(5)

```
GR   884.200  10000.000   883.900  10041.000   873.400  10065.000   871.500  10069.000   871.200  10074.000
GR   871.800  10081.000   874.100  10087.000   882.500  10103.000   881.600  10200.000   885.000  10670.000
NC     0.065      0.075     0.045      0.0       0.0        0.0       0.0        0.0       0.0        0.0
                  0.055

X1     5.730     11.000  10041.000  10103.000   650.000    650.000   650.000      0.0       0.0        0.0
X3    10.000      0.0       0.0        0.0       0.0        0.0       0.0      884.200   882.800      0.0
GR   884.500  10000.000   884.200  10041.000   873.700  10065.000   871.800  10069.000   871.500  10074.000
GR   872.100  10081.000   874.400  10087.000   882.800  10103.000   881.900  10200.000   880.000  11750.000
GR   884.000  11860.000     0.0        0.0       0.0        0.0       0.0        0.0       0.0        0.0

X1     5.820     12.000  10041.000  10103.000   460.000    460.000   460.000      0.0       0.0        0.0
GR   884.000   9450.000   881.900  10000.000   881.600  10041.000   871.100  10065.000   869.200  10069.000
GR   868.900  10074.000   869.500  10081.000   871.800  10087.000   880.200  10103.000   879.300  10200.000
GR   880.000  11350.000   884.000  11960.000     0.0        0.0       0.0        0.0       0.0        0.0
NC     0.065      0.075     0.050      0.100     0.300      0.0       0.0        0.0       0.0        0.0
-

X1     5.920     11.000  10060.000  10125.000   520.000    520.000   520.000      0.0       0.0        0.0
GR   884.000   9460.000   879.300  10000.000   877.200  10060.000   873.400  10083.000   866.000  10087.000
GR   871.100  10097.000   874.300  10099.000   878.700  10125.000   879.100  10142.000   880.000  10970.000
GR   884.000  11700.000     0.0        0.0       0.0        0.0       0.0        0.0       0.0        0.0

X1     6.000     11.000  10060.000  10125.000   440.000    440.000   440.000      0.0       0.0        0.0
GR   885.000   9820.000   879.300  10000.000   877.200  10060.000   373.400  10083.000   866.000  10087.000
GR   871.100  10097.000   874.300  10099.000   878.700  10125.000   879.100  10142.000   880.000  10400.000
GR   885.000  10860.000     0.0        0.0       0.0        0.0       0.0        0.0       0.0        0.0
-EJ    0.0        0.0       0.0        0.0       0.0        0.0       0.0        0.0       0.0        0.0
1

CCHV#   0.100 CEHV#   0.300

3265 DIVIDED FLOW

     SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS   BANK ELEV
     Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA    LEFT/RIGHT
     TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
     SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

        4.34       4.08     862.18       0.0     862.20     862.52      0.34       0.0        0.0    862.40
        365.        20.       345.        0.        25.        72.        0.         0.         0.    862.70
-       0.0        0.77       4.79       0.0      0.065      0.045     0.065       0.0     358.10   9947.40

- 0.005943           0.         0.         0.         0          0          5        0.0     112.90  10073.64
A

CCHV#   0.300 CEHV#    0.500
        4.49       3.94     865.84       0.0        0.0     866.00      0.16       3.43       0.05   866.00
        365.        0.        365.        0.         0.       114.        0.         2.         1.    866.40
        0.07       0.0        3.19       0.0      0.065      0.045     0.065      0.045     861.90  10047.11
- 0.003236         800.       800.       800.         4          0          1        0.0      49.34  10096.45
A

3685 20 TRIALS USED WSEL,CWSEL

7185 MIN SPECIFIC ENERGY
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(13)

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HEC2 VERSION UPDATED AUG 76 -MOD. JAN 1977
ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
MODIFICATIONS 52,53,54,55,56,57,58,59
*********************************************


T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK   CHICAGO OFFICE  3-77
T2      SILVER CREEK - 10YR,50TY,100YR, & 500YR - NATURAL
T3      SILVER CREEK - 50 YEAR

J1  ICHECK    INQ      NINV     IDIR      STRT     METRIC    HVINS     Q       WSEL      FQ

    -10.      3.       0.       0.    0.006000    0.0       0.0       0.     862.650    0.0

J2  NPROF    IPLOT    PRFVS    XSECV     XSECH     FN       ALLDC     IBW     CHNIM    ITRACE

-   2.000    0.0     -1.000    0.0       0.0      0.0       0.0      0.0      0.0      0.0


CCHV#   0.100 CEHV#    0.300
  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL      OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL     TWA    LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN     ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR   TOPWID     ENDST
-

    4.34     4.64   862.74    0.0    862.65   863.08    0.34     0.0     0.0    862.40
    575.     122.    453.     0.       94.      87.      0.       0.      0.     862.70
    0.0      1.30    5.22    0.02    0.065    0.045    0.065    0.0    858.10  9897.04
- 0.005981   0.       0.      0.        0        0        5      0.0    181.71 10078.75
A

CCHV#   0.300 CEHV#    0.500
    4.49     4.62   866.52    0.0     0.0     866.75    0.23     3.64    0.03   866.00
    575.     4.      571.     0.       7.      149.      0.       3.      2.     866.40
    0.06     0.56    3.82    0.21    0.065    0.045    0.065    0.045  861.90 10019.71
- 0.003569   800.    800.    800.       3        0        1      0.0     85.39 10105.11
A

3685 20 TRIALS USED WSEL,CWSEL

7185 MIN SPECIFIC ENERGY

3720 ASSUMED CRITICAL DEPTH

  SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL      OLOSS   BANK ELEV
  Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL     TWA    LEFT/RIGHT
  TIME     VLOB     VCH      VROB     XNL      XNCH     XNR      WTN     ELMIN      SSTA
  SLOPE    XLOBL    XLCH     XLOBR    ITRIAL   IDC      ICONT    CORAR   TOPWID     ENDST

    4.50     5.53   867.43   867.43    0.0    867.99    0.56     0.32    0.0    864.40
-   575.     191.    195.     188.     36.      23.      75.      3.      3.     864.40

    0.06     5.31    8.50     2.51    0.065    0.045    0.065    0.045  861.90 10133.26
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(20)

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- 0.000778      3.       3.       3.       2.               1       0.0     16.50  1124.71
 A

     5.61     9.48   880.68     0.0      0.0    880.72    0.05    0.02    0.03   883.90
     510.       0.     510.       0.       0.     292.      0.     30.     11.   882.50
     0.65      0.0     1.75      0.0    0.065    0.040   0.065   0.045  871.20 10048.37
- 0.000240     50.      50.      50.        2        0       1     0.0   51.16 10099.52
 A

 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      884.20 ELREA=       882.80

     5.73     9.35   880.85     0.0      0.0    880.90    0.05    0.18    0.00   884.20
     510.       0.     510.       0.       0.     286.      0.     35.     12.   882.80
     0.75      0.0     1.79      0.0    0.065    0.045   0.075   0.045  871.50 10048.64
- 0.000322    650.     650.     650.        2        0       1     0.0   50.65 10099.29
 A

     5.82    12.04   880.94     0.0      0.0    880.94    0.00    0.03    0.00   881.60
     510.       0.     292.     218.       0.     436.   1664.     47.     20.   880.20
     1.04      0.0     0.67     0.13    0.065    0.045   0.075   0.045  868.90 10042.51
- 0.000033    460.     460.     460.        2        0       1     0.0 1450.56 11493.07
 A

 CCHV=    0.100 CEHV=    0.300
   SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG      HV      HL   OLOSS  BANK ELEV
   Q        QLOB     QCH      QROB     ALOB      ACH     AROB    VOL     TWA  LEFT/RIGHT
   TIME     VLOB     VCH      VROB     XNL       XNCH    XNR     WTN   ELMIN     SSTA
   SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC     ICONT   CORAR TOPWID    ENDST
 -

 -   5.92    14.96   880.96     0.0      0.0    880.96    0.00    0.02    0.00   877.20

     510.      64.     256.     190.     320.     432.   1284.     72.     36.   878.70
     1.43     0.20     0.59     0.15    0.065    0.050   0.075   0.046  866.00  9809.50
- 0.000037    520.     520.     520.        2        0       1     0.0 1335.29 11144.79
 A

     6.00    14.98   880.98     0.0      0.0    880.98    0.01    0.02    0.00   877.20
     510.      68.     351.      91.     208.     433.    446.     88.     46.   878.70
     1.62     0.33     0.81     0.20    0.065    0.050   0.075   0.046  866.00  9947.15
- 0.000070    440.     440.     440.        0        0       1     0.0  542.38 10489.53
 A
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 1

 ******************************************************
 HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
 ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
 MODIFICATIONS 52,53,54,55,56,57,58,59
 ******************************************************

 T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK
 T2      SILVER CREEK - 10YR,50YR,100YR, & 500YR - NATURAL
 T3      SILVER CREEK - 100 YEAR

 J1  ICHECK    INQ     NINV     IDIR     STRT    METRIC    HVINS     Q      WSEL     FQ
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(21)

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    -10.       4.        0.        0.  0.006500    0.0       0.0       0.  [illegible]    0.0

 J2  NPROF     IPLOT     PREVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     3.000     0.0     -1.000      0.0       0.0       0.0       0.0       0.0       0.0       0.0

 CCHV#   0.100 CEHV#    0.300
-   SECNO    DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV

    Q        QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME     VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE    XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

     4.34     4.78    862.88      0.0    862.80    863.25     0.37      0.0       0.0    862.40
     680.     172.     507.        1.     116.       91.       2.        0.        0.    862.70
     0.0      1.48     5.60      0.37    0.065     0.045     0.065     0.0     858.10  9884.26
- 0.006495     0.        0.        0.        0         0         5       0.0     208.61 10092.87
 A

 CCHV#   0.300 CEHV#    0.500
     4.49     4.90    866.80      0.0      0.0     867.05     0.25      3.76      0.04   866.00
     680.      12.     666.        2.       17.      164.       3.        4.        3.    866.40
     0.06     0.74     4.06      0.46    0.065     0.045     0.065     0.045    861.90 10005.36
- 0.003563    800.     800.      800.        4         0         1       0.0     111.20 10116.56
 A

 3685 20 TRIALS USED WSEL,CWSEL

 7185 MIN SPECIFIC ENERGY

 3720 ASSUMED CRITICAL DEPTH

    SECNO    DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q        QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME     VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
-   SLOPE    XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

      449
     4.59     5.80    867.70    867.70      0.0    868.15     0.45      0.30      0.0    864.40
-    680.     203.     196.      281.       40.       24.      111.       4.        3.    864.40

     0.06     5.05     8.04      2.53    0.065     0.045     0.065     0.045    861.90 10124.67
- 0.012261     50.      50.       50.       30         9         1       0.0     167.40 10292.07
 A

 7185 MIN SPECIFIC ENERGY

 3720 ASSUMED CRITICAL DEPTH

    SECNO    DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q        QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME     VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE    XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST
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 3265 DIVIDED FLOW

       5.61     10.43    881.63      0.0       0.0     881.68     0.05      0.01      0.00   883.90
        600.       0.       600.       0.        0.       342.       0.       36.       13.   882.50
        0.64      0.0       1.75      0.00     0.065     0.040     0.065     0.045    871.20 10046.20
 - 0.000216       50.        50.       50.        0          0         1       0.0     61.52 10203.59
 A

 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      884.20 ELREA=      882.80

       5.73     10.29    881.79      0.0       0.0     881.84     0.05      0.16      0.00   884.20
        600.       0.       600.       0.        0.       335.       0.       41.       14.   882.80
 -      0.75      0.0       1.79      0.0      0.065     0.045     0.075     0.045    871.50 10046.52

 - 0.000291      650.       650.      650.        1          0         1       0.0     54.55 10101.07
 A

 -     5.82     12.97    881.87      0.0       0.0     881.87     0.00      0.02      0.00   881.60

        600.       0.       232.      368.        5.       493.     3019.       61.       23.   880.20
        1.24      0.02      0.47      0.12     0.065     0.045     0.075     0.045    868.90 10004.67
 - 0.000014      460.       460.      460.        2          0         1       0.0   1629.82 11634.48
 A

 CCHV=    0.100 CEHV=    0.300
      SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS  BANK ELEV
          Q      QLOB       QCH      QROB      ALOB       ACH      AROB       VOL       TWA LEFT/RIGHT
       TIME      VLOB       VCH      VROB       XNL      XNCH       XNR       WTN     ELMIN      SSTA
      SLOPE     XLOBL      XLCH     XLOBR    ITRIAL       IDC     ICONT     CORAR    TOPWID     ENDST

       5.92     15.87    881.87      0.0       0.0     881.87     0.00      0.01      0.00   877.20
        600.      89.       209.      302.      598.       491.     2295.      102.       42.   878.70
        1.85      0.15      0.43      0.13     0.065     0.050     0.075     0.046    866.00  9704.32
 - 0.000016      520.       520.      520.        2          0         1       0.0   1607.55 11311.88
 A

       6.00     15.88    881.88      0.0       0.0     881.89     0.00      0.01      0.00   877.20
        600.      94.       337.      169.      323.       492.      814.      128.       53.   878.70
        2.10      0.29      0.68      0.21     0.065     0.050     0.075     0.046    866.00  9918.52
 - 0.000042      440.       440.      440.        0          0         1       0.0    654.44 10572.96
 A
 1

 ******************************************************
 HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
 ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
 MODIFICATIONS 52,53,54,55,56,57,58,59
 ******************************************************

 -T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK

  T2      SILVER CREEK - 10YR,50YR,100YR, & 500YR - NATURAL
  T3      SILVER CREEK - 500 YEAR
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J1  ICHECK    INQ      NINV      IDIR     STRT      METRIC    HVINS     Q        WSEL      FQ

     -10.       5.        0.        0.  0.007000     0.0       0.0       0.    863.200    0.0

J2  NPROF    IPLOT     PRFVS     XSECV    XSECH      FN       ALLDC     IBW      CHNIM     ITRACE

    15.000    0.0     -1.000      0.0      0.0       0.0       0.0       0.0      0.0       0.0


CCHV#   0.100 CEHV#   0.300
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

     4.34      5.10    863.20      0.0     863.20    863.60      0.40      0.0       0.0     862.40
    950.       316.      615.      19.      174.       99.       23.       0.        0.     862.70
     0.0       1.82      6.20      0.84     0.065     0.045     0.065      0.0     858.10   9855.16
- 0.007037      0.        0.        0.         0         0         1       0.0     308.24 10163.39
A

CCHV#   0.300 CEHV#   0.500
     4.49      5.42    867.31      0.0       0.0     867.62      0.31      3.99      0.03    866.00
-   950.       55.       880.      14.       49.      191.       17.        5.        4.     866.40

     0.05      1.13      4.60      0.83     0.065     0.045     0.065     0.045    861.90   9959.90
- 0.003716     800.      800.      800.        4         0         1       0.0     178.20 10138.09
A
-

3685 20 TRIALS USED WSEL,CWSEL

7185 MIN SPECIFIC ENERGY

3720 ASSUMED CRITICAL DEPTH

  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

     4.50      6.08    867.98    867.98      0.0     868.47      0.49      0.33      0.0     864.40
    950.       260.      231.      459.       50.       26.      151.        5.        5.     864.40
     0.05      5.23      8.99      3.04     0.065     0.045     0.065     0.045    861.90  10101.81
- 0.014247      50.       50.       50.        30         8         1       0.0     200.78 10302.59
A

NORMAL BRIDGE,NRD#15 MIN ELTRD#  866.60 MAX ELLC#  870.00

     4.50      6.15    868.05    868.04      0.0     868.52      0.47      0.04      0.01    864.40
    950.       47.       115.      788.       16.       19.      143.        5.        5.     864.40
     0.05      2.89      6.08      5.51     0.025     0.025     0.025     0.045    861.90  10096.26
- 0.009003       4.        4.        4.        0        11         1    -61.89    208.89 10305.15
A

-  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV

   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
```

6.00	18.46	884.46	0.0	0.0	884.46	0.00	0.00	0.00	877.20
830.	161.	292.	377.	795.	660.	2282.	364.	108.	878.70
4.80	0.20	0.44	0.17	0.065	0.050	0.075	0.046	866.00	9836.79
- 0.000012	440.	440.	440.	0	0	1	0.0	974.30	10811.09

A

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SUMMARY PRINTOUT FOR MULTIPLE PROFILES

SILVER CREEK - 500 YEAR

SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
4.34	0.0	0.0	0.0	858.10	365.00	862.18	0.0	862.52	112.90	59.43	0.0	0.0
- 4.34	0.0	0.0	0.0	858.10	575.00	862.74	0.0	863.08	181.71	59.81	0.0	0.0
4.34	0.0	0.0	0.0	858.10	680.00	862.88	0.0	863.25	208.61	64.95	0.0	0.0
4.34	0.0	0.0	0.0	858.10	950.00	863.20	0.0	863.60	308.24	70.37	0.0	0.0
- 4.49	800.00	0.0	0.0	861.90	365.00	865.84	0.0	866.00	49.34	32.36	0.07	1.95
4.49	800.00	0.0	0.0	861.90	575.00	866.52	0.0	866.74	85.39	35.69	0.06	3.10
4.49	800.00	0.0	0.0	861.90	680.00	866.80	0.0	867.05	111.20	35.63	0.06	3.60
4.49	800.00	0.0	0.0	861.90	950.00	867.31	0.0	867.62	178.20	37.16	0.05	5.08
4.50	50.00	0.0	0.0	861.90	365.00	866.43	866.43	867.40	24.26	272.90	0.07	2.04
4.50	50.00	0.0	0.0	861.90	575.00	867.43	867.43	867.99	148.57	147.56	0.06	3.27
4.50	50.00	0.0	0.0	861.90	680.00	867.70	867.70	868.15	167.40	122.61	0.06	3.81
4.50	50.00	0.0	0.0	861.90	950.00	867.97	867.97	868.47	200.78	142.47	0.05	5.36
4.50	4.00	866.60	870.00	861.90	365.00	867.60	867.60	867.83	155.18	70.26	0.07	2.05
4.50	4.00	866.60	870.00	861.90	575.00	867.81	0.0	868.11	181.42	72.14	0.06	3.28
4.50	4.00	866.60	870.00	861.90	680.00	867.84	867.84	868.23	183.88	93.59	0.06	3.82
4.50	4.00	866.60	870.00	861.90	950.00	868.05	868.04	868.52	208.89	90.03	0.05	5.38
4.50	22.00	866.60	866.90	861.90	365.00	867.88	0.0	867.94	189.77	10.08	0.08	2.12
4.50	22.00	866.60	866.90	861.90	575.00	868.15	0.0	868.23	222.01	13.07	0.06	3.38
4.50	22.00	866.60	866.90	861.90	680.00	868.30	0.0	868.39	241.16	12.78	0.06	3.93
4.50	22.00	866.60	866.90	861.90	950.00	868.58	0.0	868.69	274.69	13.94	0.06	5.51
- 4.50	4.00	0.0	0.0	861.90	365.00	867.87	0.0	867.96	188.02	25.58	0.08	2.14
4.50	4.00	0.0	0.0	861.90	575.00	868.13	0.0	868.26	219.91	39.15	0.06	3.40
4.50	4.00	0.0	0.0	861.90	680.00	868.29	0.0	868.42	238.42	41.77	0.06	3.96
4.50	4.00	0.0	0.0	861.90	950.00	868.56	0.0	868.72	271.73	51.07	0.06	5.55
4.51	50.00	0.0	0.0	862.20	365.00	867.96	0.0	868.08	166.38	17.68	0.08	2.36
4.51	50.00	0.0	0.0	862.20	575.00	868.26	0.0	868.46	204.41	27.32	0.07	3.69
4.51	50.00	0.0	0.0	862.20	680.00	868.42	0.0	868.64	224.21	29.97	0.07	4.28
4.51	50.00	0.0	0.0	862.20	950.00	868.72	0.0	868.99	261.80	37.28	0.06	5.95
4.63	615.00	0.0	0.0	866.00	365.00	869.99	0.0	870.78	22.02	174.08	0.10	4.01
4.63	615.00	0.0	0.0	866.00	575.00	871.06	0.0	871.91	27.64	143.83	0.09	5.92
4.63	615.00	0.0	0.0	866.00	680.00	871.41	0.0	872.35	29.47	146.33	0.09	6.83
4.63	615.00	0.0	0.0	866.00	950.00	872.34	872.34	873.26	137.92	123.38	0.08	9.42
4.78	760.00	0.0	0.0	868.30	365.00	873.22	0.0	873.32	43.27	13.20	0.19	5.69

4.78	760.00	0.0	0.0	868.30	575.00	874.27	0.0	874.40	97.04	13.58	0.16	8.45
4.78	760.00	0.0	0.0	868.30	680.00	874.68	0.0	874.82	103.48	13.33	0.16	9.80
4.78	760.00	0.0	0.0	868.30	950.00	875.50	0.0	875.66	110.02	13.53	0.15	13.67
4.91	710.00	0.0	0.0	869.00	365.00	874.28	0.0	874.36	45.35	16.29	0.27	8.13
4.91	710.00	0.0	0.0	869.00	575.00	875.35	0.0	875.46	98.04	16.00	0.24	12.20
4.91	710.00	0.0	0.0	869.00	680.00	875.75	0.0	875.86	108.96	15.87	0.24	14.22
4.91	710.00	0.0	0.0	869.00	950.00	876.58	0.0	876.70	213.84	15.39	0.23	19.87

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SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
~~4.92~~	50.00	0.0	0.0	869.10	365.00	874.35	0.0	874.51	24.25	27.49	0.28	8.29
4.92	50.00	0.0	0.0	869.10	575.00	875.39	0.0	875.66	25.29	38.12	0.25	12.42
4.92	50.00	0.0	0.0	869.10	680.00	875.77	0.0	876.09	25.67	44.17	0.24	14.47
4.92	50.00	0.0	0.0	869.10	950.00	876.53	0.0	877.02	27.25	60.46	0.23	20.21
℄ Melody Lane (SG)												
4.924	40.00	877.60	876.50	869.10	365.00	874.46	0.0	874.61	24.36	25.78	0.28	8.39
4.92	40.00	877.60	876.50	869.10	575.00	875.56	0.0	875.81	25.46	35.02	0.25	12.55
4.92	40.00	877.60	876.50	869.10	680.00	875.96	0.0	876.27	25.86	40.19	0.24	14.61
4.92	40.00	877.60	876.50	869.10	950.00	876.82	0.0	877.27	26.40	52.51	0.23	20.37
4.930	50.00	0.0	0.0	869.10	365.00	874.62	0.0	874.74	34.98	21.39	0.28	8.54
4.93	50.00	0.0	0.0	869.10	575.00	875.81	0.0	875.98	39.58	24.16	0.25	12.74
4.93	50.00	0.0	0.0	869.10	680.00	876.27	0.0	876.46	41.36	25.75	0.24	14.81
4.93	50.00	0.0	0.0	869.10	950.00	877.28	0.0	877.53	45.27	2?.05	0.23	20.61
5.04	530.00	0.0	0.0	869.40	365.00	875.56	0.0	875.65	37.43	13.82	0.35	10.29
5.04	530.00	0.0	0.0	869.40	575.00	876.88	0.0	876.99	42.52	15.53	0.31	15.08
5.04	530.00	0.0	0.0	869.40	680.00	877.40	0.0	877.54	44.56	16.37	0.30	17.41
5.04	530.00	0.0	0.0	869.40	950.00	878.56	0.0	878.73	49.02	18.11	0.28	23.80
5.06	136.00	0.0	0.0	869.70	365.00	875.75	0.0	875.84	37.02	14.83	0.36	10.77
5.06	136.00	0.0	0.0	869.70	575.00	877.09	0.0	877.21	42.20	16.27	0.32	15.73
5.06	136.00	0.0	0.0	869.70	680.00	877.63	0.0	877.77	44.28	16.99	0.31	18.12
5.06	136.00	0.0	0.0	869.70	950.00	878.81	0.0	878.98	48.85	18.50	0.29	24.69
5.10 ~~5.07~~	50.00	0.0	0.0	869.90	365.00	875.82	0.0	875.92	25.37	14.41	0.37	10.94
5.07	50.00	0.0	0.0	869.90	575.00	877.16	0.0	877.32	25.59	19.59	0.32	15.95
5.07	50.00	0.0	0.0	869.90	680.00	877.70	0.0	877.89	25.68	22.28	0.31	18.37
5.07	50.00	0.0	0.0	869.90	950.00	878.87	0.0	879.15	25.87	29.12	0.29	24.98
℄ A Foot Bridge (SG)												
5.071	8.00	883.90	882.70	869.90	365.00	875.83	0.0	875.93	25.37	14.38	0.37	10.97
5.07	8.00	883.90	882.70	869.90	575.00	877.18	0.0	877.33	25.59	19.59	0.32	15.98
5.07	8.00	883.90	882.70	869.90	680.00	877.72	0.0	877.91	25.68	22.25	0.31	18.40
5.07	8.00	883.90	882.70	869.90	950.00	878.90	0.0	879.17	25.88	28.88	0.29	25.02
5.08	50.00	0.0	0.0	870.00	365.00	875.91	0.0	876.01	36.43	16.44	0.38	11.14
5.08	50.00	0.0	0.0	870.00	575.00	877.31	0.0	877.43	41.88	17.06	0.33	16.20
5.08	50.00	0.0	0.0	870.00	680.00	877.88	0.0	878.02	44.09	17.46	0.32	18.64
5.08	50.00	0.0	0.0	870.00	950.00	879.14	0.0	879.31	48.98	18.21	0.30	25.31
5.152	376.00	0.0	0.0	870.50	320.00	876.31	0.0	876.38	36.07	6.41	0.42	12.39
5.15	376.00	0.0	0.0	870.50	510.00	877.72	0.0	877.83	41.55	6.69	0.37	17.92
5.15	376.00	0.0	0.0	870.50	600.00	878.30	0.0	878.42	43.80	6.72	0.36	20.58
5.15	376.00	0.0	0.0	870.50	830.00	879.59	0.0	879.72	48.78	6.77	0.33	27.76
5.161	50.00	0.0	0.0	870.60	320.00	875.52	0.0	876.86	7.00	240.85	0.42	12.49

5.161	50.00	0.0	0.0	870.60	510.00	876.06	876.06	878.82	7.00	469.44	0.37	18.06
5.16	50.00	0.0	0.0	870.60	600.00	876.69	876.69	879.76	7.00	495.44	0.36	20.73
5.16	50.00	0.0	0.0	870.60	830.00	879.85	879.85	882.12	21.80	276.10	0.33	27.96

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SECTION -NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
5.163	8.00	888.00	895.10	870.60	320.00	875.63	0.0	876.91	7.00	32.19	0.42	12.50
5.16	8.00	888.00	895.10	870.60	510.00	876.71	0.0	878.92	7.00	49.90	0.37	18.07
5.16	8.00	888.00	895.10	870.60	600.00	877.39	0.0	879.87	7.00	53.24	0.36	20.74
5.16	8.00	888.00	895.10	870.60	830.00	878.84	878.32	882.25	9.83	97.38	0.33	27.98
℄ State Route 49 (NB)												
5.18	84.00	888.00	878.60	870.60	320.00	876.07	0.0	877.16	7.00	25.82	0.43	12.57
5.18	84.00	888.00	878.60	870.60	510.00	877.60	0.0	879.28	7.00	35.60	0.37	18.15
5.18	84.00	888.00	878.60	870.60	600.00	878.35	0.0	880.25	7.00	38.48	0.36	20.84
5.18	84.00	888.00	878.60	870.60	830.00	879.66	878.35	883.07	19.50	97.38	0.34	28.08
5.18	8.00	0.0	0.0	870.60	320.00	876.15	0.0	877.20	7.00	177.42	0.43	12.57
5.18	8.00	0.0	0.0	870.60	510.00	877.71	0.0	879.34	7.00	243.85	0.37	18.16
5.18	8.00	0.0	0.0	870.60	600.00	878.49	0.0	880.32	7.00	262.49	0.36	20.85
5.18	8.00	0.0	0.0	870.60	830.00	883.11	878.25	883.42	62.77	34.72	0.34	28.11
5.19	50.00	0.0	0.0	870.50	320.00	877.30	0.0	877.36	35.98	3.95	0.43	12.69
5.19	50.00	0.0	0.0	870.50	510.00	879.48	0.0	879.55	60.61	3.02	0.38	18.34
5.19	50.00	0.0	0.0	870.50	600.00	880.48	0.0	880.54	87.37	2.48	0.37	21.07
5.19	50.00	0.0	0.0	870.50	830.00	883.43	0.0	883.46	169.53	1.07	0.35	28.64
5.32	680.00	0.0	0.0	869.90	320.00	877.56	0.0	877.61	36.64	3.25	0.54	15.39
5.32	680.00	0.0	0.0	869.90	510.00	879.68	0.0	879.74	64.72	2.65	0.48	22.58
5.32	680.00	0.0	0.0	869.90	600.00	880.65	0.0	880.70	91.90	2.23	0.47	26.47
5.32	680.00	0.0	0.0	869.90	830.00	883.51	0.0	883.54	169.64	1.03	0.49	39.97
5.445	645.00	0.0	0.0	871.40	320.00	877.80	0.0	877.88	33.38	5.31	0.62	17.81
5.44	645.00	0.0	0.0	871.40	510.00	879.88	0.0	879.96	42.34	4.33	0.56	26.31
5.44	645.00	0.0	0.0	871.40	600.00	880.81	0.0	880.89	57.95	3.73	0.55	31.11
5.44	645.00	0.0	0.0	871.40	830.00	883.58	0.0	883.63	132.34	1.85	0.59	49.32
5.454	50.00	0.0	0.0	871.50	320.00	877.80	0.0	877.95	16.30	12.92	0.63	17.95
5.45	50.00	0.0	0.0	871.50	510.00	879.85	0.0	880.07	16.30	15.39	0.56	26.52
5.45	50.00	0.0	0.0	871.50	600.00	880.76	0.0	881.01	16.30	16.19	0.55	31.35
5.45	50.00	0.0	0.0	871.50	830.00	883.49	0.0	883.76	35.85	15.07	0.60	49.74
℄ — St. Johns Road (SB)												
5.47	90.00	883.90	882.80	871.50	320.00	877.92	0.0	878.07	16.30	12.30	0.64	18.16
5.47	90.00	883.90	882.80	871.50	510.00	879.99	0.0	880.20	16.30	14.70	0.57	26.80
5.47	90.00	883.90	882.80	871.50	600.00	880.92	0.0	881.15	16.30	15.51	0.56	31.66
5.47	90.00	883.90	882.80	871.50	830.00	883.59	0.0	883.86	38.93	14.57	0.60	50.17
5.475	50.00	0.0	0.0	871.70	320.00	878.07	0.0	878.13	36.28	4.80	0.64	18.31
5.47	50.00	0.0	0.0	871.70	510.00	880.21	0.0	880.28	44.14	3.71	0.58	27.02
5.47	50.00	0.0	0.0	871.70	600.00	881.17	0.0	881.23	47.63	3.29	0.57	31.92
5.47	50.00	0.0	0.0	871.70	830.00	883.89	0.0	883.95	351.36	2.05	0.61	50.55
5.52	205.00	0.0	0.0	872.60	320.00	878.17	0.0	878.27	33.38	8.16	0.66	18.99
5.52	205.00	0.0	0.0	872.60	510.00	880.29	0.0	880.38	41.12	5.66	0.60	28.08
5.52	205.00	0.0	0.0	872.60	600.00	881.23	0.0	881.32	44.57	4.85	0.59	33.18
5.52	205.00	0.0	0.0	872.60	830.00	883.93	0.0	884.00	54.44	2.91	0.63	52.56

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SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
5.58	310.00	0.0	0.0	872.50	320.00	878.41	0.0	878.49	34.62	6.45	0.70	19.95
5.58	310.00	0.0	0.0	872.50	510.00	880.46	0.0	880.54	42.12	4.90	0.64	29.60
5.58	310.00	0.0	0.0	872.50	600.00	881.38	0.0	881.46	45.49	4.30	0.63	34.99
5.58	310.00	0.0	0.0	872.50	830.00	884.02	0.0	884.09	55.12	2.72	0.68	55.32
5.59	50.00	0.0	0.0	871.20	320.00	878.42	0.0	878.53	16.50	6.44	0.71	20.10
5.59	50.00	0.0	0.0	871.20	510.00	880.43	0.0	880.60	16.50	8.00	0.64	29.82
5.59	50.00	0.0	0.0	871.20	600.00	881.40	0.0	881.48	53.17	2.72	0.63	35.33
5.59	50.00	0.0	0.0	871.20	830.00	884.03	0.0	884.10	327.32	1.93	0.68	55.89
5.59	3.00	883.20	885.00	871.20	320.00	878.40	0.0	878.54	40.80	3.64	0.71	20.11
5.59	3.00	883.20	885.00	871.20	510.00	880.36	0.0	880.63	48.88	8.10	0.64	29.83
5.59	3.00	883.20	885.00	871.20	600.00	881.20	0.0	881.57	52.32	12.65	0.63	35.34
5.59	3.00	883.20	885.00	871.20	830.00	883.65	875.46	884.27	210.21	22.22	0.68	55.91
℄ - Water Plant Access Road (NB)												
5.60	54.00	883.20	880.70	871.20	320.00	878.42	0.0	878.56	40.91	3.61	0.71	20.24
5.60	54.00	883.20	880.70	871.20	510.00	880.41	0.0	880.68	49.06	8.06	0.64	29.98
5.60	54.00	883.20	880.70	871.20	600.00	881.27	0.0	881.64	52.60	12.65	0.64	35.49
5.60	54.00	883.20	880.70	871.20	830.00	883.94	875.46	884.39	304.94	17.95	0.69	56.14
5.60	3.00	0.0	0.0	871.20	320.00	878.46	0.0	878.57	16.50	6.35	0.71	20.24
5.60	3.00	0.0	0.0	871.20	510.00	880.52	0.0	880.69	16.50	7.78	0.64	29.99
5.60	3.00	0.0	0.0	871.20	600.00	881.59	0.0	881.67	53.93	2.53	0.64	35.51
5.60	3.00	0.0	0.0	871.20	830.00	884.37	0.0	884.43	346.85	1.61	0.69	56.17
5.61	50.00	0.0	0.0	871.20	320.00	878.55	0.0	878.59	42.25	2.91	0.72	20.42
5.61	50.00	0.0	0.0	871.20	510.00	880.67	0.0	880.72	51.16	2.40	0.65	30.24
5.61	50.00	0.0	0.0	871.20	600.00	881.63	0.0	881.68	61.52	2.16	0.64	35.90
5.61	50.00	0.0	0.0	871.20	830.00	884.43	0.0	884.44	590.32	0.71	0.70	57.33
5.73	650.00	0.0	0.0	871.50	320.00	878.77	0.0	878.81	41.90	3.87	0.83	23.27
5.73	650.00	0.0	0.0	871.50	510.00	880.85	0.0	880.90	50.65	3.22	0.75	34.55
5.73	650.00	0.0	0.0	871.50	600.00	881.79	0.0	881.84	54.55	2.91	0.75	40.95
5.73	650.00	0.0	0.0	871.50	830.00	884.45	0.0	884.45	1853.84	0.06	1.89	114.85
5.82	460.00	0.0	0.0	868.90	320.00	878.88	0.0	878.89	53.26	0.95	0.96	25.95
5.82	460.00	0.0	0.0	868.90	510.00	880.94	0.0	880.94	1450.56	0.33	1.04	47.15
5.82	460.00	0.0	0.0	868.90	600.00	881.86	0.0	881.87	1629.82	0.14	1.24	61.29
5.82	460.00	0.0	0.0	868.90	830.00	884.46	0.0	884.46	2510.00	0.03	3.04	196.70
5.92	520.00	0.0	0.0	866.00	320.00	878.94	0.0	878.96	125.13	1.80	1.10	29.91
5.92	520.00	0.0	0.0	866.00	510.00	880.96	0.0	880.96	1335.29	0.37	1.43	71.84
5.92	520.00	0.0	0.0	866.00	600.00	881.87	0.0	881.87	1607.55	0.16	1.85	102.47
5.92	520.00	0.0	0.0	866.00	830.00	884.46	0.0	884.46	2240.00	0.03	4.35	301.86
6.00	440.00	0.0	0.0	866.00	320.00	879.02	0.0	879.04	130.05	1.70	1.23	33.44
6.00	440.00	0.0	0.0	866.00	510.00	880.98	0.0	880.98	542.38	0.70	1.62	87.61
6.00	440.00	0.0	0.0	866.00	600.00	881.88	0.0	881.89	654.44	0.42	2.10	127.79
6.00	440.00	0.0	0.0	866.00	830.00	884.46	0.0	884.46	974.30	0.12	4.80	363.77

SECTION NUMBER	DISCHARGE CFS	CWSEL	CWSEL DIFF EACH Q	CWSEL DIFF EACH SECTION	CWSEL-WSELK	TOPWID	T.W. DIFF	LENGTH
4.340	365.000	862.180	0.0	0.0	0.0	112.898	0.0	0.0
4.340	575.000	862.737	0.556	0.0	0.0	181.715	-68.816	0.0
4.340	680.000	862.878	0.141	0.0	0.0	208.605	-95.707	0.0

4.340	950.000	863.199	0.321	0.0	0.0	308.238	-195.340	0.0
4.490	365.000	865.842	0.0	3.661	0.0	49.336	0.0	800.000
4.490	575.000	866.520	0.678	3.783	0.0	85.391	-36.055	800.000
4.490	680.000	866.797	0.278	3.919	0.0	111.203	-61.867	800.000
4.490	950.000	867.314	0.517	4.115	0.0	178.195	-128.859	800.000
4.497	365.000	866.426	0.0	0.584	0.0	24.262	0.0	50.000
4.497	575.000	867.432	1.006	0.912	0.0	148.566	-124.305	50.000
4.497	680.000	867.699	0.268	0.902	0.0	167.398	-143.137	50.000
4.497	950.000	867.975	0.276	0.661	0.0	200.781	-176.520	50.000
4.499	365.000	867.598	0.0	1.173	0.0	155.184	0.0	4.000
4.499	575.000	867.805	0.208	0.374	0.0	181.422	-26.238	4.000
4.499	680.000	867.835	0.030	0.136	0.0	183.883	-28.699	4.000
4.499	950.000	868.051	0.215	0.076	0.0	208.891	-53.707	4.000
4.501	365.000	867.882	0.0	0.284	0.0	189.766	0.0	22.000
4.501	575.000	868.149	0.267	0.344	0.0	222.012	-32.246	22.000
4.501	680.000	868.301	0.152	0.466	0.0	241.164	-51.398	22.000
4.501	950.000	868.576	0.275	0.523	0.0	274.691	-84.926	22.000
4.503	365.000	867.870	0.0	-0.013	0.0	188.023	0.0	4.000
4.503	575.000	868.132	0.263	-0.017	0.0	219.906	-31.883	4.000
4.503	680.000	868.285	0.153	-0.016	0.0	238.422	-50.398	4.000
4.503	950.000	868.560	0.274	-0.016	0.0	271.730	-83.707	4.000
4.512	365.000	867.957	0.0	0.088	0.0	166.379	0.0	50.000
4.512	575.000	868.261	0.304	0.129	0.0	204.406	-38.027	50.000
4.512	680.000	868.420	0.159	0.134	0.0	224.211	-57.832	50.000
4.512	950.000	868.722	0.302	0.162	0.0	261.805	-95.426	50.000
4.630	365.000	869.994	0.0	2.037	0.0	22.016	0.0	615.000
4.630	575.000	871.064	1.070	2.803	0.0	27.641	-5.625	615.000
4.630	680.000	871.412	0.348	2.993	0.0	29.473	-7.457	615.000
4.630	950.000	872.337	0.925	3.616	0.0	137.918	-115.902	615.000
4.780	365.000	873.216	0.0	3.222	0.0	43.270	0.0	760.000
4.780	575.000	874.267	1.051	3.203	0.0	97.043	-53.773	760.000
4.780	680.000	874.676	0.408	3.263	0.0	103.484	-60.215	760.000
4.780	950.000	875.498	0.823	3.161	0.0	110.016	-66.746	760.000
4.907	365.000	874.280	0.0	1.064	0.0	45.352	0.0	710.000
4.907	575.000	875.355	1.075	1.088	0.0	98.043	-52.691	710.000
4.907	680.000	875.752	0.397	1.076	0.0	108.957	-63.605	710.000
4.907	950.000	876.583	0.831	1.085	0.0	213.840	-168.488	710.000
4.916	365.000	874.345	0.0	0.066	0.0	24.255	0.0	50.000
4.916	575.000	875.391	1.046	0.036	0.0	25.292	-1.037	50.000
4.916	680.000	875.767	0.376	0.015	0.0	25.667	-1.413	50.000
4.916	950.000	876.530	0.763	-0.053	0.0	27.253	-2.999	50.000
4.924	365.000	874.460	0.0	0.115	0.0	24.361	0.0	40.000
4.924	575.000	875.557	1.096	0.166	0.0	25.458	-1.098	40.000
4.924	680.000	875.962	0.406	0.196	0.0	25.864	-1.503	40.000
4.924	950.000	876.825	0.863	0.295	0.0	26.400	-2.040	40.000
4.933	365.000	874.624	0.0	0.164	0.0	34.980	0.0	50.000
4.933	575.000	875.813	1.188	0.256	0.0	39.578	-4.598	50.000

4.933	680.000	876.271	0.459	0.309	0.0	41.355	-6.375	50.000
4.933	950.000	877.282	1.011	0.458	0.0	45.270	-10.289	50.000
5.040	365.000	875.560	0.0	0.936	0.0	37.434	0.0	530.000
5.040	575.000	876.876	1.316	1.064	0.0	42.523	-5.090	530.000
5.040	680.000	877.404	0.528	1.133	0.0	44.559	-7.125	530.000
5.040	950.000	878.561	1.157	1.278	0.0	49.023	-11.590	530.000
5.060	365.000	875.751	0.0	0.191	0.0	37.020	0.0	136.000
5.060	575.000	877.089	1.338	0.213	0.0	42.203	-5.184	136.000
5.060	680.000	877.628	0.539	0.224	0.0	44.281	-7.262	136.000
5.060	950.000	878.807	1.179	0.247	0.0	48.848	-11.828	136.000
5.069	365.000	875.822	0.0	0.071	0.0	25.372	0.0	50.000
5.069	575.000	877.162	1.340	0.073	0.0	25.593	-0.221	50.000
5.069	680.000	877.699	0.538	0.071	0.0	25.681	-0.309	50.000
5.069	950.000	878.871	1.172	0.064	0.0	25.872	-0.500	50.000
5.071	365.000	875.833	0.0	0.011	0.0	25.373	0.0	8.000
5.071	575.000	877.177	1.344	0.016	0.0	25.593	-0.220	8.000
5.071	680.000	877.717	0.540	0.018	0.0	25.681	-0.309	8.000
5.071	950.000	878.897	1.179	0.026	0.0	25.876	-0.504	8.000
5.080	365.000	875.909	0.0	0.076	0.0	36.430	0.0	50.000
5.080	575.000	877.306	1.397	0.129	0.0	41.875	-5.445	[illegible]
5.080	680.000	877.877	0.571	0.159	0.0	44.086	-7.656	50.000
5.080	950.000	879.141	1.264	0.244	0.0	48.977	-12.547	50.000
5.152	320.000	876.306	0.0	0.397	0.0	36.070	0.0	376.000
5.152	510.000	877.723	1.417	0.417	0.0	41.551	-5.480	376.000
5.152	600.000	878.304	0.581	0.427	0.0	43.801	-7.730	376.000
5.152	830.000	879.589	1.286	0.448	0.0	48.777	-12.707	376.000
5.161	320.000	875.517	0.0	-0.789	0.0	7.000	0.0	50.000
5.161	510.000	876.061	0.544	-1.662	0.0	7.000	0.0	50.000
5.161	600.000	876.686	0.625	-1.618	0.0	7.000	0.0	50.000
5.161	830.000	879.849	3.163	0.260	0.0	21.797	-14.797	50.000
5.163	320.000	875.625	0.0	0.108	0.0	7.000	0.0	8.000
5.163	510.000	876.710	1.085	0.649	0.0	7.000	0.0	8.000
5.163	600.000	877.391	0.680	0.704	0.0	7.000	0.0	8.000
5.163	830.000	878.839	1.448	-1.011	0.0	9.828	-2.828	8.000
5.177	320.000	876.075	0.0	0.449	0.0	7.000	0.0	84.000
5.177	510.000	877.597	1.522	0.886	0.0	7.000	0.0	84.000
5.177	600.000	878.354	0.758	0.964	0.0	7.000	0.0	84.000
5.177	830.000	879.656	1.302	0.818	0.0	19.496	-12.496	84.000
5.179	320.000	876.150	0.0	0.075	0.0	7.000	0.0	8.000
5.179	510.000	877.712	1.563	0.116	0.0	7.000	0.0	8.000
5.179	600.000	878.489	0.776	0.134	0.0	7.000	0.0	8.000
5.179	830.000	883.111	4.622	3.454	0.0	62.773	-55.773	8.000
5.188	320.000	877.305	0.0	1.155	0.0	35.977	0.0	50.000
5.188	510.000	879.485	2.180	1.773	0.0	60.605	-24.629	50.000
5.188	600.000	880.482	0.998	1.994	0.0	87.371	-51.395	50.000
5.188	830.000	883.434	2.952	0.324	0.0	169.531	-133.555	50.000
5.320	320.000	877.555	0.0	0.251	0.0	36.545	0.0	680.000
5.320	510.000	879.682	2.127	0.198	0.0	64.723	-28.078	680.000

5.320	600.000	880.647	0.965	0.165	0.0	91.902	-55.258	680.000
5.320	830.000	883.507	2.859	0.073	0.0	169.645	-133.000	680.000
5.445	320.000	877.804	0.0	0.249	0.0	33.375	0.0	645.000
5.445	510.000	879.801	2.077	0.199	0.0	42.344	-8.969	645.000
5.445	600.000	880.812	0.931	0.164	0.0	57.949	-24.574	645.000
5.445	830.000	883.578	2.766	0.071	0.0	132.340	-98.965	645.000
5.454	320.000	877.804	0.0	0.0	0.0	16.297	0.0	50.000
5.454	510.000	879.849	2.044	-0.032	0.0	16.297	0.0	50.000
5.454	600.000	880.763	0.914	-0.049	0.0	16.297	0.0	50.000
5.454	830.000	883.486	2.723	-0.093	0.0	35.852	-19.555	50.000
5.466	320.000	877.924	0.0	0.120	0.0	16.297	0.0	90.000
5.466	510.000	879.994	2.069	0.145	0.0	16.297	0.0	90.000
5.466	600.000	880.916	0.922	0.153	0.0	16.297	0.0	90.000
5.466	830.000	883.594	2.678	0.108	0.0	38.934	-22.637	90.000
5.475	320.000	878.065	0.0	0.141	0.0	36.281	0.0	50.000
5.475	510.000	880.212	2.146	0.218	0.0	44.137	-7.855	50.000
5.475	600.000	881.167	0.955	0.251	0.0	47.625	-11.344	50.000
5.475	830.000	883.892	2.726	0.299	0.0	351.355	-315.074	50.000
5.520	320.000	878.170	0.0	0.104	0.0	33.375	0.0	205.000
5.520	510.000	880.287	2.117	0.075	0.0	41.117	-7.742	205.000
5.520	600.000	881.232	0.945	0.065	0.0	44.570	-11.195	205.000
5.520	830.000	883.930	2.698	0.037	0.0	54.441	-21.066	205.000
5.578	320.000	878.410	0.0	0.241	0.0	34.621	0.0	310.000
5.578	510.000	880.460	2.050	0.174	0.0	42.117	-7.496	310.000
5.578	600.000	881.381	0.921	0.149	0.0	45.488	-10.667	310.000
5.578	830.000	884.021	2.640	0.091	0.0	55.117	-20.496	310.000
5.587	320.000	878.420	0.0	0.009	0.0	16.500	0.0	50.000
5.587	510.000	880.428	2.008	-0.032	0.0	16.500	0.0	50.000
5.587	600.000	881.397	0.969	0.016	0.0	53.174	-36.674	50.000
5.587	830.000	884.031	2.634	0.009	0.0	327.325	-310.825	50.000
5.588	320.000	878.399	0.0	-0.021	0.0	40.800	0.0	3.000
5.588	510.000	880.361	1.962	-0.067	0.0	48.878	-8.078	3.000
5.588	600.000	881.198	0.837	-0.199	0.0	52.324	-11.524	3.000
5.588	830.000	883.646	2.448	-0.385	0.0	210.210	-169.411	3.000
5.598	320.000	878.420	0.0	0.021	0.0	40.912	0.0	54.000
5.598	510.000	880.406	1.986	0.044	0.0	49.056	-8.145	54.000
5.598	600.000	881.266	0.861	0.068	0.0	52.605	-11.693	54.000
5.598	830.000	883.938	2.672	0.293	0.0	304.937	-264.025	54.000
5.599	320.000	878.456	0.0	0.036	0.0	16.500	0.0	3.000
5.599	510.000	880.519	2.064	0.114	0.0	16.500	0.0	3.000
5.599	600.000	881.587	1.068	0.321	0.0	53.926	-37.426	3.000
5.599	830.000	884.374	2.788	0.436	0.0	346.850	-330.350	3.000
5.610	320.000	878.551	0.0	0.096	0.0	42.254	0.0	50.000
5.610	510.000	880.675	2.124	0.156	0.0	51.156	-8.902	50.000
5.610	600.000	881.634	0.959	0.047	0.0	61.520	-19.266	50.000
5.610	830.000	884.426	2.793	0.052	0.0	590.320	-548.066	50.000
5.730	320.000	878.767	0.0	0.216	0.0	41.902	0.0	650.000

5.730	510.000	880.854	2.087	0.179	0.0	50.648	-8.746	650.000
5.730	600.000	881.794	0.941	0.161	0.0	54.555	-12.652	650.000
5.730	830.000	884.455	2.661	0.029	0.0	1853.836	-1811.934	650.000
5.820	320.000	878.876	0.0	0.109	0.0	53.258	0.0	460.000
5.820	510.000	880.938	2.062	0.084	0.0	1450.563	-1397.305	460.000
5.820	600.000	881.865	0.927	0.071	0.0	1629.816	-1576.559	460.000
5.820	830.000	884.457	2.592	0.002	0.0	2510.000	-2456.742	460.000
5.920	320.000	878.942	0.0	0.066	0.0	125.129	0.0	520.000
5.920	510.000	880.957	2.015	0.019	0.0	1335.289	-1210.160	520.000
5.920	600.000	881.873	0.916	0.008	0.0	1607.555	-1482.426	520.000
5.920	830.000	884.458	2.585	0.001	0.0	2240.000	-2114.871	520.000
6.000	320.000	879.020	0.0	0.078	0.0	130.047	0.0	440.000
6.000	510.000	880.976	1.956	0.019	0.0	542.379	-412.332	440.000
6.000	600.000	881.881	0.905	0.008	0.0	654.441	-524.395	440.000
6.000	830.000	884.459	2.578	0.001	0.0	974.305	-844.258	440.000

DATA FOR LAST CROSS SECTION

PROFILE	TYPE ENC	TARGET	TOP WIDTH AREA-ACRES	TOP WIDTH AREA-DIFF
1	0.0	0.0	10.762	0.0
2	0.0	0.0	45.876	35.114
3	0.0	0.0	53.415	42.653
4	0.0	0.0	108.042	97.280

1

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HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
-MODIFICATIONS 52,53,54,55,56,57,58,59

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-ER
A
-IHC900I EXECUTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER  217
A
-IHC217I FIOCS - END OF DATA SET ON UNIT    5
A
-TRACEBACK  ROUTINE  CALLED FROM ISN   REG. 14   REG. 15   REG.  0   REG.  1
A
-          IBCOM                       00608380  00640F08  00000015  00000000
A
-            MAIN                      0003ED00  01605820  FD000008  00649FF8
A
-ENTRY POINT=  01605820
1
-SUMMARY OF ERRORS FOR THIS JOB   ERROR NUMBER   NUMBER OF ERRORS
A
-                                     217              1
1
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Illinois Department of Transportation

PRELIMINARY
WATERWAY INFORMATION TABLE

Route: IL. 47
Section:
County: McHenry
Date: 2/1/2010

Existing S.N. 056-0240
Proposed S.N. —
Waterway: Silver Creek
Prepared by: P.M.

Existing Low Grade Elev. = 891.0 at Sta. South of culvert

Drainage Area = 4.19 sq. mi					Proposed Low Grade = at Sta.				
Flood	Freq. Yr.	Q Ft³/s	Opening - ft²		Natural H.W.E.	Head - ft.		Headwater Elevation	
			Existing	Proposed		Existing	Proposed	Existing	Proposed
	10	320			874.8	0.25		875.05	
Design	50	510			876.1	2.37		878.47	
Base	100	600			876.8	2.83		879.63	
Overtop Existing	—								
Overtop Proposed	—								
Max. Calc.	500	830			878.2	4.79		882.99	

10 YEAR VELOCITY THROUGH EXISTING BRIDGE = 11.07 ft/s 10 YEAR VELOCITY THROUGH PROPOSED BRIDGE ft/s

ALL – TIME H.W.E. & DATE: 879.52 2/10/1966

Scope of Work:

EXISTING STRUCTURE

TYPE: Culvert, 7'(w) x 9'(h)
LENGTH: 84'
SPANS: 1
~~LOW BEAM~~: Invert: 870.6
SKEW: —

PROPOSED STRUCTURE

TYPE:
LENGTH:
SPANS:
LOW BEAM:
SKEW:

NOTE: PROPOSED STRUCTURE DETAILS ARE PRELIMINARY; SUBJECT TO REFINEMENT IN TSL STAGE.

DATUM IS FIS MODEL (NGVD 29)

Printed 2/1/2010 BBS 2730 (02/27/08)

PRELIMINARY WIT

(BASED ON FIS HEC-2)
(HEC-2 based on NGVD 29)

5.188
50'
5.179
8'
5.177 (GR based on 5.163) - U/S face
84'
IL. 47 SEE PLOT
5.163 (BT & GR) - D/S face
8'
5.161
50'
5.152 QT: 320, 510, 600, 830

Recreate FIS model using HEC-RAS.
Based on plot of HEC-2 (FIS) estimate culvert size @ 8'(H) x 7'(W)
with flat invert @ 870.6 station is to be 5.177 so bounding
stations are 5.161 to 5.179, dist = 100'
D/S to U/S station = 8' culv. length = 84'
Use FIS elev. @ 5.152 for start cond.; 876.31, 877.72, 878.30, 879.59

Use upstream station as the approach (5.188)

f	Q	5.188 w/culv.	nat	C.H.	nat @ U/s face	H.W.E
10	320	877.68	877.43	0.25	874.8	875.05
50	510	880.21	877.84	2.37	876.1	878.47
100	600	881.25	878.42	2.83	876.8	879.63
500	830	884.50	879.71	4.79	878.2	882.99

* ten-yr culvert velocity: 11.07 ft/sec
All time high water: 879.52 from gage record & H.A map
From HEC-RAS PLOT of B.T. data use low grade in floodplain 891.0

FIS-MODEL
HEC-2

6.0
440
5.92
520
5.82
460
(I) 5.73
650
5.610
50
5.599
3
5.598
54
5.588 - BT (Water Plant)
3
5.587
50
5.578
310
(H) 5.520
205
5.475
50
5.466 - SB (St. John)
90
5.454
50
'G' 5.445
645
5.320
680
5.188
50
5.179
8
5.177
84
5.163 - BT (IL. 47)
8
5.161
50
5.152 Q: 320, 510, 600, 830

376
5.080
50
5.071 - SB (Footbridge)
8
5.069
50
5.060
530
('F') 5.040
50
4.933
40
4.924 - SB (Melody)
40
4.916
50
4.907
710
('E') 4.780
760
4.630
615
('D') 4.512
50
4.503
4
4.501
22
4.499 - BT Footbridge connecting Tappan St / W. Melody to School
4
4.497
50
('C') 4.49 -
800
4.34: Q: 365, 575, 680, 950
NGVD 29 862.18, 862.74, 862.9, 863.2

NGVD 29 - (0.15/0.18) = NAVD 88

FIS → HEC-2
- X-sect. dist based on channel length
- FIS Sta. interpreted based on channel length, min channel elev. vs FIS profile, aerial photo

9-197
(Nov. 1954)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File No. Washington 5-5480.4
Field .

Description Prepared 8-6-64
(Date)
by G. L. Walter

WOODSTOCK 7.5 MINUTE QUAD.

Description of Gaging Station on Silver Creek at Woodstock, Ill.

(Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A or 9-213E for cross section. Use second page of this form for sketch if room is available, otherwise use Form 9-213C or 9-213H. Initial and date all sheets.)

Location.—Lat 42°20'06", long 88°26'35", in SE¼NW¼ sec. 32, T. 45 N., R. 7 E., at culvert on State Highway 47, at north edge of Woodstock.

Established.—June 18, 1964.

Drainage area.—

Gage.—Crest-stage gage; 6-ft length of 2-inch galvanized pipe mounted on left downstream wingwall.

Datum of gage, top of bottom cap, is 875.60 ft above mean sea level, datum of 1929.

Reference and bench marks.—R.P. 1 - Head of flush-shell bolt on downstream headwall, 2.5 ft from left end.

Cooperation.—Station is maintained under cooperative agreement with the Northeastern Illinois Metropolitan Area Planning Commission for flood-inundation studies.

9-176
(October 1952)
FLOOD DATA

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File 05548040

Flood data for Silver Creek at Woodstock, IL
Drainage area .... square miles. Period of record ....
Flood data for momentary peak discharges greater than .... cfs.

WATER YEAR	DATE	GAGE HEIGHT (Feet)	DISCHARGE CFS	DISCHARGE Ratio to $Q_{2.33}$	ANNUAL FLOODS Order (M)	ANNUAL FLOODS Recurrence Interval (Years)	PARTIAL DURATION SERIES Order (M)	PARTIAL DURATION SERIES Recurrence Interval (Years)	REMARKS
1965	02-06	2.80							
1966	02-10	3.92							
1967	06-11	1.49							
1968	08-17	2.45							
1969	06-09	1.00							
1970	07-23	1.25							
1971	02-19	1.25							
1972	07-14	1.81							
1973	04-22	1.63							
1974	05-16	2.21							
1975	---	b							
1976	---	c							
1977									

Graphical mean annual flood ($Q_{2.33}$) .... cfs for period ....

Sheet ..... of ..... Listed by .... Date .... Checked by .... Date ....

U. S. GOVERNMENT PRINTING OFFICE 16-47784-2

CROSS SECTION NAMING CONVENTION

FIS Model river station	FIS Model Reach Length	HECRAS River Sta.	
4.907	0	0	
4.916	50	50	
4.924	40	90	Melody Rd.
4.933	50	140	
5.040	530	670	
5.060	136	806	
5.069	50	856	
5.071	8	864	Footbridge
5.080	50	914	
5.152	376	1290	
5.161	50	1340	
5.163	8	1348	IL47
5.177	84	1432	IL47
5.179	8	1440	
5.188	50	1490	
5.320	680	2170	
5.445	645	2815	
5.454	50	2865	
5.466	90	2955	St Johns Rd.
5.475	50	3005	
5.520	205	3210	
5.578	310	3520	

HEC-RAS vs. HEC-2 Hydraulic Analysis with FIS Regulatory Model Data

Table 1 - HEC-RAS vs. HEC-2 FIS Models

FIS Model (HEC-RAS)			Diff	FIS Model (HEC-2)		
River Sta.	**Profile**	**W.S. Elev. *NGVD29***		**River Sta.**	**Profile**	**W.S. Elev. *NGVD29***
3520	10-yr	878.46	0.05	5.578	10-yr	878.41
3520	50-yr	880.55	0.09	5.578	50-yr	880.46
3520	100-yr	881.40	0.02	5.578	100-yr	881.38
3520	500-yr	884.03	0.01	5.578	500-yr	884.02
3210	10-yr	878.22	0.05	5.520	10-yr	878.17
3210	50-yr	880.38	0.09	5.520	50-yr	880.29
3210	100-yr	881.26	0.03	5.520	100-yr	881.23
3210	500-yr	883.94	0.01	5.520	500-yr	883.93
3005	10-yr	878.12	0.05	5.475	10-yr	878.07
3005	50-yr	880.31	0.10	5.475	50-yr	880.21
3005	100-yr	881.19	0.02	5.475	100-yr	881.17
3005	500-yr	883.90	0.31	5.475	500-yr	883.59
2865	10-yr	877.74	-0.18	5.454	10-yr	877.92
2865	50-yr	879.89	-0.10	5.454	50-yr	879.99
2865	100-yr	880.86	-0.06	5.454	100-yr	880.92
2865	500-yr	883.36	-0.23	5.454	500-yr	883.59
2815	10-yr	877.74	-0.06	5.445	10-yr	877.80
2815	50-yr	879.92	0.04	5.445	50-yr	879.88
2815	100-yr	880.86	0.05	5.445	100-yr	880.81
2815	500-yr	883.45	-0.13	5.445	500-yr	883.58
2170	10-yr	877.47	-0.09	5.320	10-yr	877.56
2170	50-yr	879.72	0.04	5.320	50-yr	879.68
2170	100-yr	880.69	0.04	5.320	100-yr	880.65
2170	500-yr	883.37	-0.14	5.320	500-yr	883.51
1490	10-yr	877.21	-0.09	5.188	10-yr	877.30
1490	50-yr	879.53	0.05	5.188	50-yr	879.48
1490	100-yr	880.53	0.05	5.188	100-yr	880.48
1490	500-yr	883.28	-0.15	5.188	500-yr	883.43
1440	10-yr	875.98	-0.17	5.179	10-yr	876.15
1440	50-yr	877.80	0.09	5.179	50-yr	877.71
1440	100-yr	878.58	0.09	5.179	100-yr	878.49
1440	500-yr	882.66	-0.45	5.179	500-yr	883.11

HEC-RAS vs. HEC-2 Hydraulic Analysis with FIS Regulatory Model Data

Table 1 - HEC-RAS vs. HEC-2 FIS Models						
FIS Model (HEC-RAS)			Diff	FIS Model (HEC-2)		
River Sta.	Profile	W.S. Elev. *NGVD29*		River Sta.	Profile	W.S. Elev. *NGVD29*
1340	10-yr	874.60	-0.92	5.161	10-yr	875.52
1340	50-yr	876.08	0.02	5.161	50-yr	876.06
1340	100-yr	876.71	0.02	5.161	100-yr	876.69
1340	500-yr	878.18	-1.67	5.161	500-yr	879.85
1290	10-yr	876.26	-0.05	5.152	10-yr	876.31
1290	50-yr	877.69	-0.03	5.152	50-yr	877.72
1290	100-yr	878.27	-0.03	5.152	100-yr	878.30
1290	500-yr	879.45	-0.14	5.152	500-yr	879.59
914	10-yr	875.98	0.07	5.080	10-yr	875.91
914	50-yr	877.39	0.08	5.080	50-yr	877.31
914	100-yr	877.97	0.09	5.080	100-yr	877.88
914	500-yr	879.11	-0.03	5.080	500-yr	879.14
864	10-yr	875.95	0.12	5.071	10-yr	875.83
864	50-yr	877.32	0.14	5.071	50-yr	877.18
864	100-yr	877.88	0.16	5.071	100-yr	877.72
864	500-yr	878.95	0.05	5.071	500-yr	878.90
856	10-yr	875.87	0.05	5.069	10-yr	875.82
856	50-yr	877.22	0.06	5.069	50-yr	877.16
856	100-yr	877.77	0.07	5.069	100-yr	877.70
856	500-yr	878.79	-0.08	5.069	500-yr	878.87
806	10-yr	875.81	0.06	5.060	10-yr	875.75
806	50-yr	877.15	0.06	5.060	50-yr	877.09
806	100-yr	877.70	0.07	5.060	100-yr	877.63
806	500-yr	878.72	-0.09	5.060	500-yr	878.81
670	10-yr	875.62	0.06	5.040	10-yr	875.56
670	50-yr	876.95	0.09	5.040	50-yr	876.86
670	100-yr	877.48	0.08	5.040	100-yr	877.40
670	500-yr	878.46	-0.10	5.040	500-yr	878.56
140	10-yr	874.73	0.11	4.933	10-yr	874.62
140	50-yr	875.93	0.12	4.933	50-yr	875.81
140	100-yr	876.41	0.14	4.933	100-yr	876.27
140	500-yr	877.07	-0.21	4.933	500-yr	877.28

Table 1 - HEC-RAS vs. HEC-2 FIS Models						
FIS Model (HEC-RAS)			Diff	FIS Model (HEC-2)		
River Sta.	Profile	W.S. Elev. *NGVD29*		River Sta.	Profile	W.S. Elev. *NGVD29*
50	10-yr	874.47	0.12	4.916	10-yr	874.35
50	50-yr	875.56	0.17	4.916	50-yr	875.39
50	100-yr	875.97	0.20	4.916	100-yr	875.77
50	500-yr	876.56	0.03	4.916	500-yr	876.53
0	10-yr	874.28	0.00	4.907	10-yr	874.28
0	50-yr	875.35	0.00	4.907	50-yr	875.35
0	100-yr	875.75	0.00	4.907	100-yr	875.75
0	500-yr	876.58	0.00	4.907	500-yr	876.58

Modifed Existing Model (HEC-RAS) vs. HEC-2 FIS Regulatory Model

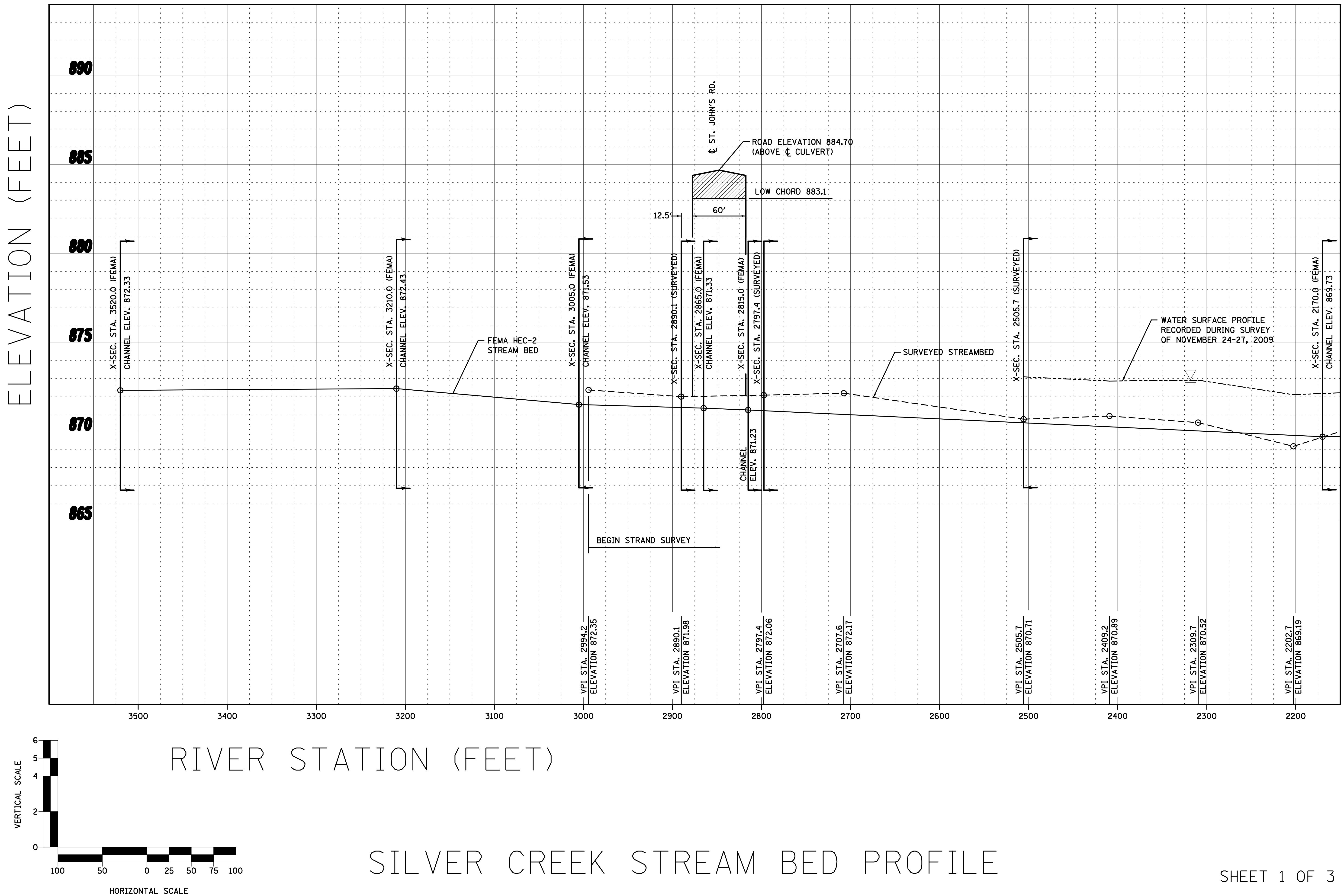
Table 2 - Modified Existing Model (HEC-RAS) vs. HEC-2 FIS Model							
Modified Existing (HEC-RAS)				(E) Diff (D-H)	FIS Model (HEC-2)		
(A) River Sta.	(B) Profile	(C) W.S. Elev. *NAVD88*	(D) W.S. Elev. *NGVD29*		(F) River Sta.	(G) Profile	(H) W.S. Elev. *NGVD29*
3520	10-yr	878.45	878.62	0.21	5.578	10-yr	878.41
3520	50-yr	880.35	880.52	0.06	5.578	50-yr	880.46
3520	100-yr	881.24	881.41	0.03	5.578	100-yr	881.38
3520	500-yr	884.10	884.27	0.25	5.578	500-yr	884.02
3210	10-yr	878.24	878.41	0.24	5.520	10-yr	878.17
3210	50-yr	880.18	880.35	0.06	5.520	50-yr	880.29
3210	100-yr	881.09	881.26	0.03	5.520	100-yr	881.23
3210	500-yr	884.02	884.19	0.26	5.520	500-yr	883.93
3005	10-yr	878.15	878.32	0.25	5.475	10-yr	878.07
3005	50-yr	880.10	880.27	0.06	5.475	50-yr	880.21
3005	100-yr	881.03	881.20	0.03	5.475	100-yr	881.17
3005	500-yr	883.99	884.16	0.57	5.475	500-yr	883.59
2170	10-yr	877.59	877.76	0.20	5.320	10-yr	877.56
2170	50-yr	879.55	879.72	0.04	5.320	50-yr	879.68
2170	100-yr	880.49	880.66	0.01	5.320	100-yr	880.65
2170	500-yr	883.44	883.61	0.10	5.320	500-yr	883.51
1490	10-yr	877.15	877.32	0.02	5.188	10-yr	877.30
1490	50-yr	879.19	879.36	-0.12	5.188	50-yr	879.48
1490	100-yr	880.18	880.35	-0.13	5.188	100-yr	880.48
1490	500-yr	883.27	883.44	0.01	5.188	500-yr	883.43
1290	10-yr	876.36	876.53	0.22	5.152	10-yr	876.31
1290	50-yr	877.81	877.98	0.26	5.152	50-yr	877.72
1290	100-yr	878.40	878.57	0.27	5.152	100-yr	878.30
1290	500-yr	879.83	880.00	0.41	5.152	500-yr	879.59
914	10-yr	876.11	876.28	0.37	5.080	10-yr	875.91
914	50-yr	877.51	877.68	0.37	5.080	50-yr	877.31
914	100-yr	878.08	878.25	0.37	5.080	100-yr	877.88
914	500-yr	879.52	879.69	0.55	5.080	500-yr	879.14
864	10-yr	876.02	876.19	0.36	5.071	10-yr	875.83
864	50-yr	877.37	877.54	0.36	5.071	50-yr	877.18
864	100-yr	877.92	878.09	0.37	5.071	100-yr	877.72
864	500-yr	879.29	879.46	0.56	5.071	500-yr	878.90

Modifed Existing Model (HEC-RAS) vs. HEC-2 FIS Regulatory Model

Table 2 - Modified Existing Model (HEC-RAS) vs. HEC-2 FIS Model							
Modified Existing (HEC-RAS)				(E) Diff (D-H)	FIS Model (HEC-2)		
(A) River Sta.	(B) Profile	(C) W.S. Elev. *NAVD88*	(D) W.S. Elev. *NGVD29*		(F) River Sta.	(G) Profile	(H) W.S. Elev. *NGVD29*
856	10-yr	876.01	876.18	0.36	5.069	10-yr	875.82
856	50-yr	877.36	877.53	0.37	5.069	50-yr	877.16
856	100-yr	877.91	878.08	0.38	5.069	100-yr	877.70
856	500-yr	879.28	879.45	0.58	5.069	500-yr	878.87
806	10-yr	875.96	876.13	0.38	5.060	10-yr	875.75
806	50-yr	877.31	877.48	0.39	5.060	50-yr	877.09
806	100-yr	877.86	878.03	0.40	5.060	100-yr	877.63
806	500-yr	879.24	879.41	0.60	5.060	500-yr	878.81
670	10-yr	875.75	875.92	0.36	5.040	10-yr	875.56
670	50-yr	877.08	877.25	0.39	5.040	50-yr	876.86
670	100-yr	877.62	877.79	0.39	5.040	100-yr	877.40
670	500-yr	879	879.17	0.61	5.040	500-yr	878.56
140	10-yr	874.84	875.01	0.39	4.933	10-yr	874.62
140	50-yr	876.02	876.19	0.38	4.933	50-yr	875.81
140	100-yr	876.49	876.66	0.39	4.933	100-yr	876.27
140	500-yr	877.90	878.07	0.79	4.933	500-yr	877.28
50	10-yr	874.27	874.44	0.09	4.916	10-yr	874.35
50	50-yr	875.33	875.50	0.11	4.916	50-yr	875.39
50	100-yr	875.72	875.89	0.12	4.916	100-yr	875.77
50	500-yr	876.53	876.70	0.17	4.916	500-yr	876.53
0	10-yr	874.11	874.28	0.00	4.907	10-yr	874.28
0	50-yr	875.18	875.35	0.00	4.907	50-yr	875.35
0	100-yr	875.58	875.75	0.00	4.907	100-yr	875.75
0	500-yr	876.41	876.58	0.00	4.907	500-yr	876.58

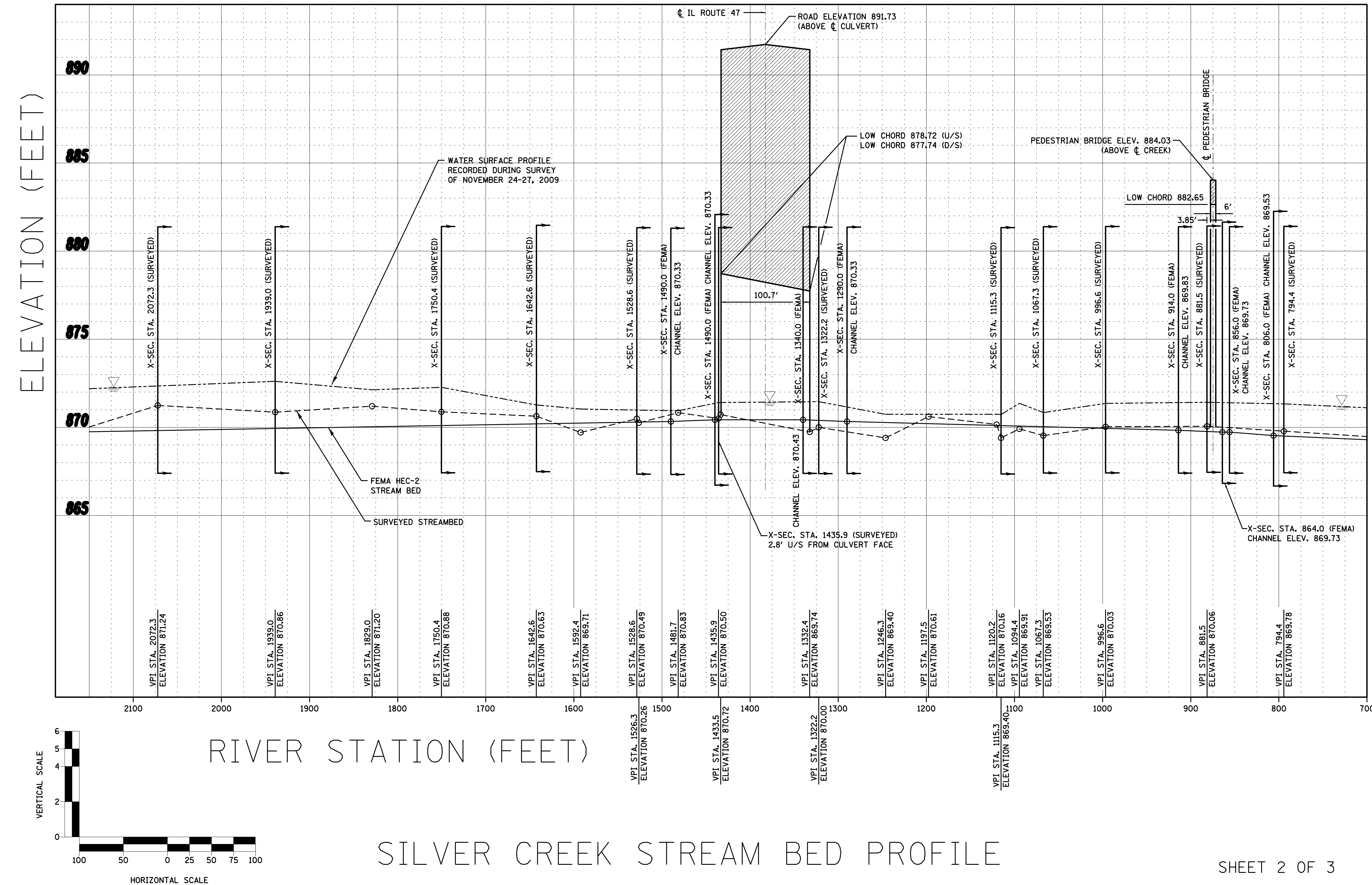
<u>EXHIBIT D</u>

STREAMBED PROFILE



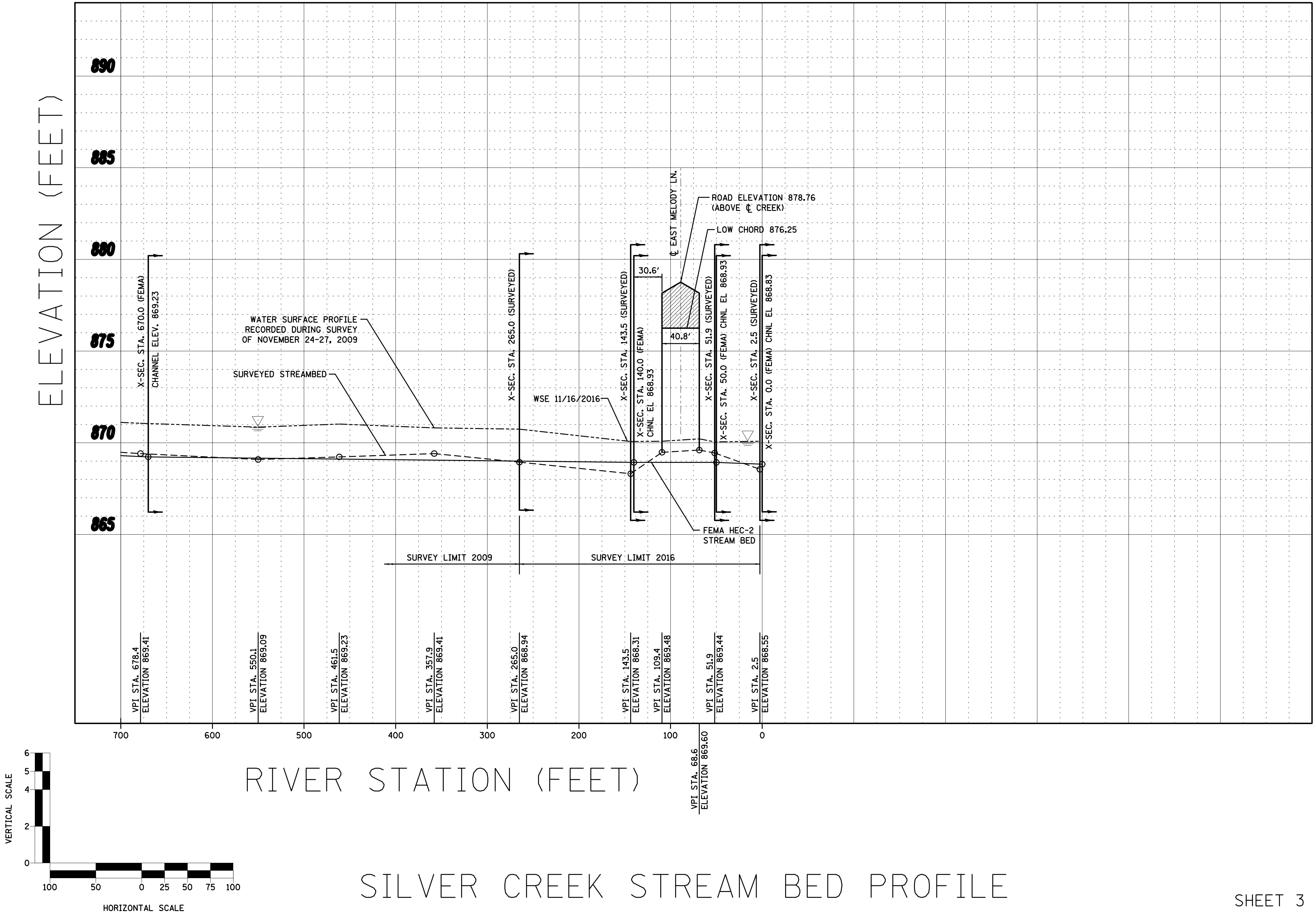
SILVER CREEK STREAM BED PROFILE

SHEET 1 OF 3



SILVER CREEK STREAM BED PROFILE

SHEET 2 OF 3

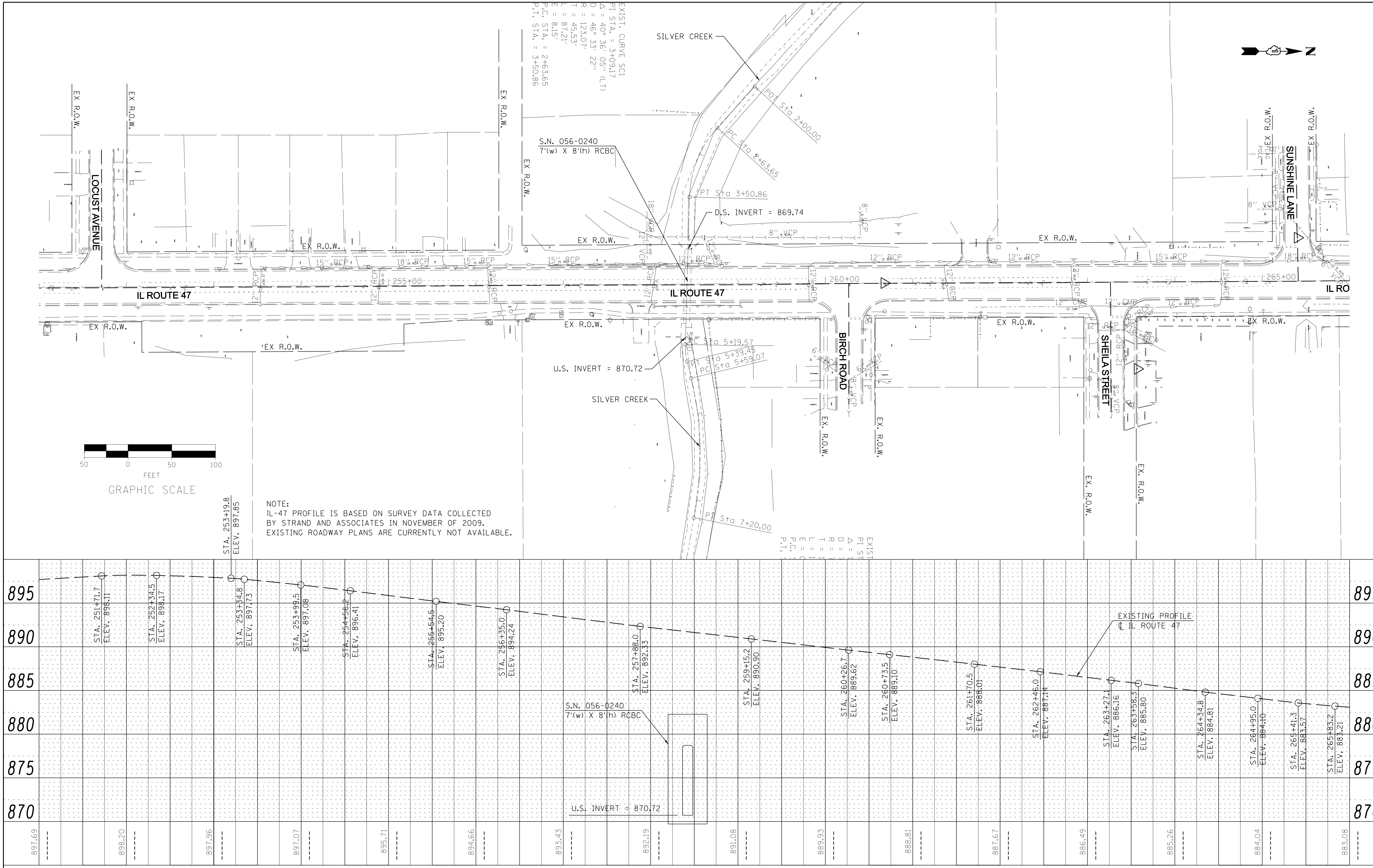


SILVER CREEK STREAM BED PROFILE

SHEET 3 OF 3

EXHIBIT E

ILLINOIS ROUTE 47 (N. SEMINARY AVE.)
ROADWAY PLAN AND PROFILE



PLAN	
NOTE BOOK NO.	SURVEYED / PLOTTED / ALIGNMENT CHECKED / R.O.W. CHECKED / CADD FILE NAME

PROFILE	
NOTE BOOK NO.	SURVEYED / PLOTTED / GRADES CHECKED / B.M. NOTED / STRUCTURE NOTATIONS CHK'D

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		DRAWN - SGL	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -
	PLOT DATE = $DATE$	DATE - 7/2010	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

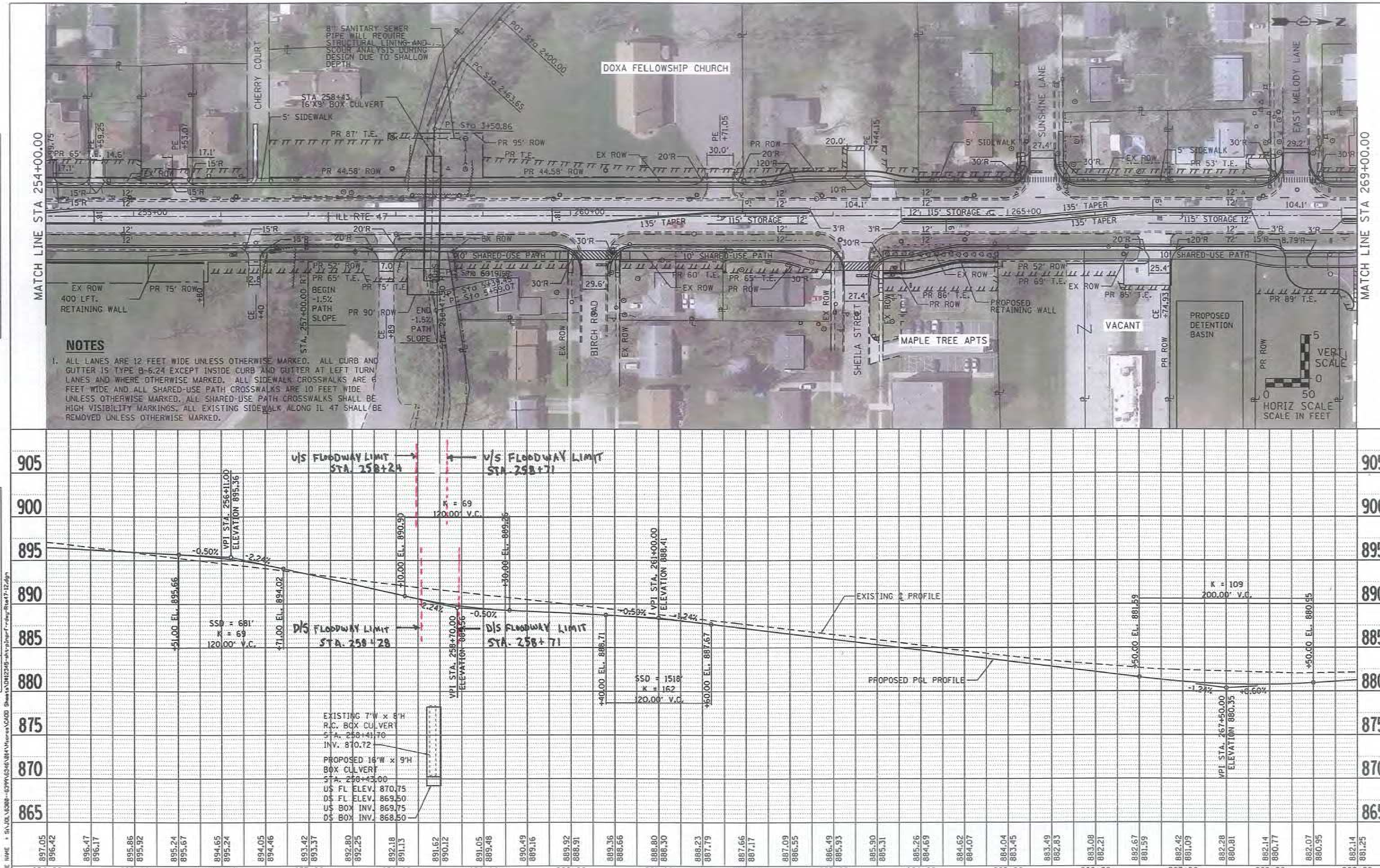
IL ROUTE 47 (N. SEMINARY AVE.)
ROADWAY PLAN AND PROFILE

SCALE: 1" = 50' | SHEET NO. 1 OF 1 SHEETS | STA. 251+00 TO STA. 266+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY	1	1

CONTRACT NO. ____

ILLINOIS FED. AID PROJECT



STRAND ASSOCIATES
1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200

USER NAME = BollP	DESIGNED -	REVISED -	
	DRAWN -	REVISED -	
PLOT SCALE = 100.0000 '/ in.	CHECKED -	REVISED -	
PLOT DATE = 12/7/2017	DATE -	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PLAN & PROFILE
ILLINOIS ROUTE 47

SCALE: 1" = 50' | SHEET | OF | SHEETS | STA. | TO STA.

