0.216	10.00	1,525.22	1,525.22	1,519.86	1,520.58	1,520.56	5.78	10.47	4.04
CB303	0.141	10.00	1,525.06	1,525.06	1,519.20	1,520.09	1,520.07	5.75	10.64	6.00
CB304	0.202	10.00	1,525.22	1,525.22	1,519.86	1,520.24	1,520.24	5.86	10.00	1.19
CB305	0.364	10.00	1,522.96	1,522.96	1,518.46	1,518.97	1,518.97	5.86	10.00	2.15
CB306	0.400	10.00	1,515.08	1,515.08	1,510.22	1,510.75	1,510.75	5.86	10.00	2.36
CB307	0.259	10.00	1,514.71	1,514.71	1,509.35	1,510.05	1,510.04	5.81	10.31	3.85
CB308	0.100	10.00	1,515.84	1,515.84	1,508.98	1,509.81	1,509.79	5.75	10.65	5.31
CB309	0.159	10.00	1,516.27	1,516.27	1,510.41	1,510.74	1,510.74	5.86	10.00	0.94
CB350	0.898	10.00	1,508.06	1,508.06	1,502.70	1,503.51	1,503.51	5.86	10.00	5.31
CB351	0.328	10.00	1,504.17	1,504.17	1,498.81	1,499.29	1,499.29	5.86	10.00	1.94
CB352	0.090	10.00	1,503.17	1,503.17	1,497.81	1,498.42	1,498.36	5.83	10.20	2.46
CB353	0.896	10.00	1,484.80	1,484.80	1,479.37	1,480.18	1,480.18	5.86	10.00	5.29
CB354	0.159	10.00	1,483.09	1,483.09	1,477.23	1,478.61	1,478.46	5.82	10.24	11.75
CB355	0.375	10.00	1,483.14	1,483.14	1,478.28	1,479.23	1,479.02	5.84	10.11	4.48
CB358	0.368	10.00	1,491.68	1,491.68	1,486.68	1,487.19	1,487.19	5.86	10.00	2.17
CB359	0.385	10.00	1,485.74	1,485.74	1,480.74	1,481.26	1,481.26	5.86	10.00	2.27
CB403	0.168	10.00	1,527.11	1,527.11	1,520.55	1,521.12	1,521.10	5.82	10.21	2.53
CB404	0.084	10.00	1,526.93	1,526.93	1,521.37	1,521.81	1,521.80	5.86	10.00	1.55
CB405	0.179	0.00	1,527.11	1,527.11	1,521.75	1,522.16	1,522.16	7.66	0.00	1.38
CB410	0.146	10.00	1,534.20	1,534.20	1,527.70	1,528.02	1,528.02	5.86	10.00	0.86
CB453	0.919	10.00	1,486.25	1,486.25	1,479.89	1,481.41	1,481.12	5.76	10.57	11.66
CB454	0.214	10.00	1,485.92	1,485.92	1,480.36	1,481.40	1,481.38	5.81	10.30	6.38
CB455	0.875	10.00	1,486.25	1,486.25	1,480.75	1,481.55	1,481.55	5.86	10.00	5.17
CB456	0.084	10.00	1,491.47	1,491.47	1,486.60	1,486.84	1,486.84	5.86	10.00	0.49
CB500	0.928	10.00	1,515.36	1,515.36	1,509.61	1,510.44	1,510.44	5.86	10.00	5.48
CB550	0.964	10.00	1,507.11	1,507.11	1,502.66	1,504.41	1,504.27	5.79	10.38	20.17
CB600	0.656	10.00	1,478.61	1,478.61	1,473.36	1,476.73	1,476.73	5.86	10.00	3.87
CB601	0.281	10.00	1,478.46	1,478.46	1,472.71	1,476.72	1,476.71	5.71	10.84	5.40
CB602	1.298	10.00	1,478.67	1,478.67	1,471.92	1,476.68	1,476.30	5.61	11.44	12.64
CB625	0.368	10.00	1,484.10	1,484.10	1,479.35	1,479.97	1,479.95	5.85	10.07	3.00
CB626	0.189	10.00	1,483.19	1,483.19	1,478.32	1,479.48	1,479.22	5.85	10.04	6.40

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Node Report

Label	Total Inlet CA (acres)	Time of Concentration (min)	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	System Intensity (in/hr)	System Flow Time (min)	Total System Flow (cfs)
CB627	0.618	10.00	1,487.24	1,487.24	1,482.24	1,483.13	1,483.09	5.84	10.13	5.80
CB628	0.142	10.00	1,485.48	1,485.48	1,480.98	1,481.30	1,481.30	5.86	10.00	0.84
CB650	0.937	10.00	1,476.61	1,476.61	1,471.20	1,472.03	1,472.03	5.86	10.00	5.53
CB651	0.067	10.00	1,474.48	1,474.48	1,468.57	1,469.59	1,469.53	5.84	10.13	7.30
CB652	0.403	10.00	1,464.33	1,464.33	1,459.58	1,460.28	1,460.26	5.84	10.12	3.74
CB653	0.237	10.00	1,475.00	1,475.00	1,471.00	1,471.41	1,471.41	5.86	10.00	1.40
CB654	0.233	10.00	1,465.64	1,465.64	1,460.64	1,461.05	1,461.05	5.86	10.00	1.38
CB675	0.897	10.00	1,476.63	1,476.63	1,471.88	1,472.69	1,472.69	5.86	10.00	5.30
CB676	0.850	10.00	1,464.24	1,464.24	1,457.49	1,458.28	1,458.28	5.86	10.00	5.02
CB677	0.757	10.00	1,457.54	1,457.54	1,452.79	1,456.57	1,456.21	5.65	11.18	23.28
CB678	0.337	10.00	1,457.10	1,457.10	1,452.35	1,455.16	1,455.16	5.86	10.00	1.99
CB679	0.455	10.00	1,456.94	1,456.94	1,451.89	1,455.16	1,455.11	5.46	12.29	4.36
CB680	0.966	10.00	1,482.00	1,482.00	1,476.00	1,476.84	1,476.84	5.86	10.00	5.71
CB700	0.196	10.00	1,547.62	1,547.62	1,543.20	1,543.57	1,543.57	5.86	10.00	1.16
CB701	0.292	10.00	1,547.39	1,547.39	1,541.97	1,542.57	1,542.56	5.77	10.54	2.83
CB702	0.513	10.00	1,550.50	1,550.50	1,545.88	1,546.49	1,546.49	5.86	10.00	3.03
CB703	0.579	10.00	1,550.40	1,550.40	1,535.78	1,536.74	1,536.67	5.78	10.44	6.36
CB731	0.581	10.00	1,517.45	1,517.45	1,513.06	1,513.71	1,513.71	5.86	10.00	3.43
CB732	0.498	10.00	1,517.00	1,517.00	1,503.58	1,504.56	1,504.47	5.80	10.36	6.31
CB764	0.532	10.00	1,489.30	1,489.30	1,482.34	1,483.24	1,483.22	5.80	10.32	6.22
CB765	0.532	10.00	1,489.30	1,489.30	1,485.30	1,485.92	1,485.92	5.86	10.00	3.14
Future M	0.000	10.00	1,534.30	1,534.30	1,521.12	1,523.81	1,523.81	5.82	10.23	72.16
J100a			1,532.80	1,532.80	1,519.44	1,522.15	1,522.05	5.80	10.34	73.26
J102b			1,525.79	1,525.79	1,508.39	1,512.53	1,512.45	5.54	11.82	95.14
J102c			1,524.26	1,524.26	1,507.70	1,511.99	1,511.88	5.53	11.92	103.97
J106b			1,502.42	1,502.42	1,490.27	1,493.92	1,493.88	5.20	13.81	162.87
J109b			1,492.14	1,492.14	1,478.92	1,485.00	1,484.96	5.00	14.96	196.78
J110b			1,491.59	1,491.59	1,477.13	1,483.46	1,483.42	4.95	15.33	201.52
J112b			1,488.95	1,488.95	1,470.39	1,477.67	1,477.59	4.82	16.58	227.37
J116b			1,476.45	1,476.45	1,460.11	1,464.70	1,464.58	4.66	18.11	272.35
J117b			1,471.42	1,471.42	1,456.68	1,461.28	1,461.26	4.61	18.52	287.26
J118b			1,468.60	1,468.60	1,455.36	1,460.18	1,460.12	4.59	18.76	297.57
J120b			1,462.38	1,462.38	1,452.28	1,458.25	1,458.22	4.49	19.70	308.28
J120c			1,462.28	1,462.28	1,452.05	1,458.08	1,458.05	4.48	19.78	310.92
J123b			1,462.46	1,462.46	1,450.23	1,455.37	1,455.33	4.42	20.34	310.52
J123c			1,460.00	1,460.00	1,449.29	1,454.95	1,454.91	4.39	20.61	312.78
J127b			1,458.36	1,458.36	1,443.62	1,450.17	1,450.15	4.12	23.06	300.74
J154b			1,458.33	1,458.33	1,451.80	1,455.10	1,455.06	5.41	12.57	45.81
J154c			1,457.86	1,457.86	1,451.37	1,454.57	1,454.54	5.37	12.79	47.81
J155b			1,457.70	1,457.70	1,449.99	1,453.57	1,453.53	5.27	13.42	62.10
J156b			1,456.31	1,456.31	1,448.79	1,452.37	1,452.33	5.17	13.98	66.63
J157b			1,455.40	1,455.40	1,447.23	1,451.03	1,451.00	5.04	14.69	78.62
J157c			1,455.38	1,455.38	1,446.47	1,450.54	1,450.49	4.99	14.98	94.90
J158b			1,455.78	1,455.78	1,445.11	1,449.30	1,449.27	4.93	15.54	106.60
J158c			1,456.64	1,456.64	1,444.51	1,448.96	1,448.92	4.91	15.75	114.46
JCT134/I			1,485.00	1,485.00	1,438.94	1,444.07	1,443.95	3.54	28.54	370.33
MH101			1,530.07	1,530.07	1,515.27	1,518.35	1,517.98	5.65	11.18	80.41
MH102			1,528.01	1,528.01	1,510.81	1,514.23	1,513.68	5.59	11.57	92.15
MH103			1,518.18	1,518.18	1,502.18	1,507.50	1,506.53	5.40	12.63	119.59
MH104			1,517.58	1,517.58	1,500.98	1,506.07	1,504.21	5.37	12.81	124.52
MH105			1,507.41	1,507.41	1,496.61	1,500.31	1,500.03	5.30	13.23	141.28

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Node Report

Label	Total Inlet CA (acres)	Time of Concentration (min)	Ground Elevation (ft)	Rim Elevation (ft)	Sump Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	System Intensity (in/hr)	System Flow Time (min)	Total System Flow (cfs)
MH106			1,503.63	1,503.63	1,492.53	1,496.42	1,496.12	5.23	13.61	160.82
MH107			1,497.32	1,497.32	1,487.82	1,491.81	1,491.42	5.16	14.04	161.64
MH108			1,493.36	1,493.36	1,482.26	1,486.74	1,486.70	5.09	14.40	188.28
MH109			1,491.34	1,491.34	1,480.14	1,485.86	1,485.82	5.04	14.69	191.87
MH110			1,490.88	1,490.88	1,477.78	1,484.18	1,483.92	4.97	15.20	195.65
MH111			1,490.02	1,490.02	1,475.32	1,482.12	1,481.94	4.92	15.70	216.52
MH112			1,489.91	1,489.91	1,472.51	1,479.60	1,479.42	4.86	16.23	225.29
MH113			1,488.63	1,488.63	1,469.13	1,476.53	1,475.22	4.80	16.78	226.32
MH114			1,486.39	1,486.39	1,468.09	1,474.19	1,473.35	4.78	16.98	236.07
MH115			1,482.88	1,482.88	1,466.08	1,471.18	1,470.52	4.74	17.36	247.42
MH116			1,479.20	1,479.20	1,463.50	1,468.22	1,467.93	4.69	17.75	265.11
MH117			1,475.30	1,475.30	1,458.40	1,463.12	1,462.98	4.64	18.24	287.15
MH118			1,469.20	1,469.20	1,455.50	1,460.42	1,460.27	4.59	18.72	294.47
MH119			1,465.00	1,465.00	1,454.00	1,459.46	1,459.39	4.55	19.06	300.40
MH120			1,464.06	1,464.06	1,453.06	1,458.77	1,458.70	4.51	19.43	306.19
MH121			1,461.52	1,461.52	1,451.52	1,457.72	1,456.86	4.46	19.96	309.59
MH123			1,467.92	1,467.92	1,450.82	1,456.69	1,455.62	4.44	20.17	308.01
MH124			1,461.10	1,461.10	1,448.60	1,454.57	1,454.43	4.37	20.81	311.23
MH125			1,460.24	1,460.24	1,447.04	1,453.53	1,453.33	4.32	21.26	307.80
MH126			1,459.27	1,459.27	1,445.47	1,452.25	1,452.08	4.27	21.71	304.35
MH127			1,456.07	1,456.07	1,444.27	1,450.93	1,450.82	4.20	22.34	299.57
MH128			1,455.54	1,455.54	1,443.44	1,449.96	1,449.83	4.10	23.26	299.16
MH129			1,457.97	1,457.97	1,442.67	1,449.03	1,448.91	4.01	24.12	292.42
MH130			1,462.10	1,462.10	1,441.90	1,448.19	1,448.08	3.93	24.87	286.60
MH131			1,467.51	1,467.51	1,441.21	1,447.40	1,447.29	3.85	25.61	280.78
MH132			1,469.86	1,469.86	1,440.46	1,446.57	1,446.43	3.77	26.41	278.50
MH133			1,476.04	1,476.04	1,439.74	1,445.71	1,445.64	3.68	27.17	272.47
MH152			1,461.54	1,461.54	1,455.34	1,457.20	1,456.79	5.75	10.65	20.40
MH153			1,459.20	1,459.20	1,453.20	1,456.32	1,456.27	5.60	11.49	19.88
MH154			1,457.80	1,457.80	1,452.60	1,456.12	1,455.84	5.49	12.13	42.09
MH155			1,456.92	1,456.92	1,451.02	1,454.06	1,454.04	5.34	12.96	49.32
MH156			1,455.85	1,455.85	1,449.45	1,453.05	1,452.94	5.22	13.70	61.52
MH157			1,454.91	1,454.91	1,447.81	1,451.26	1,451.23	5.09	14.45	69.88
MH158			1,454.62	1,454.62	1,445.72	1,449.66	1,449.57	4.96	15.31	107.11
MH159			1,457.27	1,457.27	1,443.77	1,448.37	1,448.28	4.88	16.02	117.16
MH160			1,461.37	1,461.37	1,442.87	1,447.58	1,447.42	4.79	16.88	137.06
MH161			1,464.20	1,464.20	1,442.00	1,446.39	1,446.28	4.70	17.71	134.51
MH162			1,468.76	1,468.76	1,441.06	1,445.55	1,445.28	4.62	18.49	140.88
MH163			1,472.16	1,472.16	1,440.16	1,444.88	1,444.84	4.54	19.20	138.56
MH250			1,463.50	1,463.50	1,458.50	1,459.27	1,459.25	5.76	10.59	4.59
MH290			1,455.65	1,455.65	1,450.15	1,451.60	1,451.48	5.82	10.25	13.67
MH320			1,545.00	1,545.00	1,535.00	1,536.17	1,536.07	5.66	11.14	9.01
MH409			1,527.50	1,527.50	1,520.00	1,520.62	1,520.55	5.78	10.47	2.51
MH712			1,547.65	1,547.65	1,540.75	1,541.41	1,541.34	5.76	10.55	2.83
MH736			1,511.40	1,511.40	1,500.00	1,501.02	1,500.89	5.79	10.41	6.30
MH763			1,488.00	1,488.00	1,475.00	1,476.03	1,475.88	5.80	10.36	6.22
OUTFAL			1,450.00	1,450.00	1,438.10	1,441.10	1,441.10	3.34	30.89	349.93

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Pipe Report

Label	Upstream Node	Downstream Node	Section Size	Length (ft)	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Upstream Sump Elevation (ft)	Downstream Sump Elevation (ft)	Constructed Slope (ft/ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Average Velocity (ft/s)	System CA (acres)	System Flow Time (min)	System Intensity (in/hr)	Total System Flow (cfs)
100a	Future MH	J100a	36 inch	95	96.08	1,521.12	1,519.44	1,523.81	1,522.16	1,521.12	1,519.44	0.017684	1,534.30	1,532.80	14.92	12.300	10.23	5.82	72.16
100b	J100a	MH101	36 inch	234	96.45	1,519.44	1,515.27	1,522.05	1,518.35	1,519.44	1,515.27	0.017821	1,532.80	1,530.07	14.71	12.527	10.34	5.80	73.26
101	MH101	MH102	36 inch	281	73.52	1,515.27	1,511.31	1,517.98	1,514.23	1,515.27	1,510.81	0.014093	1,530.07	1,528.01	11.85	14.106	11.18	5.65	80.41
102a	MH102	J102b	42 inch	185	106.84	1,510.81	1,508.39	1,513.68	1,512.53	1,510.81	1,508.39	0.013081	1,528.01	1,525.79	12.31	16.365	11.57	5.59	92.15
102b	J102b	J102c	42 inch	53	106.59	1,508.39	1,507.70	1,512.45	1,511.99	1,508.39	1,507.70	0.013019	1,525.79	1,524.26	9.05	17.030	11.82	5.54	95.14
102c	J102c	MH103	42 inch	422	106.84	1,507.70	1,502.18	1,511.88	1,507.50	1,507.70	1,502.18	0.013081	1,524.26	1,518.18	9.90	18.667	11.92	5.53	103.97
103	MH103	MH104	48 inch	92	177.71	1,502.18	1,500.98	1,506.53	1,506.07	1,502.18	1,500.98	0.013043	1,518.18	1,517.58	8.75	21.962	12.63	5.40	119.59
104	MH104	MH105	48 inch	334	152.56	1,500.98	1,496.61	1,504.21	1,500.51	1,500.98	1,496.61	0.013084	1,517.58	1,507.41	13.33	22.998	12.81	5.37	124.52
105	MH105	MH106	48 inch	312	152.52	1,496.61	1,492.53	1,500.03	1,496.97	1,496.61	1,492.53	0.013077	1,507.41	1,503.63	13.64	26.451	13.23	5.30	141.28
106a	MH106	J106b	48 inch	172	152.89	1,492.53	1,490.27	1,496.12	1,493.99	1,492.53	1,490.27	0.013140	1,503.63	1,502.42	13.87	30.491	13.61	5.23	160.82
106b	J106b	MH107	48 inch	187	152.66	1,490.27	1,487.82	1,493.88	1,491.81	1,490.27	1,487.82	0.013102	1,502.42	1,497.32	13.85	31.094	13.81	5.20	162.87
107	MH107	MH108	54 inch	337	234.53	1,487.82	1,482.26	1,491.42	1,487.01	1,487.82	1,482.26	0.016499	1,497.32	1,493.36	15.66	31.094	14.04	5.16	161.64
108	MH108	MH109	60 inch	251	259.29	1,482.26	1,480.14	1,486.70	1,485.92	1,482.26	1,480.14	0.008446	1,493.36	1,491.34	14.19	36.661	14.40	5.09	188.28
109a	MH109	J109b	60 inch	145	221.82	1,480.14	1,478.92	1,485.82	1,485.03	1,480.14	1,478.92	0.008414	1,491.34	1,492.14	9.13	37.740	14.69	5.04	191.87
109b	J109b	MH110	60 inch	135	222.22	1,478.92	1,477.78	1,484.96	1,484.18	1,478.92	1,477.78	0.008444	1,492.14	1,490.88	9.40	39.062	14.96	5.00	196.78
110a	MH110	J110b	60 inch	76	223.64	1,477.78	1,477.13	1,483.92	1,483.48	1,477.78	1,477.13	0.008553	1,490.88	1,491.59	9.36	39.062	15.20	4.97	195.65
110b	J110b	MH111	60 inch	211	223.98	1,477.13	1,475.32	1,483.42	1,482.12	1,477.13	1,475.32	0.008578	1,491.59	1,490.02	9.65	40.351	15.33	4.95	201.52
111	MH111	MH112	60 inch	331	222.81	1,475.32	1,472.51	1,481.94	1,479.60	1,475.32	1,472.51	0.008489	1,490.02	1,489.91	10.38	43.702	15.70	4.92	216.52
112a	MH112	J112b	60 inch	226	234.22	1,472.51	1,470.39	1,479.42	1,477.67	1,472.51	1,470.39	0.009381	1,489.91	1,488.95	10.82	46.005	16.23	4.86	225.29
112b	J112b	MH113	60 inch	135	233.63	1,470.39	1,469.13	1,477.59	1,476.53	1,470.39	1,469.13	0.009333	1,488.95	1,488.63	10.93	46.789	16.58	4.82	227.37
113	MH113	MH114	60 inch	131	215.47	1,469.13	1,468.09	1,475.22	1,474.19	1,469.13	1,468.09	0.007939	1,488.63	1,486.39	10.89	46.789	16.78	4.80	226.32
114	MH114	MH115	60 inch	255	214.70	1,468.09	1,466.08	1,473.35	1,471.18	1,468.09	1,466.08	0.007882	1,486.39	1,482.88	11.37	49.025	16.98	4.78	236.07
115	MH115	MH116	60 inch	305	222.41	1,466.08	1,463.50	1,470.52	1,468.22	1,466.08	1,463.50	0.008459	1,482.88	1,479.20	12.82	51.815	17.36	4.74	247.42
116a	MH116	J116b	60 inch	313	251.67	1,463.50	1,460.11	1,467.93	1,464.70	1,463.50	1,460.11	0.010831	1,479.20	1,476.45	14.61	56.024	17.75	4.69	265.11
116b	J116b	MH117	60 inch	112	251.35	1,460.11	1,458.90	1,464.58	1,463.16	1,460.11	1,458.40	0.010804	1,476.45	1,475.30	14.57	58.027	18.11	4.66	272.35
117a	MH117	J117b	66 inch	223	273.84	1,458.40	1,456.68	1,462.98	1,461.34	1,458.40	1,456.68	0.007713	1,475.30	1,471.42	13.14	61.362	18.24	4.64	287.15
117b	J117b	MH118	66 inch	154	272.94	1,456.68	1,455.50	1,461.26	1,460.42	1,456.68	1,455.50	0.007662	1,471.42	1,469.20	13.10	61.790	18.52	4.61	287.26
118a	MH118	J118b	72 inch	34	294.39	1,455.50	1,455.36	1,460.27	1,460.18	1,455.50	1,455.36	0.004118	1,469.20	1,468.60	11.85	63.632	18.72	4.59	294.47
118b	J118b	MH119	72 inch	210	293.59	1,455.36	1,454.50	1,460.12	1,459.46	1,455.36	1,454.00	0.004095	1,468.60	1,465.00	11.83	64.373	18.76	4.59	297.57
119	MH119	MH120	78 inch	235	307.88	1,454.00	1,453.06	1,459.39	1,458.77	1,454.00	1,453.06	0.004000	1,465.00	1,464.06	10.54	65.438	19.06	4.55	300.40
120a	MH120	J120b	78 inch	178	322.25	1,453.06	1,452.28	1,458.70	1,458.25	1,453.06	1,452.28	0.004382	1,464.06	1,462.38	10.99	67.289	19.43	4.51	306.19
120b	J120b	J120c	78 inch	52	323.75	1,452.28	1,452.05	1,458.22	1,458.08	1,452.28	1,452.05	0.004423	1,462.38	1,462.28	11.05	68.186	19.70	4.49	308.28
120c	J120c	MH121	78 inch	119	324.88	1,452.05	1,451.52	1,458.05	1,457.72	1,452.05	1,451.52	0.004454	1,462.28	1,461.52	11.09	68.899	19.78	4.48	310.92
121	MH121	MH123	78 inch	159	376.83	1,451.52	1,450.82	1,456.86	1,456.69	1,451.52	1,450.82	0.004403	1,461.52	1,467.92	12.56	68.899	19.96	4.46	309.59
123a	MH123	J123b	78 inch	119	342.77	1,450.82	1,450.23	1,455.62	1,455.37	1,450.82	1,450.23	0.004958	1,467.92	1,462.46	11.60	68.899	20.17	4.44	308.01
123b	J123b	J123c	78 inch	187	345.14	1,450.23	1,449.29	1,455.33	1,454.95	1,450.23	1,449.29	0.005027	1,462.46	1,460.00	11.69	69.749	20.34	4.42	310.52
123c	J123c	MH124	78 inch	141	340.54	1,449.29	1,448.60	1,454.91	1,454.57	1,449.29	1,448.60	0.004894	1,460.00	1,461.10	11.57	70.715	20.61	4.39	312.78
124	MH124	MH125	78 inch	313	343.67	1,448.60	1,447.04	1,454.43	1,453.53	1,448.60	1,447.04	0.004984	1,461.10	1,460.24	11.65	70.715	20.81	4.37	311.23
125	MH125	MH126	78 inch	315	343.67	1,447.04	1,445.47	1,453.33	1,452.25	1,447.04	1,445.47	0.004984	1,460.24	1,459.27	11.63	70.715	21.26	4.32	307.80
126	MH126	MH127	78 inch	327	294.90	1,445.47	1,444.27	1,452.08	1,450.93	1,445.47	1,444.27	0.003670	1,459.27	1,456.07	8.72	70.715	21.71	4.27	304.35
127a	MH127	J127b	84 inch	324	265.68	1,444.27	1,443.62	1,450.82	1,450.17	1,444.27	1,443.62	0.002006	1,456.07	1,458.36	7.44	70.715	22.34	4.20	299.57
127b	J127b	MH128	84 inch	91	263.81	1,443.62	1,443.44	1,450.15	1,449.96	1,443.62	1,443.44	0.001978	1,458.36	1,455.54	7.50	72.332	23.06	4.12	300.74
128	MH128	MH129	84 inch	386	264.93	1,443.44	1,442.67	1,449.83	1,449.03	1,443.44	1,442.67	0.001995	1,455.54	1,457.97	7.48	72.332	23.26	4.10	299.16
129	MH129	MH130	84 inch	361	273.95	1,442.67	1,441.90	1,448.91	1,448.19	1,442.67	1,441.90	0.002133	1,457.97	1,462.10	8.09	72.332	24.12	4.01	292.42
130	MH130	MH131	84 inch	347	264.51	1,441.90	1,441.21	1,448.08	1,447.40	1,441.90	1,441.21	0.001988	1,462.10	1,467.51	7.77	72.332	24.87	3.93	286.60
131	MH131	MH132	84 inch	375	265.27	1,441.21	1,440.46	1,447.29	1,446.57	1,441.21	1,440.46	0.002000	1,467.51	1,469.86	7.83	72.332	25.61	3.85	280.78
132	MH132	MH133	84 inch	358	266.01	1,440.46	1,439.74	1,446.43	1,445.71	1,440.46	1,439.74	0.002011	1,469.86	1,476.04	7.86	73.375	26.41	3.77	278.50
133	MH133	JCT134/Exst RC	84 inch	576	221.06	1,439.74	1,438.94	1,445.64	1,444.07	1,439.74	1,438.94	0.001389	1,476.04	1,485.00	7.02	73.375	27.17	3.68	272.47
152	MH152	MH153	36 inch	349	52.23	1,455.34	1,453.20	1,456.79	1,456.32	1,455.34	1,453.20	0.006132	1,461.54	1,459.20	6.93	3.522	10.65	5.75	20.40
153	MH153	MH154	36 inch	107	49.94	1,453.20	1,452.60	1,456.27	1,456.17	1,453.20	1,452.60	0.005607	1,459.20	1,457.80	2.81	3.522	11.49	5.60	19.88
154a	MH154	J154b	36 inch	160	43.79	1,452.60	1,451.80	1,455.84	1,455.10	1,452.60	1,451.80	0.005000	1,457.80	1,458.33	5.96	7.605	12.13	5.49	42.09

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Pipe Report

Label	Upstream Node	Downstream Node	Section Size	Length (ft)	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Upstream Sump Elevation (ft)	Downstream Sump Elevation (ft)	Constructed Slope (ft/ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Average Velocity (ft/s)	System CA (acres)	System Flow Time (min)	System Intensity (in/hr)	Total System Flow (cfs)
154b	J154b	J154c	36 inch	85	44.05	1,451.80	1,451.37	1,455.06	1,454.59	1,451.80	1,451.37	0.005059	1,458.33	1,457.86	6.49	8.397	12.57	5.41	45.81
154c	J154c	MH155	36 inch	69	44.11	1,451.37	1,451.02	1,454.54	1,454.13	1,451.37	1,451.02	0.005072	1,457.86	1,456.92	6.78	8.825	12.79	5.37	47.81
155a	MH155	J155b	42 inch	207	65.90	1,451.02	1,449.99	1,454.04	1,453.57	1,451.02	1,449.99	0.004976	1,456.92	1,457.70	7.52	9.155	12.96	5.34	49.32
155b	J155b	MH156	42 inch	109	65.75	1,449.99	1,449.45	1,453.53	1,453.05	1,449.99	1,449.45	0.004954	1,457.70	1,455.85	6.44	11.702	13.42	5.27	62.10
156a	MH156	J156b	42 inch	131	66.31	1,449.45	1,448.79	1,452.94	1,452.37	1,449.45	1,448.79	0.005038	1,455.85	1,456.31	7.83	11.702	13.70	5.22	61.52
156b	J156b	MH157	42 inch	196	66.06	1,448.79	1,447.81	1,452.33	1,451.34	1,448.79	1,447.81	0.005000	1,456.31	1,454.91	6.91	12.793	13.98	5.17	66.63
157a	MH157	J157b	48 inch	115	94.72	1,447.81	1,447.23	1,451.23	1,451.03	1,447.81	1,447.23	0.005043	1,454.91	1,455.40	8.24	13.634	14.45	5.09	69.88
157b	J157b	J157c	48 inch	151	94.62	1,447.23	1,446.47	1,451.00	1,450.54	1,447.23	1,446.47	0.005033	1,455.40	1,455.38	8.42	15.460	14.69	5.04	78.62
157c	J157c	MH158	48 inch	149	94.63	1,446.47	1,445.72	1,450.49	1,449.74	1,446.47	1,445.72	0.005034	1,455.38	1,454.62	7.53	18.857	14.98	4.99	94.90
158a	MH158	J158b	54 inch	121	129.65	1,445.72	1,445.11	1,449.57	1,449.30	1,445.72	1,445.11	0.005041	1,454.62	1,455.78	9.11	21.440	15.31	4.96	107.11
158b	J158b	J158c	54 inch	119	129.65	1,445.11	1,444.51	1,449.27	1,448.96	1,445.11	1,444.51	0.005042	1,455.78	1,456.64	9.10	21.440	15.54	4.93	106.60
158c	J158c	MH159	54 inch	147	129.55	1,444.51	1,443.77	1,448.92	1,448.37	1,444.51	1,443.77	0.005034	1,456.64	1,457.27	9.19	23.130	15.75	4.91	114.46
159	MH159	MH160	60 inch	362	120.58	1,443.77	1,442.87	1,448.28	1,447.58	1,443.77	1,442.87	0.002486	1,457.27	1,461.37	7.00	23.814	16.02	4.88	117.16
160	MH160	MH161	60 inch	347	121.09	1,442.87	1,442.00	1,447.42	1,446.39	1,442.87	1,442.00	0.002507	1,461.37	1,464.20	6.96	28.399	16.88	4.79	137.06
161	MH161	MH162	60 inch	377	139.71	1,442.00	1,441.06	1,446.28	1,445.55	1,442.00	1,441.06	0.002493	1,464.20	1,468.76	8.10	28.399	17.71	4.70	134.51
162	MH162	MH163	66 inch	359	182.14	1,441.06	1,440.16	1,445.28	1,444.88	1,441.06	1,440.16	0.002507	1,468.76	1,472.16	8.47	30.281	18.49	4.62	140.88
163a	MH163	CB275	66 inch	355	168.32	1,440.16	1,439.40	1,444.84	1,444.44	1,440.16	1,439.40	0.002141	1,472.16	1,476.42	7.91	30.281	19.20	4.54	138.56
163b	CB275	JCT134/Exst RC	66 inch	221	165.96	1,439.40	1,438.94	1,444.42	1,444.18	1,439.40	1,438.94	0.002081	1,476.42	1,485.00	7.80	30.493	19.94	4.46	137.07
177	CB177	MH162	24 inch	8	24.51	1,463.26	1,463.18	1,464.46	1,464.25	1,463.26	1,441.06	0.010000	1,468.00	1,468.76	7.61	1.881	10.00	5.86	11.11
200	CB200	J100a	24 inch	88	35.44	1,521.80	1,519.96	1,522.20	1,522.15	1,521.80	1,519.44	0.020909	1,525.50	1,532.80	5.41	0.227	10.00	5.86	1.34
201	CB201	CB202	24 inch	79	26.59	1,514.91	1,513.98	1,516.01	1,515.39	1,514.91	1,513.98	0.011772	1,519.36	1,520.58	7.76	1.611	10.00	5.86	9.52
202	CB202	MH102	24 inch	89	46.25	1,513.98	1,510.81	1,515.29	1,514.94	1,513.98	1,510.81	0.035618	1,520.58	1,528.01	12.69	2.259	10.17	5.83	13.28
203	CB203	CB205	24 inch	157	17.82	1,514.20	1,513.37	1,515.01	1,514.54	1,514.20	1,513.37	0.005287	1,518.60	1,521.47	4.95	0.902	10.00	5.86	5.33
205	CB205	J102c	24 inch	11	150.89	1,513.37	1,509.20	1,514.45	1,512.58	1,513.37	1,507.70	0.379091	1,521.47	1,524.26	26.57	1.637	10.53	5.77	9.52
206	CB206	MH103	24 inch	90	16.74	1,509.06	1,508.64	1,510.81	1,510.18	1,509.06	1,502.18	0.004667	1,515.16	1,518.18	5.78	3.295	11.26	5.64	18.74
207	CB207	CB550	24 inch	39	46.60	1,504.07	1,502.66	1,505.44	1,504.41	1,504.07	1,502.66	0.036154	1,508.82	1,507.11	13.11	2.489	10.33	5.80	14.56
208	CB208	CB209	24 inch	118	20.43	1,510.29	1,509.47	1,511.18	1,511.24	1,510.29	1,509.47	0.006949	1,515.24	1,515.92	5.30	0.821	10.68	5.74	4.75
209	CB209	CB206	24 inch	79	17.65	1,509.47	1,509.06	1,511.08	1,510.94	1,509.47	1,509.06	0.005190	1,515.92	1,515.16	6.20	2.439	11.05	5.68	13.96
210	CB210	CB207	24 inch	165	35.33	1,507.50	1,504.07	1,508.43	1,505.73	1,507.50	1,504.07	0.020788	1,513.50	1,508.82	8.69	1.155	10.01	5.86	6.82
211	CB211	MH106	24 inch	20	89.87	1,496.47	1,493.78	1,498.13	1,496.42	1,496.47	1,492.53	0.134500	1,501.72	1,503.63	23.46	3.676	10.29	5.81	21.53
212	CB212	CB213	24 inch	108	59.89	1,504.75	1,498.30	1,505.46	1,499.84	1,504.75	1,498.30	0.059722	1,509.75	1,503.30	10.93	0.700	10.00	5.86	4.13
213	CB213	CB211	24 inch	83	36.39	1,498.30	1,496.47	1,499.63	1,498.52	1,498.30	1,496.47	0.022048	1,503.30	1,501.72	10.76	2.327	10.16	5.83	13.68
214	CB214	J106b	24 inch	27	71.37	1,493.72	1,491.43	1,494.38	1,493.92	1,493.72	1,490.27	0.084815	1,498.47	1,502.42	11.84	0.603	10.00	5.86	3.56
216	CB216	CB217	24 inch	109	50.07	1,491.30	1,486.75	1,492.17	1,488.42	1,491.30	1,486.75	0.041743	1,497.30	1,491.75	10.74	1.015	10.00	5.86	6.00
217	CB217	CB218	24 inch	80	35.30	1,486.75	1,485.09	1,488.20	1,487.41	1,486.75	1,485.09	0.020750	1,491.75	1,489.84	10.99	2.747	10.17	5.83	16.15
218	CB218	MH108	24 inch	15	67.85	1,485.09	1,483.94	1,487.03	1,486.87	1,485.09	1,482.26	0.076667	1,489.84	1,493.36	20.39	4.650	10.29	5.81	27.23
219	CB219	CB220	24 inch	181	42.45	1,487.20	1,481.77	1,487.75	1,485.04	1,487.20	1,481.77	0.030000	1,493.60	1,486.82	7.36	0.417	10.00	5.86	2.46
220	CB220	J109b	24 inch	21	58.82	1,481.77	1,480.56	1,485.02	1,485.00	1,481.77	1,478.92	0.057619	1,486.82	1,492.14	2.46	1.322	10.41	5.79	7.72
221	CB221	CB226	24 inch	201	14.25	1,482.68	1,482.00	1,484.01	1,483.89	1,482.68	1,482.00	0.003383	1,487.68	1,486.39	4.56	1.236	10.00	5.86	7.30
222	CB222	J110b	24 inch	21	84.22	1,481.39	1,478.91	1,483.48	1,483.46	1,481.39	1,477.13	0.118095	1,486.14	1,491.59	2.42	1.289	10.00	5.86	7.61
225	CB225	CB226	24 inch	101	36.17	1,484.20	1,482.00	1,484.83	1,483.79	1,484.20	1,482.00	0.021782	1,489.20	1,486.39	7.16	0.556	10.00	5.86	3.28
226	CB226	CB227	24 inch	78	17.33	1,482.00	1,481.61	1,483.70	1,483.56	1,482.00	1,481.61	0.005000	1,486.39	1,486.96	6.04	2.289	10.73	5.73	13.22
227	CB227	MH111	24 inch	20	112.97	1,481.61	1,477.36	1,483.50	1,483.45	1,481.61	1,475.32	0.212500	1,486.96	1,490.02	24.30	2.452	10.95	5.69	14.08
228	CB228	CB229	24 inch	92	19.62	1,478.17	1,477.58	1,481.87	1,481.80	1,478.17	1,477.58	0.006413	1,483.22	1,484.28	2.11	1.122	10.00	5.86	6.63
229	CB229	MH112	24 inch	102	45.33	1,477.58	1,474.09	1,481.72	1,481.52	1,477.58	1,472.51	0.034216	1,484.28	1,489.91	3.47	1.885	10.73	5.73	10.90
230	CB230	J112b	24 inch	14	212.84	1,480.95	1,470.39	1,481.71	1,478.05	1,480.95	1,470.39	0.754286	1,487.95	1,488.95	27.52	0.784	10.00	5.86	4.63
231	CB231	CB232	24 inch	76	17.78	1,474.17	1,473.77	1,475.22	1,475.04	1,474.17	1,473.77	0.005263	1,478.62	1,482.42	5.63	1.475	10.00	5.86	8.71
232	CB232	MH115	24 inch	7	212.63	1,473.77	1,468.50	1,474.93	1,472.60	1,473.77	1,466.08	0.752857	1,482.42	1,482.88	35.16	1.804	10.22	5.82	10.59
233	CB233	CB234	24 inch	157	17.49	1,468.34	1,467.54	1,472.61	1,471.70	1,468.34	1,467.54	0.005096	1,473.09	1,478.74	5.93	3.218	10.70	5.74	18.62
234	CB234	MH116	24 inch	9	114.36	1,467.54	1,465.58	1,471.57	1,471.50	1,467.54	1,463.50	0.217778	1,478.74	1,479.20	6.72	3.699	11.14	5.66	21.11
235	CB235	CB241	24 inch	78	19.42	1,463.64	1,463.15	1,464.57	1,464.63	1,463.64	1,463.15	0.006282	1,468.39	1,469.75	5.65	1.160	10.00	5.86	6.85

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Pipe Report

Label	Upstream Node	Downstream Node	Section Size	Length (ft)	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Upstream Sump Elevation (ft)	Downstream Sump Elevation (ft)	Constructed Slope (ft/ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Average Velocity (ft/s)	System CA (acres)	System Flow Time (min)	System Intensity (in/hr)	Total System Flow (cfs)
236	CB236	MH117	24 inch	14	95.81	1,462.70	1,460.56	1,464.28	1,463.12	1,462.70	1,458.40	0.152857	1,473.50	1,475.30	23.82	3.335	10.42	5.79	19.45
237	CB237	J117b	24 inch	83	53.73	1,462.55	1,458.56	1,463.10	1,461.28	1,462.55	1,456.68	0.048072	1,467.55	1,471.42	8.75	0.428	10.00	5.86	2.53
238	CB238	CB239	24 inch	78	18.20	1,461.72	1,461.29	1,462.75	1,462.72	1,461.72	1,461.29	0.005513	1,466.17	1,465.79	5.67	1.423	10.20	5.82	8.35
239	CB239	MH118	24 inch	90	32.78	1,461.29	1,459.68	1,462.46	1,462.22	1,461.29	1,455.50	0.017889	1,465.79	1,469.20	9.32	1.841	10.43	5.78	10.74
240	CB240	J118b	24 inch	8	17.33	1,463.50	1,463.46	1,464.24	1,464.16	1,463.50	1,455.36	0.005000	1,468.50	1,468.60	4.60	0.742	10.00	5.86	4.38
241	CB241	CB236	24 inch	76	18.86	1,463.15	1,462.70	1,464.52	1,464.43	1,463.15	1,462.70	0.005921	1,469.75	1,473.50	6.61	2.474	10.23	5.82	14.51
242	CB242	CB243	24 inch	158	24.35	1,459.46	1,457.90	1,460.25	1,460.00	1,459.46	1,457.90	0.009873	1,464.41	1,463.15	6.10	0.849	10.00	5.86	5.02
243	CB243	MH120	24 inch	7	120.06	1,457.90	1,456.22	1,459.96	1,459.95	1,457.90	1,453.06	0.240000	1,463.15	1,464.06	3.31	1.852	10.43	5.78	10.80
245	CB245	J120c	24 inch	7	133.26	1,457.47	1,455.40	1,459.07	1,459.08	1,457.47	1,452.05	0.295714	1,462.22	1,462.28	19.28	0.713	10.00	5.86	4.21
247	CB247	CB248	24 inch	158	23.56	1,457.38	1,455.92	1,458.85	1,457.65	1,457.38	1,455.92	0.009241	1,462.43	1,461.17	8.12	2.832	10.31	5.81	16.58
248	CB248	MH152	24 inch	8	22.92	1,455.92	1,455.85	1,457.54	1,457.39	1,455.92	1,455.34	0.008750	1,461.17	1,461.54	8.25	3.522	10.64	5.75	20.41
249	CB249	CB247	24 inch	57	17.78	1,457.68	1,457.38	1,458.87	1,458.87	1,457.68	1,457.38	0.005263	1,462.63	1,462.43	3.04	0.167	10.00	5.86	0.99
250	MH250	CB251	24 inch	92	47.80	1,458.50	1,455.00	1,459.25	1,457.32	1,458.50	1,455.00	0.038043	1,463.50	1,460.00	9.61	0.790	10.59	5.76	4.59
251	CB251	CB253	24 inch	79	34.88	1,455.00	1,453.40	1,457.29	1,457.05	1,455.00	1,453.40	0.020253	1,460.00	1,458.65	4.24	2.307	10.75	5.73	13.33
252	CB252	MH250	24 inch	107	18.35	1,459.10	1,458.50	1,459.43	1,459.27	1,459.10	1,458.50	0.005607	1,463.70	1,463.50	3.04	0.155	10.00	5.86	0.91
253	CB253	CB677	24 inch	45	28.53	1,453.40	1,452.79	1,456.84	1,456.57	1,453.40	1,452.79	0.013556	1,458.65	1,457.54	6.06	3.326	11.06	5.68	19.03
254	CB254	J154c	24 inch	11	29.56	1,452.05	1,451.89	1,454.57	1,454.57	1,452.05	1,451.37	0.014545	1,456.80	1,457.86	0.80	0.428	10.00	5.86	2.53
255	CB255	MH155	24 inch	8	30.48	1,451.92	1,451.79	1,454.06	1,454.06	1,451.92	1,451.02	0.016250	1,456.67	1,456.92	0.62	0.330	10.00	5.86	1.95
256	CB256	J155b	24 inch	12	50.52	1,451.31	1,450.80	1,453.68	1,453.63	1,451.31	1,449.99	0.042500	1,456.06	1,457.70	4.71	2.546	10.22	5.82	14.94
257	CB257	CB256	24 inch	91	23.26	1,452.13	1,451.31	1,453.84	1,453.74	1,452.13	1,451.31	0.009011	1,457.63	1,456.06	6.99	1.572	10.00	5.86	9.29
258	CB258	J156b	24 inch	11	62.70	1,450.36	1,449.64	1,452.39	1,452.38	1,450.36	1,448.79	0.065455	1,455.11	1,456.31	2.05	1.091	10.00	5.86	6.44
259	CB259	MH157	24 inch	8	67.67	1,449.56	1,448.95	1,451.26	1,451.26	1,449.56	1,447.81	0.076250	1,454.31	1,454.91	12.58	0.841	10.00	5.86	4.97
260	CB260	CB261	24 inch	91	22.98	1,449.93	1,449.13	1,451.11	1,451.16	1,449.93	1,449.13	0.008791	1,455.43	1,453.88	6.66	1.361	10.00	5.86	8.04
261	CB261	J157b	24 inch	12	62.48	1,449.13	1,448.35	1,451.08	1,451.06	1,449.13	1,447.23	0.065000	1,453.88	1,455.40	14.82	1.827	10.23	5.82	10.72
262	CB262	MH290	24 inch	106	51.22	1,454.78	1,450.15	1,455.87	1,451.60	1,454.78	1,450.15	0.043679	1,459.28	1,455.65	12.41	1.589	10.11	5.84	9.36
263	CB263	CB262	24 inch	42	25.71	1,455.25	1,454.78	1,456.03	1,456.11	1,455.25	1,454.78	0.011190	1,459.25	1,459.28	6.33	0.840	10.00	5.86	4.96
264	CB264	MH290	24 inch	40	27.94	1,450.67	1,450.15	1,451.57	1,451.65	1,450.67	1,450.15	0.013000	1,455.17	1,455.65	6.48	0.742	10.00	5.86	4.38
265	CB265	J157c	24 inch	12	86.93	1,449.21	1,447.70	1,450.80	1,450.62	1,449.21	1,446.47	0.125833	1,453.66	1,455.38	22.34	3.396	10.43	5.79	19.81
266	CB266	CB267	24 inch	90	29.00	1,450.39	1,449.13	1,451.56	1,450.65	1,450.39	1,449.13	0.014000	1,455.39	1,453.88	8.52	1.805	10.00	5.86	10.66
267	CB267	MH158	24 inch	8	111.29	1,449.13	1,447.48	1,450.53	1,449.66	1,449.13	1,445.72	0.206250	1,453.88	1,454.62	24.73	2.583	10.18	5.83	15.18
268	CB268	J158c	24 inch	12	137.90	1,450.35	1,446.55	1,451.48	1,448.97	1,450.35	1,444.51	0.316667	1,455.10	1,456.64	25.53	1.691	10.00	5.86	9.99
269	CB269	MH159	24 inch	204	39.43	1,456.45	1,451.17	1,457.16	1,451.60	1,456.45	1,443.77	0.025882	1,462.20	1,457.27	8.08	0.684	10.00	5.86	4.04
271	CB271	CB272	24 inch	91	21.49	1,456.20	1,455.50	1,457.75	1,457.60	1,456.20	1,455.50	0.007692	1,461.20	1,460.25	7.29	2.368	10.00	5.86	13.99
272	CB272	MH160	24 inch	9	24.51	1,455.50	1,455.41	1,457.36	1,457.22	1,455.50	1,442.87	0.010000	1,460.25	1,461.37	8.57	4.585	10.21	5.82	26.92
273	CB273	J127b	24 inch	80	132.08	1,470.40	1,447.16	1,471.50	1,450.91	1,470.40	1,443.62	0.290500	1,476.40	1,458.36	24.44	1.617	10.00	5.86	9.55
274	CB274	MH132	24 inch	103	24.51	1,457.75	1,456.72	1,458.63	1,457.40	1,457.75	1,440.46	0.010000	1,462.75	1,469.86	6.49	1.043	10.00	5.86	6.16
290	MH290	CB265	24 inch	87	25.47	1,450.15	1,449.21	1,451.48	1,451.01	1,450.15	1,449.21	0.010805	1,455.65	1,453.66	8.24	2.331	10.25	5.82	13.67
300	CB300	J102b	24 inch	111	109.35	1,531.87	1,509.77	1,532.56	1,512.71	1,531.87	1,508.39	0.199099	1,536.23	1,525.79	16.43	0.665	10.00	5.86	3.93
301	CB301	CB302	24 inch	161	27.59	1,521.90	1,519.86	1,522.49	1,520.58	1,521.90	1,519.86	0.012671	1,527.26	1,525.22	5.65	0.477	10.00	5.86	2.82
302	CB302	CB303	24 inch	58	26.14	1,519.86	1,519.20	1,520.56	1,520.15	1,519.86	1,519.20	0.011379	1,525.22	1,525.06	6.03	0.693	10.47	5.78	4.04
303	CB303	MH104	24 inch	62	95.88	1,519.20	1,509.71	1,520.07	1,510.05	1,519.20	1,500.98	0.153065	1,525.06	1,517.58	17.00	1.036	10.64	5.75	6.00
304	CB304	CB303	24 inch	57	26.37	1,519.86	1,519.20	1,520.24	1,520.09	1,519.86	1,519.20	0.011579	1,525.22	1,525.06	4.25	0.202	10.00	5.86	1.19
305	CB305	MH106	24 inch	153	98.19	1,518.46	1,493.90	1,518.97	1,496.43	1,518.46	1,492.53	0.160523	1,522.96	1,503.63	12.72	0.364	10.00	5.86	2.15
306	CB306	CB307	24 inch	91	23.96	1,510.22	1,509.35	1,510.75	1,510.05	1,510.22	1,509.35	0.009560	1,515.08	1,514.71	4.86	0.400	10.00	5.86	2.36
307	CB307	CB308	24 inch	85	16.17	1,509.35	1,508.98	1,510.04	1,509.88	1,509.35	1,508.98	0.004353	1,514.71	1,515.84	4.22	0.659	10.31	5.81	3.85
308	CB308	MH108	24 inch	149	99.29	1,508.98	1,484.52	1,509.79	1,486.74	1,508.98	1,482.26	0.164161	1,515.84	1,493.36	16.81	0.917	10.65	5.75	5.31
309	CB309	CB308	24 inch	49	41.86	1,510.41	1,508.98	1,510.74	1,509.81	1,510.41	1,508.98	0.029184	1,516.27	1,515.84	5.46	0.159	10.00	5.86	0.94
320	MH320	MH101	24 inch	49	121.27	1,535.00	1,523.00	1,536.07	1,527.27	1,535.00	1,515.27	0.244898	1,545.00	1,530.07	22.62	1.579	11.14	5.66	9.01
350	CB350	MH111	24 inch	97	109.03	1,502.70	1,483.50	1,503.51	1,490.02	1,502.70	1,475.32	0.197938	1,508.06	1,490.02	17.94	0.898	10.00	5.86	5.31
351	CB351	CB352	24 inch	65	30.40	1,498.81	1,497.81	1,499.29	1,498.42	1,498.81	1,497.81	0.015385	1,504.17	1,503.17	5.42	0.328	10.00	5.86	1.94
352	CB352	MH112	24 inch	117	87.19	1,497.81	1,483.00	1,498.36	1,489.91	1,497.81	1,472.51	0.126581	1,503.17	1,489.91	12.19	0.418	10.20	5.83	2.46

Scenario: RMFUS - 95% - Final Analysis

RMF University to Southern - Pipe Report

Label	Upstream Node	Downstream Node	Section Size	Length (ft)	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Upstream Sump Elevation (ft)	Downstream Sump Elevation (ft)	Constructed Slope (ft/ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)	Average Velocity (ft/s)	System CA (acres)	System Flow Time (min)	System Intensity (in/hr)	Total System Flow (cfs)
353	CB353	CB626	24 inch	25	50.22	1,479.37	1,478.32	1,480.18	1,479.48	1,479.37	1,478.32	0.042000	1,484.80	1,483.19	10.38	0.896	10.00	5.86	5.29
354	CB354	J116b	24 inch	106	87.00	1,477.23	1,463.87	1,478.46	1,468.06	1,477.23	1,460.11	0.126038	1,483.09	1,476.45	19.33	2.004	10.24	5.82	11.75
355	CB355	CB354	24 inch	50	35.51	1,478.28	1,477.23	1,479.02	1,478.61	1,478.28	1,477.23	0.021000	1,483.14	1,483.09	7.73	0.760	10.11	5.84	4.48
358	CB358	CB627	24 inch	72	60.86	1,486.68	1,482.24	1,487.19	1,483.13	1,486.68	1,482.24	0.061667	1,491.68	1,487.24	9.13	0.368	10.00	5.86	2.17
359	CB359	CB355	24 inch	55	51.83	1,480.74	1,478.28	1,481.26	1,479.23	1,480.74	1,478.28	0.044727	1,485.74	1,483.14	8.27	0.385	10.00	5.86	2.27
403	CB403	MH409	24 inch	72	21.42	1,520.55	1,520.00	1,521.10	1,520.62	1,520.55	1,520.00	0.007639	1,527.11	1,527.50	4.57	0.430	10.21	5.82	2.53
404	CB404	CB403	24 inch	60	28.65	1,521.37	1,520.55	1,521.80	1,521.12	1,521.37	1,520.55	0.013667	1,526.93	1,527.11	4.86	0.262	10.00	5.86	1.55
405	CB405	CB404	24 inch	59	19.67	1,521.75	1,521.37	1,522.16	1,521.81	1,521.75	1,521.37	0.006441	1,527.11	1,526.93	3.61	0.179	0.00	7.66	1.38
409	MH409	CB208	24 inch	128	67.50	1,520.00	1,510.29	1,520.55	1,511.44	1,520.00	1,510.29	0.075859	1,527.50	1,515.24	10.25	0.430	10.47	5.78	2.51
410	CB410	CB209	24 inch	213	71.69	1,527.70	1,509.47	1,528.02	1,511.41	1,527.70	1,509.47	0.085587	1,534.20	1,515.92	7.74	0.146	10.00	5.86	0.86
453	CB453	CB233	24 inch	132	72.49	1,479.89	1,468.34	1,481.12	1,472.83	1,479.89	1,468.34	0.087500	1,486.25	1,473.09	16.93	2.008	10.57	5.76	11.66
454	CB454	CB453	24 inch	85	18.22	1,480.36	1,479.89	1,481.38	1,481.41	1,480.36	1,479.89	0.005529	1,485.92	1,486.25	5.29	1.089	10.30	5.81	6.38
455	CB455	CB454	24 inch	84	16.70	1,480.75	1,480.36	1,481.55	1,481.40	1,480.75	1,480.36	0.004643	1,486.25	1,485.92	4.69	0.875	10.00	5.86	5.17
456	CB456	CB238	24 inch	112	115.50	1,486.60	1,461.72	1,486.84	1,462.94	1,486.60	1,461.72	0.222143	1,491.47	1,466.17	9.12	0.084	10.00	5.86	0.49
500	CB500	CB210	24 inch	12	102.76	1,509.61	1,507.50	1,510.44	1,508.45	1,509.61	1,507.50	0.175833	1,515.36	1,513.50	17.38	0.928	10.00	5.86	5.48
550	CB550	MH105	24 inch	9	164.39	1,502.66	1,498.61	1,504.27	1,500.31	1,502.66	1,496.61	0.450000	1,507.11	1,507.41	35.48	3.453	10.38	5.79	20.17
600	CB600	CB601	24 inch	62	25.09	1,473.36	1,472.71	1,476.73	1,476.72	1,473.36	1,472.71	0.010484	1,478.61	1,478.46	1.23	0.656	10.00	5.86	3.87
601	CB601	CB602	24 inch	62	27.66	1,472.71	1,471.92	1,476.71	1,476.68	1,472.71	1,471.92	0.012742	1,478.46	1,478.67	1.72	0.937	10.84	5.71	5.40
602	CB602	MH114	24 inch	212	25.53	1,471.92	1,469.62	1,476.30	1,475.73	1,471.92	1,468.09	0.010849	1,478.67	1,486.39	4.03	2.235	11.44	5.61	12.64
625	CB625	MH116	24 inch	93	66.94	1,479.35	1,472.41	1,479.95	1,479.20	1,479.35	1,463.50	0.074624	1,484.10	1,479.20	10.75	0.510	10.07	5.85	3.00
626	CB626	CB354	24 inch	85	27.75	1,478.32	1,477.23	1,479.22	1,478.68	1,478.32	1,477.23	0.012824	1,483.19	1,483.09	7.18	1.085	10.04	5.85	6.40
627	CB627	MH115	24 inch	93	62.66	1,482.24	1,476.16	1,483.09	1,482.88	1,482.24	1,466.08	0.065376	1,487.24	1,482.88	12.47	0.986	10.13	5.84	5.80
628	CB628	CB625	24 inch	29	58.10	1,480.98	1,479.35	1,481.30	1,479.97	1,480.98	1,479.35	0.056207	1,485.48	1,484.10	6.64	0.142	10.00	5.86	0.84
650	CB650	CB651	24 inch	77	45.29	1,471.20	1,468.57	1,472.03	1,469.65	1,471.20	1,468.57	0.034156	1,476.61	1,474.48	9.77	0.937	10.00	5.86	5.53
651	CB651	CB247	24 inch	61	104.96	1,468.57	1,457.38	1,469.53	1,458.95	1,468.57	1,457.38	0.183443	1,474.48	1,462.43	19.20	1.241	10.13	5.84	7.30
652	CB652	MH250	24 inch	12	73.52	1,459.58	1,458.50	1,460.26	1,459.28	1,459.58	1,458.50	0.090000	1,464.33	1,463.50	12.26	0.636	10.12	5.84	3.74
653	CB653	CB651	24 inch	43	58.26	1,471.00	1,468.57	1,471.41	1,469.59	1,471.00	1,468.57	0.056512	1,475.00	1,474.48	7.76	0.237	10.00	5.86	1.40
654	CB654	CB652	24 inch	43	38.48	1,460.64	1,459.58	1,461.05	1,460.28	1,460.64	1,459.58	0.024651	1,465.64	1,464.33	5.78	0.233	10.00	5.86	1.38
675	CB675	J120b	24 inch	90	104.80	1,471.88	1,455.42	1,472.69	1,459.25	1,471.88	1,452.28	0.182889	1,476.63	1,462.38	17.44	0.897	10.00	5.86	5.30
676	CB676	J123b	24 inch	11	143.09	1,457.49	1,453.74	1,458.28	1,456.89	1,457.49	1,450.23	0.340909	1,464.24	1,462.46	21.36	0.850	10.00	5.86	5.02
677	CB677	MH154	24 inch	10	33.78	1,452.79	1,452.60	1,456.21	1,456.12	1,452.79	1,452.60	0.019000	1,457.54	1,457.80	7.41	4.084	11.18	5.65	23.28
678	CB678	CB679	24 inch	87	17.82	1,452.35	1,451.89	1,455.16	1,455.16	1,452.35	1,451.89	0.005287	1,457.10	1,456.94	0.63	0.337	10.00	5.86	1.99
679	CB679	J154b	24 inch	13	20.39	1,451.89	1,451.80	1,455.11	1,455.11	1,451.89	1,451.80	0.006923	1,456.94	1,458.33	1.39	0.792	12.29	5.46	4.36
680	CB680	J123c	24 inch	76	136.56	1,476.00	1,452.40	1,476.84	1,456.21	1,476.00	1,449.29	0.310526	1,482.00	1,460.00	21.47	0.966	10.00	5.86	5.71
700	CB700	CB701	24 inch	127	24.12	1,543.20	1,541.97	1,543.57	1,542.57	1,543.20	1,541.97	0.009685	1,547.62	1,547.39	3.95	0.196	10.00	5.86	1.16
701	CB701	MH712	24 inch	12	78.14	1,541.97	1,540.75	1,542.56	1,541.41	1,541.97	1,540.75	0.101667	1,547.39	1,547.65	11.78	0.487	10.54	5.77	2.83
702	CB702	CB703	24 inch	128	21.55	1,545.88	1,544.89	1,546.49	1,545.40	1,545.88	1,535.78	0.007734	1,550.50	1,550.40	4.84	0.513	10.00	5.86	3.03
703	CB703	MH320	24 inch	67	26.44	1,535.78	1,535.00	1,536.67	1,536.21	1,535.78	1,535.00	0.011642	1,550.40	1,545.00	6.92	1.092	10.44	5.78	6.36
712	MH712	MH320	24 inch	248	37.32	1,540.75	1,535.00	1,541.34	1,536.17	1,540.75	1,535.00	0.023185	1,547.65	1,545.00	7.00	0.487	10.55	5.76	2.83
731	CB731	CB732	24 inch	132	28.14	1,513.06	1,511.32	1,513.71	1,511.79	1,513.06	1,503.58	0.013182	1,517.45	1,517.00	6.07	0.581	10.00	5.86	3.43
732	CB732	MH736	24 inch	18	22.37	1,503.58	1,503.43	1,504.47	1,504.19	1,503.58	1,500.00	0.008333	1,517.00	1,511.40	6.12	1.079	10.36	5.80	6.31
736	MH736	MH109	24 inch	64	128.80	1,500.00	1,482.32	1,500.89	1,485.86	1,500.00	1,480.14	0.276250	1,511.40	1,491.34	21.22	1.079	10.41	5.79	6.30
763	MH763	MH119	24 inch	86	109.21	1,475.00	1,457.92	1,475.88	1,460.63	1,475.00	1,454.00	0.198605	1,488.00	1,465.00	18.83	1.064	10.36	5.80	6.22
764	CB764	MH763	24 inch	26	55.63	1,482.34	1,481.00	1,483.22	1,481.51	1,482.34	1,475.00	0.051538	1,489.30	1,488.00	11.70	1.064	10.32	5.80	6.22
765	CB765	CB764	24 inch	128	32.78	1,485.30	1,483.01	1,485.92	1,483.43	1,485.30	1,482.34	0.017891	1,489.30	1,489.30	6.59	0.532	10.00	5.86	3.14
Exst I	JCT134/Exst	OUTFALL	10 x 6 ft	877	322.73	1,438.94	1,438.10	1,443.95	1,441.61	1,438.94	1,438.10	0.000958	1,485.00	1,450.00	6.21	103.868	28.54	3.54	370.33

APPENDIX E

OFF-SITE HYDRAULICS

- HYDRAULIC CALCULATIONS FOR BAFFLE CHUTE DROP STRUCTURE
- EAST CHANNEL HEC-RAS MODEL
- BROADWAY ROAD BOX CULVERT HEC-RAS MODEL
- WEST CHANNEL HEC-RAS MODEL

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

Made by ____

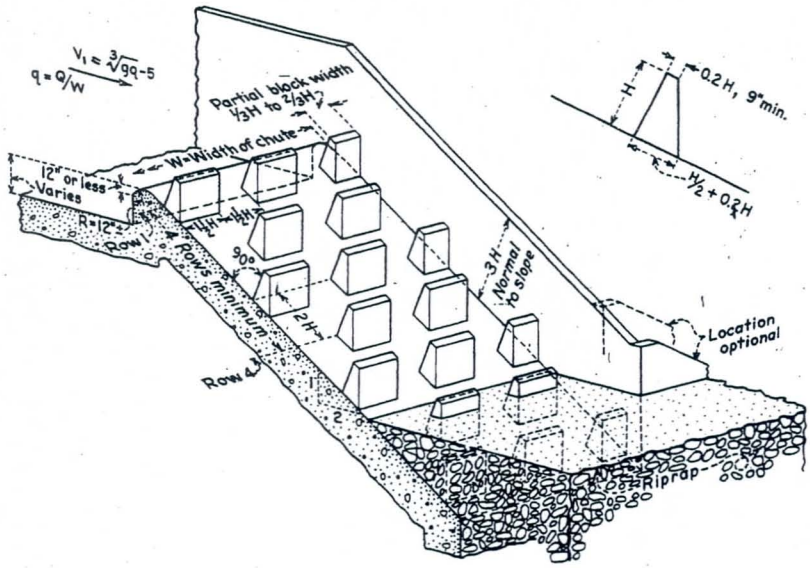
Date ____

Checked by BGN

Date 3/04/05

Subject Red Mountain Freeway, University Dr. to Southern Ave.
Baffled Chute Drop Structure Design

Reference: "Hydraulic Design of Stilling Basins and Energy Dissipators by USBR.