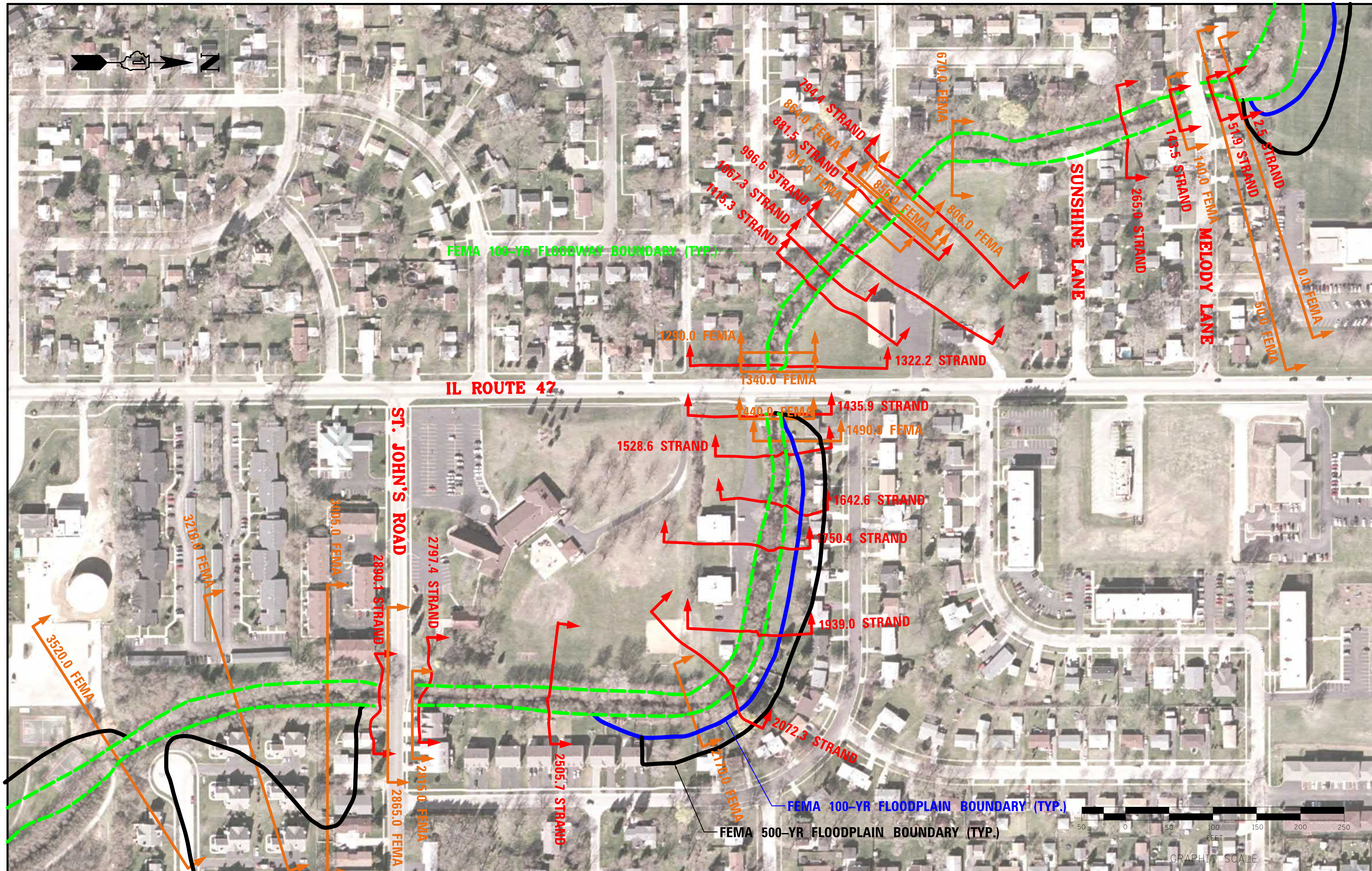
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY		#PLNPRF4712
		CONTRACT NO.		

ILLINOIS | FED. AID PROJECT

Default

EXHIBIT F

CROSS SECTIONS



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	PLOT DATE = $DATE$	DATE - 07/2010	REVISED -		SCALE: 1" = 100' SHEET NO. OF SHEETS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				

CONTRACT NO.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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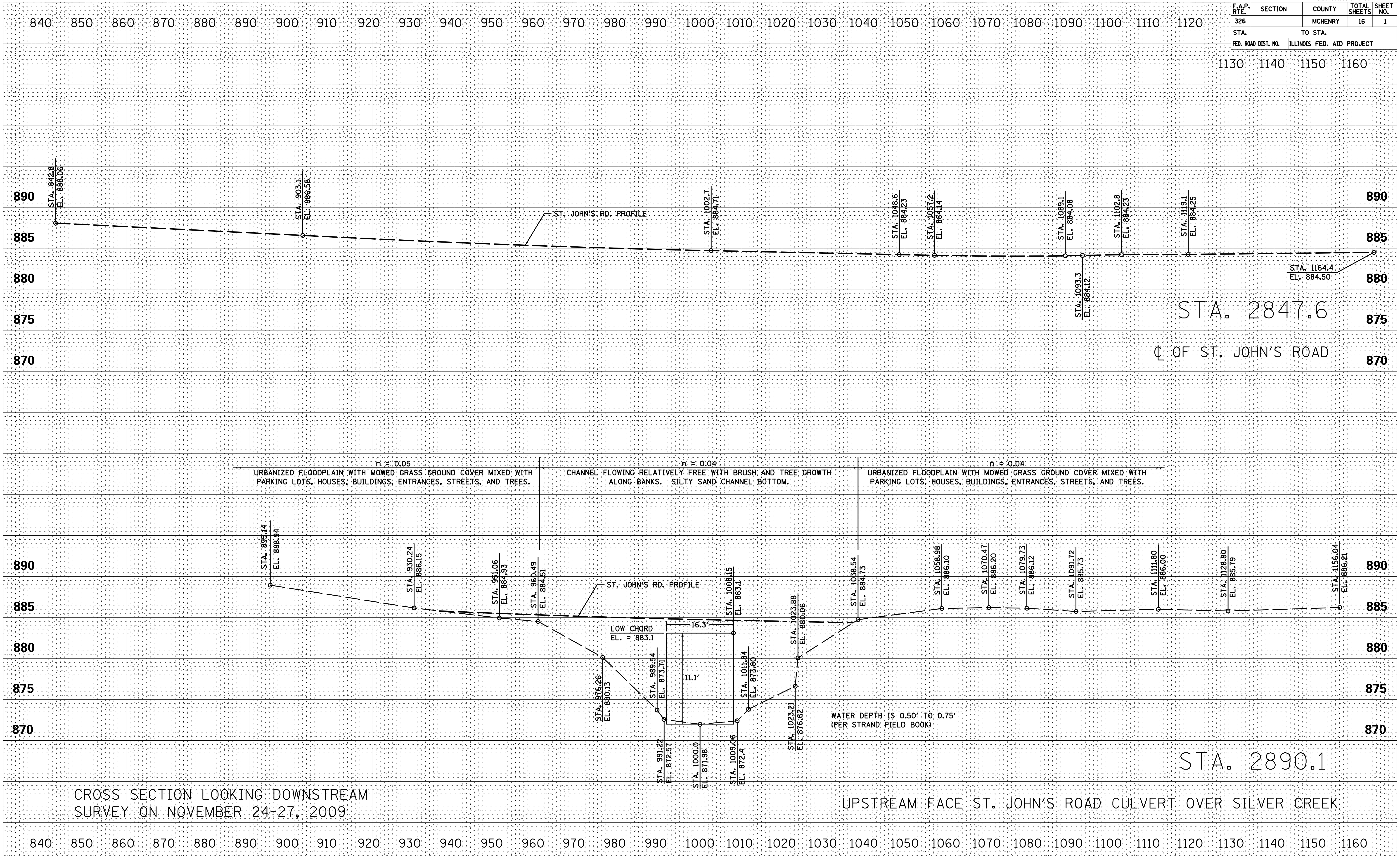
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		



FINAL SURVEY	NOTE BOOK NO.
SURVEYED	
PLOTTED	
TEMPLATE	
AREAS	
AREAS CHECKED	
BY	
DATE	

ORIGINAL SURVEY	NOTE BOOK NO.
SURVEYED	
PLOTTED	
TEMPLATE	
AREAS	
AREAS CHECKED	
BY	
DATE	

PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

CONTRACT NO.				
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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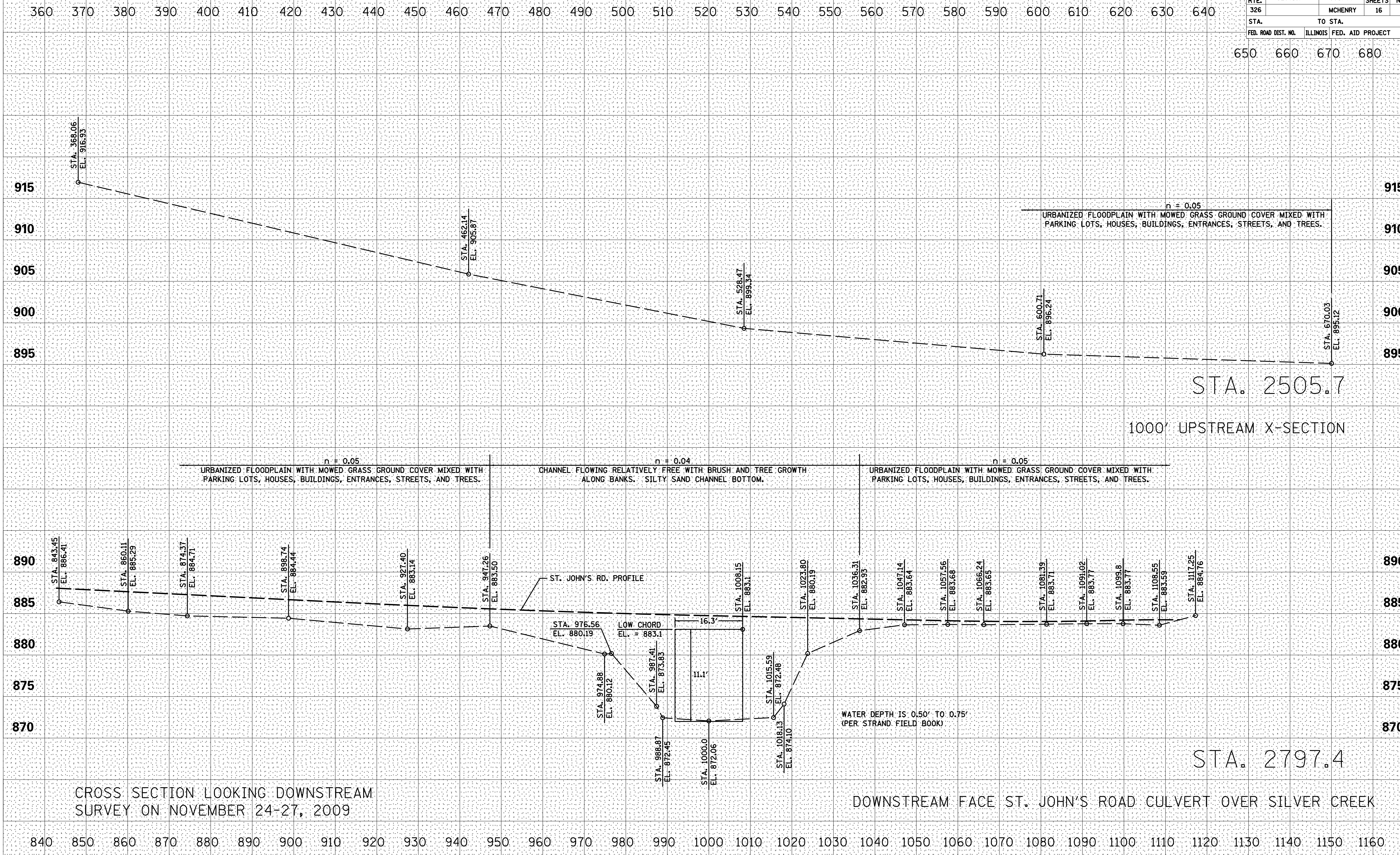
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		



FINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

ORIGINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

CONTRACT NO.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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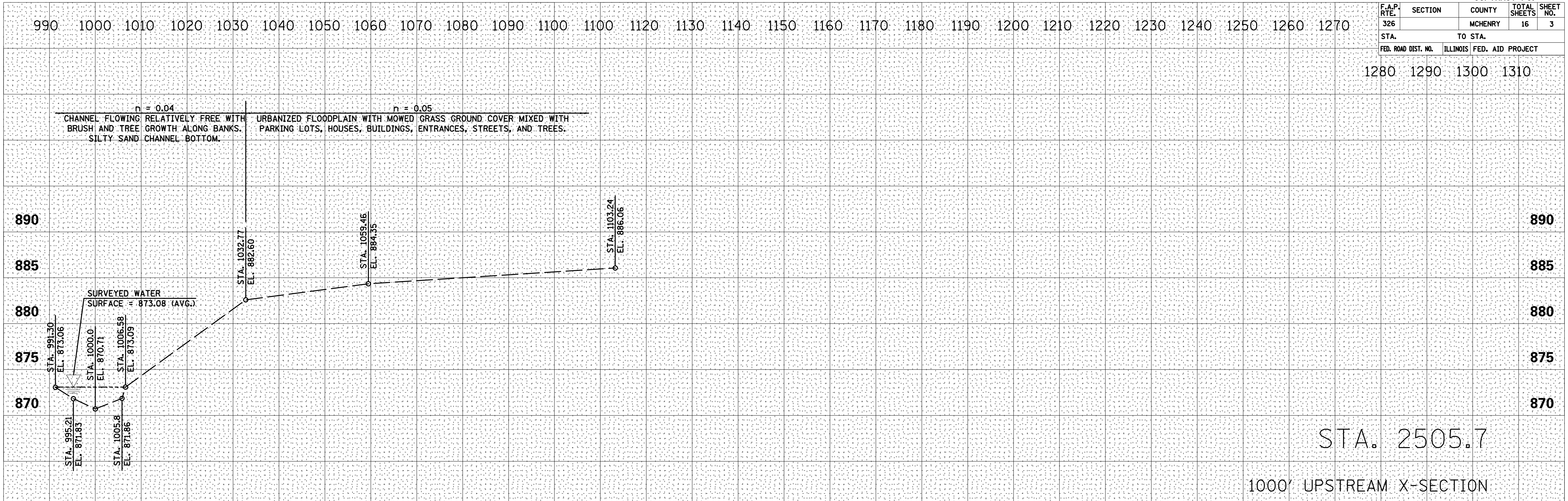
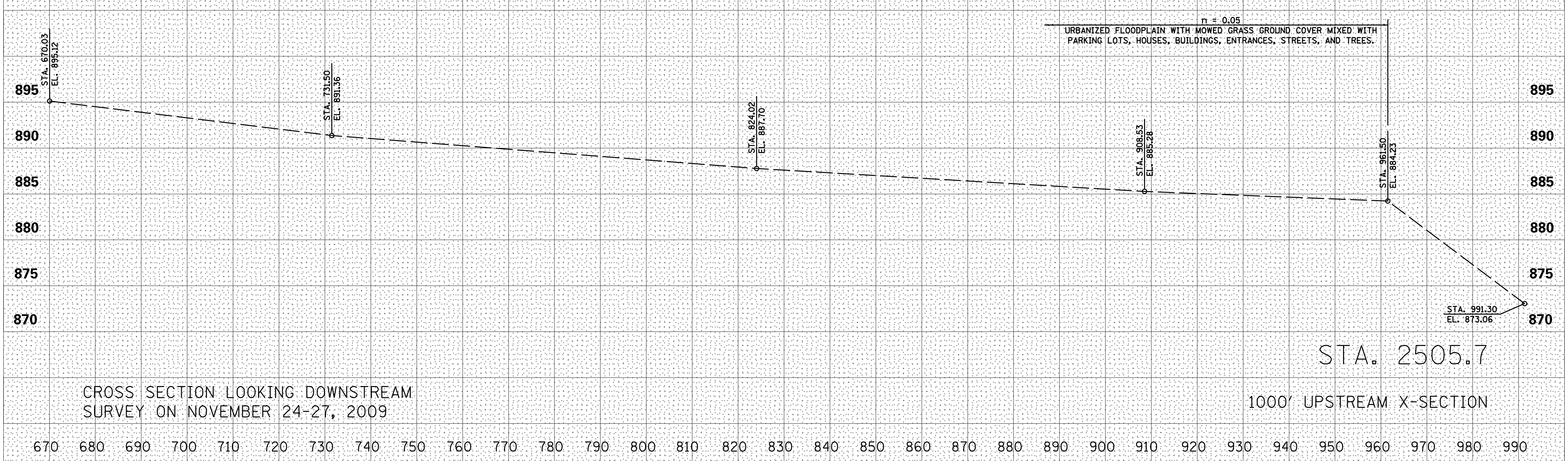
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		





FINAL SURVEY	SURVEYED	PLOTTED	TEMPLATE	AREAS	AREAS CHECKED
NOTE BOOK					
NO.					

BY | DATE

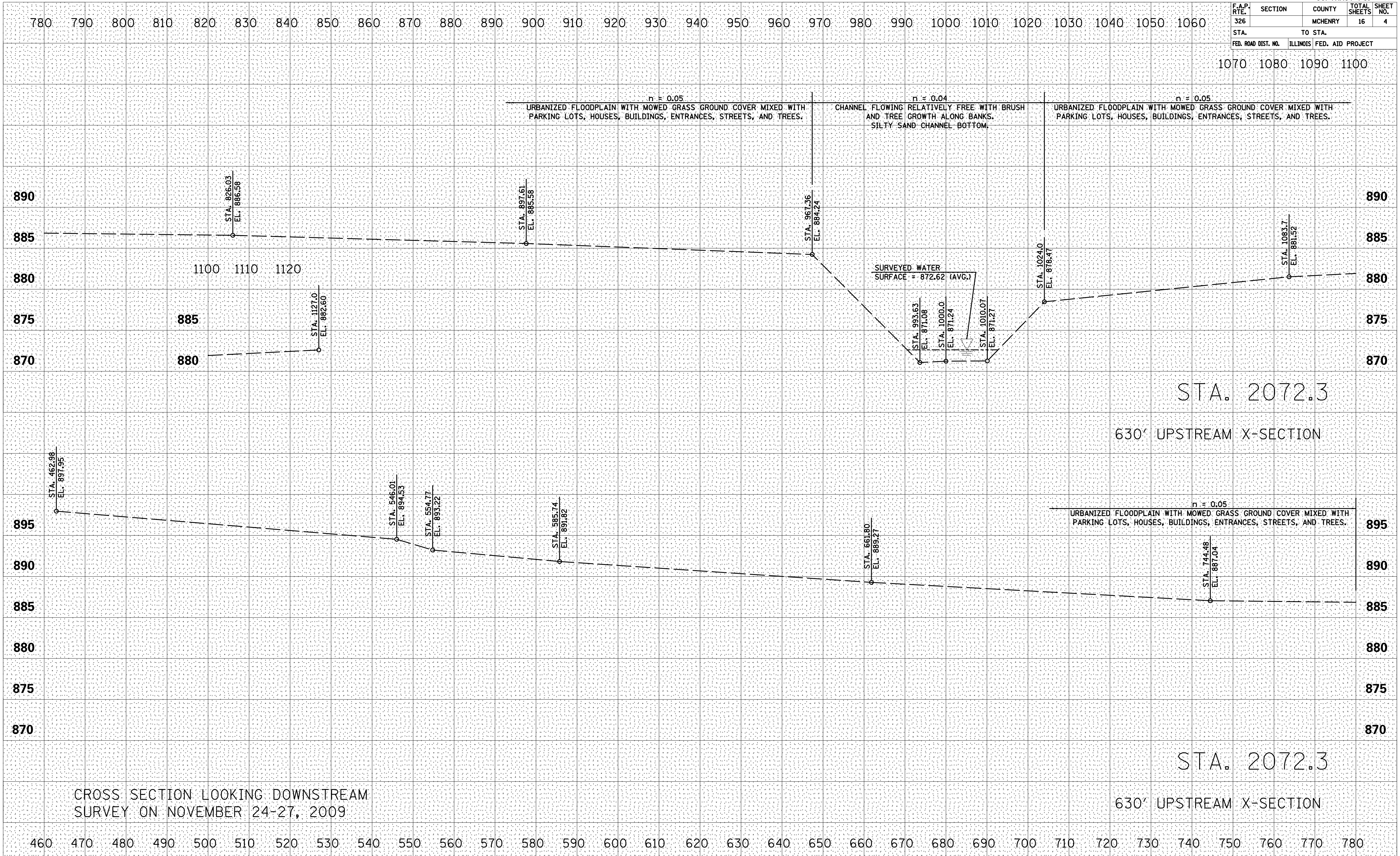
ORIGINAL SURVEY	SURVEYED	PLOTTED	TEMPLATE	AREAS	AREAS CHECKED
NOTE BOOK					
NO.					

BY | DATE

PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

CONTRACT NO.

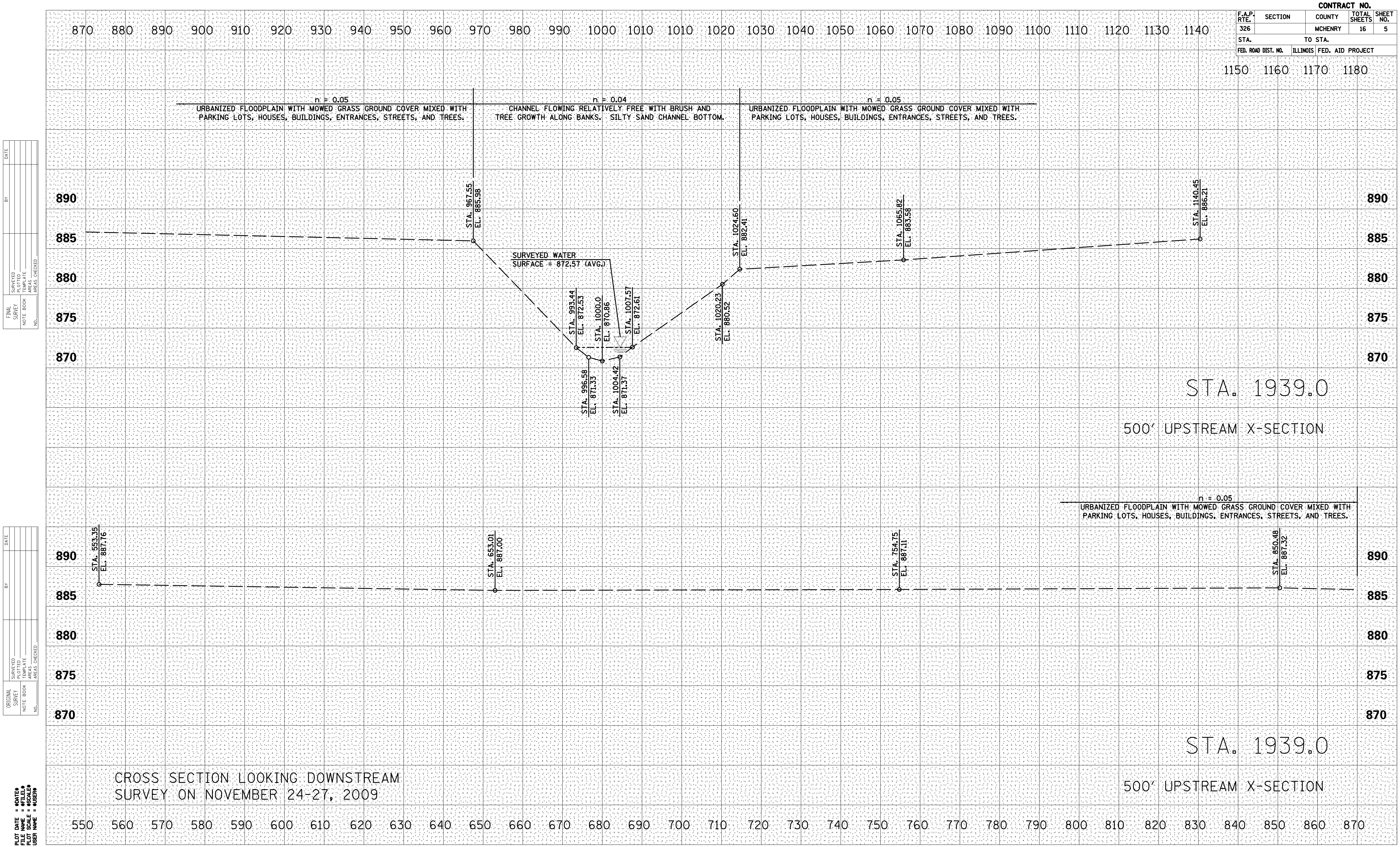
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	4
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

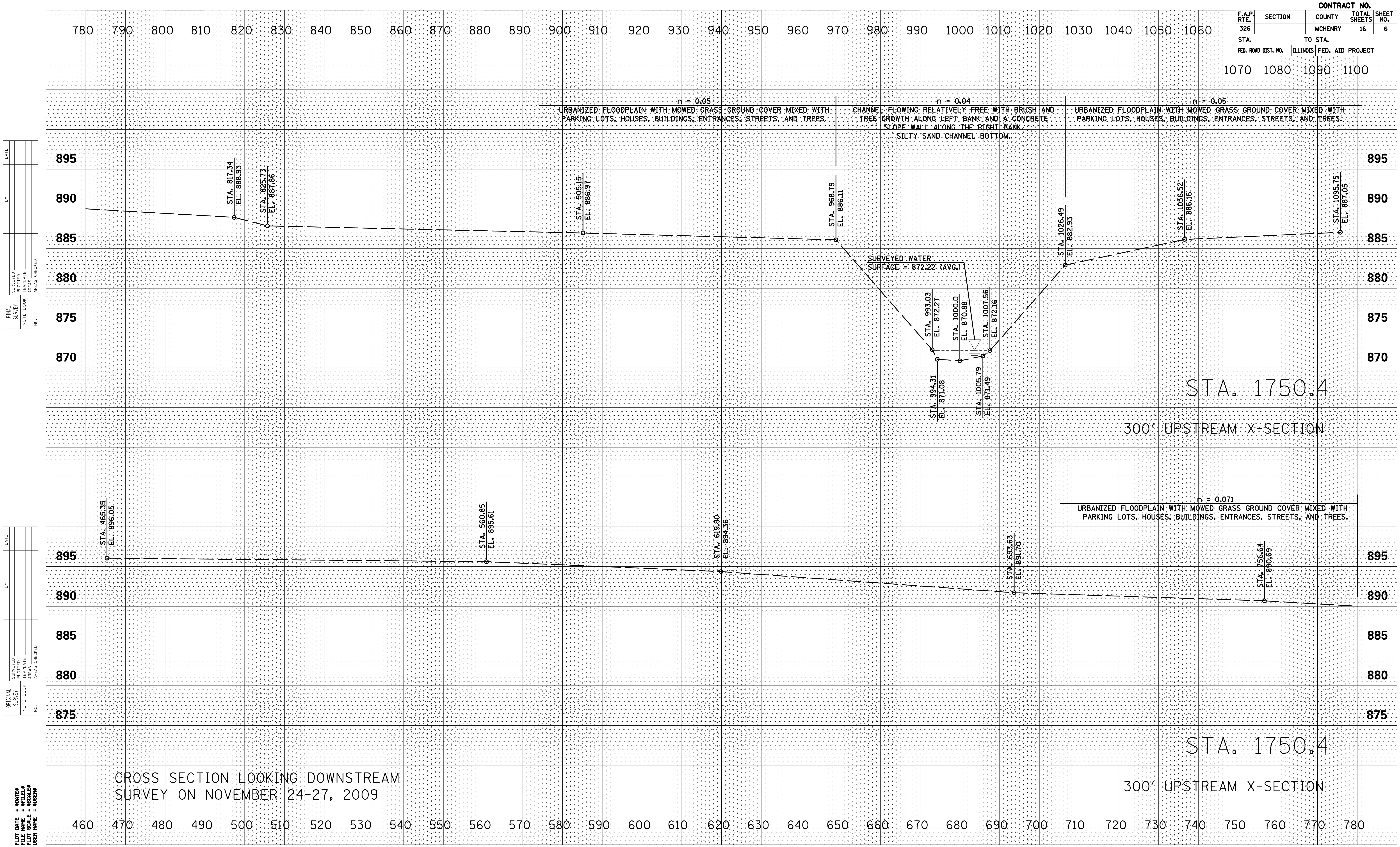


FINAL SURVEY NOTE BOOK NO. — SURVEYED / PLOTTED / TEMPLATE / AREAS / AREAS CHECKED — BY — DATE

ORIGINAL SURVEY NOTE BOOK NO. — SURVEYED / PLOTTED / TEMPLATE / AREAS / AREAS CHECKED — BY — DATE

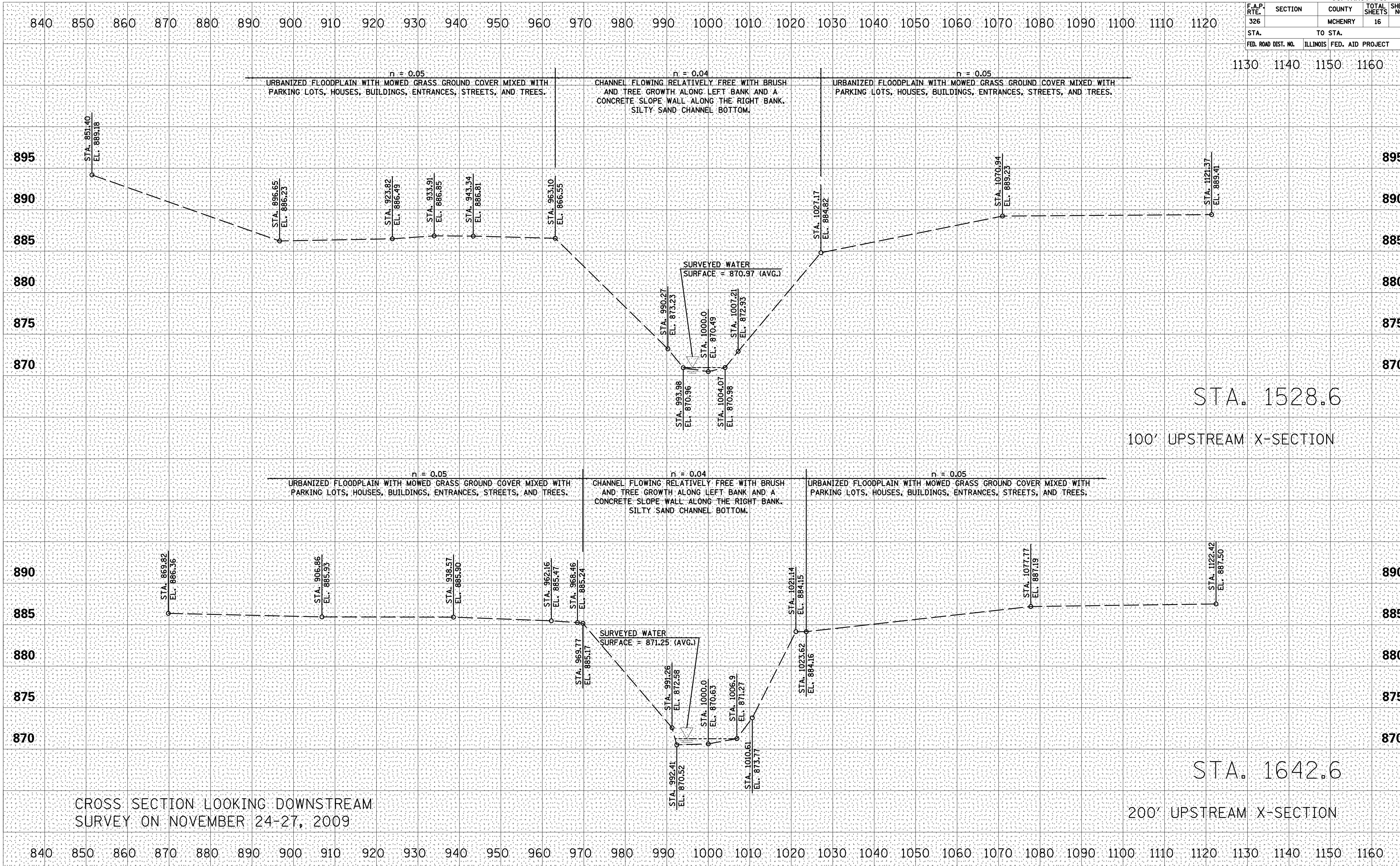
PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$


CONTRACT NO.
F.A.P. RTE. | SECTION | COUNTY | TOTAL SHEETS | SHEET NO.
326 | | MCHENRY | 16 | 5
STA. TO STA.
FED. ROAD DIST. NO. | ILLINOIS | FED. AID PROJECT
n = 0.05
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
n = 0.04
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND TREE GROWTH ALONG BANKS. SILTY SAND CHANNEL BOTTOM.
n = 0.05
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
SURVEYED WATER SURFACE = 872.57 (AVG.)
STA. 967.55 EL. 885.98
STA. 993.44 EL. 872.53
STA. 996.58 EL. 871.33
STA. 1000.0 EL. 870.86
STA. 1004.42 EL. 871.37
STA. 1007.57 EL. 872.61
STA. 1020.23 EL. 880.52
STA. 1024.60 EL. 882.41
STA. 1065.82 EL. 883.58
STA. 1140.45 EL. 886.21
STA. 1939.0
500' UPSTREAM X-SECTION
n = 0.05
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
STA. 553.35 EL. 887.76
STA. 653.01 EL. 887.00
STA. 754.75 EL. 887.11
STA. 850.48 EL. 887.32
STA. 1939.0
500' UPSTREAM X-SECTION
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON NOVEMBER 24-27, 2009


CONTRACT NO.
F.A.P. RTE. 326
SECTION
COUNTY MCHENRY
TOTAL SHEETS 16
SHEET NO. 6
STA. TO STA.
FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT
n = 0.05
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
n = 0.04
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND TREE GROWTH ALONG LEFT BANK AND A CONCRETE SLOPE WALL ALONG THE RIGHT BANK. SILTY SAND CHANNEL BOTTOM.
n = 0.05
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
STA. 817.34 EL. 888.93
STA. 825.73 EL. 887.86
STA. 905.15 EL. 886.97
STA. 968.79 EL. 886.11
SURVEYED WATER SURFACE = 872.22 (AVG.)
STA. 993.03 EL. 872.27
STA. 1000.0 EL. 870.88
STA. 1007.56 EL. 872.16
STA. 994.31 EL. 871.08
STA. 1005.79 EL. 871.49
STA. 1026.49 EL. 882.93
STA. 1056.52 EL. 886.16
STA. 1095.75 EL. 887.05
STA. 1750.4
300' UPSTREAM X-SECTION
n = 0.071
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
STA. 465.35 EL. 896.05
STA. 560.85 EL. 895.61
STA. 619.90 EL. 894.36
STA. 693.63 EL. 891.70
STA. 756.64 EL. 890.69
STA. 1750.4
300' UPSTREAM X-SECTION
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON NOVEMBER 24-27, 2009
FINAL SURVEY
ORIGINAL SURVEY

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	7
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

CONTRACT NO.



FINAL SURVEY / ORIGINAL SURVEY — NOTE BOOK NO. — SURVEYED, PLOTTED, TEMPLATE, AREAS, AREAS CHECKED — BY — DATE

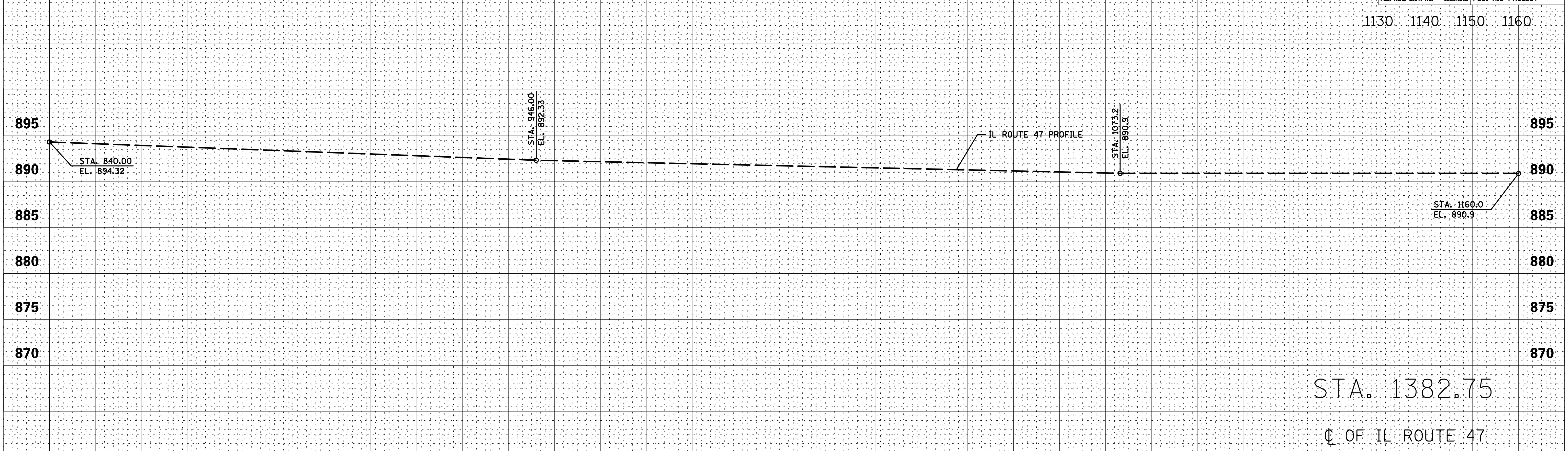
PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

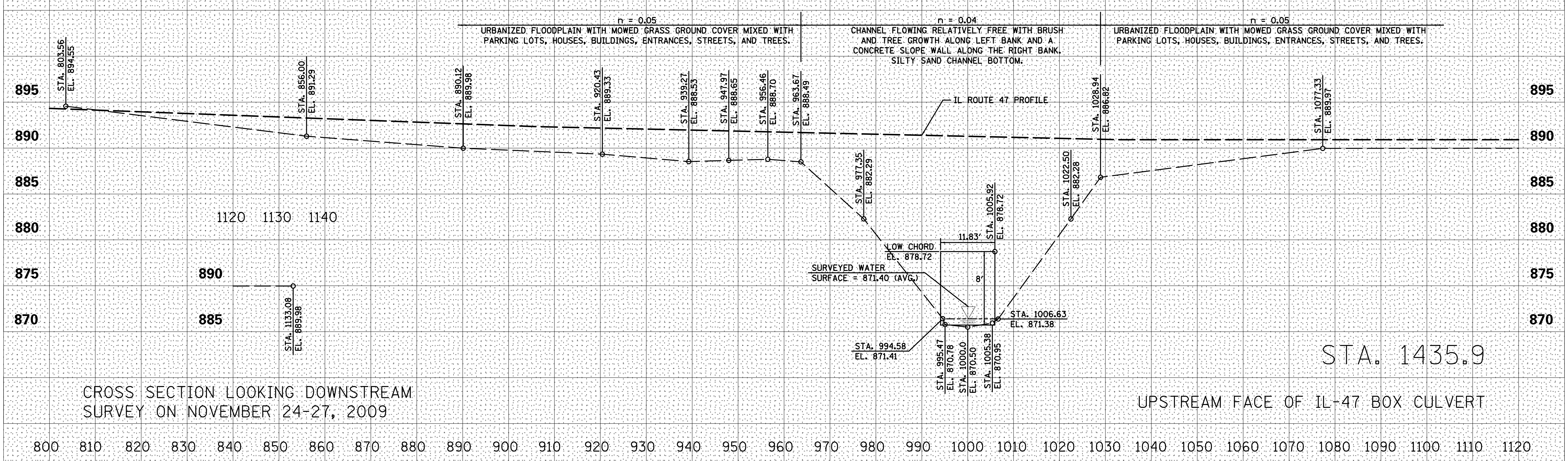
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	8

CONTRACT NO.

STA. TO STA.

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT





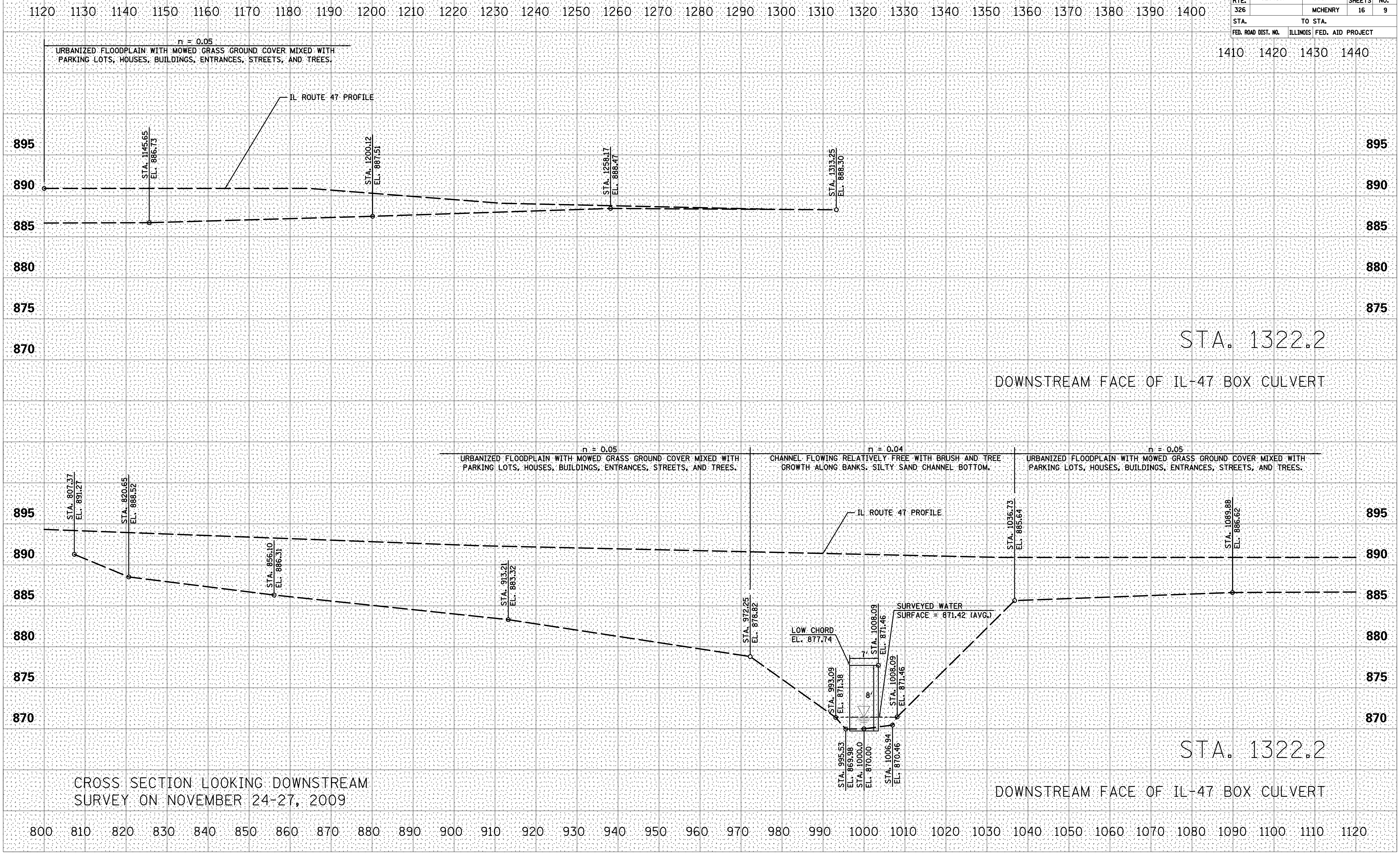
FINAL SURVEY — NOTE BOOK NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

ORIGINAL SURVEY — NOTE BOOK NO. — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE

PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

CONTRACT NO.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	9
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

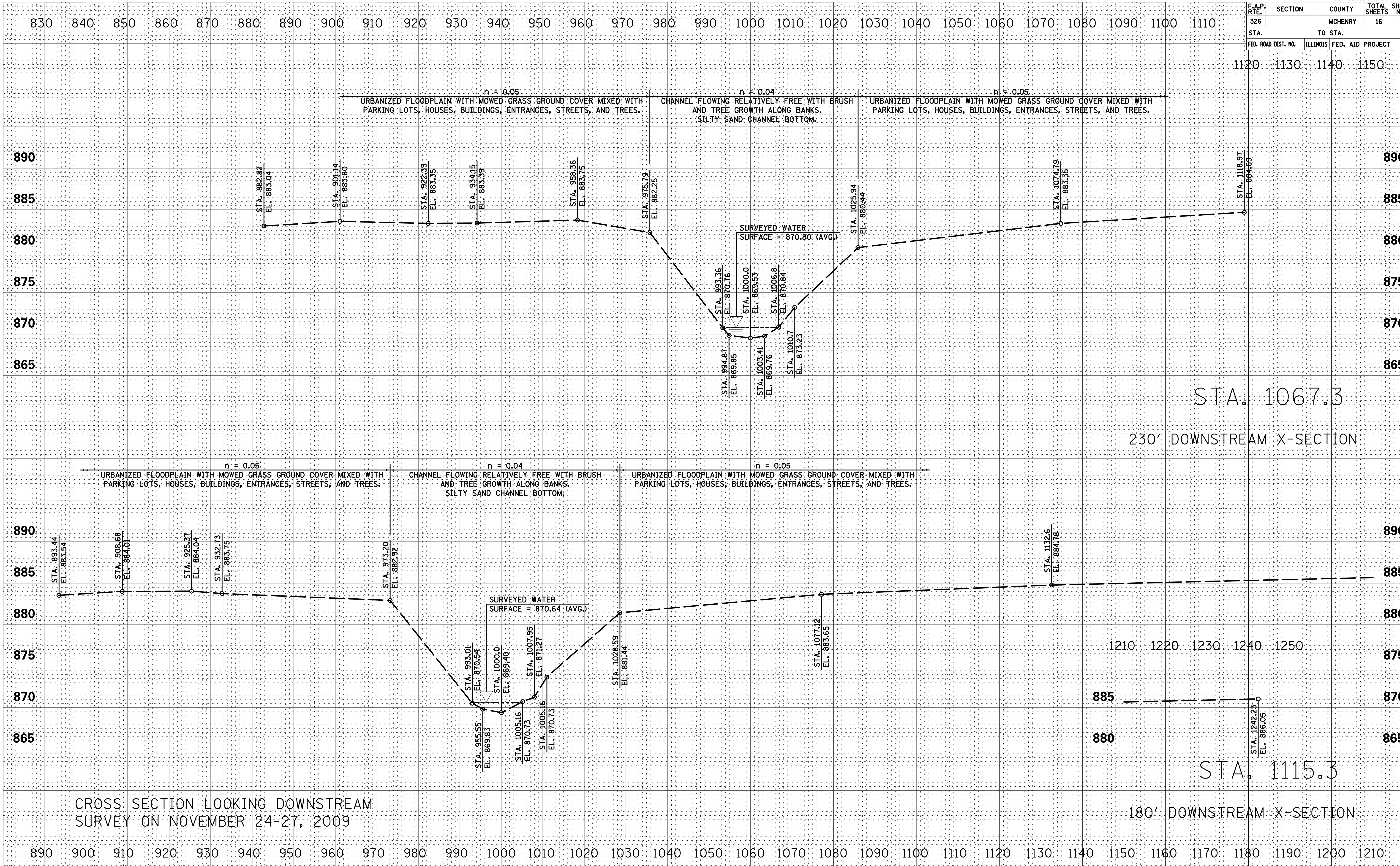


CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON NOVEMBER 24-27, 2009

PLOT DATE = $DATE$
FILE NAME = $FILEL$
PLOT SCALE = $SCALE$
USER NAME = $USER$

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	10
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

CONTRACT NO.



FINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

ORIGINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

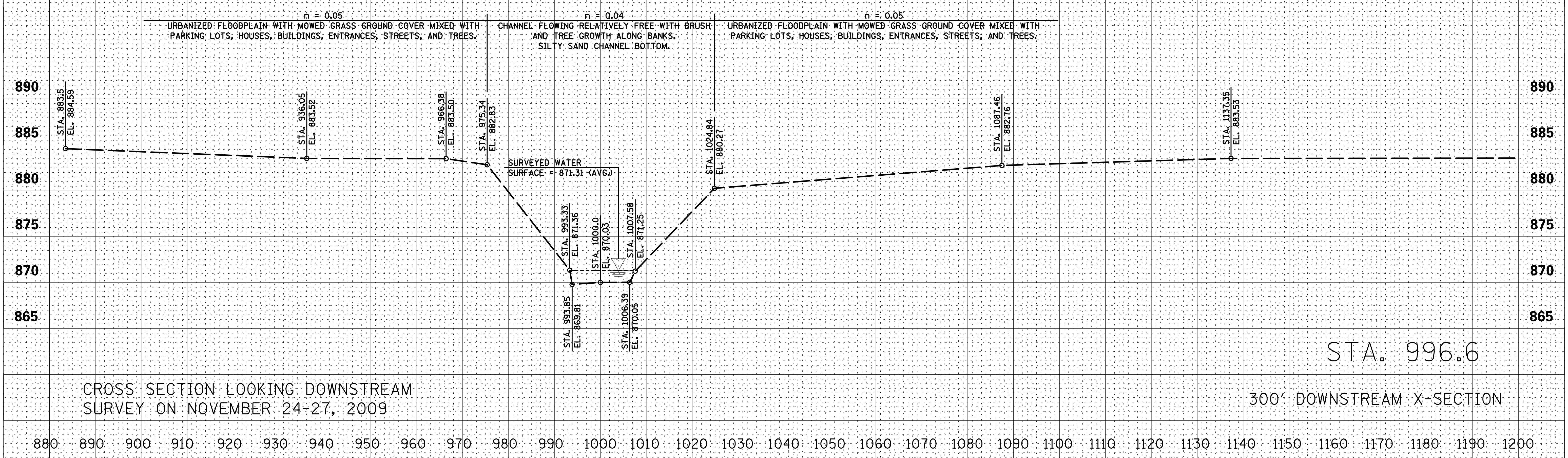
PLOT DATE = #DATE#
FILE NAME = #FILE#
PLOT SCALE = #SCALE#
USER NAME = #USER#

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	11

CONTRACT NO.

STA. TO STA.

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT



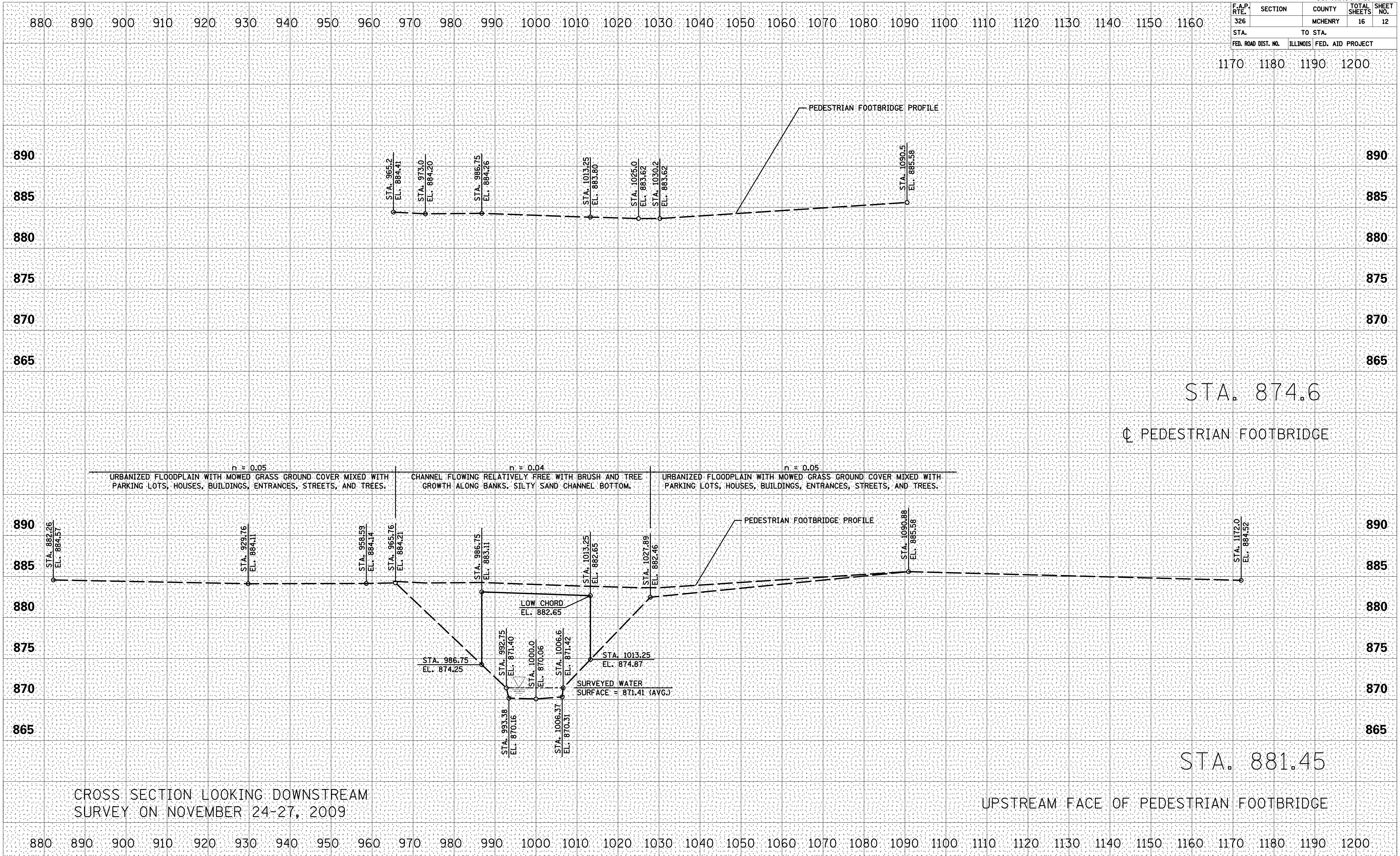
FINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

ORIGINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

PLOT DATE = $DATE$ FILE NAME = $FILE$ PLOT SCALE = $SCALE$ USER NAME = $USER$

CONTRACT NO.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	12
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

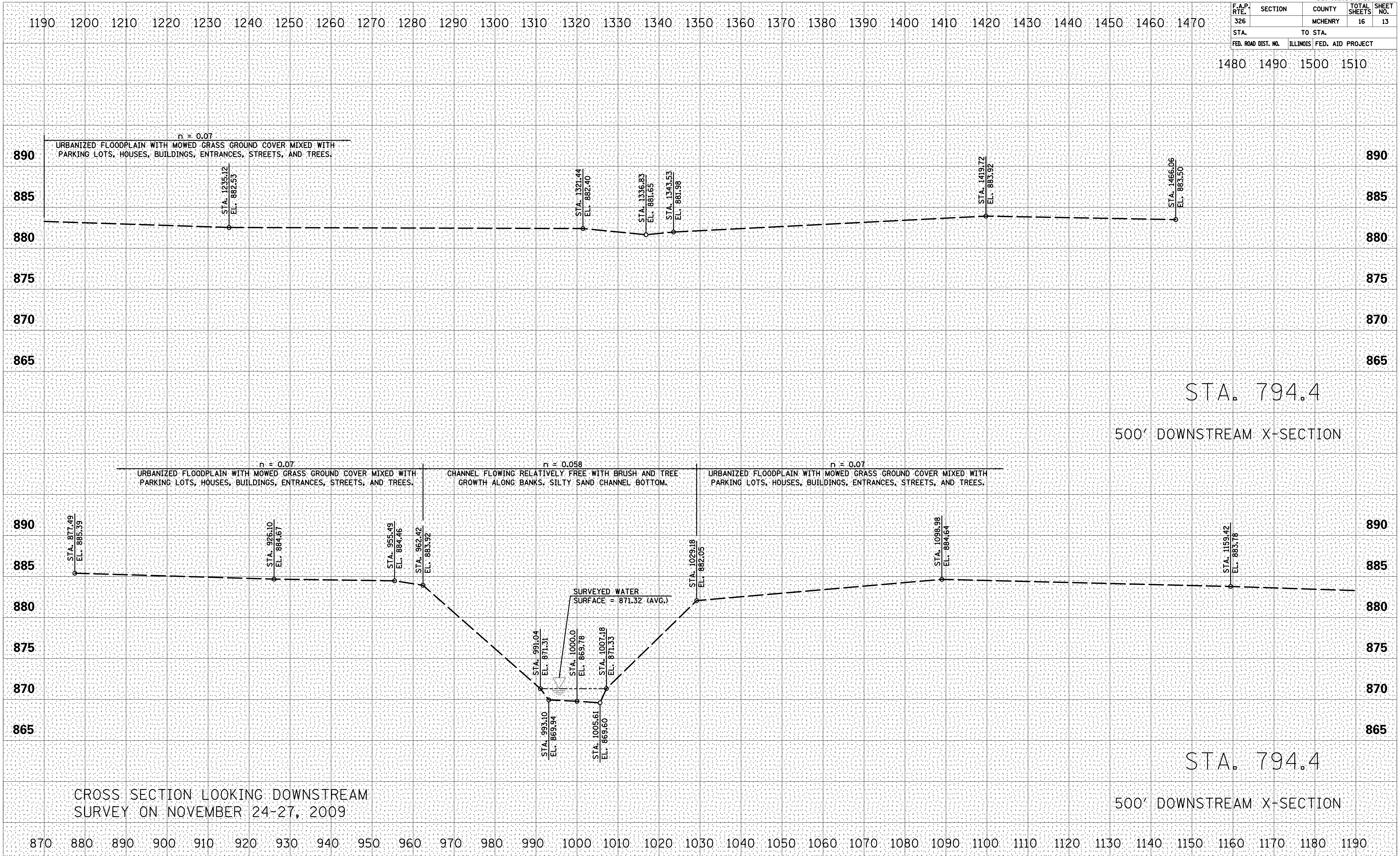


FINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

ORIGINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

PLOT DATE = #DATE#
FILE NAME = #FILE#
PLOT SCALE = #SCALE#
USER NAME = #USER#

CONTRACT NO.				
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	16	13
STA.		TO STA.		
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		



DATE | BY | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | FINAL SURVEY | NOTE BOOK | NO.

DATE | BY | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | ORIGINAL SURVEY | NOTE BOOK | NO.

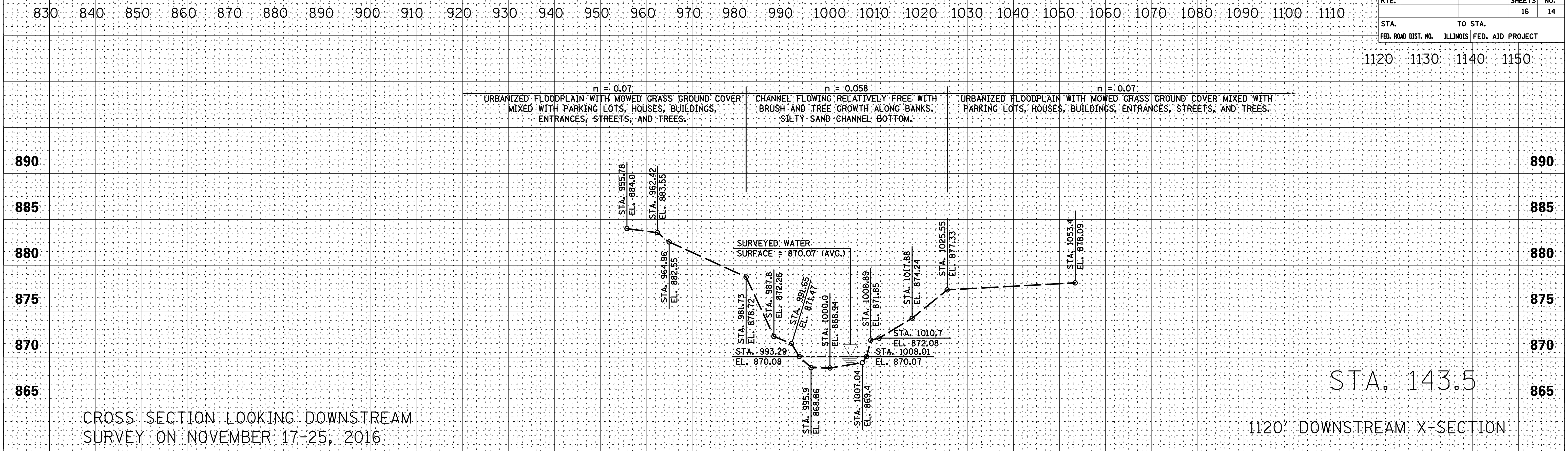
PLOT DATE = #DATE#
FILE NAME = #FILEL#
PLOT SCALE = #SCALE#
USER NAME = #USER#

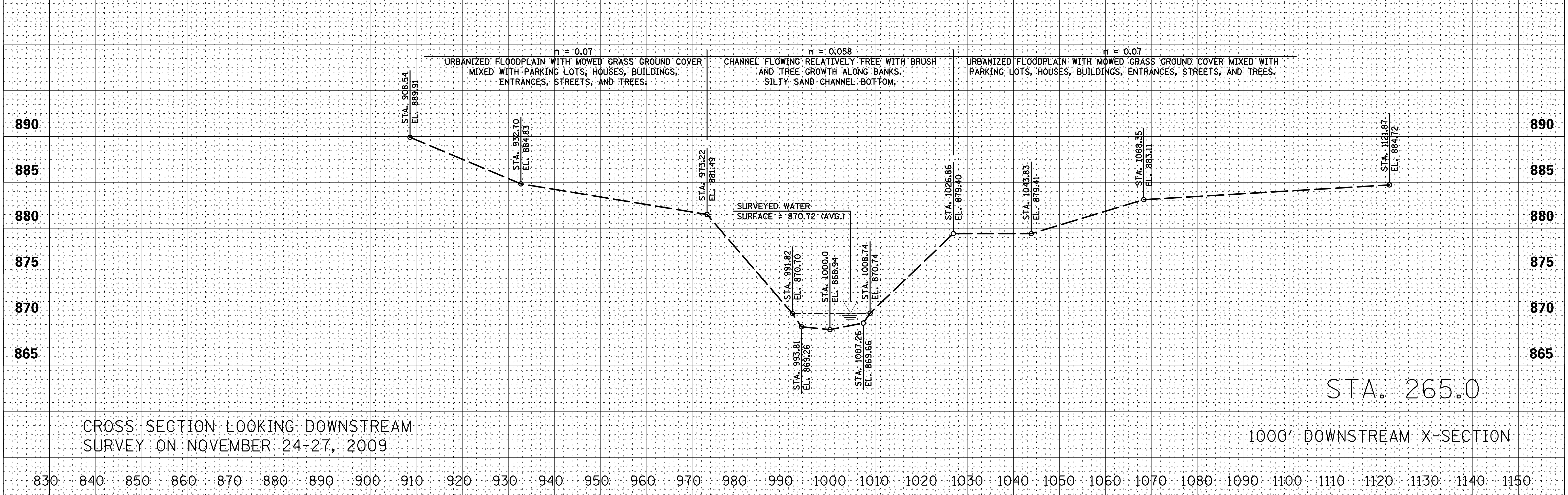
F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			16	14

CONTRACT NO.

STA. TO STA.

FED. ROAD DIST. NO. | ILLINOIS | FED. AID PROJECT





FINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

ORIGINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

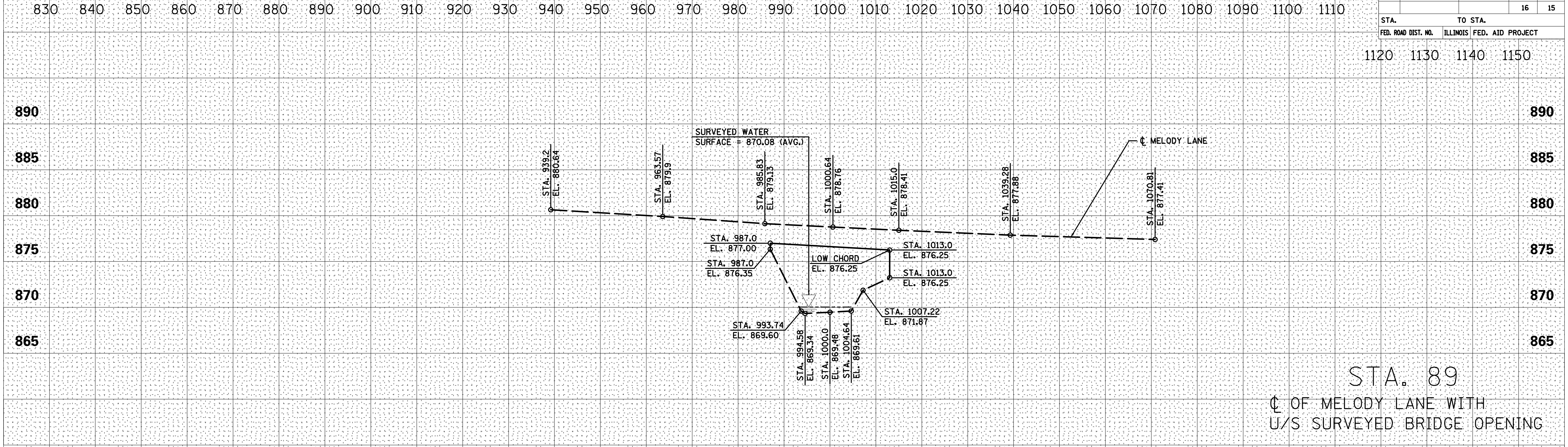
PLOT DATE = `$DATE$`
FILE NAME = `$FILEL$`
PLOT SCALE = `$SCALE$`
USER NAME = `$USER$`

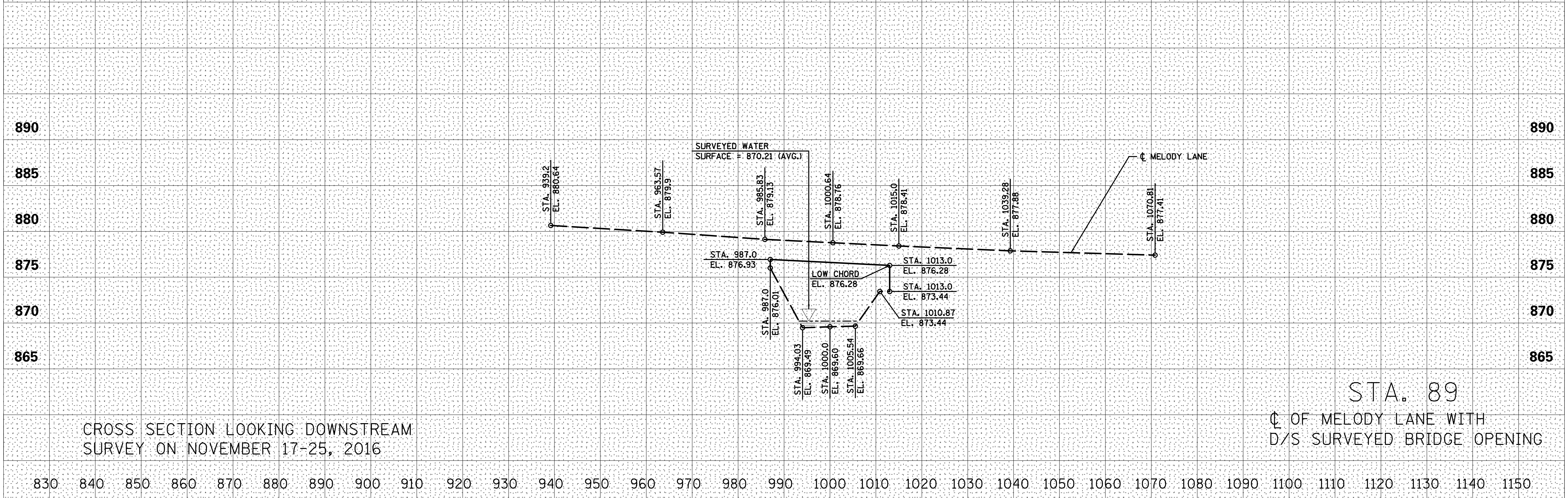
F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			16	15

CONTRACT NO.

STA. TO STA.

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT





CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON NOVEMBER 17-25, 2016

FINAL SURVEY — NOTE BOOK NO. — SURVEYED / PLOTTED / TEMPLATE / AREAS / AREAS CHECKED — BY — DATE

ORIGINAL SURVEY — NOTE BOOK NO. — SURVEYED / PLOTTED / TEMPLATE / AREAS / AREAS CHECKED — BY — DATE

PLOT DATE = $DATE$
FILE NAME = $FILEL$
PLOT SCALE = $SCALE$
USER NAME = $USER$

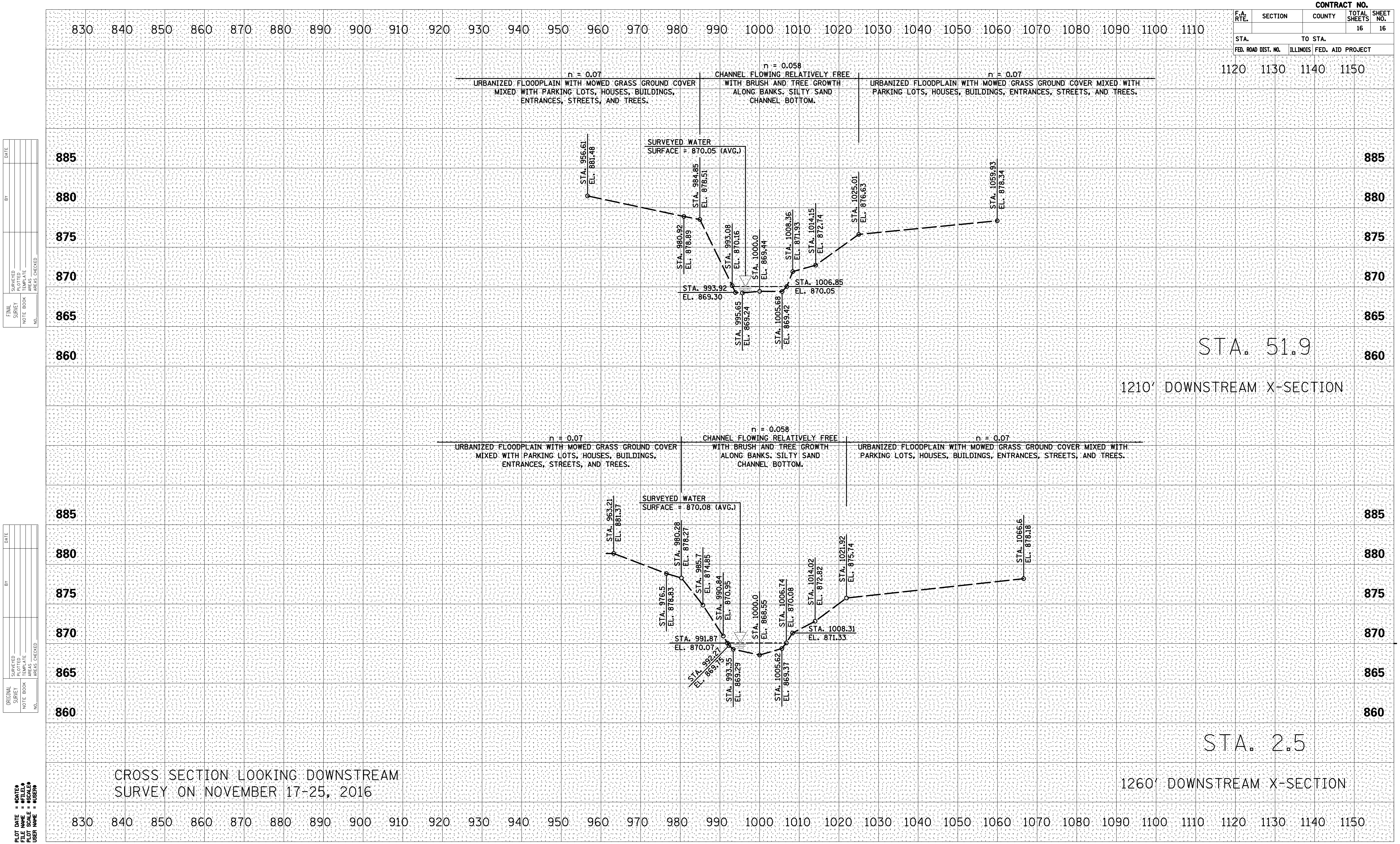
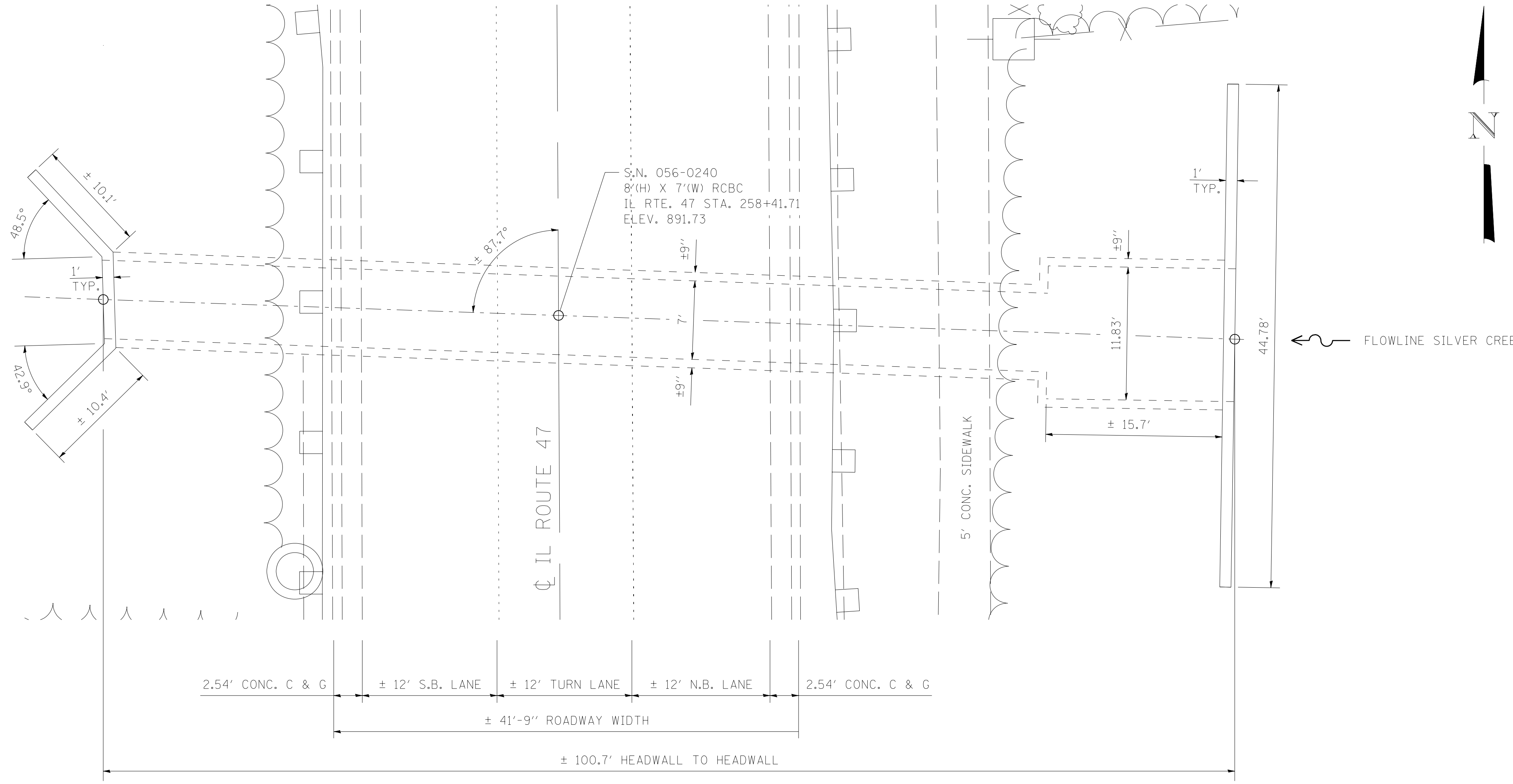
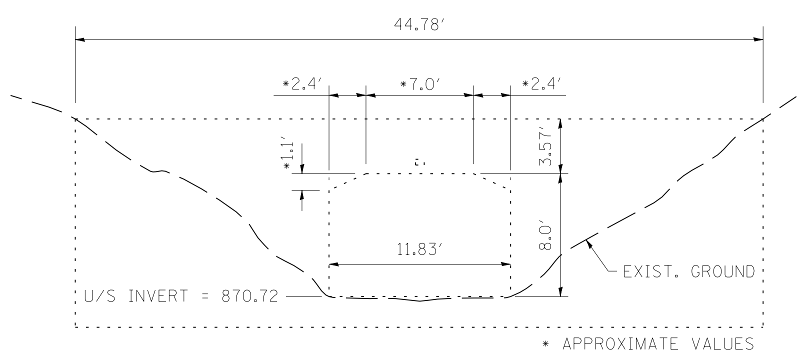

CONTRACT NO.
F.A. RTE.
SECTION
COUNTY
TOTAL SHEETS 16
SHEET NO. 16
STA.
TO STA.
FED. ROAD DIST. NO.
ILLINOIS
FED. AID PROJECT
830 840 850 860 870 880 890 900 910 920 930 940 950 960 970 980 990 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090 1100 1110
1120 1130 1140 1150
n = 0.07
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
n = 0.058
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND TREE GROWTH ALONG BANKS. SILTY SAND CHANNEL BOTTOM.
n = 0.07
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
SURVEYED WATER SURFACE = 870.05 (AVG.)
885 880 875 870 865 860
STA. 956.61 EL. 881.48
STA. 980.92 EL. 878.89
STA. 984.85 EL. 878.51
STA. 993.92 EL. 869.30
STA. 993.08 EL. 870.16
STA. 995.65 EL. 869.24
STA. 1000.0 EL. 869.44
STA. 1005.68 EL. 869.42
STA. 1006.85 EL. 870.05
STA. 1008.36 EL. 871.93
STA. 1014.15 EL. 872.74
STA. 1025.01 EL. 876.63
STA. 1059.93 EL. 878.34
STA. 51.9
1210' DOWNSTREAM X-SECTION
n = 0.07
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
n = 0.058
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND TREE GROWTH ALONG BANKS. SILTY SAND CHANNEL BOTTOM.
n = 0.07
URBANIZED FLOODPLAIN WITH MOWED GRASS GROUND COVER MIXED WITH PARKING LOTS, HOUSES, BUILDINGS, ENTRANCES, STREETS, AND TREES.
SURVEYED WATER SURFACE = 870.08 (AVG.)
STA. 963.21 EL. 881.37
STA. 976.5 EL. 878.83
STA. 980.28 EL. 878.27
STA. 985.7 EL. 874.85
STA. 990.84 EL. 870.95
STA. 991.87 EL. 870.07
STA. 992.27 EL. 869.75
STA. 993.35 EL. 869.29
STA. 1000.0 EL. 868.55
STA. 1005.62 EL. 869.37
STA. 1006.74 EL. 870.08
STA. 1008.31 EL. 871.33
STA. 1014.02 EL. 872.82
STA. 1021.92 EL. 875.74
STA. 1066.6 EL. 878.18
STA. 2.5
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON NOVEMBER 17-25, 2016
1260' DOWNSTREAM X-SECTION
FINAL SURVEY
ORIGINAL SURVEY
NOTE BOOK NO.
SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED
BY DATE
PLOT DATE = $DATE$
FILE NAME = $FILEL$
PLOT SCALE = $SCALE$
USER NAME = $USER$

EXHIBIT G

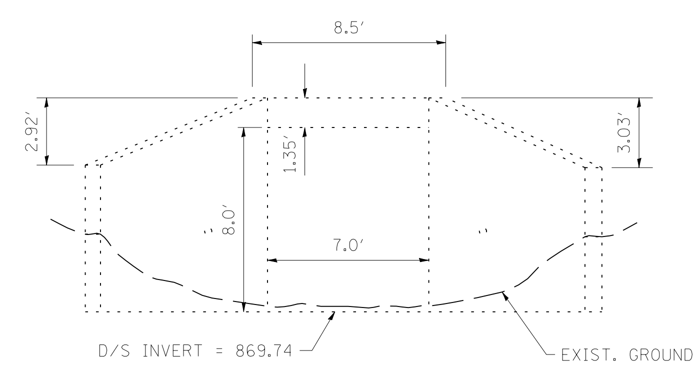
CULVERT OPENING PLOTS
(EXISTING & PROPOSED)



PLAN



ELEVATION
(UPSTREAM FACE)



ELEVATION
(DOWNSTREAM FACE)

NOTES:

1. EXISTING PLANS FOR THIS CULVERT ARE CURRENTLY UNAVAILABLE.
2. THIS EXHIBIT IS BASED ON SURVEY DATA COLLECTED BY STRAND.
3. CULVERT WALL THICKNESS AND LENGTH OF UPSTREAM EXTENSION WERE NOT MEASURED AND ARE ASSUMED VALUES.

FILE NAME = $FILEL$
USER NAME = $USER$
PLOT SCALE = $SCALE$
PLOT DATE = $DATE$

DESIGNED - SGL		REVISED -
DRAWN - SGL		REVISED -
CHECKED - FML		REVISED -
DATE - 07/2010		REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

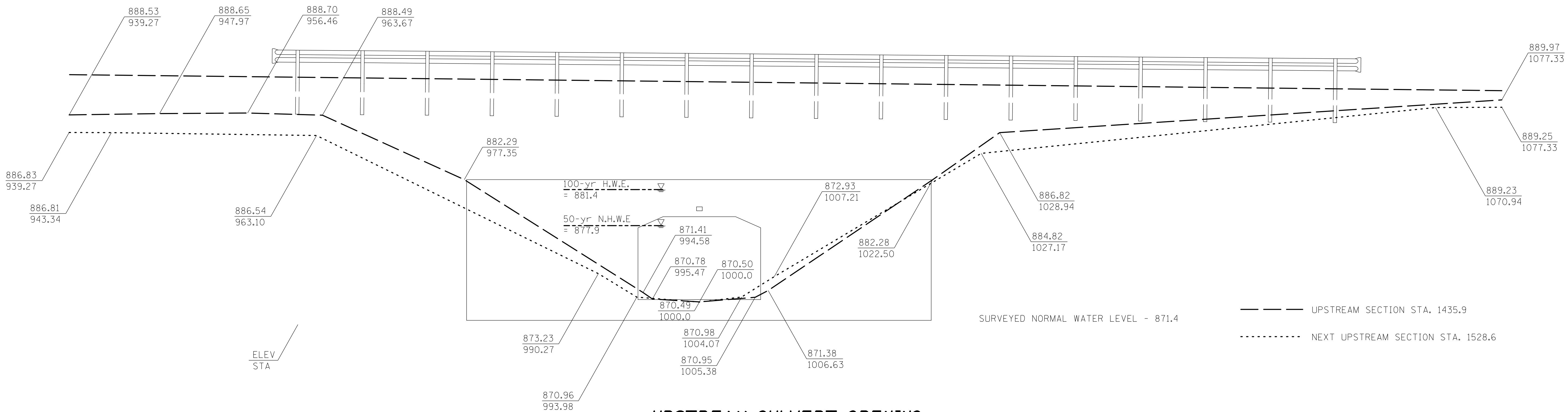
EXISTING STRUCTURAL PLAN
IL ROUTE 47 OVER SILVER CREEK

SCALE: N.T.S. | SHEET NO. __ OF ___ SHEETS | STA. _________ TO STA. _________

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
----	----------	MCHENRY	----	----

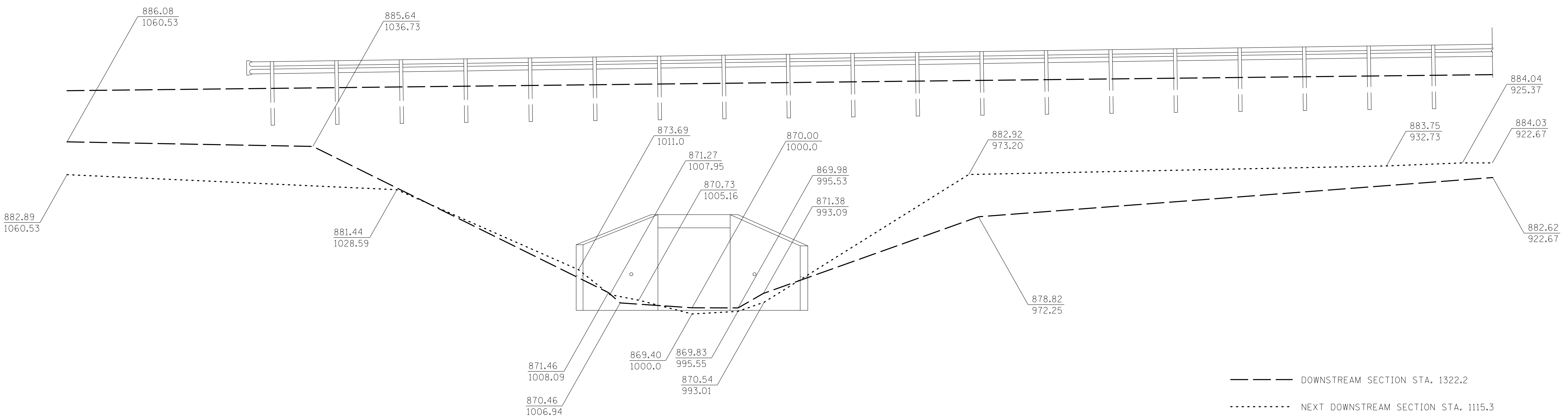
CONTRACT NO. _____

ILLINOIS FED. AID PROJECT



UPSTREAM CULVERT OPENING

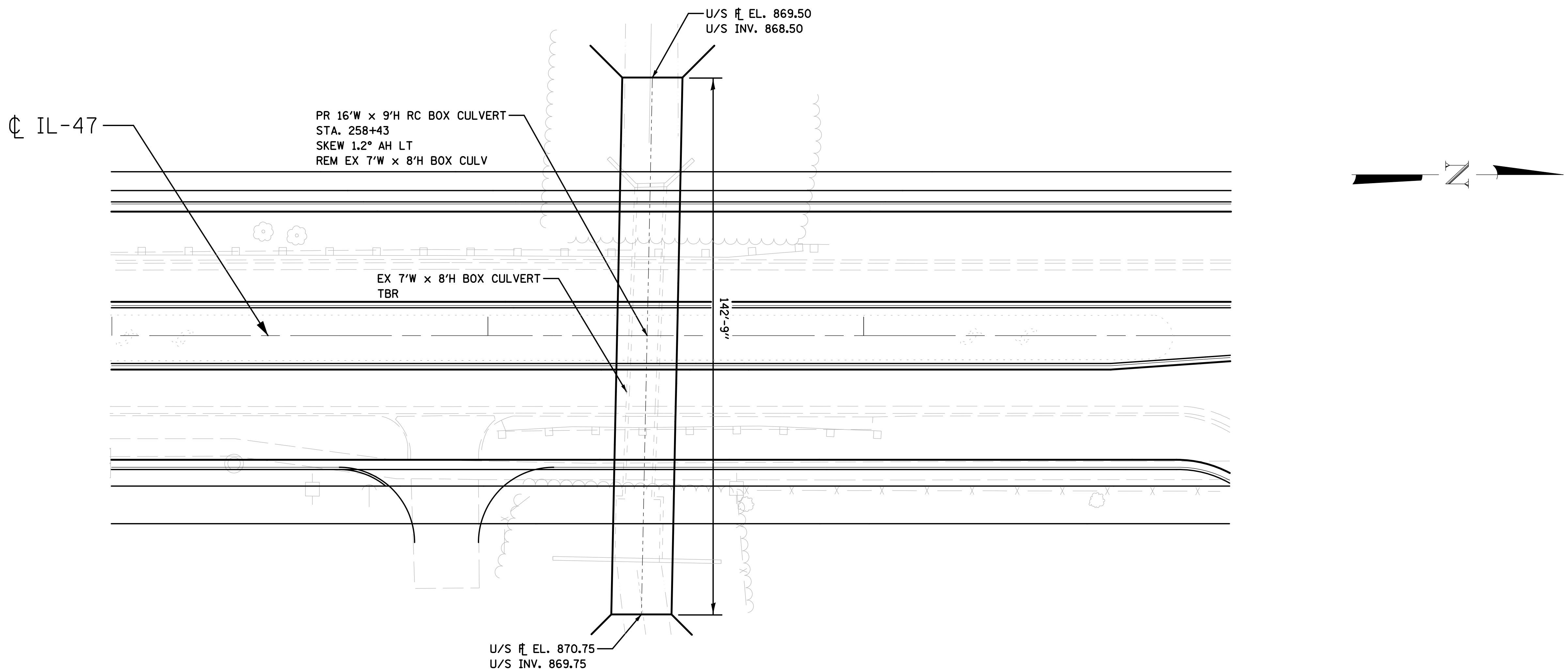
(LOOKING DOWNSTREAM)



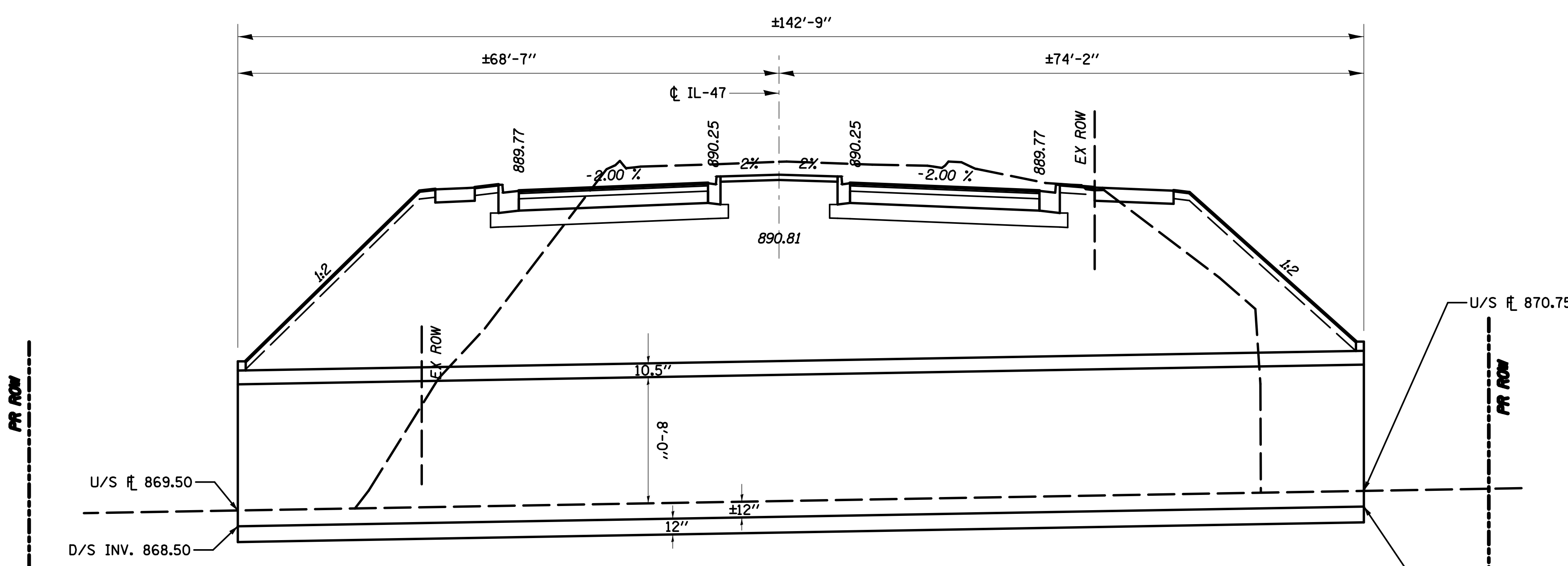
DOWNSTREAM CULVERT OPENING

(LOOKING UPSTREAM)

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	EXISTING CONDITIONS ANALYSIS IL ROUTE 47 OVER SILVER CREEK	F.A. RTE. / SECTION / COUNTY: MCHENRY / TOTAL SHEETS / SHEET NO.
		DRAWN - SGL	REVISED -			CONTRACT NO.
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -			
	PLOT DATE = $DATE$	DATE - 07/2010	REVISED -		SCALE: N.T.S. / SHEET NO. __ OF __ SHEETS / STA. ______ TO STA. ______	ILLINOIS FED. AID PROJECT



PLAN



SECTION THRU CULVERT
(LOOKING NORTH)

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED - SGL 05/2018
		DRAWN - SGL	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -
	PLOT DATE = $DATE$	DATE - 11/2014	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

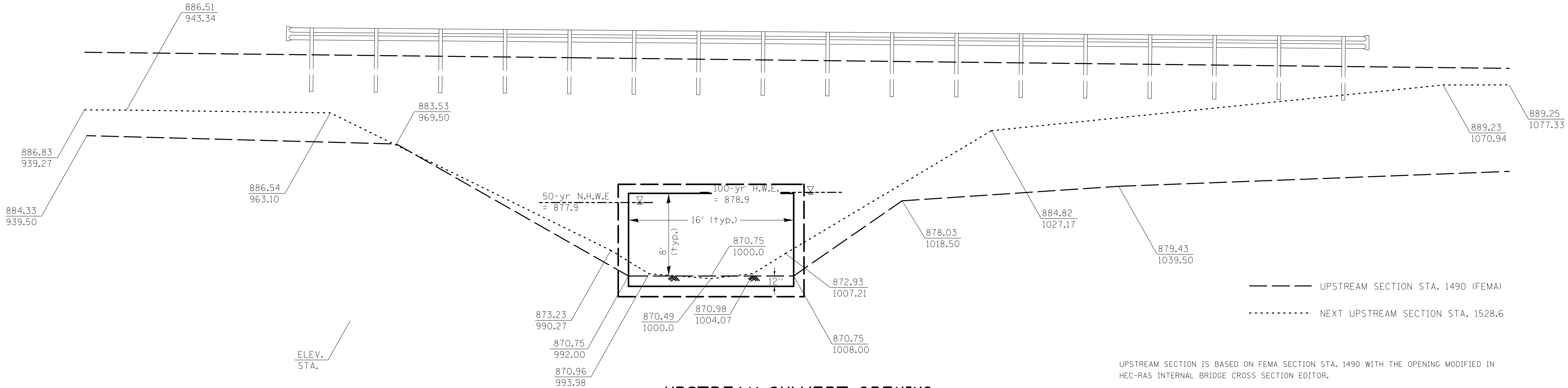
PROPOSED STRUCTURAL PLAN
IL ROUTE 47 OVER SILVER CREEK

SCALE: N.T.S. | SHEET NO. __ OF __ SHEETS | STA. ______ TO STA. ______

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		

CONTRACT NO. ____

ILLINOIS FED. AID PROJECT



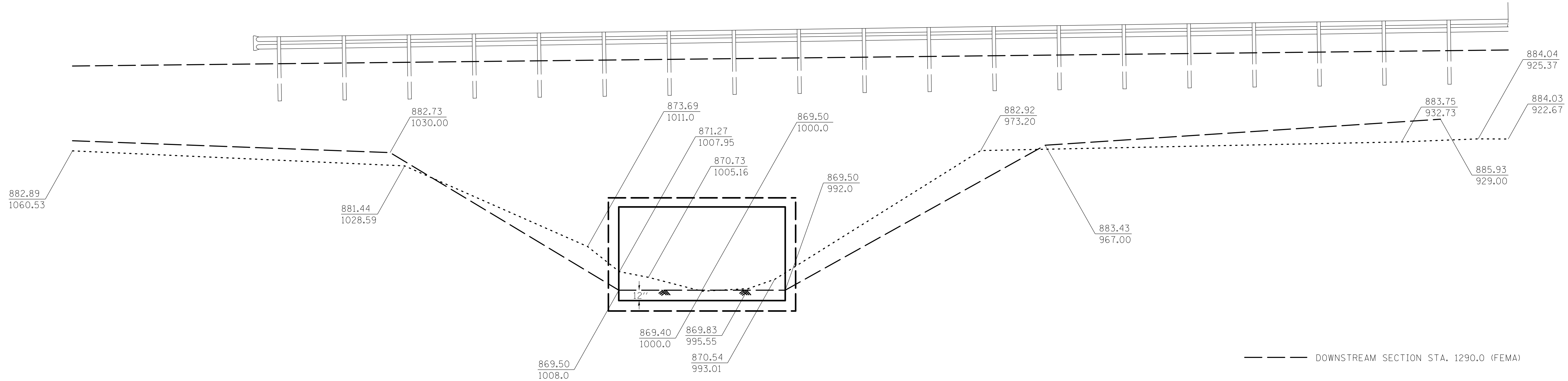
UPSTREAM SECTION STA. 1490 (FEMA)

NEXT UPSTREAM SECTION STA. 1528.6

UPSTREAM SECTION IS BASED ON FEMA SECTION STA. 1490 WITH THE OPENING MODIFIED IN HEC-RAS INTERNAL BRIDGE CROSS SECTION EDITOR.

UPSTREAM CULVERT OPENING

(LOOKING DOWNSTREAM)



DOWNSTREAM SECTION STA. 1290.0 (FEMA)

NEXT DOWNSTREAM SECTION STA. 1115.3

DOWNSTREAM SECTION IS BASED ON FEMA SECTION STA. 1290 WITH THE OPENING MODIFIED IN HEC-RAS INTERNAL BRIDGE CROSS SECTION EDITOR.

DOWNSTREAM CULVERT OPENING

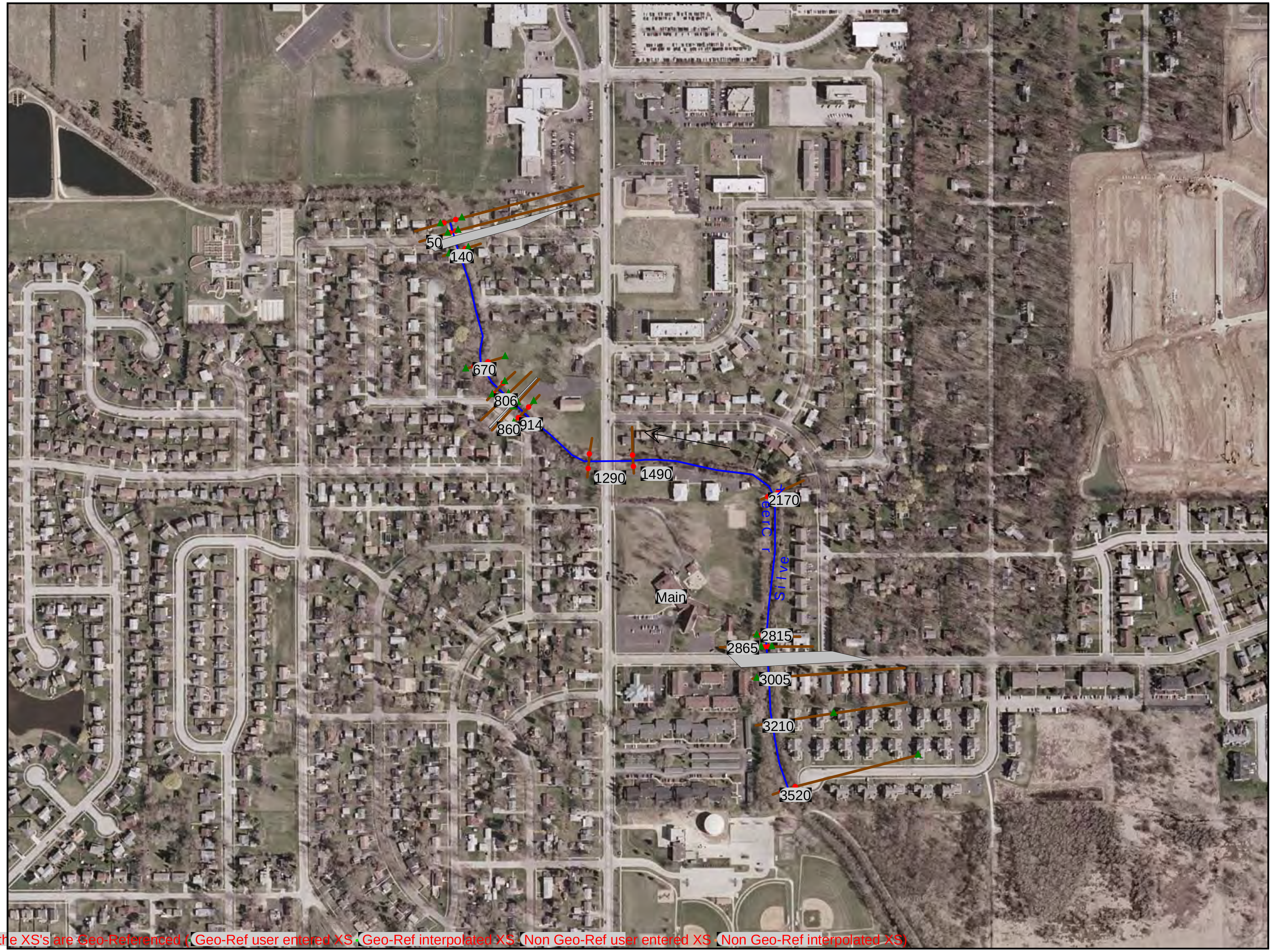
(LOOKING UPSTREAM)

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	PROPOSED CONDITIONS ANALYSIS IL ROUTE 47 OVER SILVER CREEK
		DRAWN - SGL	REVISED -		
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -		
	PLOT DATE = $DATE$	DATE - 11/2014	REVISED -		SCALE: N.T.S. SHEET NO. __ OF __ SHEETS STA. ____ TO STA. ____

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		
		CONTRACT NO. ____		
		ILLINOIS FED. AID PROJECT		

<u>EXHIBIT H</u>

NATURAL CONDITIONS HYDRAULIC MODEL AND RESULTS



None of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

NATURAL CONDITIONS - PERMIT MODEL

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 7:49:52 AM

Project in English units

****

PLAN DATA

Plan Title: Natural - FIS
Plan File : e:\0829\HECRAS\056-0240.p06

Geometry Title: FIS-Natural (NAVD88)
Geometry File : e:\0829\HECRAS\056-0240.g04

Flow Title   : FIS - NAVD88
Flow File   : e:\0829\HECRAS\056-0240.f02

```
Plan Summary Information:
Number of:  Cross Sections =   16    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    3    Lateral Structures =    0

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

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

****

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Main	3520	320	510	600	830
Silver Creek	Main	914	365	575	680	950

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
*******************************************************************************************************
* Silver Creek    Main           10-yr           *        Known WS = 878.24        Known WS = 874.11 *
* Silver Creek    Main           50-yr           *        Known WS = 880.29        Known WS = 875.18 *
* Silver Creek    Main           100-yr          *        Known WS = 881.21        Known WS = 875.58 *
* Silver Creek    Main           500-yr          *        Known WS = 883.85        Known WS = 876.41 *
*******************************************************************************************************

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

GEOMETRY DATA

Geometry Title: FIS-Natural (NAVD88)
Geometry File : e:\0829\HECRAS\056-0240.g04

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1573  1580.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1263  1580.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
```

```
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              140     140     140             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   923.5     942  887.66       T
    1058  1580.5  887.66       T

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 2925

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS =      50
Deck/Roadway Width        =      60
Weir Coefficient          =     2.5
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93  991.85  871.53 1008.15  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
         963.5  1026.5             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   923.5     942  887.66       T
    1058  1580.5  887.66       T

Downstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
        991.85 1008.15             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 871.7
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 871.7
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 60
    Centroid station of bridge opening = 1000
    Wing Wall Type                     = Angular wing walls
       Width                           = 18
       Angle                           = 30
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =
    Optional Contraction and expansion coefficients
      At approach Section
      At upstream inside (BU)
      At downstream inside (BD)
    Piers are Continuous for the width of the bridge
    Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2865

INPUT
Description: FEMA FIS Sta. 5.454
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        991.85 1008.15               50      50      50             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2815

INPUT
Description: FEMA FIS Sta. 5.445
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  885.83   969.5  885.03   993.5  871.23  1006.5  871.23  1018.5  879.53
  1039.5  880.93  1139.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              645     645     645             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   939.5     952  885.66       T
    1048  1139.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.63  1006.5  869.73  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              680     680     680             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.33  1006.5  870.33  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              200     200     200             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     993  870.53    1007  870.33    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              376     376     376             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.43     967  882.93     993  870.03    1007  869.83    1030  882.23
    1099  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030               50      50      50             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     937  884.66       T
    1063    1099  884.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 864

INPUT
Description: FEMA FIS Sta 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               58      58      58             .5       .3
```

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986.75	883.73	T
1013.25	1150	883.73	T

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 860

INPUT
Description: Pedestrian bridge
Distance from Upstream XS = 10
Deck/Roadway Width = 8
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
850	884.43	0	964	883.83	0	986.75	883.73	0
986.75	883.73	882.53	987.8	883.73	882.53	1012.2	883.73	882.53
1013.25	883.73	882.53	1013.25	883.73	0	1029	883.93	0
1150	885.43	0						

Upstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	884.43	964	883.83	986.75	882.53	987.8	869.73	1012.2	869.73
1013.25	882.53	1029	883.93	1150	885.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.05	986.75	.04	1013.25	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
986.75	1013.25	.5	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986.75	883.73	T
1013.25	1150	883.73	T

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
850	884.43	0	964	883.83	0	986.75	883.73	0
986.75	883.73	882.53	987.8	883.73	882.53	1012.2	883.73	882.53
1013.25	883.73	882.53	1013.25	883.73	0	1029	883.93	0
1150	885.43	0						

Downstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	884.43	964	883.83	986.75	882.53	987.8	869.73	1012.2	869.73
1013.25	882.53	1029	883.93	1150	885.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.75	.058	1013.25	.07

Bank Sta: Left	Right	Coeff Contr.	Expan.
986.75	1013.25	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986	883.66	T
1014	1150	883.66	T

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

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     986  883.66       T
    1014    1150  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.13     967  882.63     993  869.73    1007  869.53    1030  881.93
    1099  884.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              136     136     136              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     961  883.66       T
    1039    1099  883.66       T

CROSS SECTION
```

```
RIVER: Silver Creek
REACH: Main              RS: 670

INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              530     530     530              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     893  883.66       T
    1107    1099  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030               90      90      90              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     957  883.66       T
    1043    1099  883.66       T

BRIDGE


RIVER: Silver Creek
REACH: Main              RS: 90

INPUT
Description: Melody St Bridge (modeled as bridge in FIS study)
Distance from Upstream XS =      30
Deck/Roadway Width        =      40
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  881.53  881.53     967  877.53  876.33   986.8  877.53  876.33
   990.5  877.53  876.33  1009.5  877.53  876.33  1013.2  877.53  876.33
    1027  877.53  876.33    1150  877.43  877.43    1650  879.83  879.83

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
```

```
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     957  883.66       T
    1043    1099  883.66       T

Downstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  881.53  881.53     967  877.53  876.33   986.8  877.53  876.33
   990.5  877.53  876.33  1009.5  877.53  876.33  1013.2  877.53  876.33
    1027  877.53  876.33    1150  877.43  877.43    1650  879.83  879.83

Downstream Bridge Cross Section Data
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  881.53     967  877.53   986.8  876.33   990.5  868.93  1009.5  868.93
  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         986.8  1013.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977  879.66       T
    1023    1650  879.66       T

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 877.7
       El of the toe of the abutment   = 869.1
    Right Embankment
       El of the top of the embankment = 877.7
       El of the toe of the abutment   = 869.1
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 42
    Centroid station of bridge opening = 1000
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =
```

```
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  881.53     967  877.53   986.8  876.33   990.5  868.93  1009.5  868.93
  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         986.8  1013.2               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977  879.66       T
    1023    1650  879.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     839  879.83     968  876.33     992  868.83    1008  869.13    1021  874.33
    1064  874.33    1072  875.53    1589  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     839     .07     968    .058    1021     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           968    1021                0       0       0              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     839     952  879.66       T
    1048    1589  879.66       T

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

SUMMARY OF MANNING'S N VALUES

River:Silver Creek
*****************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *
```

Reach	River Sta.	Left	Channel	Right
Main	3520	.065	.04	.065
Main	3210	.065	.04	.065
Main	3005	.065	.04	.065
Main	2925	Bridge		
Main	2865	.05	.04	.05
Main	2815	.05	.04	.05
Main	2170	.05	.04	.05
Main	1490	.05	.04	.05
Main	1290	.05	.04	.05
Main	914	.05	.04	.05
Main	864	.05	.04	.05
Main	860	Bridge		
Main	856	.07	.058	.07
Main	806	.07	.058	.07
Main	670	.07	.058	.07
Main	140	.07	.058	.07
Main	90	Bridge		
Main	50	.07	.058	.07
Main	0	.07	.058	.07

SUMMARY OF REACH LENGTHS

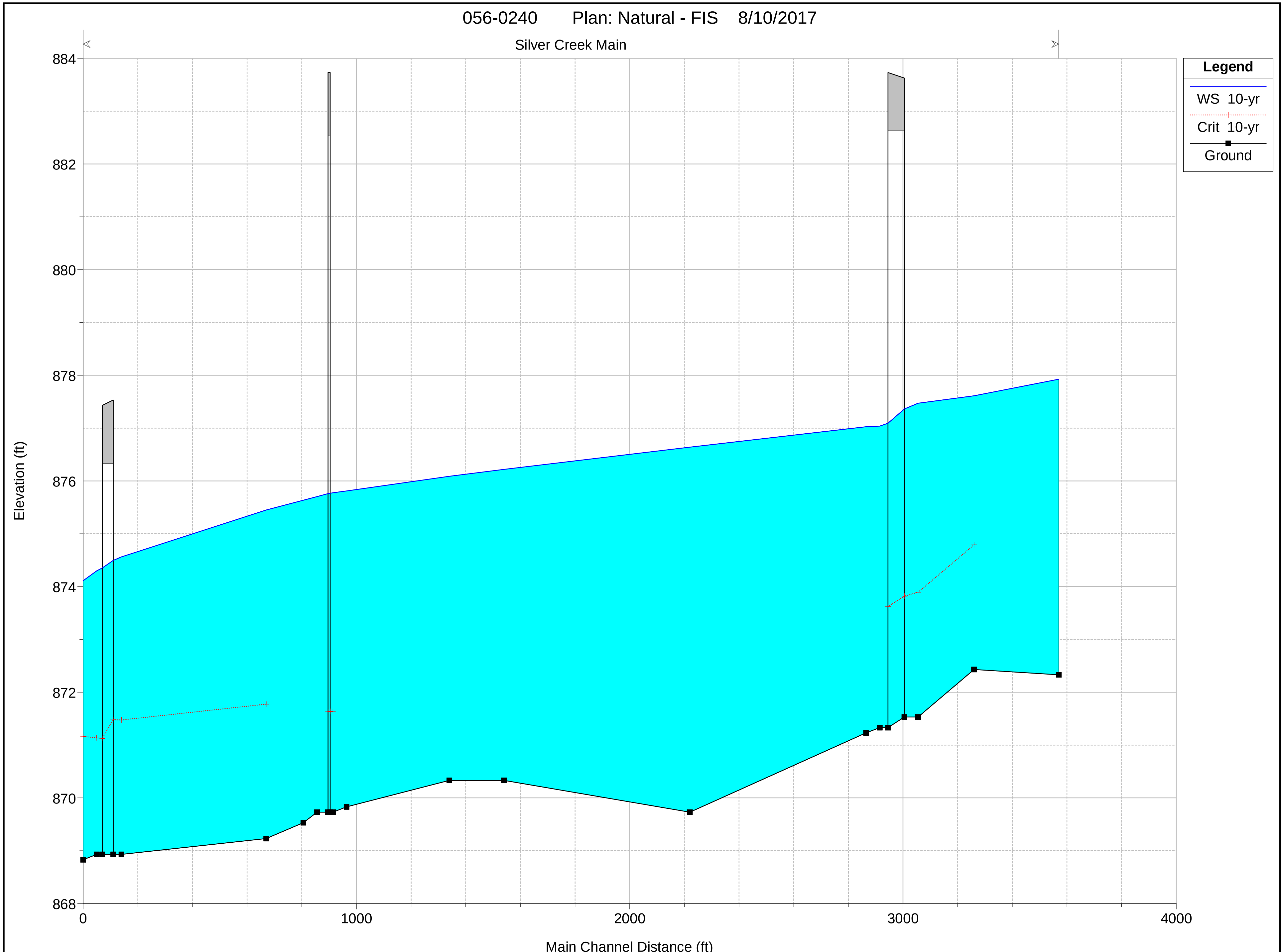
River: Silver Creek

Reach	River Sta.	Left	Channel	Right
Main	3520	310	310	310
Main	3210	205	205	205
Main	3005	140	140	140
Main	2925	Bridge		
Main	2865	50	50	50
Main	2815	645	645	645
Main	2170	680	680	680
Main	1490	200	200	200
Main	1290	376	376	376
Main	914	50	50	50
Main	864	58	58	58
Main	860	Bridge		
Main	856	50	50	50
Main	806	136	136	136
Main	670	530	530	530
Main	140	90	90	90
Main	90	Bridge		
Main	50	50	50	50
Main	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Main	3520	.1	.3
Main	3210	.1	.3
Main	3005	.1	.3
Main	2925	Bridge	
Main	2865	.3	.5
Main	2815	.3	.5
Main	2170	.1	.3
Main	1490	.1	.3
Main	1290	.1	.3
Main	914	.1	.3
Main	864	.5	.3
Main	860	Bridge	
Main	856	.3	.5
Main	806	.3	.5
Main	670	.1	.3
Main	140	.1	.3

```
*Main            *    90      *Bridge   *         *
*Main            *    50      *        .3*       .5*
*Main            *    0       *        .3*       .5*
*******************************************************
```


056-0240 Plan: Natural - FIS 8/10/2017
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
Elevation (ft)
884
882
880
878
876
874
872
870
868
0
1000
2000
3000
4000
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 7:49:52 AM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	877.92		878.02	0.000803	2.46	129.97	33.46	0.22
Main	3210	10-yr	320.00	872.43	877.61	874.79	877.73	0.001085	2.75	116.46	31.95	0.25
Main	3005	10-yr	320.00	871.53	877.47	873.89	877.55	0.000633	2.26	141.79	34.73	0.20
Main	2925		Bridge									
Main	2865	10-yr	320.00	871.33	877.04		877.22	0.001706	3.44	93.03	16.30	0.25
Main	2815	10-yr	320.00	871.23	877.03		877.12	0.000781	2.48	128.84	31.46	0.22
Main	2170	10-yr	320.00	869.73	876.64		876.71	0.000503	2.10	152.08	34.17	0.18
Main	1490	10-yr	320.00	870.33	876.22		876.31	0.000700	2.37	135.10	32.88	0.21
Main	1290	10-yr	320.00	870.33	876.09		876.17	0.000663	2.27	141.08	35.88	0.20
Main	914	10-yr	365.00	869.83	875.81		875.90	0.000741	2.45	149.11	36.74	0.21
Main	864	10-yr	365.00	869.73	875.78	871.63	875.87	0.000645	2.43	150.51	25.39	0.18
Main	860		Bridge									
Main	856	10-yr	365.00	869.73	875.70		875.80	0.001406	2.46	148.66	25.38	0.18
Main	806	10-yr	365.00	869.53	875.63		875.72	0.001433	2.37	153.77	37.22	0.21
Main	670	10-yr	365.00	869.23	875.45	871.77	875.53	0.001329	2.31	158.07	37.67	0.20
Main	140	10-yr	365.00	868.93	874.56	871.47	874.67	0.001983	2.67	136.57	35.39	0.24
Main	90		Bridge									
Main	50	10-yr	365.00	868.93	874.30	871.14	874.34	0.002568	3.14	116.38	24.37	0.25
Main	0	10-yr	365.00	868.83	874.11	871.16	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)

Main	3520	10-yr		878.02	877.92	0.09	0.29	0.00		320.00		33.46
Main	3210	10-yr		877.73	877.61	0.12	0.17	0.01		320.00		31.95
Main	3005	10-yr		877.55	877.47	0.08				320.00		34.73
Main	2925			Bridge								
Main	2865	10-yr		877.22	877.04	0.18	0.06	0.04		320.00		16.30
Main	2815	10-yr		877.12	877.03	0.10	0.40	0.01		320.00		31.46
Main	2170	10-yr		876.71	876.64	0.07	0.40	0.00		320.00		34.17
Main	1490	10-yr		876.31	876.22	0.09	0.14	0.00		320.00		32.88
Main	1290	10-yr		876.17	876.09	0.08	0.26	0.00		320.00		35.88
Main	914	10-yr		875.90	875.81	0.09	0.03	0.00		365.00		36.74
Main	864	10-yr		875.87	875.78	0.09				365.00		25.39
Main	860			Bridge								
Main	856	10-yr		875.80	875.70	0.09	0.07	0.00		365.00		25.38
Main	806	10-yr		875.72	875.63	0.09	0.19	0.00		365.00		37.22
Main	670	10-yr		875.53	875.45	0.08	0.86	0.00		365.00		37.67
Main	140	10-yr		874.67	874.56	0.11	0.06	0.00		365.00		35.39
Main	90			Bridge								
Main	50	10-yr		874.34	874.30	0.17	0.13	0.00		365.00		24.37
Main	0	10-yr		874.19	874.11	0.08				365.00		45.35

ERRORS WARNINGS AND NOTES

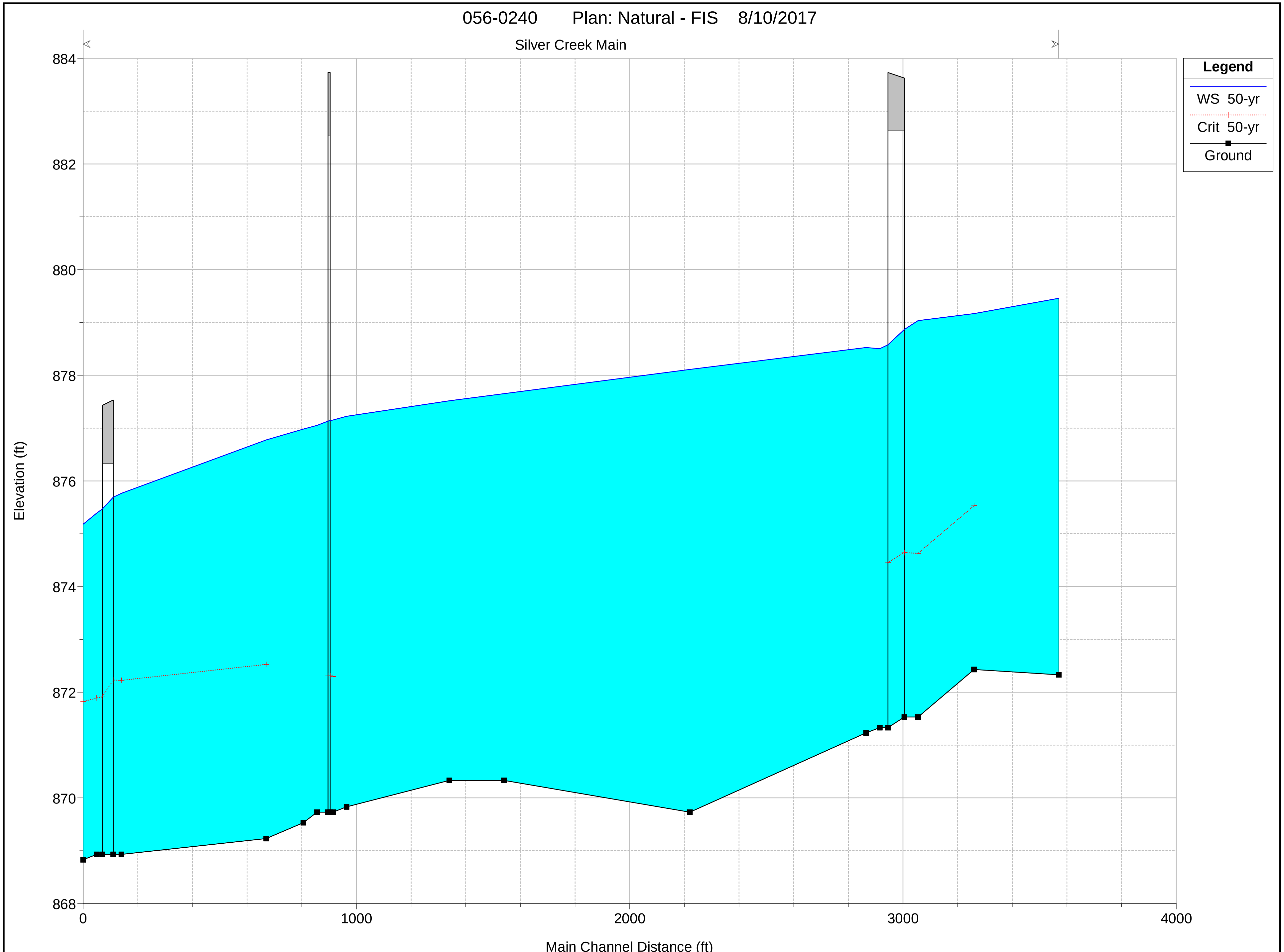
Errors Warnings and Notes for Plan : Natural - Permit

River: Silver Creek Reach: Main   RS: 2865   Profile: 10-yr

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

River: Silver Creek Reach: Main   RS: 860   Profile: 10-yr Upstream

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.


056-0240 Plan: Natural - FIS 8/10/2017
Silver Creek Main
Legend
WS 50-yr
Crit 50-yr
Ground
Elevation (ft)
884
882
880
878
876
874
872
870
868
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                HEC-RAS Version 4.1.0 Jan 2010
                U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

      X     X  XXXXXX    XXXX        XXXX       XX      XXXX
      X     X  X        X    X       X   X     X  X    X
      X     X  X        X            X   X    X    X   X
      XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
      X     X  X        X            X  X     X    X        X
      X     X  X        X    X       X   X    X    X        X
      X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 7:49:52 AM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	879.46		879.57	0.000772	2.75	185.56	39.07	0.22
Main	3210	50-yr	510.00	872.43	879.17	875.53	879.31	0.000971	2.99	170.55	37.64	0.25
Main	3005	50-yr	510.00	871.53	879.04	874.63	879.14	0.000625	2.54	200.58	40.45	0.20
Main	2925		Bridge									
Main	2865	50-yr	510.00	871.33	878.50		878.80	0.002313	4.36	116.91	16.30	0.29
Main	2815	50-yr	510.00	871.23	878.52		878.65	0.000802	2.84	179.56	36.23	0.22
Main	2170	50-yr	510.00	869.73	878.11		878.21	0.000558	2.48	205.99	40.14	0.19
Main	1490	50-yr	510.00	870.33	877.65		877.77	0.000748	2.75	185.65	37.72	0.22
Main	1290	50-yr	510.00	870.33	877.52		877.62	0.000683	2.60	196.30	41.41	0.21
Main	914	50-yr	575.00	869.83	877.22		877.35	0.000773	2.81	204.95	42.21	0.22
Main	864	50-yr	575.00	869.73	877.15	872.30	877.30	0.000877	3.10	185.63	25.62	0.20
Main	860		Bridge									
Main	856	50-yr	575.00	869.73	877.05		877.20	0.001919	3.14	183.04	25.60	0.21
Main	806	50-yr	575.00	869.53	876.98		877.10	0.001573	2.77	207.42	42.44	0.22
Main	670	50-yr	575.00	869.23	876.78	872.53	876.89	0.001493	2.72	211.43	42.80	0.22
Main	140	50-yr	575.00	868.93	875.76	872.22	875.92	0.002245	3.16	181.98	40.05	0.26
Main	90		Bridge									
Main	50	50-yr	575.00	868.93	875.39	871.89	875.49	0.003497	4.00	143.65	25.46	0.30
Main	0	50-yr	575.00	868.83	875.18	871.82	875.29	0.001675	2.67	231.51	97.99	0.23

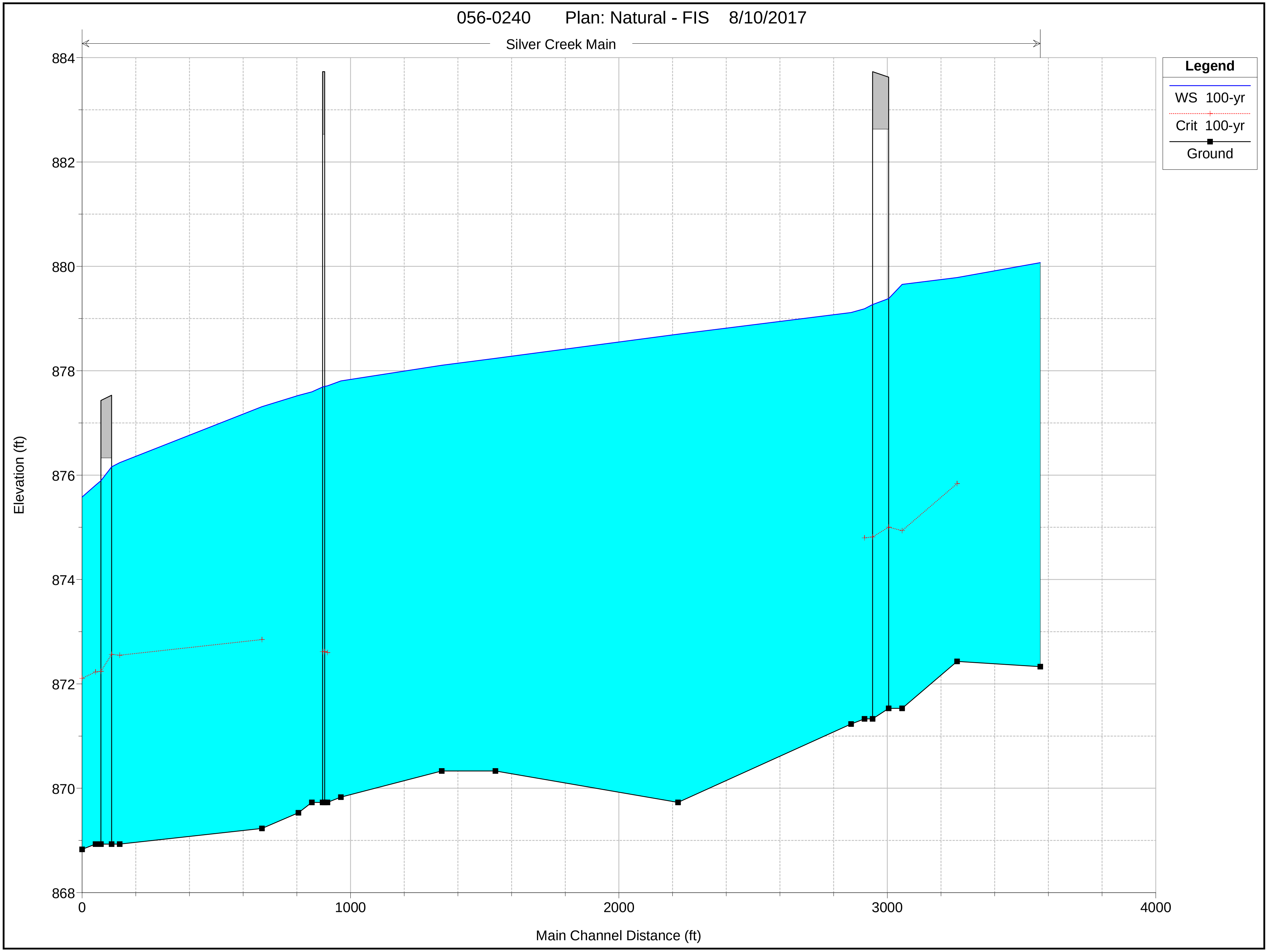
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)

Main	3520	50-yr	879.57	879.46	0.12	0.27	0.00		510.00		39.07
Main	3210	50-yr	879.31	879.17	0.14	0.16	0.01		510.00		37.64
Main	3005	50-yr	879.14	879.04	0.10				510.00		40.45
Main	2925		Bridge								
Main	2865	50-yr	878.80	878.50	0.30	0.06	0.09		510.00		16.30
Main	2815	50-yr	878.65	878.52	0.13	0.43	0.02		510.00		36.23
Main	2170	50-yr	878.21	878.11	0.10	0.44	0.00		510.00	0.00	40.14
Main	1490	50-yr	877.77	877.65	0.12	0.14	0.00		510.00		37.72
Main	1290	50-yr	877.62	877.52	0.10	0.27	0.00		510.00		41.41
Main	914	50-yr	877.35	877.22	0.12	0.04	0.00		575.00		42.21
Main	864	50-yr	877.30	877.15	0.15				575.00		25.62
Main	860		Bridge								
Main	856	50-yr	877.20	877.05	0.15	0.09	0.02		575.00		25.60
Main	806	50-yr	877.10	876.98	0.12	0.21	0.00		575.00		42.44
Main	670	50-yr	876.89	876.78	0.11	0.97	0.00		575.00		42.80
Main	140	50-yr	875.92	875.76	0.16	0.07	0.00		575.00		40.05
Main	90		Bridge								
Main	50	50-yr	875.49	875.39	0.28	0.18	0.00		575.00		25.46
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural - Permit

River: Silver Creek Reach: Main   RS: 2925   Profile: 50-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the bridge deck. This is not physically possible. Please review your bridge data and results for reasonableness.
River: Silver Creek Reach: Main   RS: 2925   Profile: 50-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 2865   Profile: 50-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 860   Profile: 50-yr Upstream
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.


056-0240 Plan: Natural - FIS 8/10/2017
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
884
882
880
878
876
874
872
870
868
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                  HEC-RAS Version 4.1.0 Jan 2010
                   U.S. Army Corps of Engineers
                  Hydrologic Engineering Center
                        609 Second Street
                        Davis, California

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

******************************************************************************
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 7:49:52 AM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	880.07		880.20	0.000763	2.85	210.17	41.31	0.22
Main	3210	100-yr	600.00	872.43	879.78	875.84	879.93	0.000940	3.08	194.54	39.90	0.25
Main	3005	100-yr	600.00	871.53	879.65	874.94	879.76	0.000624	2.65	226.34	42.72	0.20
Main	2925		Bridge									
Main	2865	100-yr	600.00	871.33	879.19	874.80	879.43	0.002505	4.69	128.06	16.30	0.29
Main	2815	100-yr	600.00	871.23	879.11		879.25	0.000811	2.98	201.49	38.11	0.23
Main	2170	100-yr	600.00	869.73	878.70		878.81	0.000559	2.61	232.51	50.05	0.19
Main	1490	100-yr	600.00	870.33	878.24		878.37	0.000748	2.88	208.63	42.48	0.22
Main	1290	100-yr	600.00	870.33	878.10		878.22	0.000683	2.71	221.31	43.69	0.21
Main	914	100-yr	680.00	869.83	877.80		877.94	0.000789	2.96	230.09	44.46	0.23
Main	864	100-yr	680.00	869.73	877.71	872.60	877.89	0.000994	3.40	199.96	25.71	0.21
Main	860		Bridge									
Main	856	100-yr	680.00	869.73	877.60		877.78	0.002180	3.45	197.00	25.69	0.22
Main	806	100-yr	680.00	869.53	877.53		877.66	0.001640	2.94	231.12	44.55	0.23
Main	670	100-yr	680.00	869.23	877.31	872.85	877.44	0.001570	2.90	234.88	44.87	0.22
Main	140	100-yr	680.00	868.93	876.24	872.55	876.42	0.002384	3.38	201.37	41.88	0.27
Main	90		Bridge									
Main	50	100-yr	680.00	868.93	875.80	872.23	875.93	0.004000	4.41	154.26	25.88	0.32
Main	0	100-yr	680.00	868.83	875.58	872.11	875.70	0.001716	2.82	262.30	107.61	0.23

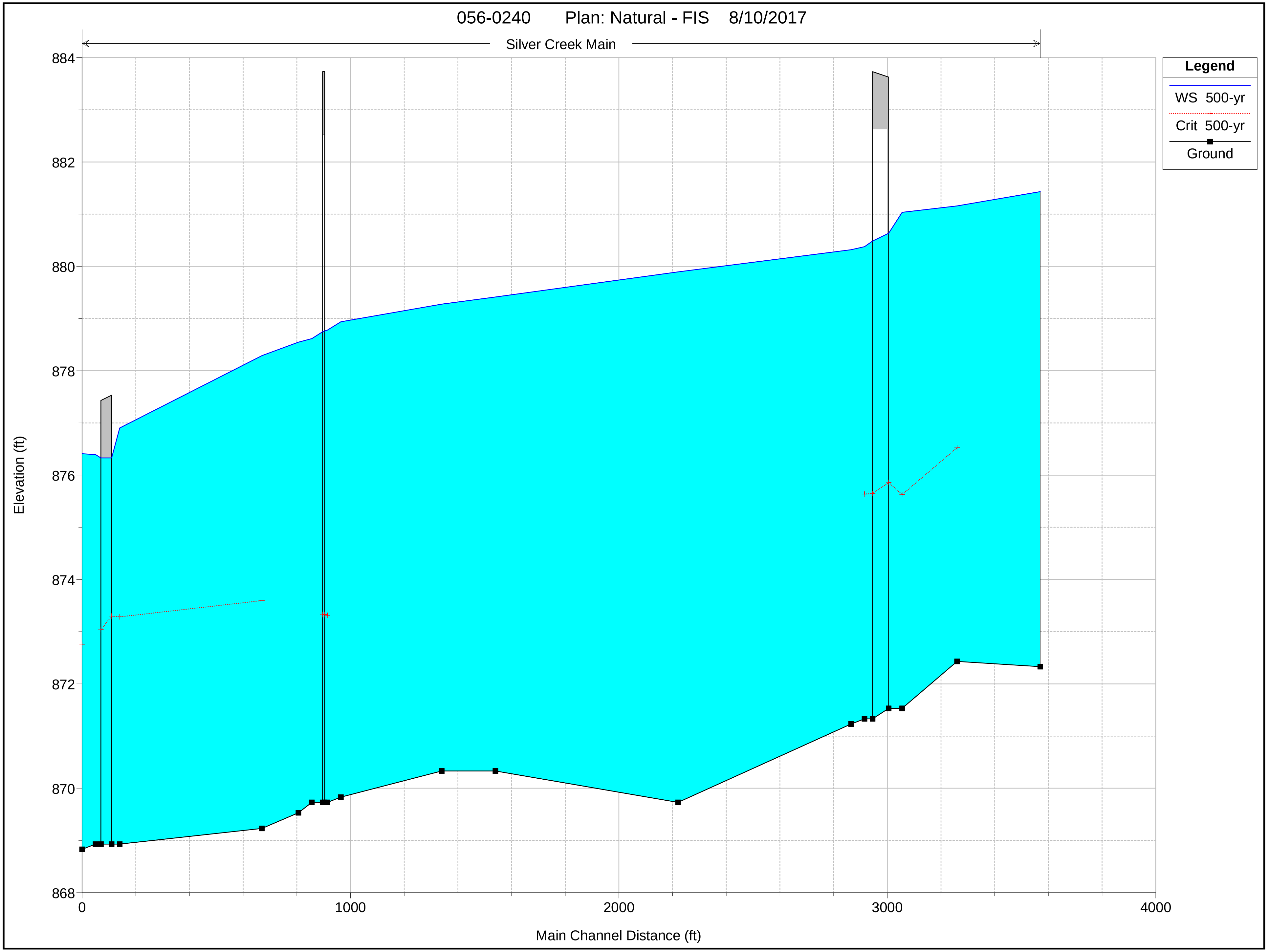
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)

Main	3520	100-yr	880.20	880.07	0.13	0.26	0.00		600.00		41.31
Main	3210	100-yr	879.93	879.78	0.15	0.16	0.01		600.00		39.90
Main	3005	100-yr	879.76	879.65	0.11	0.04	0.00		600.00		42.72
Main	2925		Bridge								
Main	2865	100-yr	879.43	879.19	0.37	0.13	0.00		600.00		16.30
Main	2815	100-yr	879.25	879.11	0.14	0.43	0.02		600.00		38.11
Main	2170	100-yr	878.81	878.70	0.11	0.44	0.00		598.86	1.14	50.05
Main	1490	100-yr	878.37	878.24	0.13	0.14	0.00		599.94	0.06	42.48
Main	1290	100-yr	878.22	878.10	0.11	0.28	0.00		600.00		43.69
Main	914	100-yr	877.94	877.80	0.14	0.04	0.00		680.00		44.46
Main	864	100-yr	877.89	877.71	0.18				680.00		25.71
Main	860		Bridge								
Main	856	100-yr	877.78	877.60	0.19	0.09	0.03		680.00		25.69
Main	806	100-yr	877.66	877.53	0.13	0.22	0.00		680.00		44.55
Main	670	100-yr	877.44	877.31	0.13	1.03	0.00		680.00		44.87
Main	140	100-yr	876.42	876.24	0.18	0.07	0.00		680.00		41.88
Main	90		Bridge								
Main	50	100-yr	875.93	875.80	0.34	0.21	0.00		680.00		25.88
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural - Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 100-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the bridge deck. This is not physically possible. Please review your bridge data and results for reasonableness.
River: Silver Creek Reach: Main RS: 2925 Profile: 100-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 860 Profile: 100-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 670 Profile: 100-yr
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.


056-0240 Plan: Natural - FIS 8/10/2017
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Elevation (ft)
884
882
880
878
876
874
872
870
868
0
1000
2000
3000
4000
Main Channel Distance (ft)

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U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 7:49:52 AM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	881.43		881.58	0.000743	3.08	269.84	46.29	0.22
Main	3210	500-yr	830.00	872.43	881.16	876.52	881.33	0.000886	3.28	252.81	44.93	0.24
Main	3005	500-yr	830.00	871.53	881.03	875.63	881.16	0.000619	2.87	288.75	47.76	0.21
Main	2925		Bridge									
Main	2865	500-yr	830.00	871.33	880.38	875.64	880.73	0.003297	5.63	147.45	16.30	0.33
Main	2815	500-yr	830.00	871.23	880.32		880.49	0.000836	3.32	253.90	52.63	0.24
Main	2170	500-yr	830.00	869.73	879.89		880.02	0.000581	2.92	305.49	75.42	0.20
Main	1490	500-yr	830.00	870.33	879.41		879.57	0.000759	3.21	270.23	62.26	0.23
Main	1290	500-yr	830.00	870.33	879.28		879.42	0.000725	3.02	275.18	48.22	0.22
Main	914	500-yr	950.00	869.83	878.94		879.11	0.000880	3.36	283.02	48.85	0.25
Main	864	500-yr	950.00	869.73	878.78	873.31	879.05	0.001352	4.18	227.51	25.88	0.25
Main	860		Bridge									
Main	856	500-yr	950.00	869.73	878.62		878.90	0.002994	4.25	223.30	25.86	0.26
Main	806	500-yr	950.00	869.53	878.55		878.73	0.001930	3.41	278.62	48.50	0.25
Main	670	500-yr	950.00	869.23	878.29	873.59	878.47	0.001893	3.39	280.63	48.66	0.25
Main	140	500-yr	950.00	868.93	876.90	873.28	877.17	0.003239	4.13	230.10	44.46	0.32
Main	90		Bridge									
Main	50	500-yr	950.00	868.93	876.39		876.88	0.005948	5.60	169.69	28.15	0.39
Main	0	500-yr	950.00	868.83	876.41	872.75	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

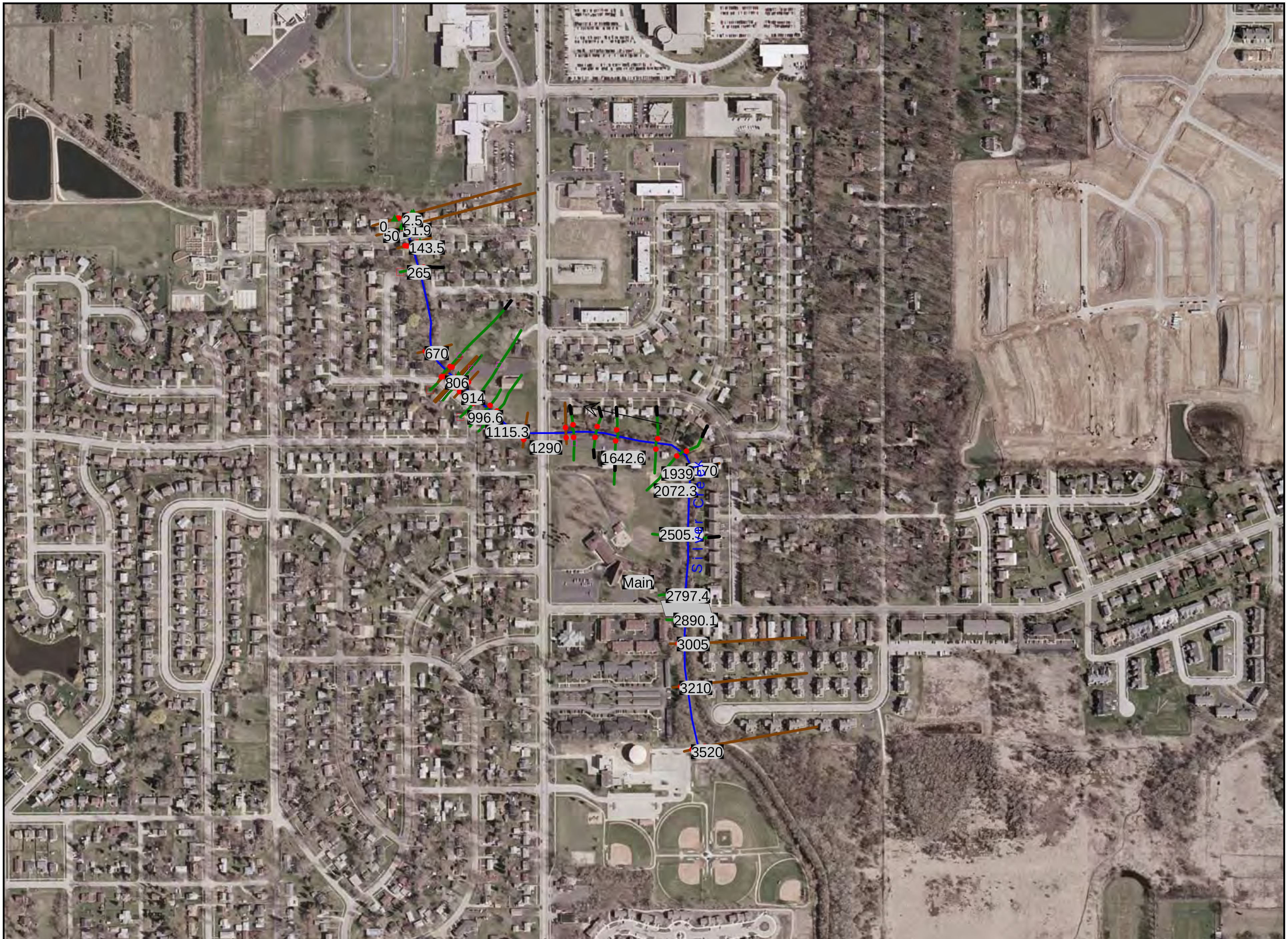
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)

Main	3520	500-yr	881.58	881.43	0.15	0.25	0.00		830.00		46.29
Main	3210	500-yr	881.33	881.16	0.17	0.15	0.01		830.00		44.93
Main	3005	500-yr	881.16	881.03	0.13	0.04	0.00		830.00		47.76
Main	2925		Bridge								
Main	2865	500-yr	880.73	880.38	0.53	0.17	0.00		830.00		16.30
Main	2815	500-yr	880.49	880.32	0.17	0.45	0.02		827.85	2.15	52.63
Main	2170	500-yr	880.02	879.89	0.13	0.45	0.00		812.91	17.09	75.42
Main	1490	500-yr	879.57	879.41	0.16	0.15	0.01		820.83	9.17	62.26
Main	1290	500-yr	879.42	879.28	0.14	0.30	0.00		830.00		48.22
Main	914	500-yr	879.11	878.94	0.17	0.05	0.01		950.00		48.85
Main	864	500-yr	879.05	878.78	0.27	0.01	0.00		950.00		25.88
Main	860		Bridge								
Main	856	500-yr	878.90	878.62	0.28	0.12	0.05		950.00		25.86
Main	806	500-yr	878.73	878.55	0.18	0.26	0.00		950.00		48.50
Main	670	500-yr	878.47	878.29	0.18	1.29	0.01		950.00		48.66
Main	140	500-yr	877.17	876.90	0.26				950.00		44.46
Main	90		Bridge								
Main	50	500-yr	876.88	876.39	0.49	0.15	0.17	0.01	949.99	0.00	28.15
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural - Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 500-yr
Warning: For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
River: Silver Creek Reach: Main RS: 2925 Profile: 500-yr Upstream
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 860 Profile: 500-yr Upstream
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 90 Profile: 500-yr
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.
River: Silver Creek Reach: Main RS: 50 Profile: 500-yr
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.

NATURAL CONDITIONS - DESIGN MODEL



14 of the 31 XS's are not Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 5:11:18 PM

Project in English units

****

PLAN DATA

Plan Title: Design - Natural
Plan File : e:\0829\HECRAS\056-0240.p03

Geometry Title: Modified Natural
Geometry File : e:\0829\HECRAS\056-0240.g07

Flow Title   : FIS - NAVD88
Flow File   : e:\0829\HECRAS\056-0240.f02

Plan Summary Information:

Number of:					
	Cross Sections	= 31	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 3	Lateral Structures	=	0

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

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

****

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Main	3520	320	510	600	830
Silver Creek	Main	914	365	575	680	950

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
****************************************************************************************************
* Silver Creek    Main           10-yr           *        Known WS = 878.24        Known WS = 874.11 *
* Silver Creek    Main           50-yr           *        Known WS = 880.29        Known WS = 875.18 *
* Silver Creek    Main           100-yr          *        Known WS = 881.21        Known WS = 875.58 *
* Silver Creek    Main           500-yr          *        Known WS = 883.85        Known WS = 876.41 *
****************************************************************************************************

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

GEOMETRY DATA

Geometry Title: Modified Natural
Geometry File : e:\0829\HECRAS\056-0240.g07

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
```

923.5	.065	963.5	.04	1026.5	.065

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
963.5	1026.5	114.9	114.9	114.9	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2890.1

INPUT
Description: U/S Face St Johns Rd Culvert
Station Elevation Data num= 20

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
895.14	888.94	930.24	886.15	951.06	884.93	960.49	884.51	976.26	880.13
989.54	873.71	991.22	872.57	1000	871.98	1009.06	872.4	1011.84	873.8
1023.21	876.62	1023.88	880.06	1038.54	884.73	1058.98	886.1	1070.47	886.2
1079.73	886.12	1091.72	885.73	1111.8	886	1128.8	885.79	1156.04	886.21

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
895.14	.05	960.49	.04	1038.54	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
960.49	1038.54	92.7	92.7	92.7	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
895.14	980	885.13	T
1021	1156.04	884.52	T

Blocked Obstructions num= 1

Sta L	Sta R	Elev
1150	1156.04	895

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 2847.6

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS = 12.5
Deck/Roadway Width = 60
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 19

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
802.2	889.13	865	835.3	888.25	865	842.8	888.06	865
903.1	886.56	865	991.85	884.91	865	991.85	884.91	883.1
1002.7	884.71	883.1	1008.15	884.65	883.1	1008.15	884.65	865
1048.6	884.23	865	1057.2	884.14	865	1089.1	884.08	865
1093.3	884.12	865	1102.8	884.23	865	1119.1	884.25	865
1164.4	884.5	865	1202.7	884.9	865	1245.3	885.27	865
1302.8	885.29	865						

Upstream Bridge Cross Section Data
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
895.14	888.94	930.24	886.15	951.06	884.93	960.49	884.51	976.26	880.13
989.54	873.71	991.22	872.57	992	872	1000	872	1008	872
1009.06	872.4	1011.84	873.8	1023.21	876.62	1023.88	880.06	1038.54	884.73
1058.98	886.1	1070.47	886.2	1079.73	886.12	1091.72	885.73	1111.8	886
1128.8	885.79	1156.04	886.21						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
895.14	.05	960.49	.04	1038.54	.05

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
        960.49 1038.54             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  895.14     980  885.13       T
    1021 1156.04  884.52       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1150 1156.04     895

Downstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   802.2  889.13     865   835.3  888.25     865   842.8  888.06     865
   903.1  886.56     865  991.85  884.91     865  991.85  884.91   883.1
  1002.7  884.71   883.1 1008.15  884.65   883.1 1008.15  884.65     865
  1048.6  884.23     865  1057.2  884.14     865  1089.1  884.08     865
  1093.3  884.12     865  1102.8  884.23     865  1119.1  884.25     865
  1164.4   884.5     865  1202.7   884.9     865  1245.3  885.27     865
  1302.8  885.29     865

Downstream Bridge Cross Section Data
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  843.45  886.41  860.11  885.29  874.37  884.71  898.74  884.44   927.4  883.14
  947.26   883.5  974.88  880.12  976.56  880.19  987.41  873.83  988.87  872.45
     992     872    1000     872    1008     872 1015.59  872.48 1018.13   874.1
  1023.8  880.19 1036.31  882.93 1047.14  883.64 1057.56  883.68 1066.24  883.65
 1081.39  883.71 1091.02  883.77  1099.8  883.77 1108.55  883.59 1117.25  884.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  843.45     .05  947.26     .04 1036.31     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        947.26 1036.31             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  843.45     982   884.1       T
    1018 1117.25  883.55       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1047.14  1099.8     895

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 872
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 872
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 60
    Centroid station of bridge opening = 1000
```

Wing Wall Type = Angular wing walls
Width = 18
Angle = 30
Radius =
Guide Banks Type = No Guide Bank present
Length =
Offset =
Angle =
Optional Contraction and expansion coefficients
At approach Section
At upstream inside (BU)
At downstream inside (BD)
Piers are Continuous for the width of the bridge
Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2797.4

INPUT
Description: D/S Face St. John's Rd. Culvert
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
843.45	886.41	860.11	885.29	874.37	884.71	898.74	884.44	927.4	883.14
947.26	883.5	974.88	880.12	976.56	880.19	987.41	873.83	988.87	872.45
1000	872.06	1015.59	872.48	1018.13	874.1	1023.8	880.19	1036.31	882.93
1047.14	883.64	1057.56	883.68	1066.24	883.65	1081.39	883.71	1091.02	883.77
1099.8	883.77	1108.55	883.59	1117.25	884.76				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
843.45	.05	947.26	.04	1036.31	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
947.26	1036.31	291.7	291.7	291.7	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
843.45	982	884.1	T
1018	1117.25	883.55	T

Blocked Obstructions num= 1

Sta L	Sta R	Elev
1047.14	1099.8	895

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2505.7

INPUT
Description: 1000' Upstream
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
824.02	887.7	908.53	885.28	961.5	884.23	991.3	873.06	995.21	871.83

```
    1000  870.71  1005.8  871.86 1006.58  873.09 1032.77   882.6 1059.46  884.35
 1103.24  886.06    1153  886.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  824.02     .05   961.5     .04 1032.77     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         961.5 1032.77             335.7   335.7   335.7             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1103    1153     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.63  1006.5  869.73  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              97.7    97.7    97.7             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2072.3

INPUT
Description: 630' Upstream
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  744.48  887.04  826.03  886.58  897.61  885.58  967.36  884.24  993.63  871.08
    1000  871.24 1010.07  871.27    1024  878.47  1083.7  881.52    1127   882.6
    1192     883

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  744.48     .05  967.36     .04    1024     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        967.36    1024                75   133.3     241             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1135    1192     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1939

INPUT
Description: 500' Upstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
```

```
  850.48  887.32  967.55  885.98  993.44  872.53  996.58  871.33    1000  870.86
 1004.42  871.37 1007.57  872.61 1020.23  880.52  1024.6  882.41 1065.82  883.58
 1140.45  886.21    1180   886.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  850.48     .05  967.55     .04  1024.6     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        967.55  1024.6            188.6   188.6   188.6             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1140.85    1180     905

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1750.4

INPUT
Description: 300' Upstream
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  756.64  890.69  817.34  888.93  825.73  887.86  905.15  886.97  968.79  886.11
  993.03  872.27  994.31  871.08    1000  870.88 1005.79  871.49 1007.56  872.16
 1026.49  882.93 1056.52  886.16 1095.75  887.05    1136   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  756.64     .05  968.79     .04 1026.49     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        968.79 1026.49            107.8   107.8   107.8             .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
     825     905     900 1095.75    1136     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1642.6

INPUT
Description: 200' Upstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  869.82  886.36  906.86  885.93  938.57   885.9  962.16  885.47  968.46  885.24
  969.77  885.17  991.26  872.58  992.41  870.52    1000  870.63  1006.9  871.27
 1010.61  873.77 1021.14  884.15 1023.62  884.16 1077.77  887.19 1122.42   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  869.82     .05  968.46     .04 1023.62     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        968.46 1023.62               95     114     136             .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
  869.82  906.86     905 1077.77 1122.42     907

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1528.6
```

INPUT
Description: 100' Uptream
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
851.4	889.18	896.65	886.23	923.82	886.49	933.91	886.85	943.34	886.81
963.1	886.55	990.27	873.23	993.98	870.96	1000	870.49	1004.07	870.98
1007.21	872.93	1027.17	884.82	1070.94	889.23	1121.37	889.41		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
851.4	.05	963.1	.04	1027.17	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
963.1	1027.17	38.6	38.6	38.6	.1	.3

Left Levee Station= 933.91 Elevation= 886.85
Blocked Obstructions num= 1

Sta L	Sta R	Elev
1082	1121.37	910

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
939.5	884.33	969.5	883.53	993.5	870.33	1006.5	870.33	1018.5	878.03
1039.5	879.43	1139.5	883.23						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
939.5	.05	969.5	.04	1018.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
969.5	1018.5	266.1	200	200	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
929	885.93	967	883.43	993	870.53	1007	870.33	1030	882.73
1099	885.33								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
929	.05	967	.04	1030	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967	1030	174.7	174.7	174.7	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 1115.3

INPUT
Description: 180' Downstream

```
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  893.44  883.54  908.68  884.01  925.37  884.04  932.73  883.75   973.2  882.92
  993.01  870.54  995.55  869.83    1000   869.4 1005.16  870.73 1007.95  871.27
    1011  873.69 1028.59  881.44 1077.12  883.65  1132.6  884.78 1242.23  886.05

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  893.44     .05   973.2     .04 1028.59     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         973.2 1028.59              48      48      48             .1       .3
Left Levee      Station=  925.37      Elevation=  884.04

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1067.3

INPUT
Description: 230' Downstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.82  883.04  901.14   883.6  922.39  883.35  934.15  883.39  958.36  883.75
  975.79  882.25  993.36  870.76  994.87  869.85    1000  869.53 1003.41  869.76
  1006.8  870.84  1010.7  873.23 1025.94  880.44 1074.79  883.35 1118.97  884.69

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.82     .05  975.79     .04 1025.94     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.79 1025.94            70.7    70.7    70.7             .1       .3
Left Levee      Station=  958.36      Elevation=  883.75

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 996.6

INPUT
Description: 300' Downstream
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   883.5  884.59  936.05  883.52  966.38   883.5  975.34  882.83  993.33  871.36
  993.85  869.81    1000  870.03 1006.39  870.05 1007.58  871.25 1024.84  880.27
 1087.46  882.76 1137.35  883.53 1200.63  883.56  1255.9  882.93 1321.41  885.89
 1401.88  884.79

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   883.5     .05  975.34     .04 1024.84     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.34 1024.84            82.6    82.6    82.6             .1       .3
Right Levee     Station= 1200.63      Elevation=  883.56

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
```

929	885.43	967	882.93	993	870.03	1007	869.83	1030	882.23
1099	884.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
929	.05	967	.04	1030	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967	1030	32.55	32.55	32.55	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 881.45

INPUT
Description: U/S Face of Footbridge
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
882.26	884.57	929.76	884.11	958.59	884.14	965.76	884.21	992.75	871.4
993.38	870.16	1000	870.06	1006.37	870.31	1006.6	871.42	1027.89	882.46
1090.88	885.58	1172	884.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
882.26	.05	965.76	.04	1027.89	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
965.76	1027.89	17.45	17.45	17.45	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
882.26	983	884.25	F
1017	1172	883.7	F

Right Levee Station= 1090.88 Elevation= 885.58

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 874.6

INPUT
Description: Footbridge
Distance from Upstream XS = 3.85
Deck/Roadway Width = 6
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 12

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
882.26	884.57	865	929.76	884.11	865	958.59	884.14	865
965.2	884.41	865	973	884.2	865	986.75	884.26	0
986.75	884.26	883.11	1013.25	883.8	882.65	1013.25	883.8	0
1025	883.62	0	1030.2	883.62	0	1090.5	885.58	0

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
882.26	884.57	929.76	884.11	958.59	884.14	965.76	884.21	992.75	871.4
993.38	870.16	1000	870.06	1006.37	870.31	1006.6	871.42	1027.89	882.46
1090.88	885.58	1172	884.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
882.26	.05	965.76	.04	1027.89	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
965.76	1027.89	.3	.5

```
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983  884.25       F
    1017    1172   883.7       F
Right Levee     Station= 1090.88      Elevation=  885.58

Downstream  Deck/Roadway Coordinates
    num=      12
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  882.26  884.57     865  929.76  884.11     865  958.59  884.14     865
   965.2  884.41     865     973   884.2     865  986.75  884.26       0
  986.75  884.26  883.11 1013.25   883.8  882.65 1013.25   883.8       0
    1025  883.62       0  1030.2  883.62       0  1090.5  885.58       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        965.76 1027.89             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983   883.1       F
    1017    1172   883.1       F

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 864

INPUT
Description: FIS 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
```

Sta	n Val	Sta	n Val	Sta	n Val
850	.05	986.75	.04	1013.25	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
986.75	1013.25	8	8	8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	983	883.1	F
1017	1150	883.1	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	884.43	964	883.83	986.75	882.53	987.8	869.73	1012.2	869.73
1013.25	882.53	1029	883.93	1150	885.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.75	.058	1013.25	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
986.75	1013.25	50	50	50	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	979	883.1	T
1021	1150	883.1	T

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
929	885.13	967	882.63	993	869.73	1007	869.53	1030	881.93
1099	884.53								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
929	.07	967	.058	1030	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967	1030	11.6	11.6	11.6	.3	.5

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 794.4

INPUT
Description: 500' Downstream
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
877.49	885.39	926.1	884.67	955.49	884.46	962.42	883.92	991.04	871.31
993.1	869.94	1000	869.78	1005.61	869.6	1007.18	871.33	1029.18	882.05
1098.98	884.64	1159.42	883.78	1235.12	882.53	1321.44	882.4	1336.83	881.65
1343.53	881.98	1419.72	883.92	1466.06	883.5				

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  877.49     .07  962.42    .058 1029.18     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42 1029.18            124.4   124.4   124.4              .1       .3
Right Levee     Station= 1098.98      Elevation=  884.64
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1419.72 1466.06     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 670

INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              405     405     405              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 265

INPUT
Description: 1000' Downstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  908.54  889.91   932.7  884.83  973.22  881.49  991.82   870.7  993.81  869.26
    1000  868.94 1007.26  869.66 1008.74  870.74 1026.86   879.4 1043.83  879.41
 1068.35  883.11 1121.87  884.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  908.54     .07  973.22    .058 1026.86     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        973.22 1026.86            121.5   121.5   121.5              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1058 1121.87     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 143.5

INPUT
Description: Surveyed XS by Strand 2017 (1120' Downstream)
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  955.78     884  962.42  883.55  964.96  882.55  981.73  878.72   987.8  872.26
  991.65  871.47  993.29  870.08   995.9  868.86    1000  868.83 1007.04   869.4
```

```
 1008.01  870.07 1008.89  871.85  1010.7  872.08 1017.88  874.24 1025.55  877.33
  1053.4  878.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  955.78     .07  981.73    .058 1025.55     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        981.73 1025.55              3.5     3.5     3.5             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1047  1053.4     879       F
```

CROSS SECTION

```
RIVER: Silver Creek
REACH: Main              RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030             88.1    88.1    88.1             .1       .3
```

BRIDGE

```
RIVER: Silver Creek
REACH: Main              RS: 89

INPUT
Description: Melody Lane
Distance from Upstream XS =    30.6
Deck/Roadway Width        =    40.8
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   939.2  880.64          963.57   879.9          985.83  879.13
     987   879.1             987   879.1     877 1000.64  878.76  876.61
    1013  878.45  876.25    1013  878.45            1015  878.41
 1039.28  877.88         1070.81  877.41

Upstream Bridge Cross Section Data
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     987  876.35  993.74   869.6  994.58  869.34
    1000  869.48 1004.64  869.61 1007.22  871.87    1013  873.23    1030  881.33
    1099  883.93

Manning's n Values        num=       7
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
     929     .07     967    .058     987    .012  993.74    .058 1004.64    .012
    1013    .058    1030     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      11
```

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
939.2	880.64		963.57	879.9		985.83	879.13	
987	879.1		987	879.1	876.93	1000.64	878.76	876.59
1013	878.45	876.28	1013	878.45		1015	878.41	
1039.28	877.88		1070.81	877.41				

Downstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
956.61	881.48	980.92	878.89	984.85	878.51	987	876.01	994.03	869.49
1000	869.6	1005.54	869.66	1010.87	873.44	1013	873.44	1025.01	876.63
1059.93	878.34								

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
956.61	.07	984.85	.058	987	.012	994.03	.058	1005.54	.012
1013	.058	1025.01	.07						

Bank Sta: Left	Right	Coeff Contr.	Expan.
984.85	1025.01	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1022	1059.93	878.34	F

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

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
W.S. Pro Method

W.S.Pro Data
Left Embankment
El of the top of the embankment = 877.53
El of the toe of the abutment = 868.93
Right Embankment
El of the top of the embankment = 877.53
El of the toe of the abutment = 868.93
Abutment Type = 1 Vert. abutments and vert. embankments with or without wingwalls
Slope of abutments =
Top with of embankment = 42
Centroid station of bridge opening = 1000
Wing Wall Type = No wing walls present
Width =
Angle =
Radius =
Guide Banks Type = No Guide Bank present
Length =
Offset =
Angle =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end

Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 51.9

INPUT
Description: Surveyed XS by Strand 2017 (1210' Downstream)
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
956.61	881.48	980.92	878.89	984.85	878.51	993.08	870.16	993.92	869.3
995.65	869.24	1000	869.44	1005.68	869.42	1006.85	870.05	1008.36	871.93
1014.15	872.74	1025.01	876.63	1059.93	878.34				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
956.61	.07	984.85	.058	1025.01	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
984.85	1025.01	1.9	1.9	1.9	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1022	1059.93	878.34	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	881.53	967	877.53	968.8	877.421	986.8	876.33	990.5	868.93
1009.5	868.93	1013.2	876.33	1027	877.53	1150	877.43	1650	879.83

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.8	.058	1013.2	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
986.8	1013.2	50	50	50	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	977	878	T
1023	1650	878	T

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2.5

INPUT
Description: Surveyed XS by Strand 2017 (1260' Downstream)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
963.21	881.37	976.5	878.83	980.28	878.27	985.7	874.85	990.84	870.95
991.87	870.07	992.27	869.75	993.35	869.29	1000	868.55	1005.62	869.37
1006.74	870.08	1008.31	871.33	1014.02	872.82	1021.92	875.74	1066.6	878.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
963.21	.07	980.28	.058	1021.92	.07

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

```
       980.28 1021.92              2.5     2.5     2.5             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1046  1066.6     878       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     839  879.83     968  876.33     992  868.83    1008  869.13    1021  874.33
    1064  874.33    1072  875.53    1589  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     839     .07     968    .058    1021     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           968    1021                0       0       0             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     839     952     878       T
    1048    1589     878       T

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

SUMMARY OF MANNING'S N VALUES

River:Silver Creek
*****************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *
*****************************************************************
*Main            *    3520        *     .065*      .04*     .065*
*Main            *    3210        *     .065*      .04*     .065*
*Main            *    3005        *     .065*      .04*     .065*
*Main            *    2890.1      *      .05*      .04*      .05*
*Main            *    2847.6      *Bridge   *        *         *
*Main            *    2797.4      *      .05*      .04*      .05*
*Main            *    2505.7      *      .05*      .04*      .05*
*Main            *    2170        *      .05*      .04*      .05*
*Main            *    2072.3      *      .05*      .04*      .05*
*Main            *    1939        *      .05*      .04*      .05*
*Main            *    1750.4      *      .05*      .04*      .05*
*Main            *    1642.6      *      .05*      .04*      .05*
*Main            *    1528.6      *      .05*      .04*      .05*
*Main            *    1490        *      .05*      .04*      .05*
*Main            *    1290        *      .05*      .04*      .05*
*Main            *    1115.3      *      .05*      .04*      .05*
*Main            *    1067.3      *      .05*      .04*      .05*
*Main            *    996.6       *      .05*      .04*      .05*
*Main            *    914         *      .05*      .04*      .05*
*Main            *    881.45      *      .05*      .04*      .05*
*Main            *    874.6       *Bridge   *        *         *
*Main            *    864         *      .05*      .04*      .05*
*Main            *    856         *      .07*     .058*      .07*
*Main            *    806         *      .07*     .058*      .07*
*Main            *    794.4       *      .07*     .058*      .07*
*Main            *    670         *      .07*     .058*      .07*
*Main            *    265         *      .07*     .058*      .07*
*Main            *    143.5       *      .07*     .058*      .07*
*Main            *    140         *      .07*     .058*      .07*
*Main            *    89          *Bridge   *        *         *
*Main            *    51.9        *      .07*     .058*      .07*
*Main            *    50          *      .07*     .058*      .07*
*Main            *    2.5         *      .07*     .058*      .07*
*Main            *    0           *      .07*     .058*      .07*
*****************************************************************
```

SUMMARY OF REACH LENGTHS

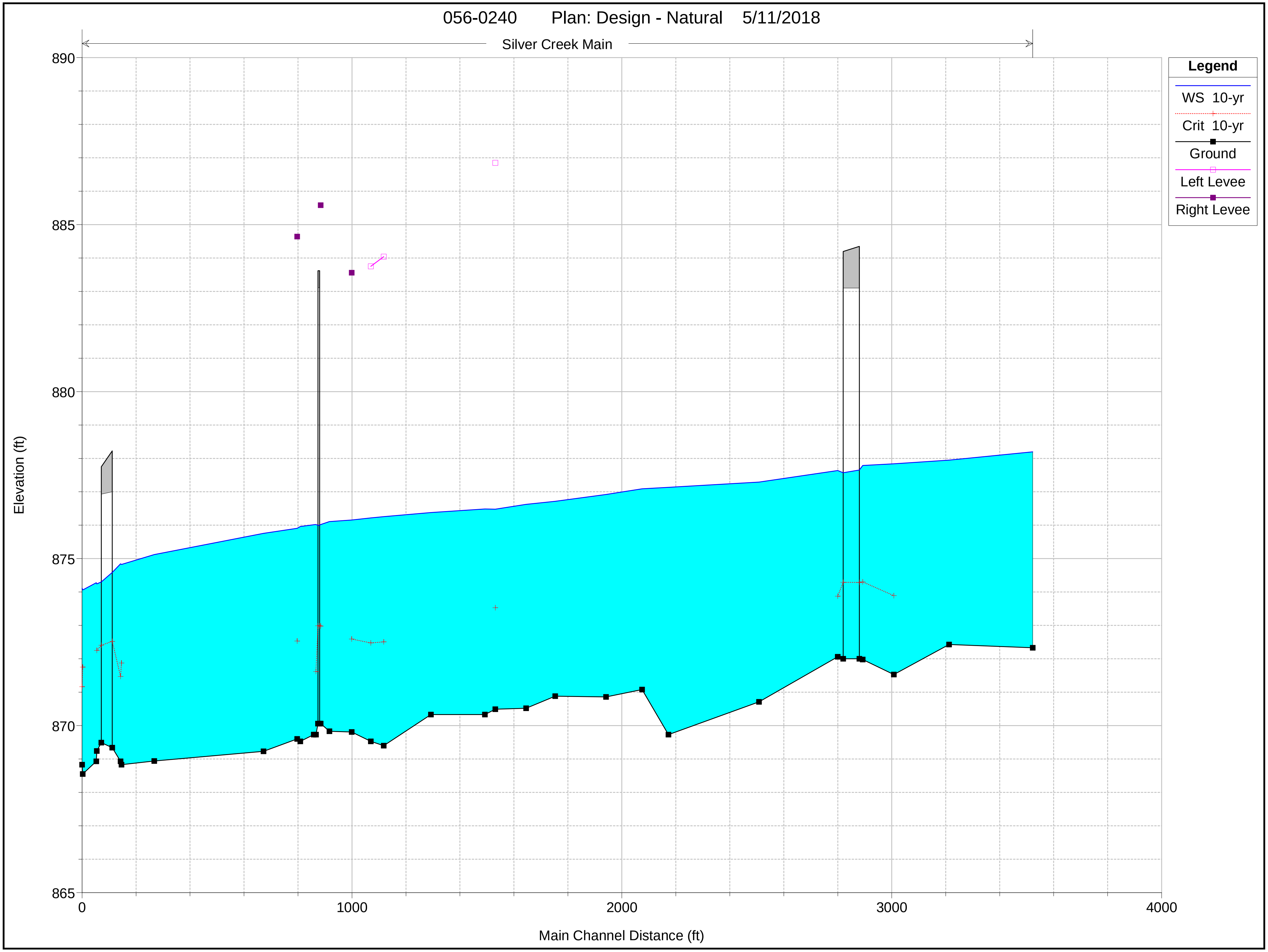
River: Silver Creek

Reach	River Sta.	Left	Channel	Right
Main	3520	310	310	310
Main	3210	205	205	205
Main	3005	114.9	114.9	114.9
Main	2890.1	92.7	92.7	92.7
Main	2847.6	Bridge		
Main	2797.4	291.7	291.7	291.7
Main	2505.7	335.7	335.7	335.7
Main	2170	97.7	97.7	97.7
Main	2072.3	75	133.3	241
Main	1939	188.6	188.6	188.6
Main	1750.4	107.8	107.8	107.8
Main	1642.6	95	114	136
Main	1528.6	38.6	38.6	38.6
Main	1490	266.1	200	200
Main	1290	174.7	174.7	174.7
Main	1115.3	48	48	48
Main	1067.3	70.7	70.7	70.7
Main	996.6	82.6	82.6	82.6
Main	914	32.55	32.55	32.55
Main	881.45	17.45	17.45	17.45
Main	874.6	Bridge		
Main	864	8	8	8
Main	856	50	50	50
Main	806	11.6	11.6	11.6
Main	794.4	124.4	124.4	124.4
Main	670	405	405	405
Main	265	121.5	121.5	121.5
Main	143.5	3.5	3.5	3.5
Main	140	88.1	88.1	88.1
Main	89	Bridge		
Main	51.9	1.9	1.9	1.9
Main	50	50	50	50
Main	2.5	2.5	2.5	2.5
Main	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Main	3520	.1	.3
Main	3210	.1	.3
Main	3005	.1	.3
Main	2890.1	.3	.5
Main	2847.6	Bridge	
Main	2797.4	.3	.5
Main	2505.7	.1	.3
Main	2170	.1	.3
Main	2072.3	.1	.3
Main	1939	.1	.3
Main	1750.4	.1	.3
Main	1642.6	.1	.3
Main	1528.6	.1	.3
Main	1490	.1	.3
Main	1290	.1	.3
Main	1115.3	.1	.3
Main	1067.3	.1	.3
Main	996.6	.1	.3
Main	914	.1	.3
Main	881.45	.3	.5
Main	874.6	Bridge	
Main	864	.3	.5
Main	856	.3	.5

```
*Main           *    806     *       .3*       .5*
*Main           *    794.4   *       .1*       .3*
*Main           *    670     *       .1*       .3*
*Main           *    265     *       .1*       .3*
*Main           *    143.5   *       .1*       .3*
*Main           *    140     *       .1*       .3*
*Main           *    89      *Bridge   *         *
*Main           *    51.9    *       .3*       .5*
*Main           *    50      *       .3*       .5*
*Main           *    2.5     *       .3*       .5*
*Main           *    0       *       .3*       .5*
*******************************************************
```