(1) Design discharge: $Q_{100} = 1775$ cfs

(2) Unit design discharge: $q = \frac{Q}{W} = \frac{1755}{60} = 29.25$ cfs/ft ✓

(3) Entrance Velocity v_1.

$v_1 = 4.71$ ft/s

$\sqrt[3]{qg} - 5 = \sqrt[3]{29.25 \times 32.2} - 5 = 4.8$ ft/s ✓ $v_1 = 4.71 \approx \sqrt[3]{qg} - 5 = 4.8$

OK.

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

Made by ____

Date ____

Checked by BGR

Date 7/04/05

Subject ____

④ Vertical offset between the approach channel floor & the chute = 2'. Use a short radius curve with R=1' to provide a crest on the sloping chute. The first row of baffle pier is placed 12" below the top of the chute.

⑤ Baffle pier height H

$$H = 0.8 D_c = 0.8 \sqrt[3]{\frac{q^2}{g}} = 0.8 \sqrt[3]{\frac{29.25^2}{32.2}} = 2.39' \quad \text{using } 2.5' \checkmark$$

⑥ Baffle pier widths: $\approx \frac{3}{2} H = \frac{3}{2} \times 2.5 = 3.75' \checkmark$

⑦ slope distance (along a 3:1 slope) between rows of baffle piers $= 2H = 2 \times 2.5 = 5.0' \checkmark$

⑧ Baffle piers constructed with their upstream face normal to the chute surface

⑨ Total nine rows of baffle piers.
One row of piers will be buried in the backfill

⑩ Chute training wall height $= 3H = 3 \times 2.5 = 7.5'$

⑪ Riprap consisting of 6"~12" stones will be placed at downstream of training walls

PARSONS BRINCKERHOFF COMPUTATION SHEET

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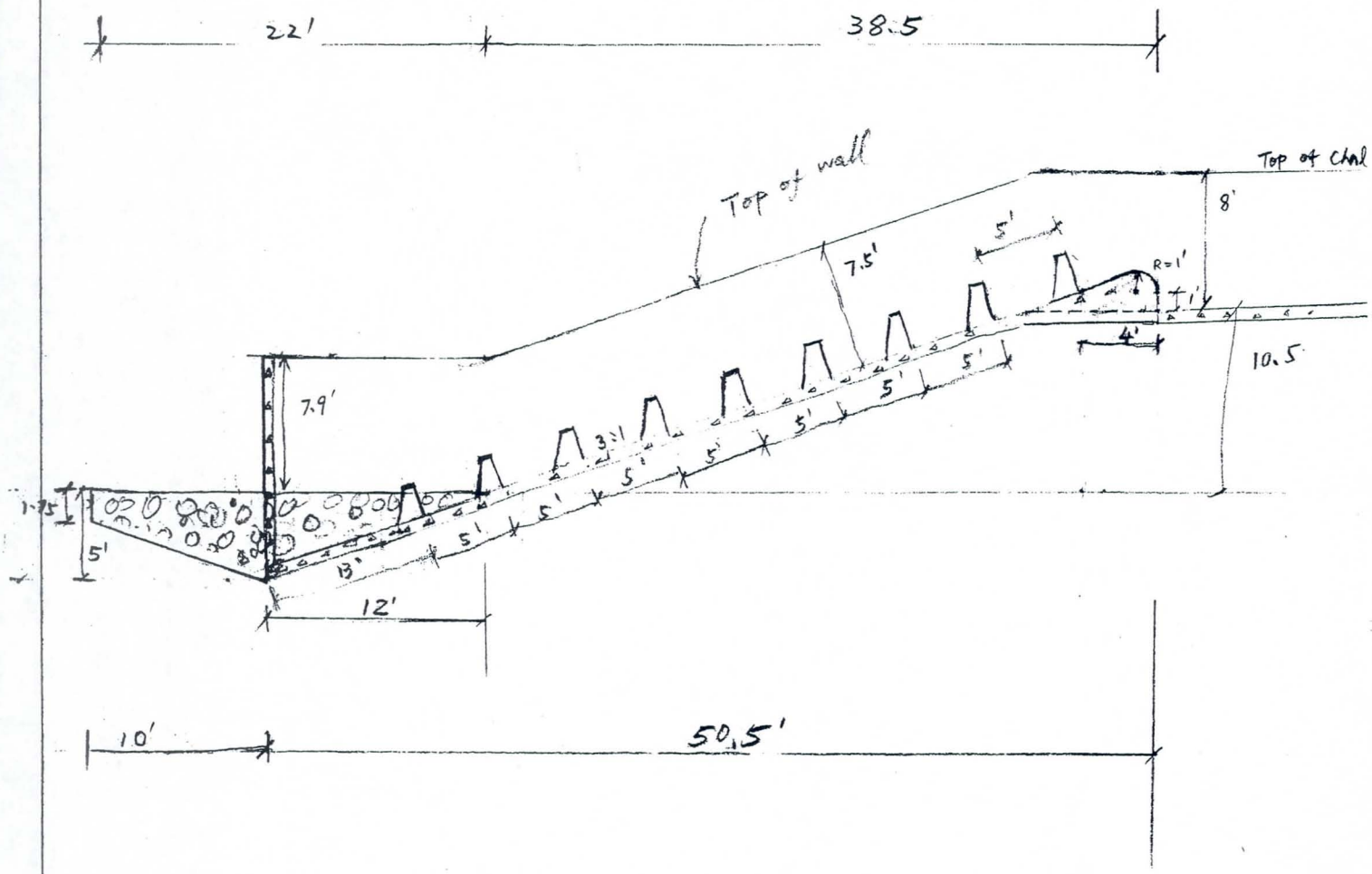
Date 3/04/05



profile view — Baffled Chute

PARSONS BRINCKERHOFF COMPUTATION SHEET

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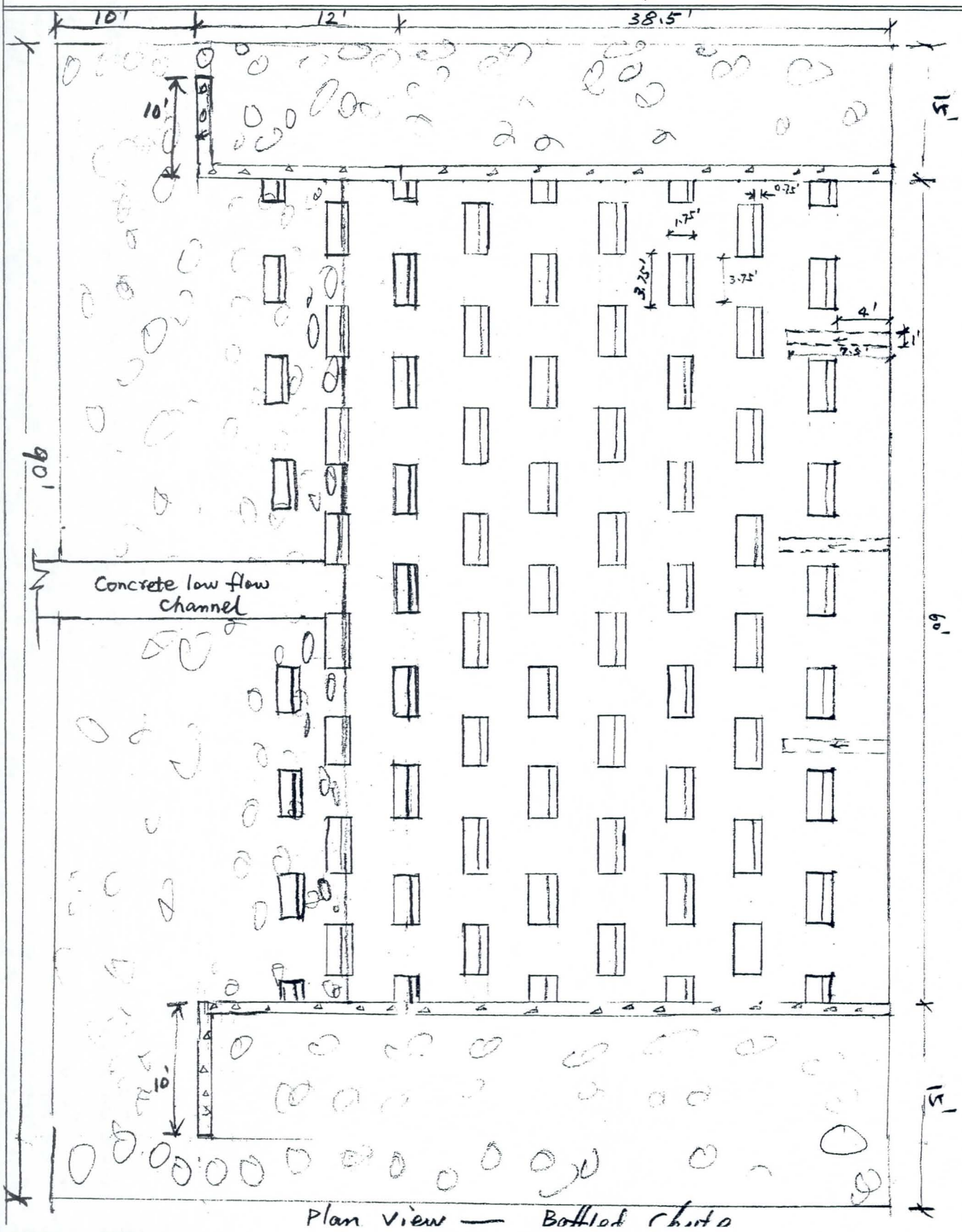
Date _____

Checked by BGS

Date 7/04/05

Subject _____



Plan View — Bottled Chute

PARSONS BRINCKERHOFF COMPUTATION SHEET

Subject

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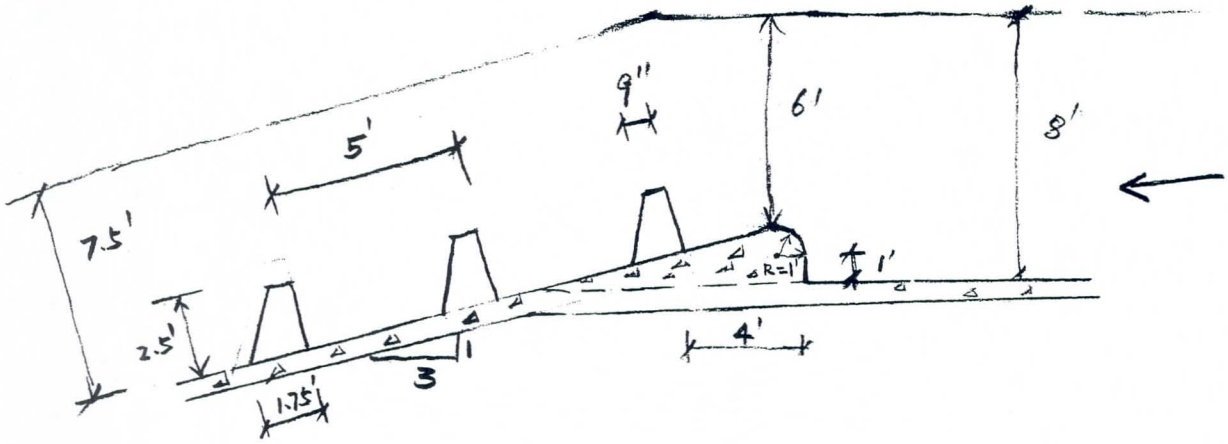
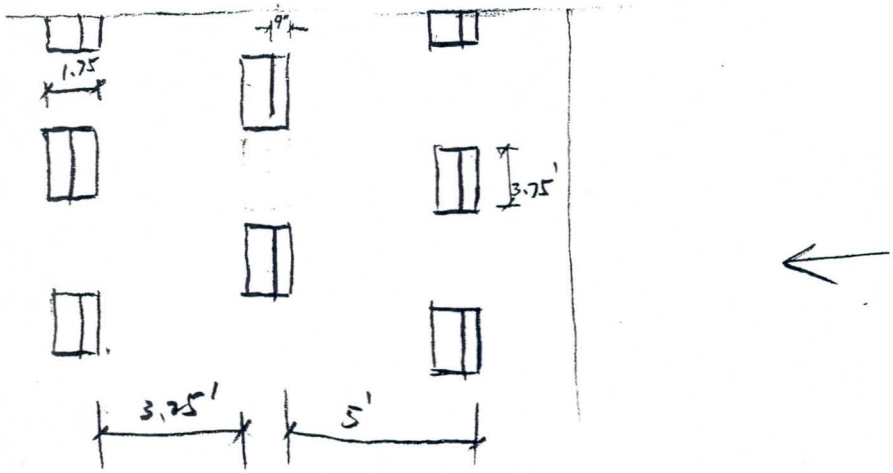
Date

Checked by BGB

Date 3/04/05



Baffle detail



Baffle array detail

```
                    HEC-RAS Version 3.1.2 April 2004
                      U.S. Army Corp of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California

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

EAST CHANNEL

PROJECT DATA
Project Title: Red Mountain - University to Southern
Project File : RMF.prj
Run Date and Time: 3/23/2005 1:38:08 PM

Project in English units

Project Description:
Red Mountain Freeway (202L) - University Drive to Southern Avenue

PLAN DATA

Plan Title: Plan 02
Plan File : l:\PROJECTS\11230 RMF- University to Southern\Drng\working_GL\Off-site Drainage\HEC-RAS\RMF.p02

Geometry Title: RMFUS 60% Submittal
Geometry File : l:\PROJECTS\11230 RMF- University to Southern\Drng\working_GL\Off-site Drainage\HEC-RAS\RMF.g01

Flow Title : RMFUS 60% Submittal
Flow File : l:\PROJECTS\11230 RMF- University to Southern\Drng\working_GL\Off-site Drainage\HEC-RAS\RMF.f01

Plan Summary Information:
Number of: Cross Sections = 69 Multiple Openings = 0
Culverts = 4 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

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

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

FLOW DATA

Flow Title: RMFUS 60% Submittal
Flow File : l:\PROJECTS\11230 RMF- University to Southern\Drng\working_GL\Off-site Drainage\HEC-RAS\RMF.f01

Flow Data (cfs)

River	Reach	RS	PF 1
RM12-U	E-Chan Upper	11200.00	96
RM12-U	E-Chan Upper	9900.000	115
RM12-U	E-Chan Upper	9870.000	120
RM12-U	E-Chan Upper	9800.000	135
RM12-U	E-Chan Upper	9600.000	190
RM12-U	E-Chan Upper	9530.000	213
RM12-U	E-Chan Upper	6596.400	792
RM12-U	E-Chan Upper	5191.77	1187
RM12-U	E-Chan Upper	5171.826	1187
RM12-U	E-Chan Upper	3900.00	1375
RM12-U	E-Chan Upper	2570.33	1575
RM12-U	E-Chan Upper	2200.000	1775

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RM12-U	E-Chan Upper	PF 1	Normal S = 0.0121	Critical

GEOMETRY DATA

Geometry Title: RMFUS 60% Submittal
Geometry File : l:\PROJECTS\11230 RMF- University to Southern\Drng\working_GL\Off-site Drainage\HEC-RAS\RMF.g01

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 11200.00

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1553.45	53.65	1553.25	53.68	1553.24	54.98	1552.81	60.17	1552.7
66.98	1552.57	74.99	1548.57	75	1548.57	75.01	1548.57	79.01	1548.65
86.84	1552.56	86.85	1552.57	90.45	1552.64	94.84	1552.73	95.07	1552.8
150	1552.2								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.98	.016	86.84	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.98	86.84	173.52	172.9	172.9	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1551.53	Element			
Vel Head (ft)	1.50	Wt. n-Val.		0.016	
W.S. Elev (ft)	1550.03	Reach Len. (ft)	173.52	172.90	172.90
Crit W.S. (ft)	1550.51	Flow Area (sq ft)		9.78	
E.G. Slope (ft/ft)	0.012103	Area (sq ft)		9.78	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	9.72	Top Width (ft)		9.72	
Vel Total (ft/s)	9.81	Avg. Vel. (ft/s)		9.81	
Max Chl Dpth (ft)	1.46	Hydr. Depth (ft)		1.01	
Conv. Total (cfs)	872.6	Conv. (cfs)		872.6	
Length Wtd. (ft)	172.90	Wetted Per. (ft)		10.39	
Min Ch El (ft)	1548.57	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		6.98	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	16.61	0.00
C & E Loss (ft)		Cum SA (acres)	0.03	5.74	0.00

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 11027.19

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1551.07	19.77	1550.9	22.07	1550.89	36.7	1550.89	44.72	1550.83
44.99	1550.91	56.8	1550.68	56.99	1550.67	57	1550.67	57.22	1550.66
64.37	1550.52	67	1550.47	75.01	1546.47	79.01	1546.55	86.84	1550.47
94.84	1550.63	95.5	1550.81	95.51	1550.82	109.73	1550.69	150	1550.36

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	67	.016	86.84	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67	86.84	30.87	30.1	30.57	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1549.44	Element			
Vel Head (ft)	1.50	Wt. n-Val.		0.016	
W.S. Elev (ft)	1547.94	Reach Len. (ft)	30.87	30.10	30.57
Crit W.S. (ft)	1548.41	Flow Area (sq ft)		9.77	
E.G. Slope (ft/ft)	0.012130	Area (sq ft)		9.77	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	9.70	Top Width (ft)		9.70	
Vel Total (ft/s)	9.83	Avg. Vel. (ft/s)		9.83	
Max Chl Dpth (ft)	1.47	Hydr. Depth (ft)		1.01	
Conv. Total (cfs)	871.6	Conv. (cfs)		871.6	
Length Wtd. (ft)	30.10	Wetted Per. (ft)		10.38	
Min Ch El (ft)	1546.47	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		7.01	
Frctn Loss (ft)	2.09	Cum Volume (acre-ft)	0.01	16.57	0.00
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	5.70	0.00

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10997.00

INPUT
Description:
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1550.72	5.34	1550.67	11.34	1550.65	42.13	1550.65	43.56	1550.66
47.75	1550.65	47.77	1550.65	47.79	1550.65	50.99	1549.58	51.32	1549.57
55.99	1549.48	62.99	1549.34	63.56	1549.52	68.55	1551.08	69.25	1551.3
74.09	1551.2	74.99	1551.35	75	1545.1	83	1545.1	83.01	1551.29
86.62	1551.38	90.64	1549.44	93.8	1550.18	94.26	1550.34	94.29	1550.35
94.3	1550.35	96.24	1550.34	96.39	1550.35	96.65	1550.35	117.15	1550.4
120.45	1550.39	121.61	1550.38	122.3	1550.37	133.26	1550.27	137.23	1550.19
137.25	1550.19	145.12	1550.12	150.01	1550.08				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	83.01	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	83.01	218.2	207.01	207.01	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1548.76	Element			
Vel Head (ft)	2.76	Wt. n-Val.		0.016	
W.S. Elev (ft)	1546.00	Reach Len. (ft)	218.20	207.01	207.01
Crit W.S. (ft)	1546.74	Flow Area (sq ft)		7.21	
E.G. Slope (ft/ft)	0.031011	Area (sq ft)		7.21	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	8.00	Top Width (ft)		8.00	
Vel Total (ft/s)	13.32	Avg. Vel. (ft/s)		13.32	
Max Chl Dpth (ft)	0.90	Hydr. Depth (ft)		0.90	
Conv. Total (cfs)	545.1	Conv. (cfs)		545.1	
Length Wtd. (ft)	207.01	Wetted Per. (ft)		9.80	
Min Ch El (ft)	1545.10	Shear (lb/sq ft)		1.42	
Alpha	1.00	Stream Power (lb/ft s)		18.96	
Frctn Loss (ft)	0.55	Cum Volume (acre-ft)	0.01	16.57	0.00
C & E Loss (ft)	0.13	Cum SA (acres)	0.03	5.69	0.00

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CULVERT

RIVER: RM12-U
REACH: E-Chan Upper RS: 10996

INPUT
Description: University Drive Crossing
Distance from Upstream XS = 1
Deck/Roadway Width = 204.8
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0 1552	1540	200 1552	1540

Upstream Bridge Cross Section Data
Station Elevation Data num= 38

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1550.72	5.34	1550.67	11.34	1550.65	42.13	1550.65	43.56	1550.66
47.75	1550.65	47.77	1550.65	47.79	1550.65	50.99	1549.58	51.32	1549.57
55.99	1549.48	62.99	1549.34	63.56	1549.52	68.55	1551.08	69.25	1551.3
74.09	1551.2	74.99	1551.35	75	1545.1	83	1545.1	83.01	1551.29
86.62	1551.38	90.64	1549.44	93.8	1550.18	94.26	1550.34	94.29	1550.35
94.3	1550.35	96.24	1550.34	96.39	1550.35	96.65	1550.35	117.15	1550.4
120.45	1550.39	121.61	1550.38	122.3	1550.37	133.26	1550.27	137.23	1550.19
137.25	1550.19	145.12	1550.12	150.01	1550.08				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	83.01	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
74.99	83.01	.3	.5

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0 1552	1540	200 1552	1540

Downstream Bridge Cross Section Data
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1548.55	5.06	1548.48	5.7	1548.48	7.46	1548.43	13.15	1548.65
21.74	1548.89	47.92	1548.38	48.16	1548.38	48.32	1548.37	48.34	1548.37
48.38	1548.37	66.97	1550.23	67.04	1550.23	67.07	1550.23	74.19	1550.94
74.44	1550.96	74.95	1551.01	74.96	1551.03	74.97	1551.02	74.99	1551.02
75	1543.02	83	1543.02	83.01	1551.02	83.04	1551.02	85.46	1550.35
93.65	1548.08	93.7	1548.07	93.76	1548.07	93.81	1548.07	93.92	1548.07
104.03	1547.93	150	1547.43						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.97	.016	83.01	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
74.97	83.01	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1551
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	4	8

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	.01	207	.016	.016	0	.3	1

Upstream Elevation = 1545.1
Centerline Station = 79
Downstream Elevation = 1543.02
Centerline Station = 79

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs) 96.00 Culv Full Len (ft)

# Barrels	1	Culv Vel US (ft/s)	11.59
Q Barrel (cfs)	96.00	Culv Vel DS (ft/s)	9.19
E.G. US. (ft)	1548.76	Culv Inv El Up (ft)	1545.10
W.S. US. (ft)	1546.00	Culv Inv El Dn (ft)	1543.02
E.G. DS (ft)	1545.63	Culv Frctn Ls (ft)	2.58
W.S. DS (ft)	1544.33	Culv Exit Loss (ft)	0.00
Delta EG (ft)	3.12	Culv Entr Loss (ft)	0.54
Delta WS (ft)	1.67	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1546.14	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1544.33	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.31	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.65	Min El Weir Flow (ft)	1552.01

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10790.00

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1548.55	5.06	1548.48	5.7	1548.48	7.46	1548.43	13.15	1548.65
21.74	1548.89	47.92	1548.38	48.16	1548.38	48.32	1548.37	48.34	1548.37
48.38	1548.37	66.97	1550.23	67.04	1550.23	67.07	1550.23	74.19	1550.94
74.44	1550.96	74.95	1551.01	74.96	1551.03	74.97	1551.02	74.99	1551.02
75	1543.02	83	1543.02	83.01	1551.02	83.04	1551.02	85.46	1550.35
93.65	1548.08	93.7	1548.07	93.76	1548.07	93.81	1548.07	93.92	1548.07
104.03	1547.93	150	1547.43						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.97	.016	83.01	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.97	83.01	48.67	36	37.01	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1545.63	Element			
Vel Head (ft)	1.31	Wt. n-Val.		0.016	
W.S. Elev (ft)	1544.33	Reach Len. (ft)	48.67	36.00	37.01
Crit W.S. (ft)	1544.66	Flow Area (sq ft)		10.47	
E.G. Slope (ft/ft)	0.009927	Area (sq ft)		10.47	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	8.00	Top Width (ft)		8.00	
Vel Total (ft/s)	9.17	Avg. Vel. (ft/s)		9.17	
Max Chl Dpth (ft)	1.31	Hydr. Depth (ft)		1.31	
Conv. Total (cfs)	963.5	Conv. (cfs)		963.5	
Length Wtd. (ft)	36.00	Wetted Per. (ft)		10.61	
Min Ch El (ft)	1543.02	Shear (lb/sq ft)		0.61	
Alpha	1.00	Stream Power (lb/ft s)		5.61	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	16.53	0.00
C & E Loss (ft)		Cum SA (acres)	0.03	5.66	0.00

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10754.00

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1548.09	1.93	1548.06	8.91	1547.96	17.15	1547.83	23.51	1548.06
24.84	1548.1	27.22	1548.09	41.98	1548.1	43.38	1547.64	44.99	1547.1
50.68	1546.99	56.98	1546.86	56.99	1546.86	66.99	1546.66	75	1542.66
83	1542.82	90.68	1546.66	98.68	1546.82	99.49	1547.08	100.95	1547.57
150	1547.15								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.99	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.99	90.68	154.62	154	154	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1545.17	Element			
Vel Head (ft)	1.42	Wt. n-Val.		0.016	
W.S. Elev (ft)	1543.74	Reach Len. (ft)	154.62	154.00	154.00
Crit W.S. (ft)	1544.18	Flow Area (sq ft)		10.03	
E.G. Slope (ft/ft)	0.014235	Area (sq ft)		10.03	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	12.01	Top Width (ft)		12.01	
Vel Total (ft/s)	9.58	Avg. Vel. (ft/s)		9.58	
Max Chl Dpth (ft)	1.08	Hydr. Depth (ft)		0.84	
Conv. Total (cfs)	804.6	Conv. (cfs)		804.6	
Length Wtd. (ft)	154.00	Wetted Per. (ft)		12.48	
Min Ch El (ft)	1542.66	Shear (lb/sq ft)		0.71	
Alpha	1.00	Stream Power (lb/ft s)		6.84	
Frctn Loss (ft)	0.42	Cum Volume (acre-ft)	0.01	16.52	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.03	5.65	0.00

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10600.00

INPUT
Description:
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1546.47	9.96	1546.25	11.29	1546.23	22.28	1546	23.97	1545.98
24.46	1545.95	38.12	1545.81	41.87	1545.79	53.91	1545.7	54.5	1545.5
54.98	1545.35	66.98	1545.1	74.98	1541.11	74.99	1541.11	75	1541.11
83	1541.27	90.68	1545.1	98.68	1545.27	99.14	1545.42	99.76	1545.62
100.36	1545.62	105.22	1545.58	114.18	1545.41	118.26	1545.36	125.38	1545.23
134.84	1545.06	145.79	1544.95	148.54	1544.92	150	1544.9		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.98	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.98	90.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1543.33	Wt. n-Val.		0.016	
Vel Head (ft)	0.96	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	1542.36	Flow Area (sq ft)		12.20	
Crit W.S. (ft)	1542.63	Area (sq ft)		12.20	
E.G. Slope (ft/ft)	0.008049	Flow (cfs)		96.00	
Q Total (cfs)	96.00	Top Width (ft)		12.73	
Top Width (ft)	12.73	Avg. Vel. (ft/s)		7.87	
Vel Total (ft/s)	7.87	Hydr. Depth (ft)		0.96	
Max Chl Dpth (ft)	1.25	Conv. (cfs)		1070.0	
Conv. Total (cfs)	1070.0	Wetted Per. (ft)		13.28	
Length Wtd. (ft)	200.00	Shear (lb/sq ft)		0.46	
Min Ch El (ft)	1541.11	Stream Power (lb/ft s)		3.63	
Alpha	1.00	Cum Volume (acre-ft)	0.01	16.48	0.00
Frctn Loss (ft)	1.62	Cum SA (acres)	0.03	5.60	0.00
C & E Loss (ft)	0.23				

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10400.00

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1544.87	52.15	1544.27	54.98	1543.33	66.98	1543.09	74.99	1539.09
75	1539.09	75.01	1539.09	83.01	1539.25	90.68	1543.08	90.69	1543.09
98.69	1543.25	99.53	1543.53	134.8	1543.01	150	1542.72		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.98	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.98	90.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1541.44	Wt. n-Val.		0.016	
Vel Head (ft)	1.19	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	1540.25	Flow Area (sq ft)		10.95	
Crit W.S. (ft)	1540.61	Area (sq ft)		10.95	
E.G. Slope (ft/ft)	0.011003	Flow (cfs)		96.00	
Q Total (cfs)	96.00	Top Width (ft)		12.33	
Top Width (ft)	12.33	Avg. Vel. (ft/s)		8.76	
Vel Total (ft/s)	8.76	Hydr. Depth (ft)		0.89	
Max Chl Dpth (ft)	1.16	Conv. (cfs)		915.2	
Conv. Total (cfs)	915.2	Wetted Per. (ft)		12.84	
Length Wtd. (ft)	200.00	Shear (lb/sq ft)		0.59	
Min Ch El (ft)	1539.09	Stream Power (lb/ft s)		5.14	
Alpha	1.00	Cum Volume (acre-ft)	0.01	16.42	0.00
Frctn Loss (ft)	1.87	Cum SA (acres)	0.03	5.55	0.00
C & E Loss (ft)	0.02				

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10200.00

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1542.25	5.3	1542.23	6.51	1542.21	53.73	1541.73	54.09	1541.61
54.97	1541.32	66.97	1541.08	74.98	1537.08	74.99	1537.08	75	1537.08
83	1537.24	90.68	1541.08	98.68	1541.24	99.34	1541.46	99.84	1541.63
122.62	1541.65	134.26	1541.69	141.47	1541.71	149.99	1541.66		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.97	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.97	90.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1539.36	Element			
Vel Head (ft)	1.07	Wt. n-Val.		0.016	
W.S. Elev (ft)	1538.28	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1538.60	Flow Area (sq ft)		11.54	
E.G. Slope (ft/ft)	0.009452	Area (sq ft)		11.54	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	12.51	Top Width (ft)		12.51	
Vel Total (ft/s)	8.32	Avg. Vel. (ft/s)		8.32	
Max Chl Dpth (ft)	1.20	Hydr. Depth (ft)		0.92	
Conv. Total (cfs)	987.5	Conv. (cfs)		987.5	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		13.04	
Min Ch El (ft)	1537.08	Shear (lb/sq ft)		0.52	
Alpha	1.00	Stream Power (lb/ft s)		4.34	
Frctn Loss (ft)	2.04	Cum Volume (acre-ft)	0.01	16.37	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.03	5.49	0.00

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 10000.00

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1539.2	7.53	1538.88	8.3	1538.91	9.11	1538.92	16.66	1539.15
22.5	1539.32	23.41	1539.34	53.41	1539.56	54.97	1539.04	66.97	1538.8
74.98	1534.8	75	1534.8	83	1534.96	90.68	1538.8	98.68	1538.96
98.83	1538.92	114.67	1538.94	122.03	1538.99	138.89	1539.04	150	1538.99

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.97	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.97	90.68	100.74	100	98.55	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1537.20	Element			
Vel Head (ft)	1.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	1535.93	Reach Len. (ft)	100.74	100.00	98.55
Crit W.S. (ft)	1536.32	Flow Area (sq ft)		10.59	
E.G. Slope (ft/ft)	0.012135	Area (sq ft)		10.59	
Q Total (cfs)	96.00	Flow (cfs)		96.00	
Top Width (ft)	12.21	Top Width (ft)		12.21	
Vel Total (ft/s)	9.06	Avg. Vel. (ft/s)		9.06	
Max Chl Dpth (ft)	1.13	Hydr. Depth (ft)		0.87	
Conv. Total (cfs)	871.5	Conv. (cfs)		871.5	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		12.70	
Min Ch El (ft)	1534.80	Shear (lb/sq ft)		0.63	
Alpha	1.00	Stream Power (lb/ft s)		5.73	
Frctn Loss (ft)	2.13	Cum Volume (acre-ft)	0.01	16.32	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	5.43	0.00

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9900.000

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1538.07	3.85	1538.04	17.76	1537.91	19.24	1537.89	28.89	1537.89
31.87	1537.66	42.94	1536.74	54.85	1537.86	54.98	1537.9	66.98	1537.66
74.98	1533.66	75	1533.66	83	1533.82	90.67	1537.65	90.68	1537.66
98.68	1537.82	100.11	1537.35	111.44	1537.68	116.44	1537.7	127.23	1537.59
150	1537.6								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.98	.016	90.67	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.98	90.67	30.15	30	29.9	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1536.15	Element			
Vel Head (ft)	1.14	Wt. n-Val.		0.016	
W.S. Elev (ft)	1535.01	Reach Len. (ft)	30.15	30.00	29.90
Crit W.S. (ft)	1535.34	Flow Area (sq ft)		13.40	
E.G. Slope (ft/ft)	0.008787	Area (sq ft)		13.40	
Q Total (cfs)	115.00	Flow (cfs)		115.00	
Top Width (ft)	13.10	Top Width (ft)		13.10	
Vel Total (ft/s)	8.58	Avg. Vel. (ft/s)		8.58	
Max Chl Dpth (ft)	1.35	Hydr. Depth (ft)		1.02	

Conv. Total (cfs)	1226.8	Conv. (cfs)		1226.8	
Length Wtd. (ft)	30.00	Wetted Per. (ft)		13.70	
Min Ch El (ft)	1533.66	Shear (lb/sq ft)		0.54	
Alpha	1.00	Stream Power (lb/ft s)		4.61	
Frctn Loss (ft)	1.01	Cum Volume (acre-ft)	0.01	16.29	0.00
C & E Loss (ft)	0.04	Cum SA (acres)	0.03	5.40	0.00

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9870.000

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1537.51	1.97	1537.5	11.02	1537.5	37.15	1537.61	38.39	1537.61
40.01	1537.63	42.8	1537.37	50.18	1536.7	55.51	1537.08	56.98	1537.56
68.98	1537.32	68.99	1537.31	74.98	1533.32	75	1533.32	83	1533.48
88.76	1537.32	89.76	1537.34	90.02	1537.26	97.81	1537.3	101.52	1537.13
107.1	1536.98	118.91	1537.28	123.06	1537.38	124.52	1537.32	125.07	1537.32
129.03	1537.22	132.32	1537.19	150	1537.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	68.99	.016	88.76	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.99	88.76	69.93	70	70.17	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1535.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.10	Wt. n-Val.		0.016	
W.S. Elev (ft)	1534.80	Reach Len. (ft)	69.93	70.00	70.17
Crit W.S. (ft)	1535.10	Flow Area (sq ft)		14.23	
E.G. Slope (ft/ft)	0.007367	Area (sq ft)		14.23	
Q Total (cfs)	120.00	Flow (cfs)		120.00	
Top Width (ft)	12.23	Top Width (ft)		12.23	
Vel Total (ft/s)	8.43	Avg. Vel. (ft/s)		8.43	
Max Chl Dpth (ft)	1.48	Hydr. Depth (ft)		1.16	
Conv. Total (cfs)	1398.1	Conv. (cfs)		1398.1	
Length Wtd. (ft)	70.00	Wetted Per. (ft)		13.09	
Min Ch El (ft)	1533.32	Shear (lb/sq ft)		0.50	
Alpha	1.00	Stream Power (lb/ft s)		4.22	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.01	16.29	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	5.40	0.00

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9800.000

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1537.1	2.77	1537.08	11.86	1536.92	15.23	1536.77	16.17	1536.73
22.94	1536.14	28.09	1535.78	30.47	1535.55	39.69	1536.27	47.09	1536.9
56.97	1536.77	56.99	1536.77	68.98	1536.53	74.98	1532.53	75	1532.53
83.01	1532.69	88.77	1536.53	89.77	1536.55	89.78	1536.55	122.81	1536.44
150.01	1536.23								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	68.98	.016	88.77	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.98	88.77	199.52	200	201.09	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1535.34	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.28	Wt. n-Val.		0.016	
W.S. Elev (ft)	1534.07	Reach Len. (ft)	199.52	200.00	201.09
Crit W.S. (ft)	1534.43	Flow Area (sq ft)		14.90	
E.G. Slope (ft/ft)	0.008176	Area (sq ft)		14.90	
Q Total (cfs)	135.00	Flow (cfs)		135.00	
Top Width (ft)	12.40	Top Width (ft)		12.40	
Vel Total (ft/s)	9.06	Avg. Vel. (ft/s)		9.06	
Max Chl Dpth (ft)	1.54	Hydr. Depth (ft)		1.20	
Conv. Total (cfs)	1493.0	Conv. (cfs)		1493.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		13.28	
Min Ch El (ft)	1532.53	Shear (lb/sq ft)		0.57	
Alpha	1.00	Stream Power (lb/ft s)		5.19	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	0.01	16.26	0.00
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	5.38	0.00

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9600.000

INPUT
Description:
Station Elevation Data num= 33

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1535.17	.78	1535.15	9	1535.02	15.41	1534.84	20.52	1534.78
21.89	1534.75	22.67	1534.72	29.23	1534.56	30.32	1534.59	38.61	1534.63
44.5	1534.61	56.43	1534.31	56.98	1534.49	68.98	1534.25	74.98	1530.25
74.99	1530.25	75	1530.25	83	1530.41	88.76	1534.25	89.76	1534.27
90.31	1534.09	93.43	1534.29	93.52	1534.29	93.7	1534.3	102.67	1534.28
104.83	1534.28	109.91	1533.92	114.55	1533.93	122.41	1533.94	132.48	1534
135.81	1533.99	142.37	1534.06	150	1534				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	68.98	.016	88.76	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.98	88.76	70	70	70	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1533.67	Element		0.016	
Vel Head (ft)	1.57	Wt. n-Val.		70.00	70.00
W.S. Elev (ft)	1532.10	Reach Len. (ft)	70.00	18.88	
Crit W.S. (ft)	1532.56	Flow Area (sq ft)		18.88	
E.G. Slope (ft/ft)	0.008185	Area (sq ft)		190.00	
Q Total (cfs)	190.00	Flow (cfs)		13.32	
Top Width (ft)	13.32	Top Width (ft)		10.07	
Vel Total (ft/s)	10.07	Avg. Vel. (ft/s)		1.42	
Max Chl Dpth (ft)	1.85	Hydr. Depth (ft)		2100.1	
Conv. Total (cfs)	2100.1	Conv. (cfs)		14.40	
Length Wtd. (ft)	70.00	Wetted Per. (ft)		0.67	
Min Ch El (ft)	1530.25	Shear (lb/sq ft)		6.74	
Alpha	1.00	Stream Power (lb/ft s)		16.18	0.00
Frctn Loss (ft)	1.64	Cum Volume (acre-ft)	0.01	5.32	0.00
C & E Loss (ft)	0.03	Cum SA (acres)	0.03		

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9530.000

INPUT
Description:
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1535.11	10.79	1535	15.36	1535.07	21.54	1533.71	33.49	1531.69
33.96	1531.72	34.17	1531.74	34.24	1531.74	43.22	1532.08	43.98	1532.13
44.96	1532.18	52.88	1532.33	56.98	1533.7	68.98	1533.46	74.98	1529.46
74.99	1529.46	75	1529.46	83	1529.62	88.76	1533.46	89.76	1533.48
91.56	1534.07	93.95	1534.1	98.14	1533.92	105.98	1533.95	113.47	1533.88
121.03	1533.67	130.44	1533.66	135.68	1532.5	139.01	1531.87	146.66	1532.79
148.99	1533.16	150	1533.18						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	68.98	.016	88.76	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
68.98	88.76	30.04	30	30	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	68.98		T
88.76	150		T

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1533.10	Element		0.016	
Vel Head (ft)	1.66	Wt. n-Val.		30.00	30.00
W.S. Elev (ft)	1531.44	Reach Len. (ft)	30.04	20.59	
Crit W.S. (ft)	1531.92	Flow Area (sq ft)		20.59	
E.G. Slope (ft/ft)	0.008025	Area (sq ft)		213.00	
Q Total (cfs)	213.00	Flow (cfs)		13.70	
Top Width (ft)	13.70	Top Width (ft)		10.34	
Vel Total (ft/s)	10.34	Avg. Vel. (ft/s)		1.50	
Max Chl Dpth (ft)	1.97	Hydr. Depth (ft)		2377.7	
Conv. Total (cfs)	2377.7	Conv. (cfs)		14.85	
Length Wtd. (ft)	30.00	Wetted Per. (ft)		0.69	
Min Ch El (ft)	1529.46	Shear (lb/sq ft)		7.18	
Alpha	1.00	Stream Power (lb/ft s)		16.15	0.00
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.01	5.29	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.03		

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9500.000

INPUT
Description:
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1534.85	2.82	1534.8	11.8	1534.65	29.77	1534.47	35.07	1534.55
40.53	1534.39	42.94	1534.37	54.44	1534.01	55.48	1534.36	57	1533.35
69	1533.11	75	1529.11	83	1529.27	90.26	1534.11	91.26	1534.13
93	1533.06	94.23	1532.87	102.36	1531.67	104.16	1531.53	109.91	1530.99
110.6	1530.92	111.69	1531.24	112.53	1531.45	115.05	1532.06	120.33	1533.36
125.13	1533.35	132.5	1533.4	150	1533.26				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	69	.016	90.26	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69 90.26 100 100 100 .1 .3
Ineffective Flow num= 1
Sta L Sta R Elev Permanent
91.26 150 T

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1532.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.80	Wt. n-Val.		0.016	
W.S. Elev (ft)	1531.03	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1531.57	Flow Area (sq ft)		19.76	
E.G. Slope (ft/ft)	0.009021	Area (sq ft)		19.76	0.08
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.95	Top Width (ft)		13.51	1.44
Vel Total (ft/s)	10.78	Avg. Vel. (ft/s)		10.78	
Max Chl Dpth (ft)	1.92	Hydr. Depth (ft)		1.46	
Conv. Total (cfs)	2242.6	Conv. (cfs)		2242.6	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		14.62	
Min Ch El (ft)	1529.11	Shear (lb/sq ft)		0.76	
Alpha	1.00	Stream Power (lb/ft s)		8.20	
Frctn Loss (ft)	0.26	Cum Volume (acre-ft)	0.01	16.14	0.00
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	5.29	0.00

Warning: Divided flow computed for this cross-section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9400.000

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1533.8	44.53	1533.37	46	1533.35	55.35	1533.26	55.48	1533.22
57	1532.22	69	1531.98	75	1527.98	83	1528.14	90.26	1532.98
91.26	1533	92.43	1532.88	140.57	1532.42	150	1532.46		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	69	.016	90.26	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69 90.26 200 200 200 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1531.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.02	Wt. n-Val.		0.016	
W.S. Elev (ft)	1529.82	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1530.45	Flow Area (sq ft)		18.67	
E.G. Slope (ft/ft)	0.010607	Area (sq ft)		18.67	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	13.26	Top Width (ft)		13.26	
Vel Total (ft/s)	11.41	Avg. Vel. (ft/s)		11.41	
Max Chl Dpth (ft)	1.83	Hydr. Depth (ft)		1.41	
Conv. Total (cfs)	2068.2	Conv. (cfs)		2068.2	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		14.33	
Min Ch El (ft)	1527.98	Shear (lb/sq ft)		0.86	
Alpha	1.00	Stream Power (lb/ft s)		9.84	
Frctn Loss (ft)	0.98	Cum Volume (acre-ft)	0.01	16.09	
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	5.25	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9200.000

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1531.37	4.85	1531.14	5	1531.16	6.23	1531.23	10.8	1531.52
11.39	1531.52	11.49	1531.52	12.28	1531.51	30.6	1531.27	43.83	1531.01
44.06	1530.98	49.59	1530.25	54.12	1530.49	55.48	1530.94	57	1529.94
69	1529.7	75	1525.7	83	1525.86	90.26	1530.7	91.26	1530.72
91.99	1530.46	120.51	1530.04	129.4	1529.87	138.72	1529.63	142.95	1529.71
150	1529.95								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	69	.016	90.26	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
69 90.26 90.41 90 89.25 .1 .3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1529.63	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.13	Wt. n-Val.		0.016	
W.S. Elev (ft)	1527.50	Reach Len. (ft)	90.41	90.00	89.25
Crit W.S. (ft)	1528.16	Flow Area (sq ft)		18.20	
E.G. Slope (ft/ft)	0.011411	Area (sq ft)		18.20	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	13.16	Top Width (ft)		13.16	
Vel Total (ft/s)	11.70	Avg. Vel. (ft/s)		11.70	
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.38	
Conv. Total (cfs)	1993.9	Conv. (cfs)		1993.9	
Length Wtd. (ft)	90.00	Wetted Per. (ft)		14.20	
Min Ch El (ft)	1525.70	Shear (lb/sq ft)		0.91	
Alpha	1.00	Stream Power (lb/ft s)		10.69	

Frctn Loss (ft)	2.20	Cum Volume (acre-ft)	0.01	16.01
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	5.19

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9110.000

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1530.5	1.32	1530.49	19.59	1530.29	33.82	1530.11	38.12	1530.04
43.52	1529.97	44.72	1529.87	46.31	1529.73	50.78	1529.18	51.35	1529.13
53.78	1529.35	55.48	1529.92	57	1528.92	69	1528.68	75.01	1524.68
83	1524.84	90.26	1529.68	91.26	1529.7	91.9	1529.41	92.98	1529.48
93.59	1529.53	106.96	1529.5	112.7	1529.55	116.64	1529.58	117.62	1529.59
121.53	1529.54	126.23	1529.54	130.16	1529.5	134.4	1529.41	150.01	1529.34

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	69	.016	90.26	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
69	90.26	30.1	30	29.88	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1528.60	Element			
Vel Head (ft)	2.12	Wt. n-Val.		0.016	
W.S. Elev (ft)	1526.48	Reach Len. (ft)	30.10	30.00	29.88
Crit W.S. (ft)	1527.14	Flow Area (sq ft)		18.22	
E.G. Slope (ft/ft)	0.011370	Area (sq ft)		18.22	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	13.16	Top Width (ft)		13.16	
Vel Total (ft/s)	11.69	Avg. Vel. (ft/s)		11.69	
Max Chl Dpth (ft)	1.80	Hydr. Depth (ft)		1.38	
Conv. Total (cfs)	1997.5	Conv. (cfs)		1997.5	
Length Wtd. (ft)	30.00	Wetted Per. (ft)		14.20	
Min Ch El (ft)	1524.68	Shear (lb/sq ft)		0.91	
Alpha	1.00	Stream Power (lb/ft s)		10.64	
Frctn Loss (ft)	1.03	Cum Volume (acre-ft)	0.01	15.97	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	5.17	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9080.000

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1530.04	2.95	1529.95	8.31	1529.86	52.24	1529.49	54.98	1528.58
66.99	1528.34	74.98	1524.34	75	1524.34	83	1524.5	90.68	1528.34
98.69	1528.5	101.42	1529.41	150.01	1529.21				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.99	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.99	90.68	80	80	80	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1528.23	Element			
Vel Head (ft)	2.22	Wt. n-Val.		0.016	
W.S. Elev (ft)	1526.01	Reach Len. (ft)	80.00	80.00	80.00
Crit W.S. (ft)	1526.71	Flow Area (sq ft)		17.83	
E.G. Slope (ft/ft)	0.013288	Area (sq ft)		17.83	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.38	Top Width (ft)		14.38	
Vel Total (ft/s)	11.94	Avg. Vel. (ft/s)		11.94	
Max Chl Dpth (ft)	1.67	Hydr. Depth (ft)		1.24	
Conv. Total (cfs)	1847.8	Conv. (cfs)		1847.8	
Length Wtd. (ft)	80.00	Wetted Per. (ft)		15.13	
Min Ch El (ft)	1524.34	Shear (lb/sq ft)		0.98	
Alpha	1.00	Stream Power (lb/ft s)		11.68	
Frctn Loss (ft)	0.37	Cum Volume (acre-ft)	0.01	15.96	
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	5.16	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 9000.000

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1529.34	31.8	1529.05	51.84	1528.71	54.98	1527.67	66.99	1527.43
74.98	1523.43	75	1523.43	83	1523.59	90.69	1527.43	98.69	1527.59
100.74	1528.27	112.76	1528.47	120.46	1528.35	124.47	1528.04	127.53	1527.93

132.52 1528.13 150.01 1528.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.99	.016	90.69	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.99	90.69	200.23	200	199.56	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1527.17	Element			
Vel Head (ft)	2.01	Wt. n-Val.		0.016	
W.S. Elev (ft)	1525.16	Reach Len. (ft)	200.23	200.00	199.56
Crit W.S. (ft)	1525.80	Flow Area (sq ft)		18.72	
E.G. Slope (ft/ft)	0.011584	Area (sq ft)		18.72	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.63	Top Width (ft)		14.63	
Vel Total (ft/s)	11.38	Avg. Vel. (ft/s)		11.38	
Max Chl Dpth (ft)	1.73	Hydr. Depth (ft)		1.28	
Conv. Total (cfs)	1979.0	Conv. (cfs)		1979.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		15.41	
Min Ch El (ft)	1523.43	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		10.00	
Frctn Loss (ft)	0.99	Cum Volume (acre-ft)	0.01	15.93	
C & E Loss (ft)	0.06	Cum SA (acres)	0.03	5.13	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8800.000

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1529.88	13.8	1529.86	13.93	1529.78	14.65	1529.35	25.58	1528.97
37.69	1528.57	37.78	1528.66	38.14	1529.07	46.09	1528.16	46.44	1528.11
46.98	1528.06	54.97	1525.39	66.98	1525.15	74.97	1521.15	74.99	1521.15
83	1521.31	90.67	1525.15	98.68	1525.31	99.89	1525.71	107.37	1525.28
111.93	1525.41	116.48	1525.5	150	1525.74				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.98	.016	90.67	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.98	90.67	202.14	200	195.79	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1524.87	Element			
Vel Head (ft)	1.98	Wt. n-Val.		0.016	
W.S. Elev (ft)	1522.89	Reach Len. (ft)	202.14	200.00	195.79
Crit W.S. (ft)	1523.51	Flow Area (sq ft)		18.86	
E.G. Slope (ft/ft)	0.011336	Area (sq ft)		18.86	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.66	Top Width (ft)		14.66	
Vel Total (ft/s)	11.29	Avg. Vel. (ft/s)		11.29	
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)		1.29	
Conv. Total (cfs)	2000.6	Conv. (cfs)		2000.6	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		15.45	
Min Ch El (ft)	1521.15	Shear (lb/sq ft)		0.86	
Alpha	1.00	Stream Power (lb/ft s)		9.76	
Frctn Loss (ft)	2.29	Cum Volume (acre-ft)	0.01	15.84	
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	5.06	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8600.000

INPUT
Description:
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1527.43	2.23	1527.43	10.66	1527.42	21.82	1527.45	22.05	1527.7
22.27	1527.95	24.36	1527.6	28.35	1526.91	34.04	1525.72	37.8	1524.96
45.36	1524.65	52.19	1524.05	54.98	1523.12	66.97	1522.88	74.97	1518.88
74.99	1518.88	82.99	1519.04	90.67	1522.88	98.68	1523.04	100.08	1522.57
106.81	1522.24	107.71	1522.26	111.42	1522.57	114.94	1523.19	116.3	1523.39
117.57	1523.68	120.44	1523.8	124.46	1523.77	133.82	1523.83	150	1523.92

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	66.97	.016	90.67	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
66.97	90.67	146.32	145.7	145.7	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1522.60	Element			
Vel Head (ft)	1.98	Wt. n-Val.		0.016	
W.S. Elev (ft)	1520.62	Reach Len. (ft)	146.32	145.70	145.70
Crit W.S. (ft)	1521.24	Flow Area (sq ft)		18.85	

E.G. Slope (ft/ft)	0.011353	Area (sq ft)			18.85
Q Total (cfs)	213.00	Flow (cfs)			213.00
Top Width (ft)	14.66	Top Width (ft)			14.66
Vel Total (ft/s)	11.30	Avg. Vel. (ft/s)			11.30
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)			1.29
Conv. Total (cfs)	1999.1	Conv. (cfs)			1999.1
Length Wtd. (ft)	145.70	Wetted Per. (ft)			15.45
Min Ch El (ft)	1518.88	Shear (lb/sq ft)			0.86
Alpha	1.00	Stream Power (lb/ft s)			9.77
Frctn Loss (ft)	2.27	Cum Volume (acre-ft)		0.01	15.75
C & E Loss (ft)	0.00	Cum SA (acres)		0.03	5.00

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8454.300

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1524.33	5.74	1524.24	11.06	1524.11	21.56	1524.16	23.63	1524.17
39.03	1523.65	44.99	1521.67	56.99	1521.43	67	1521.22	75	1517.22
83	1517.38	90.68	1521.22	98.68	1521.38	102.41	1522.62	107.83	1522.43
149.79	1522.26	150	1522.26						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	67	.016	90.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
67	90.68	65.17	54.6	55.14	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1520.95	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.99	Wt. n-Val.		0.016	
W.S. Elev (ft)	1518.96	Reach Len. (ft)	65.17	54.60	55.14
Crit W.S. (ft)	1519.59	Flow Area (sq ft)		18.83	
E.G. Slope (ft/ft)	0.011382	Area (sq ft)		18.83	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.65	Top Width (ft)		14.65	
Vel Total (ft/s)	11.31	Avg. Vel. (ft/s)		11.31	
Max Chl Dpth (ft)	1.74	Hydr. Depth (ft)		1.29	
Conv. Total (cfs)	1996.5	Conv. (cfs)		1996.5	
Length Wtd. (ft)	54.60	Wetted Per. (ft)		15.43	
Min Ch El (ft)	1517.22	Shear (lb/sq ft)		0.87	
Alpha	1.00	Stream Power (lb/ft s)		9.81	
Frctn Loss (ft)	1.66	Cum Volume (acre-ft)	0.01	15.69	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	4.95	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8400

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1522.54	4.54	1522.38	7.24	1522.06	8.91	1521.93	14.43	1521.62
14.71	1521.6	15.59	1521.55	21.33	1521.83	23.51	1522	27.94	1522.2
30.05	1522.38	31.62	1522.49	39	1523.25	43.62	1523.13	44.2	1523.12
74.99	1519.6	75	1513.6	83	1513.6	83.01	1519.6	97.5	1522.01
97.69	1522	97.82	1522	97.92	1522	121.92	1521.73	132.78	1522.01
133	1522.01	139.46	1522.08	145.51	1522.07	147.35	1522.1	148.89	1522.09
150	1522.06								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	83.01	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	83.01	240.01	240.01	240.01	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1519.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	4.59	Wt. n-Val.		0.016	
W.S. Elev (ft)	1515.15	Reach Len. (ft)	240.01	240.01	240.01
Crit W.S. (ft)	1516.40	Flow Area (sq ft)		12.38	
E.G. Slope (ft/ft)	0.029613	Area (sq ft)		12.38	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	8.01	Top Width (ft)		8.01	
Vel Total (ft/s)	17.20	Avg. Vel. (ft/s)		17.20	
Max Chl Dpth (ft)	1.55	Hydr. Depth (ft)		1.55	
Conv. Total (cfs)	1237.8	Conv. (cfs)		1237.8	
Length Wtd. (ft)	240.01	Wetted Per. (ft)		11.09	
Min Ch El (ft)	1513.60	Shear (lb/sq ft)		2.06	
Alpha	1.00	Stream Power (lb/ft s)		35.50	
Frctn Loss (ft)	0.95	Cum Volume (acre-ft)	0.01	15.67	
C & E Loss (ft)	0.26	Cum SA (acres)	0.03	4.93	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CULVERT

RIVER: RM12-U
REACH: E-Chan Upper RS: 8399

INPUT
Description: Apache Trail Crosing
Distance from Upstream XS = 1
Deck/Roadway Width = 237
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1524	1510	200	1524	1510

Upstream Bridge Cross Section Data
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1522.54	4.54	1522.38	7.24	1522.06	8.91	1521.93	14.43	1521.62
14.71	1521.6	15.59	1521.55	21.33	1521.83	23.51	1522	27.94	1522.2
30.05	1522.38	31.62	1522.49	39	1523.25	43.62	1523.13	44.2	1523.12
74.99	1519.6	75	1513.6	83	1513.6	83.01	1519.6	97.5	1522.01
97.69	1522	97.82	1522	97.92	1522	121.92	1521.73	132.78	1522.01
133	1522.01	139.46	1522.08	145.51	1522.07	147.35	1522.1	148.89	1522.09
150	1522.06								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	83.01	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
74.99	83.01	.3	.5

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1524	1510	200	1524	1510

Downstream Bridge Cross Section Data
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1517.79	3.14	1517.78	18.3	1517.89	19.93	1517.96	21.87	1517.96
26.45	1517.98	29.56	1518.03	41.37	1518.25	49.54	1518.36	49.84	1518.37
51.02	1518.38	55.21	1518.42	72.92	1517.38	74.98	1516.88	75	1510.88
83	1510.88	83.02	1516.88	95.42	1518.55	95.82	1518.54	97.38	1518.5
101.1	1518.38	108.67	1518.28	110.69	1518.24	119.29	1518.29	125.11	1518.31
129.59	1518.31	133.35	1518.25	136.12	1518.14	146.12	1518.36	149.19	1518.62
150	1518.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.98	.016	83.02	.04

Bank Sta: Left	Right	Coeff Contr.	Expan.
74.98	83.02	.3	.5

Upstream Embankment side slope = 0 horiz. to 1.0 vertical
Downstream Embankment side slope = 0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .95
Elevation at which weir flow begins = 1524
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	6	8

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	.01	240	.016	.016	0	.3	1

Upstream Elevation = 1513.6
Centerline Station = 79
Downstream Elevation = 1510.88
Centerline Station = 79

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	213.00	Culv Full Len (ft)	
# Barrels	1	Culv Vel US (ft/s)	14.65
Q Barrel (cfs)	213.00	Culv Vel DS (ft/s)	12.53
E.G. US. (ft)	1519.74	Culv Inv El Up (ft)	1513.60
W.S. US. (ft)	1515.15	Culv Inv El Dn (ft)	1510.88
E.G. DS (ft)	1515.40	Culv Frctn Ls (ft)	3.31
W.S. DS (ft)	1513.03	Culv Exit Loss (ft)	0.04
Delta EG (ft)	4.34	Culv Entr Loss (ft)	0.99
Delta WS (ft)	2.11	Q Weir (cfs)	
E.G. IC (ft)		Weir Sta Lft (ft)	
E.G. OC (ft)		Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1515.42	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1513.00	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.15	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.80	Min El Weir Flow (ft)	1524.01

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8160.000

INPUT
Description:
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1517.79	3.14	1517.78	18.3	1517.89	19.93	1517.96	21.87	1517.96
26.45	1517.98	29.56	1518.03	41.37	1518.25	49.54	1518.36	49.84	1518.37
51.02	1518.38	55.21	1518.42	72.92	1517.38	74.98	1516.88	75	1510.88
83	1510.88	83.02	1516.88	95.42	1518.55	95.82	1518.54	97.38	1518.5
101.1	1518.38	108.67	1518.28	110.69	1518.24	119.29	1518.29	125.11	1518.31
129.59	1518.31	133.35	1518.25	136.12	1518.14	146.12	1518.36	149.19	1518.62
150	1518.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.98	.016	83.02	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.98	83.02	48.33	36.4	38.24	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1515.44	Element			
Vel Head (ft)	2.43	Wt. n-Val.		0.016	
W.S. Elev (ft)	1513.01	Reach Len. (ft)	48.33	36.40	38.24
Crit W.S. (ft)	1513.67	Flow Area (sq ft)		17.03	
E.G. Slope (ft/ft)	0.011684	Area (sq ft)		17.03	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	8.01	Top Width (ft)		8.01	
Vel Total (ft/s)	12.50	Avg. Vel. (ft/s)		12.50	
Max Chl Dpth (ft)	2.13	Hydr. Depth (ft)		2.13	
Conv. Total (cfs)	1970.6	Conv. (cfs)		1970.6	
Length Wtd. (ft)	36.40	Wetted Per. (ft)		12.25	
Min Ch El (ft)	1510.88	Shear (lb/sq ft)		1.01	
Alpha	1.00	Stream Power (lb/ft s)		12.68	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	15.59	
C & E Loss (ft)		Cum SA (acres)	0.03	4.89	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8124.000

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1517.67	38.93	1517.6	40.99	1516.92	50.94	1516.74	62.94	1516.5
75	1510.47	85	1510.67	96.74	1516.54	104.74	1516.7	106.99	1518.07
138.93	1518.35	150	1518.41						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62.94	.016	96.74	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.94	96.74	125.94	124	122.43	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1514.72	Element			
Vel Head (ft)	2.91	Wt. n-Val.		0.016	
W.S. Elev (ft)	1511.81	Reach Len. (ft)	125.94	124.00	122.43
Crit W.S. (ft)	1512.65	Flow Area (sq ft)		15.56	
E.G. Slope (ft/ft)	0.021732	Area (sq ft)		15.56	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	14.98	Top Width (ft)		14.98	
Vel Total (ft/s)	13.69	Avg. Vel. (ft/s)		13.69	
Max Chl Dpth (ft)	1.34	Hydr. Depth (ft)		1.04	
Conv. Total (cfs)	1444.9	Conv. (cfs)		1444.9	
Length Wtd. (ft)	124.00	Wetted Per. (ft)		15.57	
Min Ch El (ft)	1510.47	Shear (lb/sq ft)		1.36	
Alpha	1.00	Stream Power (lb/ft s)		18.56	
Frctn Loss (ft)	0.57	Cum Volume (acre-ft)	0.01	15.58	
C & E Loss (ft)	0.14	Cum SA (acres)	0.03	4.88	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 8000.000

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1516.64	41.4	1516.63	45.24	1515.36	57.23	1515.12	69.23	1509.12
85	1509.27	97.43	1515.42	105.43	1515.58	150	1516.44		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	57.23	.016	97.43	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
57.23	97.43	202.82	200	196.16	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1512.04	Element			
Vel Head (ft)	1.73	Wt. n-Val.		0.016	
W.S. Elev (ft)	1510.31	Reach Len. (ft)	202.82	200.00	196.16
Crit W.S. (ft)	1510.84	Flow Area (sq ft)		20.18	
E.G. Slope (ft/ft)	0.013440	Area (sq ft)		20.18	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	20.27	Top Width (ft)		20.27	
Vel Total (ft/s)	10.55	Avg. Vel. (ft/s)		10.55	
Max Chl Dpth (ft)	1.19	Hydr. Depth (ft)		1.00	
Conv. Total (cfs)	1837.3	Conv. (cfs)		1837.3	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		20.80	
Min Ch El (ft)	1509.12	Shear (lb/sq ft)		0.81	
Alpha	1.00	Stream Power (lb/ft s)		8.59	
Frctn Loss (ft)	2.09	Cum Volume (acre-ft)	0.01	15.53	
C & E Loss (ft)	0.59	Cum SA (acres)	0.03	4.83	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 7800.000

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1513.62	12.53	1513.53	39.25	1513.17	50	1513.54	62	1513.3
75	1506.8	85	1507	97.68	1513.34	105.68	1513.5	150	1513.55

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1509.98	Element			
Vel Head (ft)	1.40	Wt. n-Val.		0.016	
W.S. Elev (ft)	1508.58	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1508.98	Flow Area (sq ft)		22.43	
E.G. Slope (ft/ft)	0.007510	Area (sq ft)		22.43	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	16.71	Top Width (ft)		16.71	
Vel Total (ft/s)	9.49	Avg. Vel. (ft/s)		9.49	
Max Chl Dpth (ft)	1.78	Hydr. Depth (ft)		1.34	
Conv. Total (cfs)	2457.8	Conv. (cfs)		2457.8	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		17.51	
Min Ch El (ft)	1506.80	Shear (lb/sq ft)		0.60	
Alpha	1.00	Stream Power (lb/ft s)		5.70	
Frctn Loss (ft)	1.97	Cum Volume (acre-ft)	0.01	15.43	
C & E Loss (ft)	0.10	Cum SA (acres)	0.03	4.74	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 7600.000

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1511.78	.54	1511.79	2.4	1511.8	15.54	1511.42	29.25	1511.37
30.85	1511.82	31.17	1511.88	47.91	1511.8	50	1511.28	62	1511.04
75	1504.54	85	1504.74	97.68	1511.08	105.68	1511.24	116.95	1510.98
132.05	1510.91	141.65	1510.95	142.4	1510.95	144.5	1511.04	149.16	1511.23
150	1511.23								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1508.05	Element			
Vel Head (ft)	1.94	Wt. n-Val.		0.016	
W.S. Elev (ft)	1506.11	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1506.72	Flow Area (sq ft)		19.06	
E.G. Slope (ft/ft)	0.012017	Area (sq ft)		19.06	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	15.89	Top Width (ft)		15.89	
Vel Total (ft/s)	11.17	Avg. Vel. (ft/s)		11.17	
Max Chl Dpth (ft)	1.57	Hydr. Depth (ft)		1.20	
Conv. Total (cfs)	1943.1	Conv. (cfs)		1943.1	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		16.58	
Min Ch El (ft)	1504.54	Shear (lb/sq ft)		0.86	
Alpha	1.00	Stream Power (lb/ft s)		9.64	
Frctn Loss (ft)	1.87	Cum Volume (acre-ft)	0.01	15.33	
C & E Loss (ft)	0.05	Cum SA (acres)	0.03	4.67	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 7400.000

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1509.01	2.47	1508.69	10.11	1508.69	50	1509.01	62	1508.77
75	1502.27	85	1502.47	97.68	1508.81	105.68	1508.97	106.42	1509.68
124.27	1509.5	136.98	1509.39	138.97	1509.3	142.4	1509.29	146.44	1509.24
148.58	1509.21	150	1509.22						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1505.71				
Vel Head (ft)	1.83	Wt. n-Val.		0.016	
W.S. Elev (ft)	1503.88	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1504.45	Flow Area (sq ft)		19.62	
E.G. Slope (ft/ft)	0.011064	Area (sq ft)		19.62	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	16.02	Top Width (ft)		16.02	
Vel Total (ft/s)	10.86	Avg. Vel. (ft/s)		10.86	
Max Chl Dpth (ft)	1.61	Hydr. Depth (ft)		1.22	
Conv. Total (cfs)	2025.0	Conv. (cfs)		2025.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		16.74	
Min Ch El (ft)	1502.27	Shear (lb/sq ft)		0.81	
Alpha	1.00	Stream Power (lb/ft s)		8.79	
Frctn Loss (ft)	2.31	Cum Volume (acre-ft)	0.01	15.24	
C & E Loss (ft)	0.03	Cum SA (acres)	0.03	4.60	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 7200.000

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1506.51	1.14	1506.51	50	1506.75	62	1506.51	75	1500.01
85	1500.21	97.68	1506.55	105.68	1506.71	131.22	1506.49	149.99	1506.47

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1503.46				
Vel Head (ft)	1.86	Wt. n-Val.		0.016	
W.S. Elev (ft)	1501.61	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1502.19	Flow Area (sq ft)		19.48	
E.G. Slope (ft/ft)	0.011290	Area (sq ft)		19.48	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	15.99	Top Width (ft)		15.99	
Vel Total (ft/s)	10.93	Avg. Vel. (ft/s)		10.93	
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)		1.22	
Conv. Total (cfs)	2004.6	Conv. (cfs)		2004.6	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		16.70	
Min Ch El (ft)	1500.01	Shear (lb/sq ft)		0.82	
Alpha	1.00	Stream Power (lb/ft s)		8.99	
Frctn Loss (ft)	2.24	Cum Volume (acre-ft)	0.01	15.15	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	4.52	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 7000.000

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1510.7	1.53	1510.71	7.19	1510.74	8.07	1510.74	19.58	1506.09
23.28	1504.55	29.52	1504.61	35.93	1504.65	38.65	1504.68	48.21	1504.9
50	1504.48	62	1504.24	75	1497.74	85	1497.94	97.68	1504.28

105.68	1504.44	109.04	1505.11	114.61	1504.53	116.96	1504.39	121.99	1504.44
124.27	1504.41	131.2	1504.54	133.92	1504.5	138.25	1504.48	140.35	1504.45
150	1504.54								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	197.8	200	203.59	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1501.20	Element			
Vel Head (ft)	1.86	Wt. n-Val.		0.016	
W.S. Elev (ft)	1499.34	Reach Len. (ft)	197.80	200.00	203.59
Crit W.S. (ft)	1499.92	Flow Area (sq ft)		19.44	
E.G. Slope (ft/ft)	0.011349	Area (sq ft)		19.44	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	15.98	Top Width (ft)		15.98	
Vel Total (ft/s)	10.95	Avg. Vel. (ft/s)		10.95	
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)		1.22	
Conv. Total (cfs)	1999.4	Conv. (cfs)		1999.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		16.69	
Min Ch El (ft)	1497.74	Shear (lb/sq ft)		0.83	
Alpha	1.00	Stream Power (lb/ft s)		9.04	
Frctn Loss (ft)	2.26	Cum Volume (acre-ft)	0.01	15.06	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	4.45	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6800.000

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1509	6.98	1510.05	10.65	1510.83	12.54	1509.58	21.44	1503.87
45.87	1503.42	50	1502.22	62	1501.98	75	1495.48	85	1495.68
97.68	1502.02	105.68	1502.18	107.42	1503.21	143.46	1503.3	145.14	1503.84
146.53	1504.38	150	1505.66						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	165.6	165.6	165.6	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1498.94	Element			
Vel Head (ft)	1.86	Wt. n-Val.		0.016	
W.S. Elev (ft)	1497.08	Reach Len. (ft)	165.60	165.60	165.60
Crit W.S. (ft)	1497.66	Flow Area (sq ft)		19.45	
E.G. Slope (ft/ft)	0.011334	Area (sq ft)		19.45	
Q Total (cfs)	213.00	Flow (cfs)		213.00	
Top Width (ft)	15.98	Top Width (ft)		15.98	
Vel Total (ft/s)	10.95	Avg. Vel. (ft/s)		10.95	
Max Chl Dpth (ft)	1.60	Hydr. Depth (ft)		1.22	
Conv. Total (cfs)	2000.7	Conv. (cfs)		2000.7	
Length Wtd. (ft)	165.60	Wetted Per. (ft)		16.69	
Min Ch El (ft)	1495.48	Shear (lb/sq ft)		0.82	
Alpha	1.00	Stream Power (lb/ft s)		9.03	
Frctn Loss (ft)	2.27	Cum Volume (acre-ft)	0.01	14.97	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	4.38	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6634.400

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1498.53	.66	1498.43	2.47	1498.41	9.48	1498.31	10.63	1498.25
15.2	1498.04	15.93	1498	24.77	1498.06	29.67	1498.09	30.96	1498.03
37.63	1497.77	41.72	1498.14	44.09	1498.45	49.07	1499.21	50	1500.34
62	1500.1	75	1493.6	85	1493.8	97.68	1501.14	105.68	1500.3
110.93	1502.51	125.77	1502.29	135.04	1502.14	140.24	1502.09	150.01	1502.12

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.68	36.05	38	36.13	.1	.3

Left Levee Station= 62 Elevation= 1500.1

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1498.59	Element			
Vel Head (ft)	0.08	Wt. n-Val.		0.016	
W.S. Elev (ft)	1498.51	Reach Len. (ft)	36.05	38.00	36.13

Crit W.S. (ft)	1495.79	Flow Area (sq ft)			91.37
E.G. Slope (ft/ft)	0.000145	Area (sq ft)			91.37
Q Total (cfs)	213.00	Flow (cfs)			213.00
Top Width (ft)	27.96	Top Width (ft)			27.96
Vel Total (ft/s)	2.33	Avg. Vel. (ft/s)			2.33
Max Chl Dpth (ft)	4.91	Hydr. Depth (ft)			3.27
Conv. Total (cfs)	17679.2	Conv. (cfs)			17679.2
Length Wtd. (ft)	38.00	Wetted Per. (ft)			30.38
Min Ch El (ft)	1493.60	Shear (lb/sq ft)			0.03
Alpha	1.00	Stream Power (lb/ft s)			0.06
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)		0.01	14.76
C & E Loss (ft)	0.10	Cum SA (acres)		0.03	4.29

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6596.400

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1501.08	15.6	1501	15.89	1501	20.93	1501	23.1	1500.78
28.37	1500.35	36.68	1498.44	37.38	1498.28	37.8	1498.19	60.05	1498.45
60.07	1498.45	62.97	1499.41	62.99	1499.41	74.99	1499.17	75	1493.17
95	1493.57	107.68	1499.91	115.68	1500.07	122.96	1502.24	122.98	1502.25
123.07	1502.25	150	1502.34						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	107.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	107.68	23.6	23.6	23.65	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1498.46	Element			
Vel Head (ft)	1.09	Wt. n-Val.		0.016	
W.S. Elev (ft)	1497.37	Reach Len. (ft)	23.60	23.60	23.65
Crit W.S. (ft)		Flow Area (sq ft)		94.57	
E.G. Slope (ft/ft)	0.001975	Area (sq ft)		94.57	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	27.62	Top Width (ft)		27.62	
Vel Total (ft/s)	8.38	Avg. Vel. (ft/s)		8.38	
Max Chl Dpth (ft)	4.20	Hydr. Depth (ft)		3.42	
Conv. Total (cfs)	17821.5	Conv. (cfs)		17821.5	
Length Wtd. (ft)	23.60	Wetted Per. (ft)		32.71	
Min Ch El (ft)	1493.17	Shear (lb/sq ft)		0.36	
Alpha	1.00	Stream Power (lb/ft s)		2.99	
Frctn Loss (ft)	0.03	Cum Volume (acre-ft)	0.01	14.68	
C & E Loss (ft)	0.11	Cum SA (acres)	0.03	4.27	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6572.800

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1501.07	3.53	1501.05	35.67	1500.85	38.07	1500.55	41.22	1500.17
45.81	1499.27	52.14	1498.03	55.83	1498.01	59.76	1498.02	62.91	1499.08
63	1499.64	74.99	1499.4	75.09	1492.9	97	1493.34	109.68	1499.68
117.68	1498.84	122.05	1501.21	122.53	1501.4	128.55	1502.14	128.62	1502.13
129.74	1502.14	142.51	1502.25	150	1502.25				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	109.68	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	109.68	60.11	61.3	60.13	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1498.32	Element			
Vel Head (ft)	0.72	Wt. n-Val.		0.016	
W.S. Elev (ft)	1497.60	Reach Len. (ft)	60.11	61.30	60.13
Crit W.S. (ft)		Flow Area (sq ft)		116.43	
E.G. Slope (ft/ft)	0.001127	Area (sq ft)		116.43	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	30.50	Top Width (ft)		30.50	
Vel Total (ft/s)	6.80	Avg. Vel. (ft/s)		6.80	
Max Chl Dpth (ft)	4.70	Hydr. Depth (ft)		3.82	
Conv. Total (cfs)	23587.8	Conv. (cfs)		23587.8	
Length Wtd. (ft)	61.30	Wetted Per. (ft)		36.14	
Min Ch El (ft)	1492.90	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		1.54	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	0.01	14.63	
C & E Loss (ft)	0.08	Cum SA (acres)	0.03	4.25	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6511.500

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1500.56	28.99	1500.46	43.35	1500.38	43.85	1500.29	46.56	1499.89
46.7	1499.87	46.73	1499.86	50	1498.95	62	1498.71	75	1492.21
85	1492.41	97.6	1498.71	104.6	1498.37	106.11	1497.87	106.15	1497.88
114.06	1499.73	122.61	1501.09	128.27	1501.92	143.41	1502.12	149.99	1502.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62	.016	97.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62	97.6	110.82	111.5	112.72	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1498.13	Element		0.016	
Vel Head (ft)	1.50	Wt. n-Val.			
W.S. Elev (ft)	1496.63	Reach Len. (ft)	110.82	111.50	112.72
Crit W.S. (ft)	1496.63	Flow Area (sq ft)		80.61	
E.G. Slope (ft/ft)	0.002908	Area (sq ft)		80.61	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	27.29	Top Width (ft)		27.29	
Vel Total (ft/s)	9.83	Avg. Vel. (ft/s)		9.83	
Max Chl Dpth (ft)	4.42	Hydr. Depth (ft)		2.95	
Conv. Total (cfs)	14687.5	Conv. (cfs)		14687.5	
Length Wtd. (ft)	111.50	Wetted Per. (ft)		29.33	
Min Ch El (ft)	1492.21	Shear (lb/sq ft)		0.50	
Alpha	1.00	Stream Power (lb/ft s)		4.90	
Frctn Loss (ft)	0.32	Cum Volume (acre-ft)	0.01	14.49	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	4.21	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6400.000

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1500.26	42.39	1500.46	42.72	1500.45	50.98	1497.6	62.98	1497.36
74.98	1491.36	75	1491.35	85	1491.55	96.6	1497.35	104.6	1497.51
105.26	1497.3	107.35	1497.81	110.5	1498.45	121.47	1500.65	133.85	1500.97
142.48	1501.18	150	1501.1						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62.98	.016	96.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.98	96.6	197.5	200	204.48	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1497.58	Element		0.016	
Vel Head (ft)	2.53	Wt. n-Val.			
W.S. Elev (ft)	1495.06	Reach Len. (ft)	197.50	200.00	204.48
Crit W.S. (ft)	1495.77	Flow Area (sq ft)		62.10	
E.G. Slope (ft/ft)	0.005948	Area (sq ft)		62.10	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	24.43	Top Width (ft)		24.43	
Vel Total (ft/s)	12.75	Avg. Vel. (ft/s)		12.75	
Max Chl Dpth (ft)	3.71	Hydr. Depth (ft)		2.54	
Conv. Total (cfs)	10269.5	Conv. (cfs)		10269.5	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		26.13	
Min Ch El (ft)	1491.35	Shear (lb/sq ft)		0.88	
Alpha	1.00	Stream Power (lb/ft s)		11.25	
Frctn Loss (ft)	0.45	Cum Volume (acre-ft)	0.01	14.30	
C & E Loss (ft)	0.10	Cum SA (acres)	0.03	4.15	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6200.000

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	1498.01	8.78	1497.97	36.93	1497.88	49.38	1495.92	49.8	1495.85
50.32	1495.85	50.98	1496.06	62.98	1495.82	74.98	1489.82	75	1489.82
85	1490.02	96.6	1495.82	104.6	1495.98	105.18	1496.17	106.23	1496.24
115.34	1496.18	128.07	1496.2	140.45	1496.13	143.51	1496.12	150	1496.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62.98	.016	96.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.98	96.6	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1496.24	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.88	Wt. n-Val.		0.016	
W.S. Elev (ft)	1493.36	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1494.24	Flow Area (sq ft)		58.15	
E.G. Slope (ft/ft)	0.007129	Area (sq ft)		58.15	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	23.78	Top Width (ft)		23.78	
Vel Total (ft/s)	13.62	Avg. Vel. (ft/s)		13.62	
Max Chl Dpth (ft)	3.54	Hydr. Depth (ft)		2.45	
Conv. Total (cfs)	9380.1	Conv. (cfs)		9380.1	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		25.41	
Min Ch El (ft)	1489.82	Shear (lb/sq ft)		1.02	
Alpha	1.00	Stream Power (lb/ft s)		13.88	
Frctn Loss (ft)	1.30	Cum Volume (acre-ft)	0.01	14.03	
C & E Loss (ft)	0.04	Cum SA (acres)	0.03	4.03	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 6000.000

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1496.2	43.52	1496.05	48.07	1495.49	50.97	1494.53	62.98	1494.29
74.98	1488.29	75	1488.29	85	1488.49	96.6	1494.29	104.6	1494.45
104.92	1494.55	150	1494.71						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62.98	.016	96.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.98	96.6	197.67	200	204.18	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1494.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.97	Wt. n-Val.		0.016	
W.S. Elev (ft)	1491.79	Reach Len. (ft)	197.67	200.00	204.18
Crit W.S. (ft)	1492.71	Flow Area (sq ft)		57.22	
E.G. Slope (ft/ft)	0.007454	Area (sq ft)		57.22	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	23.62	Top Width (ft)		23.62	
Vel Total (ft/s)	13.84	Avg. Vel. (ft/s)		13.84	
Max Chl Dpth (ft)	3.50	Hydr. Depth (ft)		2.42	
Conv. Total (cfs)	9173.6	Conv. (cfs)		9173.6	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		25.23	
Min Ch El (ft)	1488.29	Shear (lb/sq ft)		1.06	
Alpha	1.00	Stream Power (lb/ft s)		14.61	
Frctn Loss (ft)	1.46	Cum Volume (acre-ft)	0.01	13.76	
C & E Loss (ft)	0.01	Cum SA (acres)	0.03	3.93	

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 5800.000

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1494.58	20.27	1494.4	28.21	1493.43	48.29	1492.1	50.98	1493
62.98	1492.76	74.98	1486.76	75	1486.76	85	1486.96	96.6	1492.76
104.6	1492.92	106.39	1493.51	125.13	1494.1	130.14	1494.09	138.57	1494.41
144.18	1494.43	144.35	1494.42	144.82	1494.41	150	1494.34		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	62.98	.016	96.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
62.98	96.6	160	160	160	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1493.26	Element	Left OB	Channel	Right OB
Vel Head (ft)	3.01	Wt. n-Val.		0.016	
W.S. Elev (ft)	1490.25	Reach Len. (ft)	160.00	160.00	160.00
Crit W.S. (ft)	1491.18	Flow Area (sq ft)		56.87	
E.G. Slope (ft/ft)	0.007580	Area (sq ft)		56.87	

Q Total (cfs)	792.00	Flow (cfs)		792.00
Top Width (ft)	23.56	Top Width (ft)		23.56
Vel Total (ft/s)	13.93	Avg. Vel. (ft/s)		13.93
Max Chl Dpth (ft)	3.49	Hydr. Depth (ft)		2.41
Conv. Total (cfs)	9096.6	Conv. (cfs)		9096.6
Length Wtd. (ft)	160.00	Wetted Per. (ft)		25.16
Min Ch El (ft)	1486.76	Shear (lb/sq ft)		1.07
Alpha	1.00	Stream Power (lb/ft s)		14.90
Frctn Loss (ft)	1.50	Cum Volume (acre-ft)	0.01	13.50
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	3.82

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

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 5640

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.75	.89	1487.74	4.49	1488.39	8.03	1489.11	21.74	1492.22
25.02	1493.06	48.84	1492.48	49.94	1492.12	50.98	1491.77	53.36	1491.72
63	1491.53	75	1485.53	85	1485.73	96.6	1491.53	104.6	1491.69
106.04	1491.21	108.12	1490.52	116.48	1490.66	120.99	1490.87	124.2	1490.84
127.96	1490.93	135.8	1491.45	136.06	1491.47	136.49	1491.49	148.86	1491.42
150	1491.41								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	63	.016	96.6	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
63	96.6	177.35	177.35	177.35	.1	.3

Left Levee Station= 63 Elevation= 1491.53

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1492.03	Element			
Vel Head (ft)	3.02	Wt. n-Val.		0.016	
W.S. Elev (ft)	1489.02	Reach Len. (ft)	177.35	177.35	177.35
Crit W.S. (ft)	1489.97	Flow Area (sq ft)		56.82	
E.G. Slope (ft/ft)	0.007598	Area (sq ft)		56.82	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	23.55	Top Width (ft)		23.55	
Vel Total (ft/s)	13.94	Avg. Vel. (ft/s)		13.94	
Max Chl Dpth (ft)	3.49	Hydr. Depth (ft)		2.41	
Conv. Total (cfs)	9086.0	Conv. (cfs)		9086.0	
Length Wtd. (ft)	177.35	Wetted Per. (ft)		25.15	
Min Ch El (ft)	1485.53	Shear (lb/sq ft)		1.07	
Alpha	1.00	Stream Power (lb/ft s)		14.94	
Frctn Loss (ft)	1.21	Cum Volume (acre-ft)	0.01	13.29	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	3.73	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 5462.650

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1486.94	4.29	1486.86	16.84	1489.93	27.7	1492.76	36.52	1492.1
36.53	1492.1	59	1492.17	75	1484.17	85	1484.37	101	1492.37
108.14	1491.51	108.15	1491.51	110.07	1491.48	112.72	1491.45	131.77	1491.21
144.56	1491.07	145.9	1491.15	150	1491.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	59	.016	101	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
59	101	60.92	50.85	53.63	.1	.3

Left Levee Station= 59 Elevation= 1492.17

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1491.06	Element			
Vel Head (ft)	0.48	Wt. n-Val.		0.016	
W.S. Elev (ft)	1490.58	Reach Len. (ft)	60.92	50.85	53.63
Crit W.S. (ft)	1488.61	Flow Area (sq ft)		142.68	
E.G. Slope (ft/ft)	0.000617	Area (sq ft)		142.68	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	35.23	Top Width (ft)		35.23	
Vel Total (ft/s)	5.55	Avg. Vel. (ft/s)		5.55	
Max Chl Dpth (ft)	6.41	Hydr. Depth (ft)		4.05	
Conv. Total (cfs)	31890.9	Conv. (cfs)		31890.9	
Length Wtd. (ft)	50.85	Wetted Per. (ft)		38.21	
Min Ch El (ft)	1484.17	Shear (lb/sq ft)		0.14	
Alpha	1.00	Stream Power (lb/ft s)		0.80	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.01	12.89	
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	3.61	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 5411.890

INPUT
Description:
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.49	9.84	1487.48	10	1487.51	14.02	1488.39	30.64	1491.47
30.68	1491.44	30.91	1491.44	32.18	1491.63	43.42	1491.8	44.85	1491.8
74.99	1491.09	75	1483.09	91.75	1483.09	91.76	1491.09	97.91	1491.45
107.21	1491.73	107.26	1491.73	107.34	1491.72	111.05	1491.37	112.37	1491.33
113.55	1491.3	118.45	1491.6	119.1	1491.6	150	1491.21		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	91.76	.04

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
74.99 91.76 223.51 223.51 223.51 .3 .5
Left Levee Station= 74.99 Elevation= 1491.09

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1491.00	Element			
Vel Head (ft)	0.66	Wt. n-Val.		0.016	
W.S. Elev (ft)	1490.34	Reach Len. (ft)	223.51	223.51	223.51
Crit W.S. (ft)	1487.20	Flow Area (sq ft)		121.56	
E.G. Slope (ft/ft)	0.000805	Area (sq ft)		121.56	
Q Total (cfs)	792.00	Flow (cfs)		792.00	
Top Width (ft)	16.77	Top Width (ft)		16.77	
Vel Total (ft/s)	6.52	Avg. Vel. (ft/s)		6.52	
Max Chl Dpth (ft)	7.25	Hydr. Depth (ft)		7.25	
Conv. Total (cfs)	27917.7	Conv. (cfs)		27917.7	
Length Wtd. (ft)	223.51	Wetted Per. (ft)		31.26	
Min Ch El (ft)	1483.09	Shear (lb/sq ft)		0.20	
Alpha	1.00	Stream Power (lb/ft s)		1.27	
Frctn Loss (ft)		Cum Volume (acre-ft)	0.01	12.73	
C & E Loss (ft)		Cum SA (acres)	0.03	3.58	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CULVERT

RIVER: RM12-U
REACH: E-Chan Upper RS: 5410.8

INPUT
Description: Broadway Road Crossing
Distance from Upstream XS = 1
Deck/Roadway Width = 217.7
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1491	1480	200	1491	1480

Upstream Bridge Cross Section Data
Station Elevation Data num= 24

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.49	9.84	1487.48	10	1487.51	14.02	1488.39	30.64	1491.47
30.68	1491.44	30.91	1491.44	32.18	1491.63	43.42	1491.8	44.85	1491.8
74.99	1491.09	75	1483.09	91.75	1483.09	91.76	1491.09	97.91	1491.45
107.21	1491.73	107.26	1491.73	107.34	1491.72	111.05	1491.37	112.37	1491.33
113.55	1491.3	118.45	1491.6	119.1	1491.6	150	1491.21		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	91.76	.04

Bank Sta: Left Right Coeff Contr. Expan.
74.99 91.76 .3 .5
Left Levee Station= 74.99 Elevation= 1491.09

Downstream Deck/Roadway Coordinates
num= 2

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	1491	1480	200	1491	1480

Downstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1492.41	9.96	1492.32	17.09	1492.28	29.55	1492.1	33	1491.46
33.77	1491.4	35.09	1491.06	39.58	1491.89	40.59	1492.13	41.69	1491.97
46.37	1491.39	50.43	1490.16	74.99	1490.2	75	1482.2	108.5	1482.2
108.51	1490.2	110.6	1491.28	111.82	1491.27	122.3	1491.1	125.92	1491.14
148.32	1491.04	150	1491.07						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	108.51	.04

Bank Sta: Left Right Coeff Contr. Expan.
74.99 108.51 .3 .5

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical

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Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins         =    1491
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1          Box       6       8
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                .01   223.5     .016     .016        0                .3                  1
Number of Barrels =  2
Upstream   Elevation =  1483.09
Centerline Stations
    Sta.    Sta.
      79   87.75
Downstream Elevation =  1482.2
Centerline Stations
    Sta.    Sta.
   95.76  104.51

CULVERT OUTPUT  Profile #PF 1  Culv Group:  Culvert #1

  Q Culv Group (cfs)        792.00    Culv Full Len (ft)        223.50
  # Barrels                      2    Culv Vel US (ft/s)          8.25
  Q Barrel (cfs)            396.00    Culv Vel DS (ft/s)          8.25
  E.G. US. (ft)            1491.00    Culv Inv El Up (ft)      1483.09
  W.S. US. (ft)            1490.34    Culv Inv El Dn (ft)      1482.20
  E.G. DS (ft)             1489.22    Culv Frctn Ls (ft)          0.86
  W.S. DS (ft)             1488.77    Culv Exit Loss (ft)         0.61
  Delta EG (ft)               1.78    Culv Entr Loss (ft)         0.32
  Delta WS (ft)               1.57    Q Weir (cfs)
  E.G. IC (ft)             1490.04    Weir Sta Lft (ft)
  E.G. OC (ft)             1491.00    Weir Sta Rgt (ft)
  Culvert Control           Outlet    Weir Submerg
  Culv WS Inlet (ft)       1489.09    Weir Max Depth (ft)
  Culv WS Outlet (ft)      1488.20    Weir Avg Depth (ft)
  Culv Nml Depth (ft)                 Weir Flow Area (sq ft)
  Culv Crt Depth (ft)         4.24    Min El Weir Flow (ft)    1491.01


CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 5191.77

INPUT
Description:
Station Elevation Data     num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.41    9.96 1492.32   17.09 1492.28   29.55  1492.1      33 1491.46
   33.77  1491.4   35.09 1491.06   39.58 1491.89   40.59 1492.13   41.69 1491.97
   46.37 1491.39   50.43 1490.16   74.99  1490.2      75  1482.2   108.5  1482.2
  108.51  1490.2   110.6 1491.28  111.82 1491.27   122.3  1491.1  125.92 1491.14
  148.32 1491.04     150 1491.07

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.99    .016  108.51     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          74.99  108.51            22.95   19.48    8.74            .3       .5

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1489.22    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.45    Wt. n-Val.                            0.016
  W.S. Elev (ft)           1488.77    Reach Len. (ft)            22.95      19.48       8.74
  Crit W.S. (ft)                      Flow Area (sq ft)                    220.12
  E.G. Slope (ft/ft)      0.000426    Area (sq ft)                         220.12
  Q Total (cfs)            1187.00    Flow (cfs)                          1187.00
  Top Width (ft)             33.52    Top Width (ft)                        33.52
  Vel Total (ft/s)            5.39    Avg. Vel. (ft/s)                       5.39
  Max Chl Dpth (ft)           6.57    Hydr. Depth (ft)                       6.57
  Conv. Total (cfs)        57517.9    Conv. (cfs)                         57517.9
  Length Wtd. (ft)           19.48    Wetted Per. (ft)                      46.64
  Min Ch El (ft)           1482.20    Shear (lb/sq ft)                       0.13
  Alpha                       1.00    Stream Power (lb/ft s)                 0.68
  Frctn Loss (ft)             0.01    Cum Volume (acre-ft)        0.01      11.86
  C & E Loss (ft)             0.01    Cum SA (acres)              0.03       3.45


CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 5171.826

INPUT
Description:
Station Elevation Data     num=      29
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.38    5.59 1492.34   10.72 1492.35    13.3 1492.39   25.74 1492.27
   29.09 1492.26      47 1491.99   48.63 1491.69   50.31 1491.57   53.19 1490.83
   53.98 1490.97   58.78  1492.1   63.97 1491.38   64.34 1491.34   72.11 1490.18
   74.99 1490.12   75.02 1489.92   80.75 1482.13  109.31 1482.12  112.34 1490.17
  117.66 1490.27  118.61 1490.59  120.43 1491.19  127.63 1491.18  132.95 1491.15
  138.11 1491.03  139.98 1491.04   146.3 1490.94     150 1490.96

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
      0     .04   75.02    .016  112.34     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         75.02  112.34             181.34  170.53  169.96          .3        .5

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1489.20    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              0.49    Wt. n-Val.                            0.016
  W.S. Elev (ft)          1488.72    Reach Len. (ft)            181.34     170.53     169.96
  Crit W.S. (ft)                     Flow Area (sq ft)                     212.35
  E.G. Slope (ft/ft)      0.000441   Area (sq ft)                          212.35
  Q Total (cfs)           1187.00    Flow (cfs)                           1187.00
  Top Width (ft)            35.89    Top Width (ft)                         35.89
  Vel Total (ft/s)           5.59    Avg. Vel. (ft/s)                        5.59
  Max Chl Dpth (ft)          6.60    Hydr. Depth (ft)                        5.92
  Conv. Total (cfs)       56507.2    Conv. (cfs)                         56507.2
  Length Wtd. (ft)          170.53   Wetted Per. (ft)                       43.78
  Min Ch El (ft)          1482.12    Shear (lb/sq ft)                        0.13
  Alpha                      1.00    Stream Power (lb/ft s)                  0.75
  Frctn Loss (ft)            0.15    Cum Volume (acre-ft)         0.01      11.76
  C & E Loss (ft)            0.39    Cum SA (acres)               0.03       3.44

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 5000.08

INPUT
Description:
Station Elevation Data    num=      28
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.26     9.8 1491.11   20.07  1491.1   33.74 1490.79   35.91 1489.99
   36.65 1489.72   36.69 1489.77   36.98 1489.87   37.15 1489.89   48.91 1489.63
   48.99 1489.63      49 1489.63    49.1 1489.64      59 1489.43      75 1481.43
    75.2 1481.43      85 1481.63   100.6 1489.43  108.43 1489.58   108.6 1489.59
  109.89 1490.01  109.91 1490.02  109.94 1490.02  109.95 1490.02  114.56 1489.99
  129.03 1489.95  139.89 1489.83     150 1489.78

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04      59    .016   100.6     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             59   100.6             200.3   200.3   200.3          .1        .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1488.66    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.77    Wt. n-Val.                            0.016
  W.S. Elev (ft)          1486.89    Reach Len. (ft)            200.30     200.30     200.30
  Crit W.S. (ft)          1486.89    Flow Area (sq ft)                     111.22
  E.G. Slope (ft/ft)      0.002719   Area (sq ft)                          111.22
  Q Total (cfs)           1187.00    Flow (cfs)                           1187.00
  Top Width (ft)            31.46    Top Width (ft)                         31.46
  Vel Total (ft/s)          10.67    Avg. Vel. (ft/s)                       10.67
  Max Chl Dpth (ft)          5.46    Hydr. Depth (ft)                        3.54
  Conv. Total (cfs)       22765.0    Conv. (cfs)                         22765.0
  Length Wtd. (ft)          200.30   Wetted Per. (ft)                       33.99
  Min Ch El (ft)          1481.43    Shear (lb/sq ft)                        0.56
  Alpha                      1.00    Stream Power (lb/ft s)                  5.93
  Frctn Loss (ft)            0.54    Cum Volume (acre-ft)         0.01      11.13
  C & E Loss (ft)            0.01    Cum SA (acres)               0.03       3.30

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
         This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 4800.000

INPUT
Description:
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1486.76     .45 1486.75   11.97 1486.82   19.06 1486.92    22.1 1487.76
   27.58 1489.15   30.63 1489.21   34.77 1489.31   42.68 1489.92   46.98 1488.85
   58.98 1488.61   74.98 1480.61      75 1480.61      87 1480.85  102.52 1488.61
  110.52 1488.77  111.43 1488.47  112.85 1488.45  125.75 1488.31  134.26 1488.26
  145.74 1488.15     150 1488.14

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   58.98    .016  102.52     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.98  102.52              200     200     200          .1        .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1487.82    Element                    Left OB    Channel   Right OB
```

Vel Head (ft)	2.80	Wt. n-Val.		0.016	
W.S. Elev (ft)	1485.02	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1485.79	Flow Area (sq ft)		88.37	
E.G. Slope (ft/ft)	0.005220	Area (sq ft)		88.37	
Q Total (cfs)	1187.00	Flow (cfs)		1187.00	
Top Width (ft)	29.18	Top Width (ft)		29.18	
Vel Total (ft/s)	13.43	Avg. Vel. (ft/s)		13.43	
Max Chl Dpth (ft)	4.41	Hydr. Depth (ft)		3.03	
Conv. Total (cfs)	16428.4	Conv. (cfs)		16428.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		31.20	
Min Ch El (ft)	1480.61	Shear (lb/sq ft)		0.92	
Alpha	1.00	Stream Power (lb/ft s)		12.40	
Frctn Loss (ft)	0.73	Cum Volume (acre-ft)	0.01	10.67	
C & E Loss (ft)	0.10	Cum SA (acres)	0.03	3.17	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 4600.000

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1489.61	5.45	1489.57	8.96	1489.57	10.48	1489.57	13.2	1489.55
40.83	1489.41	41.34	1489.45	46.98	1488.04	58.98	1487.8	74.98	1479.8
75	1479.8	87	1480.04	102.52	1487.8	110.52	1487.96	112.96	1488.57
115.86	1488.55	118.76	1488.23	125.74	1487.55	150	1487.39		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1486.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.12	Wt. n-Val.		0.016	
W.S. Elev (ft)	1484.65	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1484.98	Flow Area (sq ft)		101.50	
E.G. Slope (ft/ft)	0.003568	Area (sq ft)		101.50	
Q Total (cfs)	1187.00	Flow (cfs)		1187.00	
Top Width (ft)	30.92	Top Width (ft)		30.92	
Vel Total (ft/s)	11.70	Avg. Vel. (ft/s)		11.70	
Max Chl Dpth (ft)	4.85	Hydr. Depth (ft)		3.28	
Conv. Total (cfs)	19872.1	Conv. (cfs)		19872.1	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		33.16	
Min Ch El (ft)	1479.80	Shear (lb/sq ft)		0.68	
Alpha	1.00	Stream Power (lb/ft s)		7.97	
Frctn Loss (ft)	0.86	Cum Volume (acre-ft)	0.01	10.23	
C & E Loss (ft)	0.20	Cum SA (acres)	0.03	3.03	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 4400.000

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1489.38	13.05	1489.32	19.29	1489.27	41.2	1488.67	46.98	1487.23
58.98	1486.99	74.98	1478.99	75	1478.99	87	1479.23	102.52	1486.99
110.52	1487.15	113.7	1487.94	131.99	1487.72	138.3	1487.22	143.88	1486.87
150	1486.73								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1486.00	Element	Left OB	Channel	Right OB
Vel Head (ft)	2.29	Wt. n-Val.		0.016	
W.S. Elev (ft)	1483.71	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)	1484.17	Flow Area (sq ft)		97.75	
E.G. Slope (ft/ft)	0.003956	Area (sq ft)		97.75	
Q Total (cfs)	1187.00	Flow (cfs)		1187.00	
Top Width (ft)	30.43	Top Width (ft)		30.43	
Vel Total (ft/s)	12.14	Avg. Vel. (ft/s)		12.14	
Max Chl Dpth (ft)	4.72	Hydr. Depth (ft)		3.21	
Conv. Total (cfs)	18871.9	Conv. (cfs)		18871.9	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		32.61	
Min Ch El (ft)	1478.99	Shear (lb/sq ft)		0.74	
Alpha	1.00	Stream Power (lb/ft s)		8.99	
Frctn Loss (ft)	0.75	Cum Volume (acre-ft)	0.01	9.77	
C & E Loss (ft)	0.02	Cum SA (acres)	0.03	2.89	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 4200.000

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1488.25	20.09	1488.07	27.28	1488.02	35.74	1487.96	41.1	1487.89
46.98	1486.42	58.98	1486.18	74.98	1478.18	75	1478.18	87	1478.42
102.52	1486.18	110.52	1486.34	113.31	1487.04	147.86	1487.03	149.49	1487.03
150	1487								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	202.44	200	195.8	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1485.21	Element			
Vel Head (ft)	2.33	Wt. n-Val.		0.016	
W.S. Elev (ft)	1482.88	Reach Len. (ft)	202.44	200.00	195.80
Crit W.S. (ft)	1483.36	Flow Area (sq ft)		96.87	
E.G. Slope (ft/ft)	0.004055	Area (sq ft)		96.87	
Q Total (cfs)	1187.00	Flow (cfs)		1187.00	
Top Width (ft)	30.32	Top Width (ft)		30.32	
Vel Total (ft/s)	12.25	Avg. Vel. (ft/s)		12.25	
Max Chl Dpth (ft)	4.69	Hydr. Depth (ft)		3.20	
Conv. Total (cfs)	18640.2	Conv. (cfs)		18640.2	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		32.48	
Min Ch El (ft)	1478.18	Shear (lb/sq ft)		0.76	
Alpha	1.00	Stream Power (lb/ft s)		9.25	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	0.01	9.33	
C & E Loss (ft)	0.00	Cum SA (acres)	0.03	2.75	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 4000.000

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1487.26	23.64	1486.97	42.24	1486.79	46.98	1485.61	58.98	1485.37
74.98	1477.37	75.01	1477.37	87	1477.61	102.52	1485.37	110.52	1485.53
110.91	1485.62	115.12	1485.61	119.58	1485.48	120.98	1485.46	125.6	1486.01
132.26	1485.91	134.28	1485.79	150	1484.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	100.33	100	100.43	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1484.68	Element			
Vel Head (ft)	0.93	Wt. n-Val.		0.016	
W.S. Elev (ft)	1483.75	Reach Len. (ft)	100.33	100.00	100.43
Crit W.S. (ft)	1482.55	Flow Area (sq ft)		153.59	
E.G. Slope (ft/ft)	0.001152	Area (sq ft)		153.59	
Q Total (cfs)	1187.00	Flow (cfs)		1187.00	
Top Width (ft)	37.05	Top Width (ft)		37.05	
Vel Total (ft/s)	7.73	Avg. Vel. (ft/s)		7.73	
Max Chl Dpth (ft)	6.38	Hydr. Depth (ft)		4.15	
Conv. Total (cfs)	34970.1	Conv. (cfs)		34970.1	
Length Wtd. (ft)	100.00	Wetted Per. (ft)		40.01	
Min Ch El (ft)	1477.37	Shear (lb/sq ft)		0.28	
Alpha	1.00	Stream Power (lb/ft s)		2.13	
Frctn Loss (ft)	0.17	Cum Volume (acre-ft)	0.01	8.75	
C & E Loss (ft)	0.09	Cum SA (acres)	0.03	2.59	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 3900.00

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1486.85	23.64	1486.56	42.24	1486.38	46.98	1485.2	58.98	1484.96
74.98	1476.96	75.01	1476.96	87	1477.2	102.52	1484.96	110.52	1485.12
110.91	1485.21	115.12	1485.2	119.58	1485.07	120.98	1485.05	125.6	1485.6
132.26	1485.5	134.28	1485.38	150	1483.62				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

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

```
        58.98  102.52              100     100     100              .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1484.41    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              1.86    Wt. n-Val.                            0.016
  W.S. Elev (ft)          1482.55    Reach Len. (ft)            100.00     100.00     100.00
  Crit W.S. (ft)          1482.55    Flow Area (sq ft)                     125.68
  E.G. Slope (ft/ft)     0.002668    Area (sq ft)                          125.68
  Q Total (cfs)           1375.00    Flow (cfs)                           1375.00
  Top Width (ft)            33.91    Top Width (ft)                         33.91
  Vel Total (ft/s)          10.94    Avg. Vel. (ft/s)                       10.94
  Max Chl Dpth (ft)          5.59    Hydr. Depth (ft)                        3.71
  Conv. Total (cfs)       26619.8    Conv. (cfs)                         26619.8
  Length Wtd. (ft)         100.00    Wetted Per. (ft)                       36.49
  Min Ch El (ft)          1476.96    Shear (lb/sq ft)                        0.57
  Alpha                      1.00    Stream Power (lb/ft s)                  6.28
  Frctn Loss (ft)            0.27    Cum Volume (acre-ft)        0.01        8.43
  C & E Loss (ft)            0.00    Cum SA (acres)              0.03        2.51

Warning: The energy equation could not be balanced within the specified number of iterations.  The
         program selected the water surface that had the least amount of error between computed and
         assumed values.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical
         depth, the calculated water surface came back below critical depth.  This indicates that there is
         not a valid subcritical answer.  The program defaulted to critical depth.

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 3800.000

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1486.73   16.62 1486.8   17.85 1486.64   19.54 1486.27   36.13 1481.19
   46.98  1484.8   58.98 1484.56  74.98 1476.56      75 1476.56      87  1476.8
  102.51 1484.56  102.53 1484.56 110.52 1484.72  111.77 1485.03  130.76 1485.16
  134.44 1485.11  137.82 1485.09     150 1485.11

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   58.98    .016  102.53     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          58.98  102.53            200     200     200              .1       .3
Ineffective Flow     num=        1
   Sta L   Sta R    Elev  Permanent
       0   58.98 1484.56       F

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1484.06    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              2.27    Wt. n-Val.                            0.016
  W.S. Elev (ft)          1481.79    Reach Len. (ft)            200.00     200.00     200.00
  Crit W.S. (ft)          1482.16    Flow Area (sq ft)                     113.75
  E.G. Slope (ft/ft)     0.003503    Area (sq ft)                 1.14     113.75
  Q Total (cfs)           1375.00    Flow (cfs)                           1375.00
  Top Width (ft)            36.25    Top Width (ft)               3.78      32.46
  Vel Total (ft/s)          12.09    Avg. Vel. (ft/s)                       12.09
  Max Chl Dpth (ft)          5.23    Hydr. Depth (ft)                        3.50
  Conv. Total (cfs)       23231.4    Conv. (cfs)                         23231.4
  Length Wtd. (ft)         200.00    Wetted Per. (ft)                       34.88
  Min Ch El (ft)          1476.56    Shear (lb/sq ft)                        0.71
  Alpha                      1.00    Stream Power (lb/ft s)                  8.62
  Frctn Loss (ft)            0.30    Cum Volume (acre-ft)        0.01        8.16
  C & E Loss (ft)            0.04    Cum SA (acres)              0.03        2.43

Warning: Divided flow computed for this cross-section.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water
         surface was used.
Note:    Program found supercritical flow starting at this cross section.

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 3600.000

INPUT
Description:
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1481.86    5.11 1480.51   36.14 1480.38   46.98 1483.99   58.97 1483.75
   74.98 1475.75      75 1475.75   86.99 1475.99  102.51 1483.75  102.52 1483.75
  110.52 1483.91  113.65 1484.69     150 1484.47

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   58.97    .016  102.52     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          58.97  102.52           198.18     200  203.12              .1       .3
Left Levee       Station=   58.97       Elevation= 1483.75

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1483.30    Element                    Left OB    Channel   Right OB
  Vel Head (ft)              2.45    Wt. n-Val.                            0.016
  W.S. Elev (ft)          1480.85    Reach Len. (ft)            198.18     200.00     203.12
  Crit W.S. (ft)          1481.35    Flow Area (sq ft)                     109.43
  E.G. Slope (ft/ft)     0.003895    Area (sq ft)                          109.43
```

Q Total (cfs)	1375.00	Flow (cfs)			1375.00
Top Width (ft)	31.93	Top Width (ft)			31.93
Vel Total (ft/s)	12.57	Avg. Vel. (ft/s)			12.57
Max Chl Dpth (ft)	5.10	Hydr. Depth (ft)			3.43
Conv. Total (cfs)	22030.8	Conv. (cfs)			22030.8
Length Wtd. (ft)	200.00	Wetted Per. (ft)			34.29
Min Ch El (ft)	1475.75	Shear (lb/sq ft)			0.78
Alpha	1.00	Stream Power (lb/ft s)			9.75
Frctn Loss (ft)	0.74	Cum Volume (acre-ft)		0.00	7.64
C & E Loss (ft)	0.02	Cum SA (acres)		0.02	2.29

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 3400.000

INPUT
Description:
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1485.07	20.36	1485.02	20.8	1485.02	21.12	1485.01	23.78	1483.87
24.26	1483.62	27.52	1483.6	30.65	1483.61	31.08	1483.7	32.96	1484.33
42.94	1484.19	46.98	1483.18	58.98	1482.94	74.98	1474.94	75	1474.94
87	1475.18	102.52	1482.94	110.52	1483.1	111.24	1483.28	150	1483.02

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	198.81	200	202.03	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1482.50	Element			
Vel Head (ft)	2.50	Wt. n-Val.		0.016	
W.S. Elev (ft)	1480.01	Reach Len. (ft)	198.81	200.00	202.03
Crit W.S. (ft)	1480.52	Flow Area (sq ft)		108.39	
E.G. Slope (ft/ft)	0.003999	Area (sq ft)		108.39	
Q Total (cfs)	1375.00	Flow (cfs)		1375.00	
Top Width (ft)	31.80	Top Width (ft)		31.80	
Vel Total (ft/s)	12.69	Avg. Vel. (ft/s)		12.69	
Max Chl Dpth (ft)	5.07	Hydr. Depth (ft)		3.41	
Conv. Total (cfs)	21744.4	Conv. (cfs)		21744.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		34.14	
Min Ch El (ft)	1474.94	Shear (lb/sq ft)		0.79	
Alpha	1.00	Stream Power (lb/ft s)		10.05	
Frctn Loss (ft)	0.79	Cum Volume (acre-ft)	0.00	7.14	
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	2.14	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 3200.000

INPUT
Description:
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1484.67	6.39	1484.59	6.78	1484.54	9.13	1484.5	10.48	1484.1
15.37	1482.79	19.46	1481.75	22.12	1481.03	23.65	1481.03	27.12	1481.03
32.04	1482.98	34.32	1483.87	36.18	1483.63	37.17	1483.52	37.92	1483.52
42.51	1483.49	46.99	1482.37	58.98	1482.13	74.98	1474.13	75	1474.13
87	1474.37	102.53	1482.13	110.53	1482.29	113.24	1482.96	150.01	1482.62

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.53	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.53	202.37	200	196.93	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1481.70	Element			
Vel Head (ft)	2.51	Wt. n-Val.		0.016	
W.S. Elev (ft)	1479.19	Reach Len. (ft)	202.37	200.00	196.93
Crit W.S. (ft)	1479.71	Flow Area (sq ft)		108.09	
E.G. Slope (ft/ft)	0.004029	Area (sq ft)		108.09	
Q Total (cfs)	1375.00	Flow (cfs)		1375.00	
Top Width (ft)	31.77	Top Width (ft)		31.77	
Vel Total (ft/s)	12.72	Avg. Vel. (ft/s)		12.72	
Max Chl Dpth (ft)	5.06	Hydr. Depth (ft)		3.40	
Conv. Total (cfs)	21661.2	Conv. (cfs)		21661.2	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		34.10	
Min Ch El (ft)	1474.13	Shear (lb/sq ft)		0.80	
Alpha	1.00	Stream Power (lb/ft s)		10.14	
Frctn Loss (ft)	0.80	Cum Volume (acre-ft)	0.00	6.65	
C & E Loss (ft)	0.00	Cum SA (acres)	0.02	1.99	

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 3000.000

INPUT
Description:

Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1484.73	7.06	1484.65	10.21	1483.82	11.93	1483.37	15.41	1482.23
22.07	1479.77	23.85	1479.76	27.11	1479.76	32.99	1482.43	33.32	1482.58
33.61	1482.7	33.73	1482.71	33.75	1482.71	36.22	1483.08	41.17	1481.61
53.17	1481.37	69.17	1473.37	74.99	1473.32	87	1473.56	102.52	1481.32
110.52	1481.48	113.51	1482.37	150	1482.01				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	53.17	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
53.17	102.52	157.03	152.44	147.52	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1480.48	Element			
Vel Head (ft)	0.83	Wt. n-Val.		0.016	
W.S. Elev (ft)	1479.65	Reach Len. (ft)	157.03	152.44	147.52
Crit W.S. (ft)	1478.15	Flow Area (sq ft)		187.84	
E.G. Slope (ft/ft)	0.000938	Area (sq ft)		187.84	
Q Total (cfs)	1375.00	Flow (cfs)		1375.00	
Top Width (ft)	42.57	Top Width (ft)		42.57	
Vel Total (ft/s)	7.32	Avg. Vel. (ft/s)		7.32	
Max Chl Dpth (ft)	6.33	Hydr. Depth (ft)		4.41	
Conv. Total (cfs)	44895.9	Conv. (cfs)		44895.9	
Length Wtd. (ft)	152.44	Wetted Per. (ft)		45.50	
Min Ch El (ft)	1473.32	Shear (lb/sq ft)		0.24	
Alpha	1.00	Stream Power (lb/ft s)		1.77	
Frctn Loss (ft)	0.23	Cum Volume (acre-ft)	0.00	5.97	
C & E Loss (ft)	0.10	Cum SA (acres)	0.02	1.82	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2847.56

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1481.89	1.91	1482.16	34.87	1481.84	34.89	1481.84	36.99	1481.14
48.99	1480.9	49.01	1480.9	59	1480.7	59.02	1480.69	75.01	1472.7
75.02	1472.7	87.01	1472.94	87.03	1472.95	102.52	1480.7	110.51	1480.86
112.06	1481.37	150.01	1481.08						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	59.02	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
59.02	102.52	156.41	147.3	151.34	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1480.15	Element			
Vel Head (ft)	1.88	Wt. n-Val.		0.016	
W.S. Elev (ft)	1478.28	Reach Len. (ft)	156.41	147.30	151.34
Crit W.S. (ft)	1478.28	Flow Area (sq ft)		125.07	
E.G. Slope (ft/ft)	0.002703	Area (sq ft)		125.07	
Q Total (cfs)	1375.00	Flow (cfs)		1375.00	
Top Width (ft)	33.83	Top Width (ft)		33.83	
Vel Total (ft/s)	10.99	Avg. Vel. (ft/s)		10.99	
Max Chl Dpth (ft)	5.58	Hydr. Depth (ft)		3.70	
Conv. Total (cfs)	26446.1	Conv. (cfs)		26446.1	
Length Wtd. (ft)	147.30	Wetted Per. (ft)		36.41	
Min Ch El (ft)	1472.70	Shear (lb/sq ft)		0.58	
Alpha	1.00	Stream Power (lb/ft s)		6.37	
Frctn Loss (ft)	0.22	Cum Volume (acre-ft)	0.00	5.42	
C & E Loss (ft)	0.51	Cum SA (acres)	0.02	1.69	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2700.300

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1480.53	49.15	1480.26	49.77	1480.26	50.48	1480.26	51.02	1480.26
51.36	1480.26	51.76	1480.26	74.99	1479.42	75	1471.42	106.75	1471.42
106.76	1479.42	111.77	1479.82	111.97	1479.64	112.39	1479.82	114.71	1479.59

```
  115.41  1479.8  115.54 1479.82  115.61 1479.82  150.01 1479.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.99    .016  106.76     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          74.99  106.76           130.01  130.01  134.12             .3       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)           1478.12    Element                    Left OB    Channel   Right OB
  Vel Head (ft)               0.85    Wt. n-Val.                             0.016
  W.S. Elev (ft)           1477.27    Reach Len. (ft)            130.01     130.01     134.12
  Crit W.S. (ft)           1475.28    Flow Area (sq ft)                     185.65
  E.G. Slope (ft/ft)      0.000917    Area (sq ft)                          185.65
  Q Total (cfs)            1375.00    Flow (cfs)                           1375.00
  Top Width (ft)             31.76    Top Width (ft)                         31.76
  Vel Total (ft/s)            7.41    Avg. Vel. (ft/s)                        7.41
  Max Chl Dpth (ft)           5.85    Hydr. Depth (ft)                        5.84
  Conv. Total (cfs)        45403.1    Conv. (cfs)                          45403.1
  Length Wtd. (ft)          130.01    Wetted Per. (ft)                       43.44
  Min Ch El (ft)           1471.42    Shear (lb/sq ft)                        0.24
  Alpha                       1.00    Stream Power (lb/ft s)                  1.81
  Frctn Loss (ft)                     Cum Volume (acre-ft)        0.00        4.90
  C & E Loss (ft)                     Cum SA (acres)              0.02        1.58


CULVERT


RIVER: RM12-U
REACH: E-Chan Upper       RS: 2699.3

INPUT
Description: Pueblo
Distance from Upstream XS =       1
Deck/Roadway Width        =   127.9
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    1482    1470     200    1482    1470

Upstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1480.53   49.15 1480.26   49.77 1480.26   50.48 1480.26   51.02 1480.26
   51.36 1480.26   51.76 1480.26   74.99 1479.42     75 1471.42  106.75 1471.42
  106.76 1479.42  111.77 1479.82  111.97 1479.64  112.39 1479.82  114.71 1479.59
  115.41  1479.8  115.54 1479.82  115.61 1479.82  150.01 1479.84

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.99    .016  106.76     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          74.99  106.76             .3       .3

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0    1482    1470     200    1482    1470     200    1482    1482

Downstream Bridge Cross Section Data
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1479.28    10.9 1479.14   36.52 1479.02   40.64 1478.99   45.71 1478.99
   51.33 1478.93    52.5 1478.92   52.58 1478.92   52.73 1478.92   74.99 1478.34
      75 1470.33  106.75 1470.33  106.76 1478.39   117.5 1479.44  124.65  1479.8
  131.66 1478.97  144.73 1477.08     150  1477.1

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.99    .016  106.76     .04

Bank Sta: Left   Right    Coeff Contr.   Expan.
          74.99  106.76             .1       .3

Upstream Embankment side slope              =      0 horiz. to 1.0 vertical
Downstream Embankment side slope            =      0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =    .95
Elevation at which weir flow begins         =   1482
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1          Box       6      10
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 1 - Inlet edges chamfered 3/4 inch
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
              .01     130     .016     .016        0                 .3                  1
Number of Barrels =  3
Upstream   Elevation =  1471.42
Centerline Stations
    Sta.    Sta.    Sta.
      80  90.875  101.75
Downstream Elevation =  1470.33
Centerline Stations
    Sta.    Sta.    Sta.
      80  90.875  101.75
```

CULVERT OUTPUT Profile #PF 1 Culv Group: Culvert #1

Q Culv Group (cfs)	1375.00	Culv Full Len (ft)	32.70
# Barrels	3	Culv Vel US (ft/s)	9.15
Q Barrel (cfs)	458.33	Culv Vel DS (ft/s)	7.64
E.G. US. (ft)	1478.12	Culv Inv El Up (ft)	1471.42
W.S. US. (ft)	1477.27	Culv Inv El Dn (ft)	1470.33
E.G. DS (ft)	1477.42	Culv Frctn Ls (ft)	0.31
W.S. DS (ft)	1476.37	Culv Exit Loss (ft)	
Delta EG (ft)	0.70	Culv Entr Loss (ft)	0.39
Delta WS (ft)	0.90	Q Weir (cfs)	
E.G. IC (ft)	1478.02	Weir Sta Lft (ft)	
E.G. OC (ft)	1478.12	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1476.43	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1476.33	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	3.38	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	4.03	Min El Weir Flow (ft)	1482.01

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2570.33

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1479.28	10.9	1479.14	36.52	1479.02	40.64	1478.99	45.71	1478.99
51.33	1478.93	52.5	1478.92	52.58	1478.92	52.73	1478.92	74.99	1478.34
75	1470.33	106.75	1470.33	106.76	1478.39	117.5	1479.44	124.65	1479.8
131.66	1478.97	144.73	1477.08	150	1477.1				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	106.76	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	106.76	158.38	148.45	148.38	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1477.42	Element			
Vel Head (ft)	1.05	Wt. n-Val.		0.016	
W.S. Elev (ft)	1476.37	Reach Len. (ft)	158.38	148.45	148.38
Crit W.S. (ft)		Flow Area (sq ft)		191.70	
E.G. Slope (ft/ft)	0.001094	Area (sq ft)		191.70	
Q Total (cfs)	1575.00	Flow (cfs)		1575.00	
Top Width (ft)	31.77	Top Width (ft)		31.77	
Vel Total (ft/s)	8.22	Avg. Vel. (ft/s)		8.22	
Max Chl Dpth (ft)	6.04	Hydr. Depth (ft)		6.04	
Conv. Total (cfs)	47619.8	Conv. (cfs)		47619.8	
Length Wtd. (ft)	148.45	Wetted Per. (ft)		43.82	
Min Ch El (ft)	1470.33	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		2.45	
Frctn Loss (ft)	0.24	Cum Volume (acre-ft)	0.00	4.33	
C & E Loss (ft)	0.09	Cum SA (acres)	0.02	1.48	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2421.880

INPUT
Description:
Station Elevation Data num= 17

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1478.7	34.05	1478.44	34.3	1478.44	34.32	1478.43	36.99	1477.55
48.95	1477.31	48.99	1477.31	49.01	1477.3	58.1	1477.56	75	1469.11
87	1469.35	103.42	1477.56	110.52	1477.27	112.41	1477.89	140.42	1477.66
144.99	1477.66	150	1477.61						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.1	.016	103.42	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.1	103.42	226.79	221.8	216.62	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1477.08	Element			
Vel Head (ft)	1.97	Wt. n-Val.		0.016	
W.S. Elev (ft)	1475.11	Reach Len. (ft)	226.79	221.80	216.62
Crit W.S. (ft)	1475.11	Flow Area (sq ft)		139.80	
E.G. Slope (ft/ft)	0.002619	Area (sq ft)		139.80	
Q Total (cfs)	1575.00	Flow (cfs)		1575.00	
Top Width (ft)	35.53	Top Width (ft)		35.53	
Vel Total (ft/s)	11.27	Avg. Vel. (ft/s)		11.27	
Max Chl Dpth (ft)	6.00	Hydr. Depth (ft)		3.94	
Conv. Total (cfs)	30776.3	Conv. (cfs)		30776.3	
Length Wtd. (ft)	221.80	Wetted Per. (ft)		38.31	
Min Ch El (ft)	1469.11	Shear (lb/sq ft)		0.60	
Alpha	1.00	Stream Power (lb/ft s)		6.72	
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	0.00	3.77	
C & E Loss (ft)	0.01	Cum SA (acres)	0.02	1.37	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2200.000

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1477.04	41.64	1476.84	46	1476.01	58	1475.77	75	1467.27
87.01	1467.51	103.52	1475.77	111.52	1475.93	114.52	1476.43	150	1476.38

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58	.016	103.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58	103.52	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1476.12	Wt. n-Val.		0.016	
Vel Head (ft)	3.47	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	1472.66	Flow Area (sq ft)		118.82	
Crit W.S. (ft)	1473.65	Area (sq ft)		118.82	
E.G. Slope (ft/ft)	0.005181	Flow (cfs)		1775.00	
Q Total (cfs)	1775.00	Top Width (ft)		33.08	
Top Width (ft)	33.08	Avg. Vel. (ft/s)		14.94	
Vel Total (ft/s)	14.94	Hydr. Depth (ft)		3.59	
Max Chl Dpth (ft)	5.39	Conv. (cfs)		24659.3	
Conv. Total (cfs)	24659.3	Wetted Per. (ft)		35.57	
Length Wtd. (ft)	200.00	Shear (lb/sq ft)		1.08	
Min Ch El (ft)	1467.27	Stream Power (lb/ft s)		16.14	
Alpha	1.00	Cum Volume (acre-ft)	0.00	3.11	
Frctn Loss (ft)	0.81	Cum SA (acres)	0.02	1.20	
C & E Loss (ft)	0.15				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 2000.000

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1475.16	42.81	1474.89	46.98	1473.85	58.98	1473.61	74.98	1465.61
75	1465.61	87	1465.85	102.52	1473.61	110.52	1473.77	113.25	1474.45
150	1474.41								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	58.98	.016	102.52	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
58.98	102.52	145.4	146.8	149.2	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1474.87	Wt. n-Val.		0.016	
Vel Head (ft)	4.21	Reach Len. (ft)	145.40	146.80	149.20
W.S. Elev (ft)	1470.66	Flow Area (sq ft)		107.75	
Crit W.S. (ft)	1471.99	Area (sq ft)		107.75	
E.G. Slope (ft/ft)	0.006772	Flow (cfs)		1775.00	
Q Total (cfs)	1775.00	Top Width (ft)		31.72	
Top Width (ft)	31.72	Avg. Vel. (ft/s)		16.47	
Vel Total (ft/s)	16.47	Hydr. Depth (ft)		3.40	
Max Chl Dpth (ft)	5.05	Conv. (cfs)		21569.3	
Conv. Total (cfs)	21569.3	Wetted Per. (ft)		34.05	
Length Wtd. (ft)	146.80	Shear (lb/sq ft)		1.34	
Min Ch El (ft)	1465.61	Stream Power (lb/ft s)		22.04	
Alpha	1.00	Cum Volume (acre-ft)	0.00	2.59	
Frctn Loss (ft)	1.18	Cum SA (acres)	0.02	1.05	
C & E Loss (ft)	0.07				

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 1853.2

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
      0 1473.79    28.73 1473.64     43.2 1473.57    46.98 1472.63    58.98 1472.39
  74.98 1464.39       75 1464.39       87 1464.63   102.52 1472.39   110.52 1472.55
 112.17 1472.95   112.36 1472.95   117.91 1472.91   147.56 1472.67      150 1472.66

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   58.98    .016  102.52     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          58.98  102.52            240.63   240.1  248.27             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1473.81    Element                      Left OB    Channel   Right OB
  Vel Head (ft)              4.47    Wt. n-Val.                               0.016
  W.S. Elev (ft)          1469.33    Reach Len. (ft)              240.63     240.10     248.27
  Crit W.S. (ft)          1470.77    Flow Area (sq ft)                       104.57
  E.G. Slope (ft/ft)     0.007351    Area (sq ft)                            104.57
  Q Total (cfs)           1775.00    Flow (cfs)                             1775.00
  Top Width (ft)            31.32    Top Width (ft)                           31.32
  Vel Total (ft/s)          16.97    Avg. Vel. (ft/s)                         16.97
  Max Chl Dpth (ft)          4.94    Hydr. Depth (ft)                          3.34
  Conv. Total (cfs)       20702.6    Conv. (cfs)                            20702.6
  Length Wtd. (ft)         240.10    Wetted Per. (ft)                         33.60
  Min Ch El (ft)          1464.39    Shear (lb/sq ft)                          1.43
  Alpha                      1.00    Stream Power (lb/ft s)                   24.25
  Frctn Loss (ft)            1.04    Cum Volume (acre-ft)          0.00        2.23
  C & E Loss (ft)            0.03    Cum SA (acres)                0.02        0.94