056-0240 Plan: Design - Natural 5/11/2018
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
Left Levee
Right Levee
890
885
880
875
870
865
Elevation (ft)
0
1000
2000
3000
4000
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 5:11:18 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	878.20		878.28	0.000665	2.30	139.23	34.46	0.20
Main	3210	10-yr	320.00	872.43	877.95		878.05	0.000848	2.51	127.41	33.18	0.23
Main	3005	10-yr	320.00	871.53	877.84	873.89	877.91	0.000498	2.07	154.81	36.08	0.18
Main	2890.1	10-yr	320.00	871.98	877.79	874.30	877.85	0.000453	1.96	163.27	42.33	0.17
Main	2847.6		Bridge									
Main	2797.4	10-yr	320.00	872.06	877.64	873.88	877.54	0.000329	1.85	172.67	40.50	0.15
Main	2505.7	10-yr	320.00	870.71	877.29		877.38	0.000833	2.38	134.56	38.14	0.22
Main	2170	10-yr	320.00	869.73	877.13		877.19	0.000375	1.89	169.36	35.80	0.15
Main	2072.3	10-yr	320.00	871.08	877.09		877.15	0.000444	1.94	165.37	39.70	0.17
Main	1939	10-yr	320.00	870.86	876.92		877.05	0.001191	2.90	110.16	29.48	0.26
Main	1750.4	10-yr	320.00	870.88	876.71		876.83	0.001068	2.78	115.27	30.32	0.25
Main	1642.6	10-yr	320.00	870.52	876.62		876.73	0.000835	2.58	124.23	29.15	0.22
Main	1528.6	10-yr	320.00	870.49	876.48	873.53	876.61	0.001213	2.91	109.83	29.53	0.27
Main	1490	10-yr	320.00	870.33	876.49		876.56	0.000588	2.22	144.01	33.79	0.19
Main	1290	10-yr	320.00	870.33	876.38		876.45	0.000544	2.11	151.68	37.01	0.18
Main	1115.3	10-yr	320.00	869.40	876.26	872.51	876.34	0.000678	2.34	136.68	32.96	0.20
Main	1067.3	10-yr	320.00	869.53	876.22	872.47	876.31	0.000711	2.40	133.39	32.00	0.21
Main	996.6	10-yr	320.00	869.81	876.15	872.59	876.25	0.000817	2.50	127.91	31.16	0.22
Main	914	10-yr	365.00	869.83	876.11		876.19	0.000608	2.28	160.31	37.90	0.20
Main	881.45	10-yr	365.00	870.06	876.02	872.98	876.16	0.001229	2.95	123.72	32.46	0.27
Main	874.6		Bridge									
Main	864	10-yr	365.00	869.73	876.02	871.62	876.11	0.000574	2.33	156.75	25.43	0.17
Main	856	10-yr	365.00	869.73	876.01		876.10	0.001210	2.33	156.58	25.43	0.17
Main	806	10-yr	365.00	869.53	875.96		876.03	0.001161	2.20	166.07	38.48	0.19
Main	794.4	10-yr	365.00	869.60	875.91	872.53	876.01	0.001830	2.58	141.48	35.96	0.23

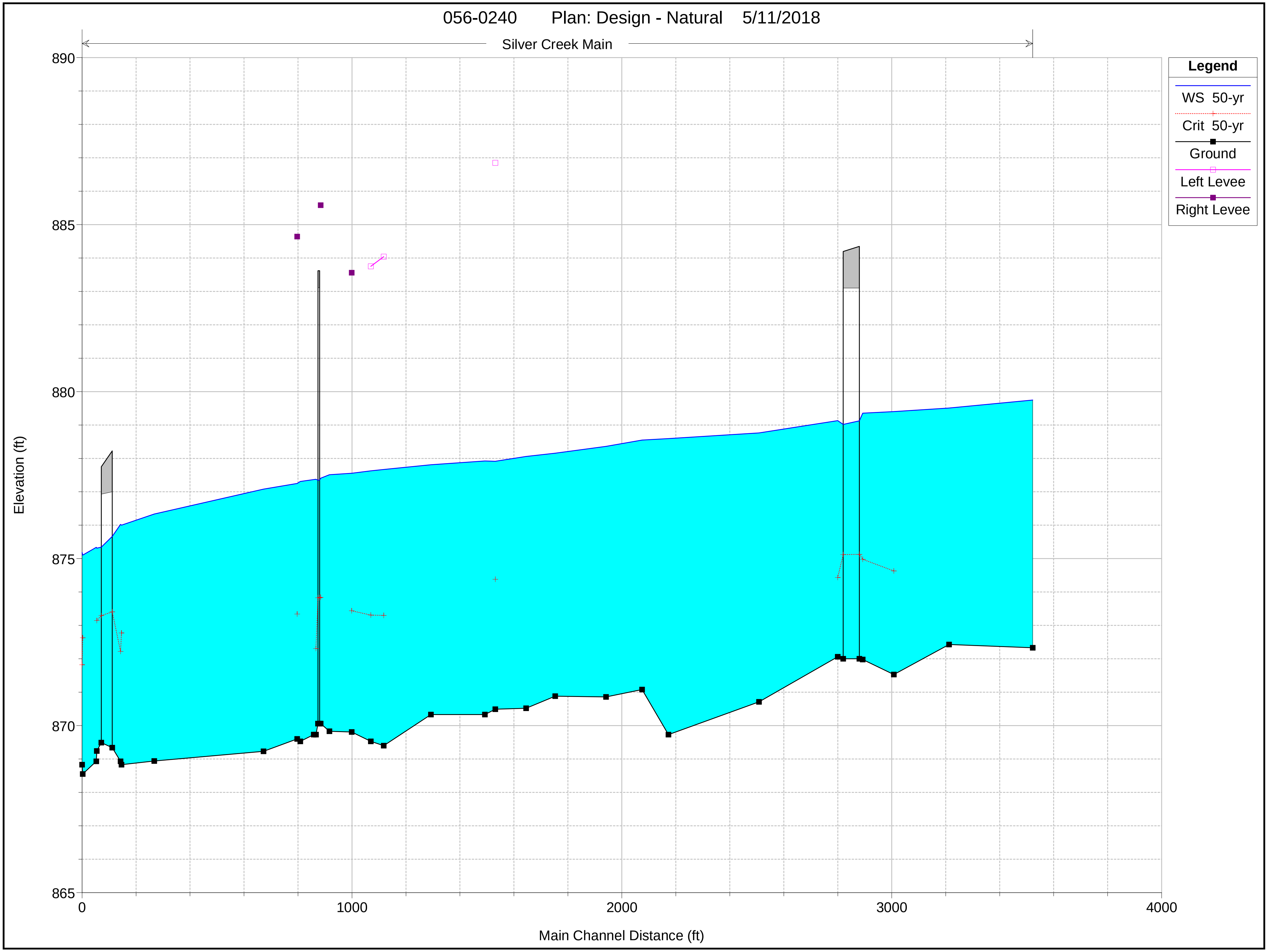
Main	670	10-yr	365.00	869.23	875.76		875.83	0.001093	2.15	169.76	38.85	0.18
Main	265	10-yr	365.00	868.94	875.12		875.23	0.002018	2.73	133.92	33.70	0.24
Main	143.5	10-yr	365.00	868.83	874.83	871.87	874.96	0.002574	2.90	125.77	33.95	0.27
Main	140	10-yr	365.00	868.93	874.84	871.47	874.94	0.001629	2.49	146.71	36.48	0.22
Main	89		Bridge									
Main	51.9	10-yr	365.00	869.24	874.24	872.25	874.48	0.005695	3.90	93.68	29.29	0.38
Main	50	10-yr	365.00	868.93	874.28		874.43	0.002599	3.15	115.90	24.35	0.25
Main	2.5	10-yr	365.00	868.55	874.06	871.75	874.26	0.004260	3.54	102.98	30.63	0.34
Main	0	10-yr	365.00	868.83	874.11	871.16	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	10-yr	878.28	878.20	0.08	0.23	0.00		320.00		34.46
Main	3210	10-yr	878.05	877.95	0.10	0.13	0.01		320.00		33.18
Main	3005	10-yr	877.91	877.84	0.07	0.06	0.00		320.00		36.08
Main	2890.1	10-yr	877.85	877.79	0.06	0.01	0.00		320.00		42.33
Main	2847.6		Bridge								
Main	2797.4	10-yr	877.54	877.64	0.06	0.10	0.05		320.00		40.50
Main	2505.7	10-yr	877.38	877.29	0.09	0.18	0.01		320.00		38.14
Main	2170	10-yr	877.19	877.13	0.06	0.04	0.00		320.00		35.80
Main	2072.3	10-yr	877.15	877.09	0.06	0.09	0.01		320.00		39.70
Main	1939	10-yr	877.05	876.92	0.13	0.21	0.00		320.00		29.48
Main	1750.4	10-yr	876.83	876.71	0.12	0.10	0.00		320.00		30.32
Main	1642.6	10-yr	876.73	876.62	0.10	0.11	0.00		320.00		29.15
Main	1528.6	10-yr	876.61	876.48	0.13	0.03	0.02		320.00		29.53
Main	1490	10-yr	876.56	876.49	0.08	0.11	0.00		320.00		33.79
Main	1290	10-yr	876.45	876.38	0.07	0.11	0.00		320.00		37.01
Main	1115.3	10-yr	876.34	876.26	0.09	0.03	0.00		320.00		32.96
Main	1067.3	10-yr	876.31	876.22	0.09	0.05	0.00		320.00		32.00
Main	996.6	10-yr	876.25	876.15	0.10	0.06	0.01		320.00		31.16
Main	914	10-yr	876.19	876.11	0.08	0.03	0.01		365.00		37.90
Main	881.45	10-yr	876.16	876.02	0.14	0.00	0.00		365.00		32.46
Main	874.6		Bridge								
Main	864	10-yr	876.11	876.02	0.08	0.01	0.00		365.00		25.43
Main	856	10-yr	876.10	876.01	0.08	0.06	0.00		365.00		25.43
Main	806	10-yr	876.03	875.96	0.08	0.02	0.01		365.00		38.48
Main	794.4	10-yr	876.01	875.91	0.10	0.17	0.01		365.00		35.96
Main	670	10-yr	875.83	875.76	0.07	0.59	0.00		365.00		38.85
Main	265	10-yr	875.23	875.12	0.12	0.28	0.00		365.00		33.70
Main	143.5	10-yr	874.96	874.83	0.13	0.01	0.01		365.00		33.95
Main	140	10-yr	874.94	874.84	0.10	0.08	0.02		365.00		36.48
Main	89		Bridge								
Main	51.9	10-yr	874.48	874.24	0.24	0.01	0.04		365.00		29.29
Main	50	10-yr	874.43	874.28	0.15	0.16	0.01		365.00		24.35
Main	2.5	10-yr	874.26	874.06	0.20	0.01	0.06		365.00		30.63
Main	0	10-yr	874.19	874.11	0.08				365.00		45.35

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Natural

```
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 10-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
             bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 2505.7     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 914     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 10-yr
     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.
```


056-0240 Plan: Design - Natural 5/11/2018
Silver Creek Main
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)
Legend
WS 50-yr
Crit 50-yr
Ground
Left Levee
Right Levee

```
               HEC-RAS Version 4.1.0 Jan 2010
                U.S. Army Corps of Engineers
               Hydrologic Engineering Center
                     609 Second Street
                     Davis, California

      X     X  XXXXXX    XXXX        XXXX       XX      XXXX
      X     X  X        X    X       X   X     X  X    X
      X     X  X        X            X   X    X    X   X
      XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
      X     X  X        X            X  X     X    X        X
      X     X  X        X    X       X   X    X    X        X
      X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 5:11:18 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	879.75		879.85	0.000656	2.59	197.09	40.13	0.21
Main	3210	50-yr	510.00	872.43	879.51		879.63	0.000795	2.78	183.63	38.89	0.23
Main	3005	50-yr	510.00	871.53	879.40	874.63	879.49	0.000514	2.37	215.63	41.79	0.18
Main	2890.1	50-yr	510.00	871.98	879.35	874.98	879.43	0.000398	2.25	227.16	45.88	0.17
Main	2847.6		Bridge									
Main	2797.4	50-yr	510.00	872.06	879.13	874.44	879.03	0.000339	2.25	226.48	44.44	0.16
Main	2505.7	50-yr	510.00	870.71	878.76		878.87	0.000770	2.59	196.59	46.12	0.22
Main	2170	50-yr	510.00	869.73	878.59		878.67	0.000428	2.27	227.25	48.25	0.17
Main	2072.3	50-yr	510.00	871.08	878.55		878.63	0.000468	2.24	227.53	46.84	0.18
Main	1939	50-yr	510.00	870.86	878.36		878.52	0.001177	3.26	156.28	34.55	0.27
Main	1750.4	50-yr	510.00	870.88	878.16		878.31	0.001066	3.14	162.67	35.38	0.26
Main	1642.6	50-yr	510.00	870.52	878.06		878.20	0.000915	3.02	168.83	33.05	0.24
Main	1528.6	50-yr	510.00	870.49	877.91	874.38	878.08	0.001202	3.27	155.98	34.86	0.27
Main	1490	50-yr	510.00	870.33	877.92		878.03	0.000645	2.60	196.02	38.64	0.20
Main	1290	50-yr	510.00	870.33	877.81		877.90	0.000580	2.45	208.56	42.54	0.19
Main	1115.3	50-yr	510.00	869.40	877.67	873.30	877.79	0.000745	2.72	187.17	38.43	0.22
Main	1067.3	50-yr	510.00	869.53	877.63	873.31	877.75	0.000786	2.80	182.09	37.13	0.22
Main	996.6	50-yr	510.00	869.81	877.56	873.44	877.69	0.000889	2.91	174.98	36.03	0.23
Main	914	50-yr	575.00	869.83	877.51		877.62	0.000660	2.65	217.19	43.32	0.21
Main	881.45	50-yr	575.00	870.06	877.41	873.84	877.58	0.001121	3.38	170.22	38.05	0.27
Main	874.6		Bridge									
Main	864	50-yr	575.00	869.73	877.38	872.30	877.52	0.000805	3.00	191.37	25.65	0.19
Main	856	50-yr	575.00	869.73	877.37		877.51	0.001698	3.01	191.12	25.65	0.19
Main	806	50-yr	575.00	869.53	877.31		877.41	0.001315	2.60	221.57	43.71	0.20
Main	794.4	50-yr	575.00	869.60	877.25	873.34	877.39	0.001950	2.97	193.70	41.77	0.24

Main	670	50-yr	575.00	869.23	877.08		877.18	0.001266	2.56	224.69	43.98	0.20
Main	265	50-yr	575.00	868.94	876.33		876.50	0.002331	3.24	177.69	38.34	0.26
Main	143.5	50-yr	575.00	868.83	876.00	872.77	876.18	0.002852	3.42	168.00	37.97	0.29
Main	140	50-yr	575.00	868.93	876.02	872.22	876.16	0.001928	2.99	192.45	41.05	0.24
Main	89		Bridge									
Main	51.9	50-yr	575.00	869.24	875.31	873.15	875.63	0.006093	4.52	127.20	33.34	0.41
Main	50	50-yr	575.00	868.93	875.34		875.59	0.003595	4.04	142.26	25.41	0.30
Main	2.5	50-yr	575.00	868.55	875.10	872.63	875.38	0.004864	4.19	137.16	34.90	0.37
Main	0	50-yr	575.00	868.83	875.18	871.82	875.29	0.001675	2.67	231.51	97.99	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	50-yr	879.85	879.75	0.10	0.22	0.00		510.00		40.13
Main	3210	50-yr	879.63	879.51	0.12	0.13	0.01		510.00		38.89
Main	3005	50-yr	879.49	879.40	0.09	0.05	0.00		510.00		41.79
Main	2890.1	50-yr	879.43	879.35	0.08	0.01	0.00		510.00		45.88
Main	2847.6		Bridge								
Main	2797.4	50-yr	879.03	879.13	0.08	0.10	0.09		510.00		44.44
Main	2505.7	50-yr	878.87	878.76	0.10	0.19	0.01		510.00		46.12
Main	2170	50-yr	878.67	878.59	0.08	0.04	0.00		509.38	0.62	48.25
Main	2072.3	50-yr	878.63	878.55	0.08	0.09	0.01		510.00	0.00	46.84
Main	1939	50-yr	878.52	878.36	0.17	0.21	0.00		510.00		34.55
Main	1750.4	50-yr	878.31	878.16	0.15	0.11	0.00		510.00		35.38
Main	1642.6	50-yr	878.20	878.06	0.14	0.12	0.00		510.00		33.05
Main	1528.6	50-yr	878.08	877.91	0.17	0.03	0.02		510.00		34.86
Main	1490	50-yr	878.03	877.92	0.11	0.12	0.00		510.00		38.64
Main	1290	50-yr	877.90	877.81	0.09	0.11	0.00		510.00		42.54
Main	1115.3	50-yr	877.79	877.67	0.12	0.04	0.00		510.00		38.43
Main	1067.3	50-yr	877.75	877.63	0.12	0.06	0.00		510.00		37.13
Main	996.6	50-yr	877.69	877.56	0.13	0.06	0.01		510.00		36.03
Main	914	50-yr	877.62	877.51	0.11	0.03	0.01		575.00		43.32
Main	881.45	50-yr	877.58	877.41	0.18	0.00	0.01		575.00		38.05
Main	874.6		Bridge								
Main	864	50-yr	877.52	877.38	0.14	0.01	0.00		575.00		25.65
Main	856	50-yr	877.51	877.37	0.14	0.07	0.02		575.00		25.65
Main	806	50-yr	877.41	877.31	0.10	0.02	0.01		575.00		43.71
Main	794.4	50-yr	877.39	877.25	0.14	0.19	0.01		575.00		41.77
Main	670	50-yr	877.18	877.08	0.10	0.68	0.01		575.00		43.98
Main	265	50-yr	876.50	876.33	0.16	0.31	0.00		575.00		38.34
Main	143.5	50-yr	876.18	876.00	0.18	0.01	0.01		575.00		37.97
Main	140	50-yr	876.16	876.02	0.14	0.09	0.02		575.00		41.05
Main	89		Bridge								
Main	51.9	50-yr	875.63	875.31	0.32	0.01	0.03		575.00		33.34
Main	50	50-yr	875.59	875.34	0.25	0.21	0.01		575.00		25.41
Main	2.5	50-yr	875.38	875.10	0.27	0.01	0.08		575.00		34.90
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Natural

```
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 50-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 50-yr
     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.
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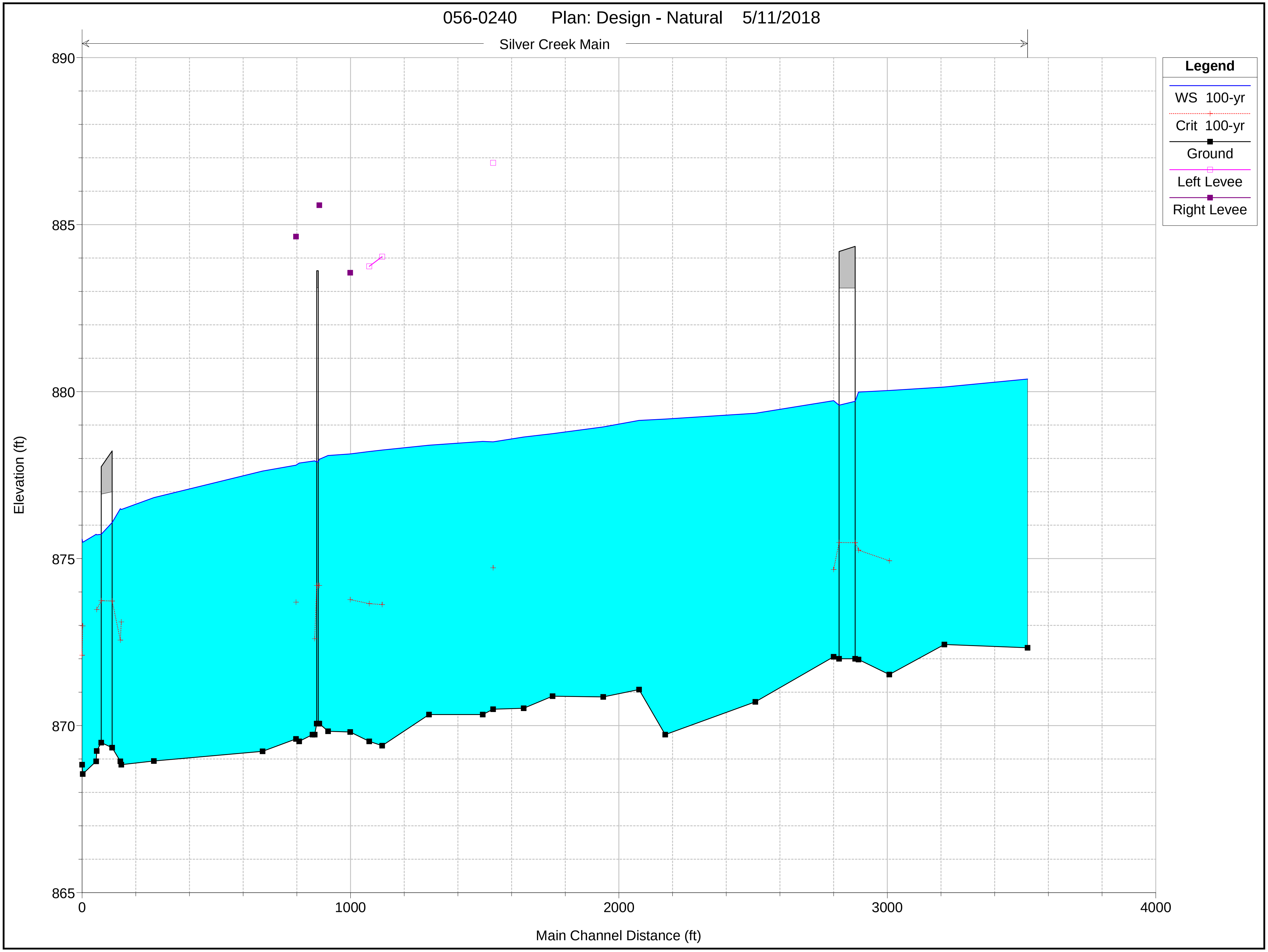
056-0240 Plan: Design - Natural 5/11/2018
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Left Levee
Right Levee
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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   X     X  X        X            X   X    X    X   X
   XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
   X     X  X        X            X  X     X    X        X
   X     X  X        X    X       X   X    X    X        X
   X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 5:11:18 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	880.37		880.49	0.000650	2.69	222.94	42.42	0.21
Main	3210	100-yr	600.00	872.43	880.14		880.27	0.000776	2.87	208.85	41.19	0.22
Main	3005	100-yr	600.00	871.53	880.03	874.94	880.13	0.000517	2.47	242.74	44.10	0.19
Main	2890.1	100-yr	600.00	871.98	879.98	875.25	880.07	0.000384	2.37	253.06	47.31	0.17
Main	2847.6		Bridge									
Main	2797.4	100-yr	600.00	872.06	879.73	874.67	879.62	0.000346	2.42	248.02	46.02	0.16
Main	2505.7	100-yr	600.00	870.71	879.35		879.46	0.000748	2.67	224.59	49.30	0.22
Main	2170	100-yr	600.00	869.73	879.18		879.27	0.000435	2.40	258.39	58.12	0.17
Main	2072.3	100-yr	600.00	871.08	879.14		879.22	0.000460	2.35	258.71	59.49	0.18
Main	1939	100-yr	600.00	870.86	878.94		879.12	0.001166	3.39	176.98	36.60	0.27
Main	1750.4	100-yr	600.00	870.88	878.74		878.91	0.001060	3.26	183.93	37.43	0.26
Main	1642.6	100-yr	600.00	870.52	878.64		878.80	0.000938	3.18	188.48	34.63	0.24
Main	1528.6	100-yr	600.00	870.49	878.50	874.73	878.67	0.001187	3.39	176.95	37.03	0.27
Main	1490	100-yr	600.00	870.33	878.51		878.62	0.000643	2.74	220.70	47.02	0.21
Main	1290	100-yr	600.00	870.33	878.39		878.50	0.000586	2.56	234.12	44.81	0.20
Main	1115.3	100-yr	600.00	869.40	878.25	873.62	878.38	0.000757	2.85	210.17	40.68	0.22
Main	1067.3	100-yr	600.00	869.53	878.21	873.65	878.34	0.000800	2.94	204.22	39.24	0.23
Main	996.6	100-yr	600.00	869.81	878.13	873.77	878.28	0.000902	3.06	196.39	38.05	0.24
Main	914	100-yr	680.00	869.83	878.09		878.21	0.000683	2.80	242.79	45.55	0.21
Main	881.45	100-yr	680.00	870.06	877.97	874.20	878.17	0.001098	3.59	189.43	40.33	0.27
Main	874.6		Bridge									
Main	864	100-yr	680.00	869.73	877.93	872.60	878.10	0.000920	3.31	205.50	25.74	0.21
Main	856	100-yr	680.00	869.73	877.92		878.09	0.001943	3.31	205.22	25.74	0.21
Main	806	100-yr	680.00	869.53	877.86		877.98	0.001382	2.76	246.18	45.84	0.21
Main	794.4	100-yr	680.00	869.60	877.80	873.69	877.95	0.002005	3.13	217.20	44.13	0.25

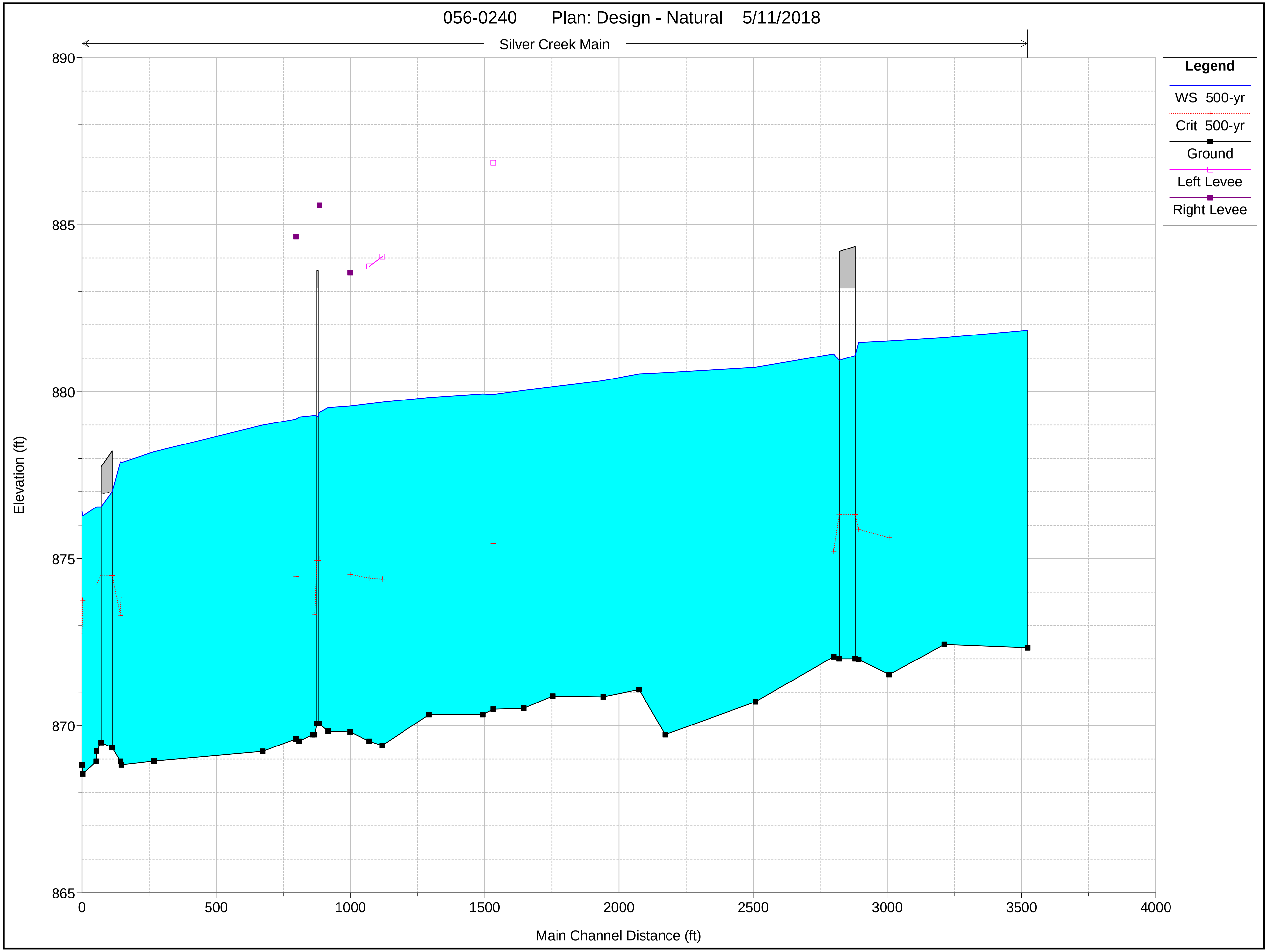
Main	670	100-yr	680.00	869.23	877.62		877.74	0.001341	2.73	248.96	46.07	0.21
Main	265	100-yr	680.00	868.94	876.82		877.01	0.002471	3.45	196.91	40.21	0.27
Main	143.5	100-yr	680.00	868.83	876.47	873.11	876.68	0.003002	3.65	186.17	39.57	0.30
Main	140	100-yr	680.00	868.93	876.49	872.56	876.65	0.002067	3.20	212.23	42.87	0.25
Main	89		Bridge									
Main	51.9	100-yr	680.00	869.24	875.71	873.48	876.07	0.006358	4.83	140.73	34.84	0.42
Main	50	100-yr	680.00	868.93	875.73		876.04	0.004147	4.47	152.29	25.80	0.32
Main	2.5	100-yr	680.00	868.55	875.49	872.98	875.80	0.005267	4.51	150.89	36.55	0.39
Main	0	100-yr	680.00	868.83	875.58	872.11	875.70	0.001716	2.82	262.30	107.61	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	100-yr	880.49	880.37	0.11	0.22	0.00		600.00		42.42
Main	3210	100-yr	880.27	880.14	0.13	0.13	0.01		600.00		41.19
Main	3005	100-yr	880.13	880.03	0.09	0.05	0.00		600.00		44.10
Main	2890.1	100-yr	880.07	879.98	0.09	0.01	0.00		600.00		47.31
Main	2847.6		Bridge								
Main	2797.4	100-yr	879.62	879.73	0.10	0.11	0.10		600.00		46.02
Main	2505.7	100-yr	879.46	879.35	0.11	0.19	0.01		600.00		49.30
Main	2170	100-yr	879.27	879.18	0.09	0.04	0.00		595.78	4.22	58.12
Main	2072.3	100-yr	879.22	879.14	0.09	0.09	0.01		598.67	1.33	59.49
Main	1939	100-yr	879.12	878.94	0.18	0.21	0.00		600.00		36.60
Main	1750.4	100-yr	878.91	878.74	0.17	0.11	0.00		600.00		37.43
Main	1642.6	100-yr	878.80	878.64	0.16	0.12	0.00		600.00		34.63
Main	1528.6	100-yr	878.67	878.50	0.18	0.03	0.02		600.00		37.03
Main	1490	100-yr	878.62	878.51	0.12	0.12	0.00		599.51	0.49	47.02
Main	1290	100-yr	878.50	878.39	0.10	0.12	0.00		600.00		44.81
Main	1115.3	100-yr	878.38	878.25	0.13	0.04	0.00		600.00		40.68
Main	1067.3	100-yr	878.34	878.21	0.13	0.06	0.00		600.00		39.24
Main	996.6	100-yr	878.28	878.13	0.14	0.06	0.01		600.00		38.05
Main	914	100-yr	878.21	878.09	0.12	0.03	0.01		680.00		45.55
Main	881.45	100-yr	878.17	877.97	0.20	0.00	0.02		680.00		40.33
Main	874.6		Bridge								
Main	864	100-yr	878.10	877.93	0.17	0.01	0.00		680.00		25.74
Main	856	100-yr	878.09	877.92	0.17	0.08	0.03		680.00		25.74
Main	806	100-yr	877.98	877.86	0.12	0.02	0.01		680.00		45.84
Main	794.4	100-yr	877.95	877.80	0.15	0.20	0.01		680.00		44.13
Main	670	100-yr	877.74	877.62	0.12	0.72	0.01		680.00		46.07
Main	265	100-yr	877.01	876.82	0.19	0.33	0.00		680.00		40.21
Main	143.5	100-yr	876.68	876.47	0.21	0.01	0.01		680.00		39.57
Main	140	100-yr	876.65	876.49	0.16	0.10	0.03		680.00		42.87
Main	89		Bridge								
Main	51.9	100-yr	876.07	875.71	0.36	0.01	0.03		680.00		34.84
Main	50	100-yr	876.04	875.73	0.31	0.23	0.00		680.00		25.80
Main	2.5	100-yr	875.80	875.49	0.32	0.01	0.10		680.00		36.55
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Natural

```
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 100-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 100-yr
     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.
```


056-0240 Plan: Design - Natural 5/11/2018
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Left Levee
Right Levee
Elevation (ft)
890
885
880
875
870
865
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)

```
HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

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```

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 5:11:18 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	881.84		881.96	0.000618	2.87	288.82	47.77	0.21
Main	3210	500-yr	830.00	872.43	881.61		881.76	0.000715	3.03	273.63	46.59	0.22
Main	3005	500-yr	830.00	871.53	881.52	875.62	881.62	0.000502	2.66	312.13	49.52	0.19
Main	2890.1	500-yr	830.00	871.98	881.47	875.87	881.58	0.000359	2.64	313.81	56.85	0.17
Main	2847.6		Bridge									
Main	2797.4	500-yr	830.00	872.06	881.13	875.23	881.00	0.000357	2.78	298.45	61.46	0.17
Main	2505.7	500-yr	830.00	870.71	880.73		880.85	0.000675	2.79	297.69	56.77	0.21
Main	2170	500-yr	830.00	869.73	880.57		880.67	0.000415	2.59	362.83	94.44	0.17
Main	2072.3	500-yr	830.00	871.08	880.53		880.63	0.000414	2.50	362.70	89.58	0.17
Main	1939	500-yr	830.00	870.86	880.33		880.53	0.001089	3.59	231.19	41.50	0.27
Main	1750.4	500-yr	830.00	870.88	880.14		880.33	0.000992	3.46	239.87	42.35	0.26
Main	1642.6	500-yr	830.00	870.52	880.04		880.23	0.000936	3.46	239.63	38.44	0.24
Main	1528.6	500-yr	830.00	870.49	879.91	875.45	880.11	0.001086	3.56	233.13	42.29	0.27
Main	1490	500-yr	830.00	870.33	879.93		880.06	0.000584	2.93	306.02	76.60	0.20
Main	1290	500-yr	830.00	870.33	879.82		879.94	0.000563	2.75	302.14	50.34	0.20
Main	1115.3	500-yr	830.00	869.40	879.68	874.38	879.83	0.000726	3.05	272.38	46.22	0.22
Main	1067.3	500-yr	830.00	869.53	879.64	874.41	879.79	0.000771	3.14	264.13	44.46	0.23
Main	996.6	500-yr	830.00	869.81	879.57	874.52	879.73	0.000859	3.26	254.48	43.04	0.24
Main	914	500-yr	950.00	869.83	879.52		879.66	0.000676	3.04	312.07	51.10	0.22
Main	881.45	500-yr	950.00	870.06	879.38	874.99	879.63	0.001012	4.01	237.20	46.00	0.27
Main	874.6		Bridge									
Main	864	500-yr	950.00	869.73	879.29	873.32	879.53	0.001154	3.94	240.83	25.97	0.23
Main	856	500-yr	950.00	869.73	879.28		879.52	0.002437	3.95	240.47	25.97	0.23
Main	806	500-yr	950.00	869.53	879.24		879.38	0.001410	3.04	312.99	51.17	0.22
Main	794.4	500-yr	950.00	869.60	879.18	874.46	879.35	0.001940	3.37	282.14	50.09	0.25

Main	670	500-yr	950.00	869.23	879.00		879.14	0.001372	3.00	316.15	51.41	0.21
Main	265	500-yr	950.00	868.94	878.20		878.41	0.002386	3.71	255.78	45.45	0.28
Main	143.5	500-yr	950.00	868.83	877.87	873.87	878.11	0.002644	3.87	250.16	62.96	0.29
Main	140	500-yr	950.00	868.93	877.90	873.30	878.08	0.001974	3.44	276.31	48.31	0.25
Main	89		Bridge									
Main	51.9	500-yr	950.00	869.24	876.55	874.24	877.03	0.006905	5.59	169.81	38.00	0.45
Main	50	500-yr	950.00	868.93	876.55		877.01	0.005493	5.47	174.36	32.47	0.38
Main	2.5	500-yr	950.00	868.55	876.28	873.75	876.70	0.006034	5.25	183.34	48.33	0.43
Main	0	500-yr	950.00	868.83	876.41	872.75	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	500-yr	881.96	881.84	0.13	0.21	0.00		830.00		47.77
Main	3210	500-yr	881.76	881.61	0.14	0.12	0.01		830.00		46.59
Main	3005	500-yr	881.62	881.52	0.11	0.05	0.00		830.00		49.52
Main	2890.1	500-yr	881.58	881.47	0.11	0.01	0.00		830.00		56.85
Main	2847.6		Bridge								
Main	2797.4	500-yr	881.00	881.13	0.13	0.11	0.15		830.00		61.46
Main	2505.7	500-yr	880.85	880.73	0.12	0.17	0.01		830.00		56.77
Main	2170	500-yr	880.67	880.57	0.10	0.04	0.00		794.31	35.69	94.44
Main	2072.3	500-yr	880.63	880.53	0.09	0.09	0.01		804.37	25.63	89.58
Main	1939	500-yr	880.53	880.33	0.20	0.20	0.00		830.00		41.50
Main	1750.4	500-yr	880.33	880.14	0.19	0.10	0.00		830.00		42.35
Main	1642.6	500-yr	880.23	880.04	0.19	0.11	0.00		830.00		38.44
Main	1528.6	500-yr	880.11	879.91	0.20	0.03	0.02		830.00		42.29
Main	1490	500-yr	880.06	879.93	0.13	0.11	0.00		811.91	18.09	76.60
Main	1290	500-yr	879.94	879.82	0.12	0.11	0.00		830.00		50.34
Main	1115.3	500-yr	879.83	879.68	0.14	0.04	0.00		830.00		46.22
Main	1067.3	500-yr	879.79	879.64	0.15	0.06	0.00		830.00		44.46
Main	996.6	500-yr	879.73	879.57	0.17	0.06	0.01		830.00		43.04
Main	914	500-yr	879.66	879.52	0.14	0.03	0.01		950.00		51.10
Main	881.45	500-yr	879.63	879.38	0.25	0.00	0.03		950.00		46.00
Main	874.6		Bridge								
Main	864	500-yr	879.53	879.29	0.24	0.01	0.00		950.00		25.97
Main	856	500-yr	879.52	879.28	0.24	0.09	0.05		950.00		25.97
Main	806	500-yr	879.38	879.24	0.14	0.02	0.01		950.00		51.17
Main	794.4	500-yr	879.35	879.18	0.18	0.20	0.01		950.00		50.09
Main	670	500-yr	879.14	879.00	0.14	0.72	0.01		950.00		51.41
Main	265	500-yr	878.41	878.20	0.21	0.30	0.00		950.00		45.45
Main	143.5	500-yr	878.11	877.87	0.23	0.01	0.01		947.52	2.48	62.96
Main	140	500-yr	878.08	877.90	0.18				950.00		48.31
Main	89		Bridge								
Main	51.9	500-yr	877.03	876.55	0.49	0.01	0.01		950.00		38.00
Main	50	500-yr	877.01	876.55	0.46	0.29	0.02	0.14	949.77	0.10	32.47
Main	2.5	500-yr	876.70	876.28	0.43	0.01	0.14		948.18	1.82	48.33
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

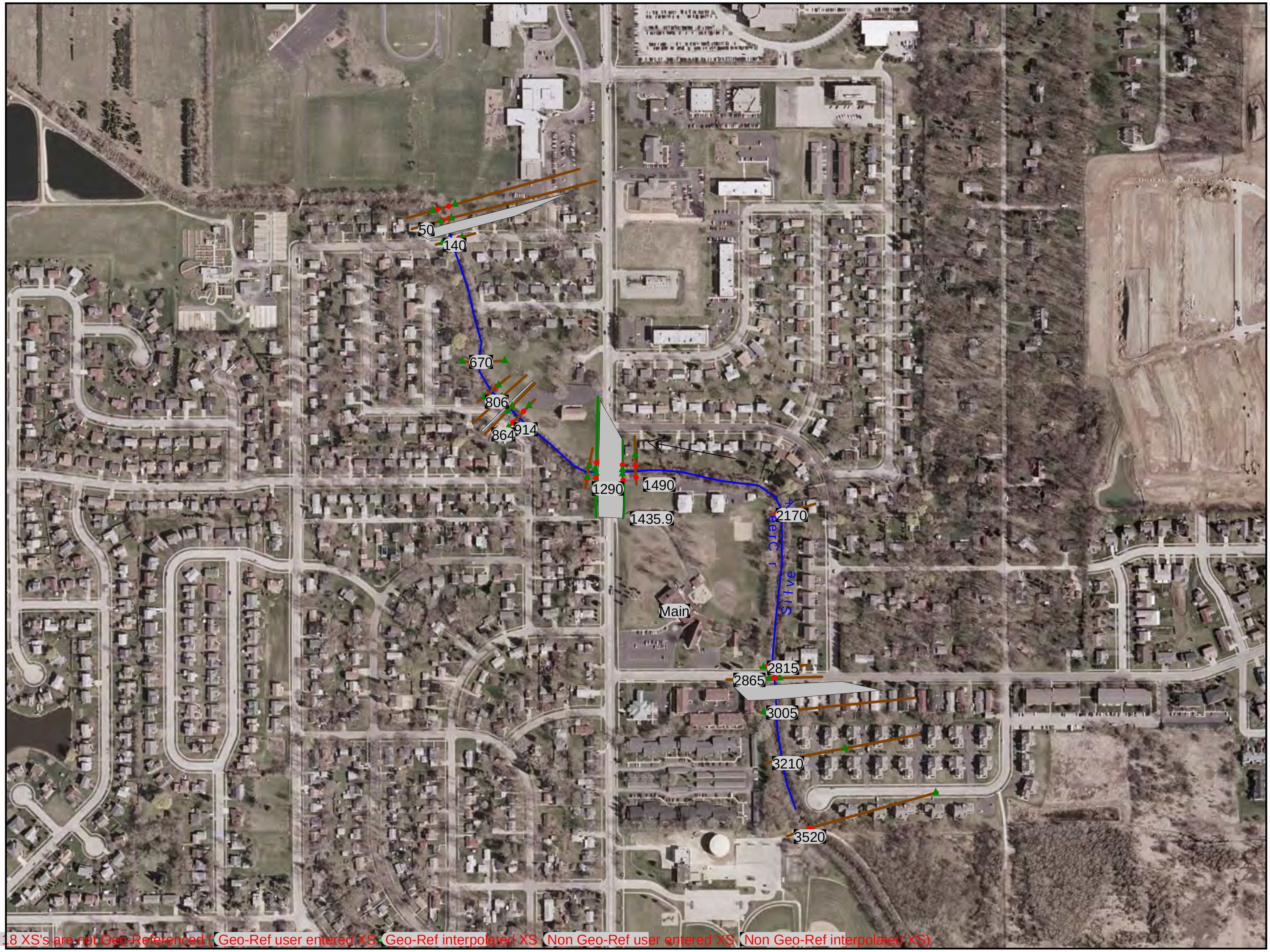
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Natural

```
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 500-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
             bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
     Note:   The downstream water surface is below the minimum elevation for pressure flow.  The sluice gate equations were used
             for pressure flow.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 500-yr
     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.
```

EXHIBIT I

EXISTING CONDITIONS HYDRAULIC MODEL AND RESULTS

EXISTING CONDITIONS - PERMIT MODEL



16 of the 18 XS's are not Geo-Referenced (Geo-Ref user entered XS, Geo-Ref interpolated XS, Non Geo-Ref user entered XS, Non Geo-Ref interpolated XS)

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                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California


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


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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 2:26:27 PM

Project in English units

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PLAN DATA

Plan Title: Existing - FIS
Plan File : e:\0829\HECRAS\056-0240.p05

           Geometry Title: FIS Model (NAVD88)
           Geometry File : e:\0829\HECRAS\056-0240.g03

           Flow Title    : FIS - NAVD88
           Flow File     : e:\0829\HECRAS\056-0240.f02

Plan Summary Information:
Number of:  Cross Sections =   18    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    4    Lateral Structures =    0

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

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


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

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)
*******************************************************************************************************************
* River           Reach           RS       *           10-yr           50-yr           100-yr           500-yr *
* Silver Creek    Main            3520     *             320             510              600              830 *
* Silver Creek    Main            914      *             365             575              680              950 *
*******************************************************************************************************************

Boundary Conditions
**************************************************************************************************************
* River           Reach           Profile          *            Upstream                 Downstream    *
```

```
******************************************************************************************************
* Silver Creek    Main           10-yr           *        Known WS = 878.24        Known WS = 874.11 *
* Silver Creek    Main           50-yr           *        Known WS = 880.29        Known WS = 875.18 *
* Silver Creek    Main           100-yr          *        Known WS = 881.21        Known WS = 875.58 *
* Silver Creek    Main           500-yr          *        Known WS = 883.85        Known WS = 876.41 *
******************************************************************************************************

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

GEOMETRY DATA

Geometry Title: FIS Model (NAVD88)
Geometry File : e:\0829\HECRAS\056-0240.g03

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1573  1580.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1263  1580.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
```

```
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              140     140     140             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   923.5     942  887.66       T
    1058  1580.5  887.66       T

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 2925

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS =      50
Deck/Roadway Width        =      60
Weir Coefficient          =     2.5
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93  991.85  871.53 1008.15  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
         963.5  1026.5             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   923.5     942  887.66       T
    1058  1580.5  887.66       T

Downstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
        991.85 1008.15             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 871.7
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 871.7
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 60
    Centroid station of bridge opening = 1000
    Wing Wall Type                     = Angular wing walls
       Width                           = 18
       Angle                           = 30
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =
    Optional Contraction and expansion coefficients
      At approach Section
      At upstream inside (BU)
      At downstream inside (BD)
    Piers are Continuous for the width of the bridge
    Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2865

INPUT
Description: FEMA FIS Sta. 5.454
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        991.85 1008.15               50      50      50             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2815

INPUT
Description: FEMA FIS Sta. 5.445
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  885.83   969.5  885.03   993.5  871.23  1006.5  871.23  1018.5  879.53
  1039.5  880.93  1139.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              645     645     645             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
   939.5     952  885.66       T
    1048  1139.5  885.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.63  1006.5  869.73  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              680     680     680             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.33  1006.5  870.33  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5             54.1    54.1    54.1             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1063  1139.5  891.66       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1435.9

INPUT
Description: IL-47 Upstream Face Culvert, Surveyed XS
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  803.56  894.55     856  891.29  890.12  889.98  920.43  889.33  939.27  888.53
  947.97  888.65  956.46   888.7  963.67  888.49  977.35  882.29  994.58  871.41
  995.47  870.78    1000   870.5 1005.38  870.95 1006.63  871.38  1022.5  882.28
 1028.94  886.82 1077.33  889.97 1133.08  889.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  803.56     .05  963.67     .04 1028.94     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        963.67 1028.94            113.7   113.7   113.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  803.56     991     892       F
    1009 1133.08  891.45       F

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 1382.75

INPUT
Description: IL 47 Culvert (modeled as bridge in FIS study)
Distance from Upstream XS =     2.8
Deck/Roadway Width        =   100.7
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      12
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   712.5   895.2     865   793.1  894.24     865     946  892.33     865
  994.09  891.79  870.72  994.09  891.79  878.72 1005.92  891.66  878.72
 1005.92  891.66  870.72  1073.2   890.9     865  1184.7  889.62     865
  1231.5   889.1     865  1328.5  888.01     865    1404  887.14     865

Upstream Bridge Cross Section Data
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  803.56  894.55     856  891.29  890.12  889.98  920.43  889.33  939.27  888.53
  947.97  888.65  956.46   888.7  963.67  888.49  977.35  882.29  994.09  871.73
  994.58  871.41  995.47  870.78    1000   870.5 1005.38  870.95 1005.92  871.14
 1006.63  871.38  1022.5  882.28 1028.94  886.82 1077.33  889.97 1133.08  889.98

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  803.56     .05  963.67     .04  994.09    .015 1005.92     .04 1028.94     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        963.67 1028.94            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

803.56	991	892	F
1009	1133.08	891.45	F

Downstream Deck/Roadway Coordinates
num= 12

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
712.5	895.2	865	793.1	894.24	865	946	892.33	865
996.5	891.76	869.74	996.5	891.76	877.74	1003.5	891.69	877.74
1003.5	891.69	869.74	1073.2	890.9	865	1184.7	889.62	865
1231.5	889.1	865	1328.5	888.01	865	1404	887.14	865

Downstream Bridge Cross Section Data
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
807.37	891.27	820.65	888.52	856.1	886.31	913.21	883.32	972.25	878.82
993.09	871.38	995.53	869.98	996.5	869.98	1000	870	1003.5	870.23
1006.94	870.46	1008.09	871.46	1036.73	885.64	1089.88	886.62	1145.65	886.73
1200.12	887.51	1258.17	888.47	1313.25	888.3				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
807.37	.05	972.25	.04	1036.73	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
972.25	1036.73	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
807.37	991	890.8	T
1009	1313.25	890.6	T

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

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 1322.2

INPUT
Description: IL 47 Downstream Culvert XS, Surveyed
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
807.37	891.27	820.65	888.52	856.1	886.31	913.21	883.32	972.25	878.82
993.09	871.38	995.53	869.98	1000	870	1006.94	870.46	1008.09	871.46
1036.73	885.64	1089.88	886.62	1145.65	886.73	1200.12	887.51	1258.17	888.47
1313.25	888.3								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

```
************************************************
  807.37     .05  972.25     .04 1036.73     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        972.25 1036.73             32.2    32.2    32.2              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  807.37     991   890.8       T
    1009 1313.25   890.6       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     993  870.53    1007  870.33    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          967    1030              376     376     376               .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     975  890.66       T
    1025    1099  890.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.43     967  882.93     993  870.03    1007  869.83    1030  882.23
    1099  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          967    1030               50      50      50               .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     937  884.66       T
    1063    1099  884.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 864

INPUT
Description: FEMA FIS Sta 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               58      58      58             .5       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850  986.75  883.73       T
 1013.25    1150  883.73       T

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 860

INPUT
Description: Pedestrian bridge
Distance from Upstream XS =      10
Deck/Roadway Width        =       8
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  884.43       0     964  883.83       0  986.75  883.73       0
  986.75  883.73  882.53   987.8  883.73  882.53  1012.2  883.73  882.53
 1013.25  883.73  882.53 1013.25  883.73       0    1029  883.93       0
    1150  885.43       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        986.75 1013.25             .5       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850  986.75  883.73       T
 1013.25    1150  883.73       T

Downstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  884.43       0     964  883.83       0  986.75  883.73       0
  986.75  883.73  882.53   987.8  883.73  882.53  1012.2  883.73  882.53
 1013.25  883.73  882.53 1013.25  883.73       0    1029  883.93       0
    1150  885.43       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        986.75 1013.25             .3       .5
```

```
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     986  883.66       T
    1014    1150  883.66       T

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     986  883.66       T
    1014    1150  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.13     967  882.63     993  869.73    1007  869.53    1030  881.93
    1099  884.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              136     136     136              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     961  883.66       T
    1039    1099  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 670

INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              530     530     530              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     893  883.66       T
    1107    1099  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030               90      90      90              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     957  883.66       T
    1043    1099  883.66       T

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 90

INPUT
Description: Melody St Bridge (modeled as bridge in FIS study)
Distance from Upstream XS =      30
Deck/Roadway Width        =      40
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  881.53  881.53     967  877.53  876.33   986.8  877.53  876.33
```

```
   990.5  877.53  876.33  1009.5  877.53  876.33  1013.2  877.53  876.33
    1027  877.53  876.33    1150  877.43  877.43    1650  879.83  879.83

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     957  883.66       T
    1043    1099  883.66       T

Downstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  881.53  881.53     967  877.53  876.33   986.8  877.53  876.33
   990.5  877.53  876.33  1009.5  877.53  876.33  1013.2  877.53  876.33
    1027  877.53  876.33    1150  877.43  877.43    1650  879.83  879.83

Downstream Bridge Cross Section Data
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  881.53     967  877.53   986.8  876.33   990.5  868.93  1009.5  868.93
  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         986.8  1013.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977  879.66       T
    1023    1650  879.66       T

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 877.7
       El of the toe of the abutment   = 869.1
    Right Embankment
       El of the top of the embankment = 877.7
       El of the toe of the abutment   = 869.1
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 42
    Centroid station of bridge opening = 1000
```

```
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd          =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  881.53     967  877.53   986.8  876.33   990.5  868.93  1009.5  868.93
  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         986.8  1013.2               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977  879.66       T
    1023    1650  879.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     839  879.83     968  876.33     992  868.83    1008  869.13    1021  874.33
    1064  874.33    1072  875.53    1589  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     839     .07     968    .058    1021     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           968    1021                0       0       0              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     839     952  879.66       T
    1048    1589  879.66       T
```

SUMMARY OF MANNING'S N VALUES

River:Silver Creek

Reach	River Sta.	n1	n2	n3
Main	3520	.065	.04	.065
Main	3210	.065	.04	.065
Main	3005	.065	.04	.065
Main	2925	Bridge		
Main	2865	.05	.04	.05
Main	2815	.05	.04	.05
Main	2170	.05	.04	.05
Main	1490	.05	.04	.05
Main	1435.9	.05	.04	.05
Main	1382.75	Bridge		
Main	1322.2	.05	.04	.05
Main	1290	.05	.04	.05
Main	914	.05	.04	.05
Main	864	.05	.04	.05
Main	860	Bridge		
Main	856	.07	.058	.07
Main	806	.07	.058	.07
Main	670	.07	.058	.07
Main	140	.07	.058	.07
Main	90	Bridge		
Main	50	.07	.058	.07
Main	0	.07	.058	.07

SUMMARY OF REACH LENGTHS

River: Silver Creek

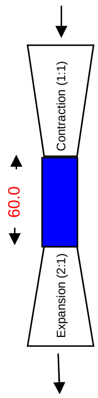
Reach	River Sta.	Left	Channel	Right
Main	3520	310	310	310
Main	3210	205	205	205
Main	3005	140	140	140
Main	2925	Bridge		
Main	2865	50	50	50
Main	2815	645	645	645
Main	2170	680	680	680
Main	1490	54.1	54.1	54.1
Main	1435.9	113.7	113.7	113.7
Main	1382.75	Bridge		
Main	1322.2	32.2	32.2	32.2
Main	1290	376	376	376
Main	914	50	50	50
Main	864	58	58	58
Main	860	Bridge		
Main	856	50	50	50
Main	806	136	136	136
Main	670	530	530	530
Main	140	90	90	90
Main	90	Bridge		
Main	50	50	50	50
Main	0	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Main	3520	.1	.3
Main	3210	.1	.3

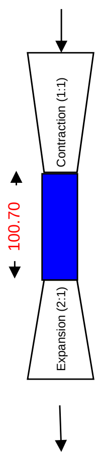
```
*Main          *    3005    *       .1*       .3*
*Main          *    2925    *Bridge   *         *
*Main          *    2865    *       .3*       .5*
*Main          *    2815    *       .3*       .5*
*Main          *    2170    *       .1*       .3*
*Main          *    1490    *       .3*       .5*
*Main          *    1435.9  *       .3*       .5*
*Main          *    1382.75 *Bridge   *         *
*Main          *    1322.2  *       .3*       .5*
*Main          *    1290    *       .3*       .5*
*Main          *    914     *       .1*       .3*
*Main          *    864     *       .5*       .3*
*Main          *    860     *Bridge   *         *
*Main          *    856     *       .3*       .5*
*Main          *    806     *       .3*       .5*
*Main          *    670     *       .1*       .3*
*Main          *    140     *       .1*       .3*
*Main          *    90      *Bridge   *         *
*Main          *    50      *       .3*       .5*
*Main          *    0       *       .3*       .5*
*******************************************************
```

St. Johns Rd. - FEMA FIS Model



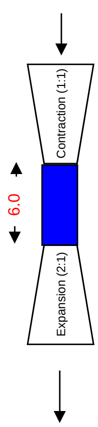
			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
3520.0	565.0	1000	**427.0**	**1573.0**	310.0	991.85	1008.15		3520.0
3210.0	255.0	1000	**737.0**	**1263.0**	205.0	991.85	1008.15		3210.0
3005.0	50.0	1000	**942.0**	**1058.0**	140.0	991.85	1008.15		3005.0
2955.0		1000.0	**991.9**	**1008.2**	50.0	991.85	1008.15		2973.0
2925.0									2925.0
2895.0		1000.0	**991.9**	**1008.2**	30.0	991.85	1008.15		2914.0
2865.0	15.0	1000	**977.0**	**1023.0**	50.0	991.85	1008.15		2865.0
2815.0	40.0	1000	**952.0**	**1048.0**	645.0	991.85	1008.15		2815.0
2170.0	362.5	1000	**629.0**	**1371.0**	2170.0	991.85	1008.15		2170.0

IL 47 - Existing Surveyed Crossing



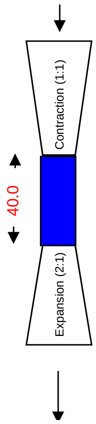
			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
2170.0	736.9	1000.01	**257.0**	**1743.0**	680.0	994.09	1005.92		2170.0
1490.0	56.9	1000.01	**937.0**	**1063.0**	54.1	994.09	1005.92		1490.0
1435.9	2.8	1000.01	**991.0**	**1009.0**	113.7	994.09	1005.92		1435.9
1433.1		1000.0	**994.1**	**1005.9**	2.8	994.09	1005.92		1433.1
1382.8									1382.8
1332.4		1000.0	**996.5**	**1003.5**	10.2	996.5	1003.5		1332.4
1322.2	5.1	1000	**991.0**	**1009.0**	32.2	996.5	1003.5		1322.2
1290.0	21.2	1000	**975.0**	**1025.0**	1290.0	996.5	1003.5		1290.0

Footbridge - FEMA FIS Model

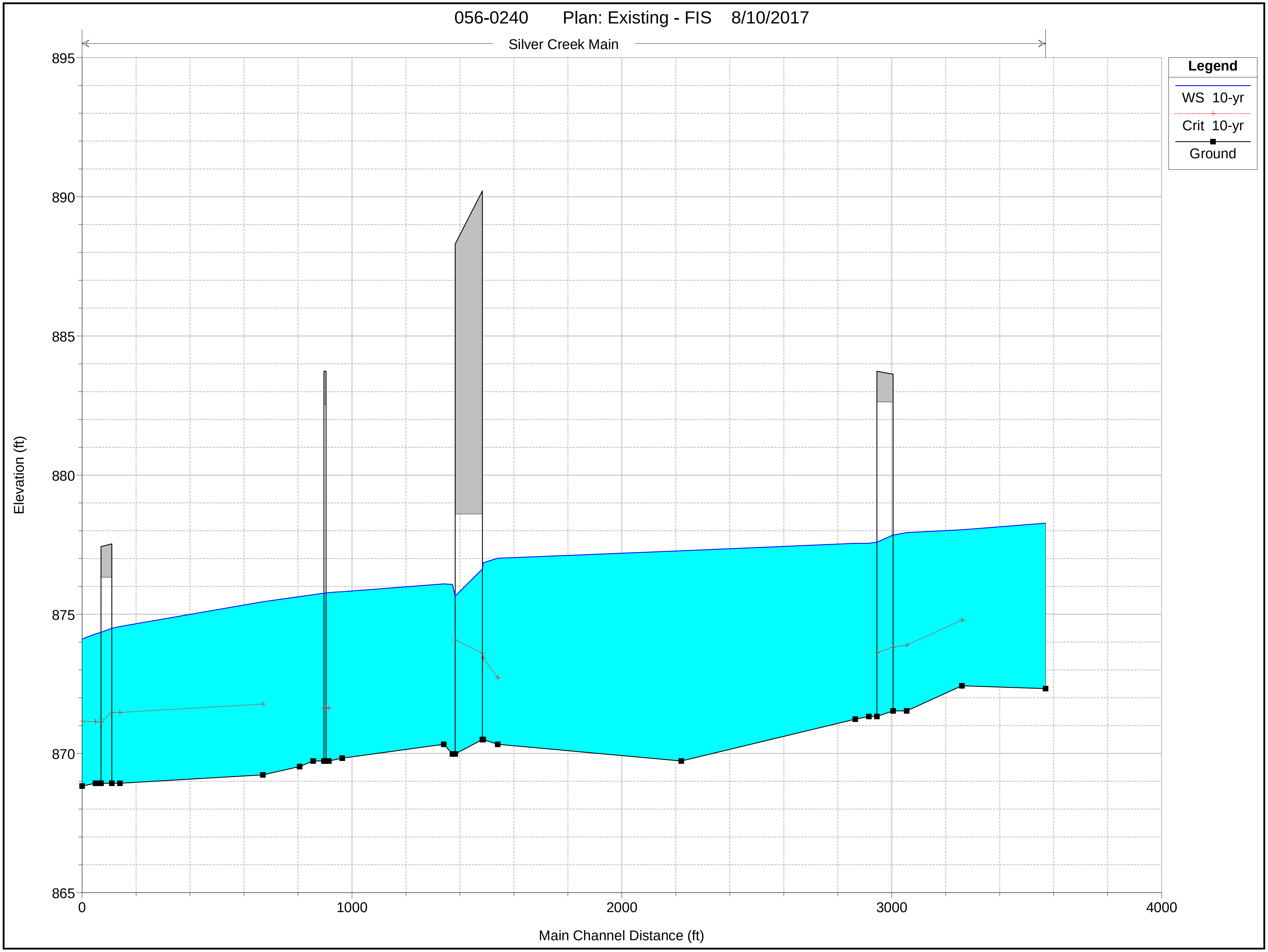


			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
914.0	50.0	1000	**937.0**	**1063.0**	58.0	986.75	1013.25		914.0
864.0		1000.0	**986.8**	**1013.3**	50.0	986.75	1013.25		864.0
861.0									861.0
858.0		1000.0	**986.8**	**1013.3**	2.0	986.75	1013.25		858.0
856.0	1.0	1000	**986.0**	**1014.0**	50.0	986.75	1013.25		856.0
806.0	26.0	1000	**961.0**	**1039.0**	136.0	986.75	1013.25		806.0
670.0	94.0	1000	**893.0**	**1107.0**	670.0	986.75	1013.25		670.0

Melody Rd. - FEMA FIS Model



			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
265.0	155.0	1000	**832.0**	**1168.0**	125.0	986.8	1013.2		265.0
140.0	30.0	1000	**957.0**	**1043.0**	90.0	986.8	1013.2		140.0
110.0		1000.0	**986.8**	**1013.2**	30.0	986.8	1013.2		110.0
90.0									90.0
70.0		1000.0	**986.8**	**1013.2**	20.0	986.8	1013.2		70.0
50.0	10.0	1000	**977.0**	**1023.0**	50.0	986.8	1013.2		50.0
0.0	35.0	1000	**952.0**	**1048.0**	0.0	986.8	1013.2		0.0


056-0240 Plan: Existing - FIS 8/10/2017
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
895
890
885
880
875
870
865
Elevation (ft)
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                 HEC-RAS Version 4.1.0 Jan 2010
                  U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 2:26:27 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	878.27		878.35	0.000632	2.26	141.82	34.73	0.20
Main	3210	10-yr	320.00	872.43	878.04	874.79	878.13	0.000796	2.45	130.37	33.51	0.22
Main	3005	10-yr	320.00	871.53	877.93	873.89	878.00	0.000469	2.02	158.27	36.42	0.17
Main	2925		Bridge									
Main	2865	10-yr	320.00	871.33	877.55		877.70	0.001345	3.16	101.38	16.30	0.22
Main	2815	10-yr	320.00	871.23	877.55		877.62	0.000558	2.20	145.70	33.12	0.18
Main	2170	10-yr	320.00	869.73	877.28		877.33	0.000345	1.83	174.66	36.29	0.15
Main	1490	10-yr	320.00	870.33	877.01	872.71	877.07	0.000425	1.97	162.24	35.56	0.16
Main	1435.9	10-yr	320.00	870.50	876.85	873.44	877.01	0.000842	3.21	99.80	28.63	0.24
Main	1382.75		Bridge									
Main	1322.2	10-yr	320.00	869.98	876.07		876.23	0.000815	3.21	99.82	37.47	0.24
Main	1290	10-yr	320.00	870.33	876.09		876.17	0.000662	2.27	141.17	35.89	0.20
Main	914	10-yr	365.00	869.83	875.81		875.90	0.000741	2.45	149.11	36.74	0.21
Main	864	10-yr	365.00	869.73	875.78	871.63	875.87	0.000645	2.43	150.51	25.39	0.18
Main	860		Bridge									
Main	856	10-yr	365.00	869.73	875.70		875.80	0.001406	2.46	148.66	25.38	0.18
Main	806	10-yr	365.00	869.53	875.63		875.72	0.001433	2.37	153.77	37.22	0.21
Main	670	10-yr	365.00	869.23	875.45	871.77	875.53	0.001329	2.31	158.07	37.67	0.20
Main	140	10-yr	365.00	868.93	874.56	871.47	874.67	0.001983	2.67	136.57	35.39	0.24
Main	90		Bridge									
Main	50	10-yr	365.00	868.93	874.30	871.14	874.34	0.002568	3.14	116.38	24.37	0.25
Main	0	10-yr	365.00	868.83	874.11	871.16	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	10-yr	878.35	878.27	0.08	0.22	0.00		320.00		34.73
Main	3210	10-yr	878.13	878.04	0.09	0.12	0.01		320.00		33.51
Main	3005	10-yr	878.00	877.93	0.06				320.00		36.42
Main	2925		Bridge								
Main	2865	10-yr	877.70	877.55	0.15	0.04	0.04		320.00		16.30
Main	2815	10-yr	877.62	877.55	0.07	0.28	0.01		320.00		33.12
Main	2170	10-yr	877.33	877.28	0.05	0.26	0.00		320.00		36.29
Main	1490	10-yr	877.07	877.01	0.06	0.03	0.03		320.00		35.56
Main	1435.9	10-yr	877.01	876.85	0.16	0.00	0.05		320.00		28.63
Main	1382.75		Bridge								
Main	1322.2	10-yr	876.23	876.07	0.16	0.02	0.04		320.00		37.47
Main	1290	10-yr	876.17	876.09	0.08	0.26	0.00		320.00		35.89
Main	914	10-yr	875.90	875.81	0.09	0.03	0.00		365.00		36.74
Main	864	10-yr	875.87	875.78	0.09				365.00		25.39
Main	860		Bridge								
Main	856	10-yr	875.80	875.70	0.09	0.07	0.00		365.00		25.38
Main	806	10-yr	875.72	875.63	0.09	0.19	0.00		365.00		37.22
Main	670	10-yr	875.53	875.45	0.08	0.86	0.00		365.00		37.67
Main	140	10-yr	874.67	874.56	0.11	0.06	0.00		365.00		35.39
Main	90		Bridge								
Main	50	10-yr	874.34	874.30	0.17	0.13	0.00		365.00		24.37
Main	0	10-yr	874.19	874.11	0.08				365.00		45.35

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Exist - Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 10-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 2865 Profile: 10-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1490 Profile: 10-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: Silver Creek Reach: Main RS: 1435.9 Profile: 10-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 10-yr Upstream
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 10-yr Downstream
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

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     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 860     Profile: 10-yr Upstream
     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.
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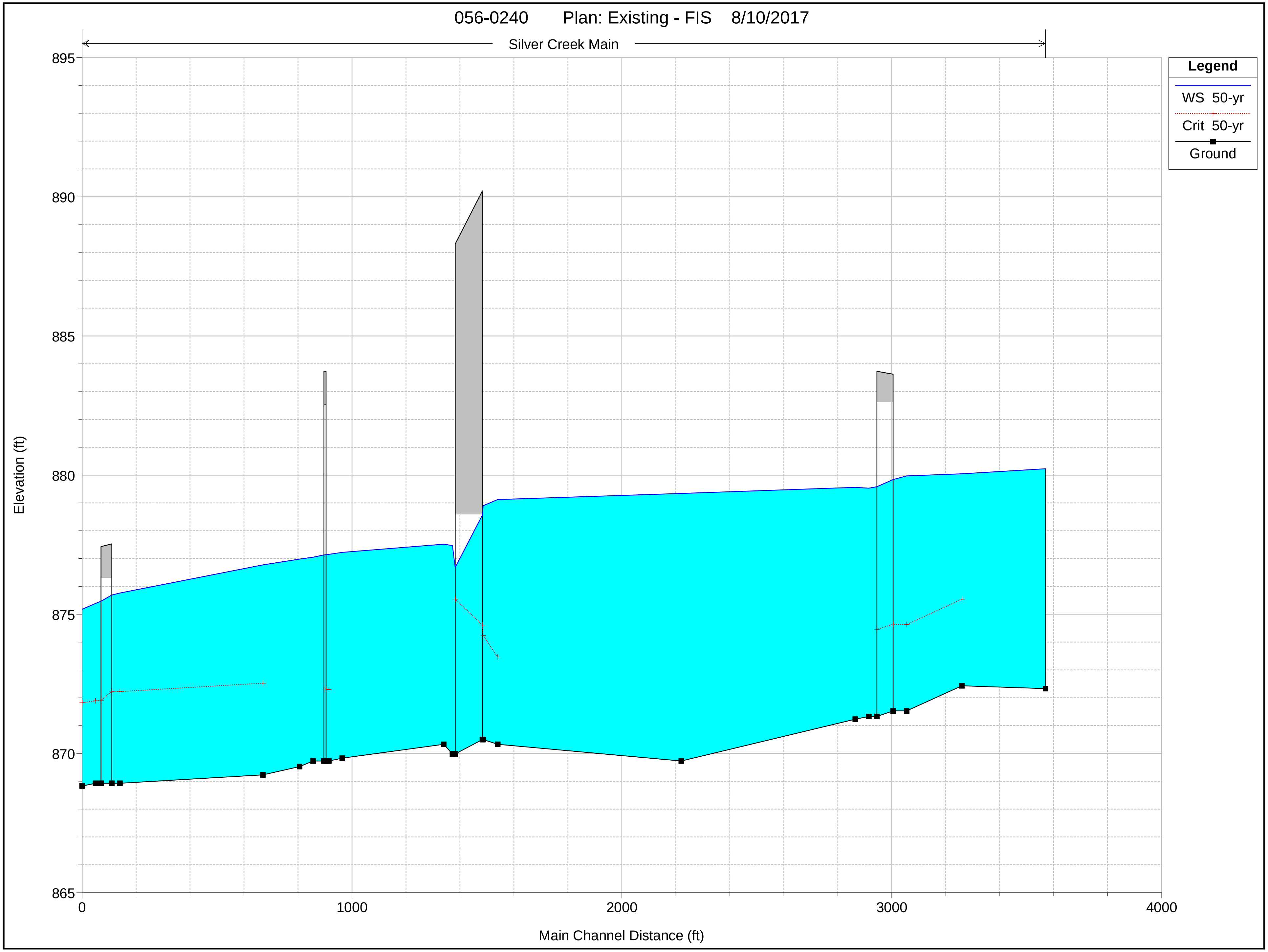
056-0240 Plan: Existing - FIS 8/10/2017
Silver Creek Main
Legend
WS 50-yr
Crit 50-yr
Ground
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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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: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 2:26:27 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	880.23		880.31	0.000507	2.35	216.77	41.89	0.18
Main	3210	50-yr	510.00	872.43	880.05	875.54	880.14	0.000588	2.49	205.19	40.86	0.20
Main	3005	50-yr	510.00	871.53	879.97	874.63	880.04	0.000385	2.13	239.99	43.87	0.16
Main	2925		Bridge									
Main	2865	50-yr	510.00	871.33	879.53		879.76	0.001614	3.82	133.67	16.30	0.23
Main	2815	50-yr	510.00	871.23	879.56		879.65	0.000468	2.33	218.87	39.97	0.17
Main	2170	50-yr	510.00	869.73	879.34		879.40	0.000289	1.98	268.03	60.85	0.14
Main	1490	50-yr	510.00	870.33	879.12	873.46	879.19	0.000334	2.08	252.81	57.36	0.15
Main	1435.9	50-yr	510.00	870.50	878.90	874.24	879.12	0.000750	3.73	136.70	34.87	0.24
Main	1382.75		Bridge									
Main	1322.2	50-yr	510.00	869.98	877.47		877.73	0.000980	4.08	124.93	44.19	0.27
Main	1290	50-yr	510.00	870.33	877.52		877.62	0.000682	2.60	196.44	41.42	0.21
Main	914	50-yr	575.00	869.83	877.22		877.35	0.000773	2.81	204.95	42.21	0.22
Main	864	50-yr	575.00	869.73	877.15	872.30	877.30	0.000877	3.10	185.63	25.62	0.20
Main	860		Bridge									
Main	856	50-yr	575.00	869.73	877.05		877.20	0.001919	3.14	183.04	25.60	0.21
Main	806	50-yr	575.00	869.53	876.98		877.10	0.001573	2.77	207.42	42.44	0.22
Main	670	50-yr	575.00	869.23	876.78	872.53	876.89	0.001493	2.72	211.43	42.80	0.22
Main	140	50-yr	575.00	868.93	875.76	872.22	875.92	0.002245	3.16	181.98	40.05	0.26
Main	90		Bridge									
Main	50	50-yr	575.00	868.93	875.39	871.89	875.49	0.003497	4.00	143.65	25.46	0.30
Main	0	50-yr	575.00	868.83	875.18	871.82	875.29	0.001675	2.67	231.51	97.99	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	50-yr	880.31	880.23	0.09	0.17	0.00		510.00		41.89
Main	3210	50-yr	880.14	880.05	0.10	0.10	0.01		510.00		40.86
Main	3005	50-yr	880.04	879.97	0.07				510.00		43.87
Main	2925		Bridge								
Main	2865	50-yr	879.76	879.53	0.23	0.04	0.07		510.00		16.30
Main	2815	50-yr	879.65	879.56	0.08	0.23	0.01		510.00	0.00	39.97
Main	2170	50-yr	879.40	879.34	0.06	0.21	0.00		505.10	4.90	60.85
Main	1490	50-yr	879.19	879.12	0.07	0.03	0.04		506.76	3.24	57.36
Main	1435.9	50-yr	879.12	878.90	0.22	0.00	0.08		510.00		34.87
Main	1382.75		Bridge								
Main	1322.2	50-yr	877.73	877.47	0.26	0.03	0.08		510.00		44.19
Main	1290	50-yr	877.62	877.52	0.10	0.27	0.01		510.00		41.42
Main	914	50-yr	877.35	877.22	0.12	0.04	0.00		575.00		42.21
Main	864	50-yr	877.30	877.15	0.15				575.00		25.62
Main	860		Bridge								
Main	856	50-yr	877.20	877.05	0.15	0.09	0.02		575.00		25.60
Main	806	50-yr	877.10	876.98	0.12	0.21	0.00		575.00		42.44
Main	670	50-yr	876.89	876.78	0.11	0.97	0.00		575.00		42.80
Main	140	50-yr	875.92	875.76	0.16	0.07	0.00		575.00		40.05
Main	90		Bridge								
Main	50	50-yr	875.49	875.39	0.28	0.18	0.00		575.00		25.46
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Exist - Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 50-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the bridge deck. This is not physically possible. Please review your bridge data and results for reasonableness.
River: Silver Creek Reach: Main RS: 2925 Profile: 50-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 2865 Profile: 50-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1490 Profile: 50-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: Silver Creek Reach: Main RS: 1435.9 Profile: 50-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 50-yr Upstream
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was

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             used.
River: Silver Creek  Reach: Main     RS: 1382.75     Profile: 50-yr Downstream
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 860     Profile: 50-yr Upstream
     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.
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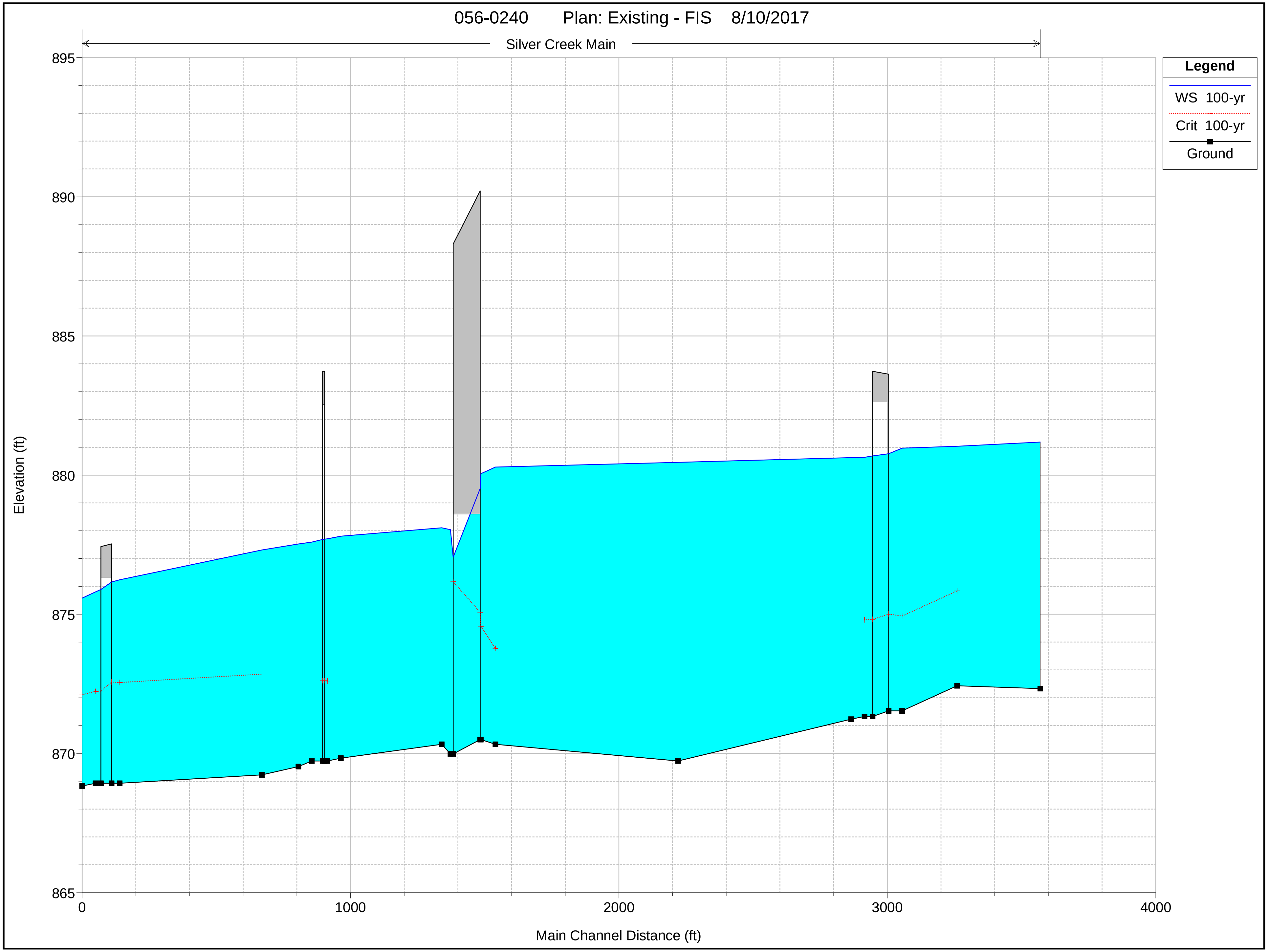
056-0240 Plan: Existing - FIS 8/10/2017
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

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                 HEC-RAS Version 4.1.0 Jan 2010
                  U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California

      X     X  XXXXXX    XXXX        XXXX       XX      XXXX
      X     X  X        X    X       X   X     X  X    X
      X     X  X        X            X   X    X    X   X
      XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
      X     X  X        X            X  X     X    X        X
      X     X  X        X    X       X   X    X    X        X
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 2:26:27 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	881.19		881.27	0.000435	2.32	258.66	45.40	0.17
Main	3210	100-yr	600.00	872.43	881.04	875.84	881.13	0.000491	2.43	247.35	44.48	0.18
Main	3005	100-yr	600.00	871.53	880.97	874.94	881.04	0.000333	2.10	285.67	47.53	0.15
Main	2925		Bridge									
Main	2865	100-yr	600.00	871.33	880.64	874.80	880.83	0.001598	3.95	151.72	16.30	0.23
Main	2815	100-yr	600.00	871.23	880.63		880.71	0.000374	2.28	271.11	57.85	0.16
Main	2170	100-yr	600.00	869.73	880.46		880.51	0.000229	1.91	352.48	91.30	0.13
Main	1490	100-yr	600.00	870.33	880.29	873.77	880.35	0.000255	1.98	335.27	86.67	0.13
Main	1435.9	100-yr	600.00	870.50	880.05	874.57	880.28	0.000649	3.81	157.38	38.36	0.23
Main	1382.75		Bridge									
Main	1322.2	100-yr	600.00	869.98	878.04		878.35	0.001043	4.44	135.20	46.94	0.29
Main	1290	100-yr	600.00	870.33	878.11		878.22	0.000682	2.71	221.49	43.70	0.21
Main	914	100-yr	680.00	869.83	877.80		877.94	0.000789	2.96	230.09	44.46	0.23
Main	864	100-yr	680.00	869.73	877.71	872.60	877.89	0.000994	3.40	199.96	25.71	0.21
Main	860		Bridge									
Main	856	100-yr	680.00	869.73	877.60		877.78	0.002180	3.45	197.00	25.69	0.22
Main	806	100-yr	680.00	869.53	877.53		877.66	0.001640	2.94	231.12	44.55	0.23
Main	670	100-yr	680.00	869.23	877.31	872.85	877.44	0.001570	2.90	234.88	44.87	0.22
Main	140	100-yr	680.00	868.93	876.24	872.55	876.42	0.002384	3.38	201.37	41.88	0.27
Main	90		Bridge									
Main	50	100-yr	680.00	868.93	875.80	872.23	875.93	0.004000	4.41	154.26	25.88	0.32
Main	0	100-yr	680.00	868.83	875.58	872.11	875.70	0.001716	2.82	262.30	107.61	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	100-yr	881.27	881.19	0.08	0.14	0.00		600.00		45.40
Main	3210	100-yr	881.13	881.04	0.09	0.08	0.01		600.00		44.48
Main	3005	100-yr	881.04	880.97	0.07	0.02	0.00		600.00		47.53
Main	2925		Bridge								
Main	2865	100-yr	880.83	880.64	0.27	0.08	0.00		600.00		16.30
Main	2815	100-yr	880.71	880.63	0.08	0.19	0.01		596.50	3.50	57.85
Main	2170	100-yr	880.51	880.46	0.05	0.16	0.00		576.81	23.19	91.30
Main	1490	100-yr	880.35	880.29	0.06	0.02	0.05		580.29	19.71	86.67
Main	1435.9	100-yr	880.28	880.05	0.23	0.00	0.12		600.00		38.36
Main	1382.75		Bridge								
Main	1322.2	100-yr	878.35	878.04	0.31	0.03	0.10		600.00		46.94
Main	1290	100-yr	878.22	878.11	0.11	0.28	0.01		600.00		43.70
Main	914	100-yr	877.94	877.80	0.14	0.04	0.00		680.00		44.46
Main	864	100-yr	877.89	877.71	0.18				680.00		25.71
Main	860		Bridge								
Main	856	100-yr	877.78	877.60	0.19	0.09	0.03		680.00		25.69
Main	806	100-yr	877.66	877.53	0.13	0.22	0.00		680.00		44.55
Main	670	100-yr	877.44	877.31	0.13	1.03	0.00		680.00		44.87
Main	140	100-yr	876.42	876.24	0.18	0.07	0.00		680.00		41.88
Main	90		Bridge								
Main	50	100-yr	875.93	875.80	0.34	0.21	0.00		680.00		25.88
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Exist - Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 100-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
River: Silver Creek Reach: Main RS: 2925 Profile: 100-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1490 Profile: 100-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: Silver Creek Reach: Main RS: 1435.9 Profile: 100-yr
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 100-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 100-yr Upstream
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 100-yr Downstream

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     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 860     Profile: 100-yr Upstream
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 670     Profile: 100-yr
     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.
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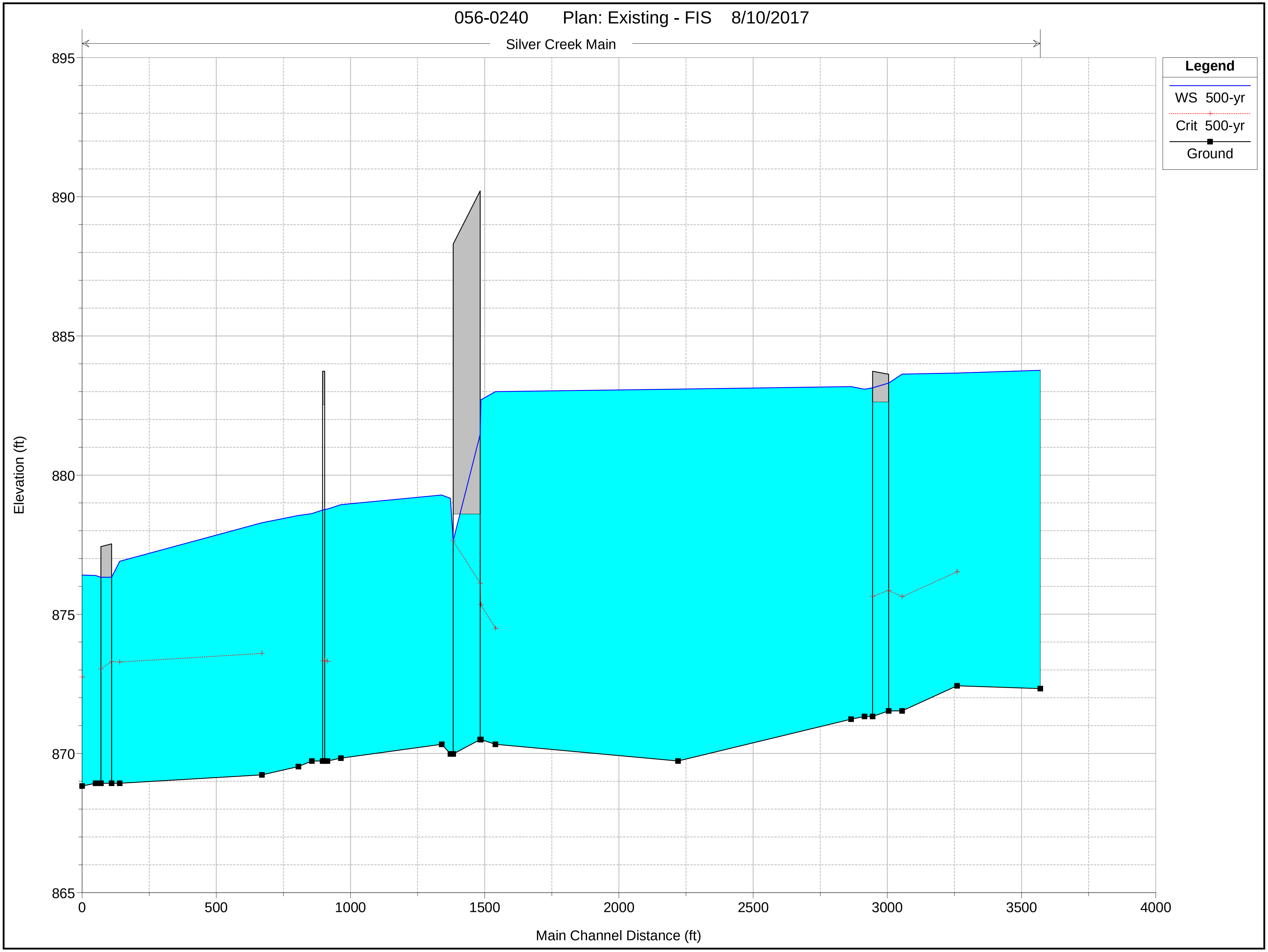
056-0240 Plan: Existing - FIS 8/10/2017
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Elevation (ft)
895
890
885
880
875
870
865
0
500
1000
1500
2000
2500
3000
3500
4000
Main Channel Distance (ft)

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               HEC-RAS Version 4.1.0 Jan 2010
                U.S. Army Corps of Engineers
               Hydrologic Engineering Center
                     609 Second Street
                     Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/10/2017 2:26:27 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	883.76		883.83	0.000280	2.14	387.66	54.81	0.14
Main	3210	500-yr	830.00	872.43	883.67	876.52	883.74	0.000302	2.20	377.06	54.10	0.15
Main	3005	500-yr	830.00	871.53	883.63	875.63	883.69	0.000215	1.95	434.56	232.80	0.13
Main	2925		Bridge									
Main	2865	500-yr	830.00	871.33	883.09		883.38	0.001617	4.32	194.60	29.31	0.22
Main	2815	500-yr	830.00	871.23	883.18		883.24	0.000216	2.04	452.68	125.94	0.13
Main	2170	500-yr	830.00	869.73	883.09		883.12	0.000120	1.61	690.55	165.49	0.10
Main	1490	500-yr	830.00	870.33	883.00	874.49	883.04	0.000132	1.68	579.47	162.96	0.10
Main	1435.9	500-yr	830.00	870.50	882.71	875.35	882.96	0.000513	4.05	205.18	46.67	0.21
Main	1382.75		Bridge									
Main	1322.2	500-yr	830.00	869.98	879.16		879.61	0.001254	5.34	155.41	55.89	0.32
Main	1290	500-yr	830.00	870.33	879.28		879.42	0.000722	3.01	275.51	48.25	0.22
Main	914	500-yr	950.00	869.83	878.94		879.11	0.000880	3.36	283.02	48.85	0.25
Main	864	500-yr	950.00	869.73	878.78	873.31	879.05	0.001352	4.18	227.51	25.88	0.25
Main	860		Bridge									
Main	856	500-yr	950.00	869.73	878.62		878.90	0.002994	4.25	223.30	25.86	0.26
Main	806	500-yr	950.00	869.53	878.55		878.73	0.001930	3.41	278.62	48.50	0.25
Main	670	500-yr	950.00	869.23	878.29	873.59	878.47	0.001893	3.39	280.63	48.66	0.25
Main	140	500-yr	950.00	868.93	876.90	873.28	877.17	0.003239	4.13	230.10	44.46	0.32
Main	90		Bridge									
Main	50	500-yr	950.00	868.93	876.39		876.88	0.005948	5.60	169.69	28.15	0.39
Main	0	500-yr	950.00	868.83	876.41	872.75	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

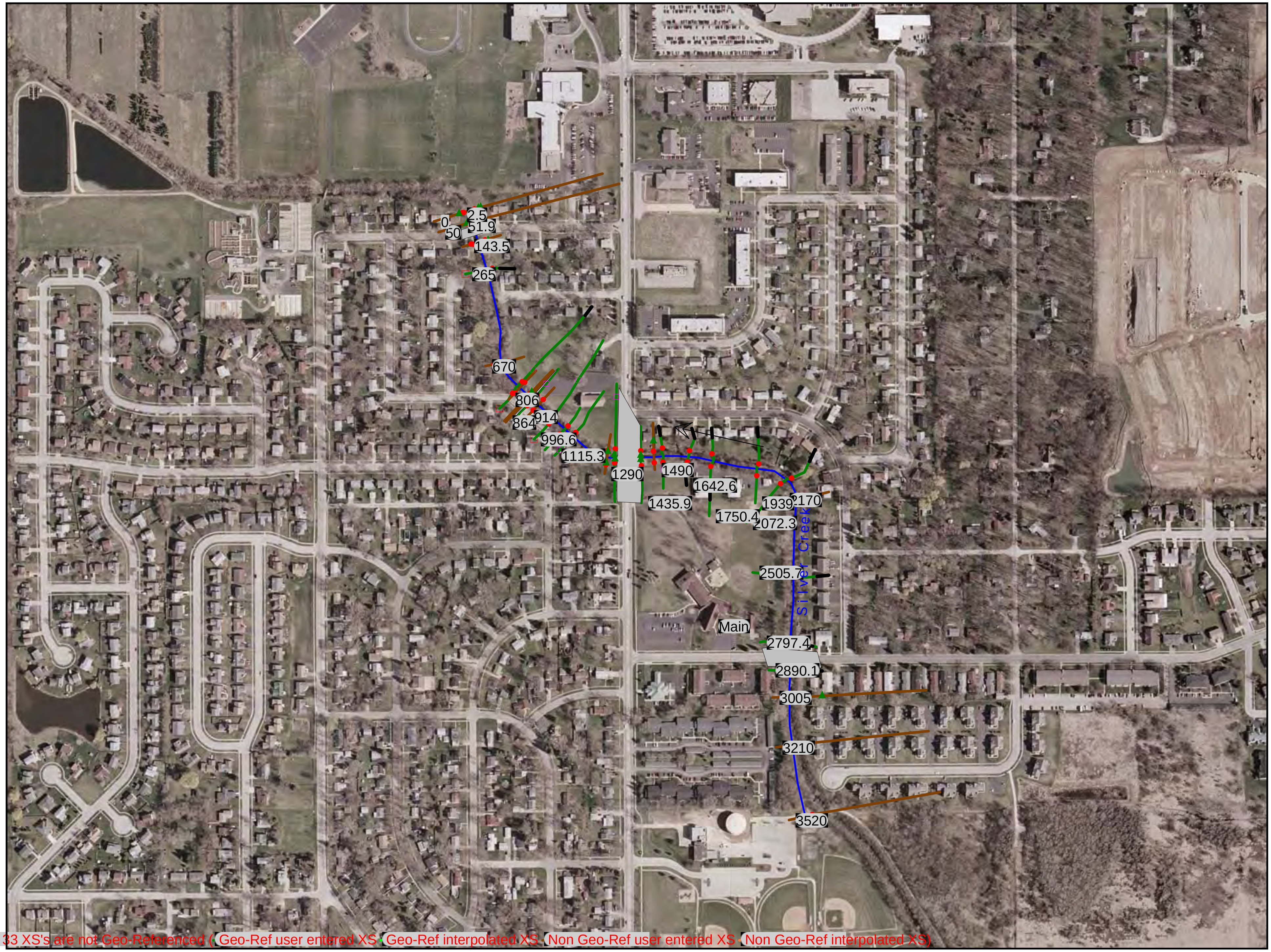
Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	500-yr	883.83	883.76	0.07	0.09	0.00		830.00		54.81
Main	3210	500-yr	883.74	883.67	0.08	0.05	0.00		830.00		54.10
Main	3005	500-yr	883.69	883.63	0.06	0.03	0.03		828.50	1.50	232.80
Main	2925		Bridge								
Main	2865	500-yr	883.38	883.09	0.29	0.02	0.11	0.60	828.68	0.72	29.31
Main	2815	500-yr	883.24	883.18	0.06	0.10	0.01		762.57	67.43	125.94
Main	2170	500-yr	883.12	883.09	0.03	0.09	0.00		678.93	151.07	165.49
Main	1490	500-yr	883.04	883.00	0.04	0.01	0.06		697.81	132.19	162.96
Main	1435.9	500-yr	882.96	882.71	0.25	0.00	0.29		830.00		46.67
Main	1382.75		Bridge								
Main	1322.2	500-yr	879.61	879.16	0.44	0.03	0.15		830.00		55.89
Main	1290	500-yr	879.42	879.28	0.14	0.30	0.01		830.00		48.25
Main	914	500-yr	879.11	878.94	0.17	0.05	0.01		950.00		48.85
Main	864	500-yr	879.05	878.78	0.27	0.01	0.00		950.00		25.88
Main	860		Bridge								
Main	856	500-yr	878.90	878.62	0.28	0.12	0.05		950.00		25.86
Main	806	500-yr	878.73	878.55	0.18	0.26	0.00		950.00		48.50
Main	670	500-yr	878.47	878.29	0.18	1.29	0.01		950.00		48.66
Main	140	500-yr	877.17	876.90	0.26				950.00		44.46
Main	90		Bridge								
Main	50	500-yr	876.88	876.39	0.49	0.15	0.17	0.01	949.99	0.00	28.15
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Exist - Permit

River: Silver Creek Reach: Main RS: 3005 Profile: 500-yr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 2925 Profile: 500-yr
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
River: Silver Creek Reach: Main RS: 2865 Profile: 500-yr
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1490 Profile: 500-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.
River: Silver Creek Reach: Main RS: 1435.9 Profile: 500-yr
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: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 500-yr
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
River: Silver Creek Reach: Main RS: 1382.75 Profile: 500-yr Upstream