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

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 1612

INPUT
Description:
Station Elevation Data    num=       17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1471.59   51.21 1471.41   62.87  1468.5   62.97 1468.48   63.07 1468.47
   74.97 1468.24   74.99 1460.23  134.99 1460.23     135 1468.23  135.02 1468.23
  144.37 1468.58  145.01 1468.43  145.06 1468.45  148.45 1469.61  149.66  1469.6
  149.79 1469.59     150 1469.59

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.97    .016     135     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          74.97    135              212     212  218.44             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1

  E.G. Elev (ft)          1469.80    Element                      Left OB    Channel   Right OB
  Vel Head (ft)              8.29    Wt. n-Val.                               0.016
  W.S. Elev (ft)          1461.51    Reach Len. (ft)              212.00     212.00     218.44
  Crit W.S. (ft)          1463.23    Flow Area (sq ft)                        76.83
  E.G. Slope (ft/ft)     0.047064    Area (sq ft)                             76.83
  Q Total (cfs)           1775.00    Flow (cfs)                             1775.00
  Top Width (ft)            60.00    Top Width (ft)                           60.00
  Vel Total (ft/s)          23.10    Avg. Vel. (ft/s)                         23.10
  Max Chl Dpth (ft)          1.28    Hydr. Depth (ft)                          1.28
  Conv. Total (cfs)        8181.9    Conv. (cfs)                             8181.9
  Length Wtd. (ft)         212.00    Wetted Per. (ft)                         62.56
  Min Ch El (ft)          1460.23    Shear (lb/sq ft)                          3.61
  Alpha                      1.00    Stream Power (lb/ft s)                   83.36
  Frctn Loss (ft)            3.63    Cum Volume (acre-ft)          0.00        1.73
  C & E Loss (ft)            0.38    Cum SA (acres)                0.02        0.69

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for
         additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than
         0.7 or greater than 1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.
         This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: RM12-U
REACH: E-Chan Upper       RS: 1400.000

INPUT
Description:
Station Elevation Data    num=       23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1468.71    6.6 1468.42    6.84 1468.41    7.25 1468.38   12.61 1469.24
   17.16 1469.67   20.56 1469.66   23.05 1469.66   27.19 1469.66   33.61 1468.94
   37.44 1468.48   38.18 1468.41   48.66 1468.81   49.43 1468.84   49.54 1468.84
    60.4  1468.9   62.97 1468.26   74.97 1468.02      75 1460.02     135 1460.02
  135.01 1468.03  145.01 1468.22     150 1469.47

Manning's n Values        num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .04   74.97    .016  135.01     .04

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          74.97  135.01             200     200  200.64             .1       .3

CROSS SECTION OUTPUT  Profile #PF 1
```

			Left OB	Channel	Right OB
E.G. Elev (ft)	1464.93	Element			
Vel Head (ft)	2.64	Wt. n-Val.		0.016	
W.S. Elev (ft)	1462.29	Reach Len. (ft)	200.00	200.00	200.64
Crit W.S. (ft)	1463.02	Flow Area (sq ft)		136.16	
E.G. Slope (ft/ft)	0.007282	Area (sq ft)		136.16	
Q Total (cfs)	1775.00	Flow (cfs)		1775.00	
Top Width (ft)	60.01	Top Width (ft)		60.01	
Vel Total (ft/s)	13.04	Avg. Vel. (ft/s)		13.04	
Max Chl Dpth (ft)	2.27	Hydr. Depth (ft)		2.27	
Conv. Total (cfs)	20800.4	Conv. (cfs)		20800.4	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		64.54	
Min Ch El (ft)	1460.02	Shear (lb/sq ft)		0.96	
Alpha	1.00	Stream Power (lb/ft s)		12.50	
Frctn Loss (ft)	3.18	Cum Volume (acre-ft)	0.00	1.21	
C & E Loss (ft)	1.69	Cum SA (acres)	0.02	0.40	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 1200.000

INPUT
Description:
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1466.97	.12	1466.96	5.37	1467.13	13.44	1466.72	14.52	1466.59
15.94	1466.47	24.07	1465.87	31.68	1465.23	32.13	1465.19	32.39	1465.18
32.67	1465.15	36.48	1464.83	37.8	1463.99	40.83	1463.19	42.92	1463.23
44.19	1463.44	44.55	1463.42	49.91	1463.71	62.97	1468.06	74.99	1467.82
75	1459.82	135	1459.82	135.01	1467.82	145.01	1468.02	147.12	1468.55
150	1468.58								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	135.01	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	135.01		88	88	88 .1	.3

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
0	74.99	1467.82	F

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1464.48	Element			
Vel Head (ft)	1.04	Wt. n-Val.		0.016	
W.S. Elev (ft)	1463.44	Reach Len. (ft)	88.00	88.00	88.00
Crit W.S. (ft)	1462.83	Flow Area (sq ft)		217.24	
E.G. Slope (ft/ft)	0.001620	Area (sq ft)	0.74	217.24	
Q Total (cfs)	1775.00	Flow (cfs)		1775.00	
Top Width (ft)	65.05	Top Width (ft)	5.04	60.01	
Vel Total (ft/s)	8.17	Avg. Vel. (ft/s)		8.17	
Max Chl Dpth (ft)	3.62	Hydr. Depth (ft)		3.62	
Conv. Total (cfs)	44093.7	Conv. (cfs)		44093.7	
Length Wtd. (ft)	88.00	Wetted Per. (ft)		67.23	
Min Ch El (ft)	1459.82	Shear (lb/sq ft)		0.33	
Alpha	1.00	Stream Power (lb/ft s)		2.67	
Frctn Loss (ft)	0.19	Cum Volume (acre-ft)	0.00	0.40	
C & E Loss (ft)	0.05	Cum SA (acres)	0.01	0.12	

Warning: Divided flow computed for this cross-section.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
Note: Hydraulic jump has occurred between this cross section and the previous upstream section.

CROSS SECTION

RIVER: RM12-U
REACH: E-Chan Upper RS: 1112.000

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1468.26	3.03	1468.1	11.13	1467.54	17.05	1467.48	37.58	1467.32
53.35	1467.19	55.37	1467.2	60.63	1467.19	62.97	1467.97	74.99	1467.73
75	1459.73	135	1459.73	135.01	1467.73	145.01	1467.93	150.01	1466.28

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.04	74.99	.016	135.01	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
74.99	135.01		0	0	0 .1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1464.24	Element			
Vel Head (ft)	1.51	Wt. n-Val.		0.016	
W.S. Elev (ft)	1462.73	Reach Len. (ft)			
Crit W.S. (ft)	1462.73	Flow Area (sq ft)		180.03	
E.G. Slope (ft/ft)	0.002958	Area (sq ft)		180.03	
Q Total (cfs)	1775.00	Flow (cfs)		1775.00	
Top Width (ft)	60.01	Top Width (ft)		60.01	
Vel Total (ft/s)	9.86	Avg. Vel. (ft/s)		9.86	

Max Chl Dpth (ft)	3.00	Hydr. Depth (ft)	3.00
Conv. Total (cfs)	32637.4	Conv. (cfs)	32637.4
Length Wtd. (ft)		Wetted Per. (ft)	66.00
Min Ch El (ft)	1459.73	Shear (lb/sq ft)	0.50
Alpha	1.00	Stream Power (lb/ft s)	4.97
Frctn Loss (ft)		Cum Volume (acre-ft)	
C & E Loss (ft)		Cum SA (acres)	

SUMMARY OF MANNING'S N VALUES

River:RM12-U

Reach	River Sta.	n1	n2	n3
E-Chan Upper	11200.00	.04	.016	.04
E-Chan Upper	11027.19	.04	.016	.04
E-Chan Upper	10997.00	.04	.016	.04
E-Chan Upper	10996	Culvert		
E-Chan Upper	10790.00	.04	.016	.04
E-Chan Upper	10754.00	.04	.016	.04
E-Chan Upper	10600.00	.04	.016	.04
E-Chan Upper	10400.00	.04	.016	.04
E-Chan Upper	10200.00	.04	.016	.04
E-Chan Upper	10000.00	.04	.016	.04
E-Chan Upper	9900.000	.04	.016	.04
E-Chan Upper	9870.000	.04	.016	.04
E-Chan Upper	9800.000	.04	.016	.04
E-Chan Upper	9600.000	.04	.016	.04
E-Chan Upper	9530.000	.04	.016	.04
E-Chan Upper	9500.000	.04	.016	.04
E-Chan Upper	9400.000	.04	.016	.04
E-Chan Upper	9200.000	.04	.016	.04
E-Chan Upper	9110.000	.04	.016	.04
E-Chan Upper	9080.000	.04	.016	.04
E-Chan Upper	9000.000	.04	.016	.04
E-Chan Upper	8800.000	.04	.016	.04
E-Chan Upper	8600.000	.04	.016	.04
E-Chan Upper	8454.300	.04	.016	.04
E-Chan Upper	8400	.04	.016	.04
E-Chan Upper	8399	Culvert		
E-Chan Upper	8160.000	.04	.016	.04
E-Chan Upper	8124.000	.04	.016	.04
E-Chan Upper	8000.000	.04	.016	.04
E-Chan Upper	7800.000	.04	.016	.04
E-Chan Upper	7600.000	.04	.016	.04
E-Chan Upper	7400.000	.04	.016	.04
E-Chan Upper	7200.000	.04	.016	.04
E-Chan Upper	7000.000	.04	.016	.04
E-Chan Upper	6800.000	.04	.016	.04
E-Chan Upper	6634.400	.04	.016	.04
E-Chan Upper	6596.400	.04	.016	.04
E-Chan Upper	6572.800	.04	.016	.04
E-Chan Upper	6511.500	.04	.016	.04
E-Chan Upper	6400.000	.04	.016	.04
E-Chan Upper	6200.000	.04	.016	.04
E-Chan Upper	6000.000	.04	.016	.04
E-Chan Upper	5800.000	.04	.016	.04
E-Chan Upper	5640	.04	.016	.04
E-Chan Upper	5462.650	.04	.016	.04
E-Chan Upper	5411.890	.04	.016	.04
E-Chan Upper	5410.8	Culvert		
E-Chan Upper	5191.77	.04	.016	.04
E-Chan Upper	5171.826	.04	.016	.04
E-Chan Upper	5000.08	.04	.016	.04
E-Chan Upper	4800.000	.04	.016	.04
E-Chan Upper	4600.000	.04	.016	.04
E-Chan Upper	4400.000	.04	.016	.04
E-Chan Upper	4200.000	.04	.016	.04
E-Chan Upper	4000.000	.04	.016	.04
E-Chan Upper	3900.00	.04	.016	.04
E-Chan Upper	3800.000	.04	.016	.04
E-Chan Upper	3600.000	.04	.016	.04
E-Chan Upper	3400.000	.04	.016	.04
E-Chan Upper	3200.000	.04	.016	.04
E-Chan Upper	3000.000	.04	.016	.04
E-Chan Upper	2847.56	.04	.016	.04
E-Chan Upper	2700.300	.04	.016	.04
E-Chan Upper	2699.3	Culvert		
E-Chan Upper	2570.33	.04	.016	.04
E-Chan Upper	2421.880	.04	.016	.04
E-Chan Upper	2200.000	.04	.016	.04
E-Chan Upper	2000.000	.04	.016	.04
E-Chan Upper	1853.2	.04	.016	.04
E-Chan Upper	1612	.04	.016	.04
E-Chan Upper	1400.000	.04	.016	.04
E-Chan Upper	1200.000	.04	.016	.04
E-Chan Upper	1112.000	.04	.016	.04

SUMMARY OF REACH LENGTHS

River: RM12-U

Reach	River Sta.	Left	Channel	Right
E-Chan Upper	11200.00	173.52	172.9	172.9
E-Chan Upper	11027.19	30.87	30.1	30.57
E-Chan Upper	10997.00	218.2	207.01	207.01
E-Chan Upper	10996	Culvert		
E-Chan Upper	10790.00	48.67	36	37.01
E-Chan Upper	10754.00	154.62	154	154

E-Chan Upper	10600.00	200	200	200
E-Chan Upper	10400.00	200	200	200
E-Chan Upper	10200.00	200	200	200
E-Chan Upper	10000.00	100.74	100	98.55
E-Chan Upper	9900.000	30.15	30	29.9
E-Chan Upper	9870.000	69.93	70	70.17
E-Chan Upper	9800.000	199.52	200	201.09
E-Chan Upper	9600.000	70	70	70
E-Chan Upper	9530.000	30.04	30	30
E-Chan Upper	9500.000	100	100	100
E-Chan Upper	9400.000	200	200	200
E-Chan Upper	9200.000	90.41	90	89.25
E-Chan Upper	9110.000	30.1	30	29.88
E-Chan Upper	9080.000	80	80	80
E-Chan Upper	9000.000	200.23	200	199.56
E-Chan Upper	8800.000	202.14	200	195.79
E-Chan Upper	8600.000	146.32	145.7	145.7
E-Chan Upper	8454.300	65.17	54.6	55.14
E-Chan Upper	8400	240.01	240.01	240.01
E-Chan Upper	8399	Culvert		
E-Chan Upper	8160.000	48.33	36.4	38.24
E-Chan Upper	8124.000	125.94	124	122.43
E-Chan Upper	8000.000	202.82	200	196.16
E-Chan Upper	7800.000	200	200	200
E-Chan Upper	7600.000	200	200	200
E-Chan Upper	7400.000	200	200	200
E-Chan Upper	7200.000	200	200	200
E-Chan Upper	7000.000	197.8	200	203.59
E-Chan Upper	6800.000	165.6	165.6	165.6
E-Chan Upper	6634.400	36.05	38	36.13
E-Chan Upper	6596.400	23.6	23.6	23.65
E-Chan Upper	6572.800	60.11	61.3	60.13
E-Chan Upper	6511.500	110.82	111.5	112.72
E-Chan Upper	6400.000	197.5	200	204.48
E-Chan Upper	6200.000	200	200	200
E-Chan Upper	6000.000	197.67	200	204.18
E-Chan Upper	5800.000	160	160	160
E-Chan Upper	5640	177.35	177.35	177.35
E-Chan Upper	5462.650	60.92	50.85	53.63
E-Chan Upper	5411.890	223.51	223.51	223.51
E-Chan Upper	5410.8	Culvert		
E-Chan Upper	5191.77	22.95	19.48	8.74
E-Chan Upper	5171.826	181.34	170.53	169.96
E-Chan Upper	5000.08	200.3	200.3	200.3
E-Chan Upper	4800.000	200	200	200
E-Chan Upper	4600.000	200	200	200
E-Chan Upper	4400.000	200	200	200
E-Chan Upper	4200.000	202.44	200	195.8
E-Chan Upper	4000.000	100.33	100	100.43
E-Chan Upper	3900.00	100	100	100
E-Chan Upper	3800.000	200	200	200
E-Chan Upper	3600.000	198.18	200	203.12
E-Chan Upper	3400.000	198.81	200	202.03
E-Chan Upper	3200.000	202.37	200	196.93
E-Chan Upper	3000.000	157.03	152.44	147.52
E-Chan Upper	2847.56	156.41	147.3	151.34
E-Chan Upper	2700.300	130.01	130.01	134.12
E-Chan Upper	2699.3	Culvert		
E-Chan Upper	2570.33	158.38	148.45	148.38
E-Chan Upper	2421.880	226.79	221.8	216.62
E-Chan Upper	2200.000	200	200	200
E-Chan Upper	2000.000	145.4	146.8	149.2
E-Chan Upper	1853.2	240.63	240.1	248.27
E-Chan Upper	1612	212	212	218.44
E-Chan Upper	1400.000	200	200	200.64
E-Chan Upper	1200.000	88	88	88
E-Chan Upper	1112.000	0	0	0

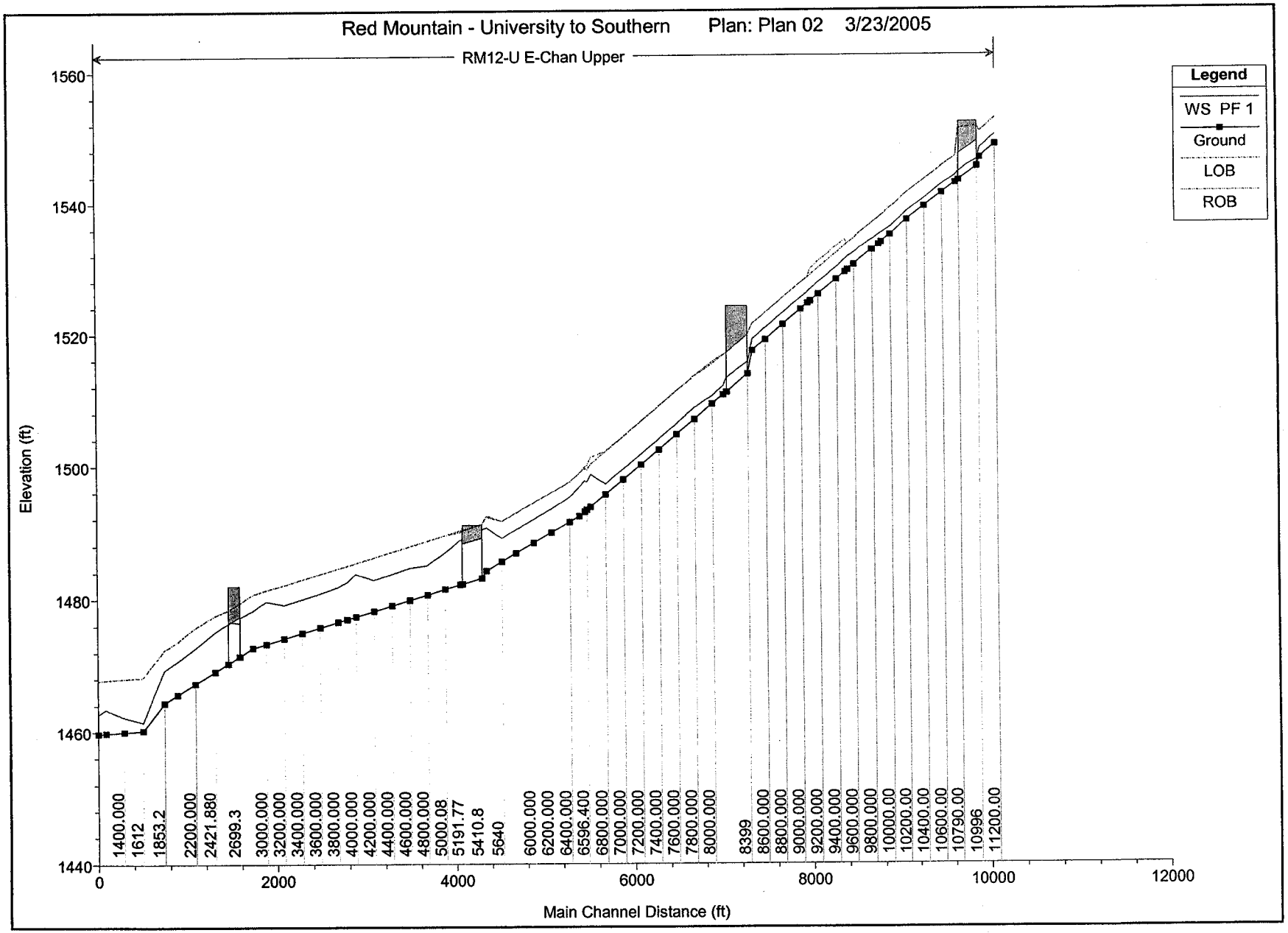
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RM12-U

Reach	River Sta.	Contr.	Expan.
E-Chan Upper	11200.00	.1	.3
E-Chan Upper	11027.19	.1	.3
E-Chan Upper	10997.00	.3	.5
E-Chan Upper	10996	Culvert	
E-Chan Upper	10790.00	.3	.5
E-Chan Upper	10754.00	.3	.5
E-Chan Upper	10600.00	.1	.3
E-Chan Upper	10400.00	.1	.3
E-Chan Upper	10200.00	.1	.3
E-Chan Upper	10000.00	.1	.3
E-Chan Upper	9900.000	.1	.3
E-Chan Upper	9870.000	.1	.3
E-Chan Upper	9800.000	.1	.3
E-Chan Upper	9600.000	.1	.3
E-Chan Upper	9530.000	.1	.3
E-Chan Upper	9500.000	.1	.3
E-Chan Upper	9400.000	.1	.3
E-Chan Upper	9200.000	.1	.3
E-Chan Upper	9110.000	.1	.3
E-Chan Upper	9080.000	.1	.3
E-Chan Upper	9000.000	.1	.3
E-Chan Upper	8800.000	.1	.3
E-Chan Upper	8600.000	.1	.3
E-Chan Upper	8454.300	.1	.3
E-Chan Upper	8400	.3	.5
E-Chan Upper	8399	Culvert	
E-Chan Upper	8160.000	.3	.5
E-Chan Upper	8124.000	.3	.5
E-Chan Upper	8000.000	.1	.3

E-Chan Upper	7800.000		.1	.3
E-Chan Upper	7600.000		.1	.3
E-Chan Upper	7400.000		.1	.3
E-Chan Upper	7200.000		.1	.3
E-Chan Upper	7000.000		.1	.3
E-Chan Upper	6800.000		.1	.3
E-Chan Upper	6634.400		.1	.3
E-Chan Upper	6596.400		.1	.3
E-Chan Upper	6572.800		.1	.3
E-Chan Upper	6511.500		.1	.3
E-Chan Upper	6400.000		.1	.3
E-Chan Upper	6200.000		.1	.3
E-Chan Upper	6000.000		.1	.3
E-Chan Upper	5800.000		.1	.3
E-Chan Upper	5640		.1	.3
E-Chan Upper	5462.650		.1	.3
E-Chan Upper	5411.890		.3	.5
E-Chan Upper	5410.8	Culvert		
E-Chan Upper	5191.77		.3	.5
E-Chan Upper	5171.826		.3	.5
E-Chan Upper	5000.08		.1	.3
E-Chan Upper	4800.000		.1	.3
E-Chan Upper	4600.000		.1	.3
E-Chan Upper	4400.000		.1	.3
E-Chan Upper	4200.000		.1	.3
E-Chan Upper	4000.000		.1	.3
E-Chan Upper	3900.00		.1	.3
E-Chan Upper	3800.000		.1	.3
E-Chan Upper	3600.000		.1	.3
E-Chan Upper	3400.000		.1	.3
E-Chan Upper	3200.000		.1	.3
E-Chan Upper	3000.000		.1	.3
E-Chan Upper	2847.56		.3	.5
E-Chan Upper	2700.300		.3	.3
E-Chan Upper	2699.3	Culvert		
E-Chan Upper	2570.33		.1	.3
E-Chan Upper	2421.880		.1	.3
E-Chan Upper	2200.000		.1	.3
E-Chan Upper	2000.000		.1	.3
E-Chan Upper	1853.2		.1	.3
E-Chan Upper	1612		.1	.3
E-Chan Upper	1400.000		.1	.3
E-Chan Upper	1200.000		.1	.3
E-Chan Upper	1112.000		.1	.3

HEC-RAS Plan: Plan 02 River: RM12-U Reach: E-Chan Upper 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)	
E-Chan Upper	1112.000	PF 1	1775.00	1459.73	1462.73	1462.73	1464.24	0.002958	9.86	180.03	60.01	1.00
E-Chan Upper	1200.000	PF 1	1775.00	1459.82	1463.44	1462.83	1464.48	0.001620	8.17	217.24	65.05	0.76
E-Chan Upper	1400.000	PF 1	1775.00	1460.02	1462.29	1463.02	1464.93	0.007282	13.04	136.16	60.01	1.53
E-Chan Upper	1612	PF 1	1775.00	1460.23	1461.51	1463.23	1469.80	0.047064	23.10	76.83	60.00	3.60
E-Chan Upper	1853.2	PF 1	1775.00	1464.39	1469.33	1470.77	1473.81	0.007351	16.97	104.57	31.32	1.64
E-Chan Upper	2000.000	PF 1	1775.00	1465.61	1470.66	1471.99	1474.87	0.006772	16.47	107.75	31.72	1.58
E-Chan Upper	2200.000	PF 1	1775.00	1467.27	1472.66	1473.65	1476.12	0.005181	14.94	118.82	33.08	1.39
E-Chan Upper	2421.880	PF 1	1575.00	1469.11	1475.11	1475.11	1477.08	0.002619	11.27	139.80	35.53	1.00
E-Chan Upper	2570.33	PF 1	1575.00	1470.33	1476.37		1477.42	0.001094	8.22	191.70	31.77	0.59
E-Chan Upper	2699.3		Culvert									
E-Chan Upper	2700.300	PF 1	1375.00	1471.42	1477.27	1475.28	1478.12	0.000917	7.41	185.65	31.76	0.54
E-Chan Upper	2847.56	PF 1	1375.00	1472.70	1478.28	1478.28	1480.15	0.002703	10.99	125.07	33.83	1.01
E-Chan Upper	3000.000	PF 1	1375.00	1473.32	1479.65	1478.15	1480.48	0.000938	7.32	187.84	42.57	0.61
E-Chan Upper	3200.000	PF 1	1375.00	1474.13	1479.19	1479.71	1481.70	0.004029	12.72	108.09	31.77	1.22
E-Chan Upper	3400.000	PF 1	1375.00	1474.94	1480.01	1480.52	1482.50	0.003999	12.69	108.39	31.80	1.21
E-Chan Upper	3600.000	PF 1	1375.00	1475.75	1480.85	1481.35	1483.30	0.003895	12.57	109.43	31.93	1.20
E-Chan Upper	3800.000	PF 1	1375.00	1476.56	1481.79	1482.16	1484.06	0.003503	12.09	113.75	36.25	1.14
E-Chan Upper	3900.00	PF 1	1375.00	1476.96	1482.55	1482.55	1484.41	0.002668	10.94	125.68	33.91	1.00
E-Chan Upper	4000.000	PF 1	1187.00	1477.37	1483.75	1482.55	1484.68	0.001152	7.73	153.59	37.05	0.67
E-Chan Upper	4200.000	PF 1	1187.00	1478.18	1482.88	1483.36	1485.21	0.004055	12.25	96.87	30.32	1.21
E-Chan Upper	4400.000	PF 1	1187.00	1478.99	1483.71	1484.17	1486.00	0.003956	12.14	97.75	30.43	1.19
E-Chan Upper	4600.000	PF 1	1187.00	1479.80	1484.65	1484.98	1486.77	0.003568	11.70	101.50	30.92	1.14
E-Chan Upper	4800.000	PF 1	1187.00	1480.61	1485.02	1485.79	1487.82	0.005220	13.43	88.37	29.18	1.36
E-Chan Upper	5000.08	PF 1	1187.00	1481.43	1486.89	1486.89	1488.66	0.002719	10.67	111.22	31.46	1.00
E-Chan Upper	5171.826	PF 1	1187.00	1482.12	1488.72		1489.20	0.000441	5.59	212.35	35.89	0.40
E-Chan Upper	5191.77	PF 1	1187.00	1482.20	1488.77		1489.22	0.000426	5.39	220.12	33.52	0.37
E-Chan Upper	5410.8		Culvert									
E-Chan Upper	5411.890	PF 1	792.00	1483.09	1490.34	1487.20	1491.00	0.000805	6.52	121.56	16.77	0.43
E-Chan Upper	5462.650	PF 1	792.00	1484.17	1490.58	1488.61	1491.06	0.000617	5.55	142.68	35.23	0.49
E-Chan Upper	5640	PF 1	792.00	1485.53	1489.02	1489.97	1492.03	0.007598	13.94	56.82	23.55	1.58
E-Chan Upper	5800.000	PF 1	792.00	1486.76	1490.25	1491.18	1493.26	0.007580	13.93	56.87	23.56	1.58
E-Chan Upper	6000.000	PF 1	792.00	1488.29	1491.79	1492.71	1494.77	0.007454	13.84	57.22	23.62	1.57
E-Chan Upper	6200.000	PF 1	792.00	1489.82	1493.36	1494.24	1496.24	0.007129	13.62	58.15	23.78	1.53
E-Chan Upper	6400.000	PF 1	792.00	1491.35	1495.06	1495.77	1497.58	0.005948	12.75	62.10	24.43	1.41
E-Chan Upper	6511.500	PF 1	792.00	1492.21	1496.63	1496.63	1498.13	0.002908	9.83	80.61	27.29	1.01
E-Chan Upper	6572.800	PF 1	792.00	1492.90	1497.60		1498.32	0.001127	6.80	116.43	30.50	0.61
E-Chan Upper	6596.400	PF 1	792.00	1493.17	1497.37		1498.46	0.001975	8.38	94.57	27.62	0.80
E-Chan Upper	6634.400	PF 1	213.00	1493.60	1498.51	1495.79	1498.59	0.000145	2.33	91.37	27.96	0.23
E-Chan Upper	6800.000	PF 1	213.00	1495.48	1497.08	1497.66	1498.94	0.011334	10.95	19.45	15.98	1.75
E-Chan Upper	7000.000	PF 1	213.00	1497.74	1499.34	1499.92	1501.20	0.011349	10.95	19.44	15.98	1.75
E-Chan Upper	7200.000	PF 1	213.00	1500.01	1501.61	1502.19	1503.46	0.011290	10.93	19.48	15.99	1.75
E-Chan Upper	7400.000	PF 1	213.00	1502.27	1503.88	1504.45	1505.71	0.011064	10.86	19.62	16.02	1.73
E-Chan Upper	7600.000	PF 1	213.00	1504.54	1506.11	1506.72	1508.05	0.012017	11.17	19.06	15.89	1.80
E-Chan Upper	7800.000	PF 1	213.00	1506.80	1508.58	1508.98	1509.98	0.007510	9.49	22.43	16.71	1.44
E-Chan Upper	8000.000	PF 1	213.00	1509.12	1510.31	1510.84	1512.04	0.013440	10.55	20.18	20.27	1.86
E-Chan Upper	8124.000	PF 1	213.00	1510.47	1511.81	1512.65	1514.72	0.021732	13.69	15.56	14.98	2.37
E-Chan Upper	8160.000	PF 1	213.00	1510.88	1513.01	1513.67	1515.44	0.011684	12.50	17.03	8.01	2.44
E-Chan Upper	8399		Culvert									
E-Chan Upper	8400	PF 1	213.00	1513.60	1515.15	1516.40	1519.74	0.029613	17.20	12.38	8.01	2.44
E-Chan Upper	8454.300	PF 1	213.00	1517.22	1518.96	1519.59	1520.95	0.011382	11.31	18.83	14.65	1.76
E-Chan Upper	8600.000	PF 1	213.00	1518.88	1520.62	1521.24	1522.60	0.011353	11.30	18.85	14.66	1.76
E-Chan Upper	8800.000	PF 1	213.00	1521.15	1522.89	1523.51	1524.87	0.011336	11.29	18.86	14.66	1.75
E-Chan Upper	9000.000	PF 1	213.00	1523.43	1525.16	1525.80	1527.17	0.011584	11.38	18.72	14.63	1.77
E-Chan Upper	9080.000	PF 1	213.00	1524.34	1526.01	1526.71	1528.23	0.013288	11.94	17.83	14.38	1.89
E-Chan Upper	9110.000	PF 1	213.00	1524.68	1526.48	1527.14	1528.60	0.011370	11.69	18.22	13.16	1.75
E-Chan Upper	9200.000	PF 1	213.00	1525.70	1527.50	1528.16	1529.63	0.011411	11.70	18.20	13.16	1.75
E-Chan Upper	9400.000	PF 1	213.00	1527.98	1529.82	1530.45	1531.84	0.010607	11.41	18.67	13.26	1.69
E-Chan Upper	9500.000	PF 1	213.00	1529.11	1531.03	1531.57	1532.83	0.009021	10.78	19.76	14.95	1.57
E-Chan Upper	9530.000	PF 1	213.00	1529.46	1531.44	1531.92	1533.10	0.008025	10.34	20.59	13.70	1.49
E-Chan Upper	9600.000	PF 1	190.00	1530.25	1532.10	1532.56	1533.67	0.008185	10.07	18.88	13.32	1.49
E-Chan Upper	9800.000	PF 1	135.00	1532.53	1534.07	1534.43	1535.34	0.008176	9.06	14.90	12.40	1.46
E-Chan Upper	9870.000	PF 1	120.00	1533.32	1534.80	1535.10	1535.91	0.007367	8.43	14.23	12.23	1.38
E-Chan Upper	9900.000	PF 1	115.00	1533.66	1535.01	1535.34	1536.15	0.008787	8.58	13.40	13.10	1.49
E-Chan Upper	10000.00	PF 1	96.00	1534.80	1535.93	1536.32	1537.20	0.012135	9.06	10.59	12.21	1.71
E-Chan Upper	10200.00	PF 1	96.00	1537.08	1538.28	1538.60	1539.36	0.009452	8.32	11.54	12.51	1.53
E-Chan Upper	10400.00	PF 1	96.00	1539.09	1540.25	1540.61	1541.44	0.011003	8.76	10.95	12.33	1.64
E-Chan Upper	10600.00	PF 1	96.00	1541.11	1542.36	1542.63	1543.33	0.008049	7.87	12.20	12.73	1.42
E-Chan Upper	10754.00	PF 1	96.00	1542.66	1543.74	1544.18	1545.17	0.014235	9.58	10.03	12.01	1.85
E-Chan Upper	10790.00	PF 1	96.00	1543.02	1544.33	1544.66	1545.63	0.009927	9.17	10.47	8.00	2.47
E-Chan Upper	10996		Culvert									
E-Chan Upper	10997.00	PF 1	96.00	1545.10	1546.00	1546.74	1548.76	0.031011	13.32	7.21	8.00	2.47
E-Chan Upper	11027.19	PF 1	96.00	1546.47	1547.94	1548.41	1549.44	0.012130	9.83	9.77	9.70	1.73
E-Chan Upper	11200.00	PF 1	96.00	1548.57	1550.03	1550.51	1551.53	0.012103	9.81	9.78	9.72	1.72


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RM12-U E-Chan Upper
Legend
WS PF 1
Ground
LOB
ROB
Elevation (ft)
1560
1540
1520
1500
1480
1460
1440
0
2000
4000
6000
8000
10000
12000
Main Channel Distance (ft)
1400.000
1612
1853.2
2200.000
2421.880
2699.3
3000.000
3200.000
3400.000
3600.000
3800.000
4000.000
4200.000
4400.000
4600.000
4800.000
5000.08
5191.77
5410.8
5640
6000.000
6200.000
6400.000
6596.400
6800.000
7000.000
7200.000
7400.000
7600.000
7800.000
8000.000
8399
8600.000
8800.000
9000.000
9200.000
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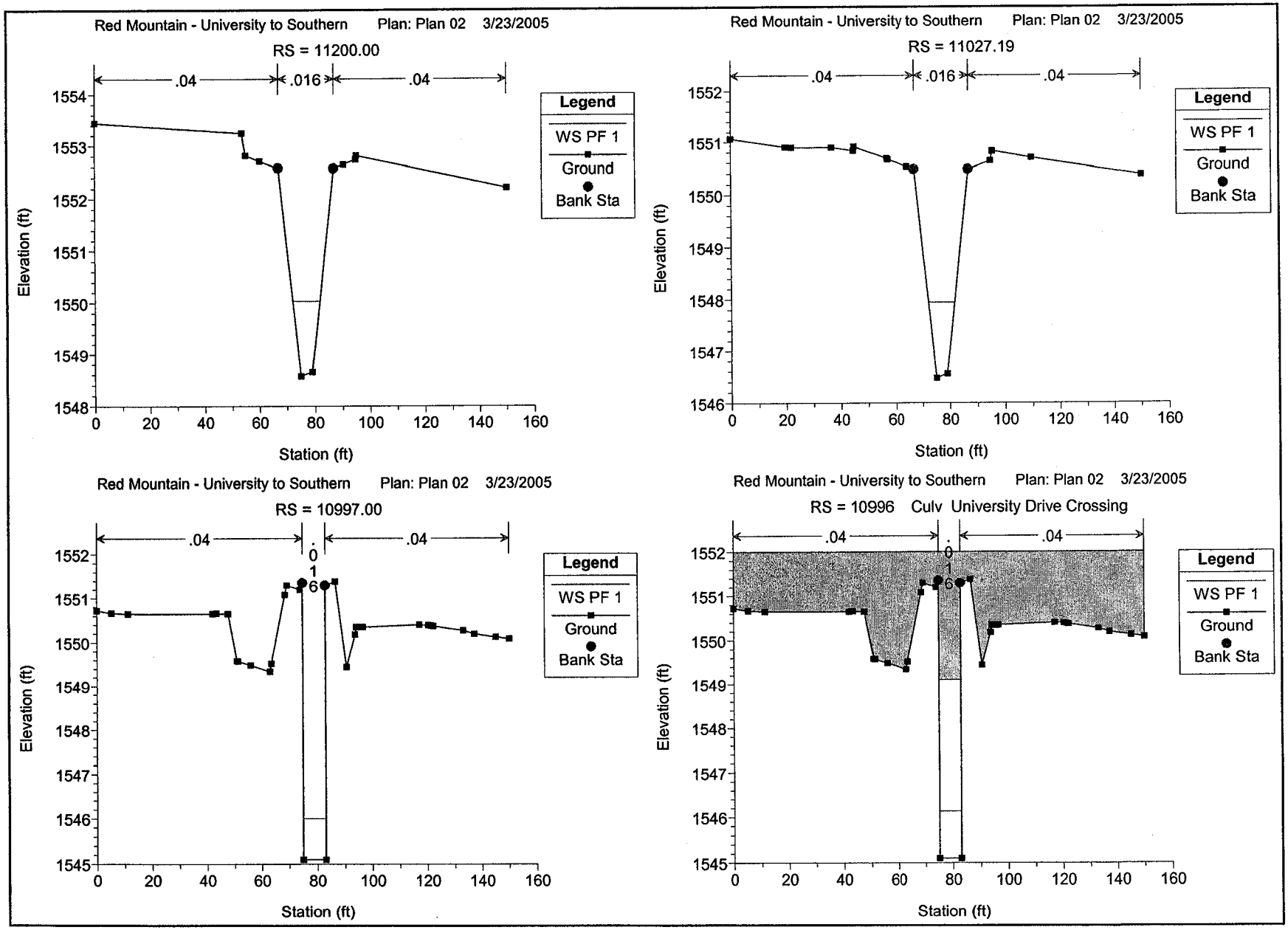
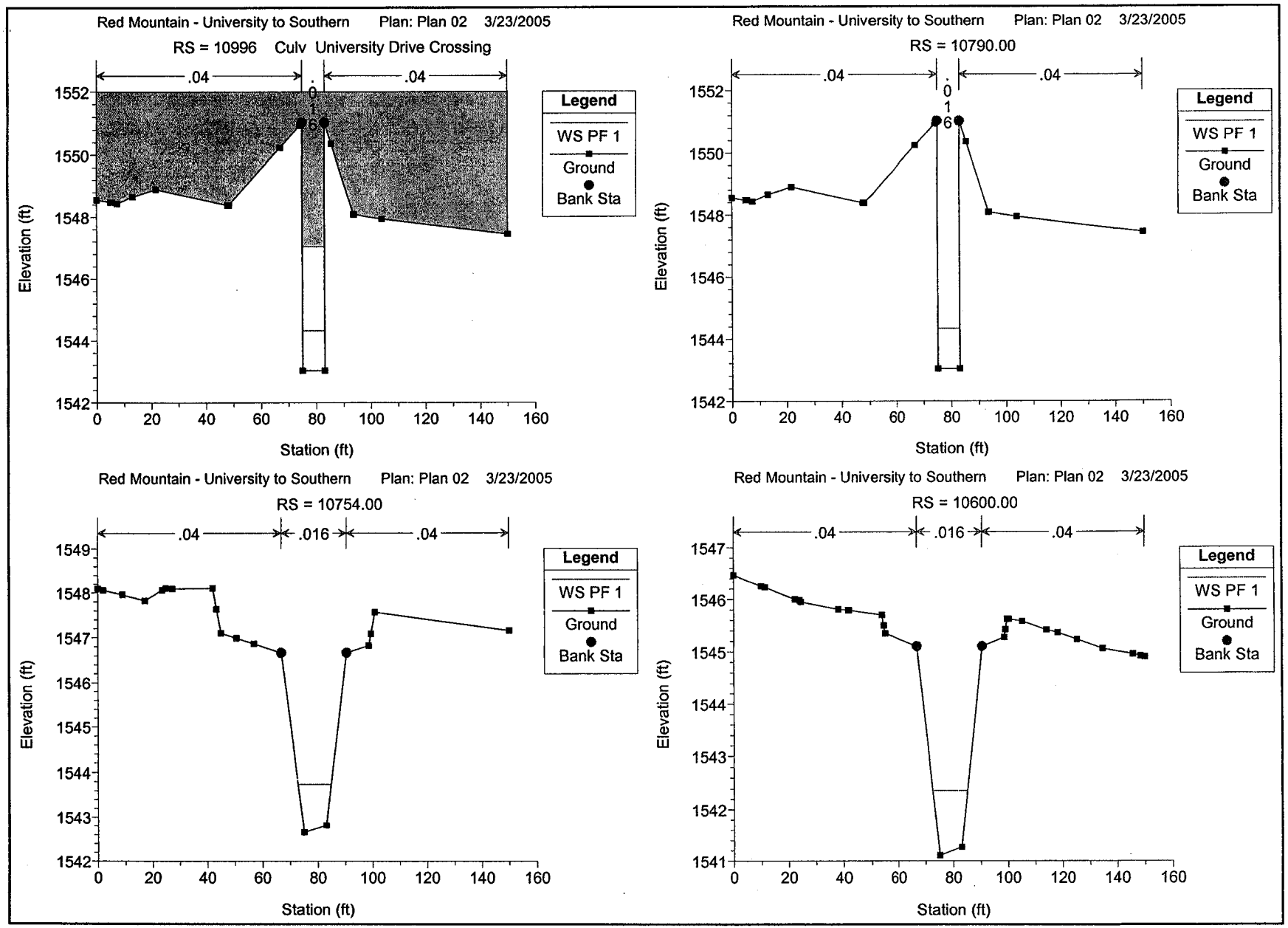
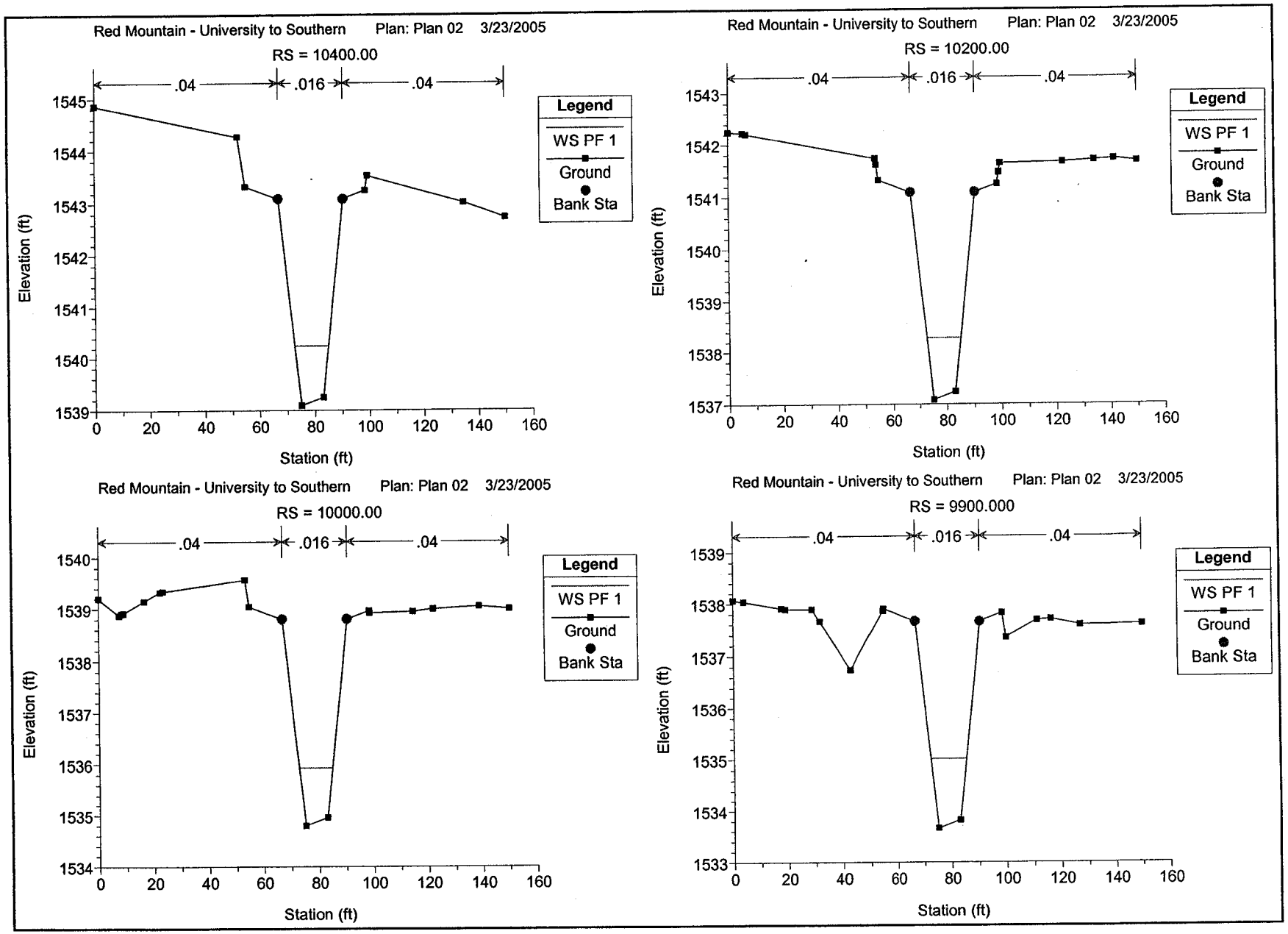
10790.00
10996
11200.00


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 11200.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 11027.19
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10997.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10996 Culv University Drive Crossing
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10996 Culv University Drive Crossing
.04
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10790.00
.04
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10754.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10600.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10400.00
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Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10200.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 10000.00
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.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 9900.000
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Legend
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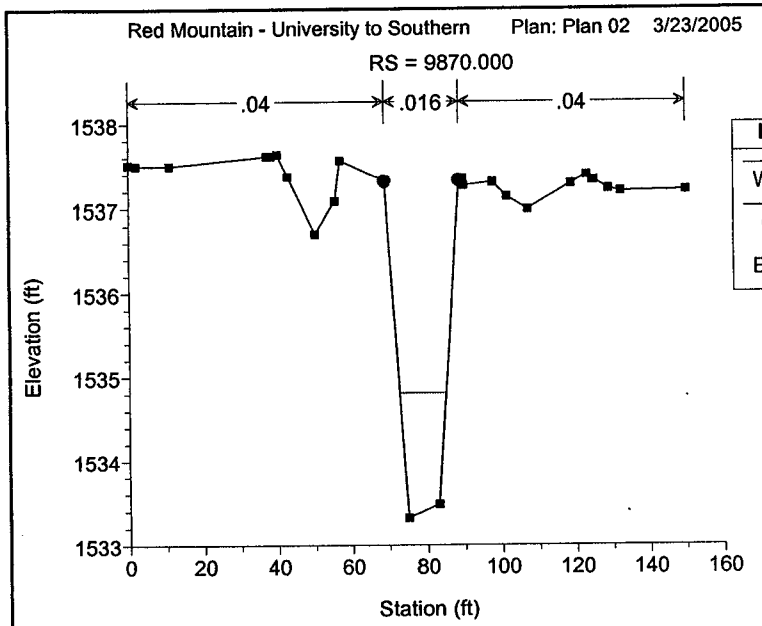
Bank Sta
Elevation (ft)
Station (ft)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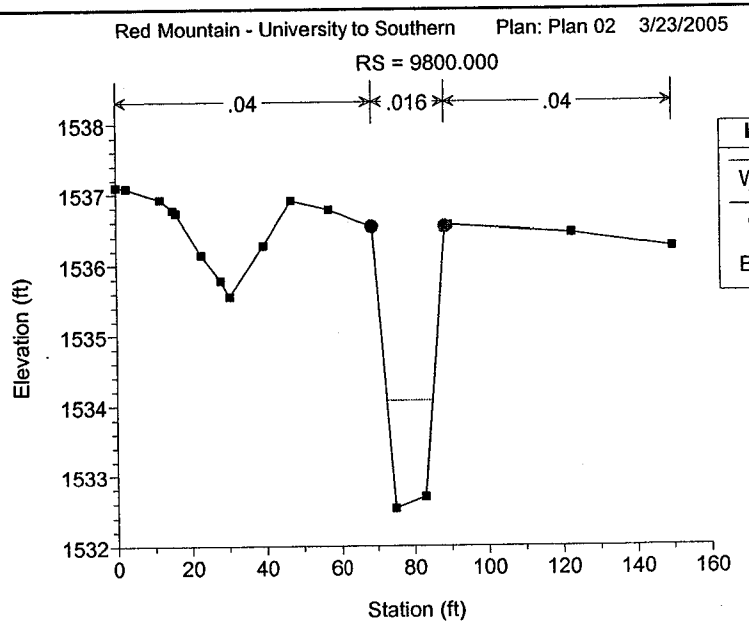
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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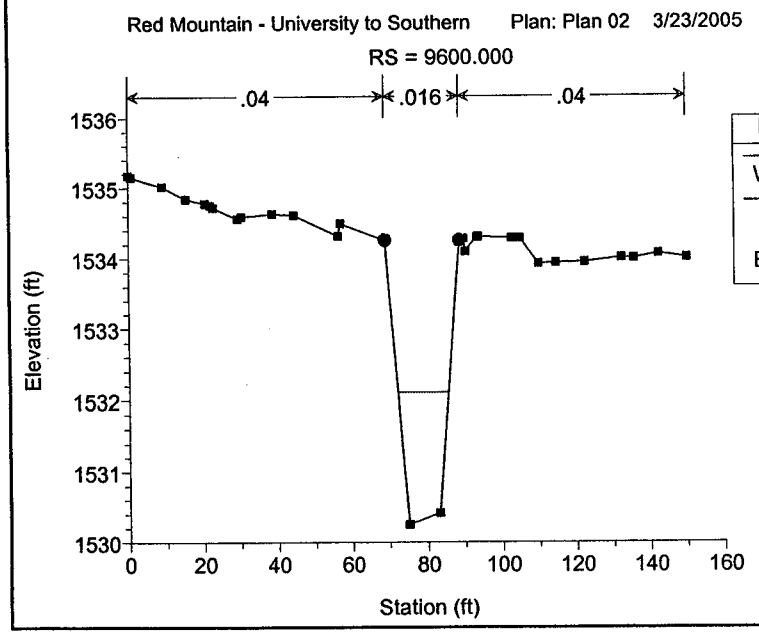
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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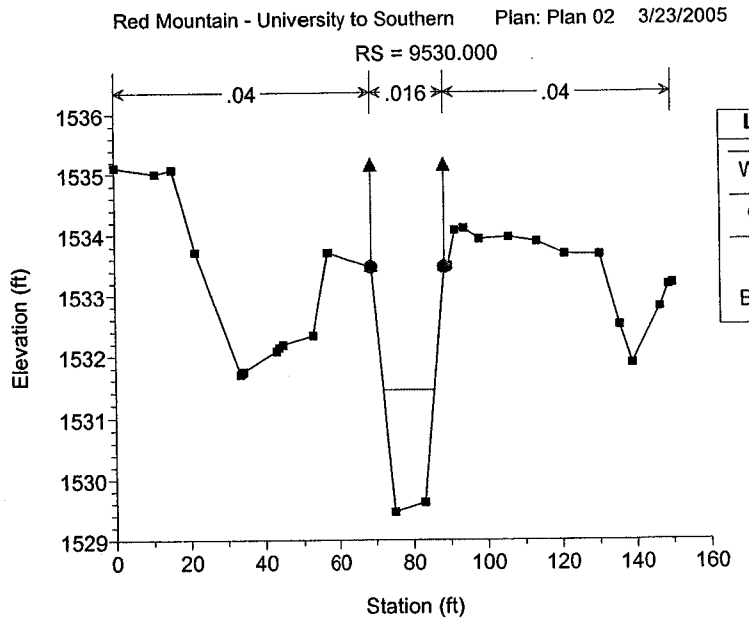
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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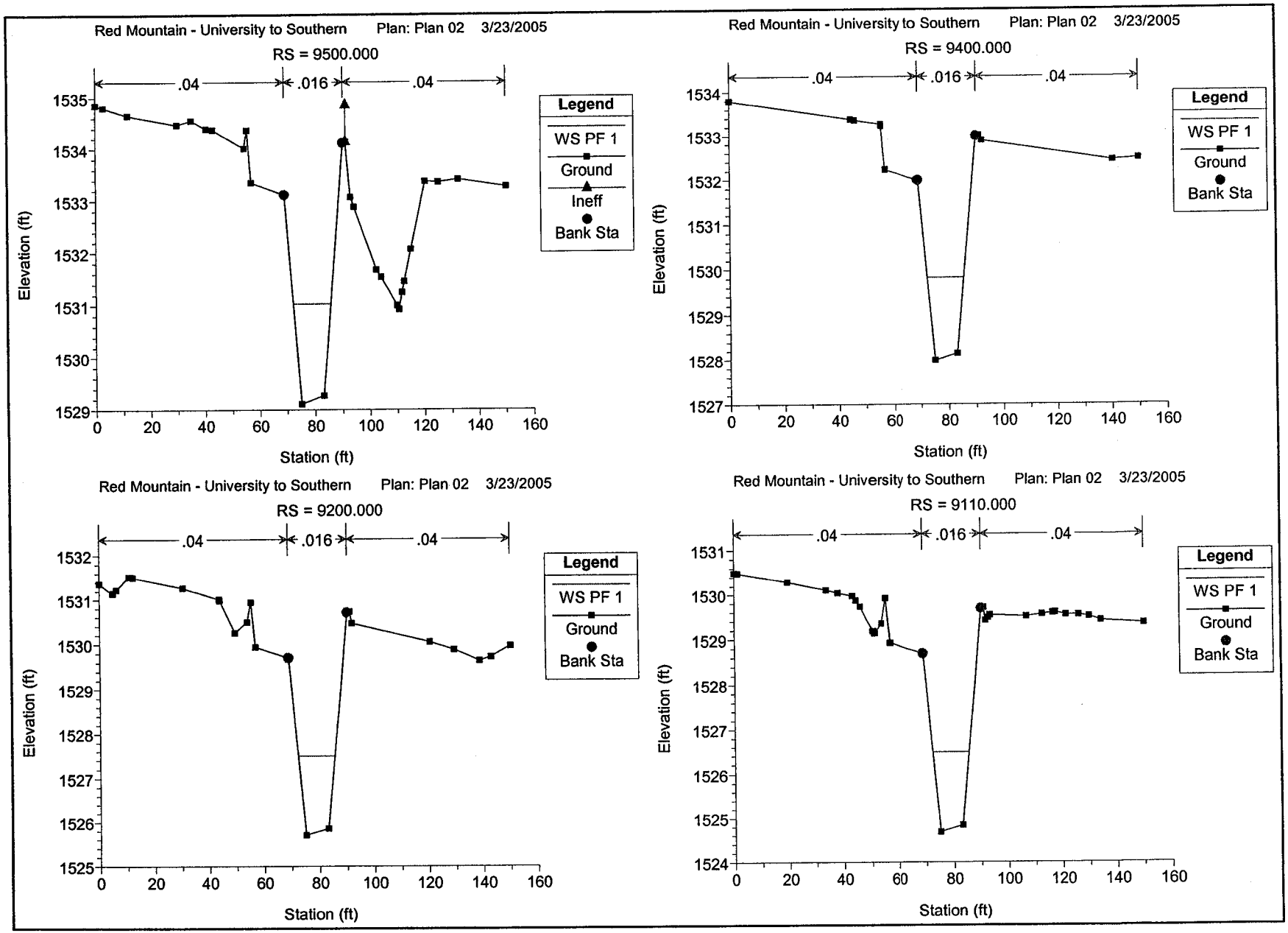
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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.016
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Legend
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 9400.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 9200.000
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.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 9110.000
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Legend
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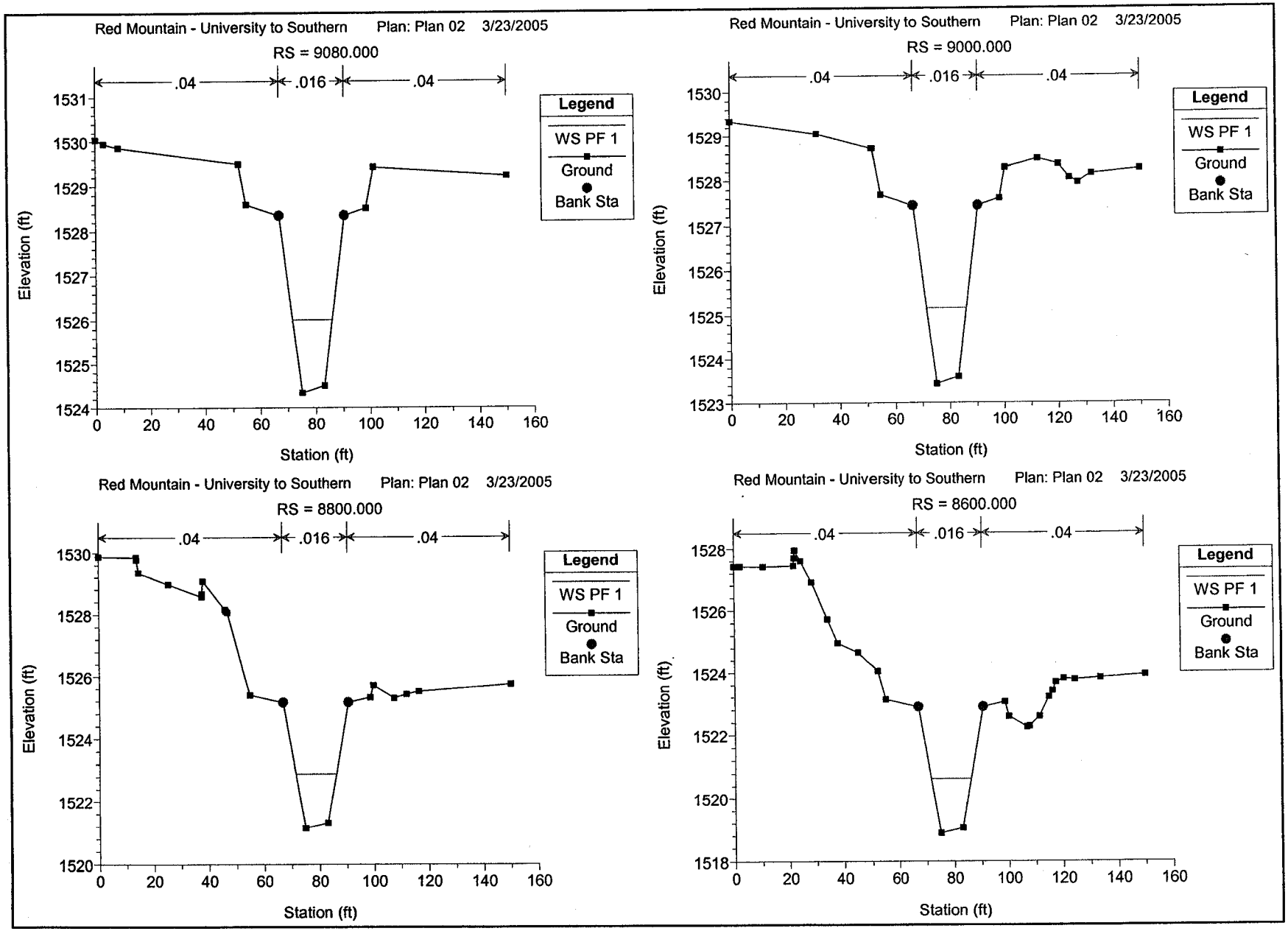
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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Legend
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Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 9000.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8800.000
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.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8600.000
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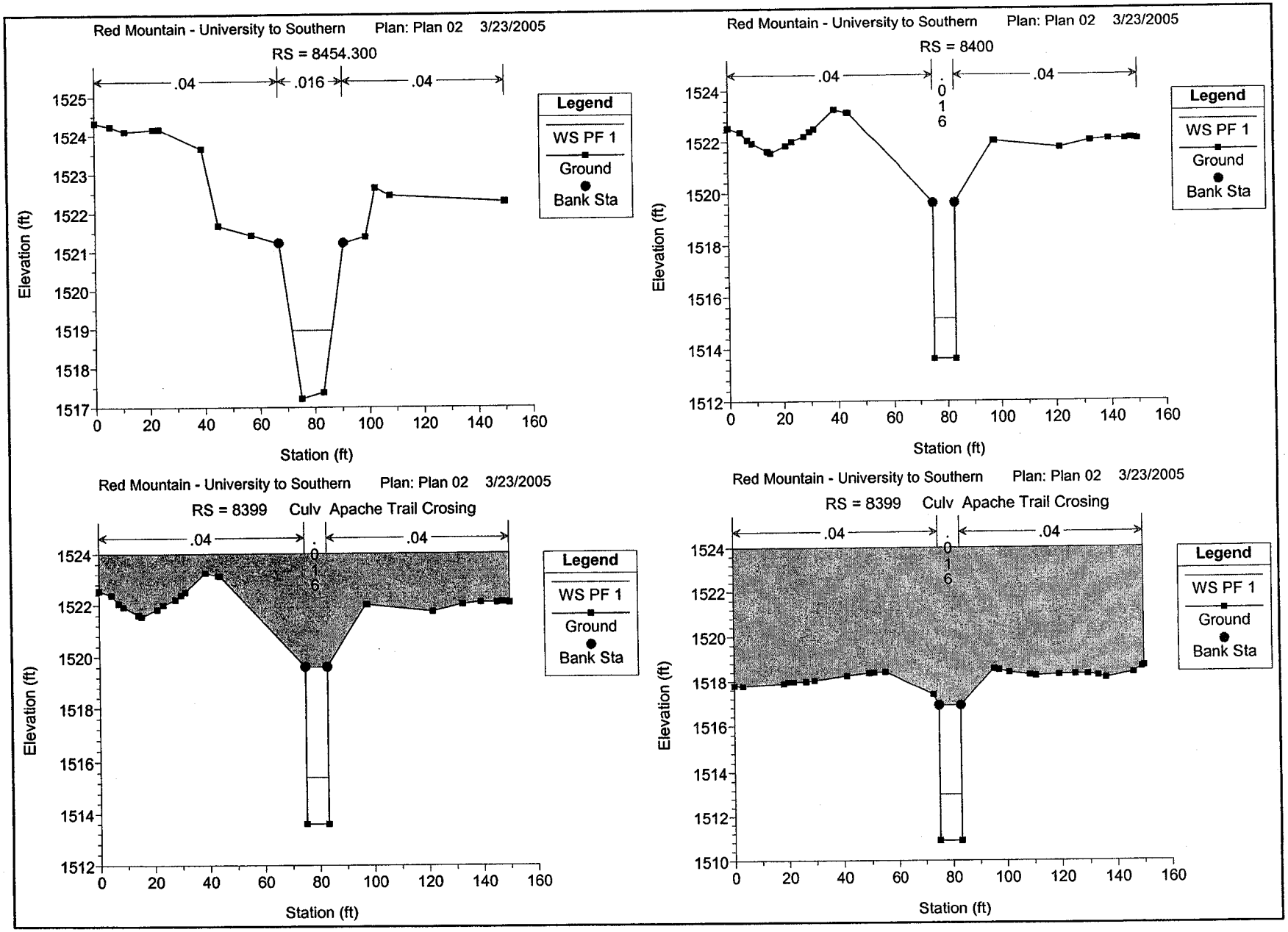
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8454.300
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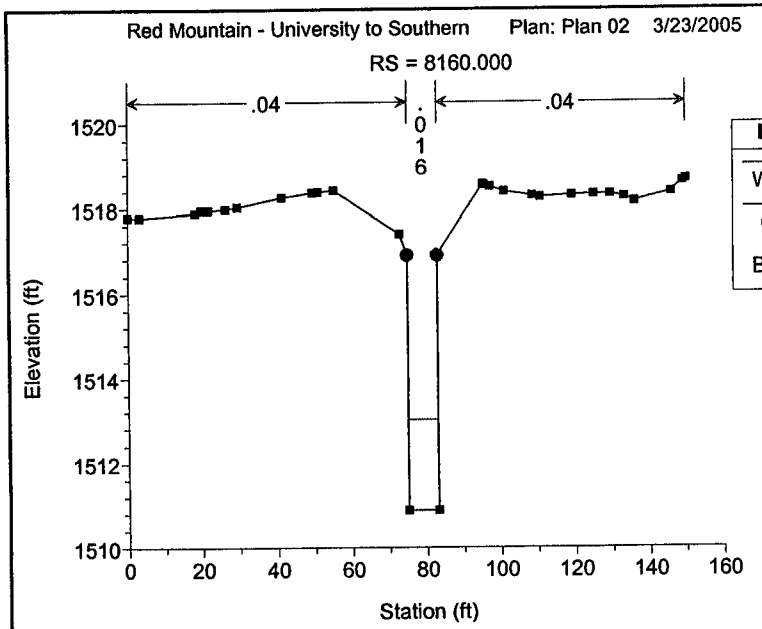
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8400
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8399 Culv Apache Trail Crosing
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8399 Culv Apache Trail Crosing
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8160.000
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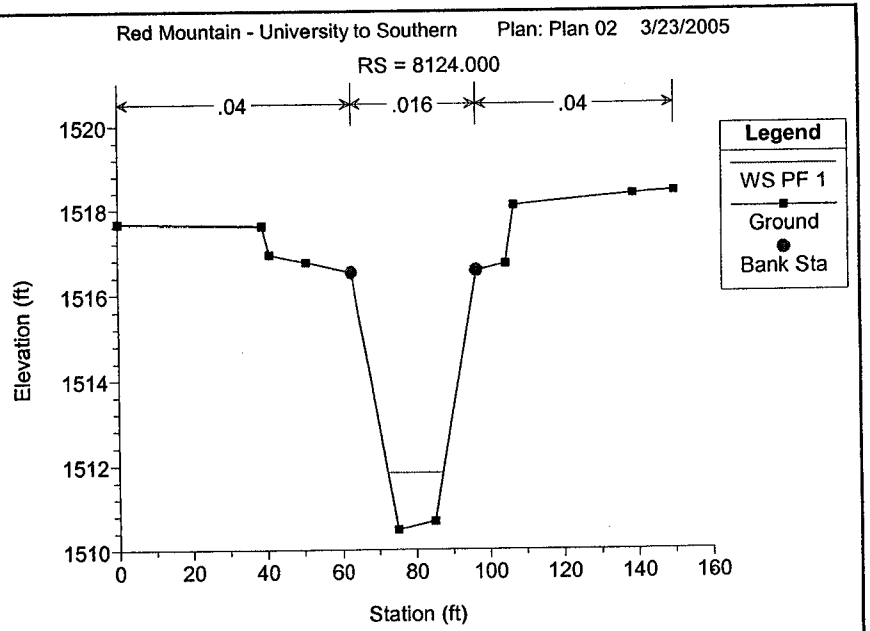
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 8124.000
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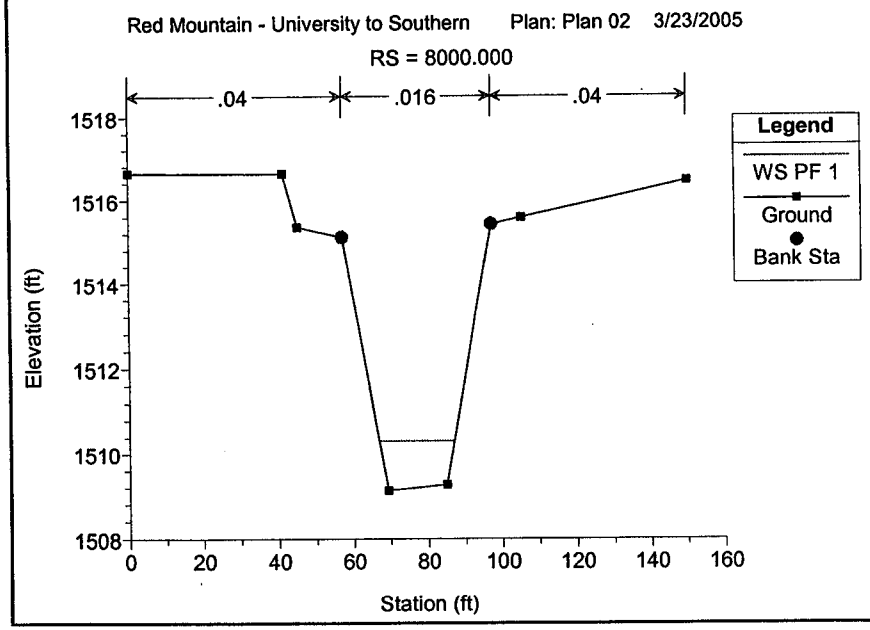
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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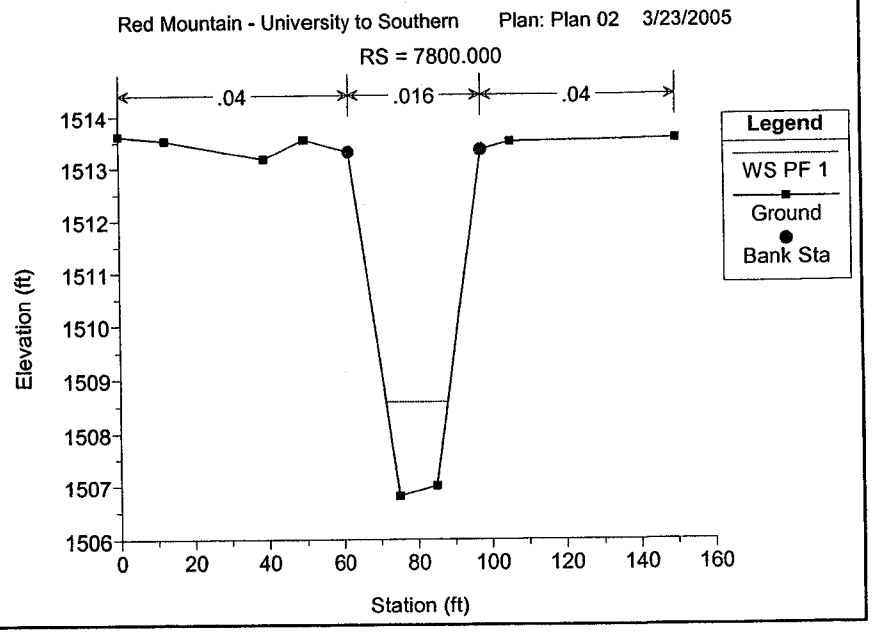
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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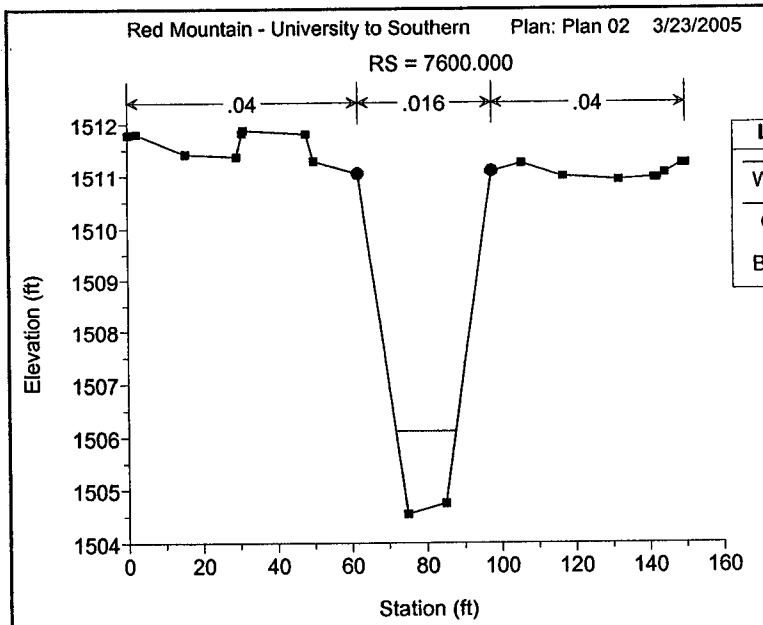
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 7600.000
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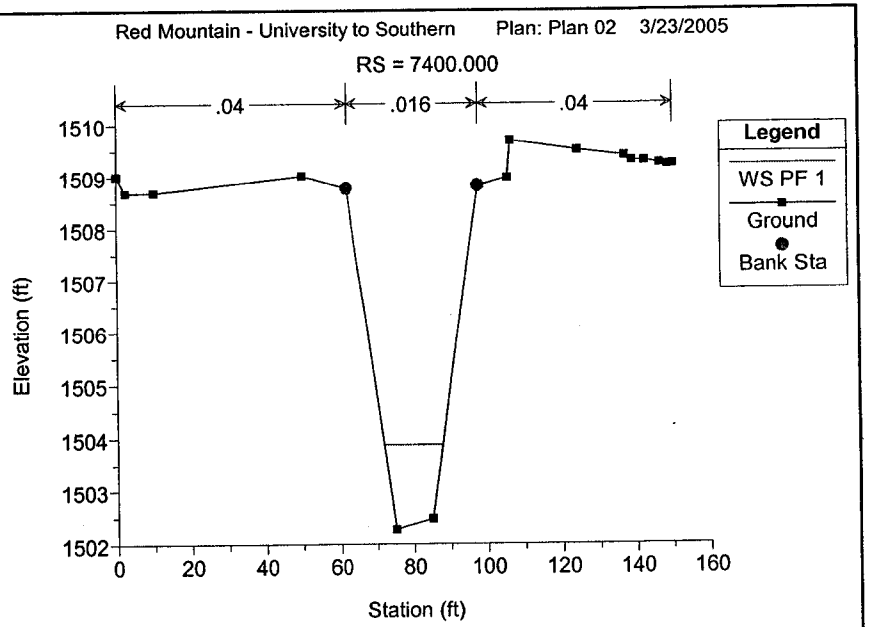
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 7400.000
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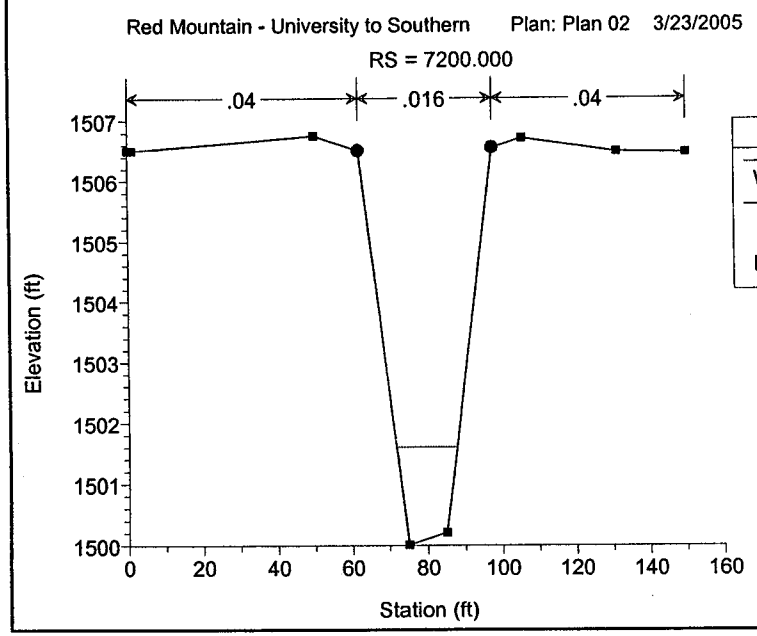
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 7200.000
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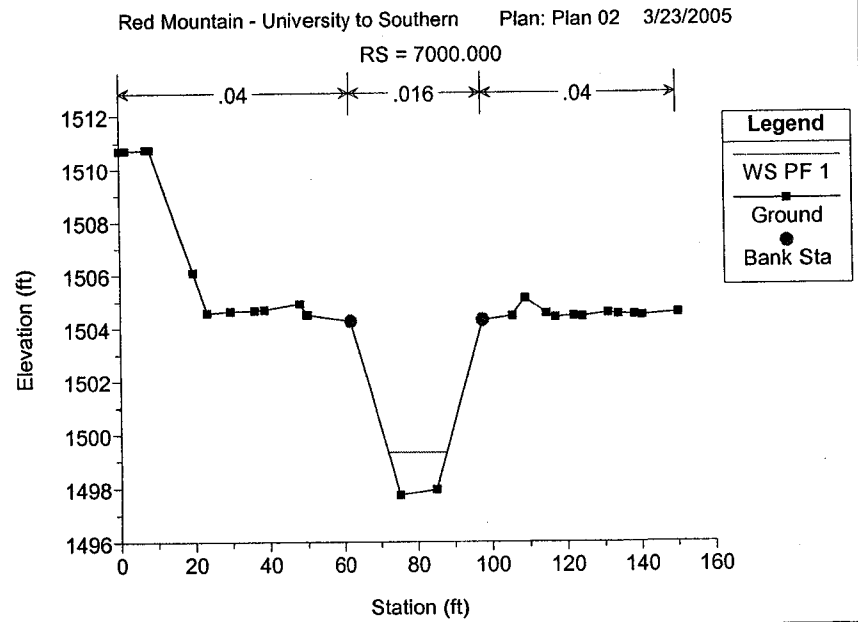
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 7000.000
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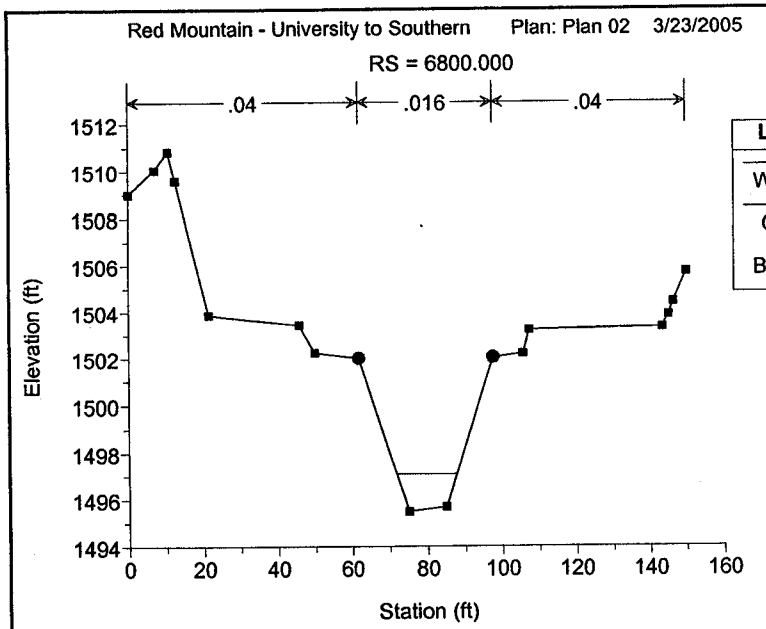
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6800.000
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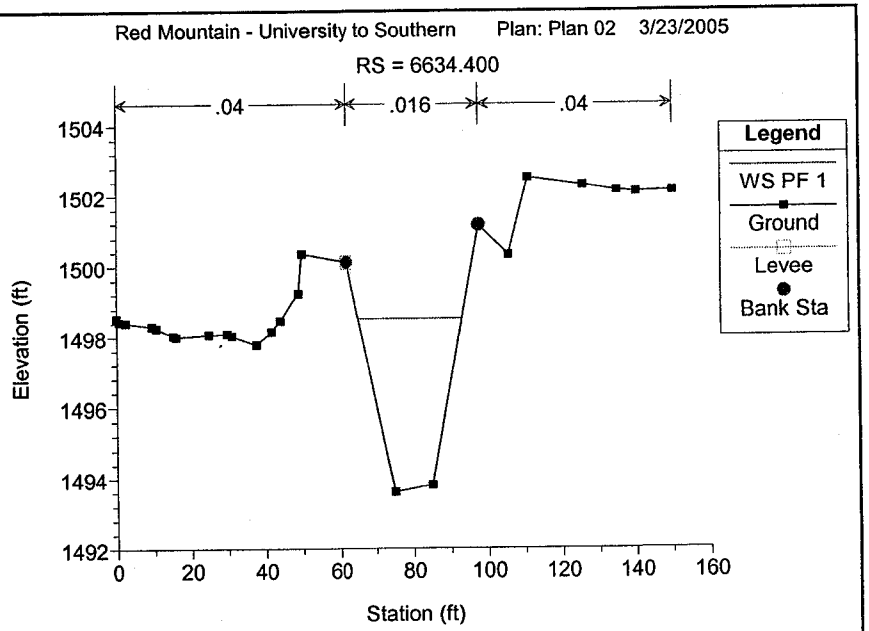
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6634.400
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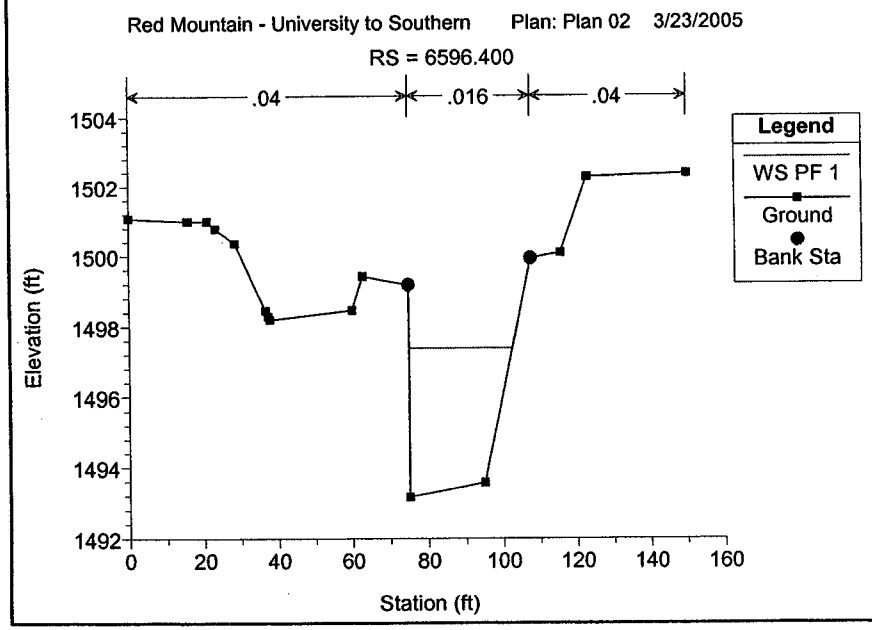
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6596.400
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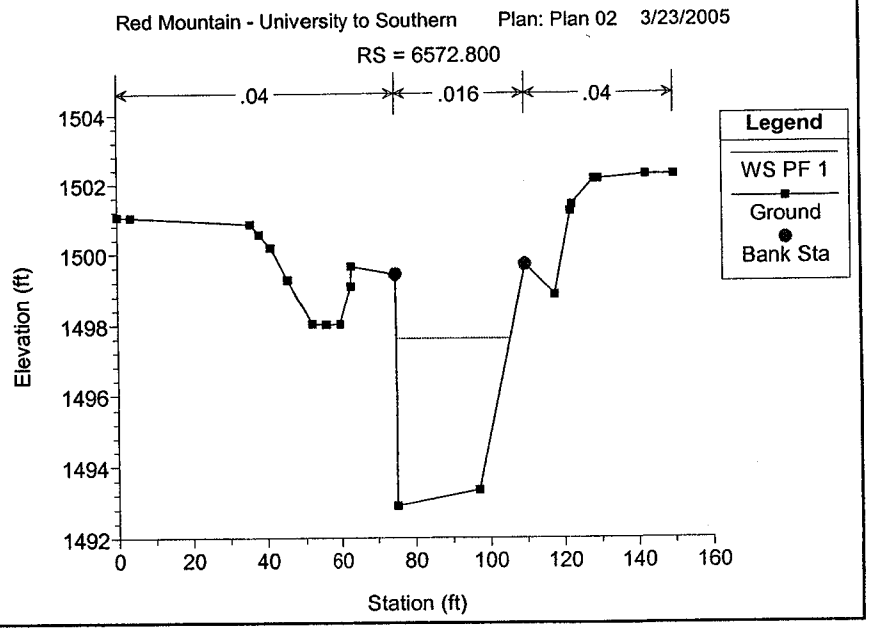
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6572.800
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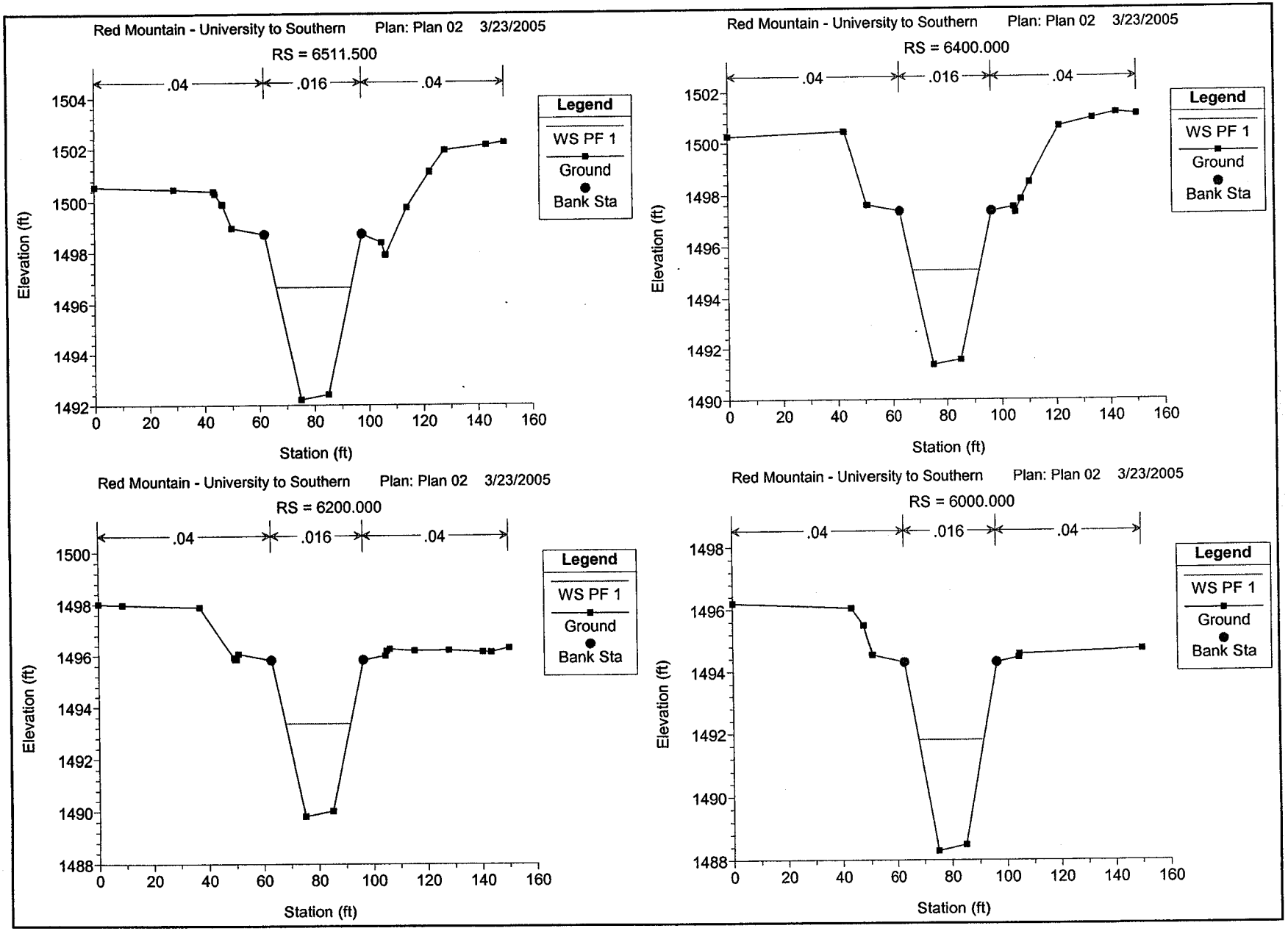
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6511.500
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6400.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6200.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 6000.000
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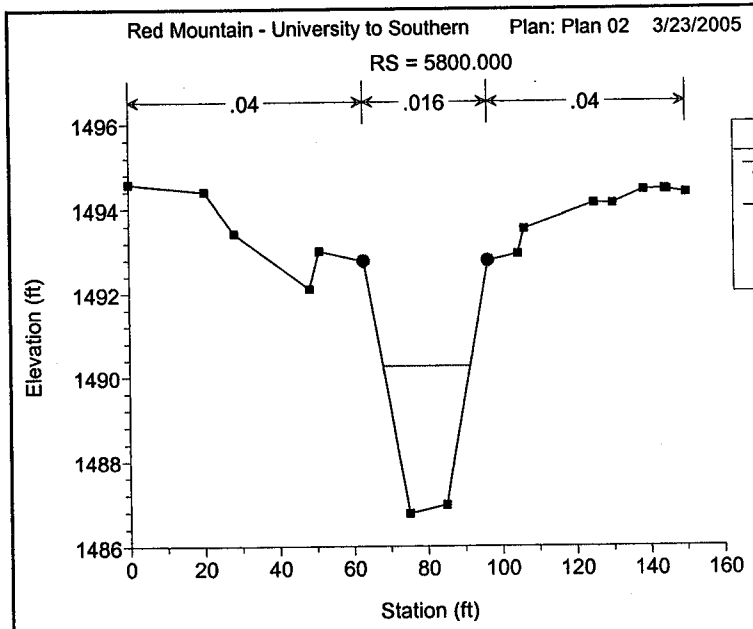
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5800.000
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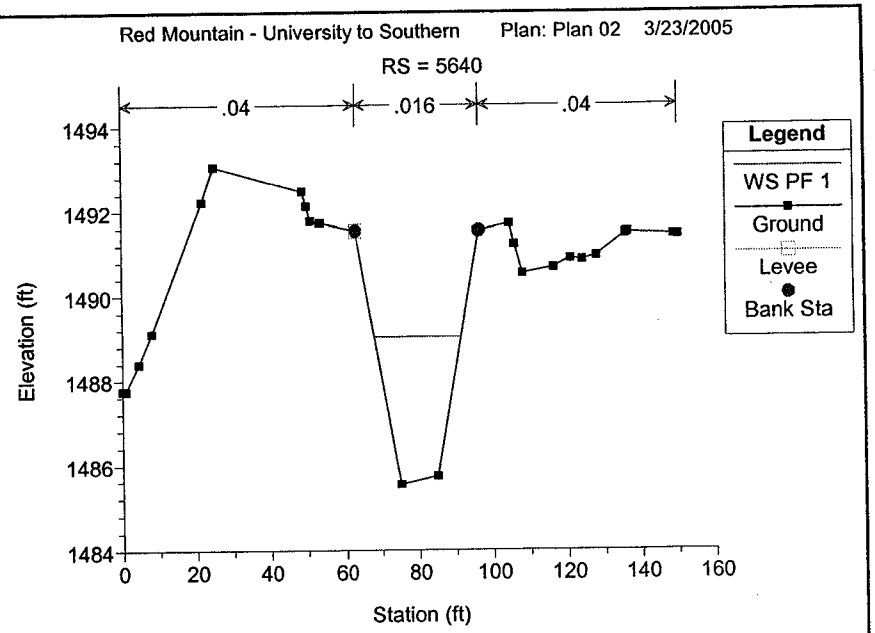
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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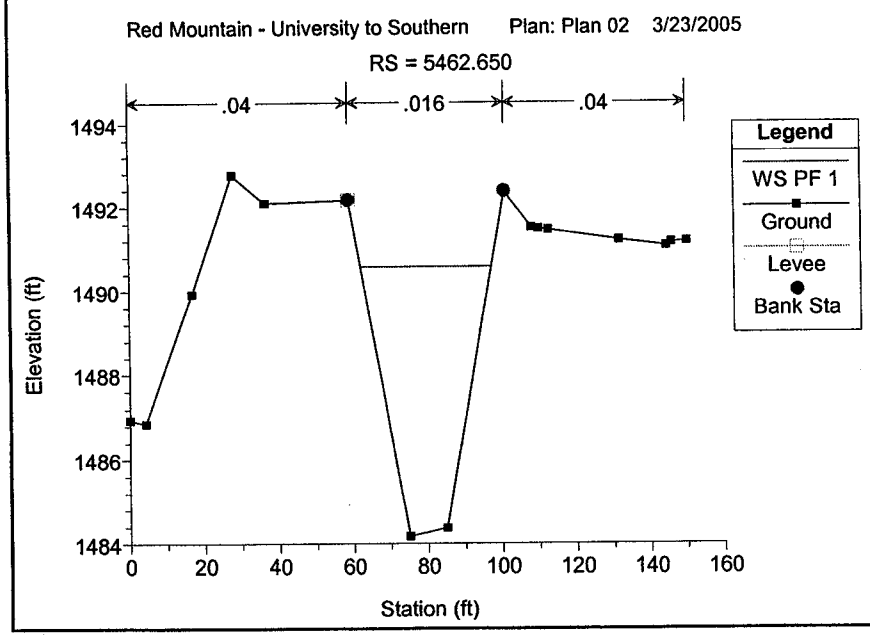
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5462.650
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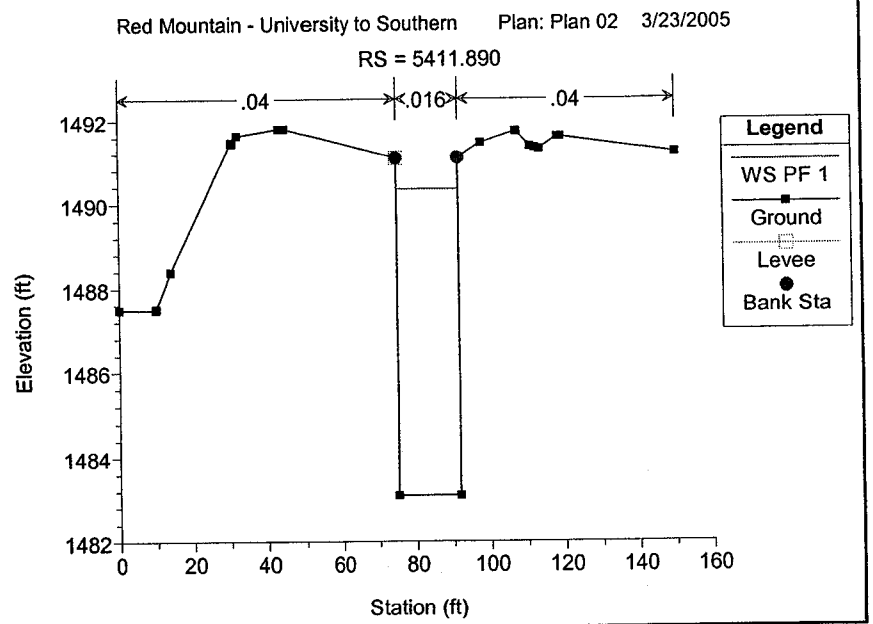
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5411.890
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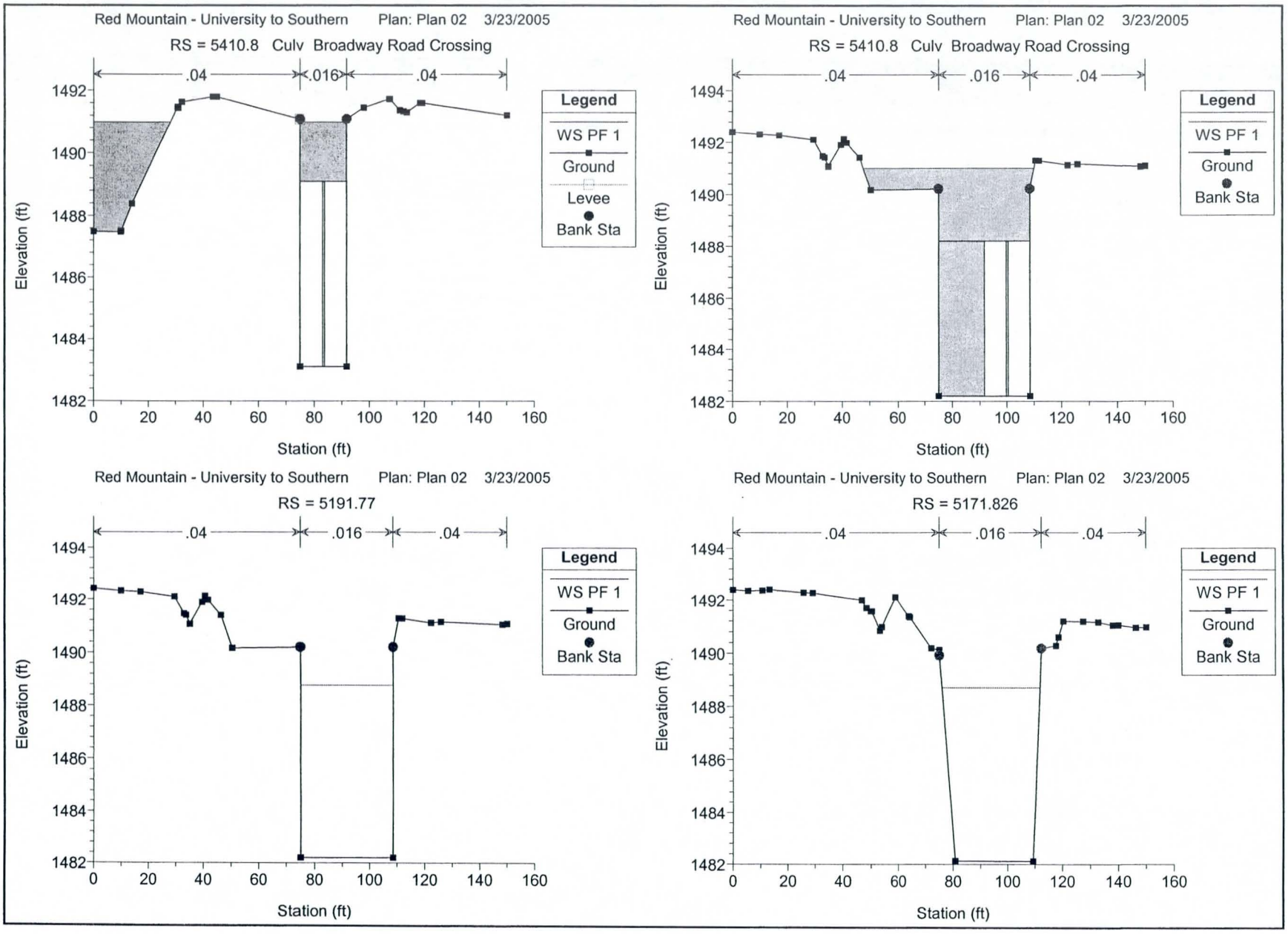
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5410.8 Culv Broadway Road Crossing
.04
.016
.04
Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5410.8 Culv Broadway Road Crossing
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5191.77
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5171.826
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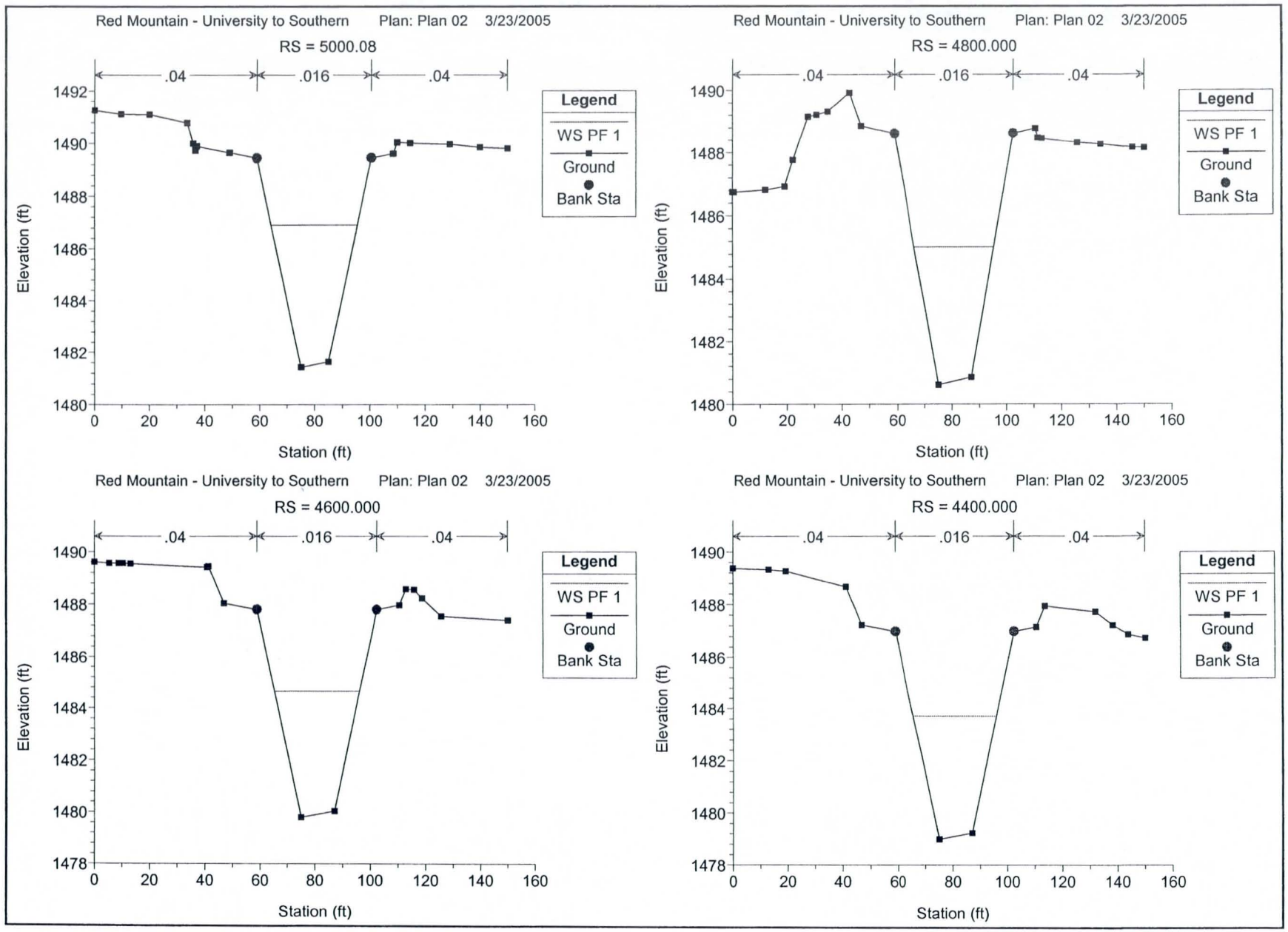
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 5000.08
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.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 4800.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 4600.000
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.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
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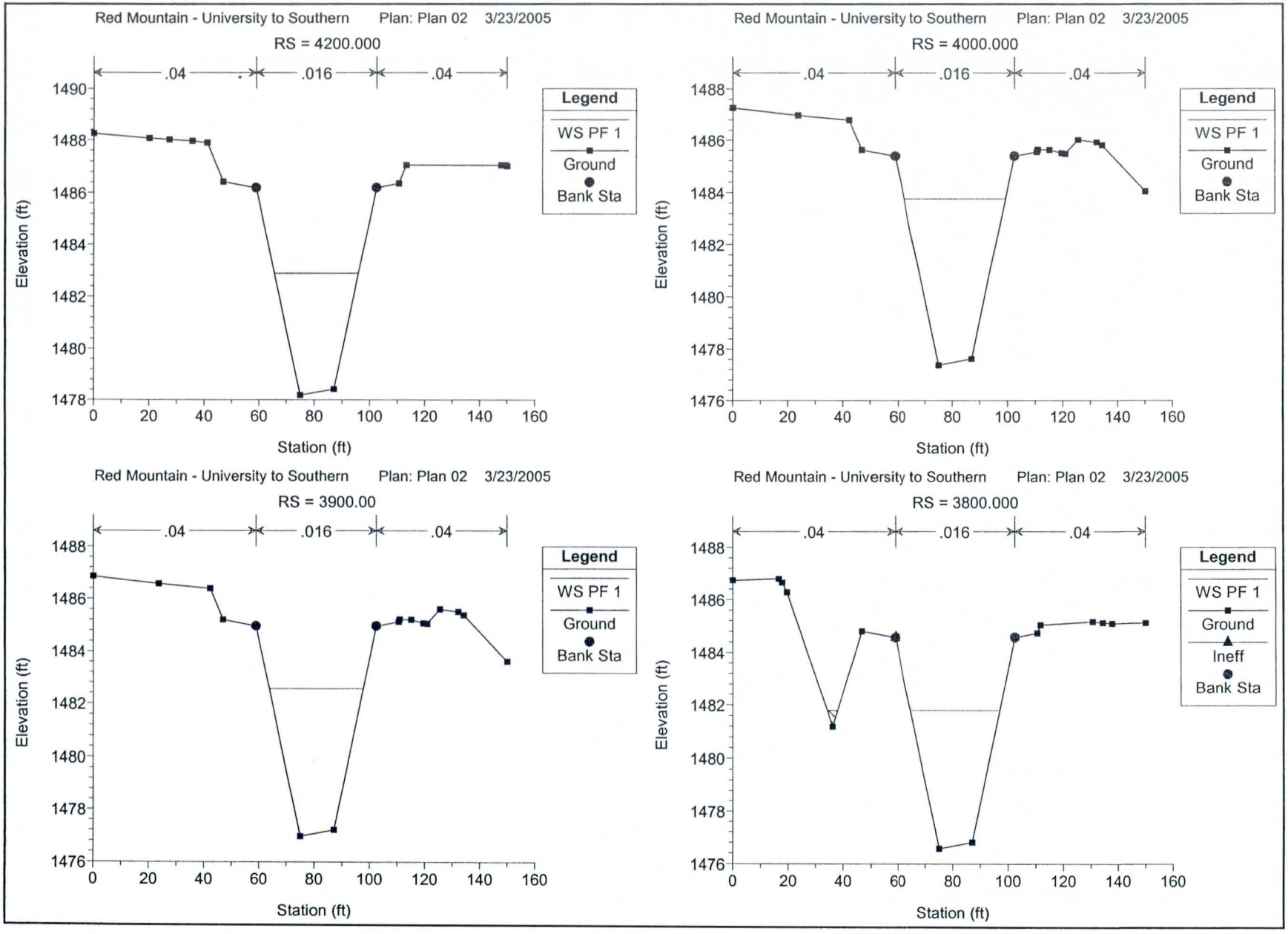
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 4200.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 4000.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3900.00
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3800.000
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.016
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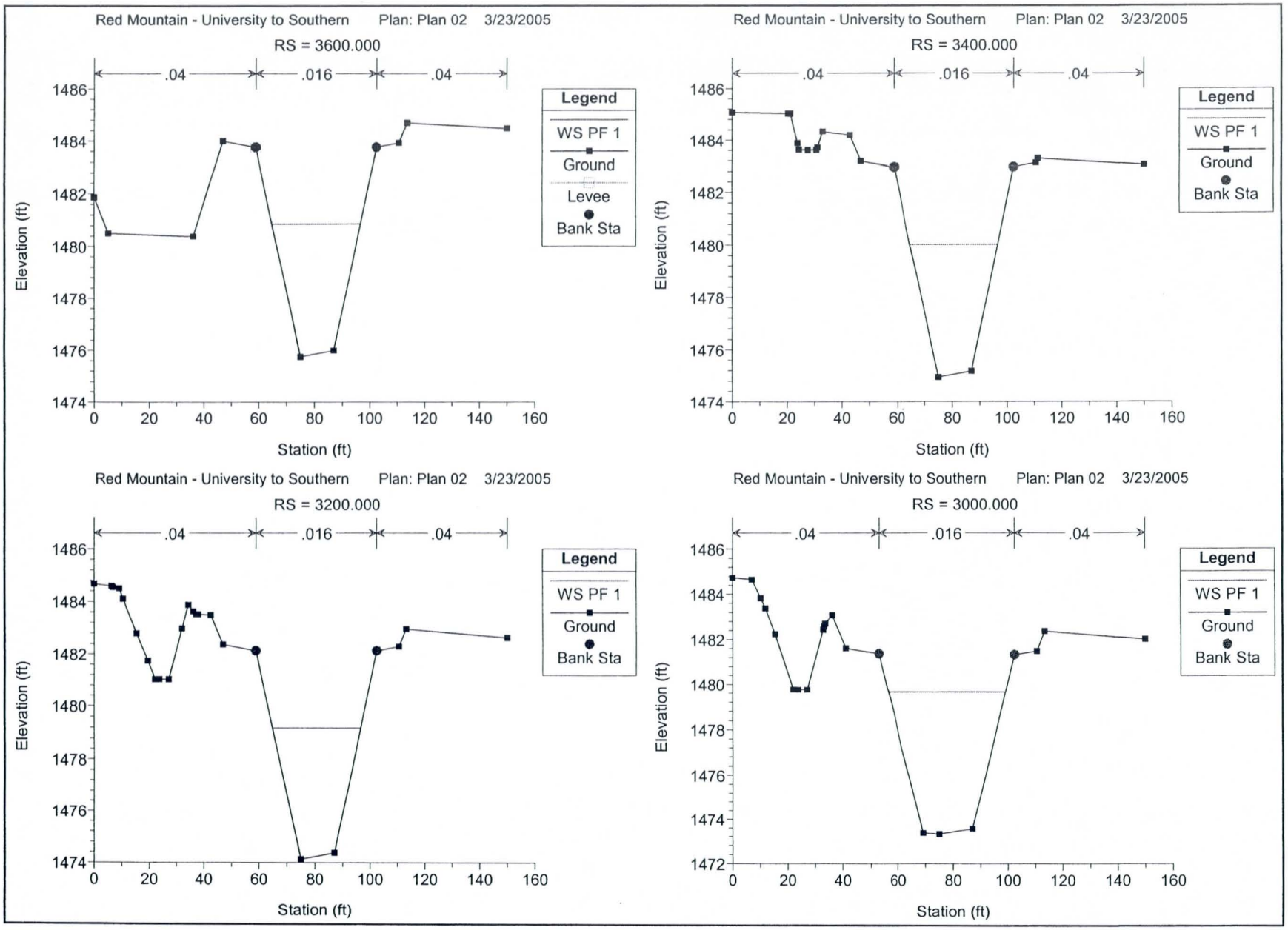
Legend
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3600.000
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.016
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Legend
WS PF 1
Ground
Levee
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3400.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3200.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 3000.000
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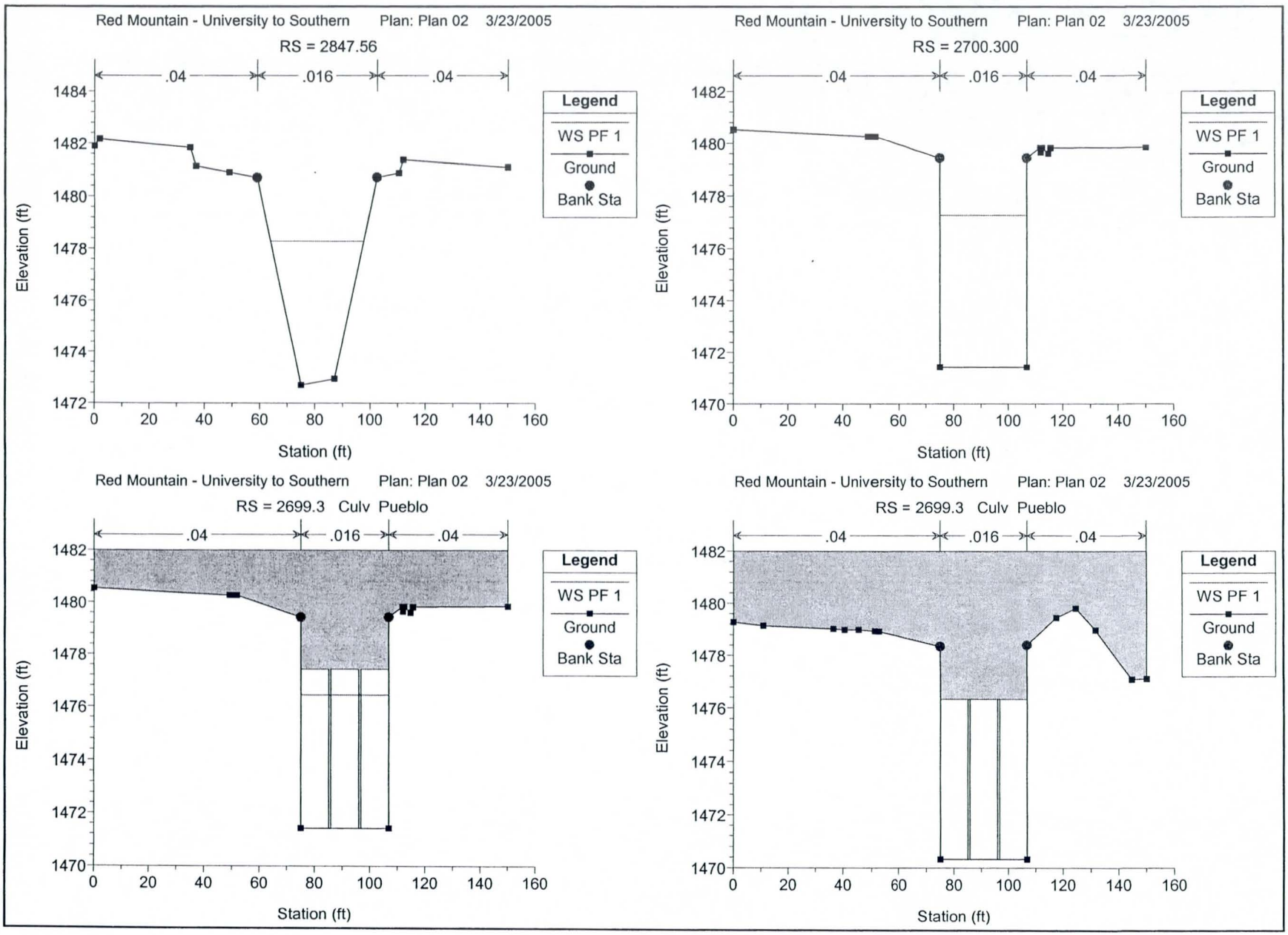
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2847.56
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2700.300
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2699.3 Culv Pueblo
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2699.3 Culv Pueblo
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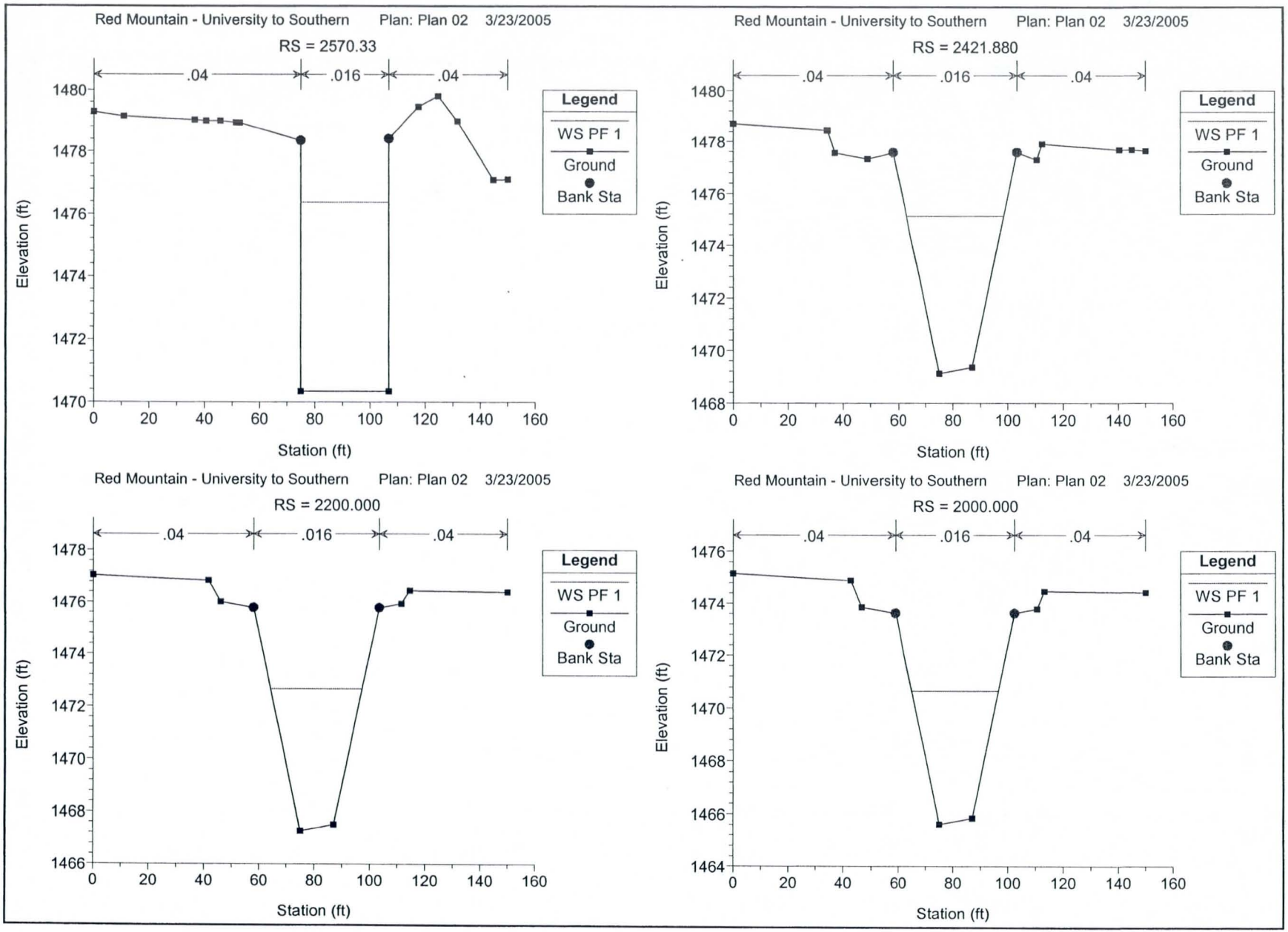
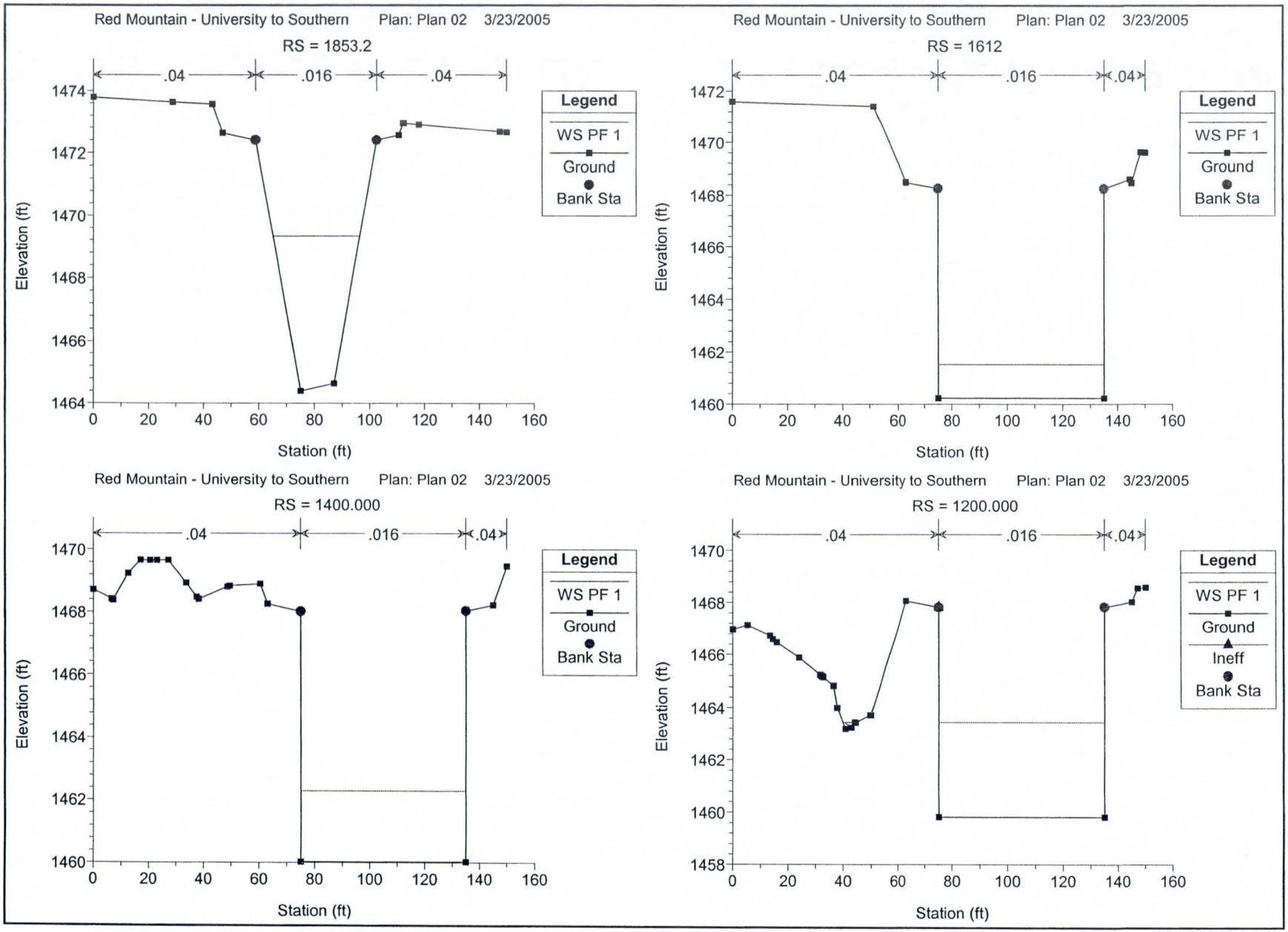
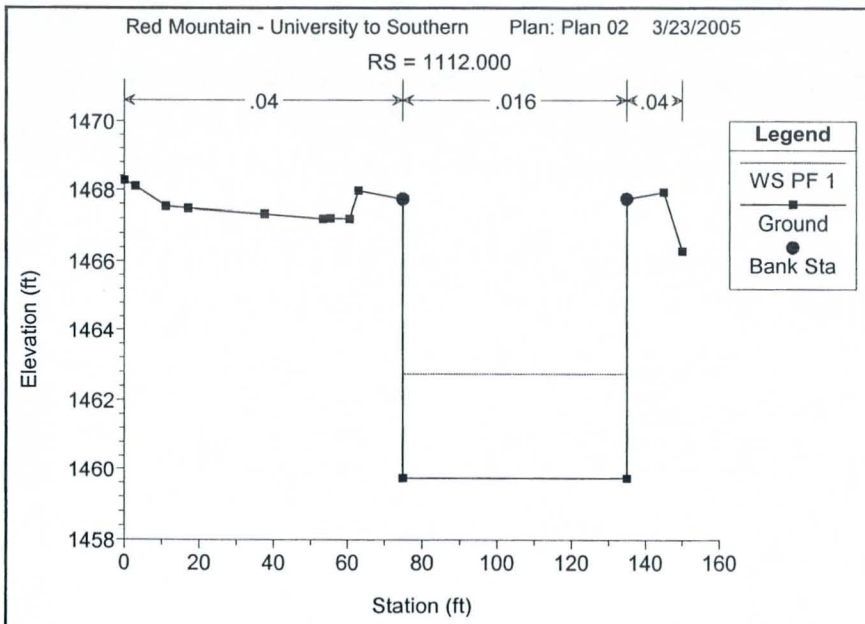
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2570.33
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2421.880
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2200.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 2000.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 1853.2
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 1612
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 1400.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 1200.000
.04
.016
.04
Legend
WS PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Red Mountain - University to Southern Plan: Plan 02 3/23/2005
RS = 1112.000
.04
.016
.04
Legend
WS PF 1
Ground
Bank Sta
Elevation (ft)
1470
1468
1466
1464
1462
1460
1458
0
20
40
60
80
100
120
140
160
Station (ft)

```
HEC-RAS Version 3.1.2 April 2004
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Broadway Road J2 Culvert
Project File : brdway.prj
Run Date and Time: 3/25/2005 4:23:27 PM

Project in English units

Project Description:
Red Mountain Freeway (202L) - University Drive to Southern Avenue
Broadway
Road East Culvert
Beginning water surface at downstream set based on water
surface elevation in PB model at Sta 5191.77 at elev = 1489.12

PLAN DATA

Plan Title: Broadway Road Culvert 95%
Plan File : p:\040024\Eng\Programs\HEC-RAS\brdway.p02

Geometry Title: Broadway Road Culvert 95%
Geometry File : p:\040024\Eng\Programs\HEC-RAS\brdway.g02

Flow Title : Broadway Road J2 Culvert
Flow File : p:\040024\Eng\Programs\HEC-RAS\brdway.f01

Plan Summary Information:

Number of:	Cross Sections =	18	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

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

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

FLOW DATA

Flow Title: Broadway Road J2 Culvert
Flow File : p:\040024\Eng\Programs\HEC-RAS\brdway.f01

Flow Data (cfs)

River	Reach	RS	Q100 yr
Broadway Rd Culv1		847.58	622

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Broadway Rd Culv1		Q100 yr	Normal S = 0.008	Known WS = 1488.77

GEOMETRY DATA

Geometry Title: Broadway Road Culvert 95%
Geometry File : p:\040024\Eng\Programs\HEC-RAS\brdway.g02

CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1 RS: 847.58

INPUT
Description: Box Culvert Sta 100-54.60
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	1494.99	.01	1488.99	7.99	1488.99	8	1494.99	8.75	1494.99
8.76	1488.99	16.74	1488.99	16.75	1494.99				