```
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 1382.75     Profile: 500-yr Downstream
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 860     Profile: 500-yr Upstream
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 90     Profile: 500-yr
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
     Note:   The downstream water surface is above the minimum elevation required for orifice flow.  The orifice flow equation was
             used for pressure flow.
River: Silver Creek  Reach: Main     RS: 50     Profile: 500-yr
     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.
```

EXISTING CONDITIONS - DESIGN MODEL



14 of the 33 XS's are not Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

```
                     HEC-RAS Version 4.1.0 Jan 2010
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California


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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 4:51:30 PM

Project in English units

****

PLAN DATA

Plan Title: Design - Existing
Plan File : e:\0829\HECRAS\056-0240.p10

```
           Geometry Title: Design - Existing
           Geometry File : e:\0829\HECRAS\056-0240.g08

           Flow Title    : FIS - NAVD88
           Flow File     : e:\0829\HECRAS\056-0240.f02
```

```
Plan Summary Information:
Number of:  Cross Sections =   33    Multiple Openings  =    0
            Culverts       =    1    Inline Structures  =    0
            Bridges        =    3    Lateral Structures =    0

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

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

****

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Main	3520	320	510	600	830
Silver Creek	Main	914	365	575	680	950

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
************************************************************************************************************
* Silver Creek    Main          10-yr          *       Known WS = 878.24       Known WS = 874.11 *
* Silver Creek    Main          50-yr          *       Known WS = 880.29       Known WS = 875.18 *
* Silver Creek    Main          100-yr         *       Known WS = 881.21       Known WS = 875.58 *
* Silver Creek    Main          500-yr         *       Known WS = 883.85       Known WS = 876.41 *
************************************************************************************************************

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

GEOMETRY DATA

Geometry Title: Design - Existing
Geometry File : e:\0829\HECRAS\056-0240.g08

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
```

```
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5            114.9   114.9   114.9             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1135  1580.5   884.3       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2890.1

INPUT
Description: U/S Face St Johns Rd Culvert
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  895.14  888.94  930.24  886.15  951.06  884.93  960.49  884.51  976.26  880.13
  989.54  873.71  991.22  872.57    1000  871.98 1009.06   872.4 1011.84   873.8
 1023.21  876.62 1023.88  880.06 1038.54  884.73 1058.98   886.1 1070.47   886.2
 1079.73  886.12 1091.72  885.73  1111.8     886  1128.8  885.79 1156.04  886.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  895.14     .05  960.49     .04 1038.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        960.49 1038.54             92.7    92.7    92.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  895.14     980  885.13       T
    1021 1156.04  884.52       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1150 1156.04     895

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 2847.6

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS =    12.5
Deck/Roadway Width        =      60
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   802.2  889.13     865   835.3  888.25     865   842.8  888.06     865
   903.1  886.56     865  991.85  884.91     865  991.85  884.91   883.1
  1002.7  884.71   883.1 1008.15  884.65   883.1 1008.15  884.65     865
  1048.6  884.23     865  1057.2  884.14     865  1089.1  884.08     865
  1093.3  884.12     865  1102.8  884.23     865  1119.1  884.25     865
  1164.4   884.5     865  1202.7   884.9     865  1245.3  885.27     865
  1302.8  885.29     865

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  895.14  888.94  930.24  886.15  951.06  884.93  960.49  884.51  976.26  880.13
  989.54  873.71  991.22  872.57     992     872    1000     872    1008     872
 1009.06   872.4 1011.84   873.8 1023.21  876.62 1023.88  880.06 1038.54  884.73
 1058.98   886.1 1070.47   886.2 1079.73  886.12 1091.72  885.73  1111.8     886
  1128.8  885.79 1156.04  886.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
************************************************
  895.14     .05  960.49     .04 1038.54     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        960.49 1038.54             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  895.14     980  885.13       T
    1021 1156.04  884.52       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1150 1156.04     895

Downstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   802.2  889.13     865   835.3  888.25     865   842.8  888.06     865
   903.1  886.56     865  991.85  884.91     865  991.85  884.91   883.1
  1002.7  884.71   883.1 1008.15  884.65   883.1 1008.15  884.65     865
  1048.6  884.23     865  1057.2  884.14     865  1089.1  884.08     865
  1093.3  884.12     865  1102.8  884.23     865  1119.1  884.25     865
  1164.4   884.5     865  1202.7   884.9     865  1245.3  885.27     865
  1302.8  885.29     865

Downstream Bridge Cross Section Data
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  843.45  886.41  860.11  885.29  874.37  884.71  898.74  884.44   927.4  883.14
  947.26   883.5  974.88  880.12  976.56  880.19  987.41  873.83  988.87  872.45
     992     872    1000     872    1008     872 1015.59  872.48 1018.13   874.1
  1023.8  880.19 1036.31  882.93 1047.14  883.64 1057.56  883.68 1066.24  883.65
 1081.39  883.71 1091.02  883.77  1099.8  883.77 1108.55  883.59 1117.25  884.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  843.45     .05  947.26     .04 1036.31     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        947.26 1036.31             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  843.45     982   884.1       T
    1018 1117.25  883.55       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1047.14  1099.8     895

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum              Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 872
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 872
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
```

```
    Slope of abutments                =
    Top with of embankment            = 60
    Centroid station of bridge opening = 1000
    Wing Wall Type                    = Angular wing walls
       Width                          = 18
       Angle                          = 30
       Radius                         =
    Guide Banks Type                  = No Guide Bank present
       Length                         =
       Offset                         =
       Angle                          =
    Optional Contraction and expansion coefficients
      At approach Section
      At upstream inside (BU)
      At downstream inside (BD)
    Piers are Continuous for the width of the bridge
    Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd         =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord               =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2797.4

INPUT
Description: D/S Face St. John's Rd. Culvert
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
  843.45  886.41  860.11  885.29  874.37  884.71  898.74  884.44   927.4  883.14
  947.26   883.5  974.88  880.12  976.56  880.19  987.41  873.83  988.87  872.45
    1000  872.06 1015.59  872.48 1018.13   874.1  1023.8  880.19 1036.31  882.93
 1047.14  883.64 1057.56  883.68 1066.24  883.65 1081.39  883.71 1091.02  883.77
  1099.8  883.77 1108.55  883.59 1117.25  884.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  843.45     .05  947.26     .04 1036.31     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        947.26 1036.31            291.7   291.7   291.7              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  843.45     982   884.1       T
    1018 1117.25  883.55       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1047.14  1099.8     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2505.7

INPUT
Description: 1000' Upstream
Station Elevation Data    num=      12
```

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
824.02	887.7	908.53	885.28	961.5	884.23	991.3	873.06	995.21	871.83
1000	870.71	1005.8	871.86	1006.58	873.09	1032.77	882.6	1059.46	884.35
1103.24	886.06	1153	886.25						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
824.02	.05	961.5	.04	1032.77	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
961.5	1032.77	335.7	335.7	335.7	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
1103	1153	900

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
939.5	884.33	969.5	883.53	993.5	870.63	1006.5	869.73	1018.5	878.03
1039.5	879.43	1139.5	883.23						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
939.5	.05	969.5	.04	1018.5	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
969.5	1018.5	97.7	97.7	97.7	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2072.3

INPUT
Description: 630' Upstream
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
744.48	887.04	826.03	886.58	897.61	885.58	967.36	884.24	993.63	871.08
1000	871.24	1010.07	871.27	1024	878.47	1083.7	881.52	1127	882.6
1192	883								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
744.48	.05	967.36	.04	1024	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967.36	1024	75	133.3	241	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
1135	1192	900

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 1939

INPUT
Description: 500' Upstream

```
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  850.48  887.32  967.55  885.98  993.44  872.53  996.58  871.33    1000  870.86
 1004.42  871.37 1007.57  872.61 1020.23  880.52  1024.6  882.41 1065.82  883.58
 1140.45  886.21    1180   886.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  850.48     .05  967.55     .04  1024.6     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        967.55  1024.6            188.6   188.6   188.6              .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1140.85    1180     905

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1750.4

INPUT
Description: 300' Upstream
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  756.64  890.69  817.34  888.93  825.73  887.86  905.15  886.97  968.79  886.11
  993.03  872.27  994.31  871.08    1000  870.88 1005.79  871.49 1007.56  872.16
 1026.49  882.93 1056.52  886.16 1095.75  887.05    1136   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  756.64     .05  968.79     .04 1026.49     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        968.79 1026.49            107.8   107.8   107.8              .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
     825     905     900 1095.75    1136     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1642.6

INPUT
Description: 200' Upstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  869.82  886.36  906.86  885.93  938.57   885.9  962.16  885.47  968.46  885.24
  969.77  885.17  991.26  872.58  992.41  870.52    1000  870.63  1006.9  871.27
 1010.61  873.77 1021.14  884.15 1023.62  884.16 1077.77  887.19 1122.42   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  869.82     .05  969.77     .04 1021.14     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        969.77 1021.14               95     114     136              .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
  869.82  906.86     905 1077.77 1122.42     907

CROSS SECTION
```

```
RIVER: Silver Creek
REACH: Main              RS: 1528.6

INPUT
Description: 100' Uptream
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   851.4  889.18  896.65  886.23  923.82  886.49  933.91  886.85  943.34  886.81
   963.1  886.55  990.27  873.23  993.98  870.96    1000  870.49 1004.07  870.98
 1007.21  872.93 1027.17  884.82 1070.94  889.23 1121.37  889.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   851.4     .05   963.1     .04 1027.17     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        963.1 1027.17              38.6    38.6    38.6              .1       .3
Left Levee      Station=  933.91      Elevation=  886.85
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1082 1121.37     910

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.33  1006.5  870.33  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        969.5  1018.5              54.1    54.1    54.1              .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1063  1139.5   890.9       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1435.9

INPUT
Description: U/S Face IL-47 Box Culvert
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
  803.56  894.55     856  891.29  890.12  889.98  920.43  889.33  939.27  888.53
  947.97  888.65  956.46   888.7  963.67  888.49  977.35  882.29  994.58  871.41
  995.47  870.78    1000   870.5 1005.38  870.95 1006.63  871.38  1022.5  882.28
 1028.94  886.82 1077.33  889.97 1133.08  889.98

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
  803.56     .05  963.67     .04 1028.94     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       963.67 1028.94             113.7   113.7   113.7              .3       .5
Ineffective Flow     num=       2
```

```
   Sta L   Sta R    Elev  Permanent
  803.56     991     892       T
    1009 1133.08  891.45       T

CULVERT


RIVER: Silver Creek
REACH: Main               RS: 1382.75

INPUT
Description: IL 47 modeled as a culvert (per IDOT design policy)
Distance from Upstream XS =     2.8
Deck/Roadway Width        =   100.7
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
***************************************************************************
   712.5   895.2     865   793.1  894.24     865     946  892.33     865
  994.09  891.79     865 1005.92  891.66     865  1073.2   890.9     865
  1184.7  889.62     865  1231.5   889.1     865  1328.5  888.01     865
    1404  887.14     865

Upstream Bridge Cross Section Data
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  803.56  894.55     856  891.29  890.12  889.98  920.43  889.33  939.27  888.53
  947.97  888.65  956.46   888.7  963.67  888.49  977.35  882.29  994.09  871.73
  994.58  871.41  995.47  870.78    1000   870.5 1005.38  870.95 1005.92  871.14
 1006.63  871.38  1022.5  882.28 1028.94  886.82 1077.33  889.97 1133.08  889.98

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  803.56     .05  963.67     .04  994.09    .015 1005.92     .04 1028.94     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        963.67 1028.94             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  803.56     991     892       T
    1009 1133.08  891.45       T

Downstream  Deck/Roadway Coordinates
    num=      10
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
***************************************************************************
   712.5   895.2     865   793.1  894.24     865     946  892.33     865
   996.5  891.76     865  1003.5  891.69     865  1073.2   890.9     865
  1184.7  889.62     865  1231.5   889.1     865  1328.5  888.01     865
    1404  887.14     865

Downstream Bridge Cross Section Data
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  807.37  891.27  820.65  888.52   856.1  886.31  913.21  883.32  972.25  878.82
  993.09  871.38  995.53  869.98   996.5  869.98    1000     870  1003.5  870.23
 1006.94  870.46 1008.09  871.46 1036.73  885.64 1089.88  886.62 1145.65  886.73
 1200.12  887.51 1258.17  888.47 1313.25   888.3

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  807.37     .05  972.25     .04   996.5    .015  1003.5     .04 1036.73     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        972.25 1036.73             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  807.37     991   890.8       T
    1009 1313.25   890.6       T
Right Levee     Station= 1258.17      Elevation=  888.47
```

```
Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
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       8       7
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
                2.8   100.7     .013     .013        0                   .5                 1
Upstream   Elevation =  870.72
           Centerline Station =  1000
Downstream Elevation =  869.74
           Centerline Station =  1000

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1322.2

INPUT
Description: D/S Face IL-47 Box Culvert
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  807.37  891.27  820.65  888.52   856.1  886.31  913.21  883.32  972.25  878.82
  993.09  871.38  995.53  869.98    1000     870 1006.94  870.46 1008.09  871.46
 1036.73  885.64 1089.88  886.62 1145.65  886.73 1200.12  887.51 1258.17  888.47
 1313.25   888.3

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  807.37     .05  972.25     .04 1036.73     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        972.25 1036.73             32.2    32.2    32.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  807.37     991   890.8       T
    1009 1313.25   890.6       T
Right Levee     Station= 1258.17      Elevation=  888.47

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     993  870.53    1007  870.33    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030            174.7   174.7   174.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
```

```
     929     975     891       T
    1025    1099  890.44       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1115.3

INPUT
Description: 180' Downstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  893.44  883.54  908.68  884.01  925.37  884.04  932.73  883.75   973.2  882.92
  993.01  870.54  995.55  869.83    1000   869.4 1005.16  870.73 1007.95  871.27
    1011  873.69 1028.59  881.44 1077.12  883.65  1132.6  884.78 1242.23  886.05

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  893.44     .05   973.2     .04 1028.59     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         973.2 1028.59               48      48      48              .1       .3
Left Levee      Station=  925.37      Elevation=  884.04

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1067.3

INPUT
Description: 230' Downstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.82  883.04  901.14   883.6  922.39  883.35  934.15  883.39  958.36  883.75
  975.79  882.25  993.36  870.76  994.87  869.85    1000  869.53 1003.41  869.76
  1006.8  870.84  1010.7  873.23 1025.94  880.44 1074.79  883.35 1118.97  884.69

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.82     .05  975.79     .04 1025.94     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.79 1025.94             70.7    70.7    70.7              .1       .3
Left Levee      Station=  958.36      Elevation=  883.75

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 996.6

INPUT
Description: 300' Downstream
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   883.5  884.59  936.05  883.52  966.38   883.5  975.34  882.83  993.33  871.36
  993.85  869.81    1000  870.03 1006.39  870.05 1007.58  871.25 1024.84  880.27
 1087.46  882.76 1137.35  883.53 1200.63  883.56  1255.9  882.93 1321.41  885.89
 1401.88  884.79

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   883.5     .05  975.34     .04 1024.84     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.34 1024.84             82.6    82.6    82.6              .1       .3
Right Levee     Station= 1200.63      Elevation=  883.56
```

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
929	885.43	967	882.93	993	870.03	1007	869.83	1030	882.23
1099	884.83								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
929	.05	967	.04	1030	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967	1030	32.55	32.55	32.55	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 881.45

INPUT
Description: U/S Face of Footbridge
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
882.26	884.57	929.76	884.11	958.59	884.14	965.76	884.21	992.75	871.4
993.38	870.16	1000	870.06	1006.37	870.31	1006.6	871.42	1027.89	882.46
1090.88	885.58	1172	884.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
882.26	.05	965.76	.04	1027.89	.05

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
965.76	1027.89	17.45	17.45	17.45	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
882.26	983	884.25	F
1017	1172	883.7	F

Right Levee Station= 1090.88 Elevation= 885.58

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 874.6

INPUT
Description: Footbridge
Distance from Upstream XS = 3.85
Deck/Roadway Width = 6
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 12

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
882.26	884.57	865	929.76	884.11	865	958.59	884.14	865
965.2	884.41	865	973	884.2	865	986.75	884.26	0
986.75	884.26	883.11	1013.25	883.8	882.65	1013.25	883.8	0
1025	883.62	0	1030.2	883.62	0	1090.5	885.58	0

Upstream Bridge Cross Section Data
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        965.76 1027.89             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983  884.25       F
    1017    1172   883.7       F
Right Levee     Station= 1090.88      Elevation=  885.58

Downstream  Deck/Roadway Coordinates
    num=      12
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  882.26  884.57     865  929.76  884.11     865  958.59  884.14     865
   965.2  884.41     865     973   884.2     865  986.75  884.26       0
  986.75  884.26  883.11 1013.25   883.8  882.65 1013.25   883.8       0
    1025  883.62       0  1030.2  883.62       0  1090.5  885.58       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        965.76 1027.89             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983  883.11       F
    1017    1172  883.11       F

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
```

```
REACH: Main              RS: 864

INPUT
Description: FIS 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25                8       8       8              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     983  883.11       F
    1017    1150  883.11       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     979   883.1       T
    1021    1150   883.1       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.13     967  882.63     993  869.73    1007  869.53    1030  881.93
    1099  884.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030             11.6    11.6    11.6              .3       .5

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 794.4
```

```
INPUT
Description: 500' Downstream
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  877.49  885.39   926.1  884.67  955.49  884.46  962.42  883.92  991.04  871.31
   993.1  869.94    1000  869.78 1005.61   869.6 1007.18  871.33 1029.18  882.05
 1098.98  884.64 1159.42  883.78 1235.12  882.53 1321.44   882.4 1336.83  881.65
 1343.53  881.98 1419.72  883.92 1466.06   883.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  877.49     .07  962.42    .058 1029.18     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42 1029.18            124.4   124.4   124.4             .1       .3
Right Levee     Station= 1098.98      Elevation=  884.64
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1419.72 1466.06     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 670

INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              405     405     405             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 265

INPUT
Description: 1000' Downstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  908.54  889.91   932.7  884.83  973.22  881.49  991.82   870.7  993.81  869.26
    1000  868.94 1007.26  869.66 1008.74  870.74 1026.86   879.4 1043.83  879.41
 1068.35  883.11 1121.87  884.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  908.54     .07  973.22    .058 1026.86     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        973.22 1026.86            121.5   121.5   121.5             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1058 1121.87     895

CROSS SECTION
```

```
RIVER: Silver Creek
REACH: Main              RS: 143.5

INPUT
Description: Surveyed Section by Strand 2017 (1120' Downstream)
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  955.78     884  962.42  883.55  964.96  882.55  981.73  878.72   987.8  872.26
  991.65  871.47  993.29  870.08   995.9  868.86    1000  868.83 1007.04   869.4
 1008.01  870.07 1008.89  871.85  1010.7  872.08 1017.88  874.24 1025.55  877.33
  1053.4  878.09

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  955.78     .07  981.73    .058 1025.55     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        981.73 1025.55              3.5     3.5     3.5             .1       .3
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1047  1053.4     879       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030             88.1    88.1    88.1             .1       .3

BRIDGE


RIVER: Silver Creek
REACH: Main              RS: 89

INPUT
Description: Melody Lane
Distance from Upstream XS =    30.6
Deck/Roadway Width        =    40.8
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
**************************************************************************
   939.2  880.64          963.57   879.9          985.83  879.13
     987   879.1             987   879.1     877 1000.64  878.76  876.61
    1013  878.45  876.25    1013  878.45            1015  878.41
 1039.28  877.88         1070.81  877.41

Upstream Bridge Cross Section Data
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     987  876.35  993.74   869.6  994.58  869.34
    1000  869.48 1004.64  869.61 1007.22  871.87    1013  873.23    1030  881.33
    1099  883.93
```

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
929	.07	967	.058	987	.012	993.74	.058	1004.64	.012
1013	.058	1030	.07						

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Contr.	Expan.
967	1030	.1	.3

Downstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
939.2	880.64		963.57	879.9		985.83	879.13	
987	879.1		987	879.1	876.93	1000.64	878.76	876.59
1013	878.45	876.28	1013	878.45		1015	878.41	
1039.28	877.88		1070.81	877.41				

Downstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
956.61	881.48	980.92	878.89	984.85	878.51	987	876.01	994.03	869.49
1000	869.6	1005.54	869.66	1010.87	873.44	1013	873.44	1025.01	876.63
1059.93	878.34								

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
956.61	.07	984.85	.058	987	.012	994.03	.058	1005.54	.012
1013	.058	1025.01	.07						

Bank Sta: Left Right Coeff Contr. Expan.

Left	Right	Contr.	Expan.
984.85	1025.01	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1022	1059.93	878.34	F

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

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
W.S. Pro Method

W.S.Pro Data
Left Embankment
El of the top of the embankment = 877.53
El of the toe of the abutment = 868.93
Right Embankment
El of the top of the embankment = 877.53
El of the toe of the abutment = 868.93
Abutment Type = 1 Vert. abutments and vert. embankments with or without wingwalls
Slope of abutments =
Top with of embankment = 42
Centroid station of bridge opening = 1000
Wing Wall Type = No wing walls present
Width =
Angle =
Radius =
Guide Banks Type = No Guide Bank present
Length =
Offset =
Angle =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 51.9

INPUT
Description: Surveyed Section by Strand 2017 (1210' Downstream)
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
956.61	881.48	980.92	878.89	984.85	878.51	993.08	870.16	993.92	869.3
995.65	869.24	1000	869.44	1005.68	869.42	1006.85	870.05	1008.36	871.93
1014.15	872.74	1025.01	876.63	1059.93	878.34				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
956.61	.07	984.85	.058	1025.01	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
984.85	1025.01	1.9	1.9	1.9	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1022	1059.93	878.34	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	881.53	967	877.53	968.8	877.421	986.8	876.33	990.5	868.93
1009.5	868.93	1013.2	876.33	1027	877.53	1150	877.43	1650	879.83

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.8	.058	1013.2	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
986.8	1013.2	47.5	47.5	47.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	977	878	F
1023	1650	878	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 2.5

INPUT
Description: Surveyed Section by Strand 2017 (1260' Downstream)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

963.21	881.37	976.5	878.83	980.28	878.27	985.7	874.85	990.84	870.95
991.87	870.07	992.27	869.75	993.35	869.29	1000	868.55	1005.62	869.37
1006.74	870.08	1008.31	871.33	1014.02	872.82	1021.92	875.74	1066.6	878.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
963.21	.07	980.28	.058	1021.92	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
980.28	1021.92	2.5	2.5	2.5	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1046	1066.6	878	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
839	879.83	968	876.33	992	868.83	1008	869.13	1021	874.33
1064	874.33	1072	875.53	1589	879.83				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
839	.07	968	.058	1021	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
968	1021	0	0	0	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
839	952	878	T
1048	1589	878	T

SUMMARY OF MANNING'S N VALUES

River:Silver Creek

Reach	River Sta.	n1	n2	n3
Main	3520	.065	.04	.065
Main	3210	.065	.04	.065
Main	3005	.065	.04	.065
Main	2890.1	.05	.04	.05
Main	2847.6	Bridge		
Main	2797.4	.05	.04	.05
Main	2505.7	.05	.04	.05
Main	2170	.05	.04	.05
Main	2072.3	.05	.04	.05
Main	1939	.05	.04	.05
Main	1750.4	.05	.04	.05
Main	1642.6	.05	.04	.05
Main	1528.6	.05	.04	.05
Main	1490	.05	.04	.05
Main	1435.9	.05	.04	.05
Main	1382.75	Culvert		
Main	1322.2	.05	.04	.05
Main	1290	.05	.04	.05
Main	1115.3	.05	.04	.05
Main	1067.3	.05	.04	.05
Main	996.6	.05	.04	.05
Main	914	.05	.04	.05
Main	881.45	.05	.04	.05
Main	874.6	Bridge		
Main	864	.05	.04	.05

Main	856	.07	.058	.07
Main	806	.07	.058	.07
Main	794.4	.07	.058	.07
Main	670	.07	.058	.07
Main	265	.07	.058	.07
Main	143.5	.07	.058	.07
Main	140	.07	.058	.07
Main	89	Bridge		
Main	51.9	.07	.058	.07
Main	50	.07	.058	.07
Main	2.5	.07	.058	.07
Main	0	.07	.058	.07

SUMMARY OF REACH LENGTHS

River: Silver Creek

Reach	River Sta.	Left	Channel	Right
Main	3520	310	310	310
Main	3210	205	205	205
Main	3005	114.9	114.9	114.9
Main	2890.1	92.7	92.7	92.7
Main	2847.6	Bridge		
Main	2797.4	291.7	291.7	291.7
Main	2505.7	335.7	335.7	335.7
Main	2170	97.7	97.7	97.7
Main	2072.3	75	133.3	241
Main	1939	188.6	188.6	188.6
Main	1750.4	107.8	107.8	107.8
Main	1642.6	95	114	136
Main	1528.6	38.6	38.6	38.6
Main	1490	54.1	54.1	54.1
Main	1435.9	113.7	113.7	113.7
Main	1382.75	Culvert		
Main	1322.2	32.2	32.2	32.2
Main	1290	174.7	174.7	174.7
Main	1115.3	48	48	48
Main	1067.3	70.7	70.7	70.7
Main	996.6	82.6	82.6	82.6
Main	914	32.55	32.55	32.55
Main	881.45	17.45	17.45	17.45
Main	874.6	Bridge		
Main	864	8	8	8
Main	856	50	50	50
Main	806	11.6	11.6	11.6
Main	794.4	124.4	124.4	124.4
Main	670	405	405	405
Main	265	121.5	121.5	121.5
Main	143.5	3.5	3.5	3.5
Main	140	88.1	88.1	88.1
Main	89	Bridge		
Main	51.9	1.9	1.9	1.9
Main	50	47.5	47.5	47.5
Main	2.5	2.5	2.5	2.5
Main	0	0	0	0

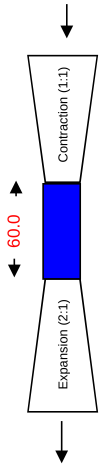
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Main	3520	.1	.3
Main	3210	.1	.3
Main	3005	.1	.3
Main	2890.1	.3	.5
Main	2847.6	Bridge	
Main	2797.4	.3	.5

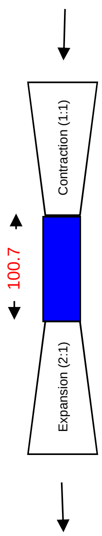
```
*Main            *    2505.7  *       .1*       .3*
*Main            *    2170    *       .1*       .3*
*Main            *    2072.3  *       .1*       .3*
*Main            *    1939    *       .1*       .3*
*Main            *    1750.4  *       .1*       .3*
*Main            *    1642.6  *       .1*       .3*
*Main            *    1528.6  *       .1*       .3*
*Main            *    1490    *       .1*       .3*
*Main            *    1435.9  *       .3*       .5*
*Main            *    1382.75 *Culvert  *         *
*Main            *    1322.2  *       .3*       .5*
*Main            *    1290    *       .3*       .5*
*Main            *    1115.3  *       .1*       .3*
*Main            *    1067.3  *       .1*       .3*
*Main            *    996.6   *       .1*       .3*
*Main            *    914     *       .1*       .3*
*Main            *    881.45  *       .3*       .5*
*Main            *    874.6   *Bridge   *         *
*Main            *    864     *       .3*       .5*
*Main            *    856     *       .3*       .5*
*Main            *    806     *       .3*       .5*
*Main            *    794.4   *       .1*       .3*
*Main            *    670     *       .1*       .3*
*Main            *    265     *       .1*       .3*
*Main            *    143.5   *       .1*       .3*
*Main            *    140     *       .1*       .3*
*Main            *    89      *Bridge   *         *
*Main            *    51.9    *       .3*       .5*
*Main            *    50      *       .3*       .5*
*Main            *    2.5     *       .3*       .5*
*Main            *    0       *       .3*       .5*
*******************************************************
```

St. Johns Rd. - Existing Surveyed Crossing



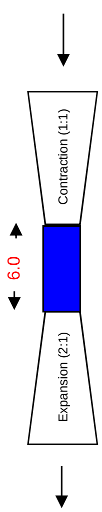
			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
3520.0	642.4	1000	**350.0**	**1650.0**	310.0	992	1008		3520.0
3210.0	332.4	1000	**660.0**	**1340.0**	205.0	992	1008		3210.0
3005.0	127.4	1000	**865.0**	**1135.0**	114.9	992	1008		3005.0
2890.1	12.5	1000	**980.0**	**1021.0**	92.7	992	1008		2890.1
2877.6		1000.0	**992.0**	**1008.0**	12.5	992.0	1008.0		2877.6
2847.6									2847.6
2817.6		1000.0	**992.0**	**1008.0**	17.0	992.0	1008.0		2817.6
2797.4	10.1	1000	**982.0**	**1018.0**	291.7	992	1008		2797.4
2505.7	156.0	1000	**836.0**	**1164.0**	335.7	992	1008		2505.7
2170.0	323.8	1000	**668.0**	**1332.0**	97.7	992	1008		2170.0
2072.3	372.7	1000	**619.0**	**1381.0**	2072.3	992	1008		2072.3

IL 47 - Existing Surveyed Crossing



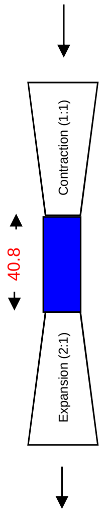
			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
2072.3	639.2	1000.0	**355.0**	**1645.0**	133.3	994.09	1005.92		2072.3
1939.0	505.9	1000.0	**488.0**	**1512.0**	188.6	994.09	1005.92		1939.0
1750.4	317.3	1000.0	**677.0**	**1323.0**	107.8	994.09	1005.92		1750.4
1642.6	209.5	1000.0	**785.0**	**1215.0**	114.0	994.09	1005.92		1642.6
1528.6	95.5	1000.0	**899.0**	**1101.0**	38.6	994.09	1005.92		1528.6
1490.0	56.9	1000.0	**937.0**	**1063.0**	54.1	994.09	1005.92		1490.0
1435.9	2.8	1000.0	**991.0**	**1009.0**	113.7	994.09	1005.92		1435.9
1433.1		1000.0	**994.1**	**1005.9**	2.8	994.09	1005.92		1433.1
1382.8									1382.8
1332.4		1000.0	**996.5**	**1003.5**	10.2	996.5	1003.5		1332.4
1322.2	5.1	1000	**991.0**	**1009.0**	32.2	996.5	1003.5		1322.2
1290.0	21.2	1000	**975.0**	**1025.0**	174.7	996.5	1003.5		1290.0
1115.3	108.6	1000	**888.0**	**1112.0**	48.0	996.5	1003.5		1115.3
1067.3	132.6	1000	**864.0**	**1136.0**	70.7	996.5	1003.5		1067.3
996.6	167.9	1000	**829.0**	**1171.0**	82.6	996.5	1003.5		996.6
914.0	209.2	1000	**787.0**	**1213.0**	914.0	996.5	1003.5		914.0

Footbridge - Existing Surveyed Crossing

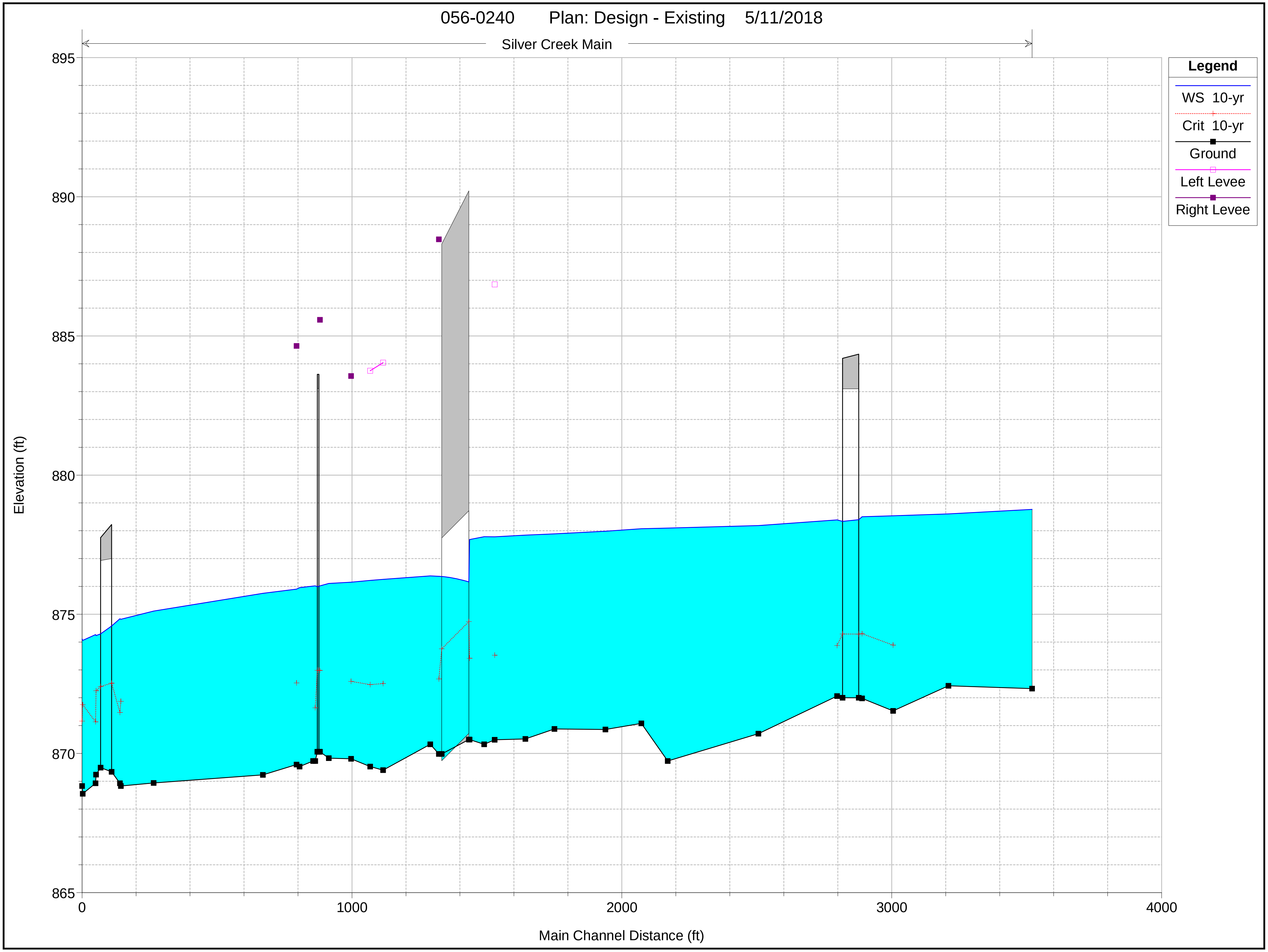


			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
1115.3	237.7	1000	**749.0**	**1251.0**	48.0	986.75	1013.25		1115.3
1067.3	189.7	1000	**797.0**	**1203.0**	70.6	986.75	1013.25		1067.3
996.7	119.1	1000	**868.0**	**1132.0**	82.6	986.75	1013.25		996.7
914.1	36.5	1000	**950.0**	**1050.0**	32.6	986.75	1013.25		914.1
881.45	3.9	1000	**983.0**	**1017.0**	17.45	986.75	1013.25		881.5
877.60		1000.0	**986.8**	**1013.3**	3.85	986.75	1013.25		877.6
874.60									874.6
871.60		1000.0	**986.8**	**1013.3**	7.6	986.75	1013.25		871.6
864.0	3.8	1000	**983.0**	**1017.0**	8.0	986.75	1013.25		864.0
856.0	7.8	1000	**979.0**	**1021.0**	50.0	986.75	1013.25		856.0
806.0	32.8	1000	**954.0**	**1046.0**	11.6	986.75	1013.25		806.0
794.4	38.6	1000	**948.0**	**1052.0**	124.4	986.75	1013.25		794.4
670.0	100.8	1000	**886.0**	**1114.0**	405.0	986.75	1013.25		670.0
265.0	303.3	1000	**683.0**	**1317.0**	121.5	986.75	1013.25		265.0
143.5	364.1	1000	**623.0**	**1377.0**	3.5	986.75	1013.25		143.5
140.0	365.8	1000	**621.0**	**1379.0**	140.0	986.75	1013.25		140.0

Melody Lane - Existing Surveyed Crossing



R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
670.0	560.6	1000	**426.0**	**1574.0**	405.0	987	1013		670.0
265.0	155.6	1000	**831.0**	**1169.0**	121.5	987	1013		265.0
143.5	34.1	1000	**953.0**	**1047.0**	3.5	987	1013		143.5
140.0	30.6	1000	**956.0**	**1044.0**	88.1	987	1013		140.0
109.40		1000.0	**987.0**	**1013.0**	30.60	987	1013		109.4
89.00									89.0
68.60		1000.0	**987.0**	**1013.0**	16.7	987	1013		68.6
51.9	8.4	1000	**978.0**	**1022.0**	1.9	987	1013		51.9
50.0	9.3	1000	**977.0**	**1023.0**	47.5	987	1013		50.0
2.5	33.1	1000	**954.0**	**1046.0**	2.5	987	1013		2.5
0.0	34.3	1000	**952.0**	**1048.0**	0.0	987	1013		0.0



056-0240 Plan: Design - Existing 5/11/2018
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
Left Levee
Right Levee
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 4:51:30 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	878.77		878.83	0.000459	2.01	159.55	36.55	0.17
Main	3210	10-yr	320.00	872.43	878.61		878.68	0.000542	2.13	150.05	35.59	0.18
Main	3005	10-yr	320.00	871.53	878.54	873.89	878.59	0.000326	1.77	180.87	38.63	0.14
Main	2890.1	10-yr	320.00	871.98	878.51	874.30	878.55	0.000272	1.66	192.40	43.96	0.14
Main	2847.6		Bridge									
Main	2797.4	10-yr	320.00	872.06	878.39	873.88	878.33	0.000202	1.60	199.87	42.50	0.12
Main	2505.7	10-yr	320.00	870.71	878.19		878.24	0.000441	1.87	170.88	42.99	0.17
Main	2170	10-yr	320.00	869.73	878.10		878.13	0.000221	1.56	205.40	39.89	0.12
Main	2072.3	10-yr	320.00	871.08	878.07		878.11	0.000242	1.55	206.31	43.57	0.13
Main	1939	10-yr	320.00	870.86	877.98		878.06	0.000583	2.23	143.50	33.22	0.19
Main	1750.4	10-yr	320.00	870.88	877.89		877.96	0.000493	2.09	153.28	34.44	0.17
Main	1642.6	10-yr	320.00	870.52	877.85		877.91	0.000404	1.98	161.83	32.47	0.16
Main	1528.6	10-yr	320.00	870.49	877.78	873.53	877.85	0.000511	2.11	151.52	34.38	0.18
Main	1490	10-yr	320.00	870.33	877.79		877.83	0.000273	1.68	190.85	38.18	0.13
Main	1435.9	10-yr	320.00	870.50	877.68	873.42	877.80	0.000529	2.79	114.77	31.16	0.19
Main	1382.75		Culvert									
Main	1322.2	10-yr	320.00	869.98	876.36	872.68	876.51	0.000689	3.05	105.00	38.86	0.22
Main	1290	10-yr	320.00	870.33	876.38		876.45	0.000543	2.11	151.73	37.01	0.18
Main	1115.3	10-yr	320.00	869.40	876.25	872.51	876.34	0.000679	2.34	136.62	32.95	0.20
Main	1067.3	10-yr	320.00	869.53	876.22	872.47	876.30	0.000712	2.40	133.33	31.99	0.21
Main	996.6	10-yr	320.00	869.81	876.15	872.59	876.25	0.000818	2.50	127.85	31.15	0.22
Main	914	10-yr	365.00	869.83	876.11		876.19	0.000609	2.28	160.23	37.89	0.20
Main	881.45	10-yr	365.00	870.06	876.02	872.98	876.15	0.001231	2.95	123.65	32.45	0.27
Main	874.6		Bridge									
Main	864	10-yr	365.00	869.73	876.02	871.64	876.10	0.000574	2.33	156.69	25.43	0.17

Main	856	10-yr	365.00	869.73	876.01		876.10	0.001211	2.33	156.52	25.43	0.17
Main	806	10-yr	365.00	869.53	875.96		876.03	0.001163	2.20	165.98	38.47	0.19
Main	794.4	10-yr	365.00	869.60	875.90	872.53	876.01	0.001833	2.58	141.39	35.95	0.23
Main	670	10-yr	365.00	869.23	875.75		875.82	0.001095	2.15	169.66	38.84	0.18
Main	265	10-yr	365.00	868.94	875.12		875.23	0.002024	2.73	133.78	33.69	0.24
Main	143.5	10-yr	365.00	868.83	874.82	871.87	874.95	0.002584	2.91	125.60	33.93	0.27
Main	140	10-yr	365.00	868.93	874.84	871.47	874.93	0.001635	2.49	146.53	36.46	0.22
Main	89		Bridge									
Main	51.9	10-yr	365.00	869.24	874.24	872.25	874.47	0.005738	3.91	93.43	29.26	0.39
Main	50	10-yr	365.00	868.93	874.27	871.14	874.42	0.002613	3.15	115.69	24.34	0.26
Main	2.5	10-yr	365.00	868.55	874.06	871.75	874.26	0.004260	3.54	102.98	30.63	0.34
Main	0	10-yr	365.00	868.83	874.11	871.16	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	10-yr	878.83	878.77	0.06	0.15	0.00		320.00		36.55
Main	3210	10-yr	878.68	878.61	0.07	0.08	0.01		320.00		35.59
Main	3005	10-yr	878.59	878.54	0.05	0.03	0.00		320.00		38.63
Main	2890.1	10-yr	878.55	878.51	0.04	0.00	0.00		320.00		43.96
Main	2847.6		Bridge								
Main	2797.4	10-yr	878.33	878.39	0.04	0.06	0.04		320.00		42.50
Main	2505.7	10-yr	878.24	878.19	0.05	0.10	0.01		320.00		42.99
Main	2170	10-yr	878.13	878.10	0.04	0.02	0.00		320.00	0.00	39.89
Main	2072.3	10-yr	878.11	878.07	0.04	0.05	0.00		320.00		43.57
Main	1939	10-yr	878.06	877.98	0.08	0.10	0.00		320.00		33.22
Main	1750.4	10-yr	877.96	877.89	0.07	0.05	0.00		320.00		34.44
Main	1642.6	10-yr	877.91	877.85	0.06	0.05	0.00		320.00		32.47
Main	1528.6	10-yr	877.85	877.78	0.07	0.01	0.01		320.00		34.38
Main	1490	10-yr	877.83	877.79	0.04	0.02	0.01		320.00		38.18
Main	1435.9	10-yr	877.80	877.68	0.12				320.00		31.16
Main	1382.75		Culvert								
Main	1322.2	10-yr	876.51	876.36	0.14	0.02	0.04		320.00		38.86
Main	1290	10-yr	876.45	876.38	0.07	0.11	0.00		320.00		37.01
Main	1115.3	10-yr	876.34	876.25	0.09	0.03	0.00		320.00		32.95
Main	1067.3	10-yr	876.30	876.22	0.09	0.05	0.00		320.00		31.99
Main	996.6	10-yr	876.25	876.15	0.10	0.06	0.01		320.00		31.15
Main	914	10-yr	876.19	876.11	0.08	0.03	0.01		365.00		37.89
Main	881.45	10-yr	876.15	876.02	0.14	0.00	0.00		365.00		32.45
Main	874.6		Bridge								
Main	864	10-yr	876.10	876.02	0.08	0.01	0.00		365.00		25.43
Main	856	10-yr	876.10	876.01	0.08	0.06	0.00		365.00		25.43
Main	806	10-yr	876.03	875.96	0.08	0.02	0.01		365.00		38.47
Main	794.4	10-yr	876.01	875.90	0.10	0.17	0.01		365.00		35.95
Main	670	10-yr	875.82	875.75	0.07	0.59	0.00		365.00		38.84
Main	265	10-yr	875.23	875.12	0.12	0.28	0.00		365.00		33.69
Main	143.5	10-yr	874.95	874.82	0.13	0.01	0.01		365.00		33.93
Main	140	10-yr	874.93	874.84	0.10	0.08	0.02		365.00		36.46
Main	89		Bridge								
Main	51.9	10-yr	874.47	874.24	0.24	0.01	0.04		365.00		29.26
Main	50	10-yr	874.42	874.27	0.15	0.16	0.01		365.00		24.34
Main	2.5	10-yr	874.26	874.06	0.20	0.01	0.06		365.00		30.63
Main	0	10-yr	874.19	874.11	0.08				365.00		45.35

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ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design - Exist

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 10-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
             bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1322.2     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 914     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
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             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 10-yr
     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.
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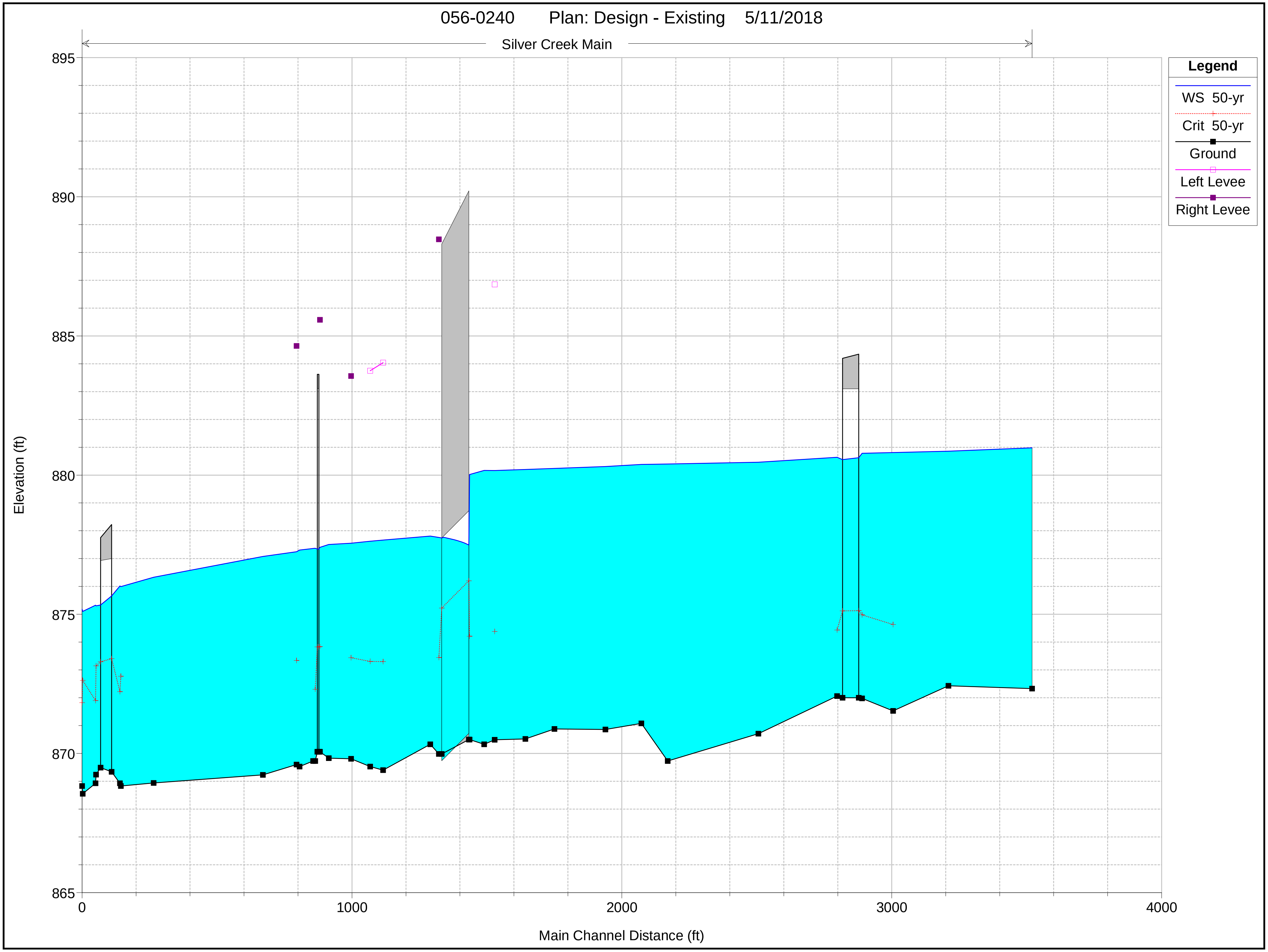
056-0240 Plan: Design - Existing 5/11/2018
Silver Creek Main
Legend
WS 50-yr
Crit 50-yr
Ground
Left Levee
Right Levee
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

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                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 4:51:30 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	880.98		881.04	0.000347	2.05	249.26	44.64	0.15
Main	3210	50-yr	510.00	872.43	880.86		880.93	0.000387	2.13	239.56	43.83	0.16
Main	3005	50-yr	510.00	871.53	880.81	874.63	880.86	0.000259	1.83	278.07	46.94	0.13
Main	2890.1	50-yr	510.00	871.98	880.78	874.98	880.83	0.000185	1.78	285.86	52.25	0.12
Main	2847.6		Bridge									
Main	2797.4	50-yr	510.00	872.06	880.64	874.44	880.58	0.000165	1.82	280.76	55.20	0.11
Main	2505.7	50-yr	510.00	870.71	880.46		880.51	0.000292	1.80	282.85	55.34	0.14
Main	2170	50-yr	510.00	869.73	880.40		880.44	0.000171	1.64	347.10	89.63	0.11
Main	2072.3	50-yr	510.00	871.08	880.38		880.42	0.000169	1.58	349.61	86.37	0.11
Main	1939	50-yr	510.00	870.86	880.31		880.38	0.000416	2.22	230.23	41.42	0.17
Main	1750.4	50-yr	510.00	870.88	880.24		880.31	0.000358	2.09	243.95	42.69	0.15
Main	1642.6	50-yr	510.00	870.52	880.20		880.27	0.000329	2.07	245.97	38.89	0.15
Main	1528.6	50-yr	510.00	870.49	880.16	874.38	880.23	0.000364	2.09	243.81	43.22	0.16
Main	1490	50-yr	510.00	870.33	880.17		880.21	0.000195	1.72	325.16	83.33	0.12
Main	1435.9	50-yr	510.00	870.50	880.02	874.21	880.19	0.000474	3.25	156.87	38.27	0.19
Main	1382.75		Culvert									
Main	1322.2	50-yr	510.00	869.98	877.76	873.45	878.00	0.000855	3.92	130.18	45.60	0.26
Main	1290	50-yr	510.00	870.33	877.81		877.90	0.000579	2.44	208.66	42.55	0.19
Main	1115.3	50-yr	510.00	869.40	877.67	873.30	877.78	0.000746	2.73	187.07	38.42	0.22
Main	1067.3	50-yr	510.00	869.53	877.62	873.31	877.75	0.000787	2.80	181.99	37.12	0.22
Main	996.6	50-yr	510.00	869.81	877.55	873.44	877.69	0.000891	2.92	174.88	36.02	0.23
Main	914	50-yr	575.00	869.83	877.51		877.62	0.000661	2.65	217.06	43.31	0.21
Main	881.45	50-yr	575.00	870.06	877.40	873.84	877.58	0.001123	3.38	170.11	38.04	0.27
Main	874.6		Bridge									
Main	864	50-yr	575.00	869.73	877.37	872.31	877.51	0.000806	3.01	191.29	25.65	0.19

Main	856	50-yr	575.00	869.73	877.36		877.50	0.001700	3.01	191.04	25.65	0.19
Main	806	50-yr	575.00	869.53	877.31		877.41	0.001317	2.60	221.43	43.70	0.20
Main	794.4	50-yr	575.00	869.60	877.25	873.34	877.38	0.001954	2.97	193.56	41.76	0.24
Main	670	50-yr	575.00	869.23	877.08		877.18	0.001268	2.56	224.53	43.97	0.20
Main	265	50-yr	575.00	868.94	876.33		876.49	0.002338	3.24	177.47	38.32	0.27
Main	143.5	50-yr	575.00	868.83	875.99	872.77	876.18	0.002864	3.43	167.73	37.94	0.29
Main	140	50-yr	575.00	868.93	876.02	872.22	876.16	0.001936	2.99	192.17	41.02	0.24
Main	89		Bridge									
Main	51.9	50-yr	575.00	869.24	875.30	873.15	875.62	0.006143	4.53	126.81	33.29	0.41
Main	50	50-yr	575.00	868.93	875.33	871.90	875.58	0.003615	4.05	141.97	25.40	0.30
Main	2.5	50-yr	575.00	868.55	875.10	872.63	875.38	0.004864	4.19	137.16	34.90	0.37
Main	0	50-yr	575.00	868.83	875.18	871.82	875.29	0.001675	2.67	231.51	97.99	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	50-yr	881.04	880.98	0.07	0.11	0.00		510.00		44.64
Main	3210	50-yr	880.93	880.86	0.07	0.06	0.01		510.00		43.83
Main	3005	50-yr	880.86	880.81	0.05	0.03	0.00		510.00		46.94
Main	2890.1	50-yr	880.83	880.78	0.05	0.00	0.00		510.00		52.25
Main	2847.6		Bridge								
Main	2797.4	50-yr	880.58	880.64	0.06	0.05	0.07		510.00		55.20
Main	2505.7	50-yr	880.51	880.46	0.05	0.07	0.00		510.00		55.34
Main	2170	50-yr	880.44	880.40	0.04	0.02	0.00		491.42	18.58	89.63
Main	2072.3	50-yr	880.42	880.38	0.04	0.03	0.00		496.59	13.41	86.37
Main	1939	50-yr	880.38	880.31	0.08	0.07	0.00		510.00		41.42
Main	1750.4	50-yr	880.31	880.24	0.07	0.04	0.00		510.00		42.69
Main	1642.6	50-yr	880.27	880.20	0.07	0.04	0.00		510.00		38.89
Main	1528.6	50-yr	880.23	880.16	0.07	0.01	0.01		510.00		43.22
Main	1490	50-yr	880.21	880.17	0.04	0.02	0.01		495.27	14.73	83.33
Main	1435.9	50-yr	880.19	880.02	0.16				510.00		38.27
Main	1382.75		Culvert								
Main	1322.2	50-yr	878.00	877.76	0.24	0.02	0.07		510.00		45.60
Main	1290	50-yr	877.90	877.81	0.09	0.11	0.01		510.00		42.55
Main	1115.3	50-yr	877.78	877.67	0.12	0.04	0.00		510.00		38.42
Main	1067.3	50-yr	877.75	877.62	0.12	0.06	0.00		510.00		37.12
Main	996.6	50-yr	877.69	877.55	0.13	0.06	0.01		510.00		36.02
Main	914	50-yr	877.62	877.51	0.11	0.03	0.01		575.00		43.31
Main	881.45	50-yr	877.58	877.40	0.18	0.00	0.01		575.00		38.04
Main	874.6		Bridge								
Main	864	50-yr	877.51	877.37	0.14	0.01	0.00		575.00		25.65
Main	856	50-yr	877.50	877.36	0.14	0.07	0.02		575.00		25.65
Main	806	50-yr	877.41	877.31	0.10	0.02	0.01		575.00		43.70
Main	794.4	50-yr	877.38	877.25	0.14	0.19	0.01		575.00		41.76
Main	670	50-yr	877.18	877.08	0.10	0.68	0.01		575.00		43.97
Main	265	50-yr	876.49	876.33	0.16	0.31	0.00		575.00		38.32
Main	143.5	50-yr	876.18	875.99	0.18	0.01	0.01		575.00		37.94
Main	140	50-yr	876.16	876.02	0.14	0.10	0.02		575.00		41.02
Main	89		Bridge								
Main	51.9	50-yr	875.62	875.30	0.32	0.01	0.03		575.00		33.29
Main	50	50-yr	875.58	875.33	0.25	0.20	0.01		575.00		25.40
Main	2.5	50-yr	875.38	875.10	0.27	0.01	0.08		575.00		34.90
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

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ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design - Exist

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 50-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1490     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1322.2     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
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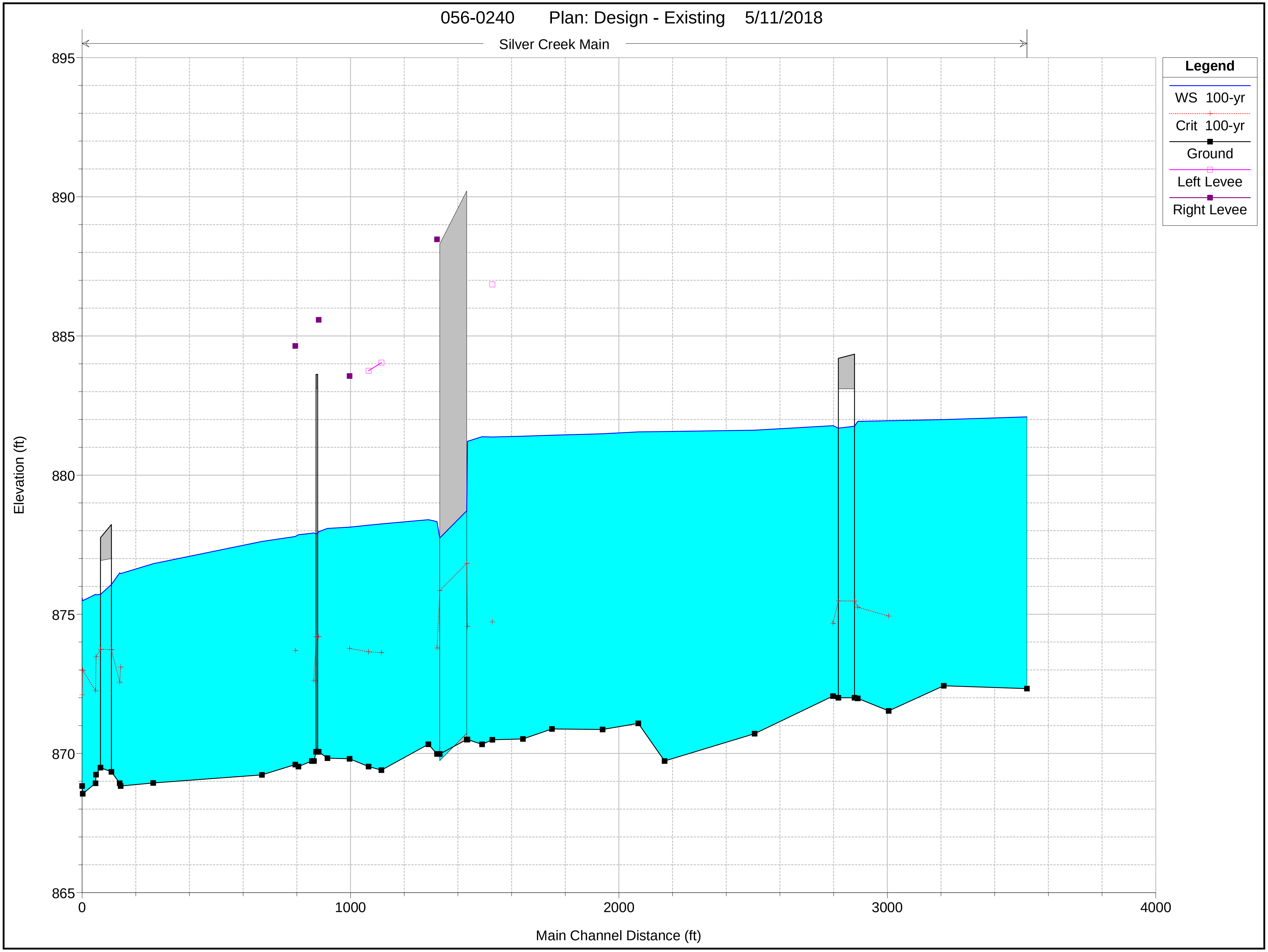
             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
```


056-0240 Plan: Design - Existing 5/11/2018
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Left Levee
Right Levee
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 4:51:30 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	882.09		882.15	0.000289	1.99	301.23	48.71	0.14
Main	3210	100-yr	600.00	872.43	882.00		882.06	0.000315	2.06	291.66	47.98	0.15
Main	3005	100-yr	600.00	871.53	881.95	874.94	882.00	0.000218	1.80	334.16	51.12	0.12
Main	2890.1	100-yr	600.00	871.98	881.93	875.25	881.98	0.000154	1.80	332.86	59.98	0.11
Main	2847.6		Bridge									
Main	2797.4	100-yr	600.00	872.06	881.78	874.67	881.72	0.000145	1.86	321.72	69.69	0.11
Main	2505.7	100-yr	600.00	870.71	881.62		881.66	0.000229	1.71	350.16	61.58	0.13
Main	2170	100-yr	600.00	869.73	881.57		881.60	0.000132	1.55	471.06	122.55	0.10
Main	2072.3	100-yr	600.00	871.08	881.55		881.59	0.000129	1.50	465.63	112.34	0.10
Main	1939	100-yr	600.00	870.86	881.49		881.56	0.000340	2.13	281.85	46.26	0.15
Main	1750.4	100-yr	600.00	870.88	881.43		881.49	0.000291	2.02	297.33	46.87	0.14
Main	1642.6	100-yr	600.00	870.52	881.40		881.46	0.000281	2.04	294.42	42.14	0.14
Main	1528.6	100-yr	600.00	870.49	881.37	874.73	881.43	0.000293	2.01	298.60	47.70	0.14
Main	1490	100-yr	600.00	870.33	881.38		881.42	0.000145	1.61	431.85	117.35	0.10
Main	1435.9	100-yr	600.00	870.50	881.21	874.56	881.39	0.000428	3.37	178.30	41.89	0.19
Main	1382.75		Culvert									
Main	1322.2	100-yr	600.00	869.98	878.33	873.79	878.61	0.000919	4.27	140.41	48.34	0.27
Main	1290	100-yr	600.00	870.33	878.40		878.50	0.000586	2.56	234.24	44.82	0.20
Main	1115.3	100-yr	600.00	869.40	878.25	873.62	878.38	0.000758	2.86	210.06	40.67	0.22
Main	1067.3	100-yr	600.00	869.53	878.20	873.65	878.34	0.000801	2.94	204.11	39.23	0.23
Main	996.6	100-yr	600.00	869.81	878.13	873.77	878.28	0.000903	3.06	196.28	38.04	0.24
Main	914	100-yr	680.00	869.83	878.08		878.20	0.000684	2.80	242.66	45.54	0.21
Main	881.45	100-yr	680.00	870.06	877.97	874.20	878.17	0.001100	3.59	189.33	40.32	0.27
Main	874.6		Bridge									
Main	864	100-yr	680.00	869.73	877.92	872.61	878.09	0.000921	3.31	205.42	25.74	0.21

Main	856	100-yr	680.00	869.73	877.91		878.08	0.001945	3.31	205.14	25.74	0.21
Main	806	100-yr	680.00	869.53	877.86		877.98	0.001384	2.76	246.03	45.82	0.21
Main	794.4	100-yr	680.00	869.60	877.79	873.69	877.95	0.002009	3.13	217.05	44.12	0.25
Main	670	100-yr	680.00	869.23	877.62		877.73	0.001343	2.73	248.79	46.06	0.21
Main	265	100-yr	680.00	868.94	876.82		877.00	0.002479	3.46	196.67	40.18	0.28
Main	143.5	100-yr	680.00	868.83	876.46	873.11	876.67	0.003015	3.66	185.88	39.54	0.30
Main	140	100-yr	680.00	868.93	876.49	872.56	876.65	0.002075	3.21	211.91	42.85	0.25
Main	89		Bridge									
Main	51.9	100-yr	680.00	869.24	875.70	873.48	876.06	0.006422	4.85	140.29	34.79	0.42
Main	50	100-yr	680.00	868.93	875.72	872.25	876.03	0.004172	4.47	151.97	25.79	0.32
Main	2.5	100-yr	680.00	868.55	875.49	872.98	875.80	0.005267	4.51	150.89	36.55	0.39
Main	0	100-yr	680.00	868.83	875.58	872.11	875.70	0.001716	2.82	262.30	107.61	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	100-yr	882.15	882.09	0.06	0.09	0.00		600.00		48.71
Main	3210	100-yr	882.06	882.00	0.07	0.05	0.00		600.00		47.98
Main	3005	100-yr	882.00	881.95	0.05	0.02	0.00		600.00		51.12
Main	2890.1	100-yr	881.98	881.93	0.05	0.00	0.00		600.00		59.98
Main	2847.6		Bridge								
Main	2797.4	100-yr	881.72	881.78	0.06	0.04	0.07		600.00		69.69
Main	2505.7	100-yr	881.66	881.62	0.05	0.06	0.00		600.00		61.58
Main	2170	100-yr	881.60	881.57	0.03	0.01	0.00		545.38	54.62	122.55
Main	2072.3	100-yr	881.59	881.55	0.03	0.03	0.00		558.47	41.53	112.34
Main	1939	100-yr	881.56	881.49	0.07	0.06	0.00		600.00		46.26
Main	1750.4	100-yr	881.49	881.43	0.06	0.03	0.00		600.00		46.87
Main	1642.6	100-yr	881.46	881.40	0.06	0.03	0.00		600.00		42.14
Main	1528.6	100-yr	881.43	881.37	0.06	0.01	0.01		600.00		47.70
Main	1490	100-yr	881.42	881.38	0.04	0.01	0.01		547.64	52.36	117.35
Main	1435.9	100-yr	881.39	881.21	0.18				600.00		41.89
Main	1382.75		Culvert								
Main	1322.2	100-yr	878.61	878.33	0.28	0.02	0.09		600.00		48.34
Main	1290	100-yr	878.50	878.40	0.10	0.12	0.01		600.00		44.82
Main	1115.3	100-yr	878.38	878.25	0.13	0.04	0.00		600.00		40.67
Main	1067.3	100-yr	878.34	878.20	0.13	0.06	0.00		600.00		39.23
Main	996.6	100-yr	878.28	878.13	0.15	0.06	0.01		600.00		38.04
Main	914	100-yr	878.20	878.08	0.12	0.03	0.01		680.00		45.54
Main	881.45	100-yr	878.17	877.97	0.20	0.00	0.02		680.00		40.32
Main	874.6		Bridge								
Main	864	100-yr	878.09	877.92	0.17	0.01	0.00		680.00		25.74
Main	856	100-yr	878.08	877.91	0.17	0.08	0.03		680.00		25.74
Main	806	100-yr	877.98	877.86	0.12	0.02	0.01		680.00		45.82
Main	794.4	100-yr	877.95	877.79	0.15	0.20	0.01		680.00		44.12
Main	670	100-yr	877.73	877.62	0.12	0.72	0.01		680.00		46.06
Main	265	100-yr	877.00	876.82	0.19	0.33	0.00		680.00		40.18
Main	143.5	100-yr	876.67	876.46	0.21	0.01	0.01		680.00		39.54
Main	140	100-yr	876.65	876.49	0.16	0.10	0.03		680.00		42.85
Main	89		Bridge								
Main	51.9	100-yr	876.06	875.70	0.36	0.01	0.03		680.00		34.79
Main	50	100-yr	876.03	875.72	0.31	0.22	0.00		680.00		25.79
Main	2.5	100-yr	875.80	875.49	0.32	0.01	0.10		680.00		36.55
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

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ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design - Exist

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 100-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1490     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1322.2     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
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          used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 100-yr
     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.
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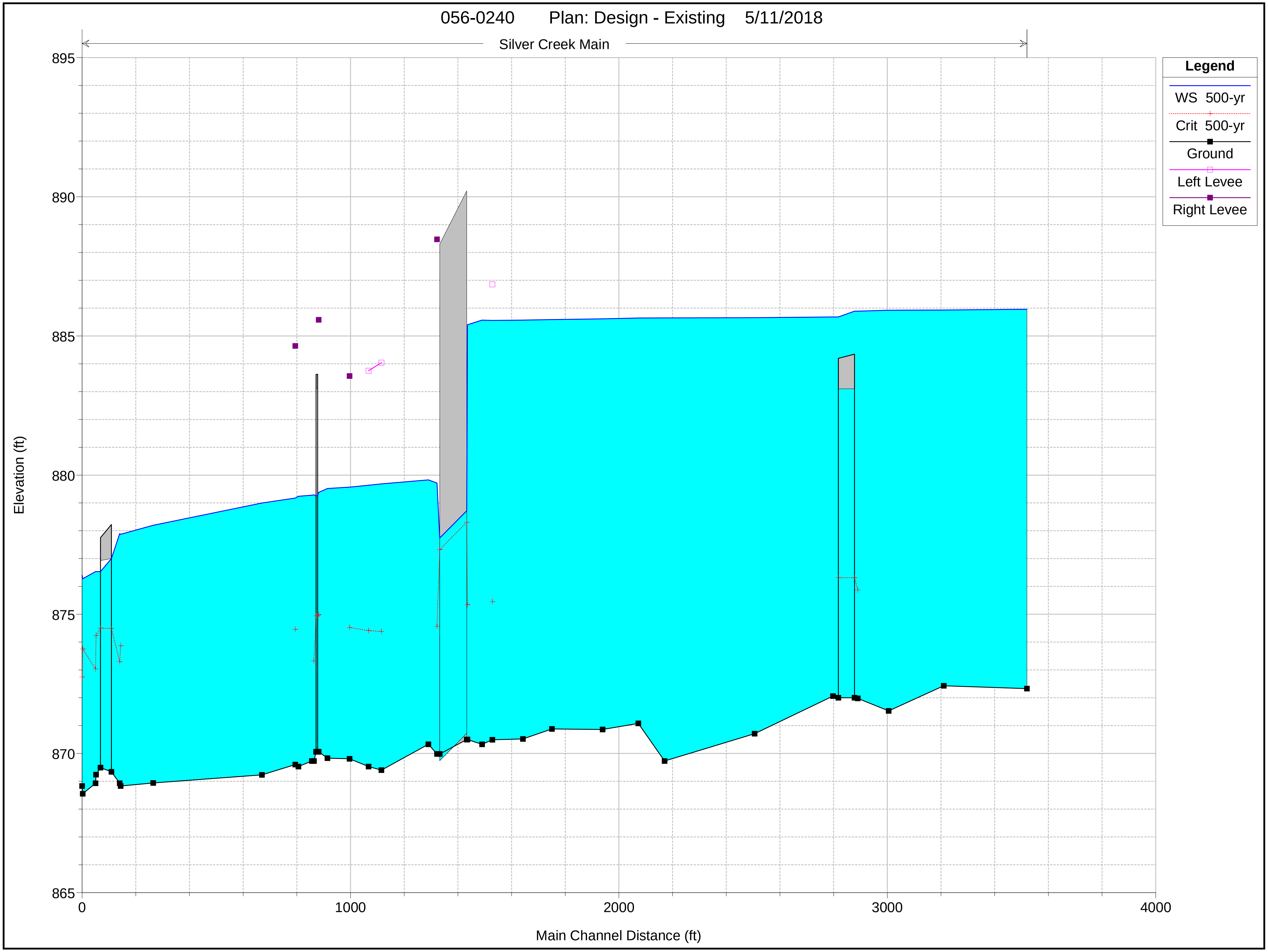
056-0240 Plan: Design - Existing 5/11/2018
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Left Levee
Right Levee
Elevation (ft)
895
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

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                  HEC-RAS Version 4.1.0 Jan 2010
                   U.S. Army Corps of Engineers
                  Hydrologic Engineering Center
                        609 Second Street
                        Davis, California

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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 4:51:30 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	885.96		885.98	0.000071	1.23	1323.38	613.55	0.07
Main	3210	500-yr	830.00	872.43	885.93		885.95	0.000078	1.28	1246.46	613.30	0.08
Main	3005	500-yr	830.00	871.53	885.92		885.94	0.000049	1.07	1550.38	615.04	0.06
Main	2890.1	500-yr	830.00	871.98	885.89	875.87	885.93	0.000148	1.54	560.67	152.39	0.10
Main	2847.6		Bridge									
Main	2797.4	500-yr	830.00	872.06	885.68		885.71	0.000129	1.37	723.07	210.29	0.10
Main	2505.7	500-yr	830.00	870.71	885.66		885.68	0.000070	1.27	757.77	197.45	0.08
Main	2170	500-yr	830.00	869.73	885.65		885.66	0.000033	0.99	1176.67	200.00	0.05
Main	2072.3	500-yr	830.00	871.08	885.65		885.66	0.000033	0.97	1165.20	242.06	0.05
Main	1939	500-yr	830.00	870.86	885.61		885.65	0.000107	1.52	663.53	155.24	0.09
Main	1750.4	500-yr	830.00	870.88	885.59		885.62	0.000112	1.58	548.98	81.48	0.09
Main	1642.6	500-yr	830.00	870.52	885.57		885.61	0.000125	1.67	515.95	92.04	0.10
Main	1528.6	500-yr	830.00	870.49	885.56	875.45	885.60	0.000118	1.56	533.40	69.37	0.09
Main	1490	500-yr	830.00	870.33	885.57		885.59	0.000046	1.16	868.79	200.00	0.06
Main	1435.9	500-yr	830.00	870.50	885.40	875.34	885.57	0.000253	3.27	253.70	56.44	0.15
Main	1382.75		Culvert									
Main	1322.2	500-yr	830.00	869.98	879.72	874.57	880.11	0.001020	5.02	165.36	64.25	0.29
Main	1290	500-yr	830.00	870.33	879.83		879.95	0.000551	2.75	302.24	50.36	0.20
Main	1115.3	500-yr	830.00	869.40	879.68	874.38	879.83	0.000726	3.05	272.40	46.22	0.22
Main	1067.3	500-yr	830.00	869.53	879.64	874.41	879.79	0.000770	3.14	264.15	44.46	0.23
Main	996.6	500-yr	830.00	869.81	879.57	874.52	879.73	0.000859	3.26	254.50	43.04	0.24
Main	914	500-yr	950.00	869.83	879.52		879.66	0.000676	3.04	312.09	51.10	0.22
Main	881.45	500-yr	950.00	870.06	879.38	874.99	879.63	0.001012	4.00	237.22	46.00	0.27
Main	874.6		Bridge									
Main	864	500-yr	950.00	869.73	879.29	873.32	879.53	0.001154	3.94	240.84	25.97	0.23