EAST CHANNEL BOX

```
Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013        0    .013    16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            0   16.75             49.85   49.85   49.85              .1        .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1495.78 1494.99   16.75 1495.78 1494.99

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 797.722*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1494.59     .01 1488.59    7.99 1488.59       8 1494.59    8.75 1494.59
    8.76 1488.59   16.74 1488.59   16.75 1494.59

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013        0    .013    16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            0   16.75             49.85   49.85   49.85              .1        .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1495.38 1494.59   16.75 1495.38 1494.59

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 747.864*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1494.19     .01 1488.19    7.99 1488.19       8 1494.19    8.75 1494.19
    8.76 1488.19   16.74 1488.19   16.75 1494.19

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013        0    .013    16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            0   16.75             49.85   49.85   49.85              .1        .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1494.98 1494.19   16.75 1494.98 1494.19

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 698.007*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1493.79     .01 1487.79    7.99 1487.79       8 1493.79    8.75 1493.79
    8.76 1487.79   16.74 1487.79   16.75 1493.79

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013        0    .013    16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            0   16.75             49.85   49.85   49.85              .1        .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1494.58 1493.79   16.75 1494.58 1493.79

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 648.149*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1493.39     .01 1487.39    7.99 1487.39       8 1493.39    8.75 1493.39
    8.76 1487.39   16.74 1487.39   16.75 1493.39

Manning's n Values          num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013        0    .013    16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
            0   16.75             49.85   49.85   49.85              .1        .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1494.18 1493.39   16.75 1494.18 1493.39
```

```
CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1                    RS: 598.291*

INPUT
Description:
Station Elevation Data     num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.99     .01 1486.99    7.99 1486.99       8 1492.99    8.75 1492.99
    8.76 1486.99   16.74 1486.99   16.75 1492.99

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1493.78 1492.99   16.75 1493.78 1492.99

CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1                    RS: 548.434*

INPUT
Description:
Station Elevation Data     num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.59     .01 1486.59    7.99 1486.59       8 1492.59    8.75 1492.59
    8.76 1486.59   16.74 1486.59   16.75 1492.59

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1493.38 1492.59   16.75 1493.38 1492.59

CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1                    RS: 498.576*

INPUT
Description:
Station Elevation Data     num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.19     .01 1486.19    7.99 1486.19       8 1492.19    8.75 1492.19
    8.76 1486.19   16.74 1486.19   16.75 1492.19

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1492.98 1492.19   16.75 1492.98 1492.19

CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1                    RS: 448.718*

INPUT
Description:
Station Elevation Data     num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.79     .01 1485.79    7.99 1485.79       8 1491.79    8.75 1491.79
    8.76 1485.79   16.74 1485.79   16.75 1491.79

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1492.58 1491.79   16.75 1492.58 1491.79

CROSS SECTION

RIVER: Broadway Rd Culv
REACH: 1                    RS: 398.861*

INPUT
Description:
Station Elevation Data     num=       8
```

```
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1491.4     .01  1485.4    7.99  1485.4       8  1491.4    8.75  1491.4
    8.76  1485.4   16.74  1485.4   16.75  1491.4

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   16.75             49.85   49.85   49.85             .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1492.19  1491.4   16.75 1492.19  1491.4

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 349.003*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1491     .01    1485    7.99    1485       8    1491    8.75    1491
    8.76    1485   16.74    1485   16.75    1491

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   16.75             49.85   49.85   49.85             .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1491.79    1491   16.75 1491.79    1491

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 299.145*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1490.6     .01  1484.6    7.99  1484.6       8  1490.6    8.75  1490.6
    8.76  1484.6   16.74  1484.6   16.75  1490.6

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   16.75             49.85   49.85   49.85             .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1491.39  1490.6   16.75 1491.39  1490.6

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 249.288*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1490.2     .01  1484.2    7.99  1484.2       8  1490.2    8.75  1490.2
    8.76  1484.2   16.74  1484.2   16.75  1490.2

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   16.75             49.85   49.85   49.85             .1       .3
Cross Section Lid
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1490.99  1490.2   16.75 1490.99  1490.2

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                    RS: 199.430*

INPUT
Description:
Station Elevation Data      num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1489.8     .01  1483.8    7.99  1483.8       8  1489.8    8.75  1489.8
    8.76  1483.8   16.74  1483.8   16.75  1489.8

Manning's n Values          num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            0   16.75             49.85   49.85   49.85             .1       .3
```

```
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1490.59  1489.8   16.75 1490.59  1489.8

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                   RS: 149.572*

INPUT
Description:
Station Elevation Data     num=        8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1489.4     .01  1483.4    7.99  1483.4       8  1489.4    8.75  1489.4
    8.76  1483.4   16.74  1483.4   16.75  1489.4

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1      .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1490.19  1489.4   16.75 1490.19  1489.4

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                   RS: 99.7152*

INPUT
Description:
Station Elevation Data     num=        8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0    1489     .01    1483    7.99    1483       8    1489    8.75    1489
    8.76    1483   16.74    1483   16.75    1489

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1      .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1489.79    1489   16.75 1489.79    1489

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                   RS: 49.8575*

INPUT
Description:
Station Elevation Data     num=        8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1488.6     .01  1482.6    7.99  1482.6       8  1488.6    8.75  1488.6
    8.76  1482.6   16.74  1482.6   16.75  1488.6

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75             49.85   49.85   49.85              .1      .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1489.39  1488.6   16.75 1489.39  1488.6

CROSS SECTION


RIVER: Broadway Rd Culv
REACH: 1                   RS: 0

INPUT
Description: L202 East Channel RS 5410.8; Box Culvert Sta 109+02.18
Station Elevation Data     num=        8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1488.2     .01  1482.2    7.99  1482.2       8  1488.2    8.75  1488.2
    8.76  1482.2   16.74  1482.2   16.75  1488.2

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013   16.75    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   16.75                 0       0       0              .1      .3
Cross Section Lid
    num=        2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0 1488.99  1488.2   16.75 1488.99  1488.2


SUMMARY OF MANNING'S N VALUES

River:Broadway Rd Culv
```

Reach	River Sta.	n1	n2	n3
1	847.58	.013	.013	.013
1	797.722*	.013	.013	.013
1	747.864*	.013	.013	.013
1	698.007*	.013	.013	.013
1	648.149*	.013	.013	.013
1	598.291*	.013	.013	.013
1	548.434*	.013	.013	.013
1	498.576*	.013	.013	.013
1	448.718*	.013	.013	.013
1	398.861*	.013	.013	.013
1	349.003*	.013	.013	.013
1	299.145*	.013	.013	.013
1	249.288*	.013	.013	.013
1	199.430*	.013	.013	.013
1	149.572*	.013	.013	.013
1	99.7152*	.013	.013	.013
1	49.8575*	.013	.013	.013
1	0	.013	.013	.013

SUMMARY OF REACH LENGTHS

River: Broadway Rd Culv

Reach	River Sta.	Left	Channel	Right
1	847.58	49.85	49.85	49.85
1	797.722*	49.85	49.85	49.85
1	747.864*	49.85	49.85	49.85
1	698.007*	49.85	49.85	49.85
1	648.149*	49.85	49.85	49.85
1	598.291*	49.85	49.85	49.85
1	548.434*	49.85	49.85	49.85
1	498.576*	49.85	49.85	49.85
1	448.718*	49.85	49.85	49.85
1	398.861*	49.85	49.85	49.85
1	349.003*	49.85	49.85	49.85
1	299.145*	49.85	49.85	49.85
1	249.288*	49.85	49.85	49.85
1	199.430*	49.85	49.85	49.85
1	149.572*	49.85	49.85	49.85
1	99.7152*	49.85	49.85	49.85
1	49.8575*	49.85	49.85	49.85
1	0	0	0	0

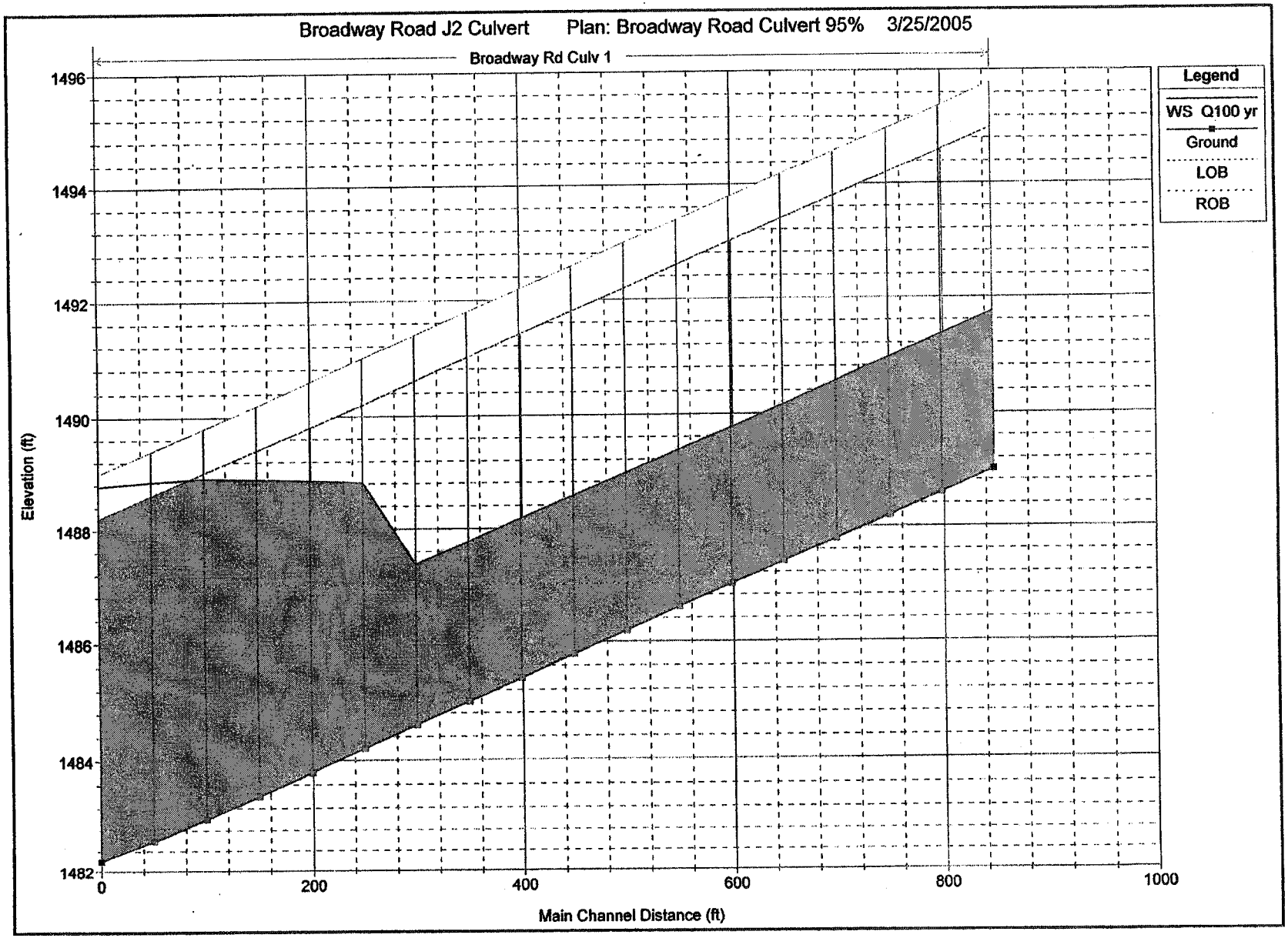
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Broadway Rd Culv

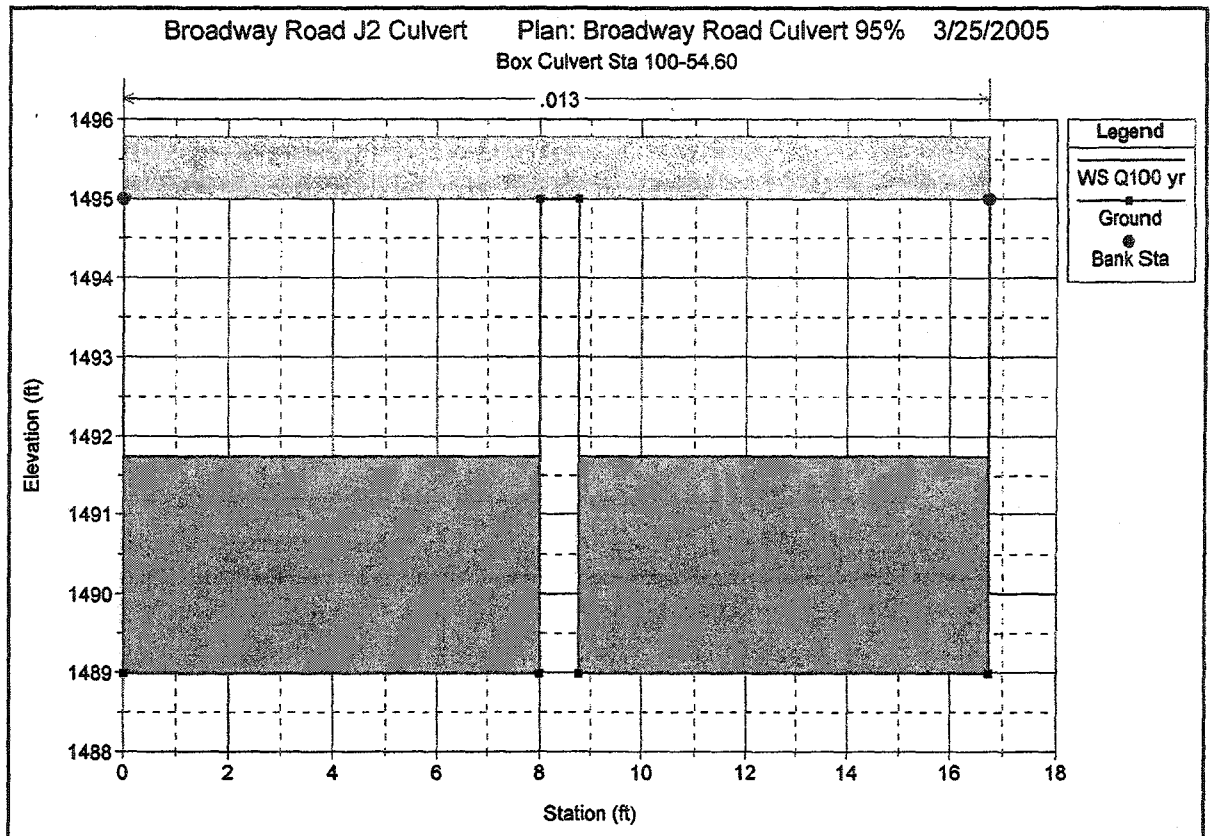
Reach	River Sta.	Contr.	Expan.
1	847.58	.1	.3
1	797.722*	.1	.3
1	747.864*	.1	.3
1	698.007*	.1	.3
1	648.149*	.1	.3
1	598.291*	.1	.3
1	548.434*	.1	.3
1	498.576*	.1	.3
1	448.718*	.1	.3
1	398.861*	.1	.3
1	349.003*	.1	.3
1	299.145*	.1	.3
1	249.288*	.1	.3
1	199.430*	.1	.3
1	149.572*	.1	.3
1	99.7152*	.1	.3
1	49.8575*	.1	.3
1	0	.1	.3

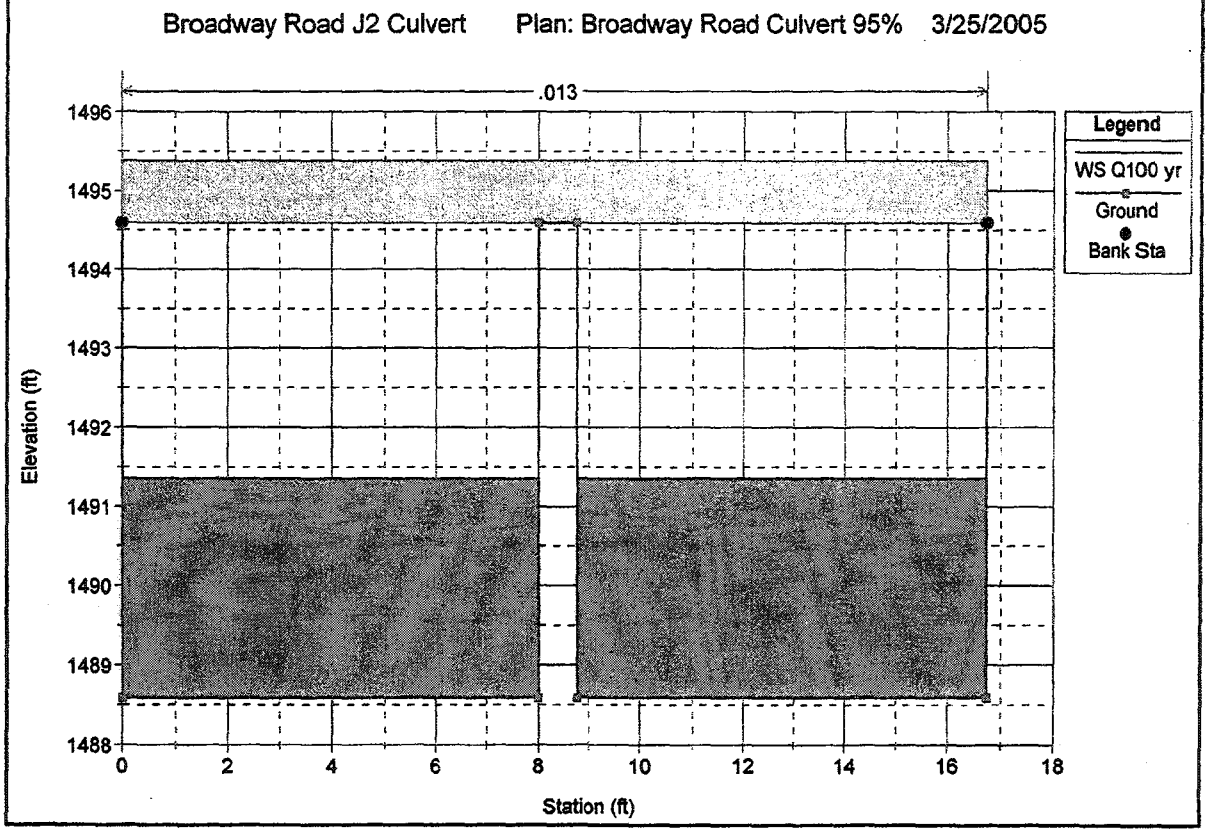
Profile Output Table - Standard Table 1

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)	
1	847.58	Q100 yr	622.00	1488.99	1491.74	1492.61	1494.86	0.008014	14.16	43.91	15.98	1.51
1	797.722*	Q100 yr	622.00	1488.59	1491.35	1492.21	1494.44	0.007936	14.12	44.07	15.98	1.50
1	747.864*	Q100 yr	622.00	1488.19	1490.95	1491.81	1494.04	0.007916	14.10	44.10	15.98	1.50
1	698.007*	Q100 yr	622.00	1487.79	1490.56	1491.41	1493.63	0.007878	14.08	44.18	15.98	1.49
1	648.149*	Q100 yr	622.00	1487.39	1490.16	1491.01	1493.23	0.007861	14.07	44.22	15.98	1.49
1	598.291*	Q100 yr	622.00	1486.99	1489.76	1490.61	1492.83	0.007860	14.07	44.22	15.98	1.49
1	548.434*	Q100 yr	622.00	1486.59	1489.36	1490.21	1492.43	0.007857	14.06	44.22	15.98	1.49
1	498.576*	Q100 yr	622.00	1486.19	1488.96	1489.81	1492.03	0.007855	14.06	44.23	15.98	1.49
1	448.718*	Q100 yr	622.00	1485.79	1488.56	1489.41	1491.63	0.007853	14.06	44.23	15.98	1.49

1	398.861*	Q100 yr	622.00	1485.40	1488.17	1489.02	1491.24	0.007853	14.06	44.23
15.98	1.49									
1	349.003*	Q100 yr	622.00	1485.00	1487.77	1488.62	1490.84	0.007849	14.06	44.24
15.98	1.49									
1	299.145*	Q100 yr	622.00	1484.60	1487.37	1488.22	1490.44	0.007847	14.06	44.24
15.98	1.49									
1	249.288*	Q100 yr	622.00	1484.20	1488.82	1487.82	1489.92	0.001971	8.43	73.76
15.99	0.69									
1	199.430*	Q100 yr	622.00	1483.80	1488.86	1487.42	1489.78	0.001555	7.70	80.78
15.99	0.60									
1	149.572*	Q100 yr	622.00	1483.40	1488.88	1487.02	1489.67	0.001263	7.10	87.59
16.00	0.53									
1	99.7152*	Q100 yr	622.00	1483.00	1488.90	1486.62	1489.58	0.001047	6.60	94.26
16.00	0.48									
1	49.8575*	Q100 yr	622.00	1482.60	1488.85	1486.22	1489.51	0.001628	6.49	95.88
	0.46									
1	0	Q100 yr	622.00	1482.20	1488.77	1485.82	1489.42	0.001628	6.49	95.88
	0.00									


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
Broadway Rd Culv 1
Legend
WS Q100 yr
Ground
LOB
ROB
Elevation (ft)
1496
1494
1492
1490
1488
1486
1484
1482
0
200
400
600
800
1000
Main Channel Distance (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
Box Culvert Sta 100-54.60
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1496
1495
1494
1493
1492
1491
1490
1489
1488
0
2
4
6
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1496
1495
1494
1493
1492
1491
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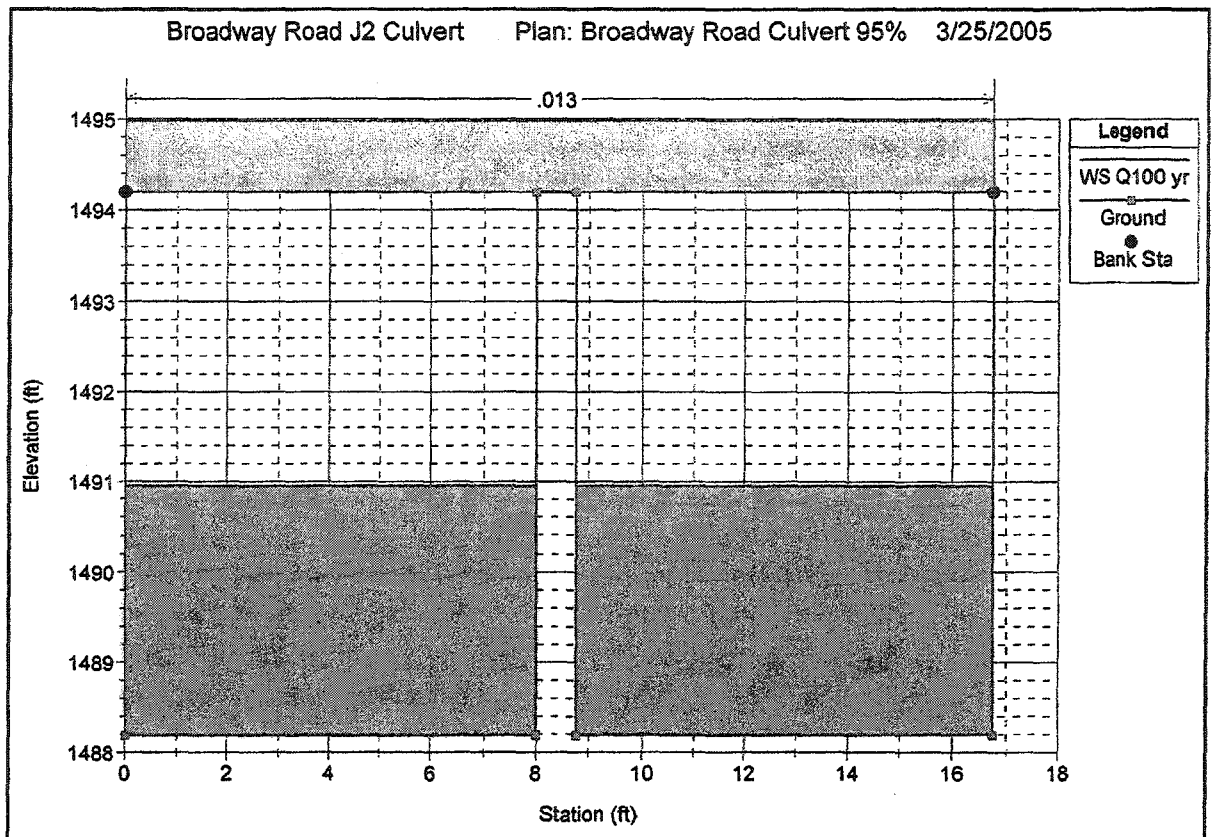
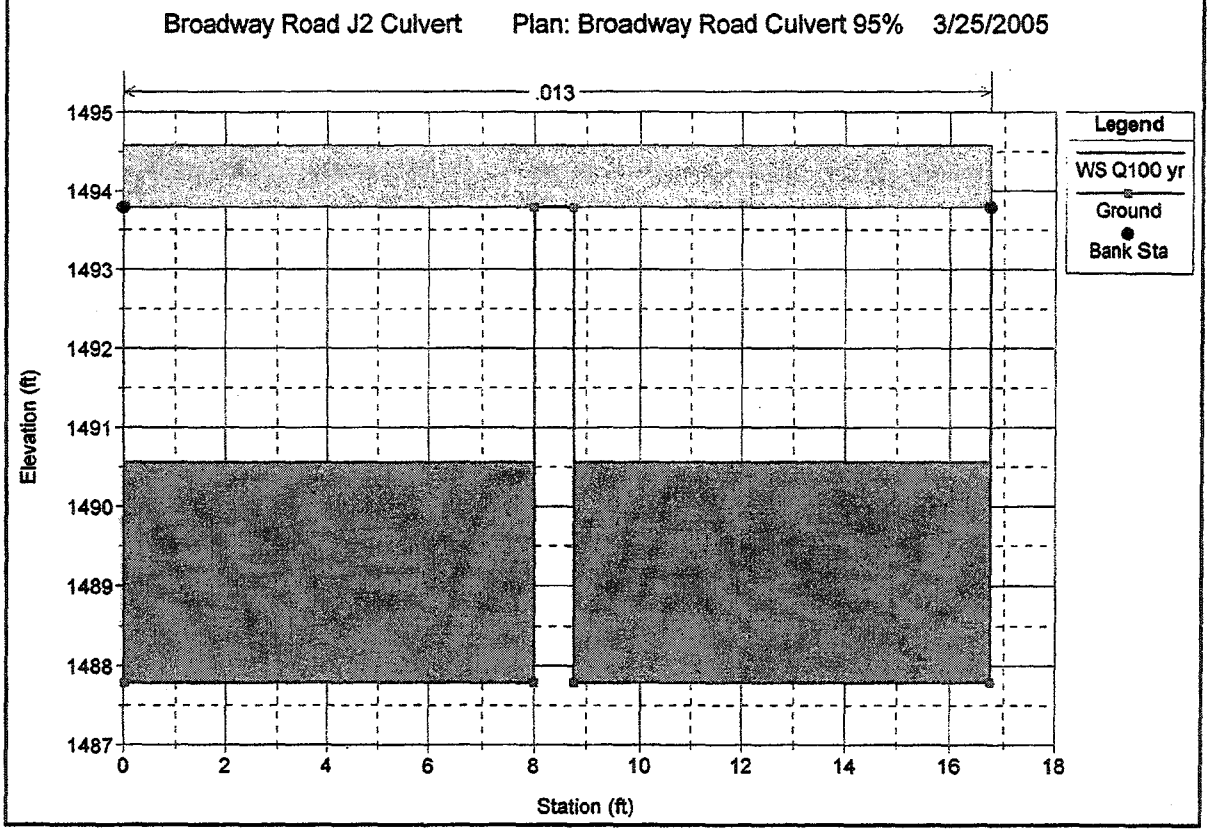
1489
1488
0
2
4
6
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1495
1494
1493
1492
1491
1490
1489
1488
0
2
4
6
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1495
1494
1493
1492
1491
1490
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1488
1487
0
2
4
6
8
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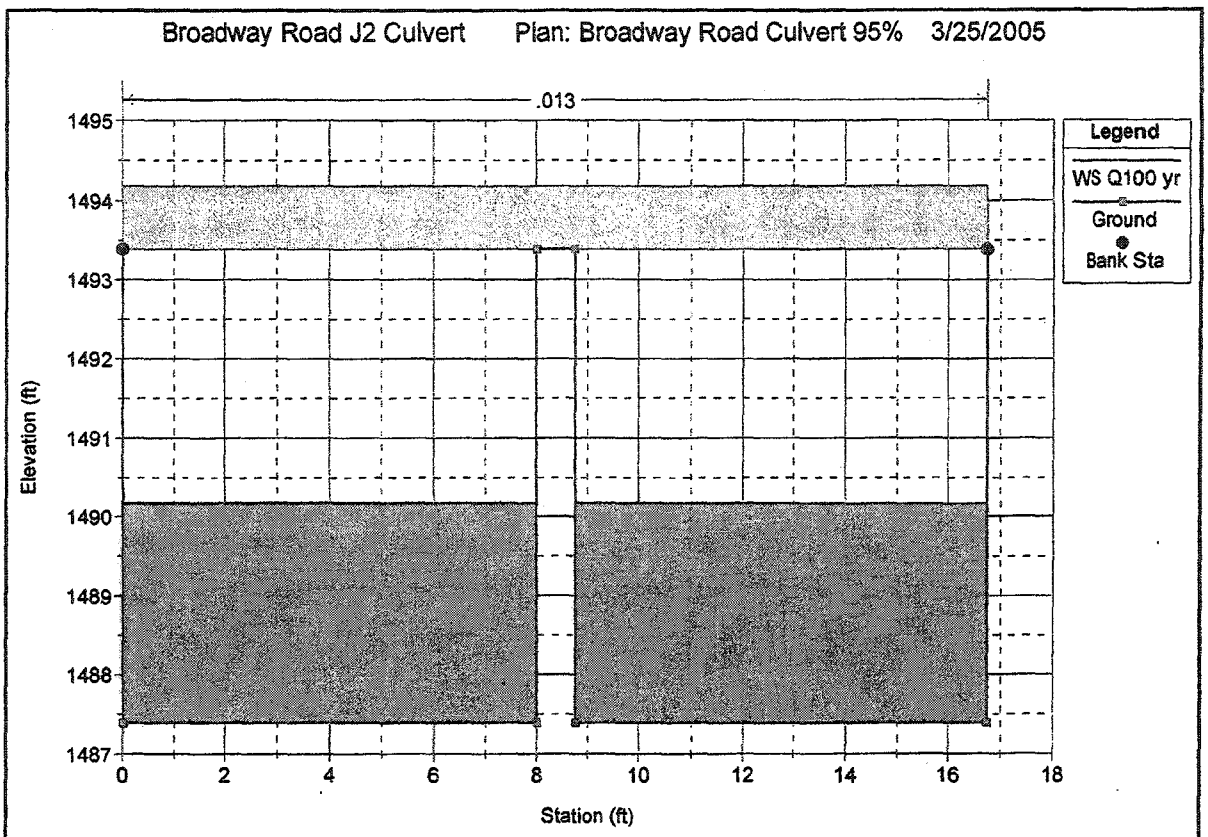
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
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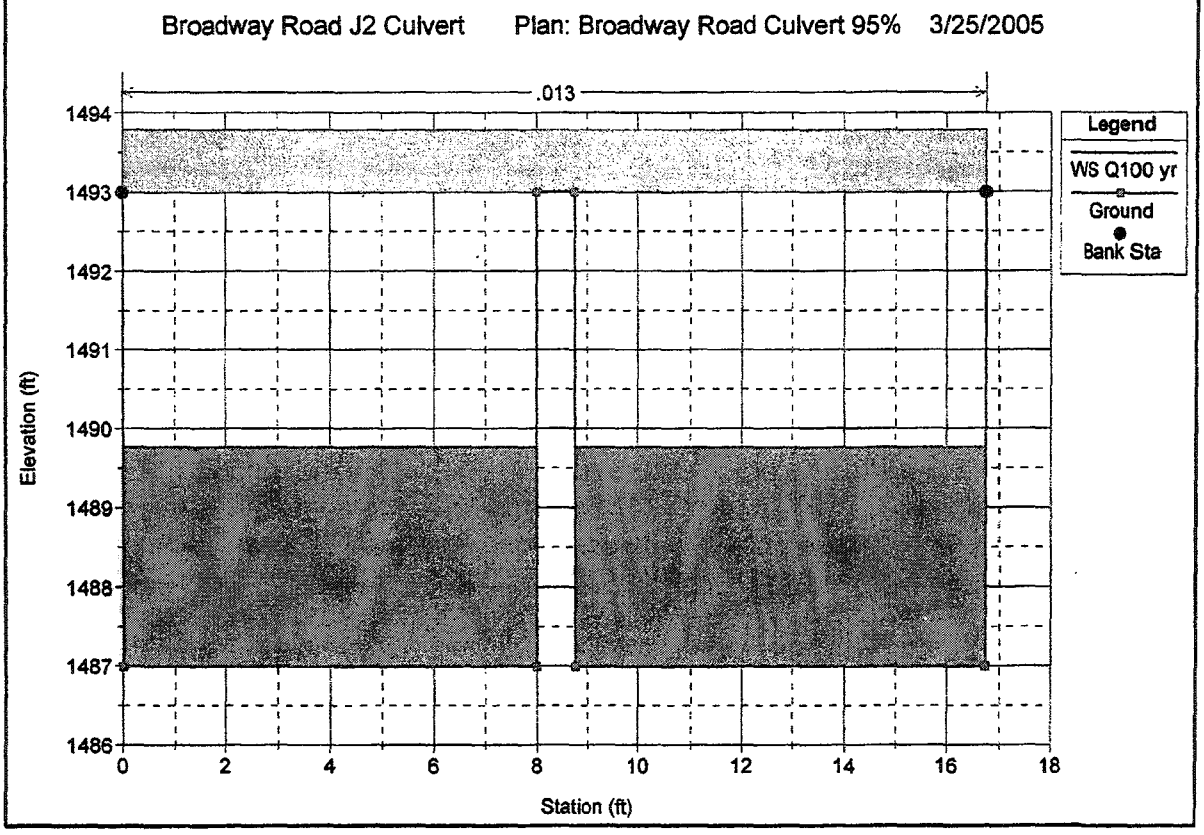
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1494
1493
1492
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1487
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8
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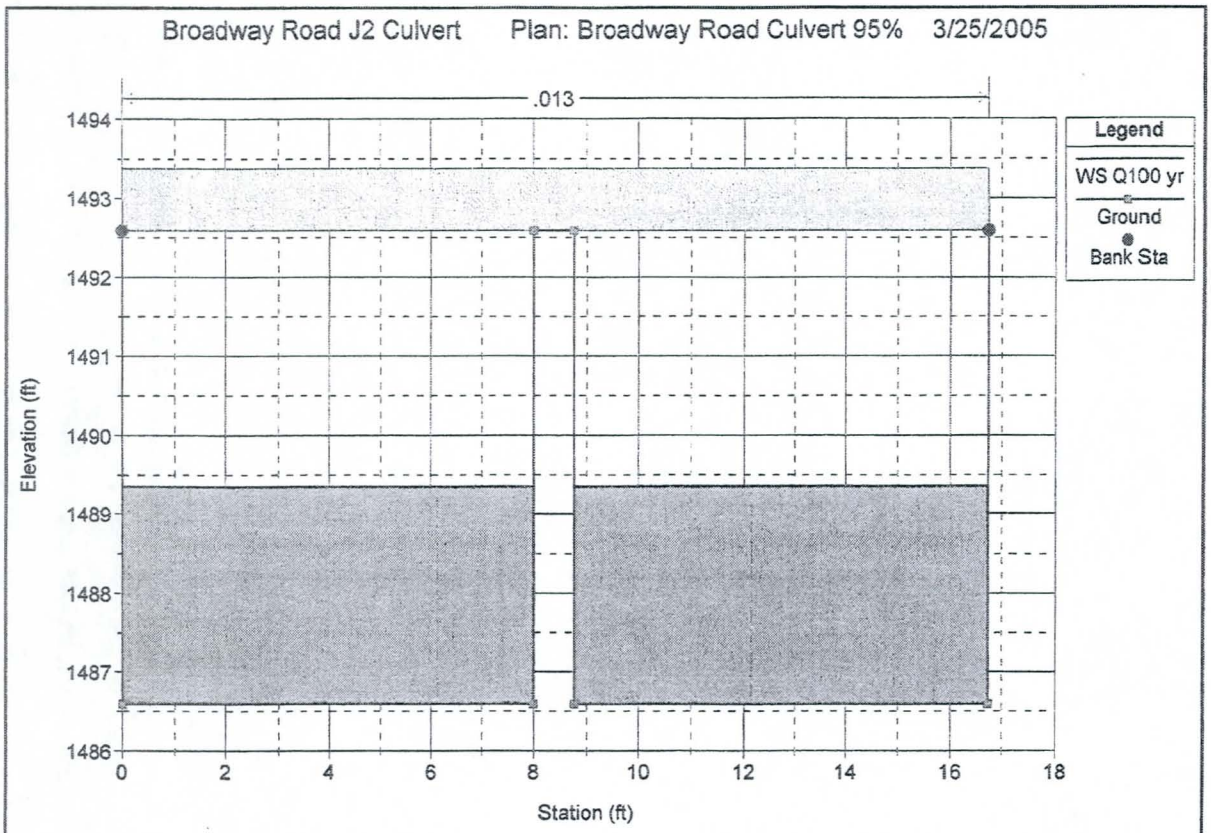
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1494
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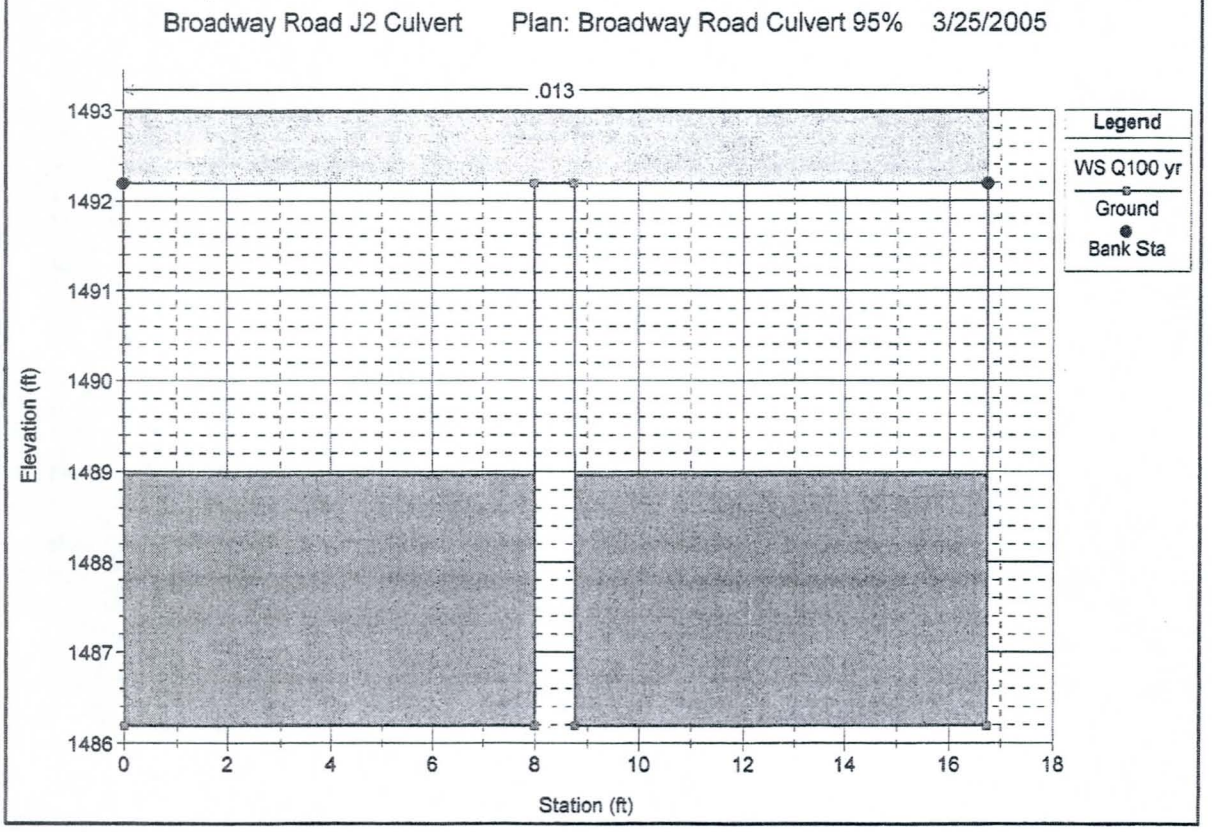
12
14
16
18


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1493
1492
1491
1490
1489
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1487
1486
0
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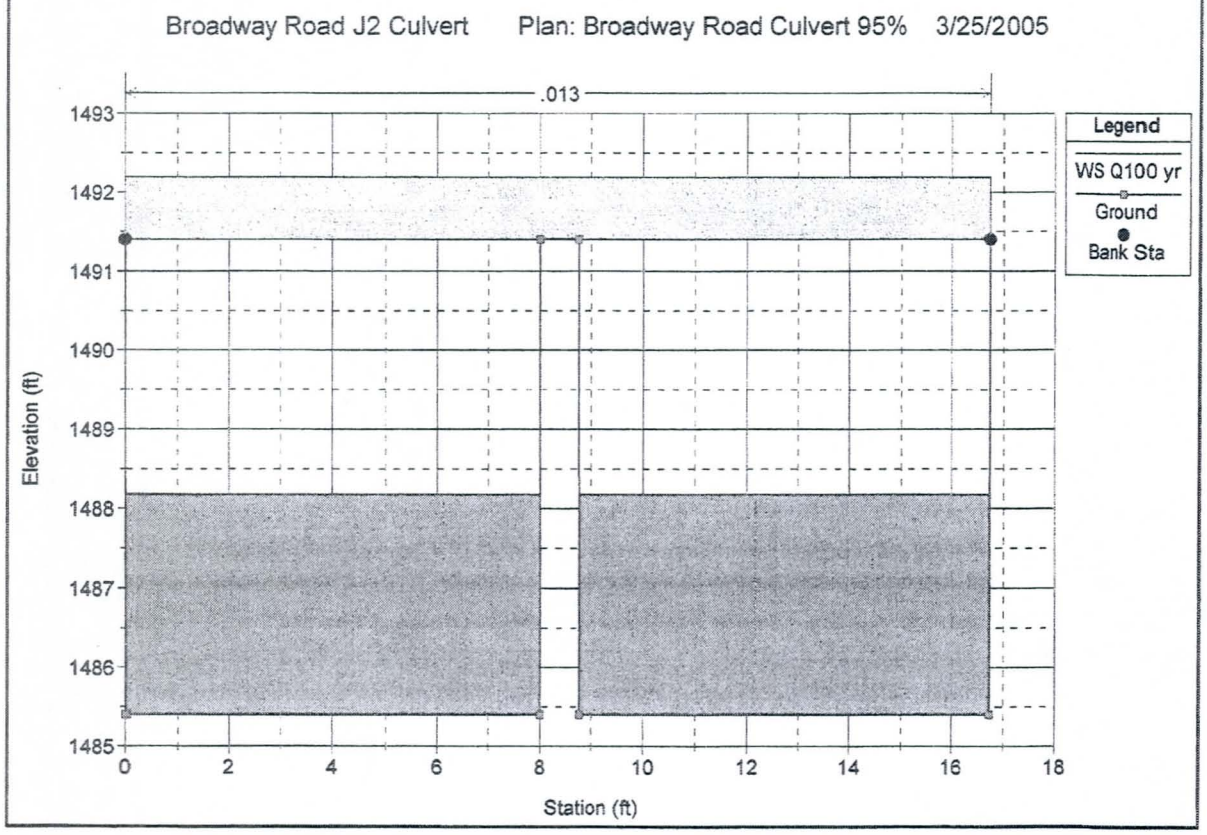
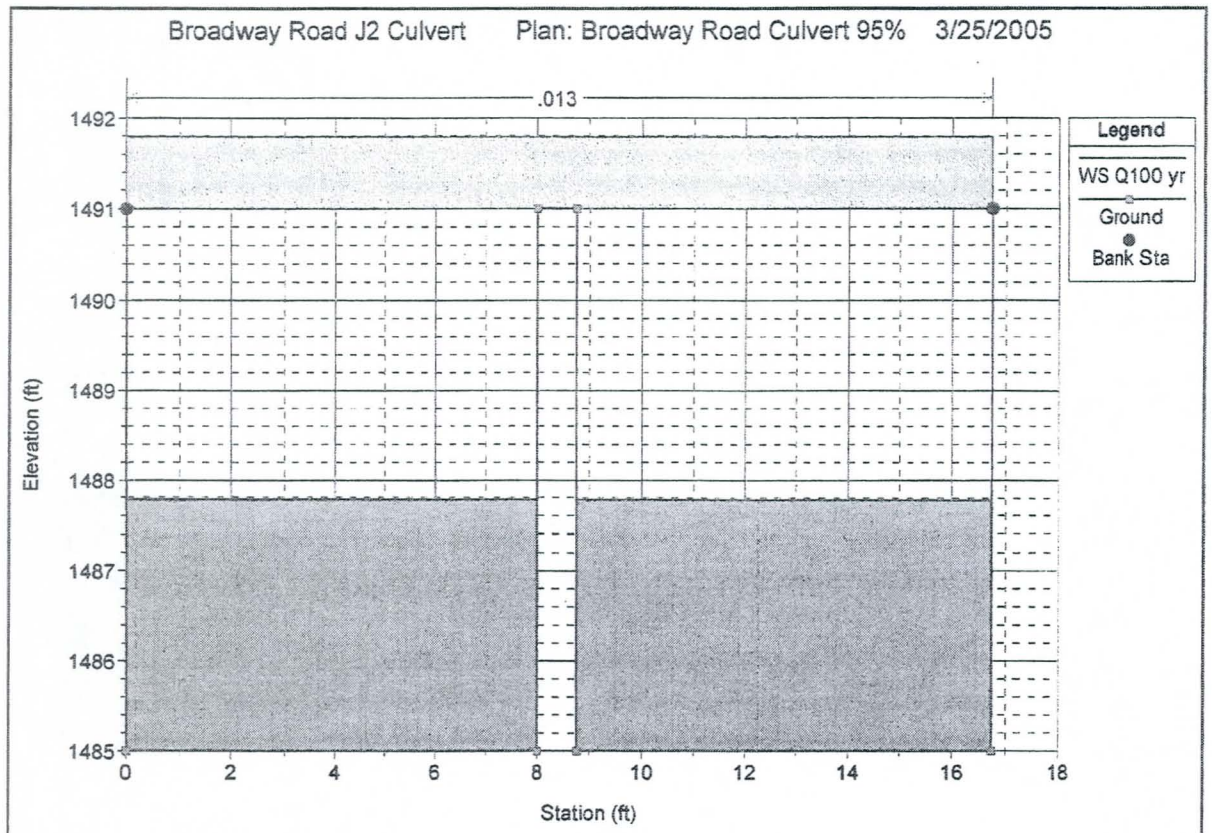
12
14
16
18

Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1493
1492
1491
1490
1489
1488
1487
1486
1485
0
2
4
6
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1493
1492
1491
1490
1489
1488
1487
1486
1485
0
2
4
6
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1492
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1490
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1485
0
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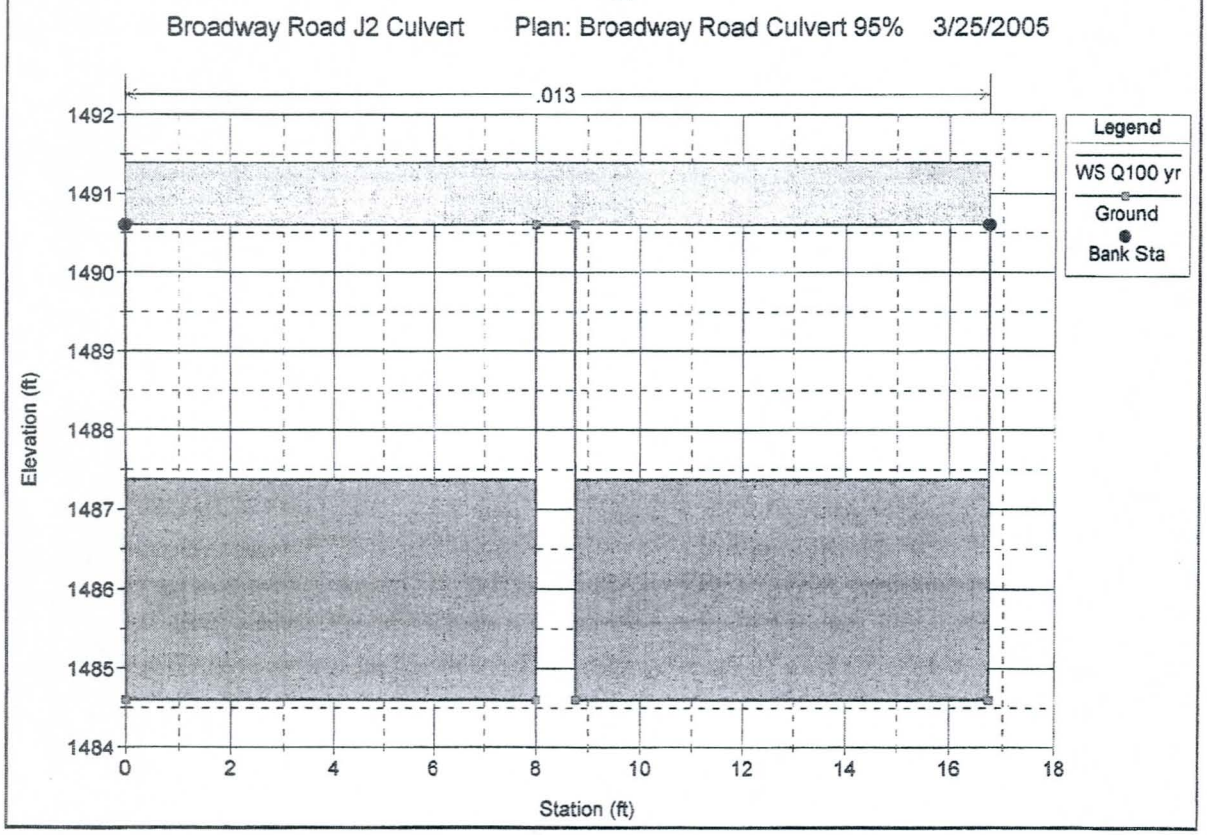
8
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1492
1491
1490
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1485
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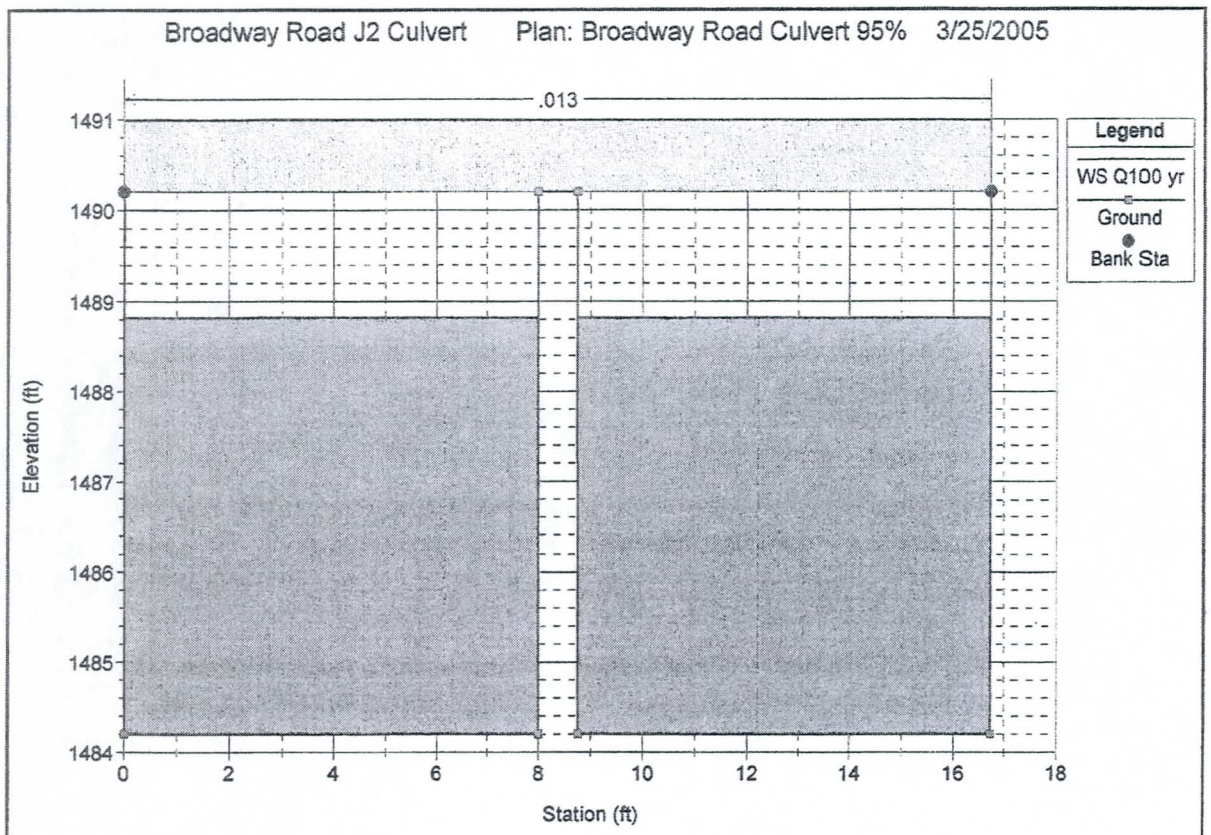
10
12
14
16
18
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1491
1490
1489
1488
1487
1486
1485
1484
0
2
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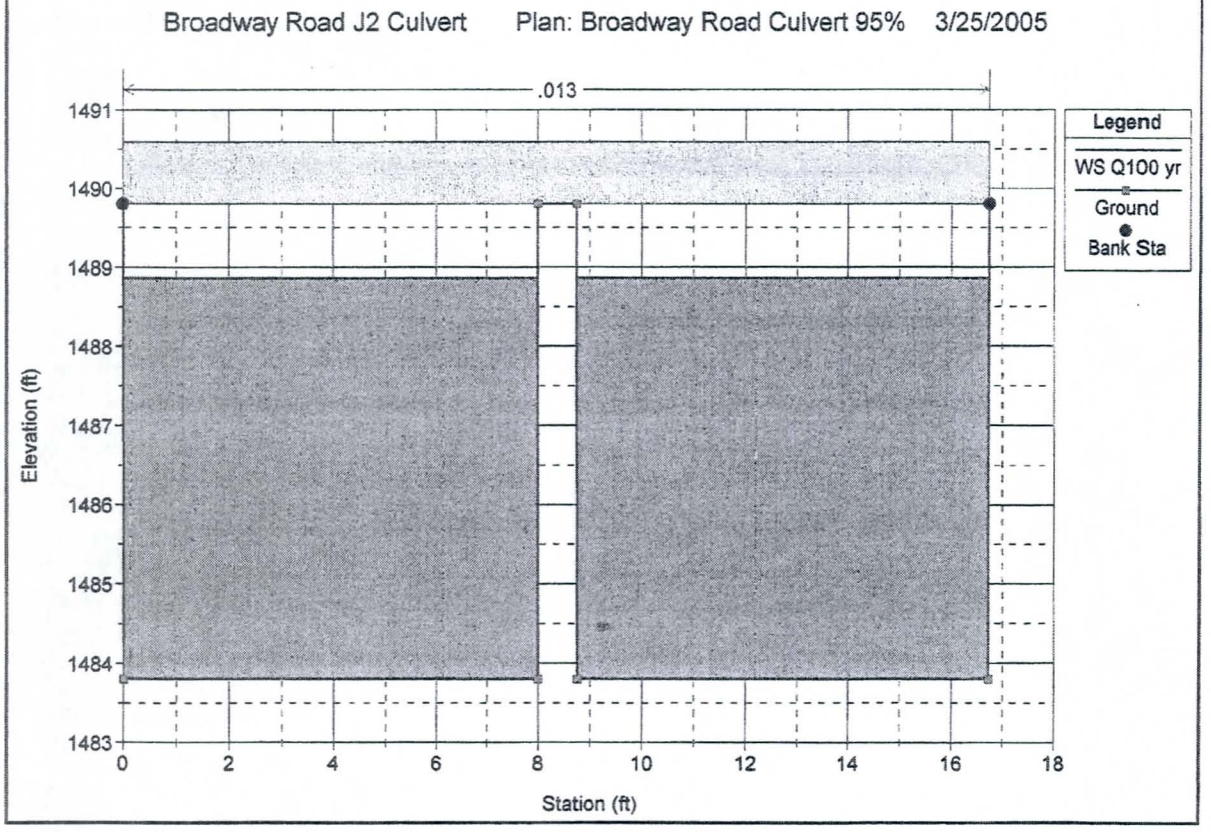
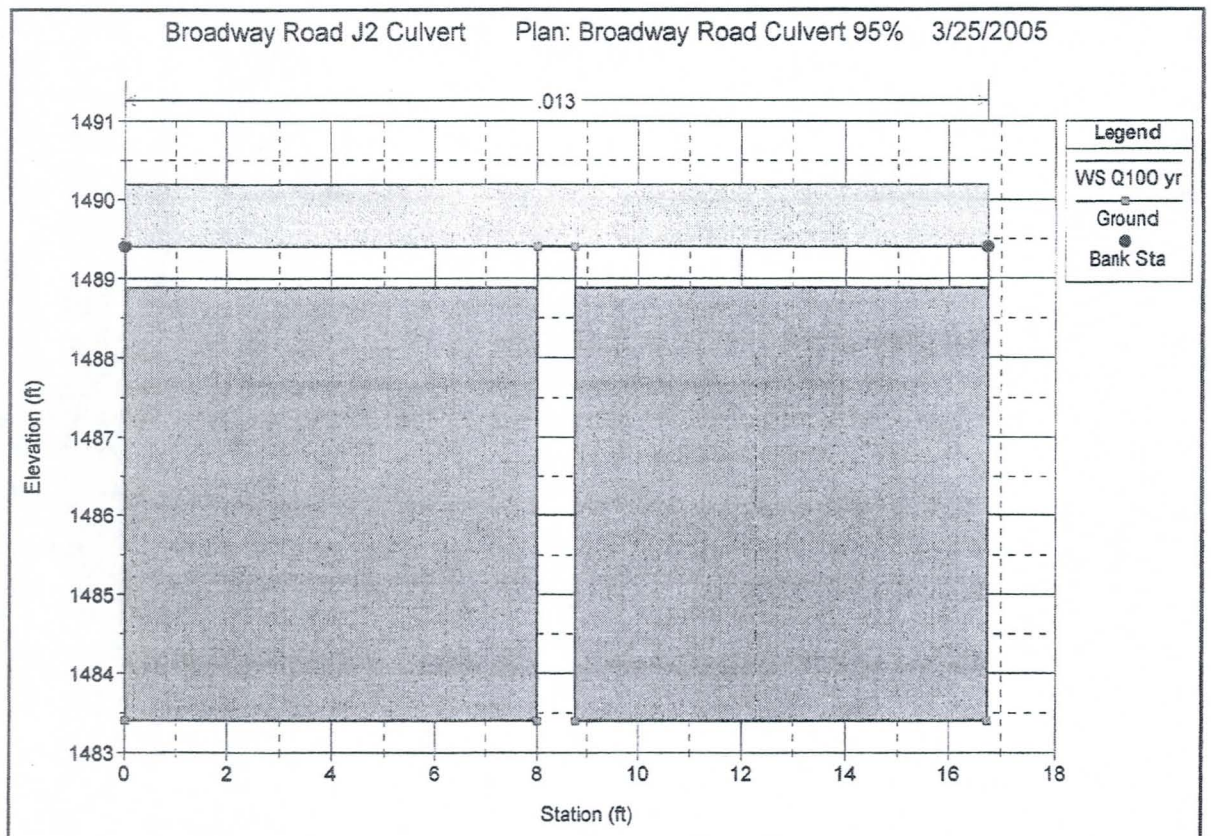
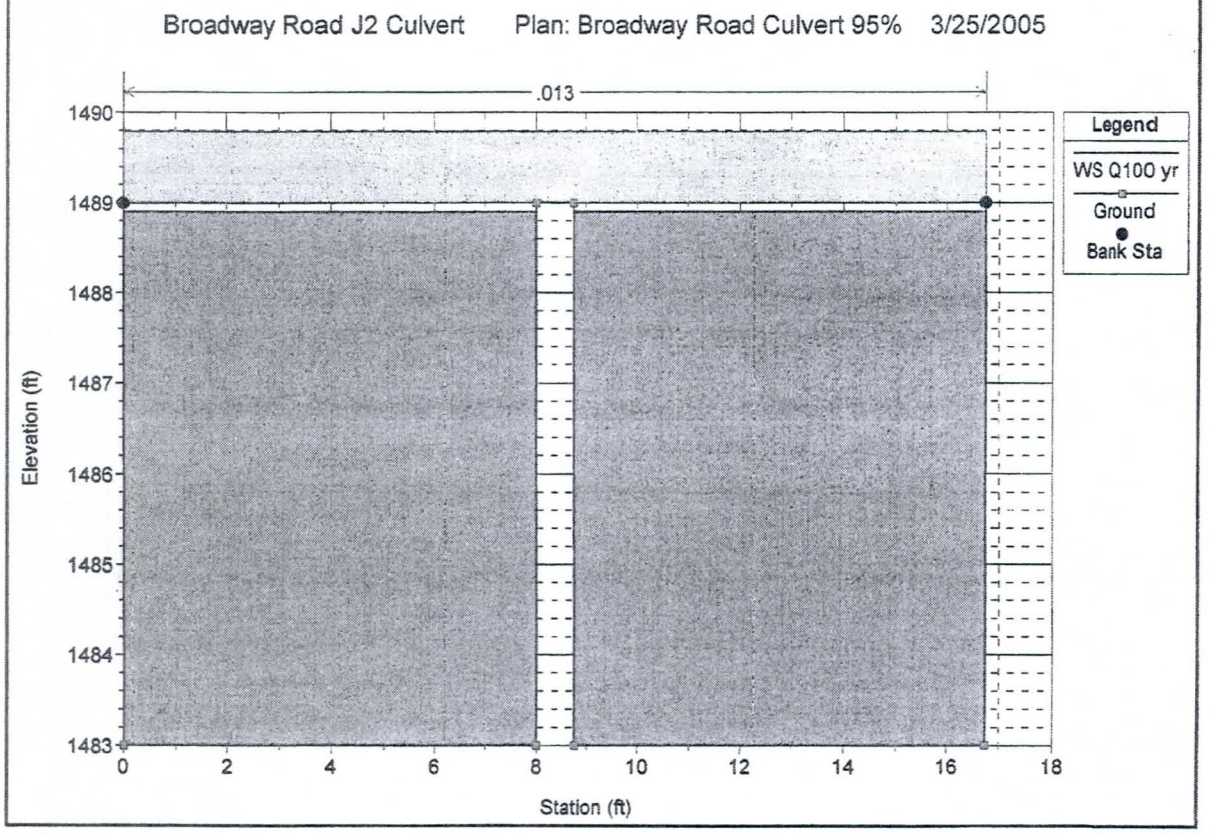
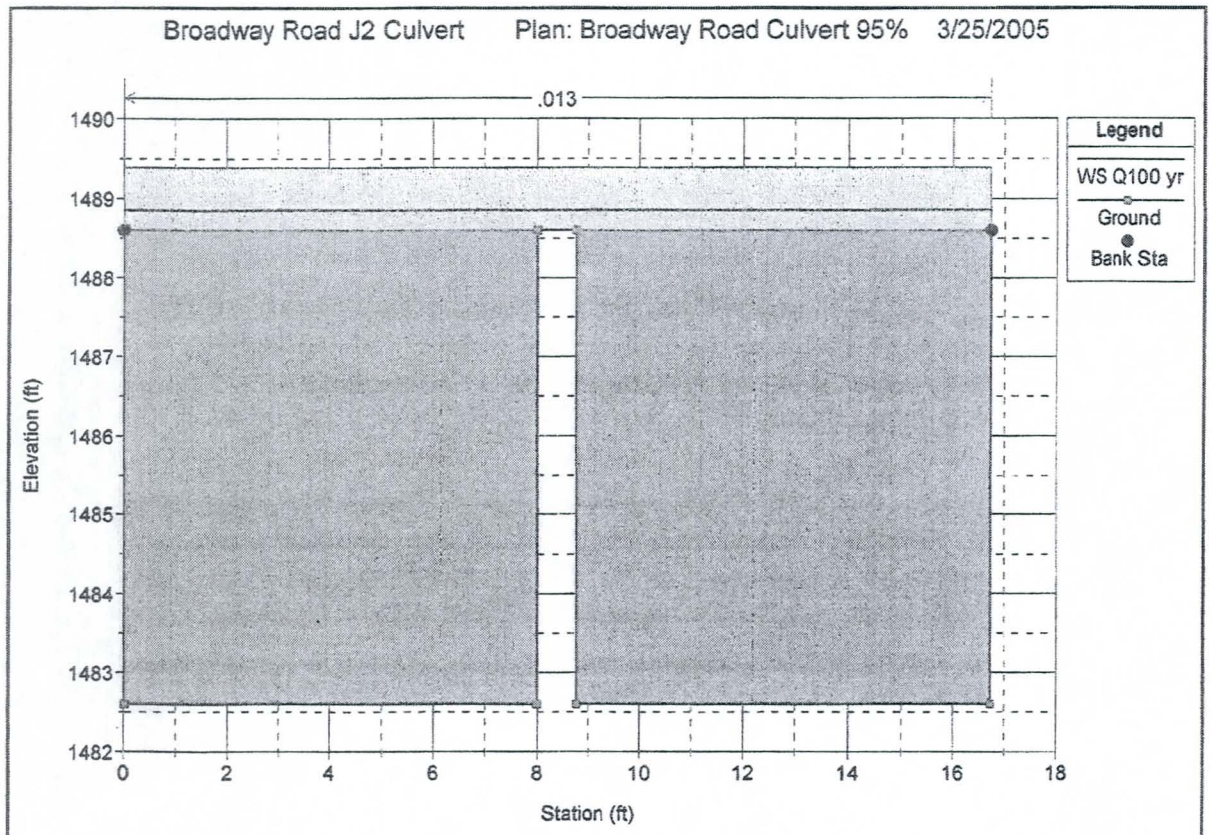
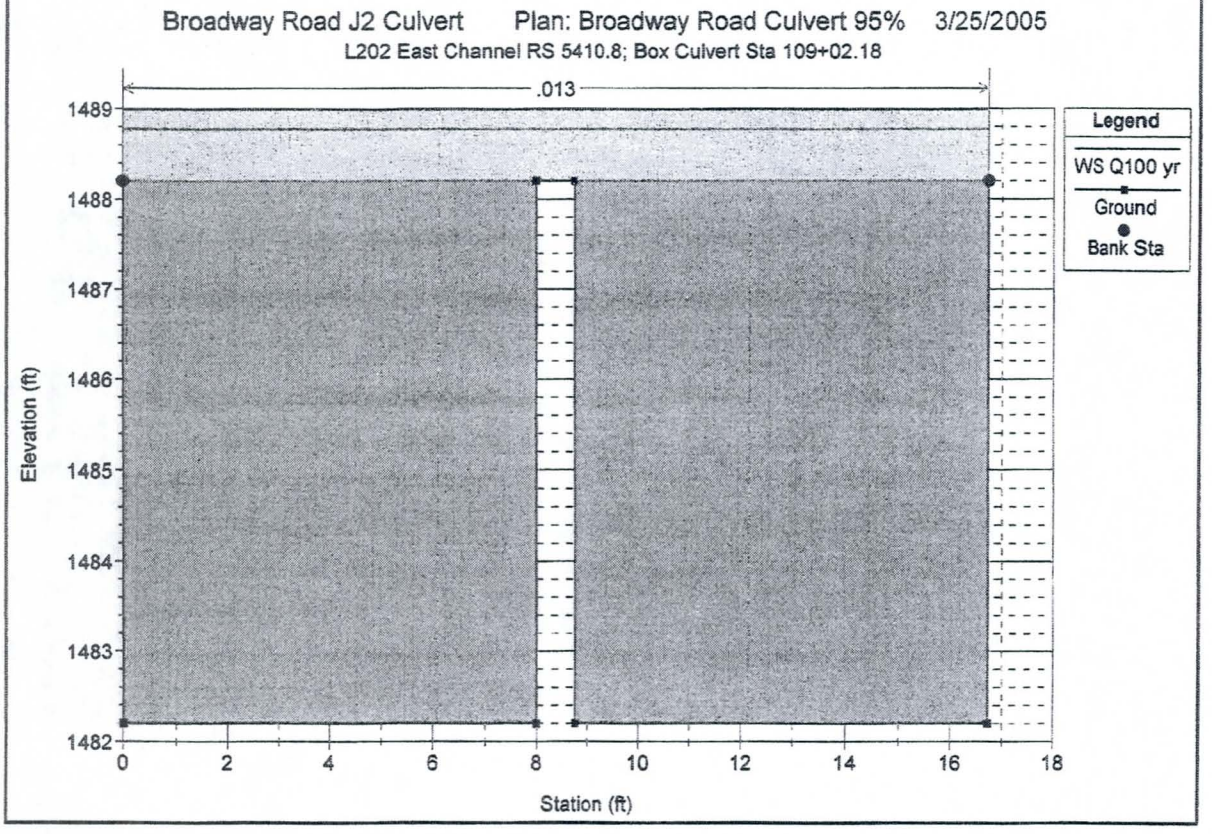
14
16
18