Main	856	500-yr	950.00	869.73	879.28		879.52	0.002437	3.95	240.48	25.97	0.23
Main	806	500-yr	950.00	869.53	879.24		879.38	0.001410	3.04	313.01	51.17	0.22
Main	794.4	500-yr	950.00	869.60	879.18	874.46	879.35	0.001940	3.37	282.16	50.09	0.25
Main	670	500-yr	950.00	869.23	879.00		879.14	0.001372	3.00	316.17	51.41	0.21
Main	265	500-yr	950.00	868.94	878.20		878.41	0.002385	3.71	255.82	45.46	0.28
Main	143.5	500-yr	950.00	868.83	877.87	873.87	878.11	0.002643	3.87	250.21	62.99	0.29
Main	140	500-yr	950.00	868.93	877.90	873.30	878.08	0.001973	3.44	276.35	48.32	0.25
Main	89		Bridge									
Main	51.9	500-yr	950.00	869.24	876.53	874.24	877.02	0.006971	5.61	169.30	37.94	0.45
Main	50	500-yr	950.00	868.93	876.53	873.04	877.00	0.005533	5.48	173.90	32.07	0.38
Main	2.5	500-yr	950.00	868.55	876.28	873.75	876.70	0.006034	5.25	183.34	48.33	0.43
Main	0	500-yr	950.00	868.83	876.41	872.75	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	500-yr	885.98	885.96	0.02	0.02	0.00		629.84	200.16	613.55
Main	3210	500-yr	885.95	885.93	0.02	0.01	0.00		648.60	181.40	613.30
Main	3005	500-yr	885.94	885.92	0.01	0.01	0.00		596.59	233.41	615.04
Main	2890.1	500-yr	885.93	885.89	0.04			3.64	823.72	2.64	152.39
Main	2847.6		Bridge								
Main	2797.4	500-yr	885.71	885.68	0.03	0.03	0.00	43.50	761.55	24.95	210.29
Main	2505.7	500-yr	885.68	885.66	0.02	0.02	0.00	10.36	795.62	24.02	197.45
Main	2170	500-yr	885.66	885.65	0.01	0.00	0.00	12.27	542.34	275.39	200.00
Main	2072.3	500-yr	885.66	885.65	0.01	0.01	0.00	6.88	581.10	242.03	242.06
Main	1939	500-yr	885.65	885.61	0.03	0.02	0.00		757.71	72.29	155.24
Main	1750.4	500-yr	885.62	885.59	0.04	0.01	0.00		817.59	12.41	81.48
Main	1642.6	500-yr	885.61	885.57	0.04	0.01	0.00	0.20	823.88	5.92	92.04
Main	1528.6	500-yr	885.60	885.56	0.04	0.00	0.01		829.55	0.45	69.37
Main	1490	500-yr	885.59	885.57	0.02	0.00	0.01	13.37	628.15	188.49	200.00
Main	1435.9	500-yr	885.57	885.40	0.17				830.00		56.44
Main	1382.75		Culvert								
Main	1322.2	500-yr	880.11	879.72	0.39	0.02	0.14		830.00		64.25
Main	1290	500-yr	879.95	879.83	0.12	0.11	0.01		830.00		50.36
Main	1115.3	500-yr	879.83	879.68	0.14	0.04	0.00		830.00		46.22
Main	1067.3	500-yr	879.79	879.64	0.15	0.06	0.00		830.00		44.46
Main	996.6	500-yr	879.73	879.57	0.17	0.06	0.01		830.00		43.04
Main	914	500-yr	879.66	879.52	0.14	0.03	0.01		950.00		51.10
Main	881.45	500-yr	879.63	879.38	0.25	0.00	0.03		950.00		46.00
Main	874.6		Bridge								
Main	864	500-yr	879.53	879.29	0.24	0.01	0.00		950.00		25.97
Main	856	500-yr	879.52	879.28	0.24	0.09	0.05		950.00		25.97
Main	806	500-yr	879.38	879.24	0.14	0.02	0.01		950.00		51.17
Main	794.4	500-yr	879.35	879.18	0.18	0.20	0.01		950.00		50.09
Main	670	500-yr	879.14	879.00	0.14	0.72	0.01		950.00		51.41
Main	265	500-yr	878.41	878.20	0.21	0.30	0.00		950.00		45.46
Main	143.5	500-yr	878.11	877.87	0.23	0.01	0.01		947.51	2.49	62.99
Main	140	500-yr	878.08	877.90	0.18				950.00		48.32
Main	89		Bridge								
Main	51.9	500-yr	877.02	876.53	0.49	0.01	0.01		950.00		37.94
Main	50	500-yr	877.00	876.53	0.47	0.27	0.02	0.12	949.80	0.08	32.07
Main	2.5	500-yr	876.70	876.28	0.43	0.01	0.14		948.18	1.82	48.33
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

```
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ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design - Exist

River: Silver Creek  Reach: Main     RS: 3520     Profile: 500-yr
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: Silver Creek  Reach: Main     RS: 3210     Profile: 500-yr
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: Silver Creek  Reach: Main     RS: 3005     Profile: 500-yr
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 500-yr
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
     Note:   The downstream water surface is above the minimum elevation required for orifice flow.  The orifice flow equation was
             used for pressure flow.
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 500-yr Upstream
     Note:   For the cross section inside the bridge at the upstream end, the water surface and energy have been projected from
             the upstream cross section.  The selected bridge modeling method does not compute answers inside the bridge.
River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 500-yr Downstream
     Note:   For the cross section inside the bridge at the downstream end, the water surface and energy have been projected from
             the downstream cross section.  The selected bridge modeling method does not compute answers inside the bridge.
River: Silver Creek  Reach: Main     RS: 2797.4     Profile: 500-yr
     Warning:Divided flow computed for this cross-section.
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: Silver Creek  Reach: Main     RS: 2505.7     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 2170     Profile: 500-yr
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1490     Profile: 500-yr
     Warning:The cross-section end points had to be extended vertically for the computed water surface.
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1322.2     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
```

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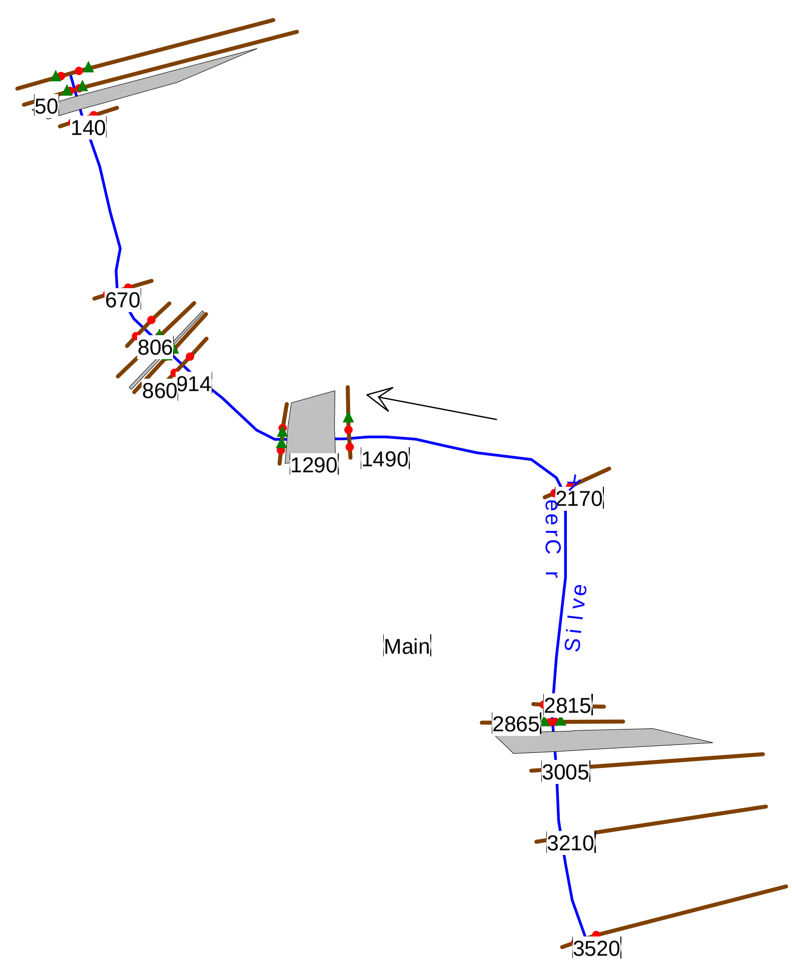
            used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
            bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
            answer has been disregarded.
     Note:   The downstream water surface is below the minimum elevation for pressure flow.  The sluice gate equations were used
            for pressure flow.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
            used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 500-yr
     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.
```

EXHIBIT J

PROPOSED CONDITIONS HYDRAULIC MODEL AND RESULTS

PROPOSED CONDITIONS - PERMIT MODEL



None of the XS's are Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/9/2017 4:40:16 PM

Project in English units

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PLAN DATA

Plan Title: Proposed - FIS
Plan File : e:\0829\HECRAS\056-0240.p09

Geometry Title: FIS-Proposed (NAVD88)
Geometry File : e:\0829\HECRAS\056-0240.g06

Flow Title   : FIS - NAVD88
Flow File   : e:\0829\HECRAS\056-0240.f02

```
Plan Summary Information:
Number of:  Cross Sections =   16    Multiple Openings  =    0
            Culverts       =    0    Inline Structures  =    0
            Bridges        =    4    Lateral Structures =    0

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

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

****

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Main	3520	320	510	600	830
Silver Creek	Main	914	365	575	680	950

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
*******************************************************************************************************
* Silver Creek    Main           10-yr           *        Known WS = 878.24        Known WS = 874.11 *
* Silver Creek    Main           50-yr           *        Known WS = 880.29        Known WS = 875.18 *
* Silver Creek    Main           100-yr          *        Known WS = 881.21        Known WS = 875.58 *
* Silver Creek    Main           500-yr          *        Known WS = 883.85        Known WS = 876.41 *
*******************************************************************************************************

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

GEOMETRY DATA

Geometry Title: FIS-Proposed (NAVD88)
Geometry File : e:\0829\HECRAS\056-0240.g06

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
```

```
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              140     140     140             .1       .3

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 2925

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS =      50
Deck/Roadway Width        =      60
Weir Coefficient          =     2.5
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   923.5  887.43   963.5  886.93  991.85  871.53 1008.15  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Coeff Contr.   Expan.
         963.5  1026.5             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  799.85  888.43       0  899.85  886.23       0  965.85  884.63       0
  991.85  884.13       0  991.85  884.13  882.63    1000  884.13  882.63
 1008.15  884.13  882.63 1008.15  884.13       0 1029.85  884.03       0
 1099.85  883.73       0 1199.85  884.33       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        991.85 1008.15             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

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

```
Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 871.7
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 871.7
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 60
    Centroid station of bridge opening = 1000
    Wing Wall Type                     = Angular wing walls
       Width                           = 18
       Angle                           = 30
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
       Angle                           =
    Optional Contraction and expansion coefficients
      At approach Section
      At upstream inside (BU)
      At downstream inside (BD)
    Piers are Continuous for the width of the bridge
    Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 2865

INPUT
Description: FEMA FIS Sta. 5.454
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  799.85  888.43  899.85  886.23  965.85  884.63  991.85  882.63  991.85  871.33
 1008.15  871.33 1008.15  882.63 1029.85  884.03 1099.85  883.73 1199.85  884.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  799.85     .05  991.85     .04 1008.15     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        991.85 1008.15               50      50      50             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  799.85     977  885.66       T
    1023 1199.85  885.66       T

CROSS SECTION
```

```
RIVER: Silver Creek
REACH: Main               RS: 2815

INPUT
Description: FEMA FIS Sta. 5.445
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  885.83   969.5  885.03   993.5  871.23  1006.5  871.23  1018.5  879.53
  1039.5  880.93  1139.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              645     645     645              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.63  1006.5  869.73  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              680     680     680              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.33  1006.5  870.33  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              200     200     200              .3       .5
Ineffective Flow     num=        1
   Sta L   Sta R    Elev  Permanent
    1050  1139.5  890.14       T

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 1390

INPUT
Description: IL 47 Culvert (modeled as bridge in FIS study)
Distance from Upstream XS =      42
```

Deck/Roadway Width = 142.7
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
858	893.92	845	908	892.8	845	958	891.68	845
992	891	845	992	891	878.75	1000	890.84	878.75
1008	890.68	878.75	1008	890.68	845	1058	890.04	845
1108	889.72	845	1158	889.47	845			

Upstream Bridge Cross Section Data
Station Elevation Data num= 7

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
939.5	884.33	969.5	883.53	992	870.75	1008	870.75	1018.5	878.03
1039.5	879.43	1139.5	883.23						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
939.5	.05	969.5	.04	992	.012	1008	.04	1018.5	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
969.5	1018.5	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1050	1139.5	890.14	T

Downstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
858	893.92	845	908	892.8	845	958	891.68	845
992	891	845	992	891	877.5	1000	890.84	877.5
1008	890.68	877.5	1008	890.68	845	1058	890.04	845
1108	889.72	845	1158	889.47	845			

Downstream Bridge Cross Section Data
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
929	885.93	967	883.43	992	869.5	1008	869.5	1030	882.73
1099	885.33								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
929	.05	967	.04	992	.012	1008	.04	1030	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
967	1030	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
929	984	891	T
1016	1099	890.44	T

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

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Selected Low Flow Methods = Energy

High Flow Method
Energy Only

Additional Bridge Parameters

```
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     993  870.53    1007  870.33    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              376     376     376              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     984     891       T
    1016    1099  890.44       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.43     967  882.93     993  870.03    1007  869.83    1030  882.23
    1099  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030               50      50      50              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 864

INPUT
Description: FEMA FIS Sta 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               58      58      58              .5       .3
```

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986.75	883.73	T
1013.25	1150	883.73	T

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 860

INPUT
Description: Pedestrian bridge
Distance from Upstream XS = 10
Deck/Roadway Width = 8
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
850	884.43	0	964	883.83	0	986.75	883.73	0
986.75	883.73	882.53	987.8	883.73	882.53	1012.2	883.73	882.53
1013.25	883.73	882.53	1013.25	883.73	0	1029	883.93	0
1150	885.43	0						

Upstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	884.43	964	883.83	986.75	882.53	987.8	869.73	1012.2	869.73
1013.25	882.53	1029	883.93	1150	885.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.05	986.75	.04	1013.25	.05

Bank Sta: Left	Right	Coeff Contr.	Expan.
986.75	1013.25	.5	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986.75	883.73	T
1013.25	1150	883.73	T

Downstream Deck/Roadway Coordinates
num= 10

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
850	884.43	0	964	883.83	0	986.75	883.73	0
986.75	883.73	882.53	987.8	883.73	882.53	1012.2	883.73	882.53
1013.25	883.73	882.53	1013.25	883.73	0	1029	883.93	0
1150	885.43	0						

Downstream Bridge Cross Section Data
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	884.43	964	883.83	986.75	882.53	987.8	869.73	1012.2	869.73
1013.25	882.53	1029	883.93	1150	885.43				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.75	.058	1013.25	.07

Bank Sta: Left	Right	Coeff Contr.	Expan.
986.75	1013.25	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	986	883.66	T
1014	1150	883.66	T

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

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               50      50      50             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     986  883.66       T
    1014    1150  883.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.13     967  882.63     993  869.73    1007  869.53    1030  881.93
    1099  884.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              136     136     136             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 670
```

```
INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030              530     530     530              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030               90      90      90              .1       .3

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 90

INPUT
Description: Melody St Bridge (modeled as bridge in FIS study)
Distance from Upstream XS =      30
Deck/Roadway Width        =      40
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     850  881.53  881.53     967  877.53  876.33   986.8  877.53  876.33
   990.5  877.53  876.33  1009.5  877.53  876.33  1013.2  877.53  876.33
    1027  877.53  876.33    1150  877.43  877.43    1650  879.83  879.83

Upstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.53     967  882.03     993  869.13    1007  868.93    1030  881.33
    1099  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .1       .3

Downstream  Deck/Roadway Coordinates
    num=       9
```

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
850	881.53	881.53	967	877.53	876.33	986.8	877.53	876.33
990.5	877.53	876.33	1009.5	877.53	876.33	1013.2	877.53	876.33
1027	877.53	876.33	1150	877.43	877.43	1650	879.83	879.83

Downstream Bridge Cross Section Data
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
850	881.53	967	877.53	986.8	876.33	990.5	868.93	1009.5	868.93
1013.2	876.33	1027	877.53	1150	877.43	1650	879.83		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
850	.07	986.8	.058	1013.2	.07

Bank Sta: Left	Right	Coeff Contr.	Expan.
986.8	1013.2	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
850	977	879.66	T
1023	1650	879.66	T

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

Number of Bridge Coefficient Sets = 1

Low Flow Methods and Data
Energy
Momentum Cd = 2
W.S. Pro Method

W.S.Pro Data
Left Embankment
El of the top of the embankment = 877.7
El of the toe of the abutment = 869.1
Right Embankment
El of the top of the embankment = 877.7
El of the toe of the abutment = 869.1
Abutment Type = 1 Vert. abutments and vert. embankments with or without wingwalls
Slope of abutments =
Top with of embankment = 42
Centroid station of bridge opening = 1000
Wing Wall Type = No wing walls present
Width =
Angle =
Radius =
Guide Banks Type = No Guide Bank present
Length =
Offset =
Angle =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
Pressure and Weir flow
Submerged Inlet Cd =
Submerged Inlet + Outlet Cd = .8
Max Low Cord =

Additional Bridge Parameters
Add Friction component to Momentum
Do not add Weight component to Momentum
Class B flow critical depth computations use critical depth
inside the bridge at the upstream end
Criteria to check for pressure flow = Upstream energy grade line

```
CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data    num=       9
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  881.53     967  877.53   986.8  876.33   990.5  868.93  1009.5  868.93
  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         986.8  1013.2                50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977  879.66       T
    1023    1650  879.66       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     839  879.83     968  876.33     992  868.83    1008  869.13    1021  874.33
    1064  874.33    1072  875.53    1589  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     839     .07     968    .058    1021     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           968    1021                 0       0       0              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     839     952  879.66       T
    1048    1589  879.66       T

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


SUMMARY OF MANNING'S N VALUES

River:Silver Creek
*****************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *
*****************************************************************
*Main            *    3520        *     .065*      .04*     .065*
*Main            *    3210        *     .065*      .04*     .065*
*Main            *    3005        *     .065*      .04*     .065*
*Main            *    2925        *Bridge   *         *         *
*Main            *    2865        *      .05*      .04*      .05*
*Main            *    2815        *      .05*      .04*      .05*
*Main            *    2170        *      .05*      .04*      .05*
*Main            *    1490        *      .05*      .04*      .05*
*Main            *    1390        *Bridge   *         *         *
*Main            *    1290        *      .05*      .04*      .05*
*Main            *    914         *      .05*      .04*      .05*
*Main            *    864         *      .05*      .04*      .05*
*Main            *    860         *Bridge   *         *         *
*Main            *    856         *      .07*     .058*      .07*
*Main            *    806         *      .07*     .058*      .07*
```

*Main	* 670	*	.07*	.058*	.07*
*Main	* 140	*	.07*	.058*	.07*
*Main	* 90	*Bridge	*	*	*
*Main	* 50	*	.07*	.058*	.07*
*Main	* 0	*	.07*	.058*	.07*

SUMMARY OF REACH LENGTHS

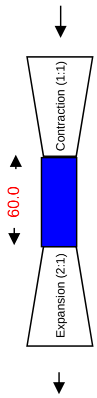
River: Silver Creek

* Reach	* River Sta.	* Left	* Channel	* Right *
*Main	* 3520	* 310*	310*	310*
*Main	* 3210	* 205*	205*	205*
*Main	* 3005	* 140*	140*	140*
*Main	* 2925	*Bridge *	*	*
*Main	* 2865	* 50*	50*	50*
*Main	* 2815	* 645*	645*	645*
*Main	* 2170	* 680*	680*	680*
*Main	* 1490	* 200*	200*	200*
*Main	* 1390	*Bridge *	*	*
*Main	* 1290	* 376*	376*	376*
*Main	* 914	* 50*	50*	50*
*Main	* 864	* 58*	58*	58*
*Main	* 860	*Bridge *	*	*
*Main	* 856	* 50*	50*	50*
*Main	* 806	* 136*	136*	136*
*Main	* 670	* 530*	530*	530*
*Main	* 140	* 90*	90*	90*
*Main	* 90	*Bridge *	*	*
*Main	* 50	* 50*	50*	50*
*Main	* 0	* 0*	0*	0*

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

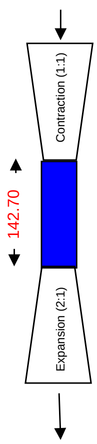
* Reach	* River Sta.	* Contr.	* Expan. *
*Main	* 3520	* .1*	.3*
*Main	* 3210	* .1*	.3*
*Main	* 3005	* .1*	.3*
*Main	* 2925	*Bridge *	*
*Main	* 2865	* .3*	.5*
*Main	* 2815	* .1*	.3*
*Main	* 2170	* .1*	.3*
*Main	* 1490	* .3*	.5*
*Main	* 1390	*Bridge *	*
*Main	* 1290	* .3*	.5*
*Main	* 914	* .1*	.3*
*Main	* 864	* .5*	.3*
*Main	* 860	*Bridge *	*
*Main	* 856	* .3*	.5*
*Main	* 806	* .1*	.3*
*Main	* 670	* .1*	.3*
*Main	* 140	* .1*	.3*
*Main	* 90	*Bridge *	*
*Main	* 50	* .3*	.5*
*Main	* 0	* .3*	.5*

St. Johns Rd. - FEMA FIS Model



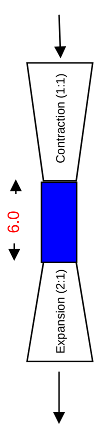
R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	Ineffective Area Offsets RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
3520.0	565.0	1000	**427.0**	**1573.0**	310.0	991.85	1008.15		3520.0
3210.0	255.0	1000	**737.0**	**1263.0**	205.0	991.85	1008.15		3210.0
3005.0	50.0	1000	**942.0**	**1058.0**	140.0	991.85	1008.15		3005.0
2955.0		1000.0	**991.9**	**1008.2**	50.0	991.85	1008.15		2973.0
2925.0									2925.0
2895.0		1000.0	**991.9**	**1008.2**	30.0	991.85	1008.15		2914.0
2865.0	15.0	1000	**977.0**	**1023.0**	50.0	991.85	1008.15		2865.0
2815.0	40.0	1000	**952.0**	**1048.0**	645.0	991.85	1008.15		2815.0
2170.0	362.5	1000	**629.0**	**1371.0**	2170.0	991.85	1008.15		2170.0

Proposed IL 47 - Proposed Design



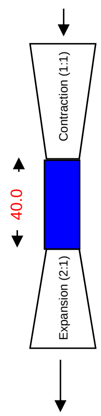
R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	Ineffective Area Offsets RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
2170.0	722.0	1000	**270.0**	**1730.0**	680.0	992	1008		2170.0
1490.0	42.0	1000	**950.0**	**1050.0**	200.0	992	1008		1490.0
1448.0		1000.0	**992.0**	**1008.0**	42.0	992.0	1008.0		1448.0
1374.40									1374.40
1305.3		1000.0	**992.0**	**1008.0**	15.3	992.0	1008.0		1305.3
1290.0	7.6	1000	**984.0**	**1016.0**	1290.0	992	1008		1290.0

Footbridge - FEMA FIS Model

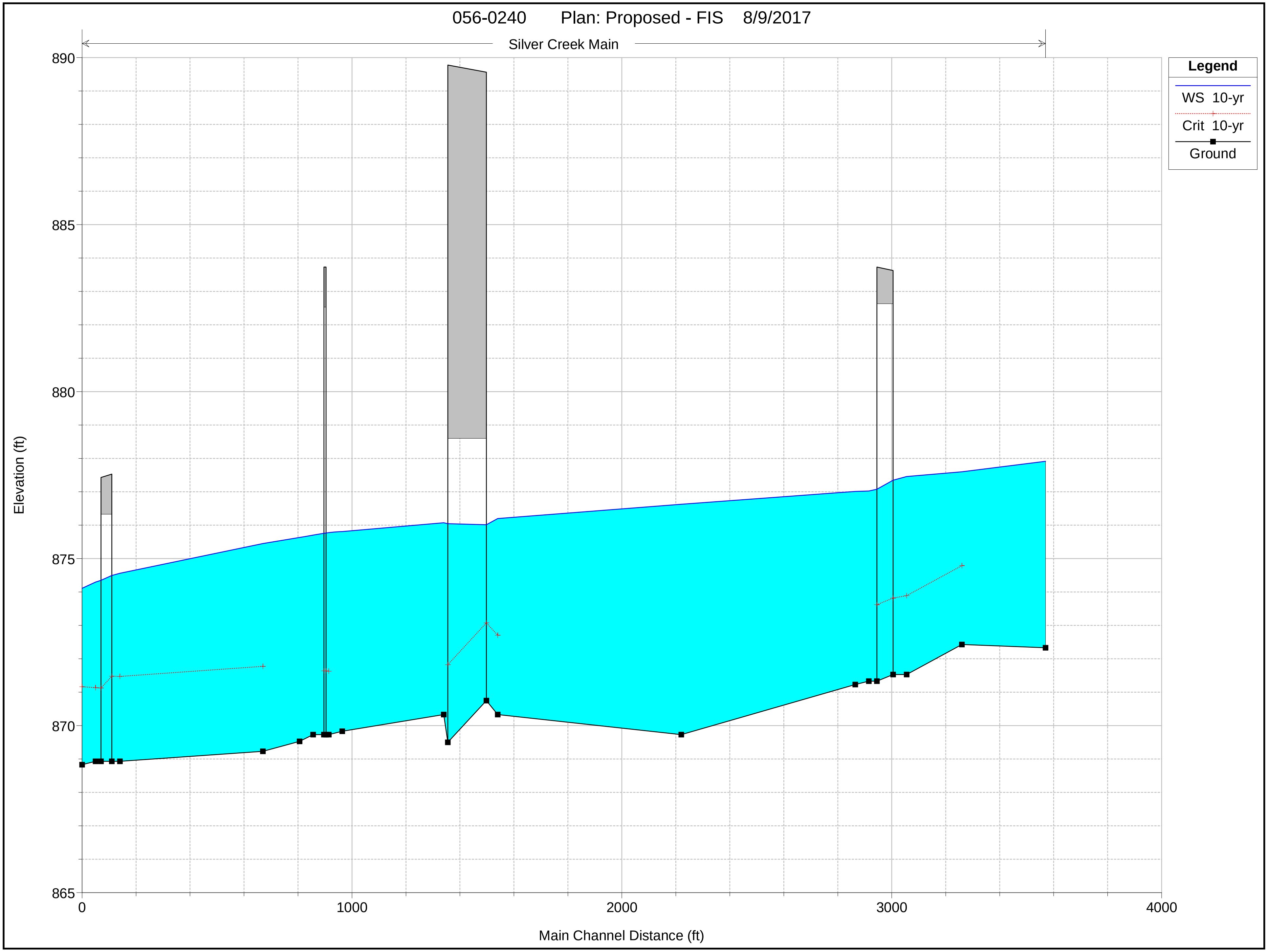


R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	Ineffective Area Offsets RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
914.0	50.0	1000	**937.0**	**1063.0**	58.0	986.75	1013.25		914.0
864.0		1000.0	**986.8**	**1013.3**	50.0	986.75	1013.25		864.0
861.0									861.0
858.0		1000.0	**986.8**	**1013.3**	2.0	986.75	1013.25		858.0
856.0	1.0	1000	**986.0**	**1014.0**	50.0	986.75	1013.25		856.0
806.0	26.0	1000	**961.0**	**1039.0**	136.0	986.75	1013.25		806.0
670.0	94.0	1000	**893.0**	**1107.0**	670.0	986.75	1013.25		670.0

Melody Rd. - FEMA FIS Model



R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
265.0	155.0	1000	**832.0**	**1168.0**	125.0	986.8	1013.2		265.0
140.0	30.0	1000	**957.0**	**1043.0**	90.0	986.8	1013.2		140.0
110.0		1000.0	**986.8**	**1013.2**	30.0	986.8	1013.2		110.0
90.0									90.0
70.0		1000.0	**986.8**	**1013.2**	20.0	986.8	1013.2		70.0
50.0	10.0	1000	**977.0**	**1023.0**	50.0	986.8	1013.2		50.0
0.0	35.0	1000	**952.0**	**1048.0**	0.0	986.8	1013.2		0.0


056-0240 Plan: Proposed - FIS 8/9/2017
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                 HEC-RAS Version 4.1.0 Jan 2010
                  U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California

    X     X  XXXXXX    XXXX        XXXX      XX      XXXX
    X     X  X        X    X       X   X    X  X    X
    X     X  X        X            X   X   X    X   X
    XXXXXXX  XXXX     X       XXX  XXXX    XXXXXX    XXXX
    X     X  X        X            X  X    X    X        X
    X     X  X        X    X       X   X   X    X        X
    X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/9/2017 4:40:16 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	877.91		878.01	0.000808	2.47	129.64	33.43	0.22
Main	3210	10-yr	320.00	872.43	877.60	874.79	877.72	0.001095	2.76	116.06	31.91	0.25
Main	3005	10-yr	320.00	871.53	877.46	873.89	877.54	0.000639	2.26	141.31	34.68	0.20
Main	2925		Bridge									
Main	2865	10-yr	320.00	871.33	877.02		877.21	0.001719	3.45	92.78	16.30	0.25
Main	2815	10-yr	320.00	871.23	877.01		877.11	0.000789	2.49	128.35	31.41	0.22
Main	2170	10-yr	320.00	869.73	876.63		876.70	0.000507	2.11	151.62	34.13	0.18
Main	1490	10-yr	320.00	870.33	876.20	872.71	876.29	0.000709	2.38	134.50	32.82	0.21
Main	1390		Bridge									
Main	1290	10-yr	320.00	870.33	876.07		876.16	0.000599	2.31	138.65	35.83	0.20
Main	914	10-yr	365.00	869.83	875.81		875.90	0.000742	2.45	149.08	36.73	0.21
Main	864	10-yr	365.00	869.73	875.77	871.63	875.87	0.000645	2.43	150.49	25.39	0.18
Main	860		Bridge									
Main	856	10-yr	365.00	869.73	875.70		875.80	0.001407	2.46	148.64	25.38	0.18
Main	806	10-yr	365.00	869.53	875.63		875.72	0.001434	2.37	153.74	37.22	0.21
Main	670	10-yr	365.00	869.23	875.45	871.77	875.53	0.001329	2.31	158.07	37.67	0.20
Main	140	10-yr	365.00	868.93	874.56	871.47	874.67	0.001983	2.67	136.57	35.39	0.24
Main	90		Bridge									
Main	50	10-yr	365.00	868.93	874.30	871.14	874.34	0.002568	3.14	116.38	24.37	0.25
Main	0	10-yr	365.00	868.83	874.11	871.16	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width

			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Main	3520	10-yr	878.01	877.91	0.09	0.29	0.00		320.00		33.43
Main	3210	10-yr	877.72	877.60	0.12	0.17	0.01		320.00		31.91
Main	3005	10-yr	877.54	877.46	0.08				320.00		34.68
Main	2925		Bridge								
Main	2865	10-yr	877.21	877.02	0.18	0.06	0.04		320.00		16.30
Main	2815	10-yr	877.11	877.01	0.10	0.40	0.01		320.00		31.41
Main	2170	10-yr	876.70	876.63	0.07	0.40	0.00		320.00		34.13
Main	1490	10-yr	876.29	876.20	0.09	0.01	0.04		320.00		32.82
Main	1390		Bridge								
Main	1290	10-yr	876.16	876.07	0.08	0.25	0.00		320.00		35.83
Main	914	10-yr	875.90	875.81	0.09	0.03	0.00		365.00		36.73
Main	864	10-yr	875.87	875.77	0.09				365.00		25.39
Main	860		Bridge								
Main	856	10-yr	875.80	875.70	0.09	0.07	0.00		365.00		25.38
Main	806	10-yr	875.72	875.63	0.09	0.19	0.00		365.00		37.22
Main	670	10-yr	875.53	875.45	0.08	0.86	0.00		365.00		37.67
Main	140	10-yr	874.67	874.56	0.11	0.06	0.00		365.00		35.39
Main	90		Bridge								
Main	50	10-yr	874.34	874.30	0.17	0.13	0.00		365.00		24.37
Main	0	10-yr	874.19	874.11	0.08				365.00		45.35

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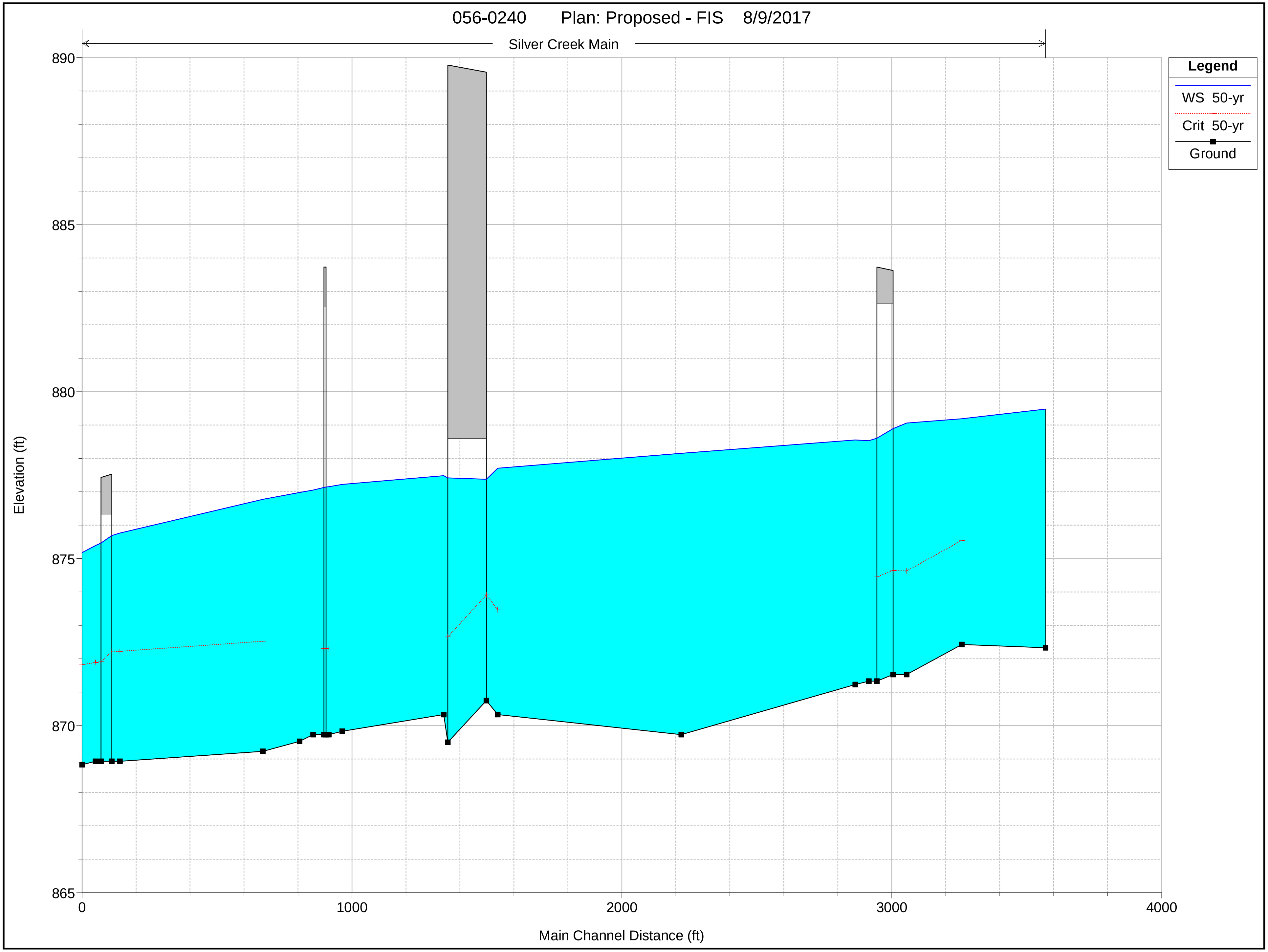
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed-Permit

River: Silver Creek Reach: Main   RS: 2865   Profile: 10-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1490   Profile: 10-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1390   Profile: 10-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1390   Profile: 10-yr Downstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 860   Profile: 10-yr Upstream
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.


056-0240 Plan: Proposed - FIS 8/9/2017
Silver Creek Main
Legend
WS 50-yr
Crit 50-yr
Ground
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

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                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

    X     X  XXXXXX    XXXX        XXXX       XX      XXXX
    X     X  X       X    X        X   X     X  X    X
    X     X  X       X             X   X    X    X   X
    XXXXXXX  XXXX    X       XXX   XXXX     XXXXXX    XXXX
    X     X  X       X             X  X     X    X        X
    X     X  X       X    X        X   X    X    X        X
    X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/9/2017 4:40:16 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	879.48		879.59	0.000764	2.74	186.29	39.14	0.22
Main	3210	50-yr	510.00	872.43	879.19	875.54	879.33	0.000959	2.98	171.39	37.72	0.25
Main	3005	50-yr	510.00	871.53	879.06	874.63	879.16	0.000617	2.53	201.55	40.54	0.20
Main	2925		Bridge									
Main	2865	50-yr	510.00	871.33	878.53		878.82	0.002289	4.35	117.36	16.30	0.29
Main	2815	50-yr	510.00	871.23	878.55		878.68	0.000789	2.82	180.56	36.32	0.22
Main	2170	50-yr	510.00	869.73	878.15		878.25	0.000544	2.46	207.71	40.85	0.19
Main	1490	50-yr	510.00	870.33	877.71	873.46	877.82	0.000726	2.72	187.72	37.90	0.22
Main	1390		Bridge									
Main	1290	50-yr	510.00	870.33	877.48		877.60	0.000595	2.78	183.73	41.28	0.20
Main	914	50-yr	575.00	869.83	877.22		877.34	0.000773	2.81	204.91	42.21	0.22
Main	864	50-yr	575.00	869.73	877.15	872.30	877.30	0.000878	3.10	185.61	25.62	0.20
Main	860		Bridge									
Main	856	50-yr	575.00	869.73	877.05		877.20	0.001920	3.14	183.02	25.60	0.21
Main	806	50-yr	575.00	869.53	876.98		877.10	0.001573	2.77	207.39	42.43	0.22
Main	670	50-yr	575.00	869.23	876.78	872.53	876.89	0.001493	2.72	211.43	42.80	0.22
Main	140	50-yr	575.00	868.93	875.76	872.22	875.92	0.002245	3.16	181.98	40.05	0.26
Main	90		Bridge									
Main	50	50-yr	575.00	868.93	875.39	871.89	875.49	0.003497	4.00	143.65	25.46	0.30
Main	0	50-yr	575.00	868.83	875.18	871.82	875.29	0.001675	2.67	231.51	97.99	0.23

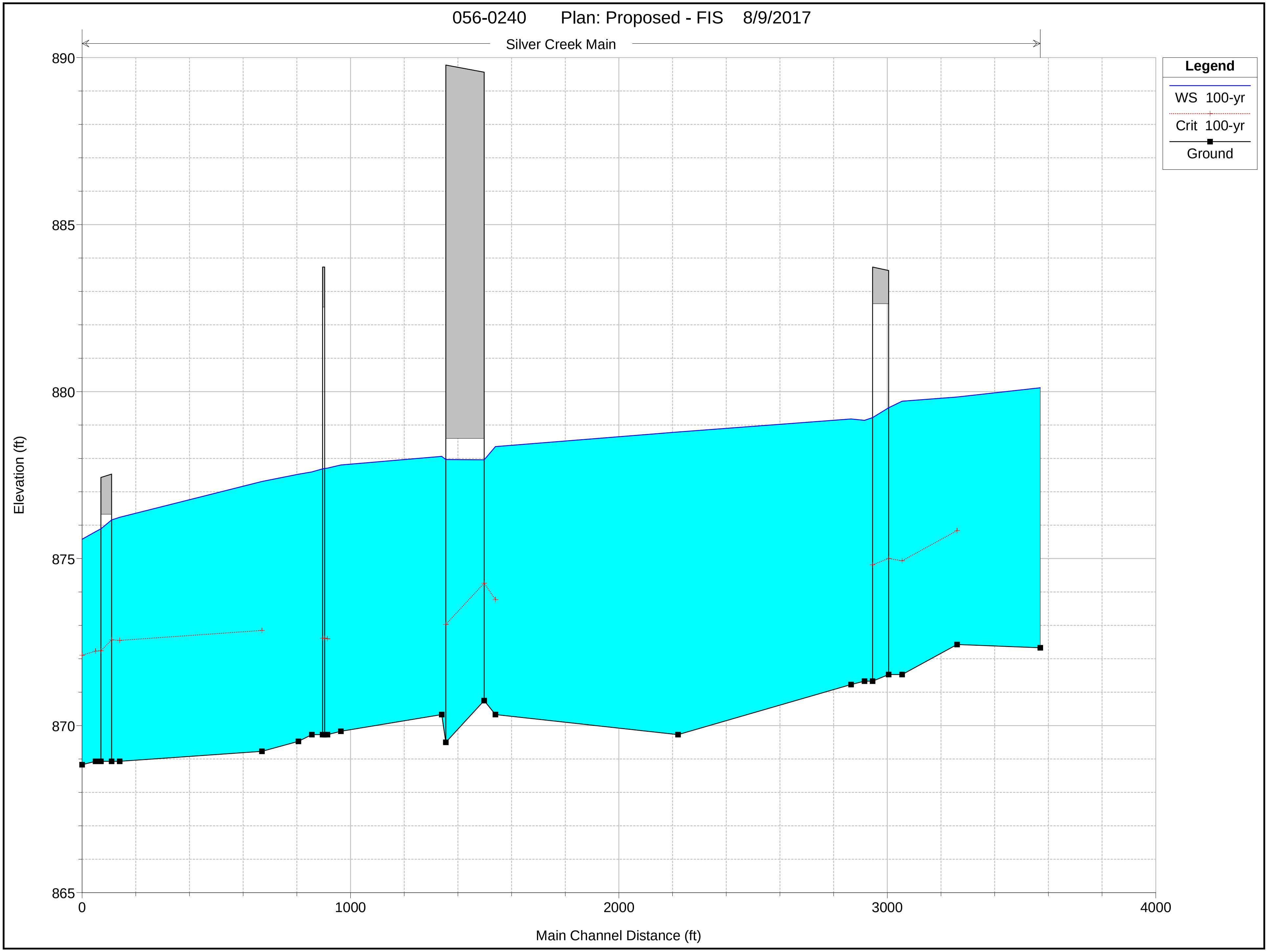
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width

			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Main	3520	50-yr	879.59	879.48	0.12	0.26	0.00		510.00		39.14
Main	3210	50-yr	879.33	879.19	0.14	0.16	0.01		510.00		37.72
Main	3005	50-yr	879.16	879.06	0.10				510.00		40.54
Main	2925		Bridge								
Main	2865	50-yr	878.82	878.53	0.29	0.06	0.08		510.00		16.30
Main	2815	50-yr	878.68	878.55	0.12	0.42	0.01		510.00		36.32
Main	2170	50-yr	878.25	878.15	0.09	0.43	0.00		509.99	0.01	40.85
Main	1490	50-yr	877.82	877.71	0.11	0.01	0.07		510.00		37.90
Main	1390		Bridge								
Main	1290	50-yr	877.60	877.48	0.12	0.26	0.00		510.00		41.28
Main	914	50-yr	877.34	877.22	0.12	0.04	0.00		575.00		42.21
Main	864	50-yr	877.30	877.15	0.15				575.00		25.62
Main	860		Bridge								
Main	856	50-yr	877.20	877.05	0.15	0.09	0.02		575.00		25.60
Main	806	50-yr	877.10	876.98	0.12	0.21	0.00		575.00		42.43
Main	670	50-yr	876.89	876.78	0.11	0.97	0.00		575.00		42.80
Main	140	50-yr	875.92	875.76	0.16	0.07	0.00		575.00		40.05
Main	90		Bridge								
Main	50	50-yr	875.49	875.39	0.28	0.18	0.00		575.00		25.46
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed-Permit

River: Silver Creek Reach: Main RS: 2925 Profile: 50-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the bridge deck. This is not physically possible. Please review your bridge data and results for reasonableness.
River: Silver Creek Reach: Main RS: 2925 Profile: 50-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 2865 Profile: 50-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1490 Profile: 50-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 1390 Profile: 50-yr Downstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main RS: 860 Profile: 50-yr Upstream
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.



056-0240 Plan: Proposed - FIS 8/9/2017
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Elevation (ft)
Main Channel Distance (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

      X     X  XXXXXX    XXXX        XXXX      XX      XXXX
      X     X  X        X    X       X   X    X  X    X
      X     X  X        X            X   X   X    X   X
      XXXXXXX  XXXX     X       XXX  XXXX    XXXXXX    XXXX
      X     X  X        X            X  X    X    X        X
      X     X  X        X    X       X   X   X    X        X
      X     X  XXXXXX    XXXX        X    X  X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/9/2017 4:40:16 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	880.11		880.24	0.000745	2.83	212.03	41.47	0.22
Main	3210	100-yr	600.00	872.43	879.84	875.84	879.98	0.000913	3.05	196.64	40.09	0.24
Main	3005	100-yr	600.00	871.53	879.71	874.93	879.82	0.000606	2.62	228.83	42.93	0.20
Main	2925		Bridge									
Main	2865	100-yr	600.00	871.33	879.14		879.49	0.002545	4.71	127.31	16.30	0.30
Main	2815	100-yr	600.00	871.23	879.18		879.31	0.000784	2.94	204.02	38.32	0.22
Main	2170	100-yr	600.00	869.73	878.79		878.89	0.000533	2.57	237.11	51.58	0.19
Main	1490	100-yr	600.00	870.33	878.35	873.77	878.48	0.000701	2.82	213.68	44.43	0.21
Main	1390		Bridge									
Main	1290	100-yr	600.00	870.33	878.06		878.20	0.000598	2.97	202.29	43.52	0.21
Main	914	100-yr	680.00	869.83	877.80		877.94	0.000790	2.96	230.06	44.45	0.23
Main	864	100-yr	680.00	869.73	877.71	872.60	877.89	0.000994	3.40	199.94	25.71	0.21
Main	860		Bridge									
Main	856	100-yr	680.00	869.73	877.59		877.78	0.002181	3.45	196.97	25.69	0.22
Main	806	100-yr	680.00	869.53	877.53		877.66	0.001641	2.94	231.09	44.54	0.23
Main	670	100-yr	680.00	869.23	877.31	872.85	877.44	0.001570	2.90	234.88	44.87	0.22
Main	140	100-yr	680.00	868.93	876.24	872.55	876.42	0.002384	3.38	201.37	41.88	0.27
Main	90		Bridge									
Main	50	100-yr	680.00	868.93	875.80	872.23	875.93	0.004000	4.41	154.26	25.88	0.32
Main	0	100-yr	680.00	868.83	875.58	872.11	875.70	0.001716	2.82	262.30	107.61	0.23

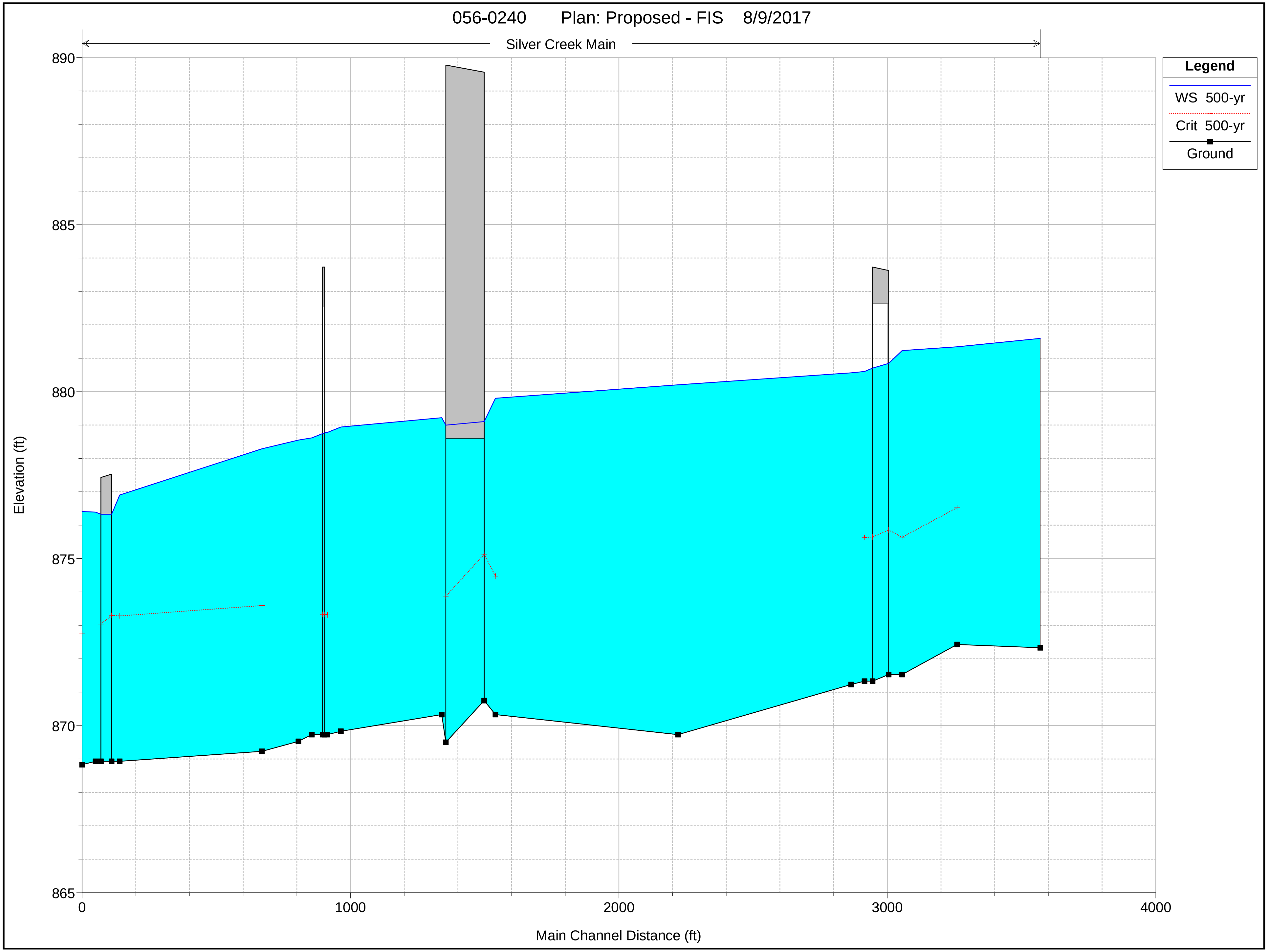
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width

			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Main	3520	100-yr	880.24	880.11	0.12	0.26	0.00		600.00		41.47
Main	3210	100-yr	879.98	879.84	0.14	0.15	0.01		600.00		40.09
Main	3005	100-yr	879.82	879.71	0.11				600.00		42.93
Main	2925		Bridge								
Main	2865	100-yr	879.49	879.14	0.34	0.06	0.11		600.00		16.30
Main	2815	100-yr	879.31	879.18	0.13	0.41	0.01		600.00		38.32
Main	2170	100-yr	878.89	878.79	0.10	0.41	0.00		598.44	1.56	51.58
Main	1490	100-yr	878.48	878.35	0.12	0.01	0.09		599.82	0.18	44.43
Main	1390		Bridge								
Main	1290	100-yr	878.20	878.06	0.14	0.26	0.00		600.00		43.52
Main	914	100-yr	877.94	877.80	0.14	0.04	0.00		680.00		44.45
Main	864	100-yr	877.89	877.71	0.18				680.00		25.71
Main	860		Bridge								
Main	856	100-yr	877.78	877.59	0.19	0.09	0.03		680.00		25.69
Main	806	100-yr	877.66	877.53	0.13	0.22	0.00		680.00		44.54
Main	670	100-yr	877.44	877.31	0.13	1.03	0.00		680.00		44.87
Main	140	100-yr	876.42	876.24	0.18	0.07	0.00		680.00		41.88
Main	90		Bridge								
Main	50	100-yr	875.93	875.80	0.34	0.21	0.00		680.00		25.88
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed-Permit

River: Silver Creek Reach: Main   RS: 2925   Profile: 100-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the bridge deck. This is not physically possible. Please review your bridge data and results for reasonableness.
River: Silver Creek Reach: Main   RS: 2925   Profile: 100-yr Upstream
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 2865   Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1490   Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1390   Profile: 100-yr Upstream
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 860   Profile: 100-yr Upstream
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 670   Profile: 100-yr
     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.



056-0240 Plan: Proposed - FIS 8/9/2017
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Elevation (ft)
865
870
875
880
885
890
Main Channel Distance (ft)
0
1000
2000
3000
4000

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 8/9/2017 4:40:16 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	881.59		881.73	0.000690	2.99	277.36	46.88	0.22
Main	3210	500-yr	830.00	872.43	881.34	876.52	881.50	0.000812	3.18	261.12	45.60	0.23
Main	3005	500-yr	830.00	871.53	881.23	875.64	881.35	0.000568	2.78	298.10	48.47	0.20
Main	2925		Bridge									
Main	2865	500-yr	830.00	871.33	880.60	875.63	880.95	0.003090	5.49	151.13	16.30	0.32
Main	2815	500-yr	830.00	871.23	880.56		880.72	0.000740	3.19	267.15	56.69	0.22
Main	2170	500-yr	830.00	869.73	880.20		880.32	0.000498	2.76	330.14	84.13	0.19
Main	1490	500-yr	830.00	870.33	879.80	874.48	879.94	0.000623	2.99	296.43	72.99	0.21
Main	1390		Bridge									
Main	1290	500-yr	830.00	870.33	879.22		879.40	0.000653	3.47	239.29	48.00	0.22
Main	914	500-yr	950.00	869.83	878.94		879.11	0.000880	3.36	282.99	48.85	0.25
Main	864	500-yr	950.00	869.73	878.78	873.31	879.05	0.001352	4.18	227.49	25.88	0.25
Main	860		Bridge									
Main	856	500-yr	950.00	869.73	878.62		878.90	0.002994	4.25	223.29	25.86	0.26
Main	806	500-yr	950.00	869.53	878.55		878.73	0.001931	3.41	278.60	48.50	0.25
Main	670	500-yr	950.00	869.23	878.29	873.59	878.47	0.001893	3.39	280.63	48.66	0.25
Main	140	500-yr	950.00	868.93	876.90	873.28	877.17	0.003239	4.13	230.10	44.46	0.32
Main	90		Bridge									
Main	50	500-yr	950.00	868.93	876.39		876.88	0.005948	5.60	169.69	28.15	0.39
Main	0	500-yr	950.00	868.83	876.41	872.75	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

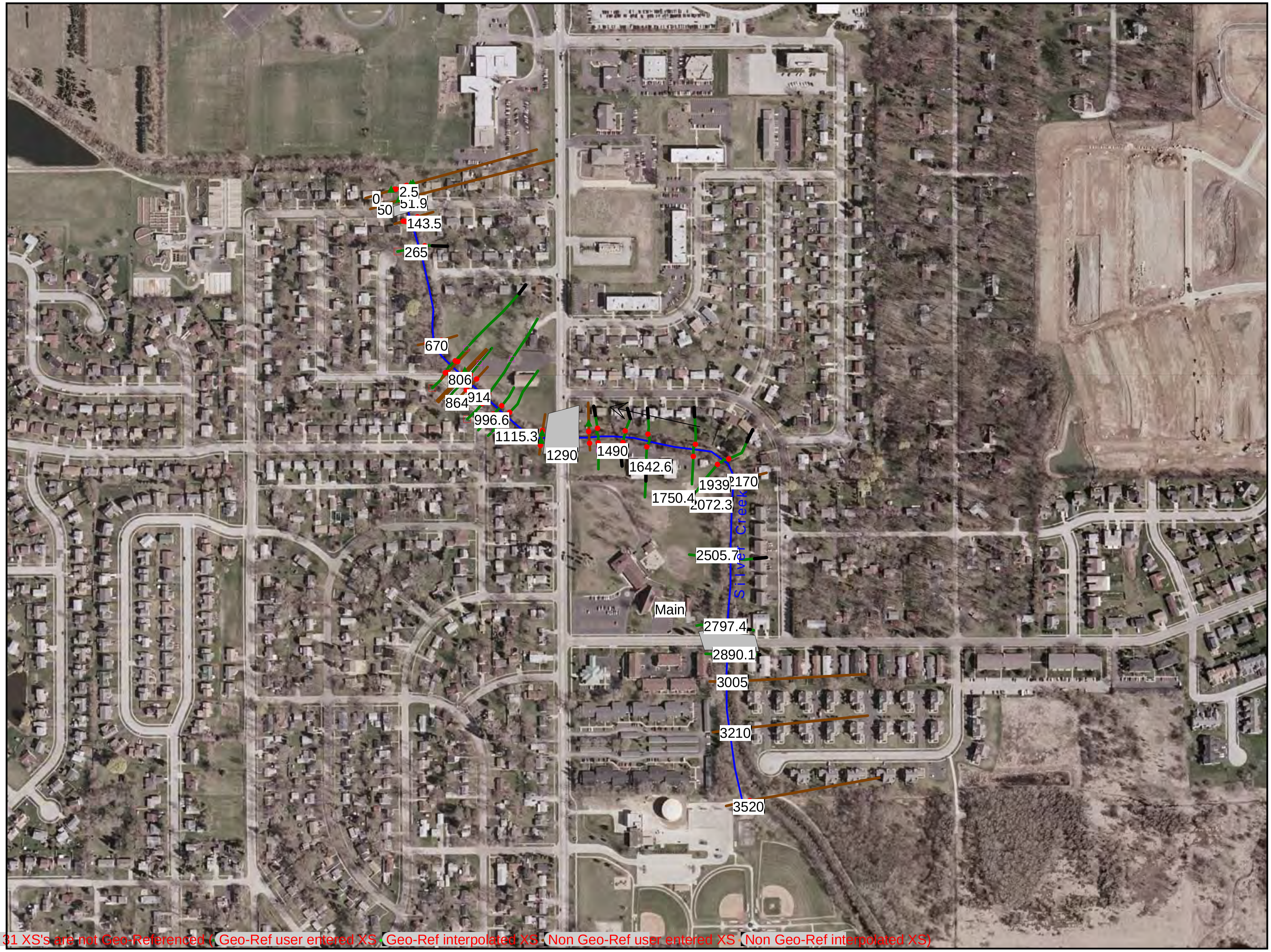
Reach	River Sta	Profile	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width

			(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Main	3520	500-yr	881.73	881.59	0.14	0.23	0.00		830.00		46.88
Main	3210	500-yr	881.50	881.34	0.16	0.14	0.01		830.00		45.60
Main	3005	500-yr	881.35	881.23	0.12	0.04	0.00		830.00		48.47
Main	2925		Bridge								
Main	2865	500-yr	880.95	880.60	0.50	0.16	0.00		830.00		16.30
Main	2815	500-yr	880.72	880.56	0.16	0.39	0.01		825.86	4.14	56.69
Main	2170	500-yr	880.32	880.20	0.12	0.38	0.00		805.40	24.60	84.13
Main	1490	500-yr	879.94	879.80	0.14	0.03	0.15		814.61	15.39	72.99
Main	1390		Bridge								
Main	1290	500-yr	879.40	879.22	0.19	0.29	0.01		830.00		48.00
Main	914	500-yr	879.11	878.94	0.17	0.05	0.01		950.00		48.85
Main	864	500-yr	879.05	878.78	0.27	0.01	0.00		950.00		25.88
Main	860		Bridge								
Main	856	500-yr	878.90	878.62	0.28	0.12	0.05		950.00		25.86
Main	806	500-yr	878.73	878.55	0.18	0.26	0.00		950.00		48.50
Main	670	500-yr	878.47	878.29	0.18	1.29	0.01		950.00		48.66
Main	140	500-yr	877.17	876.90	0.26				950.00		44.46
Main	90		Bridge								
Main	50	500-yr	876.88	876.39	0.49	0.15	0.17	0.01	949.99	0.00	28.15
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed-Permit

River: Silver Creek Reach: Main   RS: 3005   Profile: 500-yr
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 2925   Profile: 500-yr
Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy. This is not physically possible, the momentum answer has been disregarded.
River: Silver Creek Reach: Main   RS: 2925   Profile: 500-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 1490   Profile: 500-yr
Warning:The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 860   Profile: 500-yr Upstream
Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
River: Silver Creek Reach: Main   RS: 90   Profile: 500-yr
Note: Momentum answer is not valid if the water surface is above the low chord or if there is weir flow. The momentum answer has been disregarded.
Note: The downstream water surface is above the minimum elevation required for orifice flow. The orifice flow equation was used for pressure flow.
River: Silver Creek Reach: Main   RS: 50   Profile: 500-yr
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.

PROPOSED CONDITIONS - DESIGN MODEL



14 of the 31 XS's are not Geo-Referenced (Geo-Ref user entered XS Geo-Ref interpolated XS Non Geo-Ref user entered XS Non Geo-Ref interpolated XS)

```
                    HEC-RAS Version 4.1.0 Jan 2010
                     U.S. Army Corps of Engineers
                    Hydrologic Engineering Center
                          609 Second Street
                          Davis, California


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

****

PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 12:01:57 PM

Project in English units

****

PLAN DATA

Plan Title: Design - Proposed
Plan File : e:\0829\HECRAS\056-0240.p07

Geometry Title: Design - Proposed
Geometry File : e:\0829\HECRAS\056-0240.g05

Flow Title   : FIS - NAVD88
Flow File   : e:\0829\HECRAS\056-0240.f02

Plan Summary Information:

Number of:				
	Cross Sections =	31	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	3	Lateral Structures =	0

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

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

****

FLOW DATA

Flow Title: FIS - NAVD88
Flow File : e:\0829\HECRAS\056-0240.f02

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Main	3520	320	510	600	830
Silver Creek	Main	914	365	575	680	950

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
*****************************************************************************************************
* Silver Creek    Main            10-yr            *        Known WS = 878.24        Known WS = 874.11 *
* Silver Creek    Main            50-yr            *        Known WS = 880.29        Known WS = 875.18 *
* Silver Creek    Main            100-yr           *        Known WS = 881.21        Known WS = 875.58 *
* Silver Creek    Main            500-yr           *        Known WS = 883.85        Known WS = 876.41 *
*****************************************************************************************************

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

GEOMETRY DATA

Geometry Title: Design - Proposed
Geometry File : e:\0829\HECRAS\056-0240.g05

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3520

INPUT
Description: FEMA FIS Sta. 5.578
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   923.5  888.23   963.5  887.73   993.5  872.33  1006.5  872.33  1026.5  884.03
  1080.5  884.33  1580.5  884.73

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              310     310     310             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3210

INPUT
Description: FEMA FIS Sta. 5.520
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   923.5  888.33   963.5  887.83   993.5  872.43  1006.5  872.43  1026.5  884.13
  1080.5  884.43  1580.5  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5              205     205     205             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 3005

INPUT
Description: FEMA FIS Sta. 5.475
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
   923.5  887.43   963.5  886.93   993.5  871.53  1006.5  871.53  1026.5  883.23
  1080.5  883.53  1580.5  883.93

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
```

```
   923.5    .065   963.5     .04  1026.5    .065

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.5  1026.5             114.9   114.9   114.9             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2890.1

INPUT
Description: U/S Face St Johns Rd Culvert
Station Elevation Data    num=      20
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  895.14  888.94  930.24  886.15  951.06  884.93  960.49  884.51  976.26  880.13
  989.54  873.71  991.22  872.57    1000  871.98 1009.06   872.4 1011.84   873.8
 1023.21  876.62 1023.88  880.06 1038.54  884.73 1058.98   886.1 1070.47   886.2
 1079.73  886.12 1091.72  885.73  1111.8     886  1128.8  885.79 1156.04  886.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  895.14     .05  960.49     .04 1038.54     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        960.49 1038.54              92.7    92.7    92.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  895.14     980  885.13       T
    1021 1156.04  884.52       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1150 1156.04     895

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 2847.6

INPUT
Description: St. John's Rd Culvert (modeled as a bridge in FIS study)
Distance from Upstream XS =    12.5
Deck/Roadway Width        =      60
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   802.2  889.13     865   835.3  888.25     865   842.8  888.06     865
   903.1  886.56     865  991.85  884.91     865  991.85  884.91   883.1
  1002.7  884.71   883.1 1008.15  884.65   883.1 1008.15  884.65     865
  1048.6  884.23     865  1057.2  884.14     865  1089.1  884.08     865
  1093.3  884.12     865  1102.8  884.23     865  1119.1  884.25     865
  1164.4   884.5     865  1202.7   884.9     865  1245.3  885.27     865
  1302.8  885.29     865

Upstream Bridge Cross Section Data
Station Elevation Data    num=      22
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  895.14  888.94  930.24  886.15  951.06  884.93  960.49  884.51  976.26  880.13
  989.54  873.71  991.22  872.57     992     872    1000     872    1008     872
 1009.06   872.4 1011.84   873.8 1023.21  876.62 1023.88  880.06 1038.54  884.73
 1058.98   886.1 1070.47   886.2 1079.73  886.12 1091.72  885.73  1111.8     886
  1128.8  885.79 1156.04  886.21

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  895.14     .05  960.49     .04 1038.54     .05
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
        960.49 1038.54             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  895.14     980  885.13       T
    1021 1156.04  884.52       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1150 1156.04     895

Downstream  Deck/Roadway Coordinates
    num=      19
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
*************************************************************************
   802.2  889.13     865   835.3  888.25     865   842.8  888.06     865
   903.1  886.56     865  991.85  884.91     865  991.85  884.91   883.1
  1002.7  884.71   883.1 1008.15  884.65   883.1 1008.15  884.65     865
  1048.6  884.23     865  1057.2  884.14     865  1089.1  884.08     865
  1093.3  884.12     865  1102.8  884.23     865  1119.1  884.25     865
  1164.4   884.5     865  1202.7   884.9     865  1245.3  885.27     865
  1302.8  885.29     865

Downstream Bridge Cross Section Data
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
  843.45  886.41  860.11  885.29  874.37  884.71  898.74  884.44   927.4  883.14
  947.26   883.5  974.88  880.12  976.56  880.19  987.41  873.83  988.87  872.45
     992     872    1000     872    1008     872 1015.59  872.48 1018.13   874.1
  1023.8  880.19 1036.31  882.93 1047.14  883.64 1057.56  883.68 1066.24  883.65
 1081.39  883.71 1091.02  883.77  1099.8  883.77 1108.55  883.59 1117.25  884.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
  843.45     .05  947.26     .04 1036.31     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        947.26 1036.31             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  843.45     982   884.1       T
    1018 1117.25  883.55       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1047.14  1099.8     895

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum              Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 887.1
       El of the toe of the abutment   = 872
    Right Embankment
       El of the top of the embankment = 884.5
       El of the toe of the abutment   = 872
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 60
    Centroid station of bridge opening = 1000
```

```
    Wing Wall Type                    = Angular wing walls
       Width                          = 18
       Angle                          = 30
       Radius                         =
    Guide Banks Type                  = No Guide Bank present
       Length                         =
       Offset                         =
       Angle                          =
    Optional Contraction and expansion coefficients
      At approach Section
      At upstream inside (BU)
      At downstream inside (BD)
    Piers are Continuous for the width of the bridge
    Use Geometric mean as Friction Slope Method

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd         =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord               =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 2797.4

INPUT
Description: D/S Face St. John's Rd. Culvert
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  843.45  886.41  860.11  885.29  874.37  884.71  898.74  884.44   927.4  883.14
  947.26   883.5  974.88  880.12  976.56  880.19  987.41  873.83  988.87  872.45
    1000  872.06 1015.59  872.48 1018.13   874.1  1023.8  880.19 1036.31  882.93
 1047.14  883.64 1057.56  883.68 1066.24  883.65 1081.39  883.71 1091.02  883.77
  1099.8  883.77 1108.55  883.59 1117.25  884.76

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  843.45     .05  947.26     .04 1036.31     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        947.26 1036.31            291.7   291.7   291.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  843.45     982   884.1       T
    1018 1117.25  883.55       T
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1047.14  1099.8     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 2505.7

INPUT
Description: 1000' Upstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  824.02   887.7  908.53  885.28   961.5  884.23   991.3  873.06  995.21  871.83
```

```
    1000  870.71  1005.8  871.86 1006.58  873.09 1032.77   882.6 1059.46  884.35
 1103.24  886.06    1153  886.25

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  824.02     .05   961.5     .04 1032.77     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         961.5 1032.77             335.7   335.7   335.7             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1103    1153     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2170

INPUT
Description: FEMA FIS Sta. 5.320
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.63  1006.5  869.73  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              97.7    97.7    97.7             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2072.3

INPUT
Description: 630' Upstream
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  744.48  887.04  826.03  886.58  897.61  885.58  967.36  884.24  993.63  871.08
    1000  871.24 1010.07  871.27    1024  878.47  1083.7  881.52    1127   882.6
    1192     883

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  744.48     .05  967.36     .04    1024     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        967.36    1024                75   133.3     241             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1135    1192     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1939

INPUT
Description: 500' Upstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
```

```
  850.48  887.32  967.55  885.98  993.44  872.53  996.58  871.33    1000  870.86
 1004.42  871.37 1007.57  872.61 1020.23  880.52  1024.6  882.41 1065.82  883.58
 1140.45  886.21    1180   886.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  850.48     .05  967.55     .04  1024.6     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        967.55  1024.6            188.6   188.6   188.6             .1       .3
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1140.85    1180     905

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1750.4

INPUT
Description: 300' Upstream
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  756.64  890.69  817.34  888.93  825.73  887.86  905.15  886.97  968.79  886.11
  993.03  872.27  994.31  871.08    1000  870.88 1005.79  871.49 1007.56  872.16
 1026.49  882.93 1056.52  886.16 1095.75  887.05    1136   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  756.64     .05  968.79     .04 1026.49     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        968.79 1026.49            107.8   107.8   107.8             .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
     825     905     900 1095.75    1136     900

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1642.6

INPUT
Description: 200' Upstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  869.82  886.36  906.86  885.93  938.57   885.9  962.16  885.47  968.46  885.24
  969.77  885.17  991.26  872.58  992.41  870.52    1000  870.63  1006.9  871.27
 1010.61  873.77 1021.14  884.15 1023.62  884.16 1077.77  887.19 1122.42   887.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  869.82     .05  969.77     .04 1021.14     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        969.77 1021.14               95     114     136             .1       .3
Blocked Obstructions     num=       2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
************************************************
  869.82  906.86     905 1077.77 1122.42     907

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1528.6
```

```
INPUT
Description: 100' Upstream
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   851.4  889.18  896.65  886.23  923.82  886.49  933.91  886.85  943.34  886.81
   963.1  886.55  990.27  873.23  993.98  870.96    1000  870.49 1004.07  870.98
 1007.21  872.93 1027.17  884.82 1070.94  889.23 1121.37  889.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   851.4     .05   963.1     .04 1027.17     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         963.1 1027.17             38.6    38.6    38.6             .1       .3
Left Levee      Station=  933.91      Elevation=  886.85
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
    1082 1121.37     910

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 1490

INPUT
Description: FEMA FIS Sta. 5.188
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53   993.5  870.33  1006.5  870.33  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         969.5  1018.5              200     200     200             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1050  1139.5  890.14       T

CULVERT


RIVER: Silver Creek
REACH: Main               RS: 1374.4

INPUT
Description: IL 47 modeled as a culvert (per IDOT design criteria)
Distance from Upstream XS =      42
Deck/Roadway Width        =   142.7
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     858  893.92     845     908   892.8     845     958  891.68     845
     992     891     845    1000  890.84     845    1008  890.68     845
    1058  890.04     845    1108  889.72     845    1158  889.47     845

Upstream Bridge Cross Section Data
Station Elevation Data    num=       7
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   939.5  884.33   969.5  883.53     992  870.75    1008  870.75  1018.5  878.03
  1039.5  879.43  1139.5  883.23

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   939.5     .05   969.5     .04  1018.5     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
         969.5  1018.5             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1050  1139.5  890.14       T

Downstream  Deck/Roadway Coordinates
    num=       9
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
     858  893.92     845     908   892.8     845     958  891.68     845
     992     891     845    1000  890.84     845    1008  890.68     845
    1058  890.04     845    1108  889.72     845    1158  889.47     845

Downstream Bridge Cross Section Data
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     992   869.5    1008   869.5    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     984     891       T
    1016    1099  890.44       T

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
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       9      16
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 42   142.7     .013     .035        1                  .4                1
Upstream   Elevation =  869.75
           Centerline Station =  1000
Downstream Elevation =  868.5
           Centerline Station =  1000

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1290

INPUT
Description: FEMA FIS Sta. 5.152
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.93     967  883.43     993  870.53    1007  870.33    1030  882.73
    1099  885.33

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
```

```
**************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030            174.7   174.7   174.7             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     929     984     891       T
    1016    1099  890.44       T

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1115.3

INPUT
Description: 180' Downstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  893.44  883.54  908.68  884.01  925.37  884.04  932.73  883.75   973.2  882.92
  993.01  870.54  995.55  869.83    1000   869.4 1005.16  870.73 1007.95  871.27
    1011  873.69 1028.59  881.44 1077.12  883.65  1132.6  884.78 1242.23  886.05

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
  893.44     .05   973.2     .04 1028.59     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         973.2 1028.59              48      48      48             .1       .3
Left Levee      Station=  925.37      Elevation=  884.04

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 1067.3

INPUT
Description: 230' Downstream
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.82  883.04  901.14   883.6  922.39  883.35  934.15  883.39  958.36  883.75
  975.79  882.25  993.36  870.76  994.87  869.85    1000  869.53 1003.41  869.76
  1006.8  870.84  1010.7  873.23 1025.94  880.44 1074.79  883.35 1118.97  884.69

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
**************************************************
  882.82     .05  975.79     .04 1025.94     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.79 1025.94             70.7    70.7    70.7             .1       .3
Left Levee      Station=  958.36      Elevation=  883.75

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 996.6

INPUT
Description: 300' Downstream
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
   883.5  884.59  936.05  883.52  966.38   883.5  975.34  882.83  993.33  871.36
  993.85  869.81    1000  870.03 1006.39  870.05 1007.58  871.25 1024.84  880.27
 1087.46  882.76 1137.35  883.53 1200.63  883.56  1255.9  882.93 1321.41  885.89
 1401.88  884.79

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
   883.5     .05  975.34     .04 1024.84     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        975.34 1024.84              82.6    82.6    82.6              .1       .3
Right Levee     Station= 1200.63      Elevation=  883.56

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 914

INPUT
Description: FEMA FIS Sta. 5.080
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.43     967  882.93     993  870.03    1007  869.83    1030  882.23
    1099  884.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .05     967     .04    1030     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           967    1030             32.55   32.55   32.55              .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 881.45

INPUT
Description: U/S Face of Footbridge
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        965.76 1027.89             17.45   17.45   17.45              .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983  884.25       F
    1017    1172   883.7       F
Right Levee     Station= 1090.88      Elevation=  885.58

BRIDGE


RIVER: Silver Creek
REACH: Main               RS: 874.6

INPUT
Description: Footbridge
Distance from Upstream XS =    3.85
Deck/Roadway Width        =       6
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      12
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  882.26  884.57     865  929.76  884.11     865  958.59  884.14     865
   965.2  884.41     865     973   884.2     865  986.75  884.26       0
```

```
  986.75  884.26  883.11 1013.25   883.8  882.65 1013.25   883.8       0
    1025  883.62       0  1030.2  883.62       0  1090.5  885.58       0

Upstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        965.76 1027.89             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983  884.25       F
    1017    1172   883.7       F
Right Levee     Station= 1090.88      Elevation=  885.58

Downstream  Deck/Roadway Coordinates
    num=      12
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  882.26  884.57     865  929.76  884.11     865  958.59  884.14     865
   965.2  884.41     865     973   884.2     865  986.75  884.26       0
  986.75  884.26  883.11 1013.25   883.8  882.65 1013.25   883.8       0
    1025  883.62       0  1030.2  883.62       0  1090.5  885.58       0

Downstream Bridge Cross Section Data
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  882.26  884.57  929.76  884.11  958.59  884.14  965.76  884.21  992.75   871.4
  993.38  870.16    1000  870.06 1006.37  870.31  1006.6  871.42 1027.89  882.46
 1090.88  885.58    1172  884.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  882.26     .05  965.76     .04 1027.89     .05

Bank Sta: Left   Right    Coeff Contr.   Expan.
        965.76 1027.89             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  882.26     983   883.1       F
    1017    1172   883.1       F

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =     1.2
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
```

```
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 864

INPUT
Description: FIS 5.071
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .05  986.75     .04 1013.25     .05

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25                8       8       8              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     983   883.1       F
    1017    1150   883.1       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 856

INPUT
Description: FEMA FIS Sta. 5.069
Station Elevation Data    num=       8
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     850  884.43     964  883.83  986.75  882.53   987.8  869.73  1012.2  869.73
 1013.25  882.53    1029  883.93    1150  885.43

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07  986.75    .058 1013.25     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        986.75 1013.25               50      50      50              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     979   883.1       F
    1021    1150   883.1       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 806

INPUT
Description: FEMA FIS Sta. 5.060
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  885.13     967  882.63     993  869.73    1007  869.53    1030  881.93
    1099  884.53

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

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

```
          967    1030             11.6    11.6    11.6             .3       .5

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 794.4

INPUT
Description: 500' Downstream
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  877.49  885.39   926.1  884.67  955.49  884.46  962.42  883.92  991.04  871.31
   993.1  869.94    1000  869.78 1005.61   869.6 1007.18  871.33 1029.18  882.05
 1098.98  884.64 1159.42  883.78 1235.12  882.53 1321.44   882.4 1336.83  881.65
 1343.53  881.98 1419.72  883.92 1466.06   883.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  877.49     .07  962.42    .058 1029.18     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42 1029.18            124.4   124.4   124.4             .1       .3
Right Levee     Station= 1098.98      Elevation=  884.64
Blocked Obstructions     num=       1
   Sta L   Sta R    Elev
************************
 1419.72 1466.06     895

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 670

INPUT
Description: FEMA FIS Sta. 5.040
Station Elevation Data    num=       6
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
     929  884.83     967  882.33     993  869.43    1007  869.23    1030  881.63
    1099  884.23

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     929     .07     967    .058    1030     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          967    1030              405     405     405             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Main              RS: 265

INPUT
Description: 1000' Downstream
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  908.54  889.91   932.7  884.83  973.22  881.49  991.82   870.7  993.81  869.26
    1000  868.94 1007.26  869.66 1008.74  870.74 1026.86   879.4 1043.83  879.41
 1068.35  883.11 1121.87  884.72

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  908.54     .07  973.22    .058 1026.86     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        973.22 1026.86            121.5   121.5   121.5             .1       .3
```

Blocked Obstructions num= 1

Sta L	Sta R	Elev
1058	1121.87	895

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 143.5

INPUT
Description: Surveyed XS by Strand 2017 (1120' Downstream)
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
955.78	884	962.42	883.55	964.96	882.55	981.73	878.72	987.8	872.26
991.65	871.47	993.29	870.08	995.9	868.86	1000	868.83	1007.04	869.4
1008.01	870.07	1008.89	871.85	1010.7	872.08	1017.88	874.24	1025.55	877.33
1053.4	878.09								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
955.78	.07	981.73	.058	1025.55	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
981.73	1025.55	3.5	3.5	3.5	.1	.3

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 140

INPUT
Description: FEMA FIS Sta. 4.933
Station Elevation Data num= 6

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
929	884.53	967	882.03	993	869.13	1007	868.93	1030	881.33
1099	883.93								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
929	.07	967	.058	1030	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
967	1030	88.1	88.1	88.1	.1	.3

BRIDGE

RIVER: Silver Creek
REACH: Main RS: 89

INPUT
Description: Melody Lane
Distance from Upstream XS = 30.6
Deck/Roadway Width = 40.8
Weir Coefficient = 2.6
Upstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
939.2	880.64		963.57	879.9		985.83	879.13	
987	879.1		987	879.1	877	1000.64	878.76	876.61
1013	878.45	876.25	1013	878.45		1015	878.41	
1039.28	877.88		1070.81	877.41				

Upstream Bridge Cross Section Data
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
     929  884.53     967  882.03     987  876.35  993.74   869.6  994.58  869.34
    1000  869.48 1004.64  869.61 1007.22  871.87    1013  873.23    1030  881.33
    1099  883.93

Manning's n Values        num=       7
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
     929     .07     967    .058     987    .012  993.74    .058 1004.64    .012
    1013    .058    1030     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
           967    1030             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
   939.2  880.64          963.57   879.9          985.83  879.13
     987   879.1             987   879.1  876.93 1000.64  878.76  876.59
    1013  878.45  876.28    1013  878.45            1015  878.41
 1039.28  877.88         1070.81  877.41

Downstream Bridge Cross Section Data
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  956.61  881.48  980.92  878.89  984.85  878.51     987  876.01  994.03  869.49
    1000   869.6 1005.54  869.66 1010.87  873.44    1013  873.44 1025.01  876.63
 1059.93  878.34

Manning's n Values        num=       7
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  956.61     .07  984.85    .058     987    .012  994.03    .058 1005.54    .012
    1013    .058 1025.01     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        984.85 1025.01             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1022 1059.93  878.34       F

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

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
       Momentum               Cd   =       2
       W.S. Pro Method

  W.S.Pro Data
    Left Embankment
       El of the top of the embankment = 877.53
       El of the toe of the abutment   = 868.93
    Right Embankment
       El of the top of the embankment = 877.53
       El of the toe of the abutment   = 868.93
    Abutment Type                      = 1 Vert. abutments and vert. embankments with or without wingwalls
    Slope of abutments                 =
    Top with of embankment             = 42
    Centroid station of bridge opening = 1000
    Wing Wall Type                     = No wing walls present
       Width                           =
       Angle                           =
       Radius                          =
    Guide Banks Type                   = No Guide Bank present
       Length                          =
       Offset                          =
```

```
       Angle                            =

Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Pressure and Weir flow
           Submerged Inlet Cd           =
           Submerged Inlet + Outlet Cd =      .8
           Max Low Cord                 =

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 51.9

INPUT
Description: Surveyed XS by Strand 2017 (1210' Downstream)
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
  956.61  881.48  980.92  878.89  984.85  878.51  993.08  870.16  993.92   869.3
  995.65  869.24    1000  869.44 1005.68  869.42 1006.85  870.05 1008.36  871.93
 1014.15  872.74 1025.01  876.63 1059.93  878.34

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
  956.61     .07  984.85    .058 1025.01     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        984.85 1025.01              1.9     1.9     1.9             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1022 1059.93  878.34       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 50

INPUT
Description: FEMA FIS Sta. 4.916
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
     850  881.53     967  877.53   968.8 877.421   986.8  876.33   990.5  868.93
  1009.5  868.93  1013.2  876.33    1027  877.53    1150  877.43    1650  879.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
     850     .07   986.8    .058  1013.2     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         986.8  1013.2             47.5    47.5    47.5             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
     850     977     878       F
    1023    1650     878       F