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)
1491
1490
1489
1488
1487
1486
1485
1484
1483
0
2
4
6
8
10
12
14
16
18


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
Station (ft)


Broadway Road J2 Culvert Plan: Broadway Road Culvert 95% 3/25/2005
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1490
1489
1488
1487
1486
1485
1484
1483
1482
0
2
4
6
8
10
12
14
16
18
Station (ft)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L202 East Channel RS 5410.8; Box Culvert Sta 109+02.18
.013
Legend
WS Q100 yr
Ground
Bank Sta
Elevation (ft)
1489
1488
1487
1486
1485
1484
1483
1482
0
2
4
6
8
10
12
14
16
18
Station (ft)

```
HEC-RAS Version 3.1.2 April 2004
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: West Channel
Project File : westchan.prj
Run Date and Time: 3/25/2005 1:30:50 PM

Project in English units

Project Description:
Red Mountain Freeway (202L) - University Drive to Southern Avenue
West Channel
at Broadway Road
Q100 = 135 cfs

Existing Condition modeled using ADOT
topo/dtm
Plan - "Existing Manning n=0.045"
Plan - "Existing Manning
n=0.035"

PLAN DATA

Plan Title: West Channel 95%
Plan File : p:\040024\Eng\Programs\HEC-RAS\westchan.p05

Geometry Title: West Channel 95%
Geometry File : p:\040024\Eng\Programs\HEC-RAS\westchan.g05

Flow Title : West Channel
Flow File : p:\040024\Eng\Programs\HEC-RAS\westchan.f02

Plan Summary Information:

Number of:	Cross Sections =	19	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

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

Computation Options

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

WEST CHANNEL

FLOW DATA

Flow Title: West Channel
Flow File : p:\040024\Eng\Programs\HEC-RAS\westchan.f02

Flow Data (cfs)

River	Reach	RS	Q100
West Channel	1	565.39	135
West Channel	1	0	135

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
West Channel	1	Q100	Normal S = 0.0089	Normal S = 0.006

GEOMETRY DATA

Geometry Title: West Channel 95%
Geometry File : p:\040024\Eng\Programs\HEC-RAS\westchan.g05

CROSS SECTION

RIVER: West Channel
REACH: 1 RS: 565.39

```
INPUT
Description: West Channel sta 194+77.86
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1495.27       3 1492.27       11 1492.27       14 1495.27

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 516.672*

INPUT
Description:
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1494.83       3 1491.83       11 1491.83       14 1494.83

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 467.955*

INPUT
Description:
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1494.39       3 1491.39       11 1491.39       14 1494.39

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 419.238*

INPUT
Description:
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1493.95       3 1490.95       11 1490.95       14 1493.95

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 370.520*

INPUT
Description:
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1493.51       3 1490.51       11 1490.51       14 1493.51

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 321.803*

INPUT
Description:
Station Elevation Data     num=       4
     Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev
       0 1493.07       3 1490.07       11 1490.07       14 1493.07

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013       14    .013
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 273.086*

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1492.64       3 1489.64      11 1489.64      14 1492.64

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 224.369*

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  1492.2       3  1489.2      11  1489.2      14  1492.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 175.651*

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.76       3 1488.76      11 1488.76      14 1491.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 126.934*

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.32       3 1488.32      11 1488.32      14 1491.32

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 78.2173*

INPUT
Description:
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1490.88       3 1487.88      11 1487.88      14 1490.88

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14             48.72   48.72   48.72             .1       .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 29.5

INPUT
Description: West Channel sta 200+13.75
```

```
Station Elevation Data     num=       4
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 1490.44       3 1487.44      11 1487.44      14 1490.44

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013      14    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0      14                 2       2       2              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 27.5

INPUT
Description: West Channel sta 200+15.75
Station Elevation Data     num=       6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0  1490.5      .1 1490.22     2.8 1487.42    10.8 1487.42   13.59 1490.22
    13.6  1490.5

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013    13.6    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    13.6                4.25    4.25    4.25              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 23.125*

INPUT
Description:
Station Elevation Data     num=       7
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 1490.64     .03 1488.89     .11 1488.67    2.36 1486.33   10.36 1486.33
    12.7 1488.68   12.71 1490.64

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013   12.71    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   12.71                4.25    4.25    4.25              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 18.75*

INPUT
Description:
Station Elevation Data     num=       7
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 1490.78     .05 1487.28     .12 1487.13    1.91 1485.24    9.91 1485.24
   11.81 1487.15   11.82 1490.78

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013   11.82    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   11.82                4.25    4.25    4.25              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 14.375*

INPUT
Description:
Station Elevation Data     num=       7
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 1490.93     .08 1485.68     .12 1485.58    1.46 1484.14    9.47 1484.14
   10.92 1485.61   10.93 1490.93

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
       0    .013       0    .013   10.93    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   10.93                4.25    4.25    4.25              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                   RS: 10

INPUT
Description: West Channel sta 200+33.26
Station Elevation Data     num=       6
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
       0 1491.07      .1 1484.07    1.02 1483.05    9.02 1483.05   10.03 1484.07
   10.04 1491.07

Manning's n Values         num=       3
     Sta   n Val      Sta   n Val      Sta   n Val
```

```
      0    .013       0    .013   10.04    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0   10.04                 5       5       5              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 5.*

INPUT
Description:
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.23      .1 1483.53     .56 1483.02    8.51 1483.02    9.01 1483.53
    9.02 1491.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013    9.02    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0    9.02                 5       5       5              .1      .3

CROSS SECTION


RIVER: West Channel
REACH: 1                  RS: 0

INPUT
Description: West Channel Sta 200+43.26
Station Elevation Data    num=       4
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 1491.39      .1 1482.99    7.99 1482.99       8 1491.39

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013       0    .013       8    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             0       8                 0       0       0              .1      .3


SUMMARY OF MANNING'S N VALUES

River:West Channel
```

Reach	River Sta.	n1	n2	n3
1	565.39	.013	.013	.013
1	516.672*	.013	.013	.013
1	467.955*	.013	.013	.013
1	419.238*	.013	.013	.013
1	370.520*	.013	.013	.013
1	321.803*	.013	.013	.013
1	273.086*	.013	.013	.013
1	224.369*	.013	.013	.013
1	175.651*	.013	.013	.013
1	126.934*	.013	.013	.013
1	78.2173*	.013	.013	.013
1	29.5	.013	.013	.013
1	27.5	.013	.013	.013
1	23.125*	.013	.013	.013
1	18.75*	.013	.013	.013
1	14.375*	.013	.013	.013
1	10	.013	.013	.013
1	5.*	.013	.013	.013
1	0	.013	.013	.013

SUMMARY OF REACH LENGTHS

River: West Channel

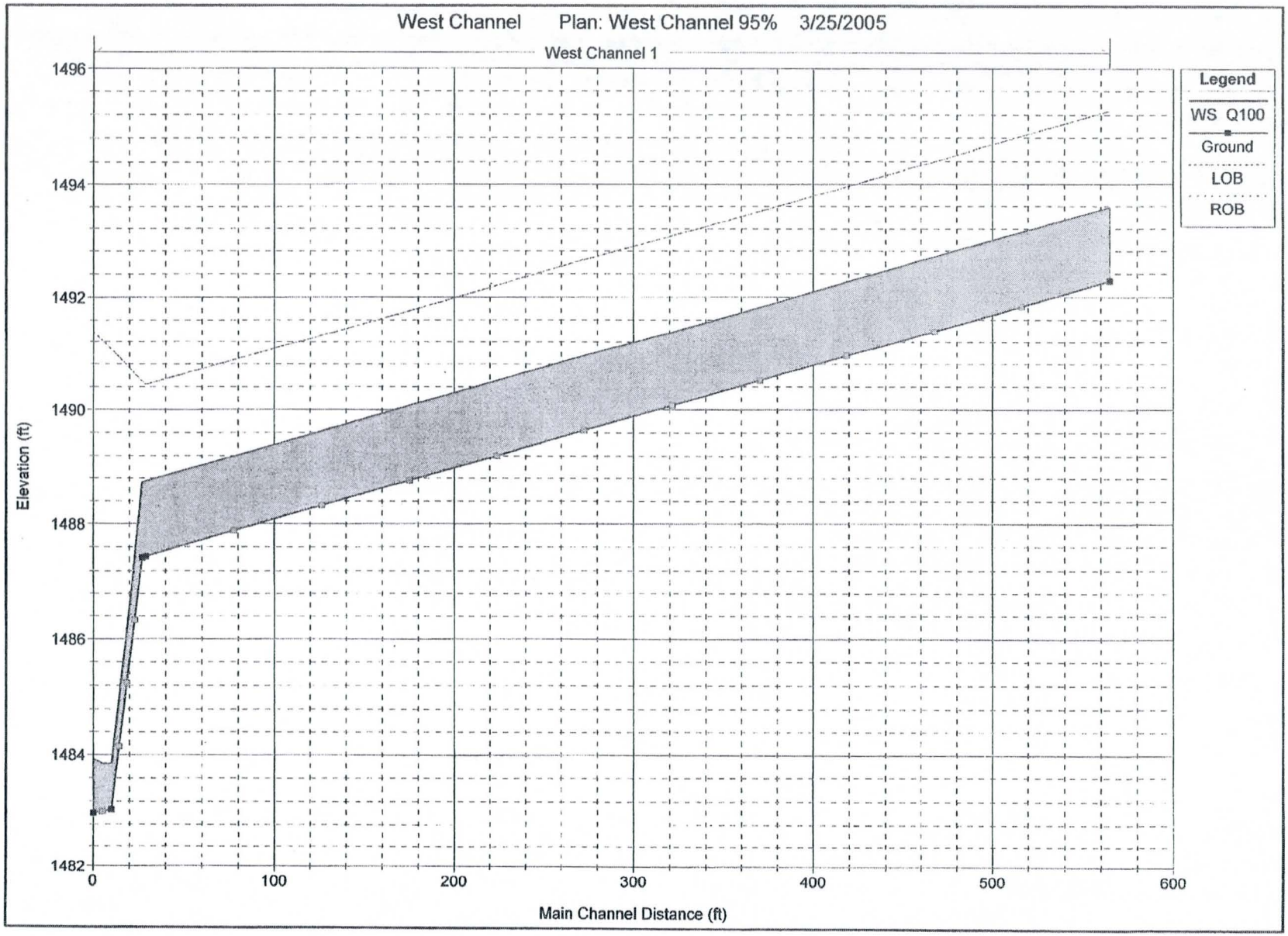
Reach	River Sta.	Left	Channel	Right
1	565.39	48.72	48.72	48.72
1	516.672*	48.72	48.72	48.72
1	467.955*	48.72	48.72	48.72
1	419.238*	48.72	48.72	48.72
1	370.520*	48.72	48.72	48.72
1	321.803*	48.72	48.72	48.72
1	273.086*	48.72	48.72	48.72
1	224.369*	48.72	48.72	48.72
1	175.651*	48.72	48.72	48.72
1	126.934*	48.72	48.72	48.72
1	78.2173*	48.72	48.72	48.72
1	29.5	2	2	2
1	27.5	4.25	4.25	4.25
1	23.125*	4.25	4.25	4.25
1	18.75*	4.25	4.25	4.25
1	14.375*	4.25	4.25	4.25
1	10	5	5	5
1	5.*	5	5	5
1	0	0	0	0

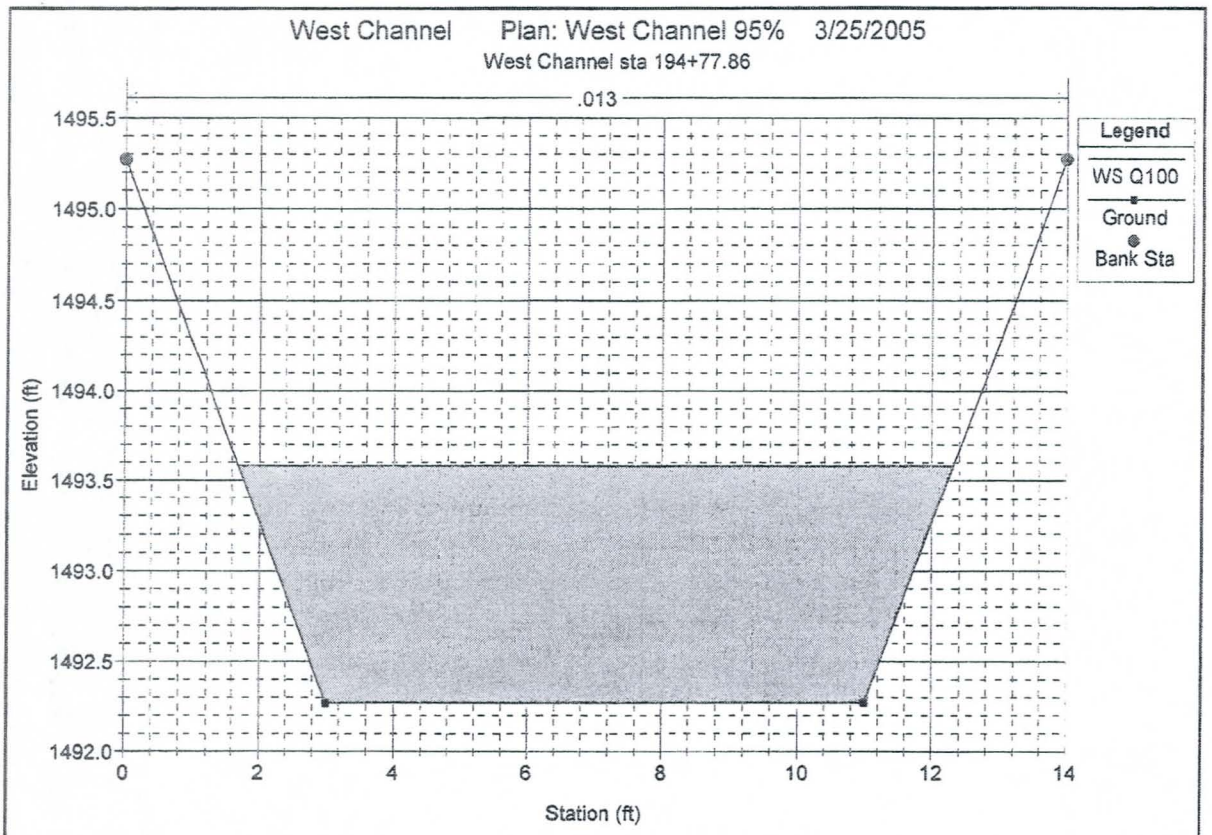
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: West Channel

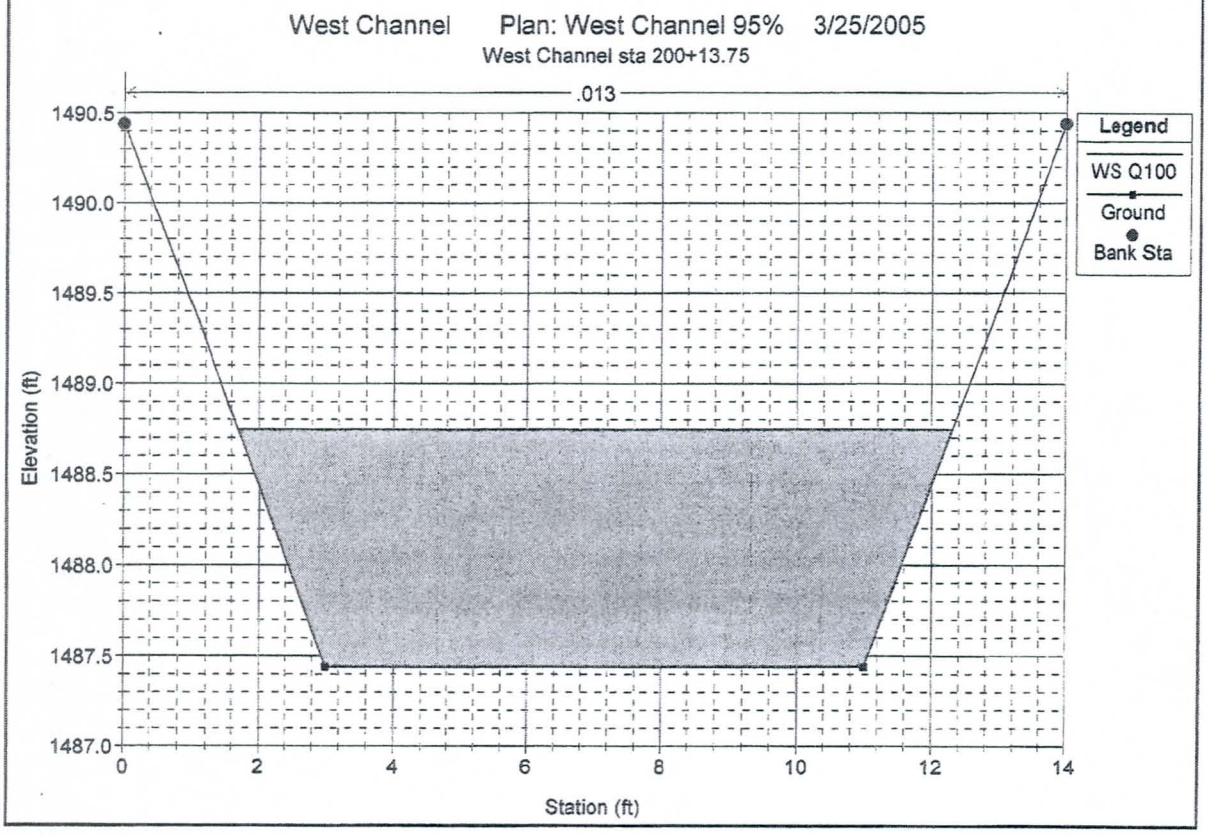
Reach	River Sta.	Contr.	Expan.
1	565.39	.1	.3
1	516.672*	.1	.3
1	467.955*	.1	.3
1	419.238*	.1	.3
1	370.520*	.1	.3
1	321.803*	.1	.3
1	273.086*	.1	.3
1	224.369*	.1	.3
1	175.651*	.1	.3
1	126.934*	.1	.3
1	78.2173*	.1	.3
1	29.5	.1	.3
1	27.5	.1	.3
1	23.125*	.1	.3
1	18.75*	.1	.3
1	14.375*	.1	.3
1	10	.1	.3
1	5.*	.1	.3
1	0	.1	.3

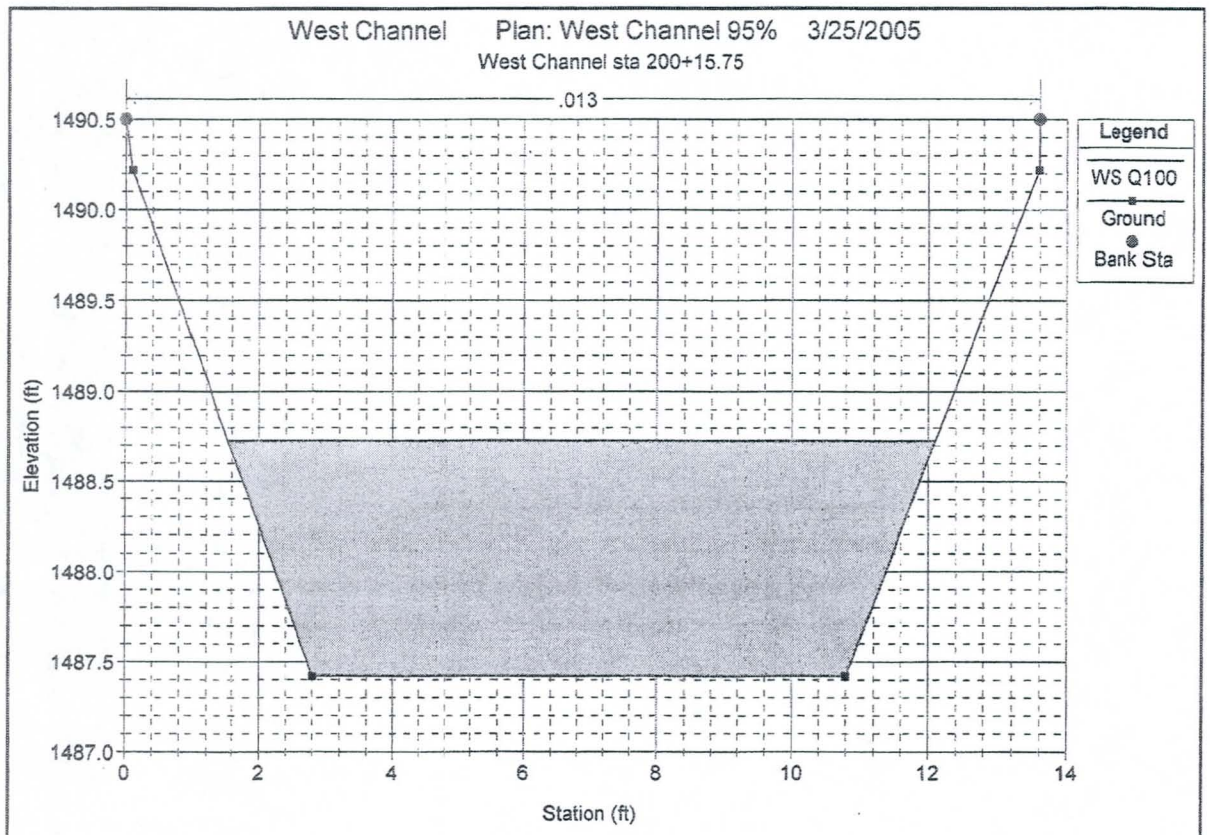
Profile Output Table - Standard Table 1

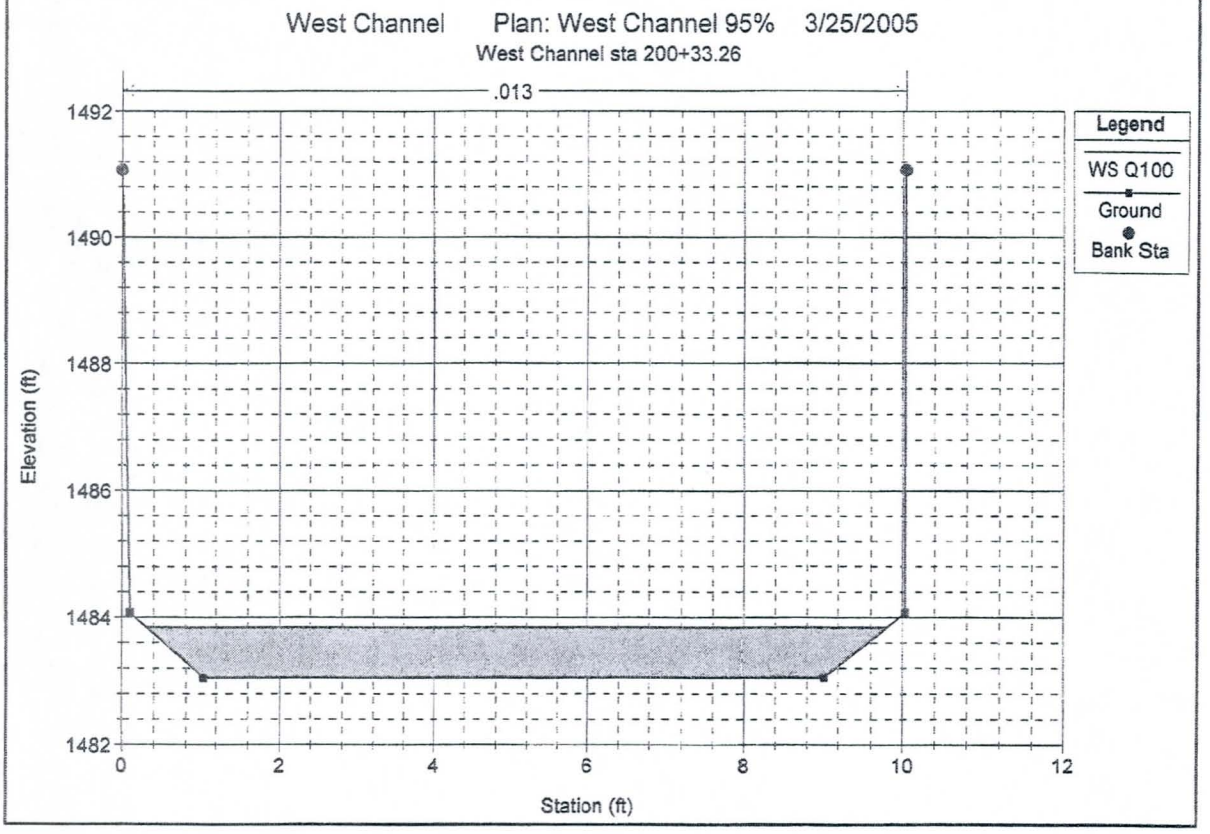
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	565.39	Q100	135.00	1492.27	1493.58	1494.16	1495.49	0.008902	11.08	12.19	10.62	1.82
1	516.672*	Q100	135.00	1491.83	1493.14	1493.73	1495.04	0.008869	11.07	12.20	10.62	1.82
1	467.955*	Q100	135.00	1491.39	1492.70	1493.28	1494.61	0.008976	11.11	12.15	10.61	1.83
1	419.238*	Q100	135.00	1490.95	1492.25	1492.84	1494.18	0.009013	11.13	12.13	10.61	1.83
1	370.520*	Q100	135.00	1490.51	1491.82	1492.41	1493.73	0.008973	11.11	12.15	10.61	1.83
1	321.803*	Q100	135.00	1490.07	1491.38	1491.96	1493.29	0.008928	11.09	12.17	10.62	1.83
1	273.086*	Q100	135.00	1489.64	1490.95	1491.54	1492.86	0.008928	11.09	12.17	10.62	1.83
1	224.369*	Q100	135.00	1489.20	1490.51	1491.09	1492.42	0.008995	11.12	12.14	10.61	1.83
1	175.651*	Q100	135.00	1488.76	1490.07	1490.65	1491.98	0.008919	11.09	12.18	10.62	1.82
1	126.934*	Q100	135.00	1488.32	1489.63	1490.22	1491.54	0.008993	11.12	12.14	10.61	1.83
1	78.2173*	Q100	135.00	1487.88	1489.19	1489.78	1491.10	0.008908	11.08	12.18	10.62	1.82
1	29.5	Q100	135.00	1487.44	1488.75	1489.33	1490.66	0.008990	11.12	12.14	10.61	1.83
1	27.5	Q100	135.00	1487.42	1488.73	1489.32	1490.65	0.008990	11.13	12.13	10.56	1.83
1	23.125*	Q100	135.00	1486.33	1487.39	1488.23	1490.48	0.018271	14.11	9.57	10.07	2.55
1	18.75*	Q100	135.00	1485.24	1486.17	1487.14	1490.28	0.028058	16.27	8.30	9.81	3.12
1	14.375*	Q100	135.00	1484.14	1484.99	1486.02	1490.04	0.038456	18.04	7.48	9.64	3.61
1	10	Q100	135.00	1483.05	1483.84	1484.94	1489.77	0.049003	19.54	6.91	9.49	4.04
1	5.*	Q100	135.00	1483.02	1483.85	1484.97	1489.44	0.043349	18.98	7.11	8.91	3.75
1	0	Q100	135.00	1482.99	1483.92	1485.07	1489.13	0.037260	18.31	7.37	7.90	3.34

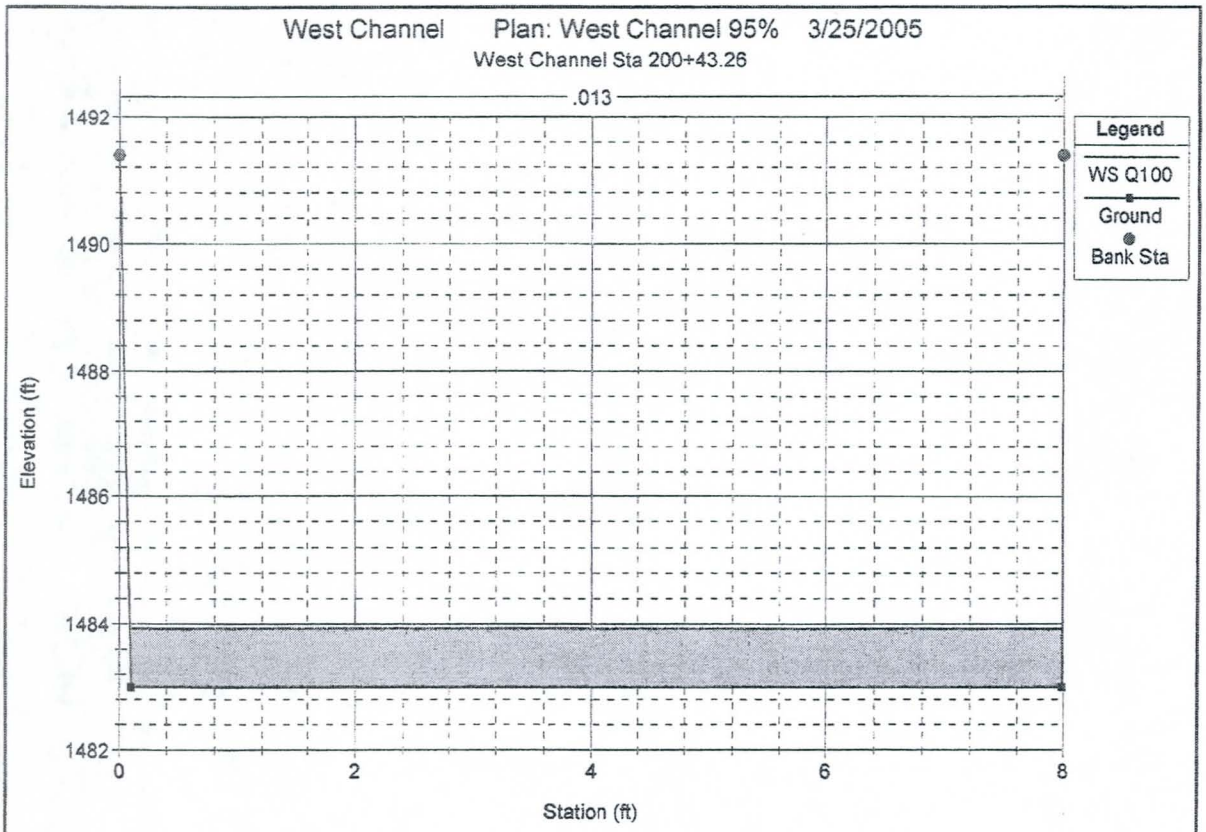

West Channel Plan: West Channel 95% 3/25/2005
West Channel 1
Legend
WS Q100
Ground
LOB
ROB
Elevation (ft)
1496
1494
1492
1490
1488
1486
1484
1482
0
100
200
300
400
500
600
Main Channel Distance (ft)


West Channel Plan: West Channel 95% 3/25/2005
West Channel sta 194+77.86
.013
Legend
WS Q100
Ground
Bank Sta
Elevation (ft)
1495.5
1495.0
1494.5
1494.0
1493.5
1493.0
1492.5
1492.0
0
2
4
6
8
10
12
14
Station (ft)


West Channel Plan: West Channel 95% 3/25/2005
West Channel sta 200+13.75
.013
Legend
WS Q100
Ground
Bank Sta
Elevation (ft)
1490.5
1490.0
1489.5
1489.0
1488.5
1488.0
1487.5
1487.0
0
2
4
6
8
10
12
14
Station (ft)


West Channel Plan: West Channel 95% 3/25/2005
West Channel sta 200+15.75
.013
Legend
WS Q100
Ground
Bank Sta
Elevation (ft)
1490.5
1490.0
1489.5
1489.0
1488.5
1488.0
1487.5
1487.0
0
2
4
6
8
10
12
14
Station (ft)

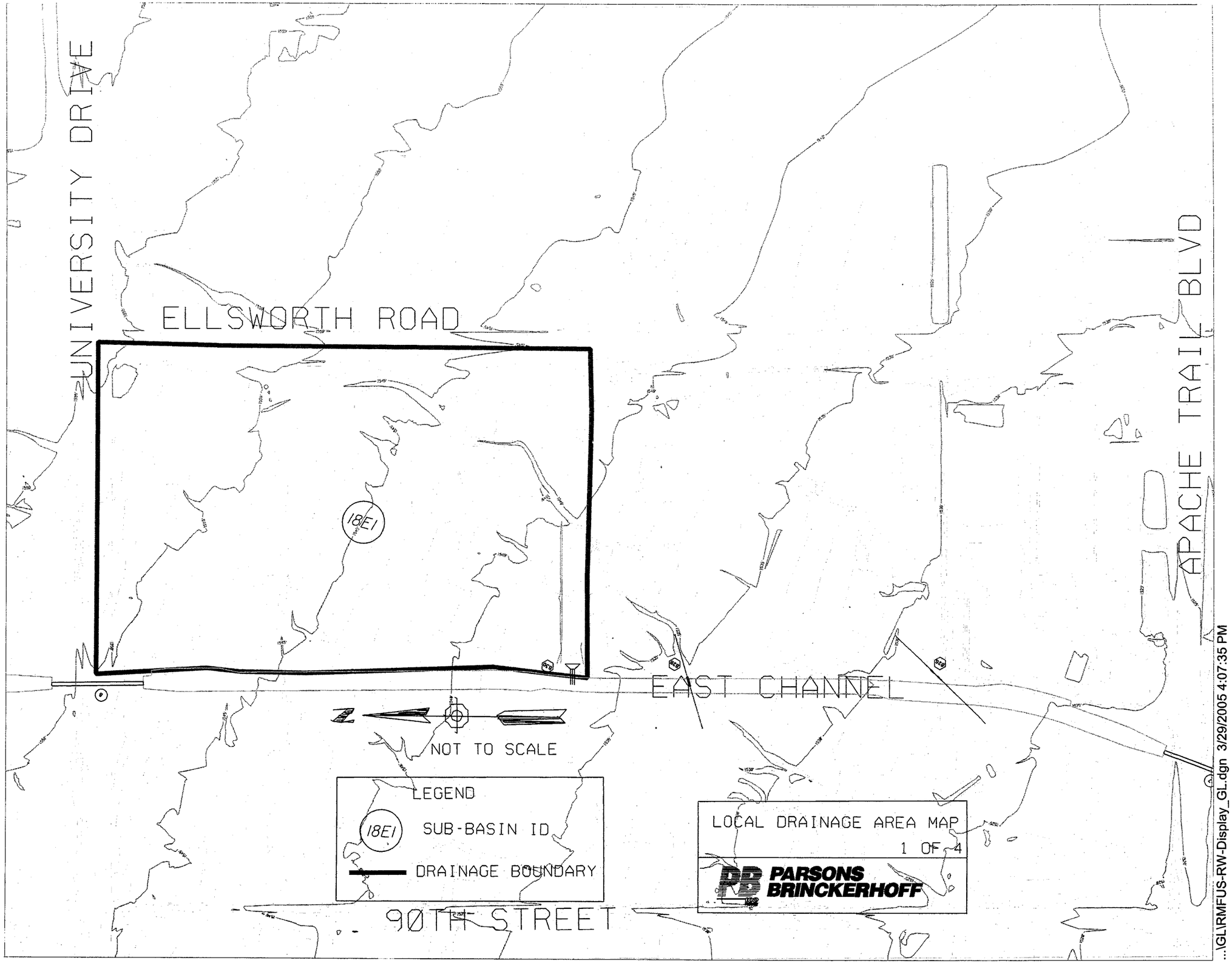

West Channel Plan: West Channel 95% 3/25/2005
West Channel sta 200+33.26
.013
Legend
WS Q100
Ground
Bank Sta
Elevation (ft)
1492
1490
1488
1486
1484
1482
0
2
4
6
8
10
12
Station (ft)


West Channel Plan: West Channel 95% 3/25/2005
West Channel Sta 200+43.26
.013
Legend
WS Q100
Ground
Bank Sta
Elevation (ft)
1492
1490
1488
1486
1484
1482
0
2
4
6
8
Station (ft)

APPENDIX F

OFF-SITE LOCAL DRAINAGE CALCULATIONS

- OFF-SITE LOCAL DRAINAGE AREA MAPS
- HYDROLOGIC AND HYDRAULIC CALCULATIONS FOR OFF-SITE LOCAL DRAINAGE



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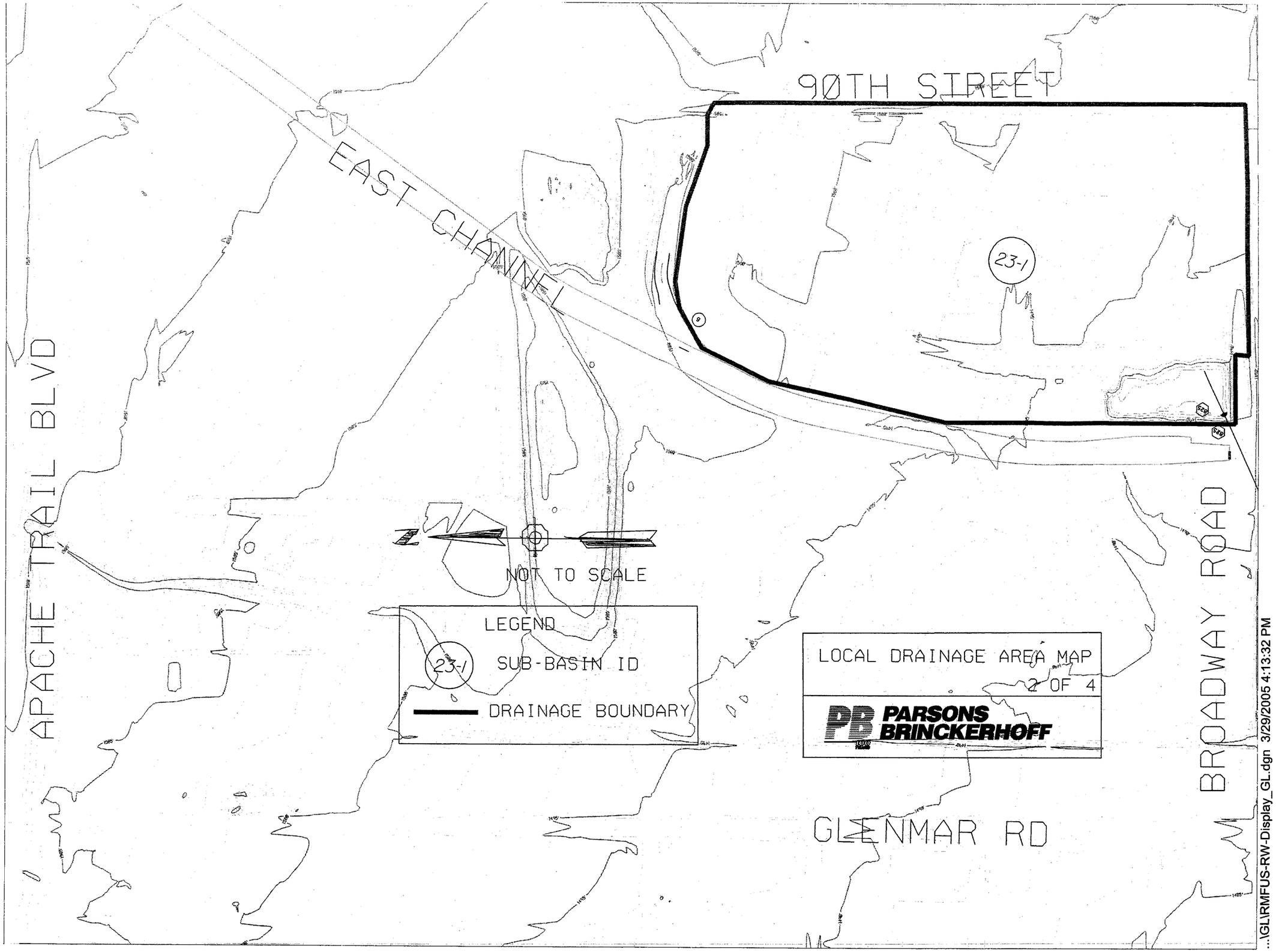

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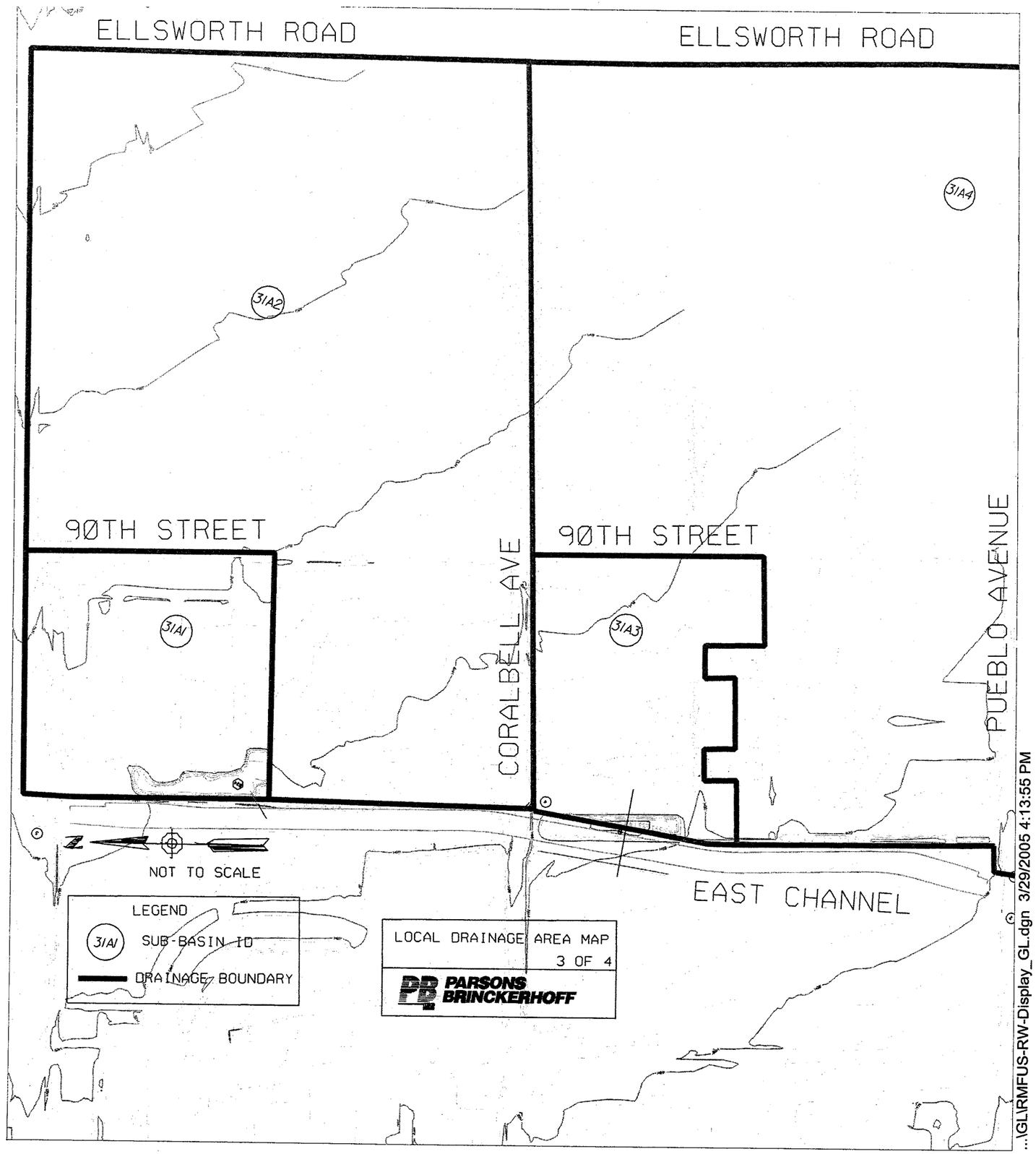

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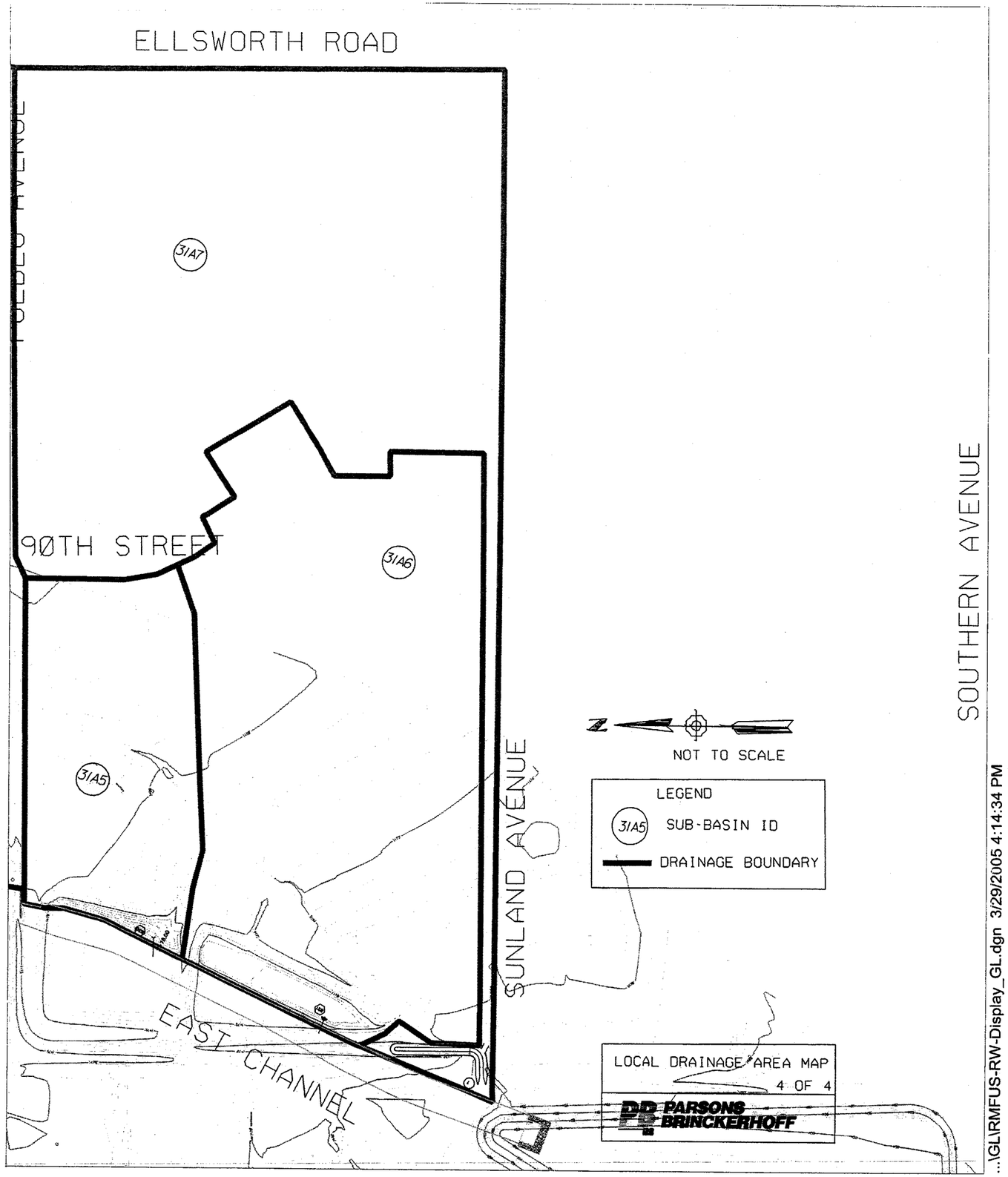

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PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

Made by GL

Date 3/23/05

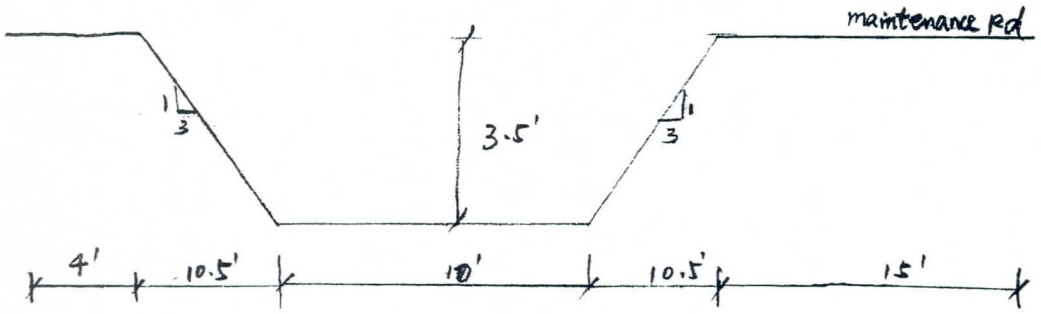
Checked by ____

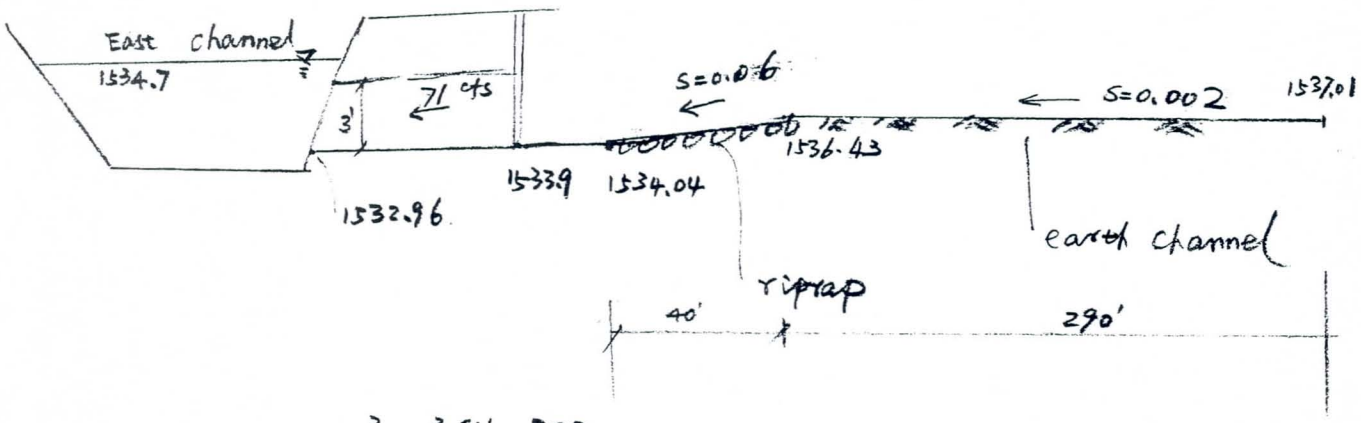
Date ____

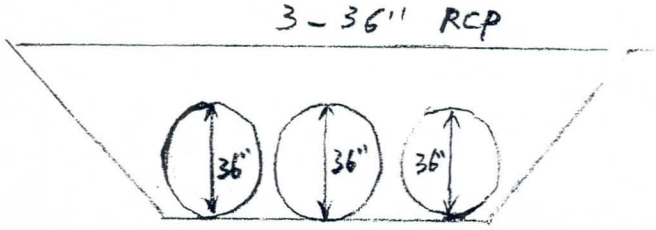
Subject Local drainage design for sub-basin 18E1
1. proposed ADOT channel
2. pipe #830

Q = 71 cfs (See next page)

Proposed ADOT channel dimension:







Pipe # 830

ADOT Channel - Earth channel portion
Worksheet for Trapezoidal Channel

Project Description	
Worksheet	Trapezoidal Channel - earth channe
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coeffic	0.025	
Slope	002000	ft/ft
Left Side Slope	3.00	H : V
Right Side Slope	3.00	H : V
Bottom Width	10.00	ft
Discharge	71.00	cfs

Results		
Depth	1.61	ft
Flow Area	23.9	ft²
Wetted Perim	20.18	ft
Top Width	19.66	ft
Critical Depth	1.04	ft
Critical Slope	0.009919	ft/ft
Velocity	2.97	ft/s
Velocity Head	0.14	ft
Specific Energ	1.75	ft
Froude Numb	0.48	
Flow Type	Subcritical	

Culvert Calculator Report
Culvert @ Station 98+00

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,537.50	ft	Headwater Depth/Height	0.77	
Computed Headwater Elev	1,536.22	ft	Discharge	71.00	cfs
Inlet Control HW Elev.	1,536.08	ft	Tailwater Elevation	1,534.07	ft
Outlet Control HW Elev.	1,536.22	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,533.90	ft	Downstream Invert	1,532.96	ft
Length	34.00	ft	Constructed Slope	0.027647	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	1.08	ft
Slope Type	Steep		Normal Depth	0.94	ft
Flow Regime	Supercritical		Critical Depth	1.57	ft
Velocity Downstream	10.32	ft/s	Critical Slope	0.004344	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	3.00	ft
Section Size	36 inch		Rise	3.00	ft
Number Sections	3				

Outlet Control Properties					
Outlet Control HW Elev.	1,536.22	ft	Upstream Velocity Head	0.62	ft
Ke	0.20		Entrance Loss	0.12	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,536.08	ft	Flow Control	Unsubmerged	
Inlet Type	Beveled ring, 33.7° bevels		Area Full	21.2	ft²
K	0.00180		HDS 5 Chart	3	
M	2.50000		HDS 5 Scale	B	
C	0.02430		Equation Form	1	
Y	0.83000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page ____ of ____

Made by ____

Date ____

Checked by ____

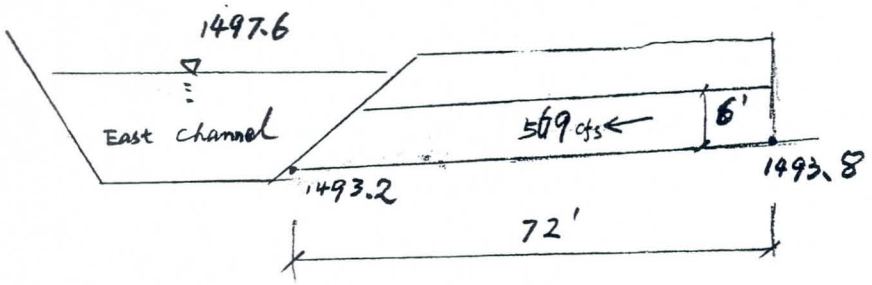
Date ____

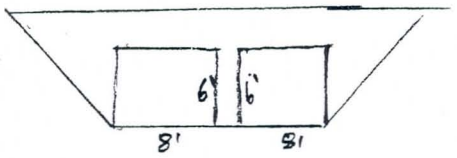
Subject Red Mountain Freeway, University Drive to Southern Ave: Culvert design (#6), between Broadway & Apach

Based on HEC-1 for the study.

Q at confluence with East channel is 569 cfs (17CT23)

This flow is used for culvert #6 design:





Culvert Calculator Report
Culvert@Sta66+12

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,500.30	ft	Headwater Depth/Height	1.05	
Computed Headwater Elev:	1,500.09	ft	Discharge	569.00	cfs
Inlet Control HW Elev.	1,499.59	ft	Tailwater Elevation	1,497.60	ft
Outlet Control HW Elev.	1,500.09	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,493.80	ft	Downstream Invert	1,493.20	ft
Length	72.00	ft	Constructed Slope	0.008333	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	4.40	ft
Slope Type	Steep		Normal Depth	2.54	ft
Flow Regime	N/A		Critical Depth	3.40	ft
Velocity Downstream	8.08	ft/s	Critical Slope	0.003719	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 6 ft		Rise	6.00	ft
Number Sections	2				

Outlet Control Properties					
Outlet Control HW Elev.	1,500.09	ft	Upstream Velocity Head	1.70	ft
Ke	0.70		Entrance Loss	1.19	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,499.59	ft	Flow Control	Unsubmerged	
Inlet Type	0° wingwall flares		Area Full	96.0	ft^2
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	3	
C	0.04230		Equation Form	1	
Y	0.82000				

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Parsons Brinckerhoff
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PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

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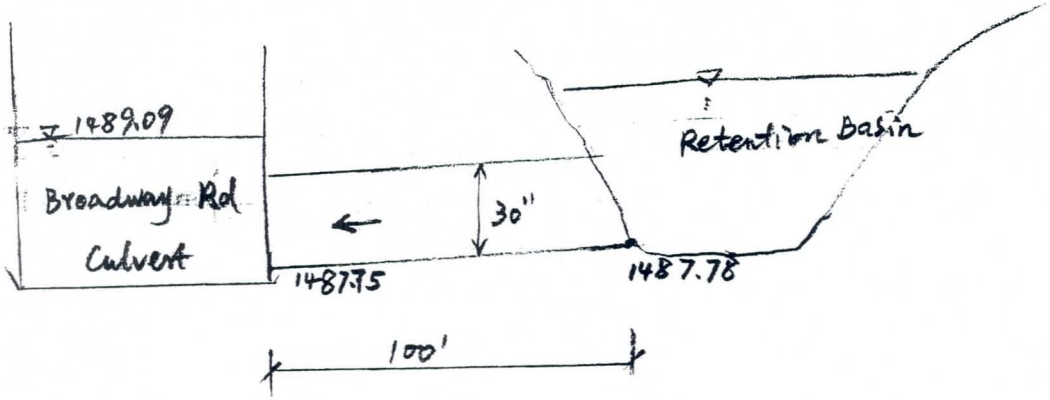
Checked by _____

Date _____

Subject Local drainage design for sub-basin 23-1 Pipe #825, At northeast corner of Broadway Rd & East Channel

Sub-basin name: 23-1

Q = 16 cfs (see following pages)



Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

HEC-1 method was used to estimate some of the local drainage peark discharge.
Unit Hydrograph: Phonix Valley S graph
Storm Frequency: 100-year 24-hour
Rainfall Depth: 3.6 inch
Rainfall Distribution: SCS type II

Following parameters were evaluated based on mapping prepared for this project or based on FCDMC's Manual

A	Local drainage area (mi2)
L	Length of longest water course (mile)
Lca	Length along the water course to a ppoint opposite the centroid (mile)
H1	Hignest elevation of the water course
H2	Lowest elevation of the water course
S	Water course slope (ft/mile)
Kn	Estimated mean Manning's "n" (based on Appendix D.2 of FCDMC's Hydrology Manual)

Sub-basin ID	A		L		Lca		H1	H2	$L*Lca/S^{0.5}$	S	Kn
	(ft^2)	(mi^2)	(ft)	(mile)	(ft)	(mile)	(ft)	(ft)		(ft/mile)	
23-1	729171	0.026	1217	0.230	341	0.065	1503.5	1492	0.002107	49.89	0.0254

Rainfall Loss Method: Green and Empt Method (values obtained from HEC-1 study for this project)
IA: intial loss (inches)
DTHETA: volumetric mosture deficit
PSIF: Wetting front suction (inches)
SKSAT: Hydraulic conductivity at naturalsaturation (in/hr)
RTIMP: Percent of sub-basin which is impervious

Sub-basin ID	IA (in)	DTHETA	PSIF (in)	SKSAT (in/hr)	RTIMP (%)
23-1	0.22	0.26	4.1	0.54	30

Retention Basin Elevation-Area Relationship for Sub-basin 23-1

Elevation (ft)	1487	1488	1489	1490	1491
Arae (ft^2)	1468	16274	21108	25244	29606
Area (acre)	0.034	0.374	0.485	0.580	0.680

Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

Retention basin elevation -outflow relationship was estimated using CulvertMethod based pon proposed pipe dimention, inlet and outlet invert elevation, and tailwater elevation.

Retention Basin Elevation-outflow Relationship for Sub-basin 23-1

HW Elevation (ft)	1487	1488	1489	1490	1491
Discharge (cfs)	0	0	0	12.05	17.46

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*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   24MAR05  TIME  08:49:12  *
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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
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   Red Mountain Freeway, University Drive to Southern Avenue
  2           ID    100-year peak discharge estimation for sub-basin 23-1
  3           IT      5                    300
  4           IO      3

  5           KK
  6           KM   BASIN 23-1
  7           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  8           KM    L=       .2  Lca=       .1   S=   49.9  Kn= .025  LAG=   3.5
  9           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 10           BA     .03
 11           IN      15
 12           KM   RAINFALL DEPTH OF 3.60 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 13           KM   AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
 14           PB   3.600
 15           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 16           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 17           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 18           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 19           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 20           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 21           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 22           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 23           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 24           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 25           PC    .983    .986    .989    .992    .995    .998   1.000
 26           LG     .22     .26    4.10     .54   30.00
 27           UI    162.     39.      0.      0.      0.      0.      0.      0.      0.      0.
 28           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 29           KK   basin
 30           KM        Rtention basin
 31           RS       1    STOR      -1
 32           SA    0.03    0.37    0.48    0.58    0.68
 33           SE    1487    1488    1489    1490    1491
 34           SQ       0       0       0   12.05   17.46
 35           ZZ
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*             JUN  1998                *
*           VERSION 4.1                *
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*                                      *
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```

Red Mountain Freeway, University Drive to Southern Avenue
100-year peak discharge estimation for sub-basin 23-1

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

   IT        HYDROGRAPH TIME DATA
                   NMIN          5  MINUTES IN COMPUTATION INTERVAL
                  IDATE      1   0  STARTING DATE
                  ITIME       0000  STARTING TIME
                     NQ        300  NUMBER OF HYDROGRAPH ORDINATES
                 NDDATE      2   0  ENDING DATE
                 NDTIME       0055  ENDING TIME
                  ICENT         19  CENTURY MARK
```

```
         COMPUTATION INTERVAL      .08 HOURS
               TOTAL TIME BASE   24.92 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
```

*** ***

```
           ***************
           *             *
  5 KK     *             *
           *             *
           ***************
                    BASIN 23-1
                     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                     L=        .2  Lca=        .1   S=    49.9  Kn= .025  LAG=     3.5
                     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    RAINFALL DEPTH OF 3.60 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
                    AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
                    THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 11 IN         TIME DATA FOR INPUT TIME SERIES
                    JXMIN          15  TIME INTERVAL IN MINUTES
                   JXDATE      1    0  STARTING DATE
                   JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

 10 BA         SUBBASIN CHARACTERISTICS
                    TAREA         .03  SUBBASIN AREA

               PRECIPITATION DATA

 15 PB              STORM        3.60  BASIN TOTAL PRECIPITATION

 15 PI           INCREMENTAL  PRECIPITATION  PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
 26 LG          GREEN AND AMPT LOSS RATE
                      STRTL       .22  STARTING LOSS
                        DTH       .26  MOISTURE DEFICIT
                       PSIF      4.10  WETTING FRONT SUCTION
                      XKSAT       .54  HYDRAULIC CONDUCTIVITY
                     RTIMP      30.00  PERCENT IMPERVIOUS AREA

 26 UI          INPUT UNITGRAPH,   2 ORDINATES,   VOLUME =  .87
                  162.0      39.0

                                                                  ***

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

                     HYDROGRAPH AT STATION

   TOTAL RAINFALL =     3.60, TOTAL LOSS =     1.94, TOTAL EXCESS =     1.66

 PEAK FLOW    TIME                         MAXIMUM AVERAGE FLOW
                                  6-HR       24-HR       72-HR       24.92-HR
+   (CFS)     (HR)
                       (CFS)
+     55.    12.00                  4.          1.          1.           1.
                     (INCHES)     1.163       1.434       1.435        1.435
                      (AC-FT)        2.          2.          2.           2.

                     CUMULATIVE AREA =     .03 SQ MI
```

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

              **************
              *            *
  29 KK       *    basin   *
              *            *
              **************
                                  Rtention basin

                HYDROGRAPH ROUTING DATA

  31 RS           STORAGE ROUTING
                       NSTPS          1  NUMBER OF SUBREACHES
                        ITYP       STOR  TYPE OF INITIAL CONDITION
                       RSVRIC      -1.00  INITIAL CONDITION
                            X        .00  WORKING R AND D COEFFICIENT

  32 SA                AREA          .0        .4        .5        .6        .7

  33 SE            ELEVATION     1487.00   1488.00   1489.00   1490.00   1491.00

  34 SQ            DISCHARGE          0.        0.        0.       12.       17.
                                                                   ***

                                                COMPUTED STORAGE-ELEVATION DATA

              STORAGE        .00       .17       .59      1.12      1.75
            ELEVATION    1487.00   1488.00   1489.00   1490.00   1491.00

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

                          HYDROGRAPH AT STATION     basin

  PEAK FLOW      TIME                                MAXIMUM AVERAGE FLOW
                                          6-HR        24-HR        72-HR      24.92-HR
+   (CFS)        (HR)
                                  (CFS)
+     16.        12.08                     3.           1.           1.           1.
                                (INCHES)  1.077        1.169        1.169        1.169
                                 (AC-FT)     2.           2.           2.           2.