CROSS SECTION


RIVER: Silver Creek
REACH: Main               RS: 2.5
```

INPUT
Description: Surveyed XS by Strand 2017 (1260' Downstream)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
963.21	881.37	976.5	878.83	980.28	878.27	985.7	874.85	990.84	870.95
991.87	870.07	992.27	869.75	993.35	869.29	1000	868.55	1005.62	869.37
1006.74	870.08	1008.31	871.33	1014.02	872.82	1021.92	875.74	1066.6	878.18

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
963.21	.07	980.28	.058	1021.92	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
980.28	1021.92	2.5	2.5	2.5	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1046	1066.6	878	F

CROSS SECTION

RIVER: Silver Creek
REACH: Main RS: 0

INPUT
Description: FEMA FIS Sta. 4.907
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
839	879.83	968	876.33	992	868.83	1008	869.13	1021	874.33
1064	874.33	1072	875.53	1589	879.83				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
839	.07	968	.058	1021	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
968	1021	0	0	0	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
839	952	878	F
1048	1589	878	F

****

SUMMARY OF MANNING'S N VALUES

River:Silver Creek

Reach	River Sta.	n1	n2	n3
Main	3520	.065	.04	.065
Main	3210	.065	.04	.065
Main	3005	.065	.04	.065
Main	2890.1	.05	.04	.05
Main	2847.6	Bridge		
Main	2797.4	.05	.04	.05
Main	2505.7	.05	.04	.05
Main	2170	.05	.04	.05
Main	2072.3	.05	.04	.05
Main	1939	.05	.04	.05
Main	1750.4	.05	.04	.05
Main	1642.6	.05	.04	.05
Main	1528.6	.05	.04	.05
Main	1490	.05	.04	.05
Main	1374.4	Culvert		
Main	1290	.05	.04	.05
Main	1115.3	.05	.04	.05
Main	1067.3	.05	.04	.05
Main	996.6	.05	.04	.05
Main	914	.05	.04	.05
Main	881.45	.05	.04	.05

Main	874.6	Bridge		
Main	864	.05	.04	.05
Main	856	.07	.058	.07
Main	806	.07	.058	.07
Main	794.4	.07	.058	.07
Main	670	.07	.058	.07
Main	265	.07	.058	.07
Main	143.5	.07	.058	.07
Main	140	.07	.058	.07
Main	89	Bridge		
Main	51.9	.07	.058	.07
Main	50	.07	.058	.07
Main	2.5	.07	.058	.07
Main	0	.07	.058	.07

SUMMARY OF REACH LENGTHS

River: Silver Creek

Reach	River Sta.	Left	Channel	Right
Main	3520	310	310	310
Main	3210	205	205	205
Main	3005	114.9	114.9	114.9
Main	2890.1	92.7	92.7	92.7
Main	2847.6	Bridge		
Main	2797.4	291.7	291.7	291.7
Main	2505.7	335.7	335.7	335.7
Main	2170	97.7	97.7	97.7
Main	2072.3	75	133.3	241
Main	1939	188.6	188.6	188.6
Main	1750.4	107.8	107.8	107.8
Main	1642.6	95	114	136
Main	1528.6	38.6	38.6	38.6
Main	1490	200	200	200
Main	1374.4	Culvert		
Main	1290	174.7	174.7	174.7
Main	1115.3	48	48	48
Main	1067.3	70.7	70.7	70.7
Main	996.6	82.6	82.6	82.6
Main	914	32.55	32.55	32.55
Main	881.45	17.45	17.45	17.45
Main	874.6	Bridge		
Main	864	8	8	8
Main	856	50	50	50
Main	806	11.6	11.6	11.6
Main	794.4	124.4	124.4	124.4
Main	670	405	405	405
Main	265	121.5	121.5	121.5
Main	143.5	3.5	3.5	3.5
Main	140	88.1	88.1	88.1
Main	89	Bridge		
Main	51.9	1.9	1.9	1.9
Main	50	47.5	47.5	47.5
Main	2.5	2.5	2.5	2.5
Main	0	0	0	0

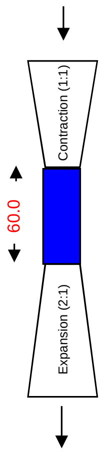
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Main	3520	.1	.3
Main	3210	.1	.3
Main	3005	.1	.3
Main	2890.1	.3	.5
Main	2847.6	Bridge	
Main	2797.4	.3	.5

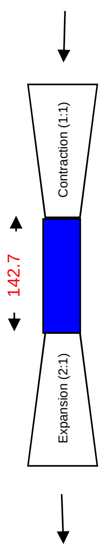
Main	2505.7		.1	.3
Main	2170		.1	.3
Main	2072.3		.1	.3
Main	1939		.1	.3
Main	1750.4		.1	.3
Main	1642.6		.1	.3
Main	1528.6		.1	.3
Main	1490		.3	.5
Main	1374.4	Culvert		
Main	1290		.3	.5
Main	1115.3		.1	.3
Main	1067.3		.1	.3
Main	996.6		.1	.3
Main	914		.1	.3
Main	881.45		.1	.3
Main	874.6	Bridge		
Main	864		.3	.5
Main	856		.3	.5
Main	806		.3	.5
Main	794.4		.1	.3
Main	670		.1	.3
Main	265		.1	.3
Main	143.5		.1	.3
Main	140		.1	.3
Main	89	Bridge		
Main	51.9		.3	.5
Main	50		.3	.5
Main	2.5		.3	.5
Main	0		.3	.5

St. Johns Rd. - Existing Surveyed Crossing



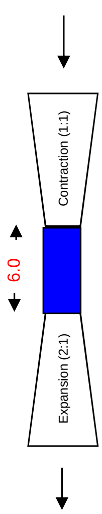
R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
3520.0	642.4	1000	350.0	1650.0	310.0	992	1008		3520.0
3210.0	332.4	1000	660.0	1340.0	205.0	992	1008		3210.0
3005.0	127.4	1000	865.0	1135.0	114.9	992	1008		3005.0
2890.1	12.5	1000	980.0	1021.0	92.7	992	1008		2890.1
2877.6		1000.0	992.0	1008.0	12.5	992.0	1008.0		2877.6
2847.6									2847.6
2817.6		1000.0	992.0	1008.0	17.0	992.0	1008.0		2817.6
2797.4	10.1	1000	982.0	1018.0	291.7	992	1008		2797.4
2505.7	156.0	1000	836.0	1164.0	335.7	992	1008		2505.7
2170.0	323.8	1000	668.0	1332.0	97.7	992	1008		2170.0
2072.3	372.7	1000	619.0	1381.0	2072.3	992	1008		2072.3

IL 47 -Proposed Design



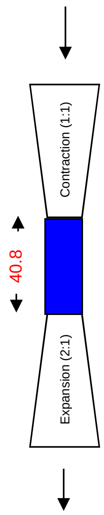
R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
2072.3	624.3	1000.0	368.0	1632.0	133.3	992	1008		2072.3
1939.0	491.0	1000.0	501.0	1499.0	188.6	992	1008		1939.0
1750.4	302.4	1000.0	690.0	1310.0	107.8	992	1008		1750.4
1642.6	194.6	1000.0	797.0	1203.0	114.0	992	1008		1642.6
1528.6	80.6	1000.0	911.0	1089.0	38.6	992	1008		1528.6
1490.0	42.0	1000.0	950.0	1050.0	200.0	992	1008		1490.0
1448.0		1000.0	992.0	1008.0	42.0	992	1008		1448.0
1374.4									1374.4
1305.3		1000.0	992.0	1008.0	15.3	992	1008		1305.3
1290.0	7.6	1000	984.0	1016.0	174.7	992	1008		1290.0
1115.3	95.0	1000	897.0	1103.0	48.0	992	1008		1115.3
1067.3	119.0	1000	873.0	1127.0	70.7	992	1008		1067.3
996.6	154.4	1000	838.0	1162.0	82.6	992	1008		996.6
914.0	195.7	1000	796.0	1204.0	914.0	992	1008		914.0

Footbridge - Existing Surveyed Crossing

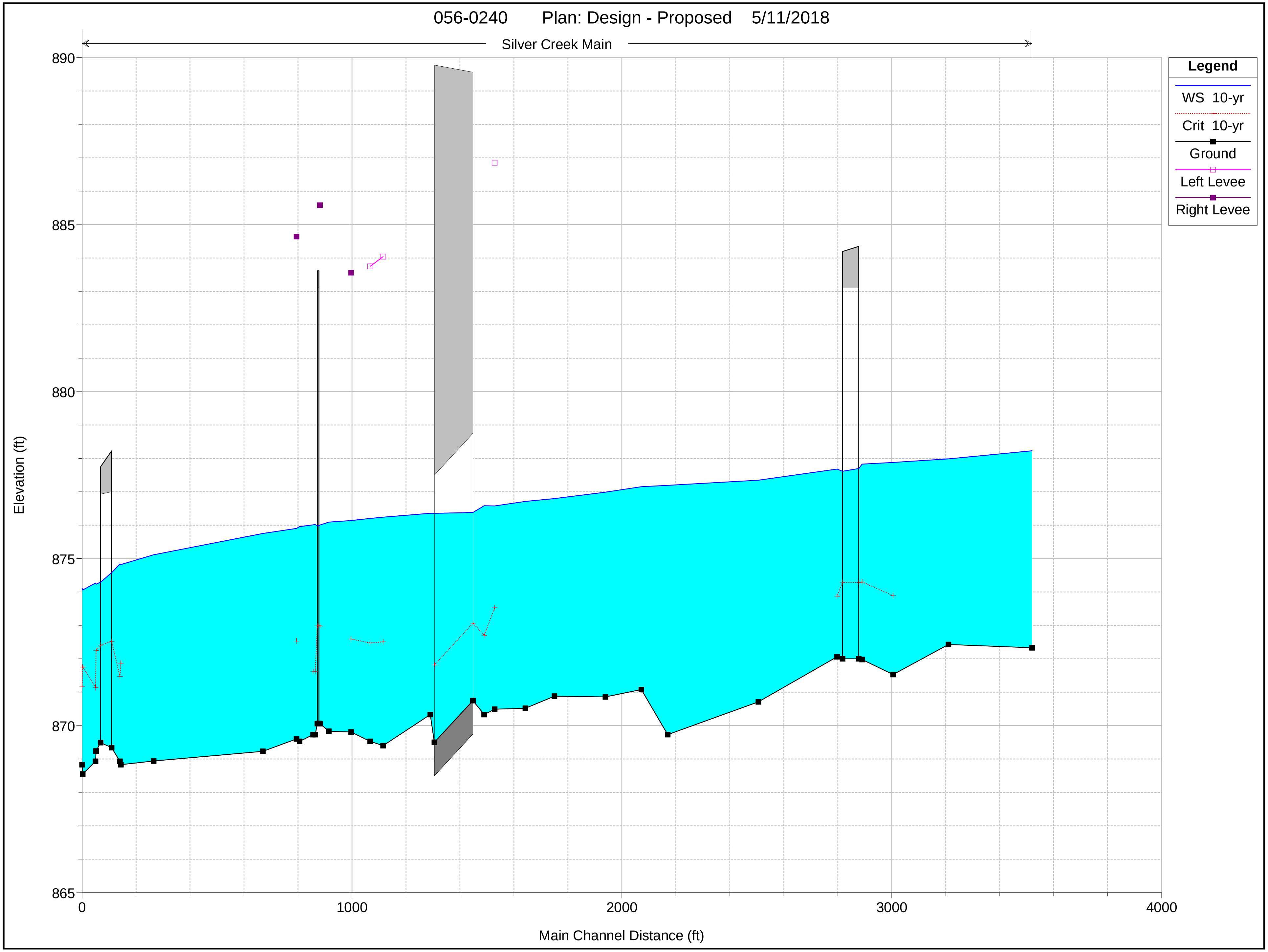


R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
1115.3	237.7	1000	749.0	1251.0	48.0	986.75	1013.25		1115.3
1067.3	189.7	1000	797.0	1203.0	70.6	986.75	1013.25		1067.3
996.7	119.1	1000	868.0	1132.0	82.6	986.75	1013.25		996.7
914.1	36.5	1000	950.0	1050.0	32.6	986.75	1013.25		914.1
881.45	3.9	1000	983.0	1017.0	17.45	986.75	1013.25		881.45
877.60		1000.0	986.8	1013.3	3.85	986.75	1013.25		877.6
874.60									874.6
871.60		1000.0	986.8	1013.3	7.6	986.75	1013.25		871.6
864.0	3.8	1000	983.0	1017.0	8.0	986.75	1013.25		864.0
856.0	7.8	1000	979.0	1021.0	50.0	986.75	1013.25		856.0
806.0	32.8	1000	954.0	1046.0	11.6	986.75	1013.25		806.0
794.4	38.6	1000	948.0	1052.0	124.4	986.75	1013.25		794.4
670.0	100.8	1000	886.0	1114.0	405.0	986.75	1013.25		670.0
265.0	303.3	1000	683.0	1317.0	121.5	986.75	1013.25		235.0
143.5	364.1	1000	623.0	1377.0	3.5	986.75	1013.25		143.5
140.0	365.8	1000	621.0	1379.0	140.0	986.75	1013.25		140.0

Melody Lane - Existing Surveyed Crossing



			Ineffective Area Offsets		D/S Reach				
R.S.	Δ Exp/Cont	CL Station	LT	RT	Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
670.0	560.6	1000	**426.0**	**1574.0**	405.0	987	1013		670.0
265.0	155.6	1000	**831.0**	**1169.0**	121.5	987	1013		265.0
143.5	34.1	1000	**953.0**	**1047.0**	3.5	987	1013		143.5
140.0	30.6	1000	**956.0**	**1044.0**	88.1	987	1013		140.0
109.40		1000.0	**987.0**	**1013.0**	30.60	987	1013		109.4
89.00									89.0
68.60		1000.0	**987.0**	**1013.0**	16.7	987	1013		68.6
51.9	8.4	1000	**978.0**	**1022.0**	1.9	987	1013		51.9
50.0	9.3	1000	**977.0**	**1023.0**	47.5	987	1013		50.0
2.5	33.1	1000	**954.0**	**1046.0**	2.5	987	1013		2.5
0.0	34.3	1000	**952.0**	**1048.0**	0.0	987	1013		0.0


056-0240 Plan: Design - Proposed 5/11/2018
Silver Creek Main
Legend
WS 10-yr
Crit 10-yr
Ground
Left Levee
Right Levee
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

   X     X  XXXXXX    XXXX        XXXX       XX      XXXX
   X     X  X        X    X       X   X     X  X    X
   X     X  X        X            X   X    X    X   X
   XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
   X     X  X        X            X  X     X    X        X
   X     X  X        X    X       X   X    X    X        X
   X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 12:01:57 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	10-yr	320.00	872.33	878.23		878.31	0.000651	2.28	140.29	34.57	0.20
Main	3210	10-yr	320.00	872.43	877.98		878.08	0.000826	2.49	128.64	33.32	0.22
Main	3005	10-yr	320.00	871.53	877.88	873.89	877.94	0.000485	2.05	156.25	36.22	0.17
Main	2890.1	10-yr	320.00	871.98	877.83	874.30	877.89	0.000439	1.94	164.92	42.43	0.17
Main	2847.6		Bridge									
Main	2797.4	10-yr	320.00	872.06	877.68	873.88	877.59	0.000319	1.84	174.26	40.62	0.15
Main	2505.7	10-yr	320.00	870.71	877.35		877.43	0.000799	2.34	136.69	38.44	0.22
Main	2170	10-yr	320.00	869.73	877.19		877.25	0.000362	1.87	171.56	36.01	0.15
Main	2072.3	10-yr	320.00	871.08	877.15		877.21	0.000426	1.91	167.89	39.95	0.16
Main	1939	10-yr	320.00	870.86	876.99		877.12	0.001132	2.85	112.26	29.72	0.26
Main	1750.4	10-yr	320.00	870.88	876.80		876.91	0.001007	2.72	117.78	30.61	0.24
Main	1642.6	10-yr	320.00	870.52	876.71		876.81	0.000790	2.52	126.78	29.39	0.21
Main	1528.6	10-yr	320.00	870.49	876.58	873.53	876.70	0.001132	2.84	112.71	29.89	0.26
Main	1490	10-yr	320.00	870.33	876.58	872.71	876.66	0.000553	2.17	147.29	34.11	0.18
Main	1374.4		Culvert									
Main	1290	10-yr	320.00	870.33	876.36		876.43	0.000485	2.17	147.72	36.92	0.18
Main	1115.3	10-yr	320.00	869.40	876.24	872.51	876.33	0.000685	2.35	136.18	32.90	0.20
Main	1067.3	10-yr	320.00	869.53	876.20	872.47	876.29	0.000719	2.41	132.89	31.94	0.21
Main	996.6	10-yr	320.00	869.81	876.14	872.59	876.24	0.000826	2.51	127.40	31.10	0.22
Main	914	10-yr	365.00	869.83	876.09		876.17	0.000615	2.29	159.67	37.83	0.20
Main	881.45	10-yr	365.00	870.06	876.00	872.98	876.14	0.001245	2.96	123.14	32.39	0.27
Main	874.6		Bridge									
Main	864	10-yr	365.00	869.73	876.02	871.62	876.10	0.000574	2.33	156.69	25.43	0.17
Main	856	10-yr	365.00	869.73	876.01	871.62	876.10	0.001211	2.33	156.52	25.43	0.17
Main	806	10-yr	365.00	869.53	875.96		876.03	0.001163	2.20	165.98	38.47	0.19

Main	794.4	10-yr	365.00	869.60	875.90	872.53	876.01	0.001833	2.58	141.39	35.95	0.23
Main	670	10-yr	365.00	869.23	875.75		875.82	0.001095	2.15	169.66	38.84	0.18
Main	265	10-yr	365.00	868.94	875.12		875.23	0.002024	2.73	133.78	33.69	0.24
Main	143.5	10-yr	365.00	868.83	874.82	871.87	874.95	0.002584	2.91	125.60	33.93	0.27
Main	140	10-yr	365.00	868.93	874.84	871.47	874.93	0.001635	2.49	146.53	36.46	0.22
Main	89		Bridge									
Main	51.9	10-yr	365.00	869.24	874.24	872.25	874.47	0.005738	3.91	93.43	29.26	0.39
Main	50	10-yr	365.00	868.93	874.27	871.14	874.42	0.002613	3.15	115.69	24.34	0.26
Main	2.5	10-yr	365.00	868.55	874.06	871.75	874.26	0.004260	3.54	102.98	30.63	0.34
Main	0	10-yr	365.00	868.83	874.11	871.18	874.19	0.001631	2.31	157.68	45.35	0.22

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	10-yr	878.31	878.23	0.08	0.23	0.00		320.00		34.57
Main	3210	10-yr	878.08	877.98	0.10	0.13	0.01		320.00		33.32
Main	3005	10-yr	877.94	877.88	0.07	0.05	0.00		320.00		36.22
Main	2890.1	10-yr	877.89	877.83	0.06	0.01	0.00		320.00		42.43
Main	2847.6		Bridge								
Main	2797.4	10-yr	877.59	877.68	0.06	0.10	0.05		320.00		40.62
Main	2505.7	10-yr	877.43	877.35	0.09	0.17	0.01		320.00		38.44
Main	2170	10-yr	877.25	877.19	0.05	0.04	0.00		320.00		36.01
Main	2072.3	10-yr	877.21	877.15	0.06	0.09	0.01		320.00		39.95
Main	1939	10-yr	877.12	876.99	0.13	0.20	0.00		320.00		29.72
Main	1750.4	10-yr	876.91	876.80	0.11	0.10	0.00		320.00		30.61
Main	1642.6	10-yr	876.81	876.71	0.10	0.11	0.00		320.00		29.39
Main	1528.6	10-yr	876.70	876.58	0.13	0.03	0.02		320.00		29.89
Main	1490	10-yr	876.66	876.58	0.07				320.00		34.11
Main	1374.4		Culvert								
Main	1290	10-yr	876.43	876.36	0.07	0.10	0.00		320.00		36.92
Main	1115.3	10-yr	876.33	876.24	0.09	0.03	0.00		320.00		32.90
Main	1067.3	10-yr	876.29	876.20	0.09	0.05	0.00		320.00		31.94
Main	996.6	10-yr	876.24	876.14	0.10	0.06	0.01		320.00		31.10
Main	914	10-yr	876.17	876.09	0.08	0.03	0.01		365.00		37.83
Main	881.45	10-yr	876.14	876.00	0.14	0.00	0.00		365.00		32.39
Main	874.6		Bridge								
Main	864	10-yr	876.10	876.02	0.08	0.01	0.00		365.00		25.43
Main	856	10-yr	876.10	876.01	0.08	0.06	0.00		365.00		25.43
Main	806	10-yr	876.03	875.96	0.08	0.02	0.01		365.00		38.47
Main	794.4	10-yr	876.01	875.90	0.10	0.17	0.01		365.00		35.95
Main	670	10-yr	875.82	875.75	0.07	0.59	0.00		365.00		38.84
Main	265	10-yr	875.23	875.12	0.12	0.28	0.00		365.00		33.69
Main	143.5	10-yr	874.95	874.82	0.13	0.01	0.01		365.00		33.93
Main	140	10-yr	874.93	874.84	0.10	0.08	0.02		365.00		36.46
Main	89		Bridge								
Main	51.9	10-yr	874.47	874.24	0.24	0.01	0.04		365.00		29.26
Main	50	10-yr	874.42	874.27	0.15	0.16	0.01		365.00		24.34
Main	2.5	10-yr	874.26	874.06	0.20	0.01	0.06		365.00		30.63
Main	0	10-yr	874.19	874.11	0.08				365.00		45.35

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ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Proposed

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 10-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
             bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 2505.7     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 914     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 10-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 10-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 10-yr
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     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 0     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
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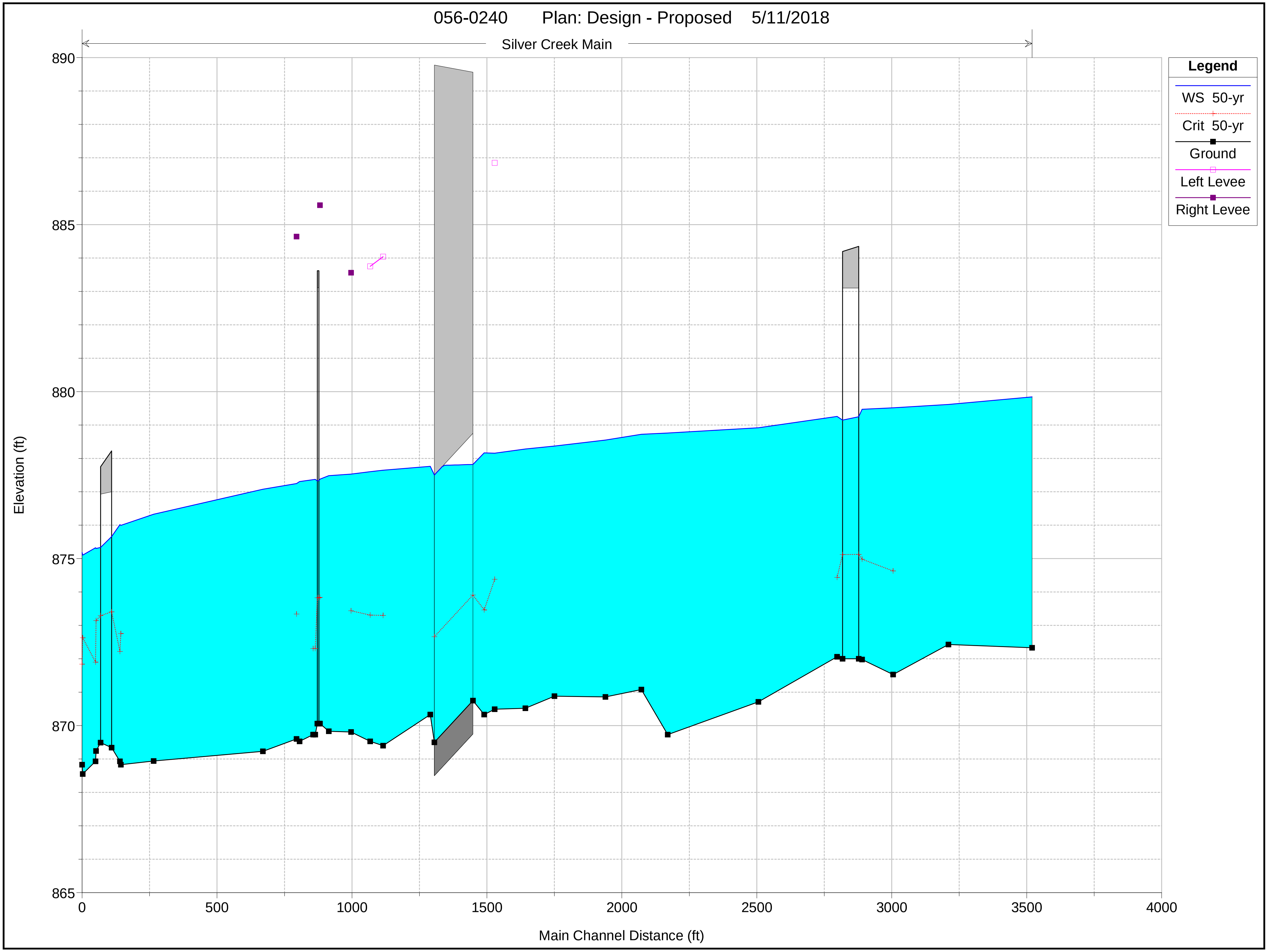
056-0240 Plan: Design - Proposed 5/11/2018
Silver Creek Main
Legend
WS 50-yr
Crit 50-yr
Ground
Left Levee
Right Levee
Elevation (ft)
Main Channel Distance (ft)
890
885
880
875
870
865
0
500
1000
1500
2000
2500
3000
3500
4000

```
                  HEC-RAS Version 4.1.0 Jan 2010
                   U.S. Army Corps of Engineers
                  Hydrologic Engineering Center
                        609 Second Street
                        Davis, California

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

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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 12:01:57 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	50-yr	510.00	872.33	879.84		879.94	0.000623	2.54	200.87	40.48	0.20
Main	3210	50-yr	510.00	872.43	879.62		879.73	0.000747	2.72	187.84	39.28	0.22
Main	3005	50-yr	510.00	871.53	879.52	874.63	879.60	0.000484	2.31	220.43	42.21	0.18
Main	2890.1	50-yr	510.00	871.98	879.47	874.98	879.55	0.000371	2.20	231.97	46.14	0.16
Main	2847.6		Bridge									
Main	2797.4	50-yr	510.00	872.06	879.26	874.44	879.16	0.000317	2.21	231.01	44.78	0.15
Main	2505.7	50-yr	510.00	870.71	878.92		879.01	0.000701	2.50	203.67	46.95	0.21
Main	2170	50-yr	510.00	869.73	878.76		878.83	0.000391	2.20	235.54	51.06	0.16
Main	2072.3	50-yr	510.00	871.08	878.72		878.79	0.000422	2.17	235.86	50.53	0.17
Main	1939	50-yr	510.00	870.86	878.55		878.70	0.001053	3.13	162.89	35.22	0.26
Main	1750.4	50-yr	510.00	870.88	878.37		878.51	0.000943	2.99	170.29	36.13	0.24
Main	1642.6	50-yr	510.00	870.52	878.28		878.41	0.000813	2.89	176.30	33.66	0.22
Main	1528.6	50-yr	510.00	870.49	878.16	874.38	878.31	0.001040	3.10	164.61	35.77	0.25
Main	1490	50-yr	510.00	870.33	878.17	873.46	878.26	0.000563	2.48	205.64	41.28	0.19
Main	1374.4		Culvert									
Main	1290	50-yr	510.00	870.33	877.76		877.87	0.000507	2.65	192.73	42.37	0.19
Main	1115.3	50-yr	510.00	869.40	877.65	873.30	877.76	0.000755	2.74	186.27	38.34	0.22
Main	1067.3	50-yr	510.00	869.53	877.60	873.31	877.72	0.000796	2.81	181.19	37.04	0.22
Main	996.6	50-yr	510.00	869.81	877.53	873.44	877.66	0.000902	2.93	174.07	35.95	0.23
Main	914	50-yr	575.00	869.83	877.48		877.59	0.000670	2.66	216.06	43.22	0.21
Main	881.45	50-yr	575.00	870.06	877.38	873.84	877.56	0.001142	3.40	169.29	37.94	0.27
Main	874.6		Bridge									
Main	864	50-yr	575.00	869.73	877.37	872.30	877.51	0.000806	3.01	191.29	25.65	0.19
Main	856	50-yr	575.00	869.73	877.36	872.30	877.50	0.001700	3.01	191.04	25.65	0.19
Main	806	50-yr	575.00	869.53	877.31		877.41	0.001317	2.60	221.43	43.70	0.20

Main	794.4	50-yr	575.00	869.60	877.25	873.34	877.38	0.001954	2.97	193.56	41.76	0.24
Main	670	50-yr	575.00	869.23	877.08		877.18	0.001268	2.56	224.53	43.97	0.20
Main	265	50-yr	575.00	868.94	876.33		876.49	0.002338	3.24	177.47	38.32	0.27
Main	143.5	50-yr	575.00	868.83	875.99	872.75	876.18	0.002864	3.43	167.73	37.94	0.29
Main	140	50-yr	575.00	868.93	876.02	872.22	876.16	0.001936	2.99	192.17	41.02	0.24
Main	89		Bridge									
Main	51.9	50-yr	575.00	869.24	875.30	873.15	875.62	0.006143	4.53	126.81	33.29	0.41
Main	50	50-yr	575.00	868.93	875.33	871.90	875.58	0.003615	4.05	141.97	25.40	0.30
Main	2.5	50-yr	575.00	868.55	875.10	872.63	875.38	0.004864	4.19	137.16	34.90	0.37
Main	0	50-yr	575.00	868.83	875.18	871.84	875.29	0.001675	2.67	231.51	97.99	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	50-yr	879.94	879.84	0.10	0.21	0.00		510.00		40.48
Main	3210	50-yr	879.73	879.62	0.11	0.12	0.01		510.00		39.28
Main	3005	50-yr	879.60	879.52	0.08	0.05	0.00		510.00		42.21
Main	2890.1	50-yr	879.55	879.47	0.08	0.01	0.00		510.00		46.14
Main	2847.6		Bridge								
Main	2797.4	50-yr	879.16	879.26	0.08	0.10	0.08		510.00		44.78
Main	2505.7	50-yr	879.01	878.92	0.10	0.17	0.01		510.00		46.95
Main	2170	50-yr	878.83	878.76	0.07	0.04	0.00		508.81	1.19	51.06
Main	2072.3	50-yr	878.79	878.72	0.07	0.08	0.01		509.91	0.09	50.53
Main	1939	50-yr	878.70	878.55	0.15	0.19	0.00		510.00		35.22
Main	1750.4	50-yr	878.51	878.37	0.14	0.09	0.00		510.00		36.13
Main	1642.6	50-yr	878.41	878.28	0.13	0.10	0.00		510.00		33.66
Main	1528.6	50-yr	878.31	878.16	0.15	0.03	0.02		510.00		35.77
Main	1490	50-yr	878.26	878.17	0.10				509.98	0.02	41.28
Main	1374.4		Culvert								
Main	1290	50-yr	877.87	877.76	0.11	0.11	0.00		510.00		42.37
Main	1115.3	50-yr	877.76	877.65	0.12	0.04	0.00		510.00		38.34
Main	1067.3	50-yr	877.72	877.60	0.12	0.06	0.00		510.00		37.04
Main	996.6	50-yr	877.66	877.53	0.13	0.06	0.01		510.00		35.95
Main	914	50-yr	877.59	877.48	0.11	0.03	0.01		575.00		43.22
Main	881.45	50-yr	877.56	877.38	0.18	0.00	0.00		575.00		37.94
Main	874.6		Bridge								
Main	864	50-yr	877.51	877.37	0.14	0.01	0.00		575.00		25.65
Main	856	50-yr	877.50	877.36	0.14	0.07	0.02		575.00		25.65
Main	806	50-yr	877.41	877.31	0.10	0.02	0.01		575.00		43.70
Main	794.4	50-yr	877.38	877.25	0.14	0.19	0.01		575.00		41.76
Main	670	50-yr	877.18	877.08	0.10	0.68	0.01		575.00		43.97
Main	265	50-yr	876.49	876.33	0.16	0.31	0.00		575.00		38.32
Main	143.5	50-yr	876.18	875.99	0.18	0.01	0.01		575.00		37.94
Main	140	50-yr	876.16	876.02	0.14	0.10	0.02		575.00		41.02
Main	89		Bridge								
Main	51.9	50-yr	875.62	875.30	0.32	0.01	0.03		575.00		33.29
Main	50	50-yr	875.58	875.33	0.25	0.20	0.01		575.00		25.40
Main	2.5	50-yr	875.38	875.10	0.27	0.01	0.08		575.00		34.90
Main	0	50-yr	875.29	875.18	0.11				557.11	17.89	97.99

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Proposed

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 50-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 50-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 856     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 50-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 0     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
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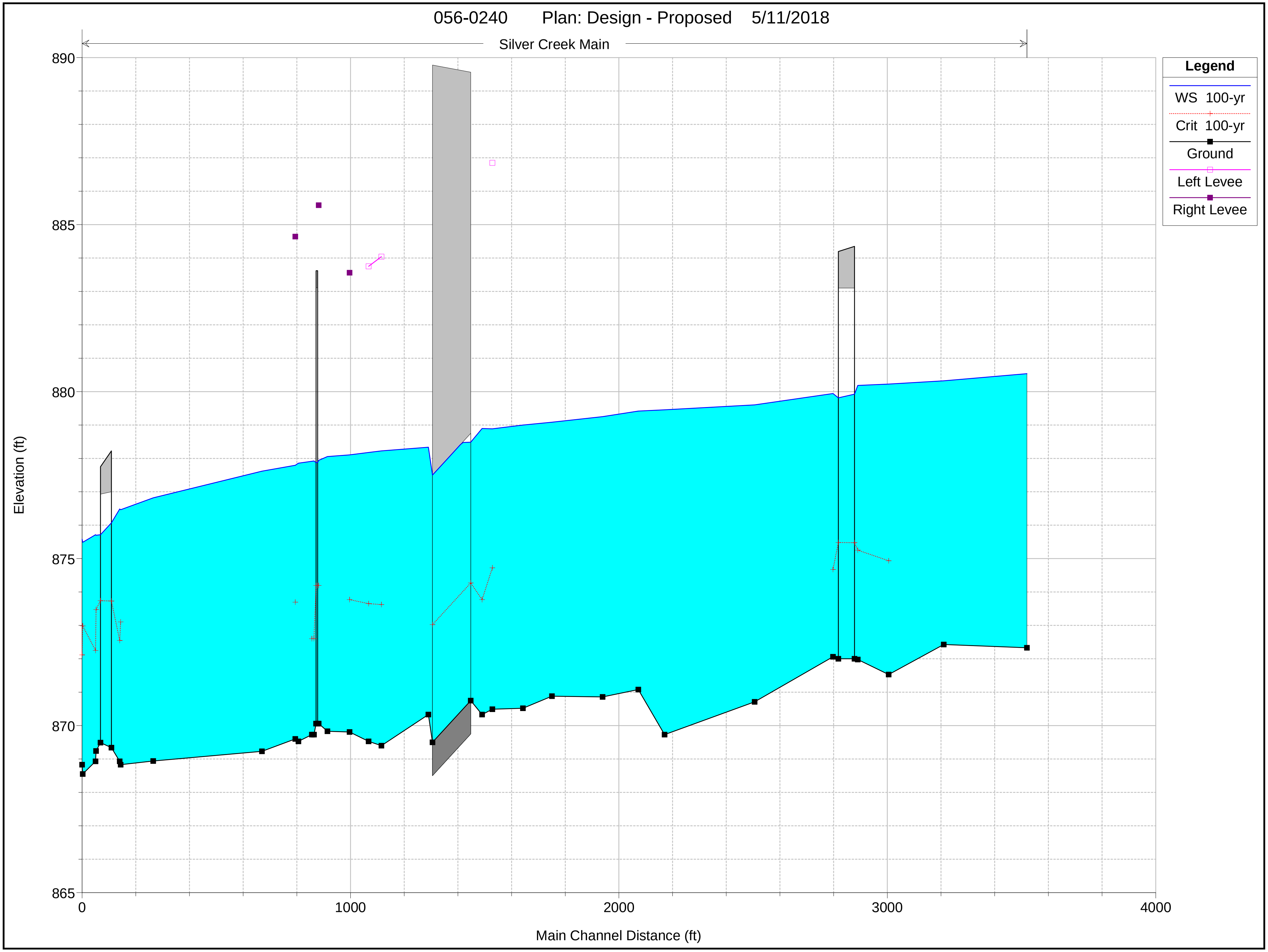
056-0240 Plan: Design - Proposed 5/11/2018
Silver Creek Main
Legend
WS 100-yr
Crit 100-yr
Ground
Left Levee
Right Levee
Elevation (ft)
890
885
880
875
870
865
0
1000
2000
3000
4000
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
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X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 12:01:57 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	100-yr	600.00	872.33	880.54		880.64	0.000598	2.61	229.88	43.02	0.20
Main	3210	100-yr	600.00	872.43	880.32		880.44	0.000704	2.77	216.48	41.86	0.21
Main	3005	100-yr	600.00	871.53	880.23	874.94	880.32	0.000470	2.39	251.36	44.81	0.18
Main	2890.1	100-yr	600.00	871.98	880.18	875.25	880.27	0.000346	2.30	261.19	48.20	0.16
Main	2847.6		Bridge									
Main	2797.4	100-yr	600.00	872.06	879.94	874.67	879.84	0.000313	2.35	255.69	46.58	0.16
Main	2505.7	100-yr	600.00	870.71	879.60		879.70	0.000646	2.53	237.24	50.67	0.21
Main	2170	100-yr	600.00	869.73	879.45		879.53	0.000378	2.28	275.09	63.05	0.16
Main	2072.3	100-yr	600.00	871.08	879.42		879.50	0.000393	2.23	276.37	65.58	0.16
Main	1939	100-yr	600.00	870.86	879.25		879.41	0.000984	3.18	188.49	37.70	0.25
Main	1750.4	100-yr	600.00	870.88	879.08		879.23	0.000881	3.05	197.01	38.64	0.24
Main	1642.6	100-yr	600.00	870.52	879.00		879.14	0.000786	2.98	201.13	35.61	0.22
Main	1528.6	100-yr	600.00	870.49	878.89	874.73	879.04	0.000959	3.13	191.63	38.47	0.25
Main	1490	100-yr	600.00	870.33	878.89	873.77	879.00	0.000521	2.55	240.21	53.54	0.19
Main	1374.4		Culvert									
Main	1290	100-yr	600.00	870.33	878.34		878.46	0.000519	2.84	211.06	44.58	0.20
Main	1115.3	100-yr	600.00	869.40	878.22	873.62	878.35	0.000768	2.87	209.06	40.57	0.22
Main	1067.3	100-yr	600.00	869.53	878.18	873.65	878.31	0.000812	2.95	203.12	39.14	0.23
Main	996.6	100-yr	600.00	869.81	878.10	873.77	878.25	0.000916	3.07	195.28	37.94	0.24
Main	914	100-yr	680.00	869.83	878.06		878.18	0.000693	2.82	241.43	45.43	0.22
Main	881.45	100-yr	680.00	870.06	877.94	874.20	878.14	0.001119	3.61	188.36	40.20	0.27
Main	874.6		Bridge									
Main	864	100-yr	680.00	869.73	877.92	872.60	878.09	0.000921	3.31	205.42	25.74	0.21
Main	856	100-yr	680.00	869.73	877.91	872.60	878.08	0.001945	3.31	205.14	25.74	0.21
Main	806	100-yr	680.00	869.53	877.86		877.98	0.001384	2.76	246.03	45.82	0.21

Main	794.4	100-yr	680.00	869.60	877.79	873.69	877.95	0.002009	3.13	217.05	44.12	0.25
Main	670	100-yr	680.00	869.23	877.62		877.73	0.001343	2.73	248.79	46.06	0.21
Main	265	100-yr	680.00	868.94	876.82		877.00	0.002479	3.46	196.67	40.18	0.28
Main	143.5	100-yr	680.00	868.83	876.46	873.10	876.67	0.003015	3.66	185.88	39.54	0.30
Main	140	100-yr	680.00	868.93	876.49	872.55	876.65	0.002075	3.21	211.91	42.85	0.25
Main	89		Bridge									
Main	51.9	100-yr	680.00	869.24	875.70	873.48	876.06	0.006422	4.85	140.29	34.79	0.42
Main	50	100-yr	680.00	868.93	875.72	872.25	876.03	0.004172	4.47	151.97	25.79	0.32
Main	2.5	100-yr	680.00	868.55	875.49	872.98	875.80	0.005267	4.51	150.89	36.55	0.39
Main	0	100-yr	680.00	868.83	875.58	872.12	875.70	0.001716	2.82	262.30	107.61	0.23

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	100-yr	880.64	880.54	0.11	0.20	0.00		600.00		43.02
Main	3210	100-yr	880.44	880.32	0.12	0.12	0.01		600.00		41.86
Main	3005	100-yr	880.32	880.23	0.09	0.05	0.00		600.00		44.81
Main	2890.1	100-yr	880.27	880.18	0.08	0.01	0.00		600.00		48.20
Main	2847.6		Bridge								
Main	2797.4	100-yr	879.84	879.94	0.09	0.10	0.10		600.00		46.58
Main	2505.7	100-yr	879.70	879.60	0.10	0.16	0.01		600.00		50.67
Main	2170	100-yr	879.53	879.45	0.08	0.04	0.00		593.06	6.94	63.05
Main	2072.3	100-yr	879.50	879.42	0.08	0.08	0.01		596.85	3.15	65.58
Main	1939	100-yr	879.41	879.25	0.16	0.18	0.00		600.00		37.70
Main	1750.4	100-yr	879.23	879.08	0.14	0.09	0.00		600.00		38.64
Main	1642.6	100-yr	879.14	879.00	0.14	0.10	0.00		600.00		35.61
Main	1528.6	100-yr	879.04	878.89	0.15	0.03	0.02		600.00		38.47
Main	1490	100-yr	879.00	878.89	0.10				597.83	2.17	53.54
Main	1374.4		Culvert								
Main	1290	100-yr	878.46	878.34	0.13	0.11	0.00		600.00		44.58
Main	1115.3	100-yr	878.35	878.22	0.13	0.04	0.00		600.00		40.57
Main	1067.3	100-yr	878.31	878.18	0.14	0.06	0.00		600.00		39.14
Main	996.6	100-yr	878.25	878.10	0.15	0.06	0.01		600.00		37.94
Main	914	100-yr	878.18	878.06	0.12	0.03	0.01		680.00		45.43
Main	881.45	100-yr	878.14	877.94	0.20	0.00	0.01		680.00		40.20
Main	874.6		Bridge								
Main	864	100-yr	878.09	877.92	0.17	0.01	0.00		680.00		25.74
Main	856	100-yr	878.08	877.91	0.17	0.08	0.03		680.00		25.74
Main	806	100-yr	877.98	877.86	0.12	0.02	0.01		680.00		45.82
Main	794.4	100-yr	877.95	877.79	0.15	0.20	0.01		680.00		44.12
Main	670	100-yr	877.73	877.62	0.12	0.72	0.01		680.00		46.06
Main	265	100-yr	877.00	876.82	0.19	0.33	0.00		680.00		40.18
Main	143.5	100-yr	876.67	876.46	0.21	0.01	0.01		680.00		39.54
Main	140	100-yr	876.65	876.49	0.16	0.10	0.03		680.00		42.85
Main	89		Bridge								
Main	51.9	100-yr	876.06	875.70	0.36	0.01	0.03		680.00		34.79
Main	50	100-yr	876.03	875.72	0.31	0.22	0.00		680.00		25.79
Main	2.5	100-yr	875.80	875.49	0.32	0.01	0.10		680.00		36.55
Main	0	100-yr	875.70	875.58	0.12				645.56	34.44	107.61

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Proposed

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 100-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 100-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 856     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 140     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Upstream
     Note:   Manning's n values were composited to a single value in the main channel.
River: Silver Creek  Reach: Main     RS: 89     Profile: 100-yr Downstream
     Note:   Manning's n values were composited to a single value in the main channel.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 0     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
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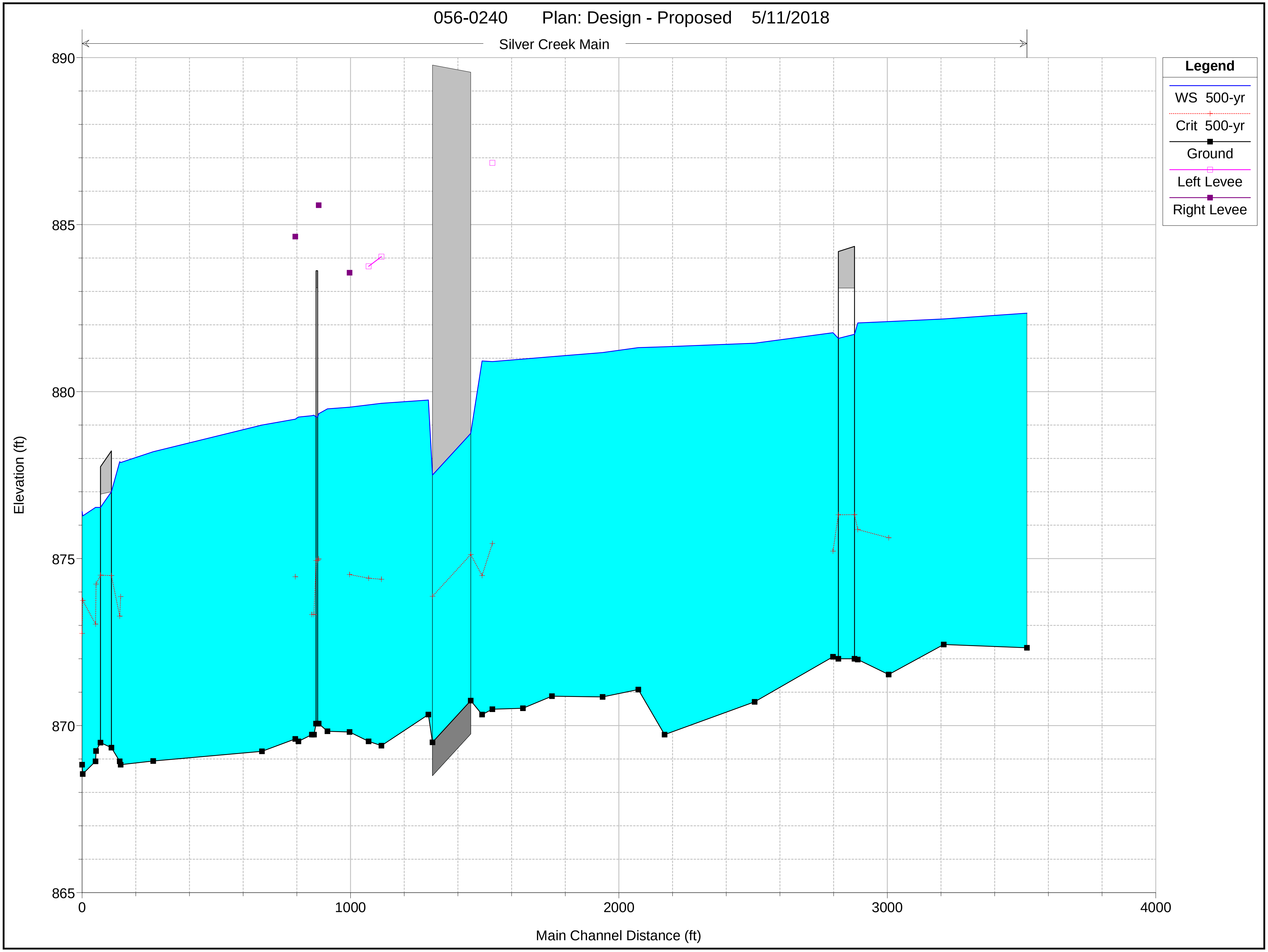
056-0240 Plan: Design - Proposed 5/11/2018
Silver Creek Main
Legend
WS 500-yr
Crit 500-yr
Ground
Left Levee
Right Levee
890
885
880
875
870
865
Elevation (ft)
0
1000
2000
3000
4000
Main Channel Distance (ft)

```
HEC-RAS Version 4.1.0 Jan 2010
 U.S. Army Corps of Engineers
Hydrologic Engineering Center
      609 Second Street
      Davis, California

X     X  XXXXXX    XXXX        XXXX      XX      XXXX
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X     X  X        X            X   X   X    X   X
XXXXXXX  XXXX     X       XXX  XXXX    XXXXXX    XXXX
X     X  X        X            X  X    X    X        X
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PROJECT DATA
Project Title: 056-0240
Project File : 056-0240.prj
Run Date and Time: 5/11/2018 12:01:57 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Main	3520	500-yr	830.00	872.33	882.35		882.46	0.000495	2.65	313.75	49.64	0.19
Main	3210	500-yr	830.00	872.43	882.17		882.29	0.000557	2.76	300.32	48.64	0.20
Main	3005	500-yr	830.00	871.53	882.10	875.62	882.19	0.000394	2.43	341.61	51.65	0.17
Main	2890.1	500-yr	830.00	871.98	882.06	875.87	882.15	0.000280	2.46	338.01	60.83	0.15
Main	2847.6		Bridge									
Main	2797.4	500-yr	830.00	872.06	881.76	875.23	881.66	0.000279	2.58	321.32	69.55	0.15
Main	2505.7	500-yr	830.00	870.71	881.45		881.54	0.000474	2.44	339.98	60.68	0.18
Main	2170	500-yr	830.00	869.73	881.34		881.41	0.000282	2.24	444.35	116.25	0.14
Main	2072.3	500-yr	830.00	871.08	881.32		881.39	0.000277	2.17	439.76	106.53	0.14
Main	1939	500-yr	830.00	870.86	881.17		881.32	0.000745	3.10	267.46	44.92	0.22
Main	1750.4	500-yr	830.00	870.88	881.05		881.18	0.000658	2.97	279.56	45.52	0.21
Main	1642.6	500-yr	830.00	870.52	880.97		881.11	0.000634	3.00	276.76	40.99	0.20
Main	1528.6	500-yr	830.00	870.49	880.90	875.45	881.04	0.000688	3.00	276.64	45.96	0.22
Main	1490	500-yr	830.00	870.33	880.92	874.49	881.00	0.000353	2.43	379.83	104.39	0.16
Main	1374.4		Culvert									
Main	1290	500-yr	830.00	870.33	879.75		879.91	0.000520	3.24	256.26	50.05	0.20
Main	1115.3	500-yr	830.00	869.40	879.65	874.38	879.80	0.000737	3.06	270.86	46.09	0.22
Main	1067.3	500-yr	830.00	869.53	879.60	874.41	879.76	0.000782	3.16	262.63	44.33	0.23
Main	996.6	500-yr	830.00	869.81	879.53	874.52	879.70	0.000873	3.28	252.99	42.91	0.24
Main	914	500-yr	950.00	869.83	879.48		879.63	0.000687	3.06	310.25	50.96	0.22
Main	881.45	500-yr	950.00	870.06	879.34	874.99	879.59	0.001031	4.03	235.93	45.85	0.27
Main	874.6		Bridge									
Main	864	500-yr	950.00	869.73	879.29	873.32	879.53	0.001154	3.94	240.84	25.97	0.23
Main	856	500-yr	950.00	869.73	879.28	873.32	879.52	0.002437	3.95	240.48	25.97	0.23
Main	806	500-yr	950.00	869.53	879.24		879.38	0.001410	3.04	313.01	51.17	0.22

Main	794.4	500-yr	950.00	869.60	879.18	874.46	879.35	0.001940	3.37	282.16	50.09	0.25
Main	670	500-yr	950.00	869.23	879.00		879.14	0.001372	3.00	316.17	51.41	0.21
Main	265	500-yr	950.00	868.94	878.20		878.41	0.002385	3.71	255.82	45.46	0.28
Main	143.5	500-yr	950.00	868.83	877.87	873.86	878.11	0.002643	3.87	250.21	62.99	0.29
Main	140	500-yr	950.00	868.93	877.90	873.28	878.08	0.001973	3.44	276.35	48.32	0.25
Main	89		Bridge									
Main	51.9	500-yr	950.00	869.24	876.53	874.24	877.02	0.006971	5.61	169.30	37.94	0.45
Main	50	500-yr	950.00	868.93	876.53	873.04	877.00	0.005533	5.48	173.90	32.07	0.38
Main	2.5	500-yr	950.00	868.55	876.28	873.75	876.70	0.006034	5.25	183.34	48.33	0.43
Main	0	500-yr	950.00	868.83	876.41	872.76	876.56	0.001850	3.19	327.91	212.75	0.25

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Main	3520	500-yr	882.46	882.35	0.11	0.16	0.00		830.00		49.64
Main	3210	500-yr	882.29	882.17	0.12	0.10	0.01		830.00		48.64
Main	3005	500-yr	882.19	882.10	0.09	0.04	0.00		830.00		51.65
Main	2890.1	500-yr	882.15	882.06	0.09	0.01	0.00		830.00		60.83
Main	2847.6		Bridge								
Main	2797.4	500-yr	881.66	881.76	0.11	0.08	0.13		830.00		69.55
Main	2505.7	500-yr	881.54	881.45	0.09	0.12	0.01		830.00		60.68
Main	2170	500-yr	881.41	881.34	0.07	0.03	0.00		764.38	65.62	116.25
Main	2072.3	500-yr	881.39	881.32	0.07	0.06	0.01		780.40	49.60	106.53
Main	1939	500-yr	881.32	881.17	0.15	0.13	0.00		830.00		44.92
Main	1750.4	500-yr	881.18	881.05	0.14	0.07	0.00		830.00		45.52
Main	1642.6	500-yr	881.11	880.97	0.14	0.08	0.00		830.00		40.99
Main	1528.6	500-yr	881.04	880.90	0.14	0.02	0.02		830.00		45.96
Main	1490	500-yr	881.00	880.92	0.09				779.37	50.63	104.39
Main	1374.4		Culvert								
Main	1290	500-yr	879.91	879.75	0.16	0.11	0.01		830.00		50.05
Main	1115.3	500-yr	879.80	879.65	0.15	0.04	0.00		830.00		46.09
Main	1067.3	500-yr	879.76	879.60	0.16	0.06	0.00		830.00		44.33
Main	996.6	500-yr	879.70	879.53	0.17	0.06	0.01		830.00		42.91
Main	914	500-yr	879.63	879.48	0.15	0.03	0.01		950.00		50.96
Main	881.45	500-yr	879.59	879.34	0.25	0.00	0.01		950.00		45.85
Main	874.6		Bridge								
Main	864	500-yr	879.53	879.29	0.24	0.01	0.00		950.00		25.97
Main	856	500-yr	879.52	879.28	0.24	0.09	0.05		950.00		25.97
Main	806	500-yr	879.38	879.24	0.14	0.02	0.01		950.00		51.17
Main	794.4	500-yr	879.35	879.18	0.18	0.20	0.01		950.00		50.09
Main	670	500-yr	879.14	879.00	0.14	0.72	0.01		950.00		51.41
Main	265	500-yr	878.41	878.20	0.21	0.30	0.00		950.00		45.46
Main	143.5	500-yr	878.11	877.87	0.23	0.01	0.01		947.51	2.49	62.99
Main	140	500-yr	878.08	877.90	0.18				950.00		48.32
Main	89		Bridge								
Main	51.9	500-yr	877.02	876.53	0.49	0.01	0.01		950.00		37.94
Main	50	500-yr	877.00	876.53	0.47	0.27	0.02	0.12	949.80	0.08	32.07
Main	2.5	500-yr	876.70	876.28	0.43	0.01	0.14		948.18	1.82	48.33
Main	0	500-yr	876.56	876.41	0.15			0.01	866.45	83.54	212.75

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Design-Proposed

River: Silver Creek  Reach: Main     RS: 2847.6     Profile: 500-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the downstream energy.  This
             is not physically possible, the momentum answer has been disregarded.
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
River: Silver Creek  Reach: Main     RS: 2072.3     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Main     RS: 1528.6     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1115.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 1067.3     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 996.6     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 881.45     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr
     Warning:For the final momentum answer at the bridge, the upstream energy was computed lower than the energy inside of the
             bridge deck.  This is not physically possible.  Please review your bridge data and results for reasonableness.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Upstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 874.6     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 864     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 856     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 794.4     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr
     Note:   Momentum answer is not valid if the water surface is above the low chord or if there is weir flow.  The momentum
             answer has been disregarded.
     Note:   The downstream water surface is below the minimum elevation for pressure flow.  The sluice gate equations were used
             for pressure flow.
River: Silver Creek  Reach: Main     RS: 89     Profile: 500-yr Downstream
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 51.9     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Main     RS: 50     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Main     RS: 2.5     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
```

River: Silver Creek Reach: Main   RS: 0   Profile: 500-yr
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

EXHIBIT K

PERMIT SUMMARY

Illinois Department of Transportation

Permit Summary for Floodway Construction in Northeast Illinois

Applicant Agency:	Illinois Department of Transportation	County:	McHenry
Route:	Illinois Route 47 / N. Seminary Rd.	Stream:	Silver Creek
Section:		SN:	056-0240

General Description (bridge length, bridge width, number of spans, abutment type, proposed scope of work within floodway, etc.):
Existing Facility: IL-47 over Silver Creek with 7'(W) x 8'(H) Reinforced Concrete Box Culvert
Proposed Improvement: Widening of IL-47; removal and replacement of existing culvert with RC box culvert 16'(W) x 9'(H)

1. Is the proposed work classified as repairs such as deck replacement, pavement resurfacing, or the armoring or filling of a scour hole? ☐ Yes ☒ No

2. Does the proposed work only consist of modifications to the existing structure which will occur above the regulatory 100-year flood profile? ☐ Yes ☒ No

Note: If the answer to question 1 or 2 is yes, no permit is required and questions 3 through 12 may be omitted.

3. Does the proposed work below the regulatory 100-year flood profile consist of widening of the existing structure by 12 feet or less? ☐ Yes ☒ No

Note: If yes, Regional Permit No. 2 applies and questions 4 through 9 may be omitted.

4. Is the proposed improvement, including the approach roadway, more restrictive to normal and flood flows than the existing structure? ☐ Yes ☒ No

5. Is a Channel Modification proposed? ☐ Yes ☒ No

6. Are there any buildings or structures located upstream in the 100-year floodplain within the influence of the structure backwater? ☐ Yes ☒ No

   6a. If no, does the backwater of the proposed improvement exceed the backwater of the existing structure by more than 0.1 foot? ☐ Yes ☒ No

   6b. If yes, does the proposed backwater exceed the natural high water elevation by more than 0.1 foot? ☐ Yes ☐ No

7. Are transitions required for this project? ☐ Yes ☒ No

8. Is the flood profile at the project site impacted by backwater from a downstream receiving stream? ☐ Yes ☒ No

   If yes, list frequency of starting elevation for analysis: Starting WSE based on FIS model

9. Is backwater from a downstream structure affecting the flood profile at the project site? ☐ Yes ☒ No

9a. Was the existing downstream structure used in the analysis for determining flood profile at the project site? years? (Attach documentation) ☐ Yes ☒ No

9b. Is the downstream structure scheduled for improvement in the next 5 ☐ Yes ☒ No

9c. Was the proposed downstream improvement used in the analysis? ☐ Yes ☒ No

10. Is a floodway map change required due to the proposed project? ☐ Yes ☒ No

11. Will fill or material be placed in the floodway due to the proposed work? ☒ Yes ☐ No

11a. If yes, is compensatory storage provided at the project location? (Attach a copy of completed Attachment A) ☒ Yes ☐ No

11b. If the answer to 11a is no, is compensatory storage provided at another location? If yes, give location and attach a copy of completed Attachment A. ☐ Yes ☒ No

11c. Has compensatory storage relief been granted? (Attach Documentation) ☐ Yes ☒ No

12. Coordination based on Memorandum of Agreement has occurred with Agency(ies) (Attach documentation):. ☐ Yes ☐ No

---

All engineering analysis has been performed by me or under my direct supervision.

Signature: [signature] IL/P.E. #: 062.061690

Date: 8-11-2017 P.E. Expiration Date: 11/30/2017

FOR DEPARTMENTAL USE ONLY

Is a permit required for this project? ☐ Yes ☐ No

If yes, specify type of permit: ☐ Floodway, ☐ Regional 1, ☐ Regional 2

Permit Summary
(Attachment A - Compensatory Storage)

Part of Permit Summary for Floodway Construction in Northeast Illinois:

☒ Phase I (Preliminary) ☐ Phase II (Final)

Applicant Agency:	Illinois Department of Transportation	County:	McHenry
Route:	IL-47 / Seminary Ave.	Stream:	Silver Creek
Section:		SN:	052-0240 (Existing)

Provide the following information for Item 11:

a. Flood Water Elevations (Natural): 100-year 878.21 ft. Normal 871.4 ft. 10-year 876.19 ft.

b. Determine the amount of fill or material being placed in the floodway:

1. Between the 100-year and 10-year flood elevation 64 cu. yds.
2. Between the 10-year and normal water elevation 64 cu. yds.

c. Determine the volume being provided to compensate for above item b: (i.e. from structures removal, excavation, etc.)

1. Between the 100-year and 10-year flood elevation 67 cu. yds.
2. Between the 10-year and normal water elevation 146 cu. yds.

d. Mark on the exhibits the location and amount of compensatory storage to be excavated. Also show the location of floodway and floodplain boundaries. (Include a set of plans and cross sections)

Attach copy of calculations and Exhibit(s) reflecting the above finding.

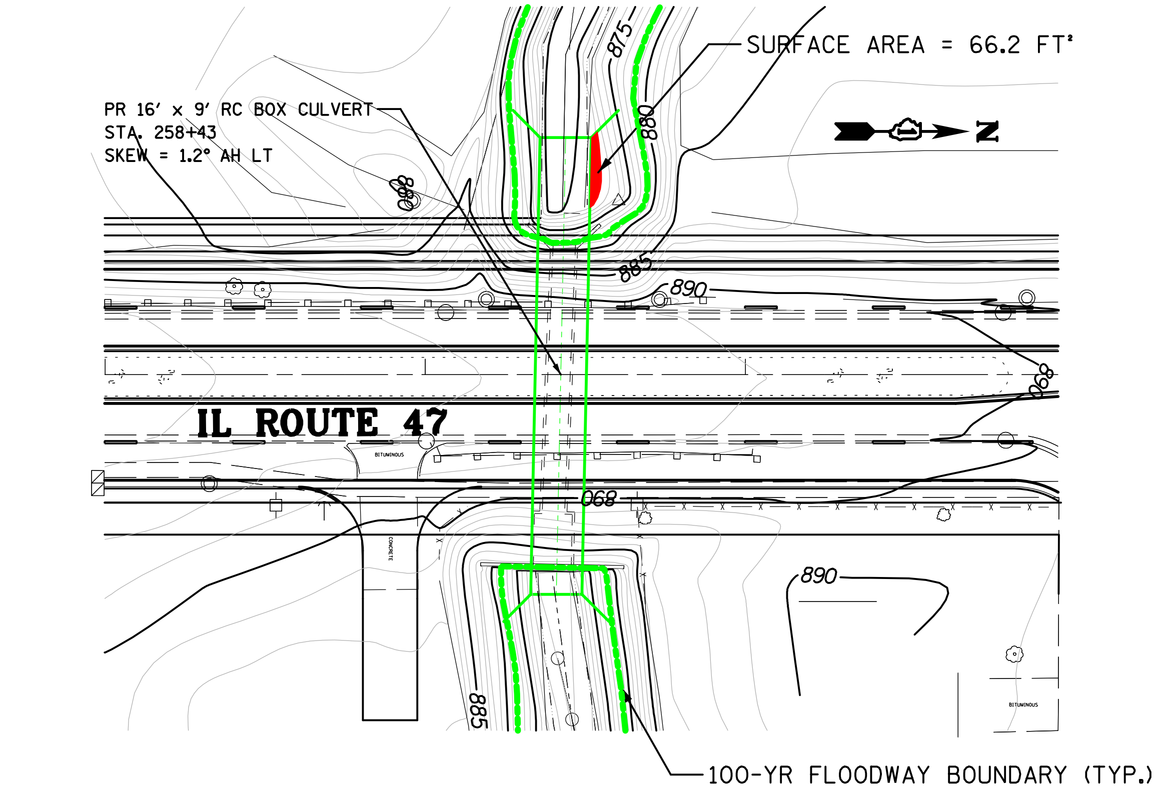
All engineering analysis has been performed by me or under my direct supervision.

Signature:	[signature]	IL/P.E. #:	062.061690
Date:	8-11-2017	P.E. Expiration Date:	11/30/2017

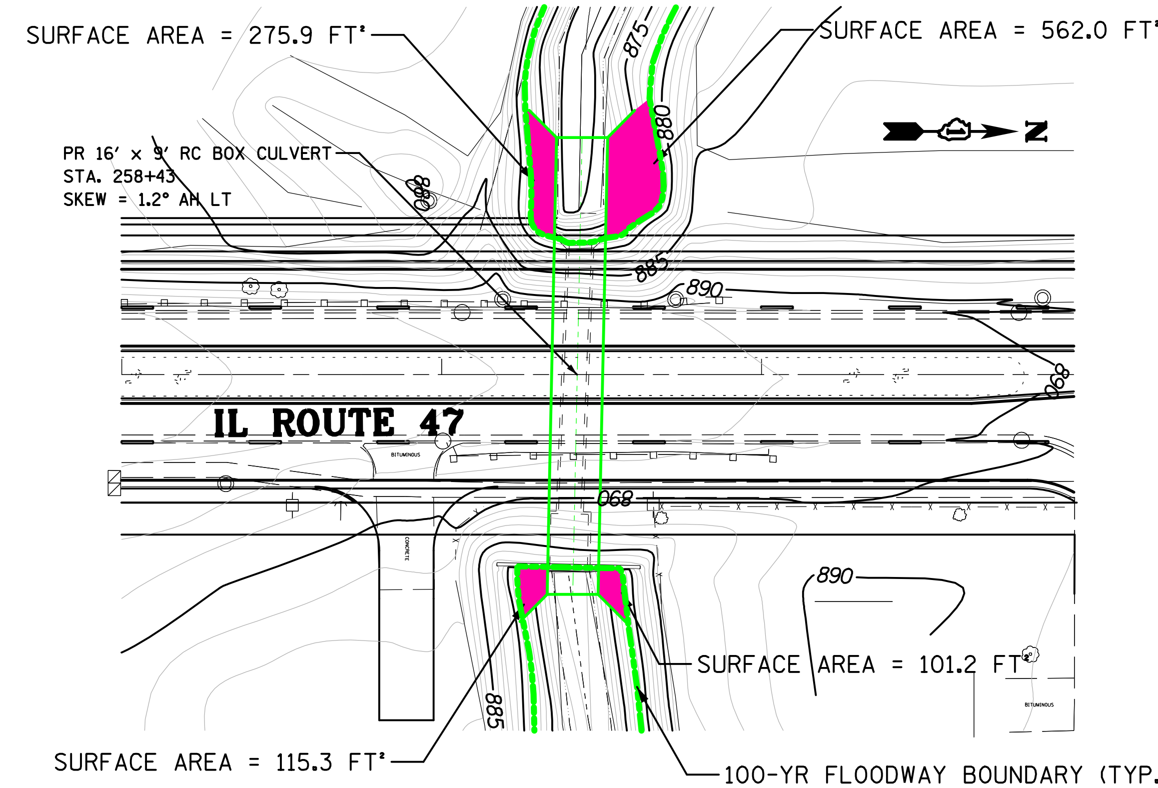
<u>EXHIBIT L</u>

COMPENSATORY STORAGE CALCULATIONS

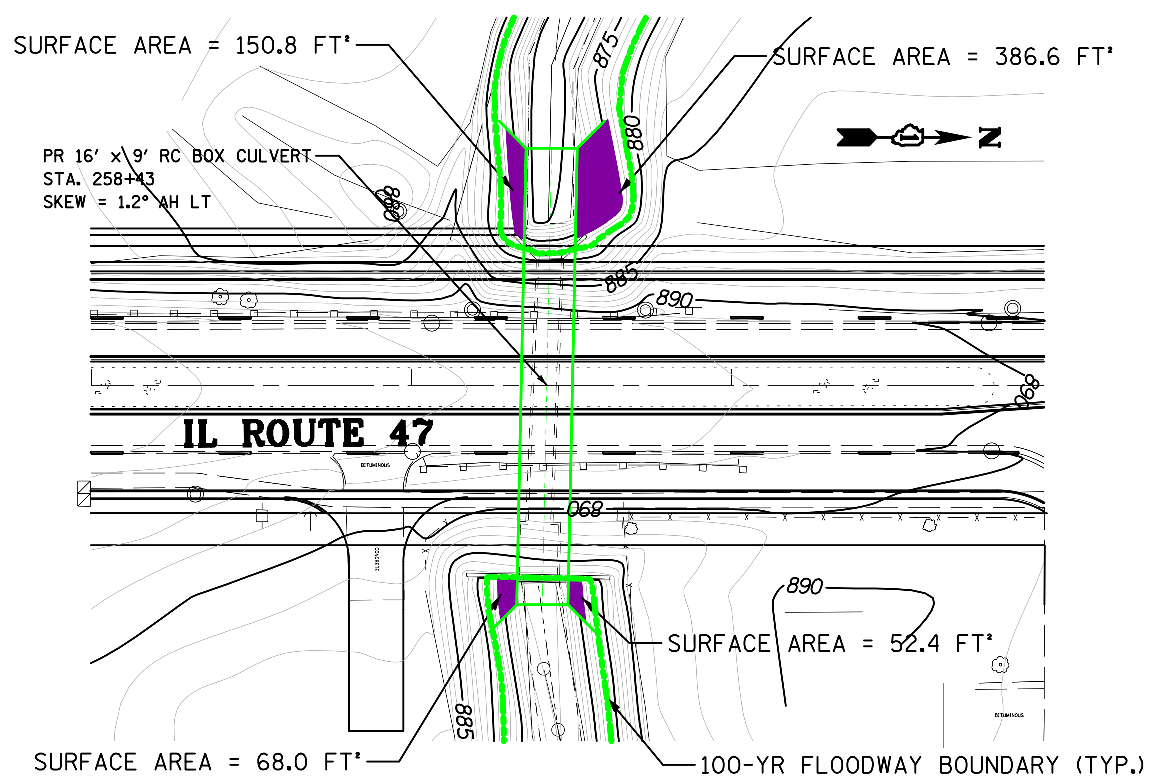
SURFACE AREA OF FLOODWAY FILL
NORMAL W.S.E. = 871.4

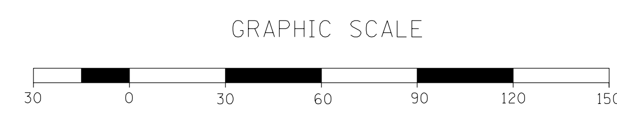


SURFACE AREA OF FLOODWAY FILL
100-YR N.H.W.E. = 878.20



SURFACE AREA OF FLOODWAY FILL
10-YR N.W.H.E. = 876.17





FILE NAME = $FILEL$ $MODELNAME$	USER NAME = $USER$ PLOT SCALE = $SCALE$ PLOT DATE = $DATE$	DESIGNED - SGL	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
		DRAWN - SGL	REVISED -	
		CHECKED - FML	REVISED -	
		DATE - 11/18/2014	REVISED -	

FLOODWAY COMPENSATORY STORAGE PLAN
IL-47 & SILVER CREEK

SCALE: ____ SHEET ___ OF ___ SHEETS STA. ____ TO STA. ____

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		

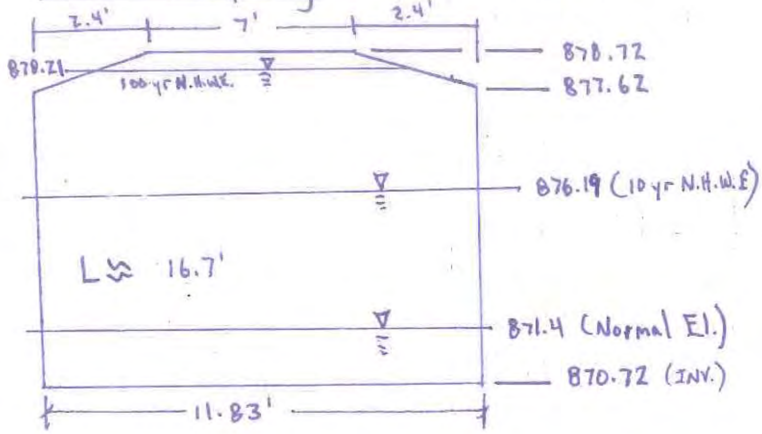
CONTRACT NO. ____

ILLINOIS FED. AID PROJECT

LIN ENGINEERING, LIMITED CONSULTING ENGINEERS Chatham, Illinois	ROUTE IL-47	SHEET 1 OF 4
	SECTION	DESIGNED SGL DATE 11-18-14
	COUNTY McHenry	CHECKED DATE

Compensatory Storage Provided in Existing Culvert (Sta. 258+41.7)

Upstream Opening (11.83' w x 8' h)



Area (Normal - 10yr)

$= (876.19 - 871.4)(11.83) = 56.67\ ft^2$

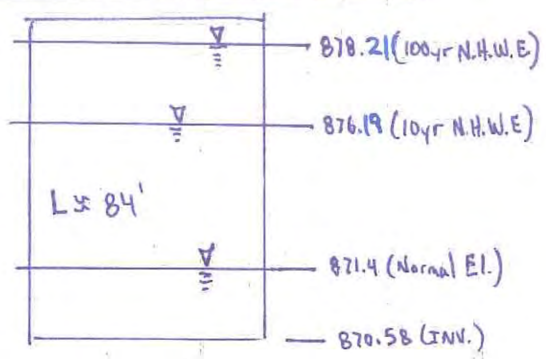
Area (10 - 100yr)

$= (877.62 - 876.19)(11.83) + (7')(878.21 - 877.62) + (0.59')(2.4 + 1.16) = 23.15\ ft^2$

V (Normal - 10) - $(56.67 ft^2)(16.7') =$ 35.1 yd^3

V (10 - 100) - $(23.15 ft^2)(16.7') =$ 14.3 yd^3

7'w x 8' h Section (U/S side)



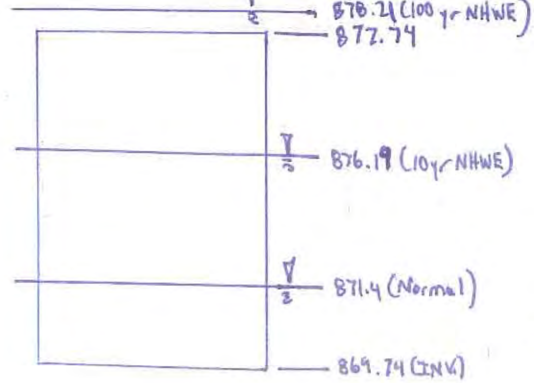
Area (Normal - 10yr)

$= (876.19 - 871.4)(7') = 33.53\ ft^2$

Area (10 - 100yr)

$= (878.21 - 876.19)(7') = 14.14\ ft^2$

7w x 8'h Section (D/S side)



Area (Normal - 10yr) $= 33.53\ ft^2$

V(Normal - 10) $= (33.53)(84') = 104.3\ yd^3$

Area (10-100yr) $= (7')(877.74 - 876.19) = 10.9\ ft^2$

Avg Area (10-100yr) $= (14.1 + 10.9)/2 = 12.5\ ft^2$

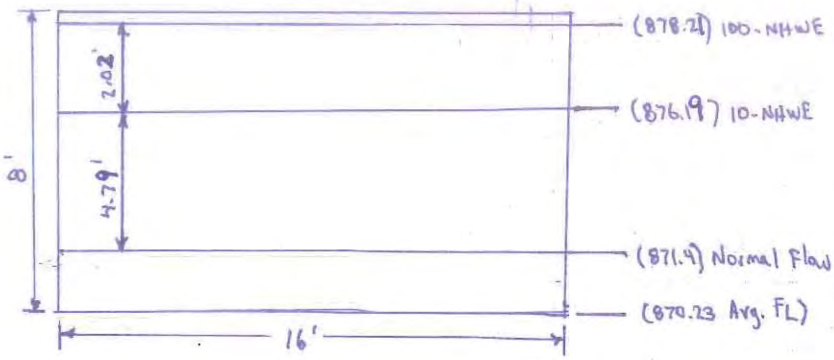
V(10-100yr) $= (12.5)(84) = 38.9\ yd^3$

Total Volume (Normal - 10): $35.1 + 104.3 = \underline{139.4 yd^3}$

Total Volume (10 - 100yr) $= 14.3\ yd^3 + 38.9\ yd^3 = \underline{53.2 yd^3}$

LIN ENGINEERING, LIMITED CONSULTING ENGINEERS Chatham, Illinois	ROUTE IL-47	SHEET 2 OF 4
	SECTION	DESIGNED SGL DATE 11-18-14
	COUNTY McHenry	CHECKED DATE

16' w x 9' h Replacement Culvert - Comp. Storage Provided



Area (Normal - 10yr)
$= (16')(4.79') = 76.64 \text{ ft}^2$

Area (10-100yr)
$= (16')(2.02') = 32.32 \text{ ft}^2$

$L = 100.7'$ (Length of Ex Culv)

Volume (Normal - 10yr)
$(100.7')(76.64 \text{ ft}^2)/27 = \underline{285.8 \text{ yd}^3}$

Volume (10-100yr)
$(100.7')(32.32 \text{ ft}^2)/27 = \underline{120.5 \text{ yd}^3}$

Net Compensatory Storage Provided

Existing Culvert Volumes (from Page 1)

(Normal-10yr) = 139.4 yd^3

(10-100yr) = 53.2 yd^3

Proposed Culvert Volumes

(Normal-10yr) = 285.8 yd^3

(10-100yr) = 120.5 yd^3

Net Comp Storage

(Normal-10yr) = $285.8 - 139.4 \text{ yd}^3 = \underline{146.4 \text{ yd}^3}$

(10-100yr) = $120.5 - 53.2 \text{ yd}^3 = \underline{67.3 \text{ yd}^3}$

LIN ENGINEERING, LIMITED CONSULTING ENGINEERS Chatham, Illinois	ROUTE IL-47 SECTION COUNTY McHenry	SHEET 3 OF 4 DESIGNED SGL DATE 11-18-2014 CHECKED DATE

Floodway Fill Computations (See Floodway Compensatory Storage Plan)
Areas Measured in Microstation

NW Quad

- Area of Normal Flow (871.4)
  $66.22\ ft^2$
- Area of 10-yr Flow (876.19)
  $386.55\ ft^2$
- Area of 100-yr Flow (878.21)
  $562.02\ ft^2$

Volume (Normal to 10-yr)
$(66.22 + 386.55\ ft^2)/2\ (4.79')/27$
$= 40.16\ yd^3$

Volume (10-100yr)
$(386.55 + 562.02)/2\ (2.02')/27$
$= 35.48\ yd^3$

SW Quad

- Area of Normal Flow (871.4)
  $0\ ft^2$
- Area of 10-yr Flow (876.19)
  $150.76\ ft^2$
- Area of 100-yr Flow (878.21)
  $275.90\ ft^2$

Volume (Normal to 10-yr)
$(0 + 150.76\ ft^2)/2\ (4.79')/27$
$= 13.37\ yd^3$

Volume (10-100yr)
$(150.76 + 275.9\ ft^2)/2\ (2.02)/27$
$= 15.96\ yd^3$

NE Quad

- Area of Normal Flow (871.4) - 0
- Area of 10-yr Flow (876.19)
  $52.36\ ft^2$
- Area of 100-yr Flow (878.21)
  $101.2\ ft^2$

Volume (Normal to 10-yr)
$(52.36\ ft^2)/2\ (4.79')/27$
$= 4.64\ yd^3$

SE Quad

- Area of Normal Flow (871.4) - 0
- Area of 10-yr Flow (876.19)
  $67.99\ ft^2$
- Area of 100-yr Flow (878.21)
  $115.3\ ft^2$

Volume (Normal to 10-yr)
$(67.99)/2\ (4.79')/27$
$= 6.03\ yd^3$

LIN ENGINEERING, LIMITED CONSULTING ENGINEERS Chatham, Illinois	ROUTE IL-47	SHEET 4 OF 4
	SECTION	DESIGNED SGL DATE 11-18
	COUNTY McHenry	CHECKED DATE

Floodway Fill Computations (cont....)