  PEAK STORAGE   TIME                                MAXIMUM AVERAGE STORAGE
                                          6-HR        24-HR        72-HR      24.92-HR
+  (AC-FT)       (HR)
       2.       12.08                     1.           1.           1.           1.

  PEAK STAGE     TIME                                MAXIMUM AVERAGE STAGE
                                          6-HR        24-HR        72-HR      24.92-HR
+   (FEET)       (HR)
   1490.75      12.08                  1489.31      1488.80      1488.77      1488.77

                          CUMULATIVE AREA =     .03 SQ MI

1
                                                  RUNOFF SUMMARY
                                            FLOW IN CUBIC FEET PER SECOND
                                         TIME IN HOURS,  AREA IN SQUARE MILES

                                                PEAK    TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM    TIME OF
          OPERATION        STATION              FLOW    PEAK                                           AREA      STAGE      MAX STAGE
+                                                                     6-HOUR      24-HOUR     72-HOUR
          HYDROGRAPH AT
+                                                  55.   12.00          4.          1.          1.       .03
          ROUTED TO
+                                basin             16.   12.08          3.          1.          1.       .03
+                                                                                                                 1490.75      12.08

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

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

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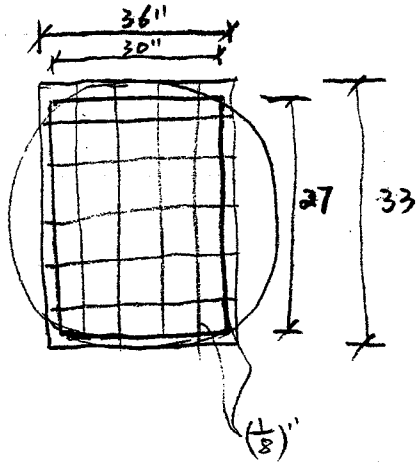
Subject _____

Access barrier head loss calculations (42" pipe)



$$\text{Gross area} = 30'' \times \frac{1}{12} \times 27'' \times \frac{1}{12} = 5.625 \text{ ft}$$

$$\text{Bar area} = \left(\frac{1}{8}\right) \times \frac{1}{12} \times \frac{27}{12} \times 4 + \left(\frac{1}{8}\right) \times \frac{1}{12} \times \frac{30''}{12} \times 5$$

$$= 0.224 \text{ ft}^2$$

$$\text{Net area} = 5.625 - 0.224 = 5.401 \text{ ft}^2$$

$$K_t = 1.45 - 0.45 \frac{a_n}{a_g} - \left(\frac{a_n}{a_g}\right)^2$$

$$= 1.45 - 0.45 \frac{5.401}{5.625} - \left(\frac{5.401}{5.625}\right)^2 = 0.04$$

Head loss for access barrier:

$$H_g = K_t \frac{v_n^2}{2g}$$

$$v_n = \frac{Q}{A} = \frac{15}{5.625/2} = 5.33 \text{ ft/s}$$

$$H_g = 0.04 \times \frac{5.33^2}{2 \times 32.2} = 0.02$$

Culvert Calculator Report
Pipe @ Sta 54+11

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,491.50	ft	Headwater Depth/Height	1.67	
Computed Headwater Elev:	1,490.69	ft	Discharge	16.00	cfs
Inlet Control HW Elev.	1,490.35	ft	Tailwater Elevation	1,489.09	ft
Outlet Control HW Elev.	1,490.69	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,487.78	ft	Downstream Invert	1,484.75	ft
Length	75.00	ft	Constructed Slope	0.040400	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	4.34	ft
Slope Type	N/A		Normal Depth	0.88	ft
Flow Regime	N/A		Critical Depth	1.48	ft
Velocity Downstream	6.65	ft/s	Critical Slope	0.009725	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	1.75	ft
Section Size	21 inch		Rise	1.75	ft
Number Sections	1				

pipe size 30". Because of access barrier (with 50% clogging) a 21" pipe was used in the calculation

Outlet Control Properties					
Outlet Control HW Elev.	1,490.69	ft	Upstream Velocity Head	0.69	ft
Ke	0.22		Entrance Loss	0.15	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,490.35	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	2.4	ft²
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

inlet loss for groove end projecting

$Ke = 0.2 + 0.02 = 0.22$

access barrier loss

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

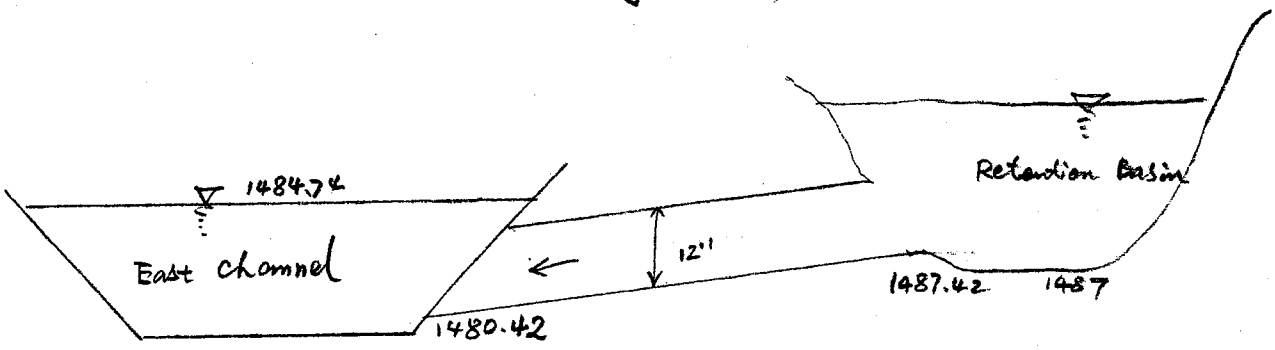
Checked by _____

Date _____

Subject Local drainage design for Sub-basin 31A1 Pipe # 824, Between Broadway Rd & Corabell Ave

Sub-basin 31A1

Q = 5 cfs (See following pages)



Subject: Red Mountain Freeway, University Dr. to Southern Ave
HEC-1 Parameters for Local Drainage Area

Sheet No.
Drawing No.
Computed By GL **Checked By** BGS **Date** 24-Jan-05

HEC-1 method was used to estimate some of the local drainage peark discharge.
Unit Hydrograph: Phonix Valley S graph
Storm Frequency: 100-year 24-hour
Rainfall Depth: 3.6 inch
Rainfall Distribution: SCS type II

Following parameters were evaluated based on mapping prepared for this project or based on FCDMC's Manual

A	Local drainage area (mi2)
L	Length of longest water course (mile)
Lca	Length along the water course to a ppoint opposite the centroid (mile)
H1	Hignest elevation of the water course
H2	Lowest elevation of the water course
S	Water course slope (ft/mile)
Kn	Estimated mean Manning's "n" (based on Appendix D.2 of FCDMC's Hydrology Manual)

Sub-basin ID	A		L		Lca		H1	H2	$L*Lca/S^{0.5}$	S	Kn
	(ft^2)	(mi^2)	(ft)	(mile)	(ft)	(mile)	(ft)	(ft)		(ft/mile)	
31A1	433047	0.016	757	0.143	459	0.087	1497	1491	0.001927	41.85	0.0254

Rainfall Loss Method: Green and Empt Method (values obtained from HEC-1 study for this project)
IA: intial loss (inches)
DTHETA: volumetric mosture deficit
PSIF: Wetting front suction (inches)
SKSAT: Hydraulic conductivity at naturalsaturation (in/hr)
RTIMP: Percent of sub-basin which is impervious

Sub-basin ID	IA (in)	DTHETA	PSIF (in)	SKSAT (in/hr)	RTIMP (%)
31A1	0.29	0.29	4.15	0.46	30

Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

Retention Basin Elevation-Area Relationship for Sub-basin 31A1

Elevation (ft)	1487	1488	1489	1490
Arae (ft^2)	13517	18565	21636	25692
Area (acre)	0.310	0.426	0.497	0.590

Retention basin elevation -outflow relationship was estimated using CulvertMethod based pon proposed pipe dimention, inlet and outlet invert elevation, and tailwater elevation.

Retention Basin Elevation-outflow Relationship for Sub-basin 31A1

HW Elevation (ft)	1487	1488	1489	1490
Discharge (cfs)	0	1.48	4.67	6.42

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1****************************************
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*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   24MAR05  TIME  08:59:52  *
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*   HYDROLOGIC ENGINEERING CENTER      *
*          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
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   Red Mountain Freeway, University to Southern Avenue
  2           ID   100-year peak discharge estimation for local drainage area 31A1
  3           IT       5                    300
  4           IO       3

  5           KK
  6           KM   BASIN 31A1
  7           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  8           KM    L=        .1  Lca=       .1   S=   41.8  Kn= .025  LAG=   3.4
  9           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 10           BA     .02
 11           IN      15
 12           PB   3.600
 13           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 14           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 15           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 16           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 17           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 18           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 19           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 20           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 21           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 22           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 23           PC    .983    .986    .989    .992    .995    .998   1.000
 24           LG     .29     .29    4.15     .46   30.00
 25           UI    102.     21.      0.      0.      0.      0.      0.      0.      0.      0.
 26           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 27           KK   basin
 28           KM        Rtention basin
 29           RS       1    STOR      -1
 30           SA    0.31   0.426   0.497    0.59
 31           SE    1487    1488    1489    1490
 32           SQ       0    1.48    4.67    6.42
 33           ZZ
```


```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   24MAR05  TIME  08:59:52  *
*                                      *
****************************************
```

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


Red Mountain Freeway, University to Southern Avenue
100-year peak discharge estimation for local drainage area 31A1

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

  IT        HYDROGRAPH TIME DATA
                 NMIN          5  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        300  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE      2   0  ENDING DATE
              NDTIME       0055  ENDING TIME
               ICENT         19  CENTURY MARK

          COMPUTATION INTERVAL     .08 HOURS
               TOTAL TIME BASE   24.92 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

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

          **************
          *            *
  5 KK    *            *
          *            *
          **************
                    BASIN 31A1
                     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                     L=       .1  Lca=       .1   S=   41.8  Kn= .025  LAG=   3.4
                     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 11 IN          TIME DATA FOR INPUT TIME SERIES
                     JXMIN          15  TIME INTERVAL IN MINUTES
                    JXDATE       1   0  STARTING DATE
                    JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

 10 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .02  SUBBASIN AREA

                PRECIPITATION DATA

 13 PB                STORM        3.60  BASIN TOTAL PRECIPITATION

 13 PI            INCREMENTAL PRECIPITATION PATTERN
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .01       .00       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .03       .03
                     .03       .09       .09       .09       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00

 24 LG          GREEN AND AMPT LOSS RATE
                     STRTL         .29  STARTING LOSS
                       DTH         .29  MOISTURE DEFICIT
                      PSIF        4.15  WETTING FRONT SUCTION
                     XKSAT         .46  HYDRAULIC CONDUCTIVITY
                     RTIMP       30.00  PERCENT IMPERVIOUS AREA

 24 UI          INPUT UNITGRAPH,   2 ORDINATES,  VOLUME =  .79
                    102.0      21.0
                                                          ***
     ***            ***            ***            ***            ***

                    HYDROGRAPH AT STATION

    TOTAL RAINFALL =    3.60, TOTAL LOSS =    1.92, TOTAL EXCESS =    1.68

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+     34.      12.00        2.          1.          1.          1.
                         (INCHES)    1.083       1.332       1.333       1.333
                          (AC-FT)      1.          1.          1.          1.

                    CUMULATIVE AREA =     .02 SQ MI

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

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

```
                *             *
27 KK           *    basin    *
                *             *
                **************
```

Rtention basin

HYDROGRAPH ROUTING DATA

```
29 RS        STORAGE ROUTING
                  NSTPS        1  NUMBER OF SUBREACHES
                   ITYP     STOR  TYPE OF INITIAL CONDITION
                 RSVRIC    -1.00  INITIAL CONDITION
                      X      .00  WORKING R AND D COEFFICIENT

30 SA           AREA        .3        .4        .5        .6

31 SE        ELEVATION   1487.00   1488.00   1489.00   1490.00

32 SQ        DISCHARGE       0.        1.        5.        6.
                                                          ***
```

COMPUTED STORAGE-ELEVATION DATA

```
        STORAGE        .00       .37       .83      1.37
      ELEVATION    1487.00   1488.00   1489.00   1490.00

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

HYDROGRAPH AT STATION basin

	PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	24.92-HR
+	5.	12.08	(CFS)	2.	1.	1.	1.
			(INCHES)	.950	1.296	1.297	1.297
			(AC-FT)	1.	1.	1.	1.

	PEAK STORAGE (AC-FT)	TIME (HR)		6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	24.92-HR
+	1.	12.08		0.	0.	0.	0.

	PEAK STAGE (FEET)	TIME (HR)		6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	24.92-HR
+	1489.07	12.08		1488.10	1487.40	1487.39	1487.39

CUMULATIVE AREA = .02 SQ MI

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT		34.	12.00	2.	1.	1.	.02		
+	ROUTED TO	basin	5.	12.08	2.	1.	1.	.02	1489.07	12.08

+
+

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

Culvert Calculator Report
Pipe @ Sta 46+50

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,490.00	ft	Headwater Depth/Height	1.93	
Computed Headwater Elev:	1,489.17	ft	Discharge	5.00	cfs
Inlet Control HW Elev.	1,489.17	ft	Tailwater Elevation	1,484.74	ft
Outlet Control HW Elev.	1,488.98	ft	Control Type	Inlet Control	

Grades					
Upstream Invert	1,487.24	ft	Downstream Invert	1,480.42	ft
Length	69.00	ft	Constructed Slope	0.098841	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	0.47	ft
Slope Type	N/A		Normal Depth	0.47	ft
Flow Regime	N/A		Critical Depth	0.92	ft
Velocity Downstream	13.86	ft/s	Critical Slope	0.017127	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	1.00	ft
Section Size	12 inch		Rise	1.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,488.98	ft	Upstream Velocity Head	0.68	ft
Ke	0.20		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,489.17	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	0.8	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

Checked by _____

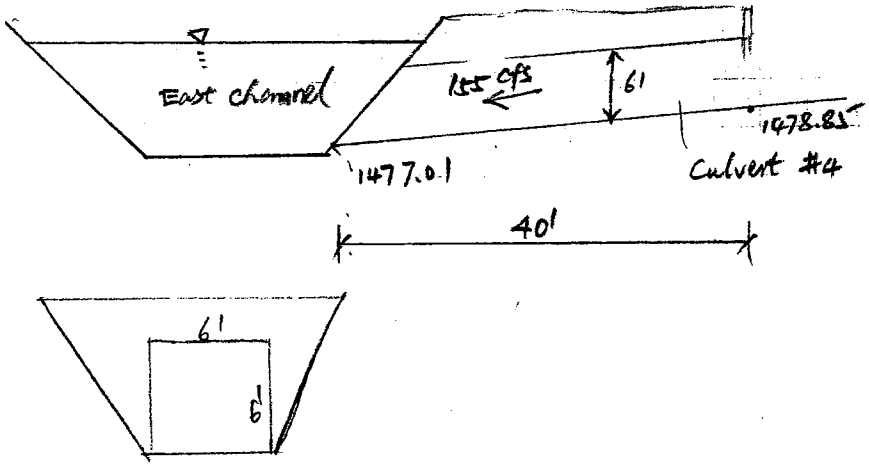
Date _____

Subject: Local drainage design for Sub-basin 31A2 Culvert #4, South of Cerobell Avenue

Sub-basin 31 A2

Q = 155 cfs (See next page)

6×6' RCB



PB Project No.	11230		
Subject:	Red Mountain Freeway, University Dr. to Southern Ave Discharge Estimation for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Mar-05

Method: Rational Method

Equation: Q=CiA
Where:
Q= Design discharge
i = Drainfall intensity (in/hr)
A= Local drainage area (acre)
C= runoff coefficient

Software: FCDMC Hydrologic Design Manual Ratioanl Method

East channel centerline station	39+05.64 to 39+41.00
Location of proposed culvert	South of Corabell Avenue
Culvert ID	4
Sub-basin ID	31A2
Drainage area (acre)	51.58
Water course length (ft)	3054
Hightest elevation on watersources (ft)	1509
Lowest elevation on water course (ft)	1485
Runoff coefficient (medium density residential)	0.54
10-year 6-hour rainfall depth (inch)	1.9

Discharge Estimation for Sub-basin 31A2

Flood Control District of Maricopa County
Hydrologic Design Manual Rational Method

Wtcrse. Length = 3054 (feet)
Top Elev. = 1509 (feet)
Bottom Elev. = 1485 (feet)
Slope = .0079 (feet/feet)

Kb = .0622
P(10,6) = 1.9 (inches)
Area = 51.58 (acres)
C(10) = .54

Hydrological Summary Table

PARAMETER	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs):	36	53	70	101	129	155
C :	0.540	0.540	0.540	0.594	0.648	0.675
Tc (min):	35.1	30.3	27.2	24.6	23.2	21.9
i(Adj) (in/hr):	1.3	1.9	2.5	3.3	3.9	4.4
i(Phx) (in/hr):	1.4	2.1	2.7	3.6	4.2	4.8

Culvert Calculator Report
CorabellAve_culvert

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,485.00	ft	Headwater Depth/Height	1.37	
Computed Headwater Elev	1,483.68	ft	Discharge	155.00	cfs
Inlet Control HW Elev.	1,482.86	ft	Tailwater Elevation	1,482.55	ft
Outlet Control HW Elev.	1,483.68	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,478.19	ft	Downstream Invert	1,477.01	ft
Length	63.00	ft	Constructed Slope	0.018651	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	5.54	ft
Slope Type	N/A		Normal Depth	1.61	ft
Flow Regime	N/A		Critical Depth	2.75	ft
Velocity Downstream	6.46	ft/s	Critical Slope	0.004184	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.00	ft
Section Size	6 x 4 ft		Rise	4.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,483.68	ft	Upstream Velocity Head	0.65	ft
Ke	0.50		Entrance Loss	0.32	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,482.86	ft	Flow Control	Unsubmerged	
Inlet Type	90 and 15° wingwall flares		Area Full	24.0	ft²
K	0.06100		HDS 5 Chart	8	
M	0.75000		HDS 5 Scale	2	
C	0.04000		Equation Form	1	
Y	0.80000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

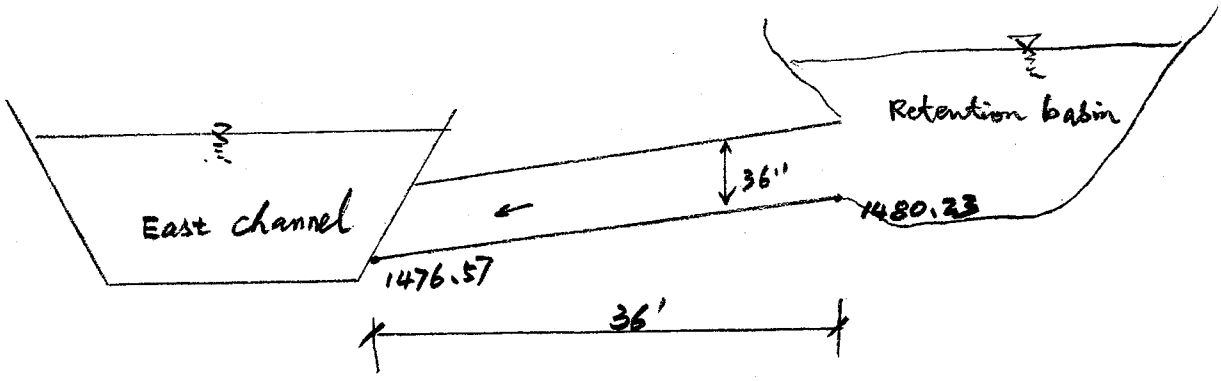
Checked by _____

Date _____

Subject Local drainage design for sub-basin 31A3
Pipe # 822, At station 36+80

Sub-basin name: 31A3

Q = 27 cfs (see following pages)



Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

HEC-1 method was used to estimate some of the local drainage peark discharge.
Unit Hydrograph: Phonix Valley S graph
Storm Frequency: 100-year 24-hour
Rainfall Depth: 3.6 inch
Rainfall Distribution: SCS type II

Following parameters were evaluated based on mapping prepared for this project or based on FCDMC's Manual

A	Local drainage area (mi2)
L	Length of longest water course (mile)
Lca	Length along the water course to a ppoint opposite the centroid (mile)
H1	Hignest elevation of the water course
H2	Lowest elevation of the water course
S	Water course slope (ft/mile)
Kn	Estimated mean Manning's "n" (based on Appendix D.2 of FCDMC's Hydrology Manual)

Sub-basin ID	A		L		Lca		H1	H2	$L*Lca/S^{0.5}$	S	Kn
	(ft^2)	(mi^2)	(ft)	(mile)	(ft)	(mile)	(ft)	(ft)		(ft/mile)	
31A3	399805	0.014	1132	0.214	390	0.074	1492	1485	0.002771	32.65	0.0254

Rainfall Loss Method: Green and Empt Method (values obtained from HEC-1 study for this project)
IA: intial loss (inches)
DTHETA: volumetric mosture deficit
PSIF: Wetting front suction (inches)
SKSAT: Hydraulic conductivity at naturalsaturation (in/hr)
RTIMP: Percent of sub-basin which is impervious

Sub-basin ID	IA (in)	DTHETA	PSIF (in)	SKSAT (in/hr)	RTIMP (%)
31A3	0.29	0.29	4.15	0.46	18

Subject: Red Mountain Freeway, University Dr. to Southern Ave
HEC-1 Parameters for Local Drainage Area

Sheet No.
Drawing No.
Date 24-Jan-05

Computed By GL **Checked By** BGS

Retention Basin Elevation-Area Relationship for Sub-basin 31A3

Elevation (ft)	1479.7	1480	1481	1482	1483	1484	1485
Arae (ft^2)	0	256	1597	3453	5175	7327	9667
Area (acre)	0.000	0.006	0.037	0.079	0.119	0.168	0.222

Retention basin elevation -outflow relationship was estimated using CulvertMethod based pon proposed pipe dimention, inlet and outlet invert elevation, and tailwater elevation.

Retention Basin Elevation-outflow Relationship for Sub-basin 31A3

HW Elevation (ft)	1480	1481	1482	1483	1484	1485
Discharge (cfs)	0	3.04	14.66	32.09	51.8	67.05

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   24MAR05  TIME  09:07:39  *
*                                      *
****************************************
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****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          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
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   Red Mountain Freeway, University Drive to Southern Avenue
  2           ID   100-year peak discharge estimation for sub-basin 31A3
  3           IT       5                    300
  4           IO       3

  5           KK
  6           KM   BASIN 31A3
  7           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  8           KM    L=        .2  Lca=       .1   S=   32.7  Kn= .025  LAG=   3.9
  9           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 10           BA     .01
 11           IN      15
 12           PB   3.600
 13           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 14           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 15           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 16           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 17           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 18           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 19           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 20           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 21           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 22           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 23           PC    .983    .986    .989    .992    .995    .998   1.000
 24           LG     .29     .29    4.15     .46   18.00
 25           UI     79.     29.      0.      0.      0.      0.      0.      0.      0.      0.
 26           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 27           KK   basin
 28           KM        Rtention basin
 29           RS       1    STOR      -1
 30           SA       0   0.006   0.037   0.079   0.119   0.168   0.222
 31           SE  1479.7    1480    1480    1482    1483    1484    1485
 32           SQ       0       0    3.04   14.66   32.09   51.80   67.05
 33           ZZ
```

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   24MAR05  TIME  09:07:39  *
*                                      *
****************************************
```

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

Red Mountain Freeway, University Drive to Southern Avenue
100-year peak discharge estimation for sub-basin 31A3

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

  IT          HYDROGRAPH TIME DATA
                 NMIN          5  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      2   0  ENDING DATE
               NDTIME       0055  ENDING TIME
               ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL     .08 HOURS
                 TOTAL TIME BASE   24.92 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

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

          **************
          *            *
  5 KK    *            *
          *            *
          **************
                    BASIN 31A3
                     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                     L=       .2  Lca=       .1   S=   32.7  Kn= .025  LAG=   3.9
                     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 11 IN          TIME DATA FOR INPUT TIME SERIES
                     JXMIN          15  TIME INTERVAL IN MINUTES
                    JXDATE      1    0  STARTING DATE
                    JXTIME           0  STARTING TIME

             SUBBASIN RUNOFF DATA

 10 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PB                STORM        3.60  BASIN TOTAL PRECIPITATION

 13 PI            INCREMENTAL PRECIPITATION PATTERN
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .01       .00       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .03       .03
                     .03       .09       .09       .09       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00

 24 LG          GREEN AND AMPT LOSS RATE
                     STRTL         .29  STARTING LOSS
                       DTH         .29  MOISTURE DEFICIT
                      PSIF        4.15  WETTING FRONT SUCTION
                     XKSAT         .46  HYDRAULIC CONDUCTIVITY
                     RTIMP       18.00  PERCENT IMPERVIOUS AREA

 24 UI          INPUT UNITGRAPH,   2 ORDINATES,  VOLUME = 1.39
                     79.0      29.0
                                                          ***

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

                     HYDROGRAPH AT STATION

   TOTAL RAINFALL =    3.60, TOTAL LOSS =    2.25, TOTAL EXCESS =    1.35

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                          (CFS)
+     29.       12.00        2.         1.         0.         0.
                         (INCHES)    1.618      1.880      1.881      1.881
                          (AC-FT)       1.         1.         1.         1.

                         CUMULATIVE AREA =     .01 SQ MI

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

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

```
                *             *
27 KK           *    basin    *
                *             *
                **************
```

Rtention basin

HYDROGRAPH ROUTING DATA

```
29 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                    RSVRIC      -1.00  INITIAL CONDITION
                         X        .00  WORKING R AND D COEFFICIENT

30 SA              AREA          .0        .0        .0        .1        .1        .2        .2

31 SE          ELEVATION     1479.70   1480.00   1480.00   1482.00   1483.00   1484.00   1485.00

32 SQ          DISCHARGE         0.        0.        3.       15.       32.       52.       67.
                                                                  ***
```

COMPUTED STORAGE-ELEVATION DATA

```
          STORAGE        .00       .00       .00       .11       .21       .36       .55
        ELEVATION    1479.70   1480.00   1480.00   1482.00   1483.00   1484.00   1485.00

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

HYDROGRAPH AT STATION basin

```
 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR      24-HR     72-HR    24.92-HR
+  (CFS)       (HR)      (CFS)
+    27.      12.00                     2.        1.        0.        0.
                        (INCHES)     1.623     1.886     1.886     1.886
                        (AC-FT)         1.        1.        1.        1.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                      6-HR      24-HR     72-HR    24.92-HR
+ (AC-FT)      (HR)                      0.        0.        0.        0.
     0.       12.00

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                      6-HR      24-HR     72-HR    24.92-HR
+  (FEET)      (HR)                   1480.15   1480.04   1480.03   1480.03
  1482.68     12.00

                        CUMULATIVE AREA =     .01 SQ MI
```

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT		29.	12.00	2.	1.	0.	.01		
+	ROUTED TO	basin	27.	12.00	2.	1.	0.	.01	1482.68	12.00
+										
+										

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

Culvert Calculator Report
Pipe @ Sta 36+80

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,484.50	ft	Headwater Depth/Height	0.83	
Computed Headwater Elev:	1,482.73	ft	Discharge	27.00	cfs
Inlet Control HW Elev.	1,482.51	ft	Tailwater Elevation	1,480.85	ft
Outlet Control HW Elev.	1,482.73	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,480.23	ft	Downstream Invert	1,476.57	ft
Length	36.00	ft	Constructed Slope	0.101667	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	4.28	ft
Slope Type	N/A		Normal Depth	0.72	ft
Flow Regime	N/A		Critical Depth	1.68	ft
Velocity Downstream	3.82	ft/s	Critical Slope	0.004514	ft/ft

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

Outlet Control Properties					
Outlet Control HW Elev.	1,482.73	ft	Upstream Velocity Head	0.68	ft
Ke	0.20		Entrance Loss	0.14	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,482.51	ft	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	7.1	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

Checked by _____

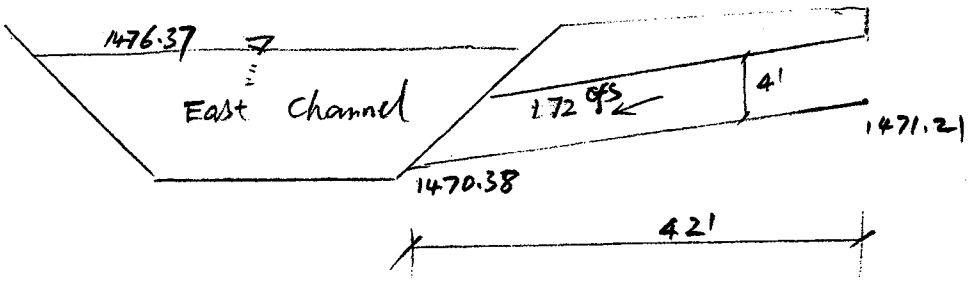
Date _____

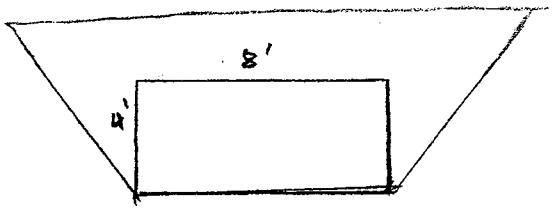
Subject Local drainage design for sub-basin 31A4, culvert #3, South of Pueblo Ave

Sub-basin 31A4

Q = 172 cfs (see next page)

8' x 4' RCB





PB Project No.	11230		
Subject:	Red Mountain Freeway, University Dr. to Southern Ave Discharge Estimation for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

Method: Rational Method

Equation: Q=CiA
Where:
Q= Design discharge
i = Drainfall intensity (in/hr)
A= Local drainage area (acre)
C= runoff coefficient

Software: FCDMC Hydrologic Design Manual Ratioanl Method

East channel centerline station	25+77.00 to 25+98.00
Location of proposed culvert	South of Pueblo Avenue
Culvert ID	3
Sub-basin ID	31A4
Drainage area (acre)	54.83
Water course length (ft)	3290
Hightest elevation on watersources (ft)	1503
Lowest elevation on water course (ft)	1475
Runoff coefficient (medium density residential)	0.57
10-year 6-hour rainfall depth (inch)	1.9

Discharge Estimation for Sub-basin 31A4

Flood Control District of Maricopa County
Hydrologic Design Manual Rational Method

Wtcrse. Length = 3290 (feet)
Top Elev. = 1503 (feet)
Bottom Elev. = 1475 (feet)
Slope = .0085 (feet/feet)

Kb = .0622
P(10,6) = 1.9 (inches)
Area = 54.83 (acres)
C(10) = .57

Hydrological Summary Table

PARAMETER	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs):	40	59	78	112	143	172
C :	0.570	0.570	0.570	0.627	0.684	0.712
Tc (min):	35.8	30.8	27.7	25.0	23.5	22.3
i(Adj) (in/hr):	1.3	1.9	2.5	3.3	3.8	4.4
i(Phx) (in/hr):	1.4	2.1	2.7	3.5	4.2	4.8

Culvert Calculator Report
PuebloAve_culvert

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,478.00	ft	Headwater Depth/Height	1.47	
Computed Headwater Elev:	1,477.11	ft	Discharge	172.00	cfs
Inlet Control HW Elev.	1,476.37	ft	Tailwater Elevation	1,476.37	ft
Outlet Control HW Elev.	1,477.11	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	1,471.21	ft	Downstream Invert	1,470.38	ft
Length	42.00	ft	Constructed Slope	0.019762	ft/ft

Hydraulic Profile					
Profile	PressureProfile		Depth, Downstream	5.99	ft
Slope Type	N/A		Normal Depth	1.34	ft
Flow Regime	N/A		Critical Depth	2.43	ft
Velocity Downstream	5.38	ft/s	Critical Slope	0.003450	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	8.00	ft
Section Size	8 x 4 ft		Rise	4.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,477.11	ft	Upstream Velocity Head	0.45	ft
Ke	0.50		Entrance Loss	0.22	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,476.37	ft	Flow Control	Unsubmerged	
Inlet Type	45° Bevels; 10 - 45° skewed headwall		Area Full	32.0	ft²
K	0.49800		HDS 5 Chart	11	
M	0.66700		HDS 5 Scale	4	
C	0.03270		Equation Form	2	
Y	0.75000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

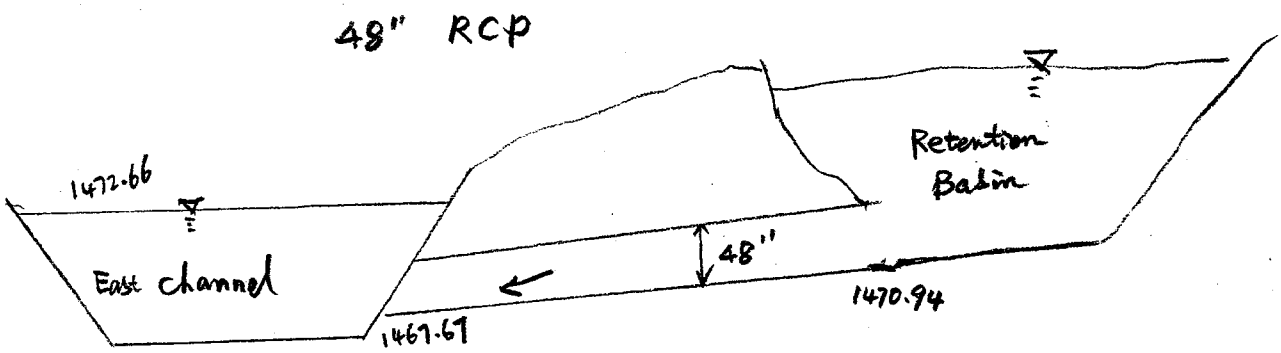
Checked by _____

Date _____

Subject Local drainage design for Sub-basin 31A5
Pipe #820, At Station 24+78.00

Sub-basin 31A5

Q = 29 cfs (See following pages)



Subject: Red Mountain Freeway, University Dr. to Southern Ave
HEC-1 Parameters for Local Drainage Area

Sheet No.
Drawing No.
Computed By GL **Checked By** BGS **Date** 24-Jan-05

HEC-1 method was used to estimate some of the local drainage peark discharge.
Unit Hydrograph: Phonix Valley S graph
Storm Frequency: 100-year 24-hour
Rainfall Depth: 3.6 inch
Rainfall Distribution: SCS type II

Following parameters were evaluated based on mapping prepared for this project or based on FCDMC's Manual

A	Local drainage area (mi2)
L	Length of longest water course (mile)
Lca	Length along the water course to a ppoint opposite the centroid (mile)
H1	Hignest elevation of the water course
H2	Lowest elevation of the water course
S	Water course slope (ft/mile)
Kn	Estimated mean Manning's "n" (based on Appendix D.2 of FCDMC's Hydrology Manual)

Sub-basin ID	A		L		Lca		H1	H2	$L*Lca/S^{0.5}$	S	Kn
	(ft^2)	(mi^2)	(ft)	(mile)	(ft)	(mile)	(ft)	(ft)		(ft/mile)	
31A5	428229	0.015	1245	0.236	420	0.080	1485	1475	0.00288	42.41	0.0254

Rainfall Loss Method: Green and Empt Method (values obtained from HEC-1 study for this project)
IA: intial loss (inches)
DTHETA: volumetric mosture deficit
PSIF: Wetting front suction (inches)
SKSAT: Hydraulic conductivity at naturalsaturation (in/hr)
RTIMP: Percent of sub-basin which is impervious

Sub-basin ID	IA (in)	DTHETA	PSIF (in)	SKSAT (in/hr)	RTIMP (%)
31A5	0.29	0.29	4.15	0.46	18

Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

Retention Basin Elevation-Area Relationship for Sub-basin 31A5

Elevation (ft)	1471	1472	1473	1474	1475
Arae (ft^2)	400	1907	5144	9548	15275
Area (acre)	0.009	0.044	0.118	0.219	0.351

Retention basin elevation -outflow relationship was estimated using CulvertMethod based pon proposed pipe dimention, inlet and outlet invert elevation, and tailwater elevation.

Retention Basin Elevation-outflow Relationship for Sub-basin 31A5

HW Elevation (ft)	1471	1472	1473	1474	1475
Discharge (cfs)	0	0	23.45	47.83	76.86

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   23MAR05  TIME  17:18:44  *
*                                      *
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```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         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   Red Mountain Freeway, University Drive to Southern Avenue
  2           ID   100-yr peak discharge estimation for sub-basin 31A5
  3           IT       5                    300
  4           IO       3

  5           KK
  6           KM   BASIN 31A5
  7           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  8           KM    L=       .2  Lca=       .1   S=   42.4  Kn= .025  LAG=   4.0
  9           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 10           BA     .01
 11           IN      15
 12           PB   3.600
 13           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 14           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 15           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 16           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 17           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 18           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 19           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 20           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 21           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 22           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 23           PC    .983    .986    .989    .992    .995    .998   1.000
 24           LG     .29     .29    4.15     .46   18.00
 25           UI     82.     32.      0.      0.      0.      0.      0.      0.      0.      0.
 26           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 27           KK   basin
 28           KM       Rtention basin
 29           RS      1    STOR      -1
 30           SA  0.009   0.044   0.118   0.219   0.351
 31           SE   1471    1472    1473    1474    1475
 32           SQ      0       0   23.45   47.83   76.86
 33           ZZ
```


```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   23MAR05  TIME  17:18:44  *
*                                      *
****************************************
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```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*         609 SECOND STREET            *
*      DAVIS, CALIFORNIA 95616         *
*          (916) 756-1104              *
*                                      *
****************************************
```


Red Mountain Freeway, University Drive to Southern Avenue
100-yr peak discharge estimation for sub-basin 31A5

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

  IT        HYDROGRAPH TIME DATA
                 NMIN          5  MINUTES IN COMPUTATION INTERVAL
                IDATE      1   0  STARTING DATE
                ITIME       0000  STARTING TIME
                   NQ        300  NUMBER OF HYDROGRAPH ORDINATES
               NDDATE      2   0  ENDING DATE
               NDTIME       0055  ENDING TIME
                ICENT         19  CENTURY MARK

            COMPUTATION INTERVAL     .08 HOURS
                 TOTAL TIME BASE   24.92 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
```

*** ***

```
         ***************
         *             *
  5 KK   *             *
         *             *
         ***************
                  BASIN 31A5
                   THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                   L=        .2  Lca=        .1   S=   42.4  Kn= .025  LAG=    4.0
                   PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                  THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 11 IN          TIME DATA FOR INPUT TIME SERIES
                   JXMIN          15  TIME INTERVAL IN MINUTES
                  JXDATE      1    0  STARTING DATE
                  JXTIME           0  STARTING TIME

             SUBBASIN RUNOFF DATA

 10 BA          SUBBASIN CHARACTERISTICS
                   TAREA          .01  SUBBASIN AREA

                PRECIPITATION DATA

 13 PB             STORM         3.60  BASIN TOTAL PRECIPITATION

 13 PI           INCREMENTAL PRECIPITATION PATTERN
```

.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.01	.00	.01
.01	.01	.01	.01	.01	.01	.01	.01	.03	.03
.03	.09	.09	.09	.01	.01	.01	.01	.01	.01
.01	.01	.01	.01	.01	.01	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.00	.00	.00	.00	.00	.00	.00	.00		

```
 24 LG           GREEN AND AMPT LOSS RATE
                    STRTL        .29  STARTING LOSS
                      DTH        .29  MOISTURE DEFICIT
                     PSIF       4.15  WETTING FRONT SUCTION
                   XKSAT         .46  HYDRAULIC CONDUCTIVITY
                   RTIMP       18.00  PERCENT IMPERVIOUS AREA

 24 UI           INPUT UNITGRAPH,   2 ORDINATES,  VOLUME = 1.47
                    82.0      32.0
                                                        ***

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

                     HYDROGRAPH AT STATION

   TOTAL RAINFALL =    3.60, TOTAL LOSS =    2.25, TOTAL EXCESS =    1.35

  PEAK FLOW     TIME                        MAXIMUM AVERAGE FLOW
                                  6-HR       24-HR      72-HR     24.92-HR
+  (CFS)        (HR)
                        (CFS)
+    31.       12.00                2.          1.         1.          1.
                       (INCHES)  1.708       1.985      1.985       1.985
                        (AC-FT)     1.          1.         1.          1.

                    CUMULATIVE AREA =     .01 SQ MI
```

*** ***

****

```
                *             *
27 KK           *    basin    *
                *             *
                **************
```

Rtention basin

HYDROGRAPH ROUTING DATA

```
29 RS          STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

30 SA             AREA          .0        .0        .1        .2        .4

31 SE          ELEVATION     1471.00   1472.00   1473.00   1474.00   1475.00

32 SQ          DISCHARGE        0.        0.       23.       48.       77.
                                                                  ***
```

COMPUTED STORAGE-ELEVATION DATA

```
          STORAGE        .00       .02       .10       .27       .55
        ELEVATION    1471.00   1472.00   1473.00   1474.00   1475.00
```

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 23.
THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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

HYDROGRAPH AT STATION basin

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	24.92-HR
+	(CFS)	(HR)	(CFS)	2.	1.	1.	1.
+	29.	12.00	(INCHES)	1.708	1.985	1.985	1.985
			(AC-FT)	1.	1.	1.	1.

	PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE 6-HR	24-HR	72-HR	24.92-HR
+	(AC-FT)	(HR)				
	0.	12.00	0.	0.	0.	0.

	PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE 6-HR	24-HR	72-HR	24.92-HR
+	(FEET)	(HR)				
	1473.22	12.00	1472.08	1472.02	1472.02	1472.02

CUMULATIVE AREA = .01 SQ MI

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT		31.	12.00	2.	1.	1.	.01		
+	ROUTED TO	basin	29.	12.00	2.	1.	1.	.01	1473.22	12.00
+										

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

Culvert Calculator Report
Pipe @ Sta 21+78

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,475.50	ft	Headwater Depth/Height	0.58	
Computed Headwater Elev	1,473.25	ft	Discharge	29.00	cfs
Inlet Control HW Elev.	1,472.97	ft	Tailwater Elevation	1,472.66	ft
Outlet Control HW Elev.	1,473.25	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,470.94	ft	Downstream Invert	1,467.67	ft
Length	35.00	ft	Constructed Slope	0.093429	ft/ft

Hydraulic Profile					
Profile	CompositePressureProfileS1S2		Depth, Downstream	4.99	ft
Slope Type	N/A		Normal Depth	0.70	ft
Flow Regime	N/A		Critical Depth	1.60	ft
Velocity Downstream	2.31	ft/s	Critical Slope	0.003622	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	4.00	ft
Section Size	48 inch		Rise	4.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,473.25	ft	Upstream Velocity Head	0.60	ft
Ke	0.20		Entrance Loss	0.12	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,472.97	ft	Flow Control	Unsubmerged	
Inlet Type	Groove end projecting		Area Full	12.6	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

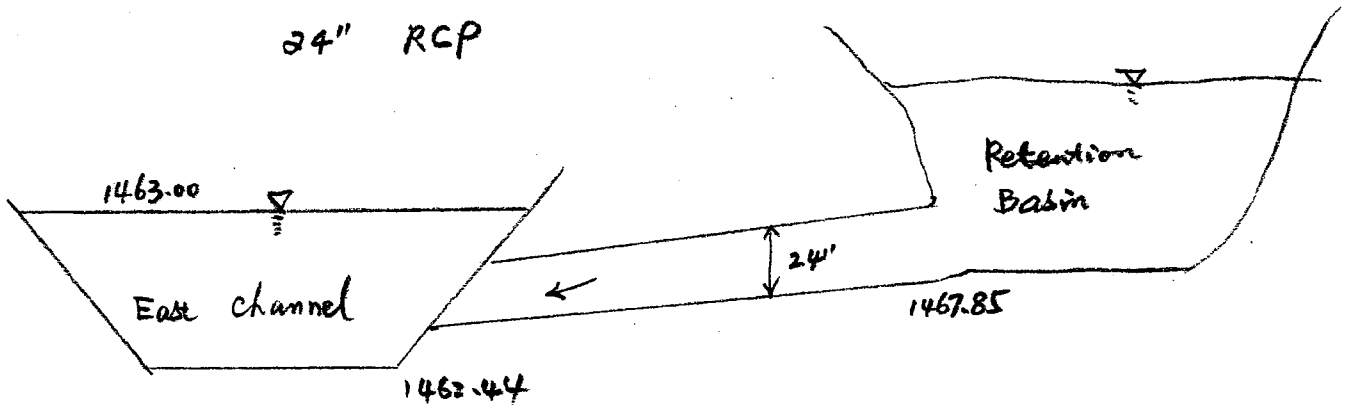
Checked by _____

Date _____

Subject Local drainage design for sub-basin 31A6
Pipe #821; At station 17+20.

Sub-basin 31A6

Q= 19 cfs (See following pages)



Subject:	Red Mountain Freeway, University Dr. to Southern Ave HEC-1 Parameters for Local Drainage Area	**Sheet No.**	
		Drawing No.	
Computed By	GL **Checked By** BGS	**Date**	24-Jan-05

HEC-1 method was used to estimate some of the local drainage peark discharge.
Unit Hydrograph: Phonix Valley S graph
Storm Frequency: 100-year 24-hour
Rainfall Depth: 3.6 inch
Rainfall Distribution: SCS type II

Following parameters were evaluated based on mapping prepared for this project or based on FCDMC's Manual

A	Local drainage area (mi2)
L	Length of longest water course (mile)
Lca	Length along the water course to a ppoint opposite the centroid (mile)
H1	Hignest elevation of the water course
H2	Lowest elevation of the water course
S	Water course slope (ft/mile)
Kn	Estimated mean Manning's "n" (based on Appendix D.2 of FCDMC's Hydrology Manual)

Sub-basin ID	A		L		Lca		H1	H2	$L*Lca/S^{0.5}$	S	Kn
	(ft^2)	(mi^2)	(ft)	(mile)	(ft)	(mile)	(ft)	(ft)		(ft/mile)	
31A6	1125883	0.040	1599	0.303	801	0.152	1482	1470	0.007298	39.62	0.0254

Rainfall Loss Method: Green and Empt Method (values obtained from HEC-1 study for this project)
IA: intial loss (inches)
DTHETA: volumetric mosture deficit
PSIF: Wetting front suction (inches)
SKSAT: Hydraulic conductivity at naturalsaturation (in/hr)
RTIMP: Percent of sub-basin which is impervious

Sub-basin ID	IA (in)	DTHETA	PSIF (in)	SKSAT (in/hr)	RTIMP (%)
31A6	0.29	0.29	4.15	0.46	18

Subject: Red Mountain Freeway, University Dr. to Southern Ave
HEC-1 Parameters for Local Drainage Area

Sheet No.
Drawing No.
Computed By GL **Checked By** BGS **Date** 24-Jan-05

Retention Basin Elevation-Area Relationship for Sub-basin 31A6

Elevation (ft)	1468	1468	1470	1471
Arae (ft^2)	15424	29604	37495	45965
Area (acre)	0.354	0.680	0.861	1.055

Retention basin elevation -outflow relationship was estimated using CulvertMethod based pon proposed pipe dimention, inlet and outlet invert elevation, and tailwater elevation.

Retention Basin Elevation-outflow Relationship for Sub-basin 31A6

HW Elevation (ft)	1468	1468	1470	1471
Discharge (cfs)	0.1	5.08	14.88	24.4

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   23MAR05  TIME  17:36:39  *
*                                      *
****************************************
```

```
****************************************
*                                      *
*    U.S. ARMY CORPS OF ENGINEERS      *
*    HYDROLOGIC ENGINEERING CENTER     *
*          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   Red Mountain Freeway, University DRive to Southern Avenue
  2           ID   100-year peak discharge estimation for sub-basin 31A6
  3           IT       5                    300
  4           IO       3

  5           KK
  6           KM   BASIN 31A6
  7           KM    THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
  8           KM    L=       .3  Lca=       .2   S=   39.6  Kn= .025  LAG=   5.6
  9           KM    PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
 10           BA     .04
 11           IN      15
 12           PB   3.600
 13           KM   THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL
 14           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 15           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 16           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 17           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 18           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 19           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 20           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 21           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 22           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 23           PC    .983    .986    .989    .992    .995    .998   1.000
 24           LG     .29     .29    4.15     .46   18.00
 25           UI    117.    170.     20.      0.      0.      0.      0.      0.      0.      0.
 26           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 27           KK   basin
 28           KM        Rtention basin
 29           RS       1    STOR      -1
 30           SA       0   0.354   0.680   0.861   1.055
 31           SE  1467.9    1468    1469    1470    1471
 32           SQ       0    0.10    5.08   14.88   24.40
 33           ZZ
```

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN   1998               *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   23MAR05  TIME  17:36:39  *
*                                      *
****************************************
```

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

Red Mountain Freeway, University DRive to Southern Avenue
100-year peak discharge estimation for sub-basin 31A6

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

 IT         HYDROGRAPH TIME DATA
                NMIN           5  MINUTES IN COMPUTATION INTERVAL
               IDATE       1   0  STARTING DATE
               ITIME        0000  STARTING TIME
                  NQ         300  NUMBER OF HYDROGRAPH ORDINATES
              NDDATE       2   0  ENDING DATE
              NDTIME        0055  ENDING TIME
               ICENT          19  CENTURY MARK

          COMPUTATION INTERVAL     .08 HOURS
               TOTAL TIME BASE   24.92 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

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

          **************
          *            *
  5 KK    *            *
          *            *
          **************
                    BASIN 31A6
                     THE FOLLOWING PARAMETERS WERE PROVIDED FOR THIS BASIN
                     L=       .3  Lca=       .2   S=   39.6  Kn= .025  LAG=   5.6
                     PHOENIX VALLEY S-GRAPH WAS USED FOR THIS BASIN
                    THE FOLLOWING PC RECORD USED A 24-HOUR SCS TYPE II RAINFALL

 11 IN          TIME DATA FOR INPUT TIME SERIES
                     JXMIN          15  TIME INTERVAL IN MINUTES
                    JXDATE      1    0  STARTING DATE
                    JXTIME           0  STARTING TIME

              SUBBASIN RUNOFF DATA

 10 BA          SUBBASIN CHARACTERISTICS
                     TAREA         .04  SUBBASIN AREA

                PRECIPITATION DATA

 13 PB                STORM        3.60  BASIN TOTAL PRECIPITATION

 13 PI            INCREMENTAL PRECIPITATION PATTERN
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .01       .00       .01
                     .01       .01       .01       .01       .01       .01       .01       .01       .03       .03
                     .03       .09       .09       .09       .01       .01       .01       .01       .01       .01
                     .01       .01       .01       .01       .01       .01       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00       .00       .00
                     .00       .00       .00       .00       .00       .00       .00       .00

 24 LG          GREEN AND AMPT LOSS RATE
                     STRTL         .29  STARTING LOSS
                       DTH         .29  MOISTURE DEFICIT
                      PSIF        4.15  WETTING FRONT SUCTION
                     XKSAT         .46  HYDRAULIC CONDUCTIVITY
                     RTIMP       18.00  PERCENT IMPERVIOUS AREA

 24 UI          INPUT UNITGRAPH,   3 ORDINATES,  VOLUME =  .99
                    117.0     170.0      20.0
                                                          ***

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

                     HYDROGRAPH AT STATION

    TOTAL RAINFALL =    3.60, TOTAL LOSS =    2.25, TOTAL EXCESS =    1.35

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                      6-HR       24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                                    (CFS)
+     82.      12.00                     5.          1.          1.          1.
                                  (INCHES)      1.150       1.336       1.336       1.336
                                   (AC-FT)         2.          3.          3.          3.

                     CUMULATIVE AREA =     .04 SQ MI

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

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

```
                *            *
27 KK           *    basin   *
                *            *
                **************
```

Rtention basin

HYDROGRAPH ROUTING DATA

```
29 RS          STORAGE ROUTING
                    NSTPS          1  NUMBER OF SUBREACHES
                     ITYP       STOR  TYPE OF INITIAL CONDITION
                   RSVRIC      -1.00  INITIAL CONDITION
                        X        .00 WORKING R AND D COEFFICIENT

30 SA              AREA          .0        .4        .7        .9       1.1

31 SE          ELEVATION     1467.90   1468.00   1469.00   1470.00   1471.00

32 SQ          DISCHARGE          0.        0.        5.       15.       24.
                                                                ***
```

COMPUTED STORAGE-ELEVATION DATA

```
          STORAGE        .00       .01       .52      1.29      2.25
        ELEVATION    1467.90   1468.00   1469.00   1470.00   1471.00

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

HYDROGRAPH AT STATION basin

```
 PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                     6-HR      24-HR      72-HR    24.92-HR
+  (CFS)       (HR)        (CFS)
+     19.      12.17                   5.         1.         1.         1.
                          (INCHES)  1.125      1.330      1.331      1.331
                          (AC-FT)      2.         3.         3.         3.

 PEAK STORAGE  TIME                          MAXIMUM AVERAGE STORAGE
                                     6-HR      24-HR      72-HR    24.92-HR
+ (AC-FT)      (HR)                    0.         0.         0.         0.
     2.       12.17

 PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                     6-HR      24-HR      72-HR    24.92-HR
+  (FEET)      (HR)                 1468.76    1468.22    1468.21    1468.21
  1470.42     12.17

                          CUMULATIVE AREA =     .04 SQ MI
```

1

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

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT		82.	12.00	5.	1.	1.	.04		
+	ROUTED TO	basin	19.	12.17	5.	1.	1.	.04	1470.42	12.17
+										
+										

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

Culvert Calculator Report
Pipe @ Sta17+20

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,470.50	ft	Headwater Depth/Height	1.27	
Computed Headwater Elev:	1,470.38	ft	Discharge	19.00	cfs
Inlet Control HW Elev.	1,470.25	ft	Tailwater Elevation	1,463.00	ft
Outlet Control HW Elev.	1,470.38	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,467.85	ft	Downstream Invert	1,462.44	ft
Length	38.00	ft	Constructed Slope	0.142368	ft/ft

Hydraulic Profile					
Profile	S2		Depth, Downstream	0.74	ft
Slope Type	Steep		Normal Depth	0.64	ft
Flow Regime	Supercritical		Critical Depth	1.57	ft
Velocity Downstream	18.14	ft/s	Critical Slope	0.007688	ft/ft

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

Outlet Control Properties					
Outlet Control HW Elev.	1,470.38	ft	Upstream Velocity Head	0.80	ft
Ke	0.20		Entrance Loss	0.16	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,470.25	ft	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	3.1	ft^2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				

PARSONS BRINCKERHOFF COMPUTATION SHEET

Page _____ of _____

Made by _____

Date _____

Checked by _____

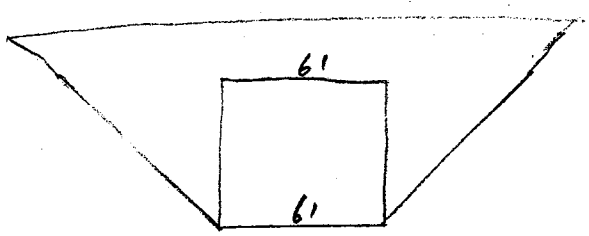
Date _____

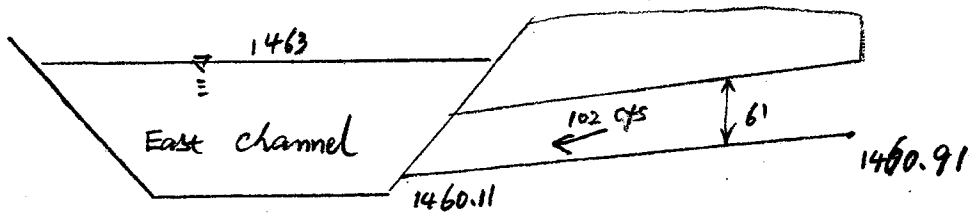
Subject: Local drainage design for sub-basin 31A7
Culvert #1, North of Sunland Ave.

Sub-basin : 31A7

Q = 102 cfs (See next page)

6' x 6' RCB





PB Project No.	11230				
Subject:	Red Mountain Freeway, University Dr. to Southern Ave				
	Discharge Estimation for Local Drainage Area		**Sheet No.**		
			Drawing No.		
Computed By	GL	**Checked By**	BGS	**Date**	24-Mar-05

Method: Rational Method

Equation: Q=CiA
Where:
Q= Design discharge
i = Drainfall intensity (in/hr)
A= Local drainage area (acre)
C= runoff coefficient

Software: FCDMC Hydrologic Design Manual Ratioanl Method

East channel centerline station	12+46.6 to 12+60.00
Location of proposed culvert	North of Sunland Ave
Culvert ID	1
Sub-basin ID	31A7
Drainage area (acre)	35.48
Water course length (ft)	3685
Hightest elevation on watersources (ft)	1494
Lowest elevation on water course (ft)	1468
Runoff coefficient (medium density residential)	0.57
10-year 6-hour rainfall depth (inch)	1.9

Discharge Estimation for Sub-basin 31A7

Flood Control District of Maricopa County
Hydrologic Design Manual Rational Method

Wtcrse. Length = 3685 (feet)
Top Elev. = 1494 (feet)
Bottom Elev. = 1468 (feet)
Slope = .0071 (feet/feet)

Kb = .0622
P(10,6) = 1.9 (inches)
Area = 35.48 (acres)
C(10) = .57

Hydrological Summary Table

PARAMETER	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Q (cfs):	22	34	46	66	85	102
C :	0.570	0.570	0.570	0.627	0.684	0.712
Tc (min):	42.6	36.1	32.3	29.0	27.3	25.8
i(Adj) (in/hr):	1.1	1.7	2.3	3.0	3.5	4.0
i(Phx) (in/hr):	1.2	1.8	2.5	3.2	3.8	4.4

Culvert Calculator Report
SunlandAve_culvert

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	1,468.00	ft	Headwater Depth/Height	0.61	
Computed Headwater Elev	1,464.55	ft	Discharge	102.00	cfs
Inlet Control HW Elev.	1,464.20	ft	Tailwater Elevation	1,463.00	ft
Outlet Control HW Elev.	1,464.55	ft	Control Type	Entrance Control	

Grades					
Upstream Invert	1,460.91	ft	Downstream Invert	1,460.11	ft
Length	40.00	ft	Constructed Slope	0.020000	ft/ft

Hydraulic Profile					
Profile	CompositeS1S2		Depth, Downstream	2.89	ft
Slope Type	Steep		Normal Depth	1.18	ft
Flow Regime	N/A		Critical Depth	2.08	ft
Velocity Downstream	5.88	ft/s	Critical Slope	0.003893	ft/ft

Section					
Section Shape	Box		Mannings Coefficient	0.013	
Section Material	Concrete		Span	6.00	ft
Section Size	6 x 6 ft		Rise	6.00	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	1,464.55	ft	Upstream Velocity Head	1.04	ft
Ke	0.50		Entrance Loss	0.52	ft

Inlet Control Properties					
Inlet Control HW Elev.	1,464.20	ft	Flow Control	Unsubmerged	
Inlet Type	45° Bevels; 10 - 45° skewed headwall		Area Full	36.0	ft²
K	0.49800		HDS 5 Chart	11	
M	0.66700		HDS 5 Scale	4	
C	0.03270		Equation Form	2	
Y	0.75000				