NE Quad

Volume (10-100yr)

$(52.36 + 101.2)/2 \times (2.02')/27$

$= 5.74\ yd^3$

SE Quad

Volume (10-100yr)

$(67.99 + 115.3)/2 \times (2.02')/27$

$= 6.86\ yd^3$

Total Fill

(Normal-10yr) $40.16 + 13.37 + 4.64 + 6.03 = 64.2\ yd^3$

(10-100-yr) $35.48 + 15.96 + 5.74 + 6.86 = 64.0\ yd^3$

	Comp Storage Provided	Floodway Fill	
(Normal-10yr)	$146.4\ yd^3$	$64.2\ yd^3$	∴ OK
(10-100yr)	$67.3\ yd^3$	$64.0\ yd^3$	∴ OK

EXHIBIT M

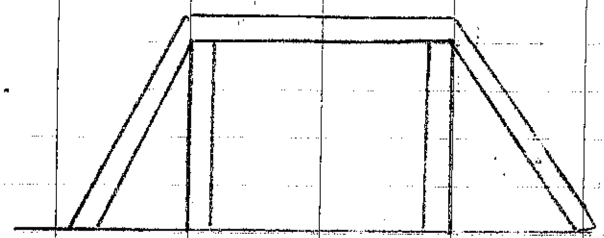
SURVEY NOTES

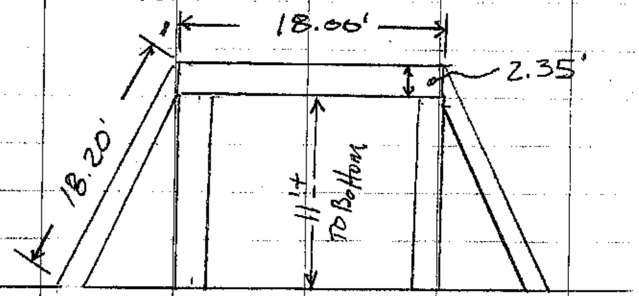
208165 ST Johns Rd 11/24/09

Silver Creek TRIB#1
File# 8165 1124 Pella TDS

TC 16644 BS 353
Hi = 5.59 R.H = 4.77

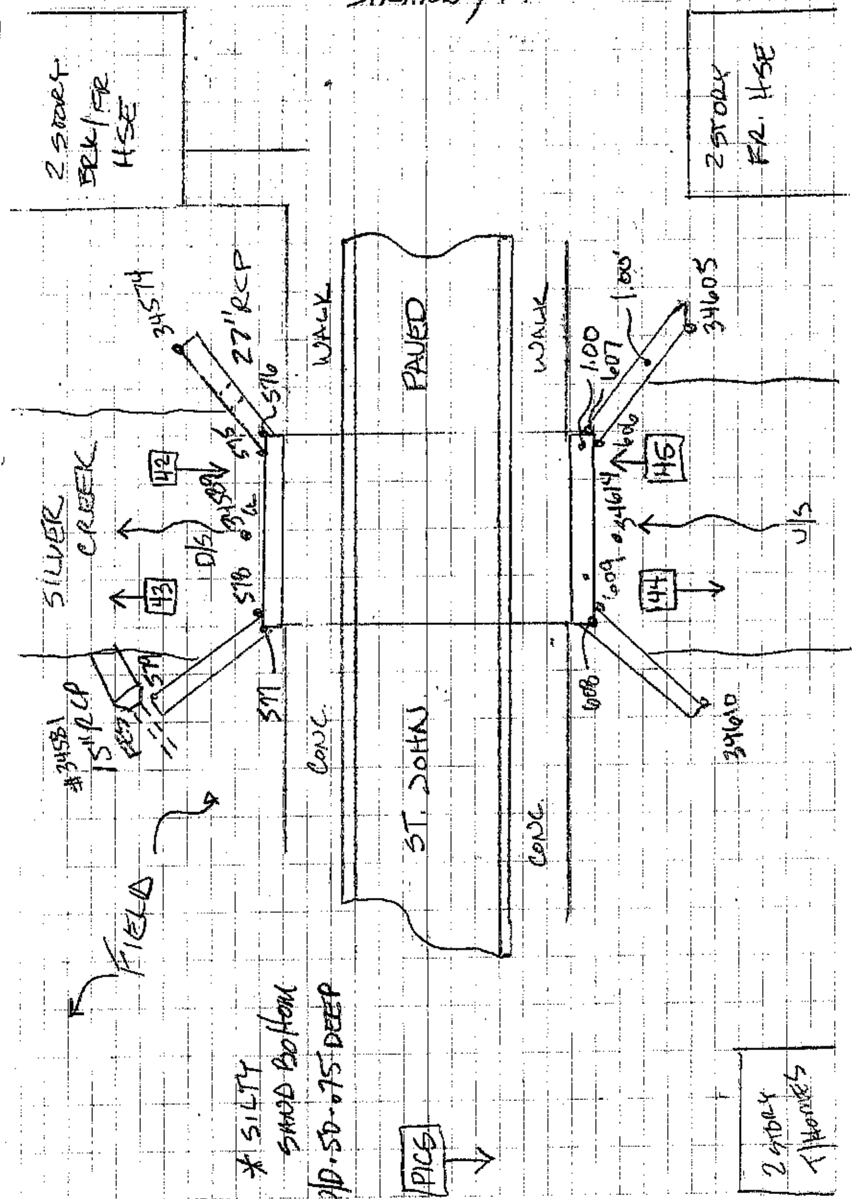
34573 104-452
34629 103-16643
34630 103-352 (15932)


U/S



D/S

TR/Jm STRAND/47 Rainy 35/1

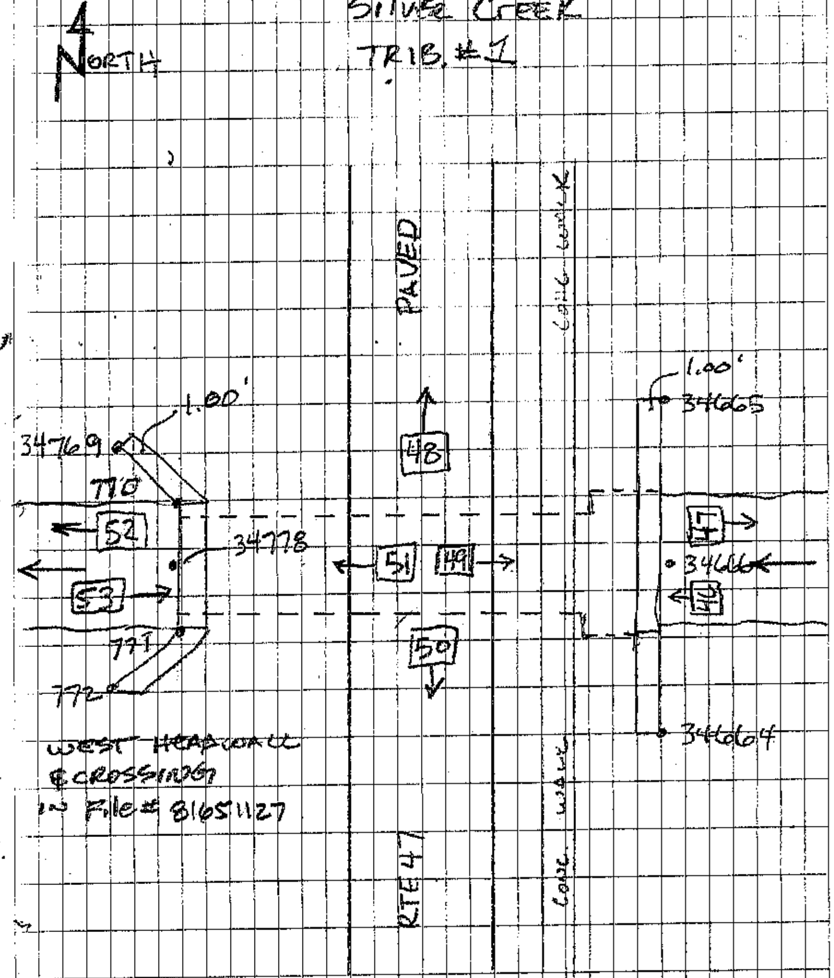


208165	RTE47	11/24/09
	Silver Creek TRIB#1	11/25/09
	File# 8165 1124 Yellow FDs	
	⊼ @ 25603 BS @ 321	
	Hi = 5.65 RH = 4.84	
34631	SET GOD	
34632	SET MAG	
34633	SET MAG	
34634	SET GOD	
34663	103 - 322	
	⊼ @ 34631 BS 25603	
	Hi = 5.29 R.H = 4.84	
34664		
34673		
	⊼ @ 34632 BS @ 34631	
	Hi = 5.59 RH = 4.58	
34674		
34693	103 - 34631	
34694	103 - 34633	
	⊼ @ 34633 BS 34631	
	Hi = 5.30 R.H = 4.58	
34695	SET GOD	
34696	SET GOD	
34697	SET GOD	
34716	103 - 34631	

CONT. PG 41

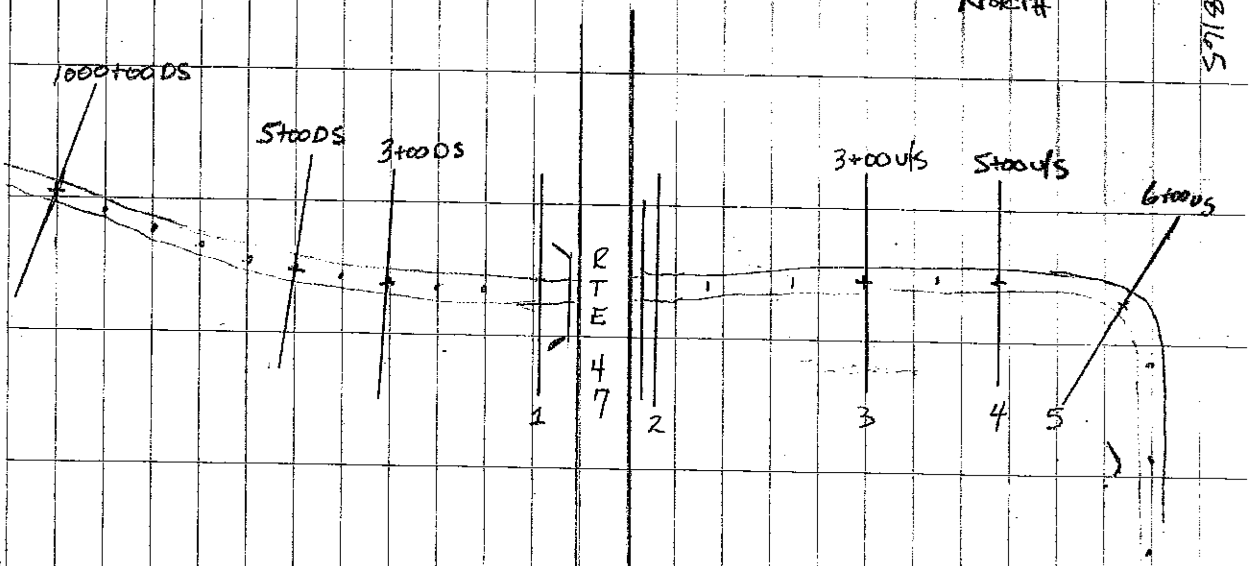
TR/JM STRAND/47 RAINY 36/1

Silver Creek
TRIB. #1



11/25 W/D IN CULVERT 0.70 (E-SIDE U/S)
11/27 W/D IN CULVERT 1.00 (W-SIDE D/S)

SILVER CREEK TRIB 1

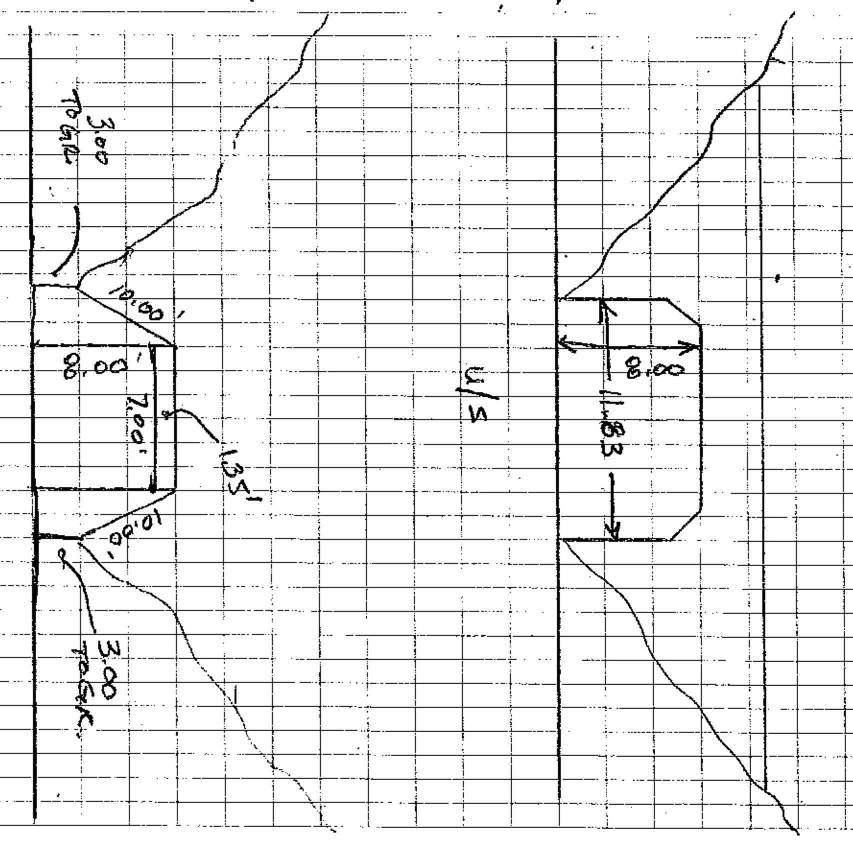


* WATER ELEVS XS 2-5 U/S AND
STATIONS BTW TAKEN ON
11/25/09 File #8165 1124

11/24/09

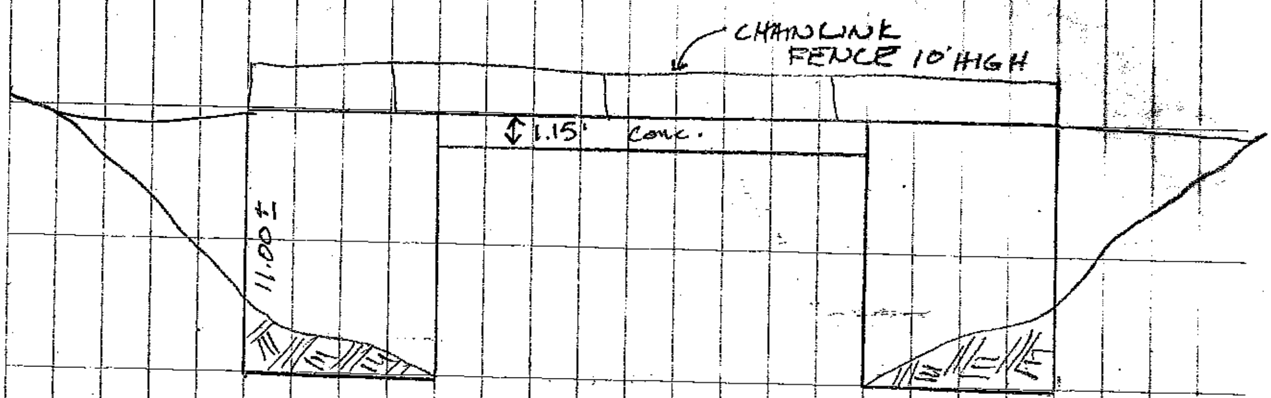
TR/JM

STRAND 47
SILVER CREEK
TRIB. #1



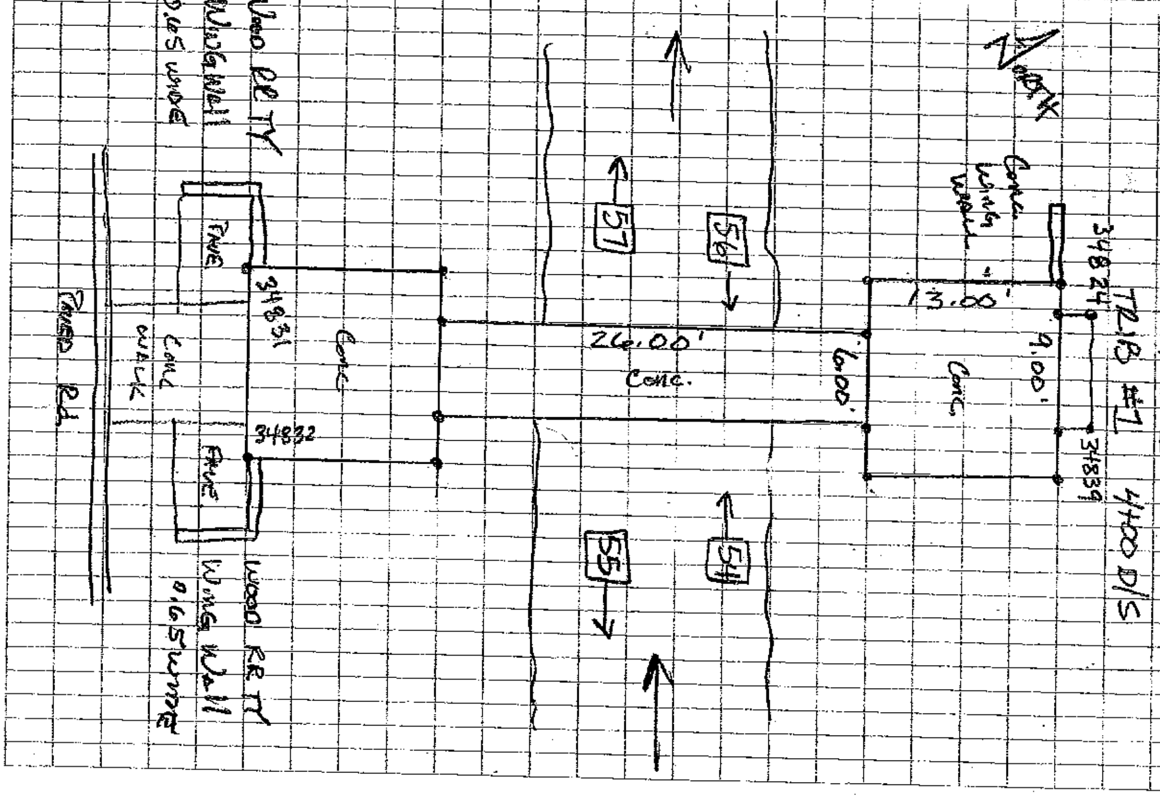
Pedestrian BRIDGE
4400 D/S

2081/65



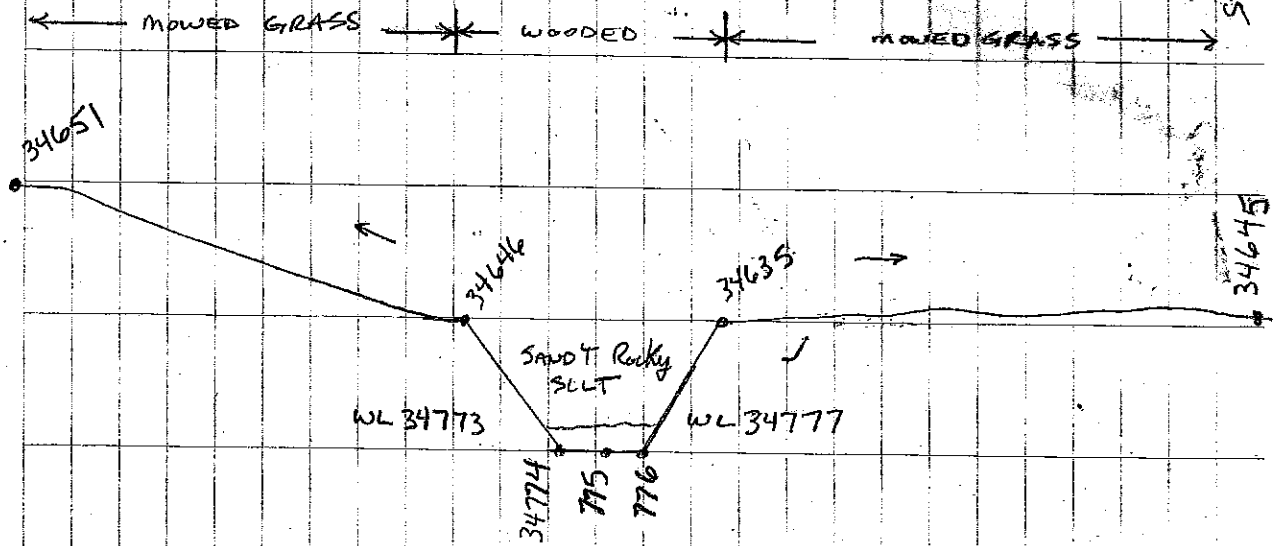
11/24/09

STRAND 47
File # 8105127
SILVER CREEK
TRIB #1 4400 D/S



38/1

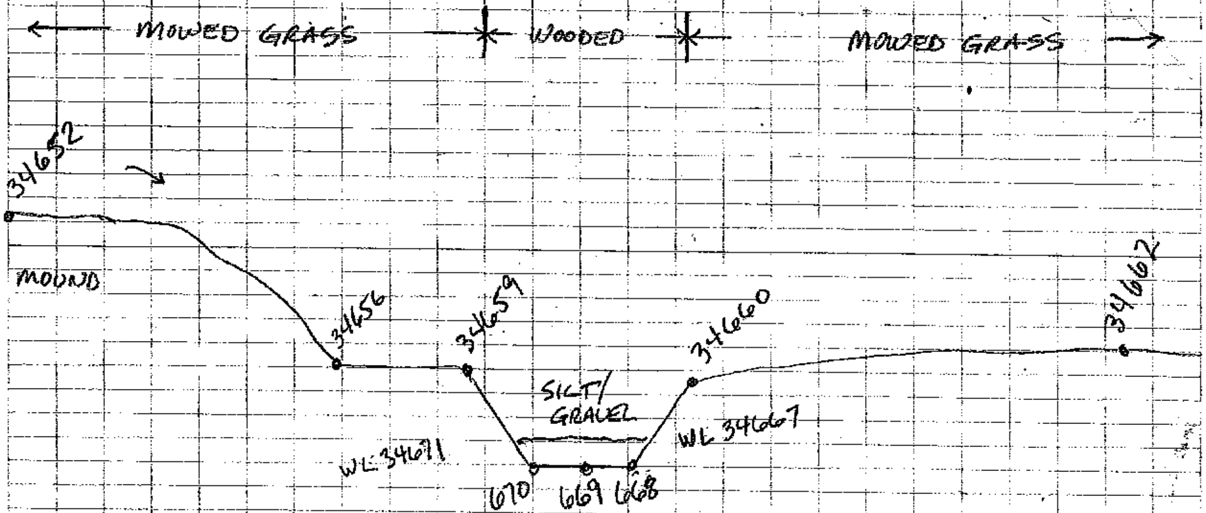
SILVER CREEK TRIB 1
File 8165 1124



WD=1.50

XS-1 D/S

SILVER CREEK TRIB 1
File 8165 1124



WD = 0.70

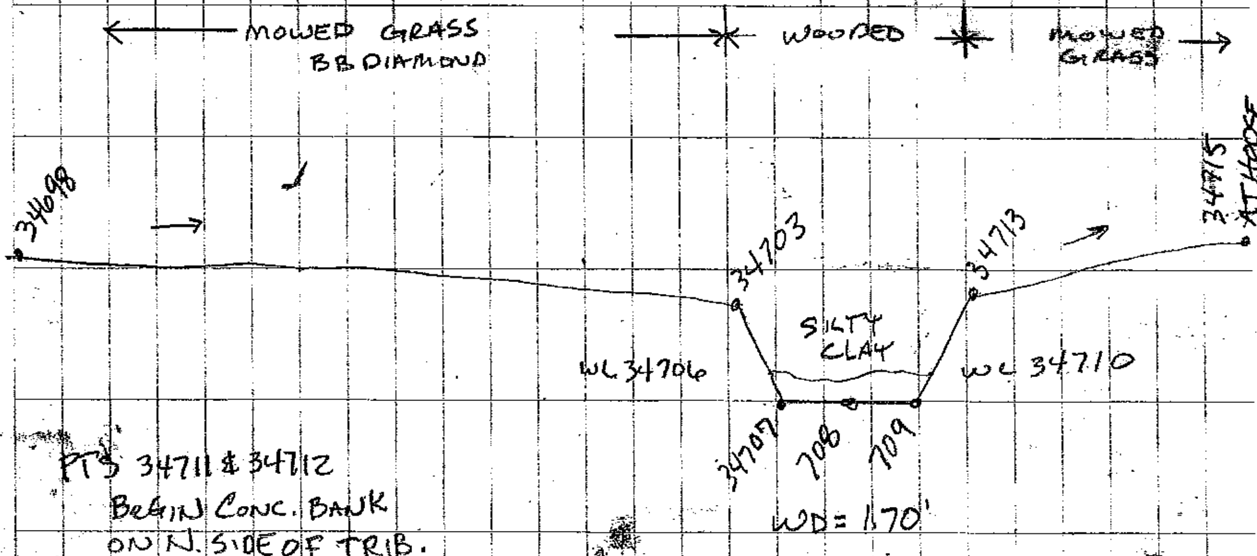
XS-2 U/S U/S HEADWALL

STRAND 47

11/25/09

SILVER CREEK TRIB 1
File 81651124

208165



PTS 34711 & 34712
BEGIN CONC. BANK
ON N. SIDE OF TRIB.
Running EAST.

XS-4 5+00

TR/3M STRAND 47

⊼ @ 34695 BS @ 34633

HI = 5.09 HC = 5.25

34717

34740 103-34697

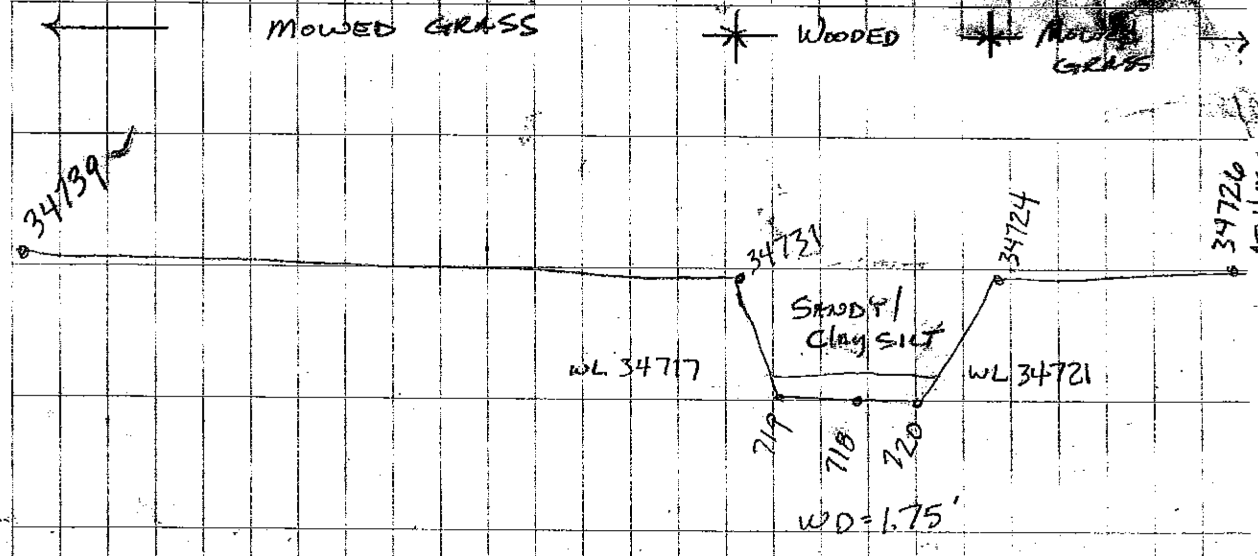
11/25/09

RAIN

41

SILVER CREEK TRIB 1
File 8165124

208165



6+00 XS-5 ℄ BEND IN TRIB

STRAND 47

11/25/09
RAM

421

208165 RTE 47
SILVER CREEK TRIB 1

⊼ @ 34697 BS @ 34633
Hi = 5.19 R.H = 5.21

34741
34742

⊼ @ 34696 BS @ 34697
Hi = 5.19 R.H. = 4.84

34743
34763 103 - 34695
⊼ @ 34695 BS @ 34633
Hi = 5.01 R.H. = 4.84

34891 30" RCP FES IN Conc Bank

TR/JM STRAND / 47 43|1

11/27/09
Sunny 45°

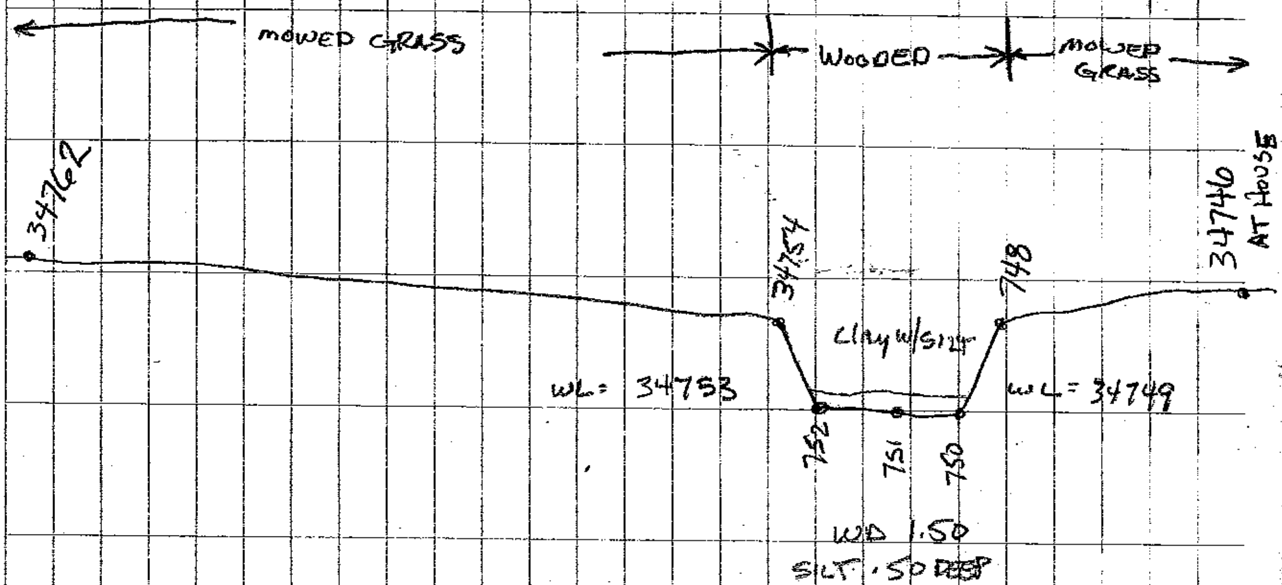
8+00 u/s WL (w) 34741
℄ 34742 .50 SILT Clay Bottom
W/D -2.00

9+00 u/s WL (w) 34743
℄ 34744 Clay Sandy GRAVEL
#34745 W/D -2.25 AT FES 24" RCP

PICS

19-22 NESW 1000+00 u/s
23-26 NESW 6+00 u/s
27-30 WNES 5+00 u/s
31-34 WNES 3+00 u/s

SILVER CREEK TRIB 1
File 81651127



XS-6 U/S 1000+00

208165 RTE 47

SILVER CREEK TRIB 1

File 8165 1127

⊼ @ 34634 BS @ 25603

Hi = 5.51 R.H. 4.84

34764 SET 60D.

34765 SET 60D.

34766 SET 60D.

34767 SET 60D

34768 12" RCP FES

34781 103-322

⊼ @ 34764 BS @ 34634

Hi = 5.36 R.H. 4.71

34782

34784 103 - 34634

⊼ @ 34765 BS @ 34634

Hi = 5.09 R.H. 4.71

34785

34790 12" RCP FES spillway

34802 103-34634

⊼ @ 34766 BS @ 34634

Hi = 5.20 R.H. 4.71

34803

34840 103- 34634

* Cont. PG 48

TR/JM STRAND 47 11/27/09

1+00 DS WL(N) 34779

℄ 34780 SILTY CLAY Bottom

WD - 1.50'

2+00 DS WL(N) 34782

℄ 34783 SILTY CLAY Bottom

WD - 1.50'

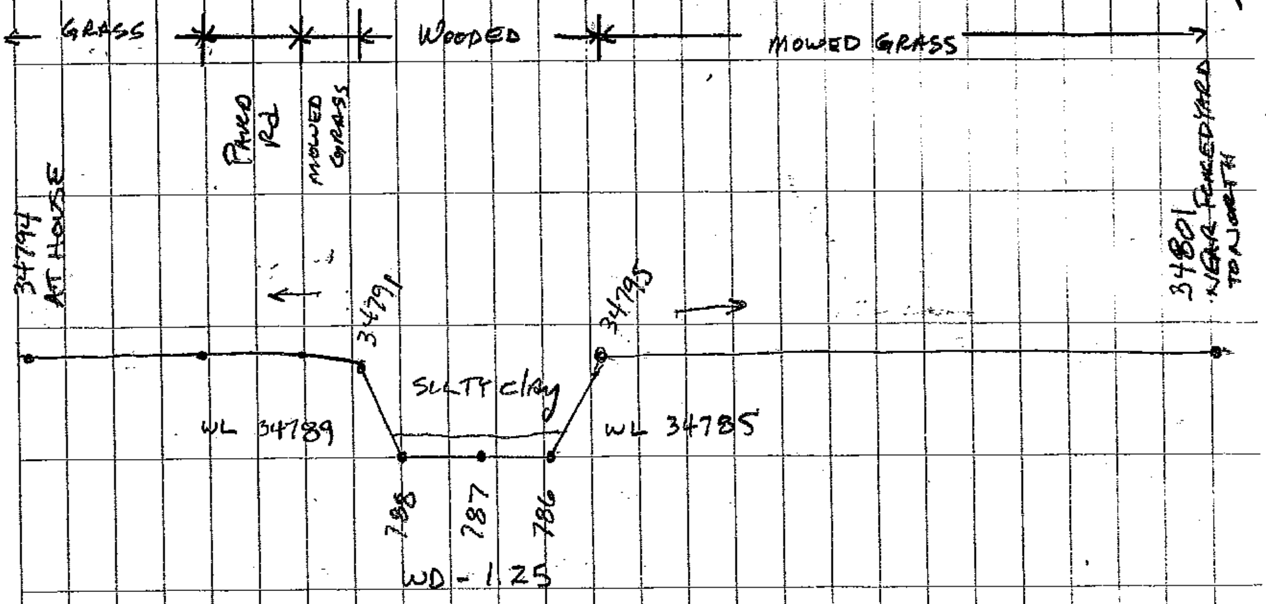
Pics

D/S 3+00 WNES 35-38

D/S 5+00 WNES 39-42

D/S 10+00 WNES 43-46

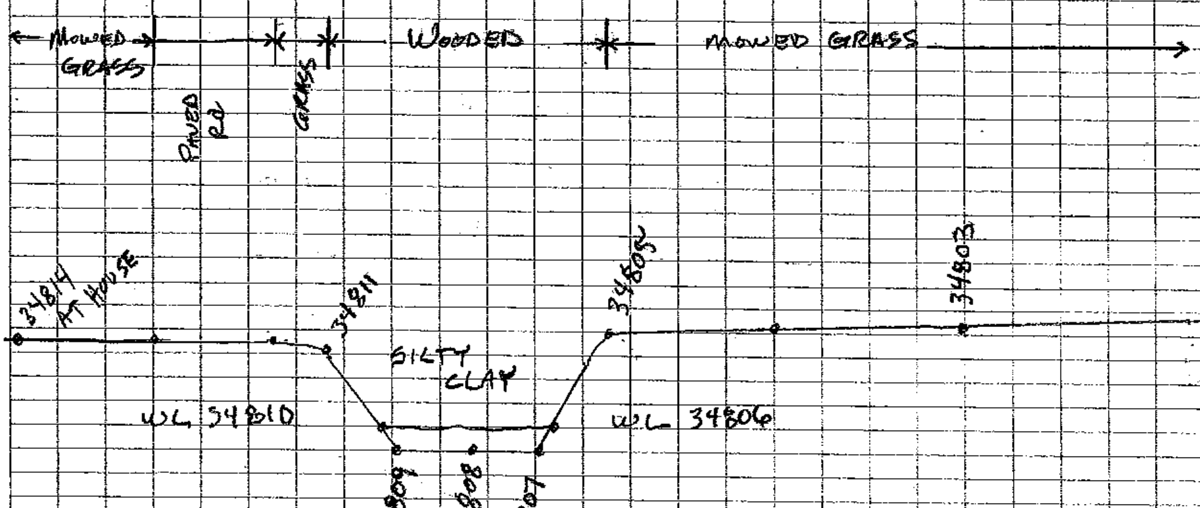
SILVER CREEK TRIB 1
File # 8165 1127



XS-7 D/S 3+00 D/S

5/18/09

SILVER CREEK TRIB 1
File # 8165 1127



XS-8 D/S 4+00 D/S I AT Pedestrian BRIDGE U/S SIDE

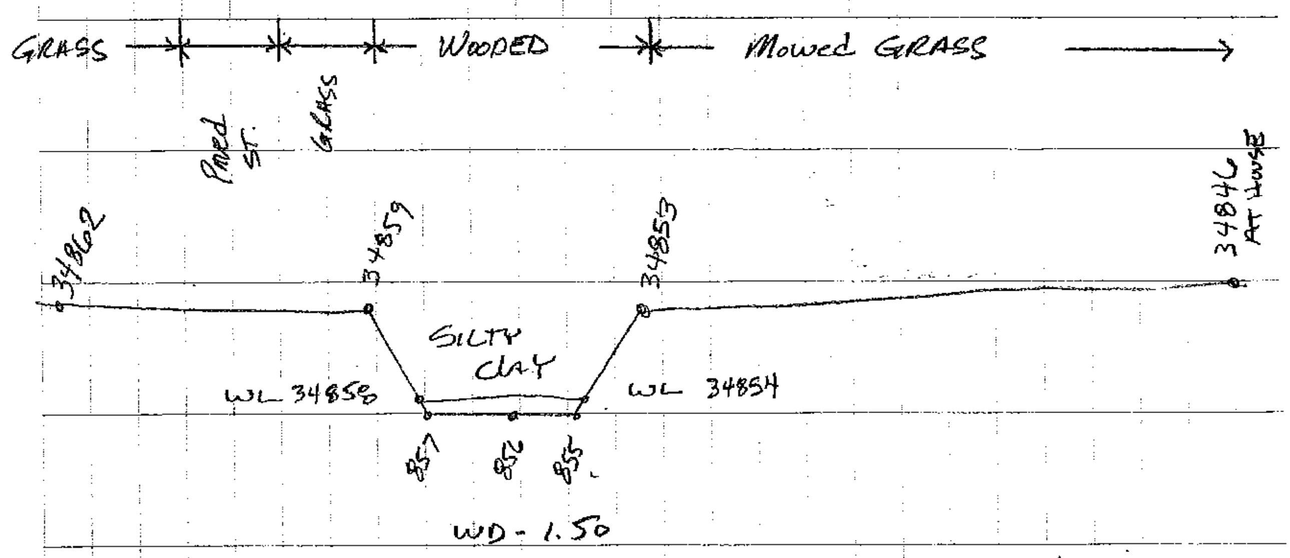
STRAND 47

Smith 45

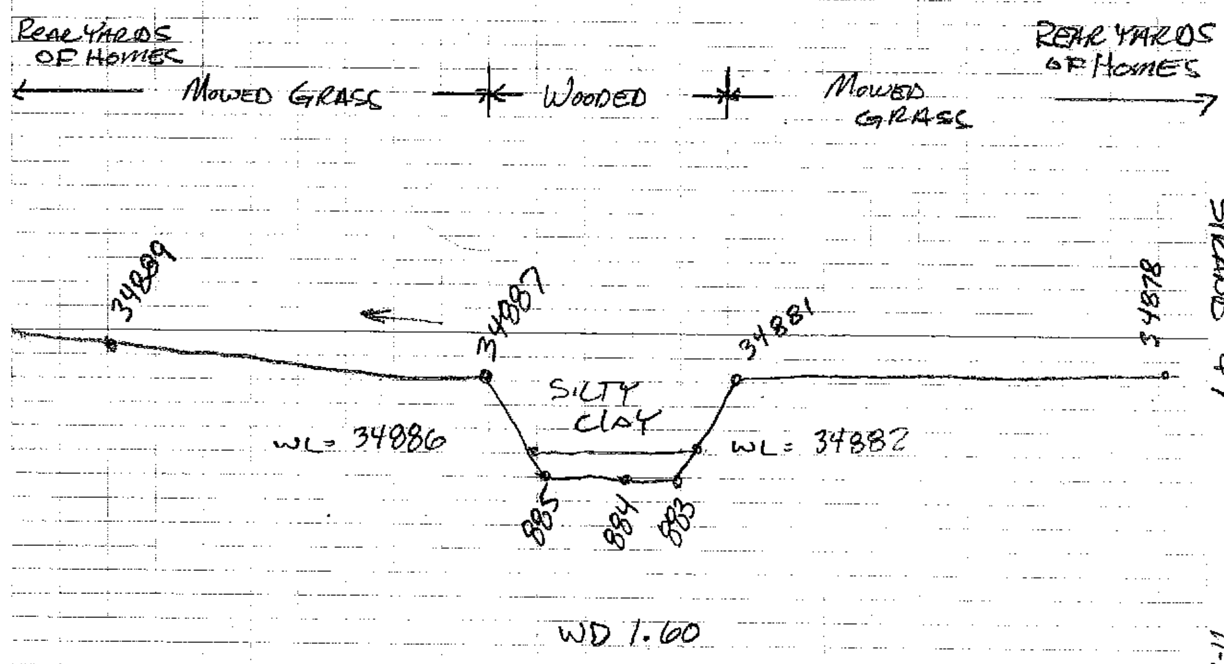
11/27/09

SILVER CREEK TRIB 1
File# 8165 1127

ZOBOLES



XS-9 5+00 D/S



XS-10 1000+00 D/S

STRAND 47

11-27-09
47

208165 RTE47

SILVER CREEK TRIB I

File# 8165127

π@ 34767 BS@ 34634

Hi = 5.30 RH = 4.71

34841	SET GOOD .
34842	"
34843	"
34844	"
34845	"
34863	103- 34634
	π@ 34841 BS@ 34767
	Hi = 5.205 R.H 4.67
34864	
34866	103 - 34767
	π@ 34842 BS@ 34767
	Hi = 5.24 R.H. 4.67
34867	
34869	103- 34767
34869	8" VCP
34870	12" CMP
34871	103- 34767
	π@ 34843 BS@ 34767
	Hi = 5.15 R.H = 4.67
34872	
34874	103- 34767

TR/JM STRAND /47 481

11-27-09

6+00 D/S	WL	34864	
	℄	34865	SANDY SILT Bottom
	WD	1.25	
7+00 DS	WL	34867	
	℄	34868	SILTY CLAY
	WD	1.80	
8+00 DS	WL	34872	
	℄	34873	GRAVEL SILTY clay
	WD	1.60	
9+00 DS	WL	34876	
	℄	34875	SANDY SILTY clay
	WD	1.40	

208165

RTE 47

SILVER CREEK TRIB I

File # 8165127

$\overline{\wedge}$ @ 34844 BS @ 34767

Hi 5.19 R.H. 4.67

34875

34877 603-34767

$\overline{\wedge}$ @ 34845 BS @ 34844

Hi = 5.22 R.H. 4.84

34878

34890 603- 34844

TR/JM STRAND/47 11-27-09

11/17/16 208165

BM, DC

GPS "K" File=208165K1117

Import file= 208165_2011.CSV

* USING Illinois EAST 2011 ADJ.

* ORIGINAL JOB WAS 2007 ADJ.

Leica "K" File = 208165GUN

Import file= 208165_2011.CSV

* SF = 1.0

PT. RANGE = 66,000+

STRAND /IL 47

11/17/16
BM, DC

208165

GPS	VRS	+ KARA		
66003	CK	CP 323		0.11
66004	CK	CP 324		0.19
66009	SET	X	(N.E.X. Greenwood +47)	
66010	SET	X	(N. Curb Greenwood)	
66337	CK	CP 363		
66338	CK	CP 305		
66339	SET	60 D	(ADVANCE AUTO)	
66340	SET	60 D	(GAS CAP)	
66920	SET	60 D	(METRA BRIDGE)	
66921	SET	MAG		
66930	SET	60 D	(CENTURY Heating)	
66931	SET	60 D		
66945	SET	X		
66946	SET	X		
66947	SET	60 D		
67173	SET	60 D		
67174	SET	60 D		
67175	SET	MAG		

STRAND / IL 47

66009 : 2061899.214
954613.480
891.345

66010 : 2061916.668
954220.030
5025 890.530

66339 : 2055250.238
957472.687
916.492

66340 : 2055915.023
957296.445
912.077

66920 : 205 36 47.592
95 75 47.614
926.728

66921 : 205 36 30.220
95 73 86.503
930.03

66930 : 205 83 17.286
955158.611
896.602

66931 : 2058189.169
955302.908
890.019

66945:
2058756.831
954790.555
897.770

66946:
2058886.127
954664.077
898.414

66947:
2059089.805
954602.483
899.318

P45

11/17/16 208165

BM, DC

Leica "K"

⊼ 323 HI = 5.05' / ⌖ 324 HR = 5.0'

66005 SET X

66006 CK 324

⊼ 66005 HI = 5.0' / ⌖ 323 HR = 5.0'

66007 SET X

66008 CK 323

225+50

⊼ 66009 HI = 5.025 / ⌖ 66010 HR = 5.0'

66011+

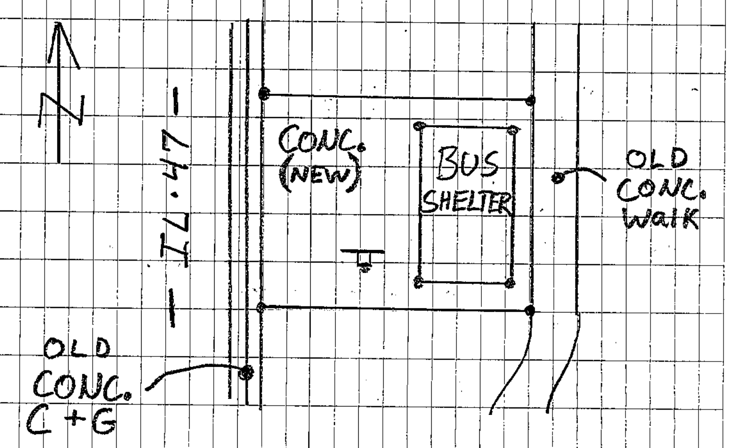
230+00

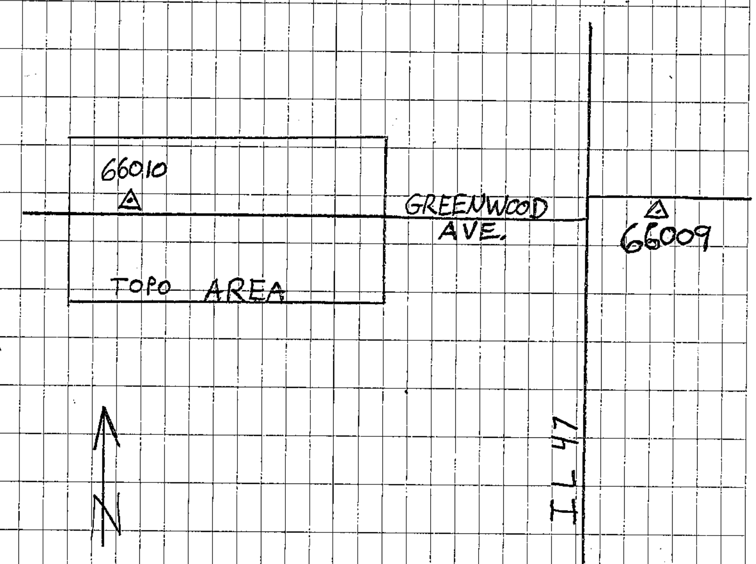
⊼ 66010 HI = 4.84 / ⌖ 66009 HR = 7.0'

66024+

LAST $\boxed{66229}$

STRAND / IL 47





11/18/16 208165

BM, DC

Leica "K"

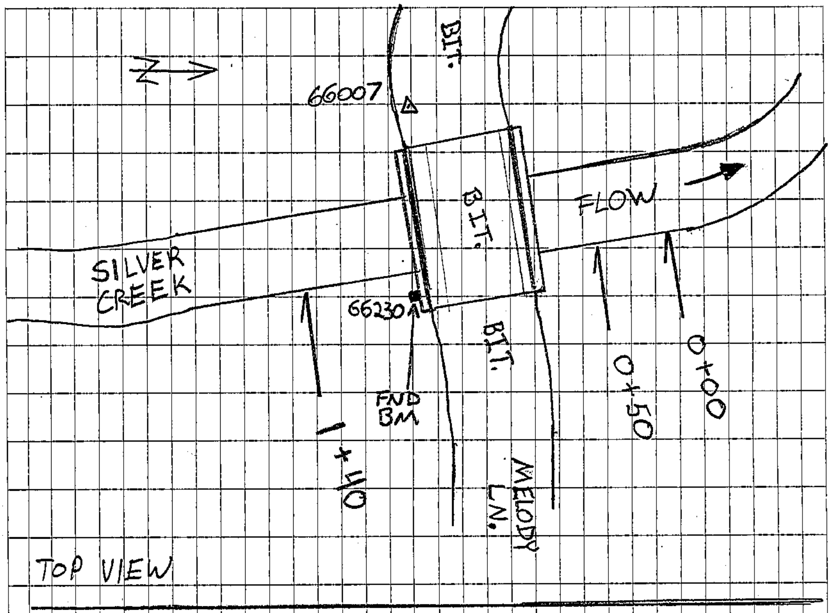
269+10

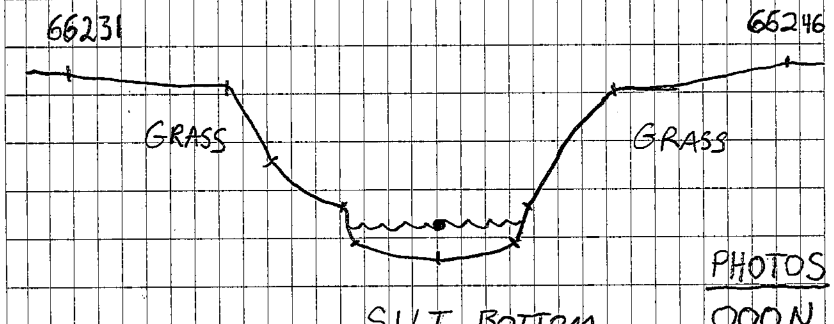
⊼ 66007 HI= 4.91' / ⚲ 66005 HR= 5.0'

LAST $\boxed{66336}$

STRAND / IL 47

41/BM3



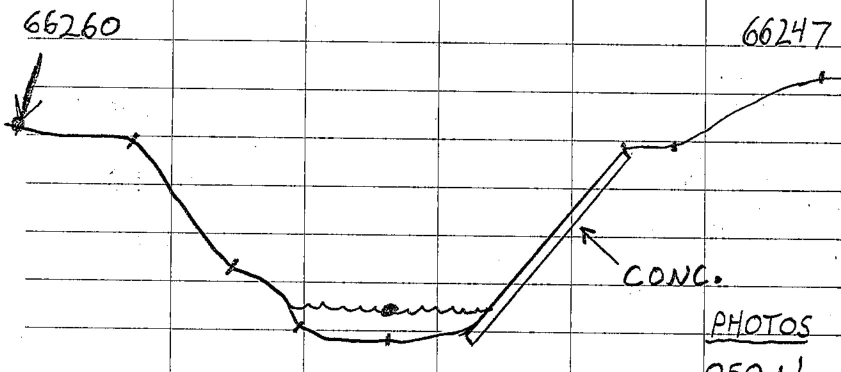


STA 0+00
(Looking S.)

PHOTOS
000N
000E
000S
000W

11/18/16
Bm, DC

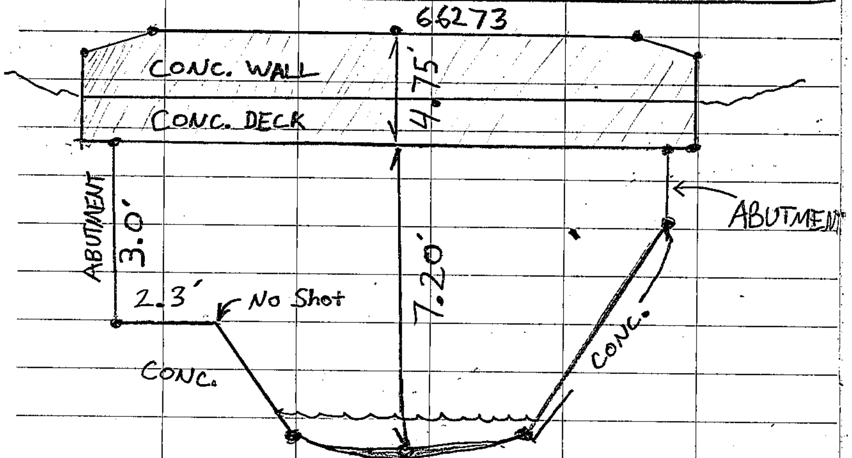
208165



SILT BOTTOM

STA 0+50
(Looking S.)

PHOTOS
050 N
050 E
050 S
050 W



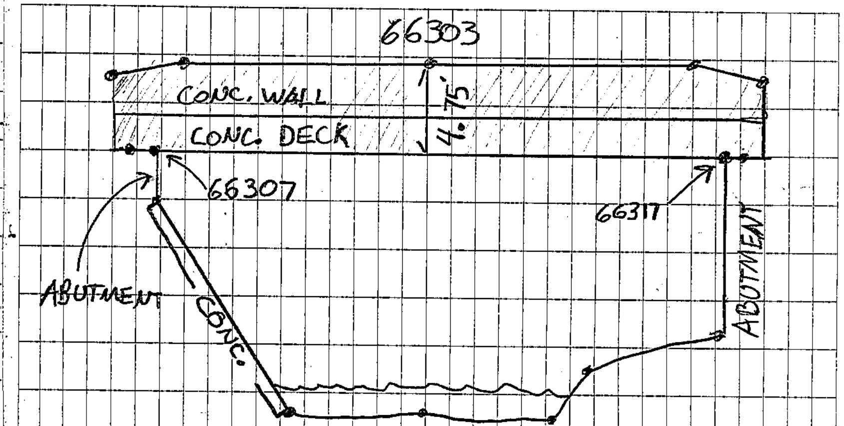
SAND BOTTOM

NORTH FACE
BRIDGE

SEE PHOTO # 050S

STRAND / IL 47

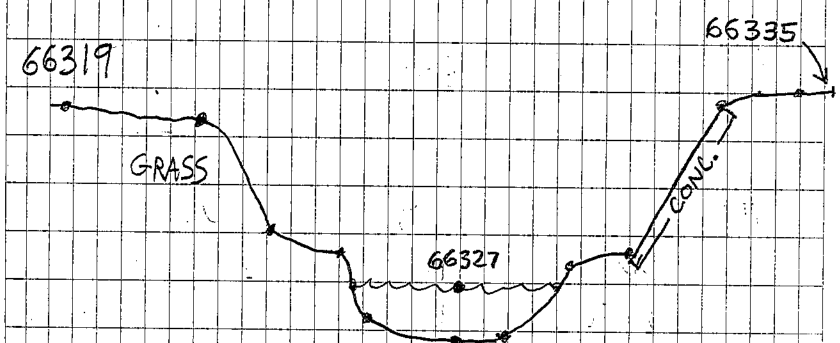
42/Bm3



SAND BOTTOM

SOUTH FACE
BRIDGE (Looking N.)

SEE PHOTO #140N



SILT BOTTOM

STA 1+40
(Looking S.)

PHOTOS
140 N
140 E
140 S
140 W

11/21/16 208165 STRAND / IL47 43/BU3

BU, DC

LEICA "K"

153+50

⊼ 66339 HI = 4.885 / ⚲ 363 HR = 5.0'

66341 - 66834

160+00

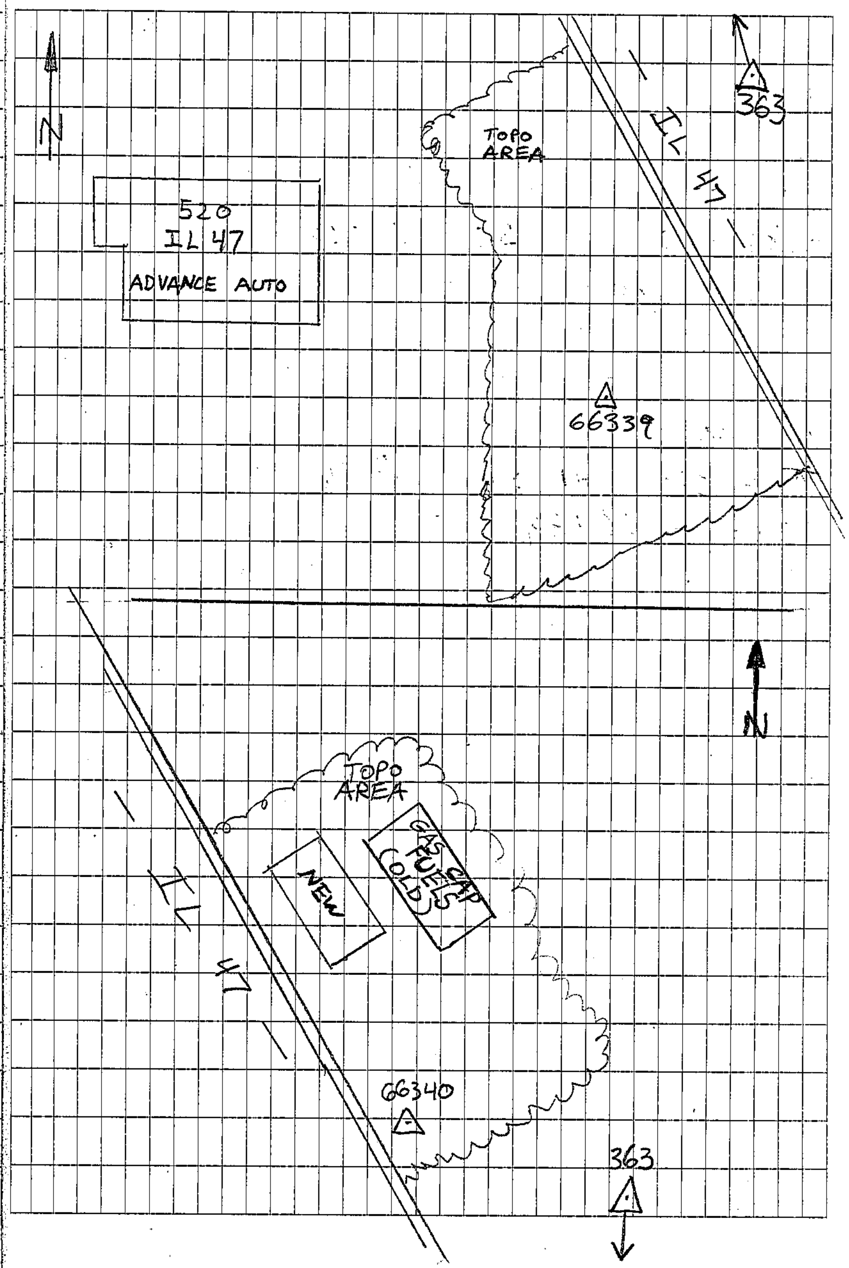
⊼ 66340 HI = 5.03' / ⚲ 363 HR = 5.0'

66835 - 66919

*NOTE: ONLY SHOT NEW CONC.

*NOTE: ONLY SHOT GAS FILL CAPS WITHIN THE NEW CONC.

*NOTE: PER GAS STATION OWNER — MORE NEW CONCRETE IN JANUARY ALSO, ALL PAVEMENT WILL BE REPLACED SOON.



11/22/16
Bn, DC

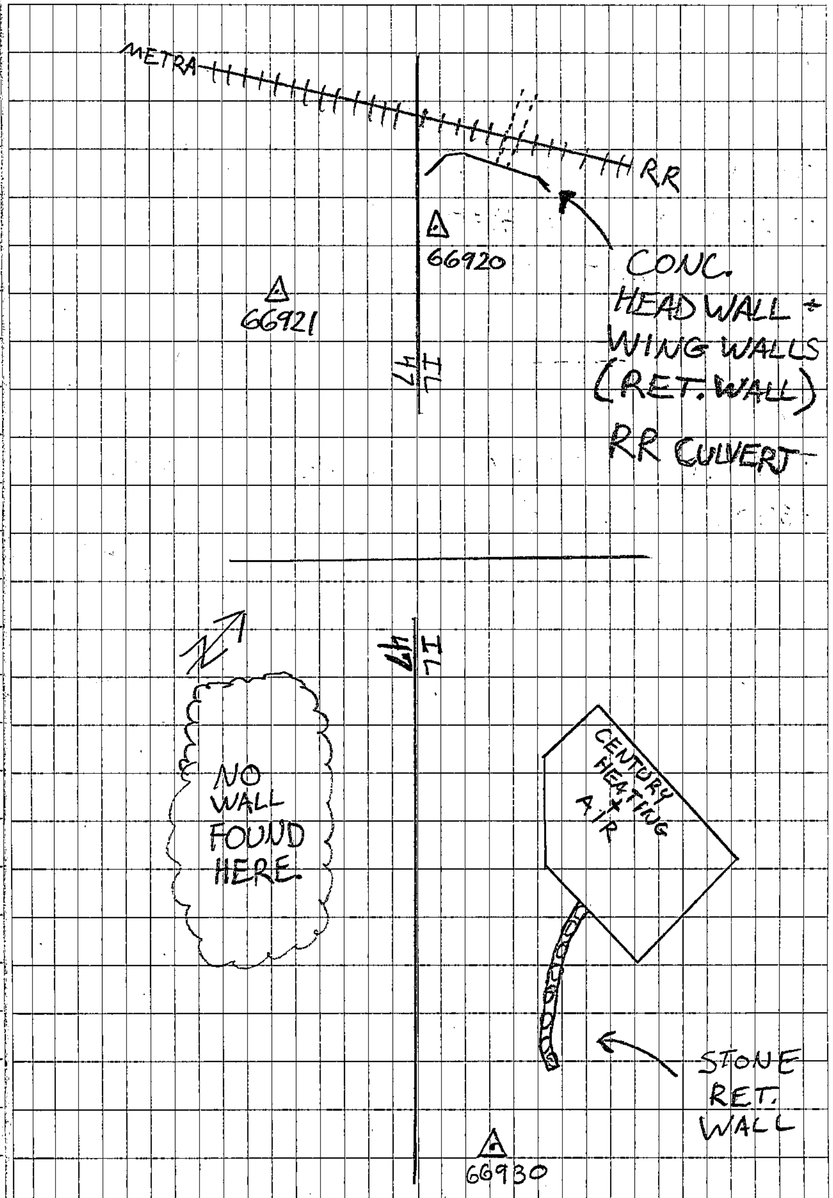
208165

LEICA "K"

136+00
⊼ 66920 HI = 5.17' / ⊕ 66921 HR = 5.0'
66922 — 66929

193+00
⊼ 66930 HI = 5.01' / ⊕ 66931 HR = 5.0'
66932 — 66944

STRAND / IL 47



11/22/16 208165

BM, DC

LEIKA "K"

200+00

⊼ 66947 HI=4.97' / ⊕ 66946 HR=5.0

* BACKSIGHT BAD. V=0.37'

HI good HR good

66948 — 67172

⊼ 66946 HI=5.07' / ⊕ 66945 HR=6.0'

67027 CK 66947

NOTE: USE 67027 COORDS instead of 66947?

67049 SET 60D

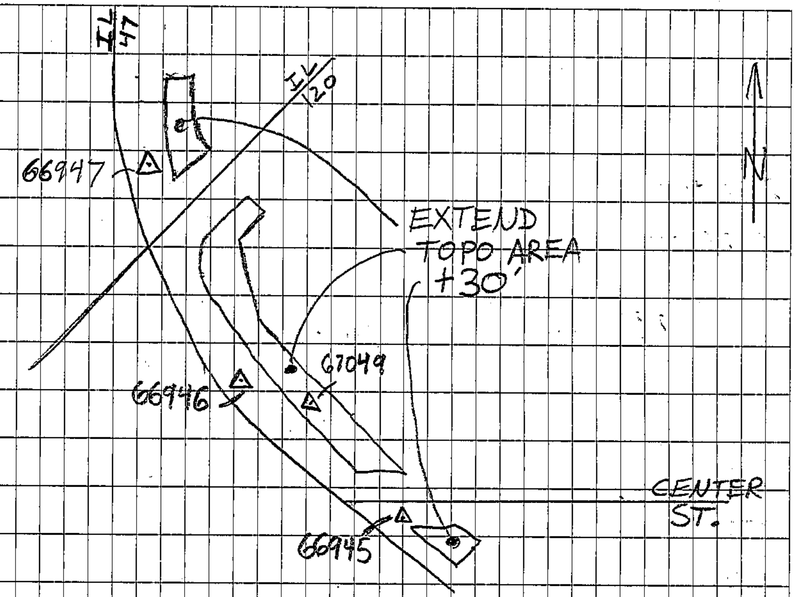
⊼ 67049 HI=4.965' / ⊕ 66946 HR=6.0'

67103 CK 66945

⊼ 66945 HI=4.74' / ⊕ 66946 HR=6.0'

LAST $\boxed{67172}$

STRAND / IL 47 45/BM3



67173:	67175:
2067562.974	2067221.557
954495.833	955038.496
890.444	883.787
67174:	67939:
2067162.879	2066433.011
954664.150	954788.399
888.657	884.819

11/23/16

BM, DC

208165

LEICA "K"

282+00 — 290+00

⊼ 67175 HI= 5.175' / 67174 HR= 5.0'

66176 — 67938

⊼ 67173 HI= 5.01' / 67174 HR= 5.0'

⊼ 67174 HI= 5.075' / 67175 HR= 5.0'

LAST $\boxed{67938}$

NOTE: Shots 67216 – 67220
Don't Need. Old CBs.

NOTE: ONLY SHOT X-sec. +
NEW TOPO, DID NOT SHOOT
OLD TOPO (Signs, buildings, Power Pole..)

275+00

⊼ 67939 HI= 5.085' / 67175 HR= 5.9'

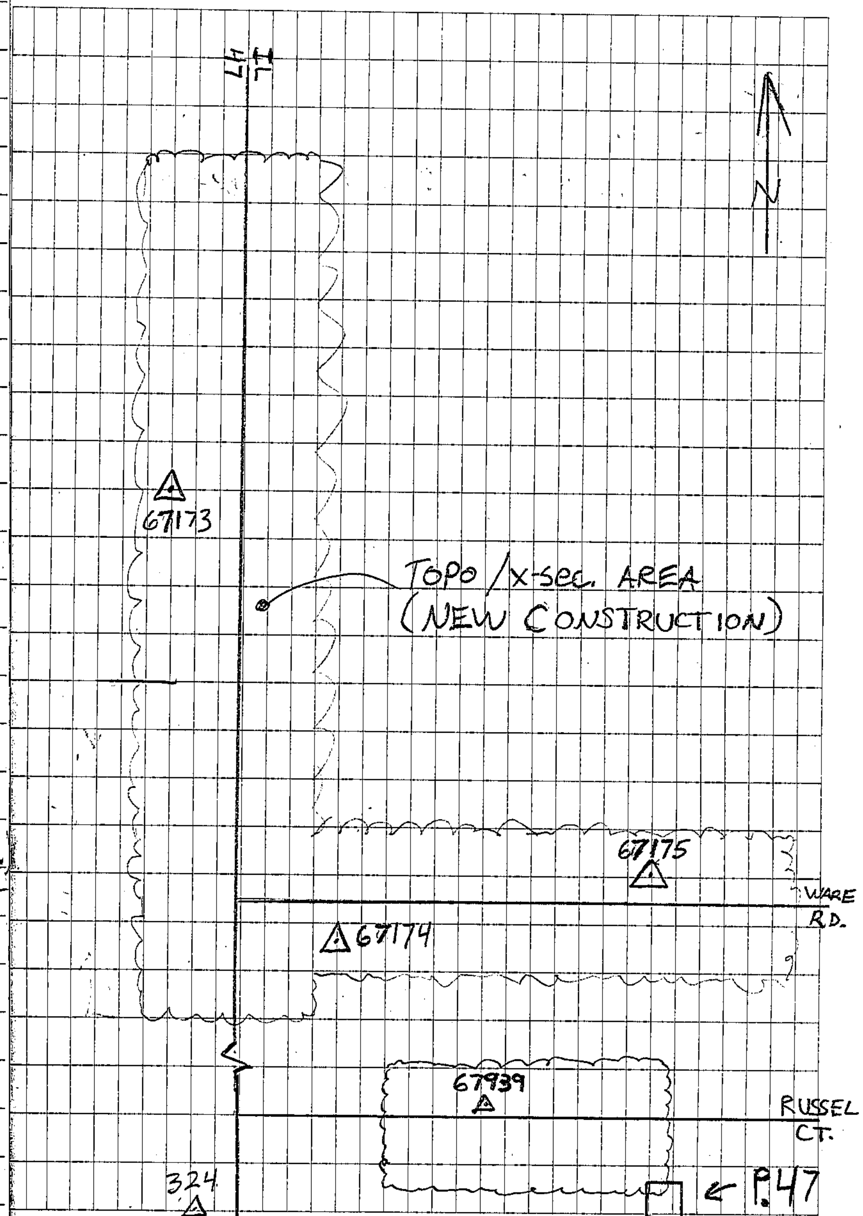
67940 — 68191

NOTE: TREES + SIGNS in this setup —
DO NOT USE ELEVATION.

LAST $\boxed{68191}$

STRAND/IL47

46/BM3

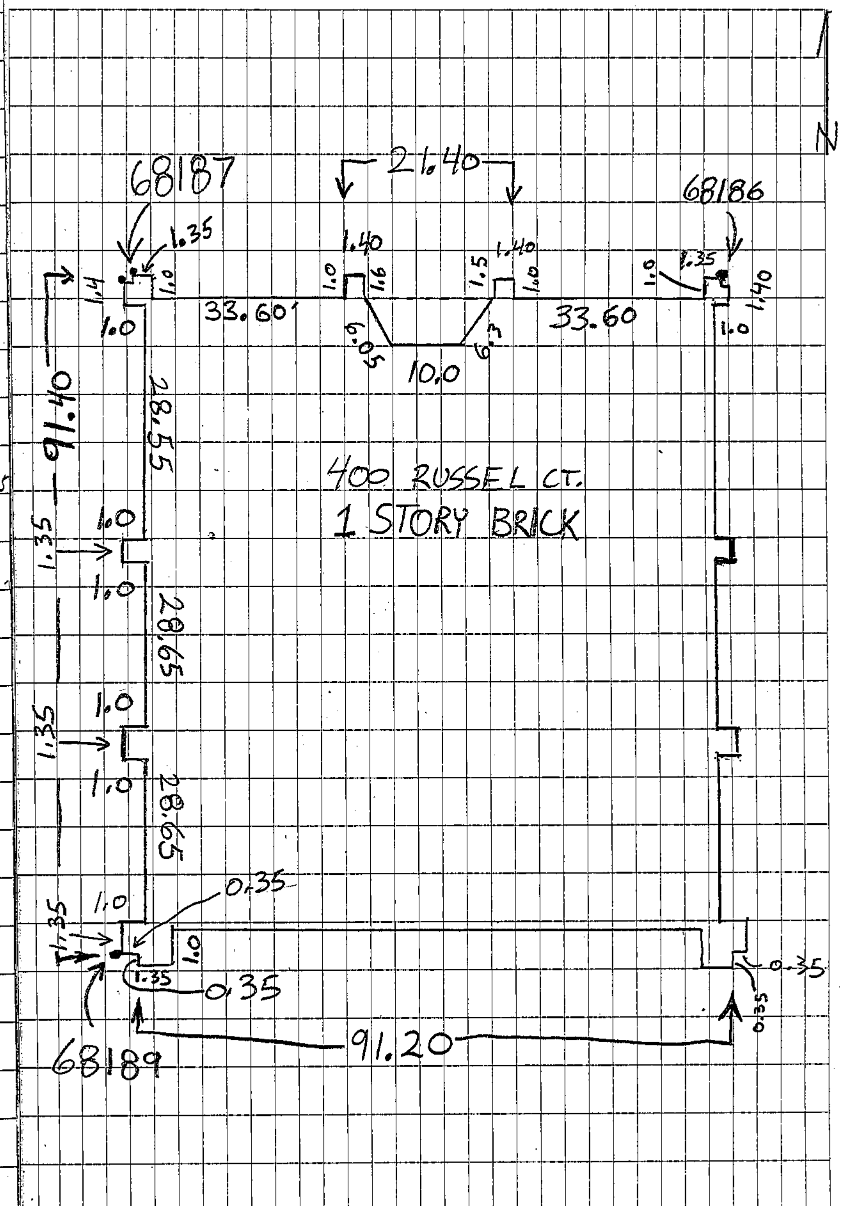


11/25/16 208165

BM, DC

306	—	67216	E. Limit
306	—	67217	S. Curb E 1of2
306	—	67218	S. Curb W 1of2
306	—	67219	N. Curb E 1of2
306	—	67220	N. Curb W 1of2
√ 306	—	67317	NW x P.LOT
√ 351	—	67318	20' N. of 67317
√ 306	—	67319	S. Curb N.W. P.LOT.
√ 306	—	67357	Curb by Sign N.W. of FES
√ 306	—	67358	S. Curb end of walk
√ 351	—	67359	in Road WVV?
√ 306	—	67567	N. Curb @ PC

STRAND / IL 47 47/Bu3



<u>EXHIBIT N</u>

CORRESPONDENCE

Sam Lahniers

From: Fred Lin [flin@lineng.com]
Sent: Tuesday, September 15, 2009 2:04 PM
To: Mark Wood (m.wood@americansurvey.com)
Cc: Darcie Gabrisko
Subject: IL Route 47 Survey Request
Attachments: SurveyRequest.docx

Hi Mark,

Darcie requested me to get in touch with you directly regarding hydraulic survey items needed for IL Route 47; attached please find the survey request for the two culverts; please contact me if you have any questions on the attached file,

Thanks Mark,
Fred

Fred M. Lin, P.E.
Vice President/Transportation Manager
flin@lineng.com

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Survey Request for IL Route 47 at Silver Creek Tributary 1 (10'x8' RCBC) & Tributary 2 (5'x5' RCBC)
Woodstock, McHenry County
PTB No. 149/08

Flood Plain Cross Sections:

- 1000' Upstream & Downstream
- 500' Upstream & Downstream
- 300' Upstream & Downstream
- Limits of the above survey to be 500' beyond tops of banks

Upstream and Downstream Culvert Opening Sections:

- Limits of culvert opening surveys to just tops of banks
- Please also provide field book sketch of culverts, verifying dimensions of box culvert cells, invert elevations, and noting the presence of siltation, if applicable

Roadway Profile Shots:

- Every 100' up to 500' from culvert centerline in both directions

Photo Logs:

- Standing at 1000', 5000', and 300' upstream & downstream looking in four directions
- Upstream & Downstream face of culvert
- Standing on roadway at culvert centerline looking upstream, downstream, and along roadway in both directions

Tin File & Alignment:

- Please provide tin file and flowline alignment gpk file for the 10'x8' box culvert only (Silver Creek Tributary No. 1); extent of dtm survey to be 150' from upstream & downstream face of box culvert, and 100' beyond tops of banks

Sam Lahniers

From: Gabrisko, Darcie [Darcie.Gabrisko@strand.com]
Sent: Monday, February 01, 2010 4:05 PM
To: flin@lineng.com
Cc: Moline, Adam R.
Subject: FW: IL 47 Hyd report SN : 056-0240
Attachments: Message from KMBT_421 (204 KB); SilverCk_Woodstock_HEC2-Nat1977.pdf

Fred,

We are still working to get our drainage surveys complete and will pass them on as soon as complete.

Darcie

-----Original Message-----
From: Masouridis, Eleftherios P [mailto:Eleftherios.Masouridis@illinois.gov]
Sent: Monday, February 01, 2010 3:31 PM
To: Gabrisko, Darcie
Subject: RE: IL 47 Hyd report SN : 056-0240

Hello Darcie,

Please forward this information to Lin Engineering for their use in preparing the Hydraulic Report.

Some of the FIS data references the creek as Silvery Creek Tributary NO.
1 when it is actually Silver Creek. This can be confusing so I have sorted through some information I obtained from the ISWS and obtained the FIS HEC-2 model. Based on this data I developed a Preliminary WIT which can be used to evaluate profile impacts.'

Since the velocities seem excessive we may need to look into enlarging the opening.

The attached file includes the FIS model.

The other file contains the preliminary WIT and some other data I collected. I will forward some additional information in the future.

I have no information with which to prepare a preliminary WIT for the other crossing to the north that Lin Engr is also preparing a Hydraulic Report for. For this unnamed tributary I suggest using one sub-basin along with the Clark Unit Hydrograph method to estimate flow rates. They need to submit a report for existing conditions for both crossings. We should set a timeframe for this now as these items are used to evaluate geometry. Please let me know when they expect to submit the reports.

Please let me know if there are any questions.

-----Original Message-----
From: Gabrisko, Darcie [mailto:Darcie.Gabrisko@strand.com]

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SIGB-        OUTS1538    8620    SYSMSG        12.45.55  22 MAR 77        MNTR.                SIG105.004
SIGB-        OUTS1538    8620    SYSMSG        12.45.55  22 MAR 77        MNTR.                SIG105.004
SIGB-        OUTS1538    8620    SYSMSG        12.45.55  22 MAR 77        MNTR.                SIG105.004
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City of Woodstock (Mc Henry Co.) - Silver Creek - FIS 4740-11-06

Final Output for natural floods - 10-yr, 50-yr, 100-yr & 500-yr

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HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
MODIFICATIONS 52,53,54,55,56,57,58,59
**********************************************


T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK   CHICAGO OFFICE  2 - 77
T2      SILVER CREEK - 10YR,50YR,100YR, & 500YR - NATURAL
T3      SILVER CREEK - 10 YEAR
J1  ICHECK      INQ       NINV      IDIR      STRT     METRIC     HVINS        Q      WSEL        FQ

         0.        2.        0.        0.  0.005942       0.0       0.0       0.   862.200      0.0
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH        FN     ALLDC       IBW     CHNIM    ITRACE

        0.0       0.0    -1.000       0.0       0.0       0.0       0.0       0.0       0.0       0.0

-NC     0.065     0.065     0.045     0.100     0.300       0.0       0.0       0.0       0.0       0.0

QT      4.000   365.000   575.000   680.000   950.000       0.0       0.0       0.0       0.0       0.0

X1      4.340     9.000 10048.000 10075.000       0.0       0.0       0.0       0.0       0.0       0.0
GR    863.500  9828.000   861.600 10000.000   862.400 10048.000   858.100 10052.000   858.500 10064.000
GR    862.700 10075.000   862.900 10095.000   863.000 10147.000   863.500 10188.000       0.0       0.0
NC        0.0       0.0       0.0     0.300     0.500       0.0       0.0       0.0       0.0       0.0

-X1     4.490     9.000 10047.000 10100.000   800.000   800.000   800.000       0.0       0.0       0.0

GR    870.000  9700.000   866.900 10000.000   866.000 10047.000   861.900 10050.000   863.000 10058.000
GR    862.700 10072.000   865.300 10093.000   866.400 10100.000   870.000 10250.000       0.0       0.0

X1      4.497    15.000 10147.500 10152.500    50.000    50.000    50.000       0.0       0.0       0.0
X3     10.000       0.0       0.0       0.0       0.0       0.0       0.0   864.400   864.400       0.0
GR    870.000 10030.000   868.600 10050.000   867.600 10133.000   864.400 10138.000   864.400 10147.500
GR    863.100 10148.797   862.200 10149.797   861.900 10150.000   862.200 10151.199   863.100 10152.199
GR    864.400 10152.500   864.400 10157.000   867.300 10160.000   866.600 10250.000   870.000 10380.000
NC      0.025     0.025     0.025       0.0       0.0       0.0       0.0       0.0       0.0       0.0

X1      4.499       0.0       0.0       0.0     4.000     4.000     4.000       0.0       0.0       0.0
BT     15.000 10030.000   870.000   870.000 10050.000   868.600   868.600 10133.000   867.600   867.600
BT  10138.000   867.500   864.400 10147.500   867.400   864.400 10148.797   867.400   865.700 10149.797
BT    867.400   866.600 10150.000   867.400   866.900 10151.199   867.400   866.600 10152.199   867.400
BT    865.700 10152.500   867.400   864.400 10157.000   867.400   864.400 10160.000   867.300   867.300
BT  10250.000   866.600   866.600 10380.000   870.000   870.000       0.0       0.0       0.0       0.0

-X1     4.501       0.0       0.0       0.0    22.000    22.000    22.000       0.0       0.0       0.0

X2        0.0       0.0       0.0   866.900   866.600       0.0       0.0       0.0       0.0       0.0
NC      0.065     0.065     0.045     0.300     0.500       0.0       0.0       0.0       0.0       0.0

X1      4.503       0.0       0.0       0.0     4.000     4.000     4.000       0.0       0.0       0.0
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X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	864.400	864.400	0.0
X1	4.512	9.000	10133.000	10160.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	870.000	10030.000	868.900	10050.000	867.900	10133.000	864.700	10138.000	862.200	10150.000
GR	864.700	10157.000	867.700	10160.000	866.900	10250.000	870.000	10380.000	0.0	0.0
NC	0.0	0.0	0.0	0.100	0.300	0.0	0.0	0.0	0.0	0.0
X1	4.630	10.000	10024.000	10067.000	615.000	615.000	615.000	0.0	0.0	0.0
GR	871.900	10000.000	876.000	10012.000	875.800	10024.000	867.900	10044.000	866.100	10047.000
GR	866.000	10054.000	867.900	10055.000	872.300	10067.000	871.800	10112.000	873.000	10240.000
X1	4.780	7.000	10129.000	10182.000	760.000	760.000	760.000	0.0	0.0	0.0
GR	876.600	10000.000	875.800	10129.000	868.300	10153.000	868.600	10169.000	873.800	10182.000
GP	873.800	10225.000	875.000	10240.000	0.0	0.0	0.0	0.0	0.0	0.0
-NC	0.070	0.070	0.058	0.300	0.500	0.0	0.0	0.0	0.0	0.0
X1	4.907	8.000	10129.000	10182.000	710.000	710.000	710.000	0.0	0.0	0.0
GR	880.000	10000.000	876.500	10129.000	869.000	10153.000	869.300	10169.000	874.500	10182.000
GR	874.500	10225.000	875.700	10233.000	880.000	10750.000	0.0	0.0	0.0	0.0
X1	4.916	9.000	1136.800	1163.200	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	876.500	876.500	0.0
GR	881.700	1000.000	877.700	1117.000	876.500	1136.800	869.100	1140.500	869.100	1159.500
GR	876.500	1163.200	877.700	1177.000	877.600	1300.000	880.000	1800.000	0.0	0.0
SB	1.000	1.500	2.500	0.0	19.000	0.0	168.000	0.500	0.0	0.0
X1	4.924	0.0	0.0	0.0	40.000	40.000	40.000	0.0	0.0	0.0
X2	0.0	0.0	1.000	876.500	877.600	0.0	0.0	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	877.700	877.600	0.0
BT	9.000	1000.000	881.700	881.700	1117.000	877.700	877.700	1136.800	877.700	876.500
BT	1140.500	877.700	876.500	1159.500	877.700	876.500	1163.200	877.700	876.500	1177.000
BT	877.700	877.700	1300.000	877.600	877.600	1800.000	880.000	880.000	0.0	0.0
X1	4.933	6.000	10038.000	10101.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	884.700	10000.000	882.200	10038.000	869.300	10064.000	869.100	10078.000	881.500	10101.000
GR	884.100	10170.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.0	0.0	0.0	0.100	0.300	0.0	0.0	0.0	0.0	0.0
X1	5.040	0.0	0.0	0.0	530.000	530.000	530.000	0.0	0.300	0.0
NC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.060	0.0	0.0	0.0	136.000	136.000	136.000	0.0	0.300	0.0
NC	0.0	0.0	0.0	0.300	0.500	0.0	0.0	0.0	0.0	0.0
X1	5.069	8.000	136.750	163.250	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	882.700	882.700	0.0
GR	884.600	0.0	884.000	114.000	882.700	136.750	869.900	137.800	869.900	162.200
GR	882.700	163.250	884.100	179.000	885.600	300.000	0.0	0.0	0.0	0.0
SB	1.000	1.200	2.500	0.0	24.400	0.0	325.800	0.082	0.0	0.0

X1	5.071	0.0	0.0	0.0	8.000	8.000	8.000	0.0	0.0	0.0
-X2	0.0	0.0	1.000	882.700	883.900	0.0	0.0	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	883.900	883.900	0.0
BT	8.000	0.0	884.600	0.0	114.000	884.000	0.0	136.750	883.900	882.700
BT	137.800	883.900	882.700	162.200	883.900	882.700	163.250	883.900	882.700	179.000
BT	884.100	884.100	300.000	885.600	885.600	0.0	0.0	0.0	0.0	0.0
X1	5.080	6.000	10038.000	10101.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	885.600	10000.000	883.100	10038.000	870.200	10064.000	870.000	10078.000	882.400	10101.000
GR	885.000	10170.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.050	0.050	0.040	0.100	0.300	0.0	0.0	0.0	0.0	0.0
QT	4.000	320.000	510.000	600.000	830.000	0.0	0.0	0.0	0.0	0.0
X1	5.152	0.0	0.0	0.0	376.000	376.000	376.000	0.0	0.500	0.0
X1	5.161	8.000	10296.500	10303.500	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	886.200	10230.000	883.700	10268.000	878.600	10296.500	870.600	10296.500	870.600	10303.500
GR	878.600	10303.500	883.000	10331.000	885.500	10400.000	0.0	0.0	0.0	0.0
NC	0.015	0.015	0.015	0.010	0.010	0.0	0.0	0.0	0.0	0.0
-										
X1	5.163	14.000	10296.500	10303.500	8.000	8.000	8.000	0.0	0.0	0.0
BT	14.000	10000.000	895.100	895.100	10100.000	893.900	893.900	10118.000	893.700	893.700
BT	10200.000	892.700	888.200	10267.500	891.800	883.700	10296.500	891.300	878.600	10296.500
BT	891.300	878.600	10303.500	891.300	878.600	10303.500	891.300	878.600	10330.500	891.000
BT	883.000	10400.000	890.300	885.700	10493.000	889.300	889.300	10500.000	889.200	889.200
BT	10600.000	888.000	888.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	895.100	10000.000	893.900	10100.000	893.700	10118.000	888.200	10200.000	883.700	10267.500
GR	878.600	10296.500	870.600	10296.500	870.600	10303.500	878.600	10303.500	883.000	10330.500
GR	885.700	10400.000	889.300	10493.000	889.200	10500.000	888.000	10600.000	0.0	0.0
X1	5.177	0.0	0.0	0.0	84.000	84.000	84.000	0.0	0.0	0.0
X2	0.0	0.0	0.0	878.600	888.000	0.0	0.0	0.0	0.0	0.0
NC	0.050	0.050	0.040	0.100	0.300	0.0	0.0	0.0	0.0	0.0
X1	5.179	8.000	10296.500	10303.500	8.000	8.000	8.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GR	886.200	10230.000	883.700	10268.000	878.600	10296.500	870.600	10296.500	870.600	10303.500
-GR	878.600	10303.500	883.000	10331.000	885.500	10400.000	0.0	0.0	0.0	0.0
X1	5.188	7.000	10030.000	10079.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	884.500	10000.000	883.700	10030.000	870.500	10054.000	870.500	10067.000	878.200	10079.000
GR	879.600	10100.000	883.400	10200.000	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.320	7.000	10030.000	10079.000	680.000	680.000	680.000	0.0	0.0	0.0
GR	884.500	10000.000	883.700	10030.000	870.800	10054.000	869.900	10067.000	878.200	10079.000
GR	879.600	10100.000	883.400	10200.000	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.445	7.000	10030.000	10079.000	645.000	645.000	645.000	0.0	0.0	0.0

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GR	886.000	10000.000	885.200	10030.000	871.400	10054.000	871.400	10067.000	879.700	10079.000
GR	881.100	10100.000	884.900	10200.000	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.0	0.0	0.0	0.300	0.500	0.0	0.0	0.0	0.0	0.0
X1	5.454	10.000	10192.000	10208.297	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	882.800	882.800	0.0
GR	888.600	10000.000	886.400	10100.000	884.800	10166.000	882.800	10192.000	871.500	10192.000
GR	871.500	10208.297	882.800	10208.297	884.200	10230.000	883.900	10300.000	884.500	10400.000
-SB	1.000	1.200	2.500	0.0	16.300	0.0	184.200	0.0	0.0	0.0
X1	5.466	0.0	0.0	0.0	90.000	90.000	90.000	0.0	0.0	0.0
X2	0.0	0.0	1.000	882.800	883.900	0.0	0.0	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BT	10.000	10000.000	888.600	0.0	10100.000	886.400	0.0	10166.000	884.800	0.0
BT	10192.000	884.300	882.800	10192.000	884.300	882.800	10208.297	884.300	882.800	10208.297
BT	884.300	882.800	10230.000	884.200	0.0	10300.000	883.900	0.0	10400.000	884.500
BT	884.500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.475	7.000	10040.000	10103.000	50.000	50.000	50.000	0.0	0.0	0.0
GR	887.600	10000.000	887.100	10040.000	871.700	10070.000	871.700	10083.000	883.400	10103.000
GR	883.700	10157.000	884.100	10657.000	0.0	0.0	0.0	0.0	0.0	0.0
NC	0.065	0.065	0.040	0.100	0.300	0.0	0.0	0.0	0.0	0.0
X1	5.520	0.0	0.0	0.0	205.000	205.000	205.000	0.0	0.900	0.0
X1	5.578	0.0	0.0	0.0	310.000	310.000	310.000	0.0	-0.100	0.0
-X1	5.587	14.000	1092.000	1108.500	50.000	50.000	50.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	880.700	880.700	0.0
GR	884.700	1000.000	885.000	1065.000	872.500	1092.000	871.200	1092.200	871.200	1093.100
GR	871.200	1096.100	871.200	1100.000	871.200	1104.100	871.200	1107.100	871.200	1108.300
GR	872.500	1108.500	884.500	1132.000	883.200	1200.000	884.000	1420.000	0.0	0.0
NC	0.025	0.025	0.025	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.588	0.0	0.0	0.0	3.000	3.000	3.000	0.0	0.0	0.0
BT	14.000	1000.000	884.700	884.700	1065.000	885.000	885.000	1092.000	885.200	872.500
BT	1092.200	885.200	874.600	1093.100	885.200	876.600	1096.100	885.200	879.600	1100.000
BT	885.200	880.700	1104.100	885.200	879.600	1107.100	885.200	876.600	1108.300	885.200
BT	874.600	1108.500	885.200	872.500	1132.000	884.500	884.500	1200.000	883.200	883.200
BT	1420.000	884.000	884.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
X1	5.598	0.0	0.0	0.0	54.000	54.000	54.000	0.0	0.0	0.0
X2	0.0	0.0	0.0	880.700	883.200	0.0	1.000	0.0	0.0	0.0
NC	0.065	0.065	0.040	0.100	0.300	0.0	0.0	0.0	0.0	0.0
-X1	5.599	0.0	0.0	0.0	3.000	3.000	3.000	0.0	0.0	0.0
X3	10.000	0.0	0.0	0.0	0.0	0.0	0.0	880.700	880.700	0.0
X1	5.610	10.000	10041.000	10103.000	50.000	50.000	50.000	0.0	0.0	0.0

(5)

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  GR   884.200  10000.000    883.900  10041.000    873.400  10065.000    871.500  10069.000    871.200  10074.000
  GR   871.800  10081.000    874.100  10087.000    882.500  10103.000    881.600  10200.000    885.000  10670.000
  NC     0.065      0.075      0.045        0.0        0.0        0.0        0.0        0.0        0.0        0.0
                    0.065

  X1     5.730     11.000  10041.000  10103.000    650.000    650.000    650.000        0.0        0.0        0.0
  X3    10.000        0.0        0.0        0.0        0.0        0.0        0.0    884.200    882.800        0.0
  GR   884.500  10000.000    884.200  10041.000    873.700  10065.000    871.800  10069.000    871.500  10074.000
  GR   872.100  10081.000    874.400  10087.000    882.800  10103.000    881.900  10200.000    880.000  11750.000
  GR   884.000  11860.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0

  X1     5.820     12.000  10041.000  10103.000    460.000    460.000    460.000        0.0        0.0        0.0
  GR   884.000   9450.000    881.900  10000.000    881.600  10041.000    871.100  10065.000    869.200  10069.000
  GR   868.900  10074.000    869.500  10081.000    871.800  10087.000    880.200  10103.000    879.300  10200.000
  GR   880.000  11350.000    884.000  11960.000        0.0        0.0        0.0        0.0        0.0        0.0
  NC     0.065      0.075      0.050      0.100      0.300        0.0        0.0        0.0        0.0        0.0
 -

  X1     5.920     11.000  10060.000  10125.000    520.000    520.000    520.000        0.0        0.0        0.0
  GR   884.000   9460.000    879.300  10000.000    877.200  10060.000    873.400  10083.000    866.000  10087.000
  GR   871.100  10097.000    874.300  10099.000    878.700  10125.000    879.100  10142.000    880.000  10970.000
  GR   884.000  11700.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0

  X1     6.000     11.000  10060.000  10125.000    440.000    440.000    440.000        0.0        0.0        0.0
  GR   885.000   9820.000    879.300  10000.000    877.200  10060.000    373.400  10083.000    866.000  10087.000
  GR   871.100  10097.000    874.300  10099.000    878.700  10125.000    879.100  10142.000    880.000  10400.000
  GR   885.000  10860.000        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
 -EJ       0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0        0.0
 1

  CCHV#   0.100 CEHV#   0.300

  3265 DIVIDED FLOW

       SECNO     DEPTH     CWSEL     CRIWS     WSELK      EG        HV        HL       OLOSS   BANK ELEV
       Q         QLOB      QCH       QROB      ALOB       ACH       AROB      VOL      TWA    LEFT/RIGHT
       TIME      VLOB      VCH       VROB      XNL        XNCH      XNR       WTN      ELMIN      SSTA
       SLOPE     XLOBL     XLCH      XLOBR     ITRIAL     IDC       ICONT     CORAR    TOPWID     ENDST

          4.34      4.08    862.18       0.0    862.20    862.52      0.34       0.0       0.0    862.40
          365.       20.      345.        0.       25.       72.        0.        0.        0.    862.70
 -         0.0      0.77      4.79       0.0     0.065     0.045     0.065       0.0    858.10   9947.40

 -  0.005943          0.        0.        0.         0         0         5       0.0    112.90  10073.64
 A

  CCHV#   0.300 CEHV#   0.500
          4.49      3.94    865.84       0.0       0.0    866.00      0.16      3.43      0.05    866.00
          365.        0.      365.        0.        0.      114.        0.        2.        1.    866.40
          0.07       0.0      3.19       0.0     0.065     0.045     0.065     0.045    861.90  10047.11
 -  0.003236       800.      800.      800.         4         0         1       0.0     49.34  10096.45
 A

  3685 20 TRIALS USED WSEL,CWSEL

  7185 MIN SPECIFIC ENERGY
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(13)

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HEC2 VERSION UPDATED AUG 76 -MOD. JAN 1977
ERROR CORRECTIONS 01.02.03.04.05.06.07.08.09.10
MODIFICATIONS 52.53.54.55.56.57.58.59
**********************************************


T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK   CHICAGO OFFICE  3-77
T2      SILVER CREEK - 10YR,50TY,100YR, & 500YR - NATURAL
T3      SILVER CREEK - 50 YEAR

J1  ICHECK     INQ      NINV      IDIR      STRT     METRIC    HVINS     Q       WSEL      FQ

     -10.       3.       0.        0.   0.006000     0.0       0.0       0.    862.650    0.0

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH      FN      ALLDC     IBW     CHNIM    ITRACE

-    2.000     0.0     -1.000      0.0       0.0       0.0      0.0      0.0      0.0      0.0


CCHV#   0.100 CEHV#    0.300
   SECNO     DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   BANK ELEV
   Q         QLOB     QCH      QROB     ALOB      ACH      AROB     VOL     TWA    LEFT/RIGHT
   TIME      VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN     SSTA
   SLOPE     XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID    ENDST
-

    4.34     4.64   862.74     0.0    862.65   863.08     0.34     0.0      0.0    862.40
    575.     122.     453.      0.       94.      87.      0.       0.       0.    862.70
    0.0      1.30     5.22     0.02    0.065    0.045    0.065     0.0    858.10  9897.04
- 0.005981    0.       0.       0.       0        0        5       0.0    181.71 10078.75
A

CCHV#   0.300 CEHV#    0.500
    4.49     4.62   866.52     0.0      0.0    866.75     0.23     3.64     0.03   866.00
    575.      4.      571.      0.       7.      149.      0.       3.       2.    866.40
    0.06     0.56     3.82     0.21    0.065    0.045    0.065    0.045   861.90 10019.71
- 0.003569   800.     800.     800.      3        0        1       0.0     85.39 10105.11
A

3685 20 TRIALS USED WSEL,CWSEL

7185 MIN SPECIFIC ENERGY

3720 ASSUMED CRITICAL DEPTH

   SECNO     DEPTH    CWSEL    CRIWS    WSELK     EG       HV       HL      OLOSS   BANK ELEV
   Q         QLOB     QCH      QROB     ALOB      ACH      AROB     VOL     TWA    LEFT/RIGHT
   TIME      VLOB     VCH      VROB     XNL       XNCH     XNR      WTN     ELMIN     SSTA
   SLOPE     XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR   TOPWID    ENDST

    4.50     5.53   867.43   867.43     0.0    867.99     0.56     0.32     0.0    864.40
-   575.     191.     195.     188.      36.      23.      75.      3.       3.    864.40

    0.06     5.31     8.50     2.51    0.065    0.045    0.065    0.045   861.90 10133.26
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(20)

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 - 0.000778      3.       3.       3.       2.                1      0.0     16.50  1124.71
 A

      5.61     9.48   880.68     0.0      0.0    880.72     0.05     0.02     0.03   883.90
      510.      0.      510.      0.       0.      292.       0.      30.      11.   882.50
      0.65     0.0      1.75     0.0    0.065     0.040    0.065    0.045   871.20 10048.37
 - 0.000240     50.       50.      50.       2         0        1      0.0    51.16 10099.52
 A

  OVERBANK AREA ASSUMED NON-EFFECTIVE.ELLEA#       884.20 ELREA#        882.80

      5.73     9.35   880.85     0.0      0.0    880.90     0.05     0.18     0.00   884.20
      510.      0.      510.      0.       0.      286.       0.      35.      12.   882.80
      0.75     0.0      1.79     0.0    0.065     0.045    0.075    0.045   871.50 10048.64
 - 0.000322    650.     650.     650.       2         0        1      0.0    50.65 10099.29
 A

      5.82    12.04   880.94     0.0      0.0    880.94     0.00     0.03     0.00   881.60
      510.      0.      292.     218.       0.      436.    1664.      47.      20.   880.20
      1.04     0.0      0.67    0.13    0.065     0.045    0.075    0.045   868.90 10042.51
 - 0.000033    460.     460.     460.       2         0        1      0.0  1450.56 11493.07
 A

  CCHV#   0.100 CEHV#   0.300
    SECNO    DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL    OLOSS  BANK ELEV
    Q        QLOB     QCH      QROB     ALOB      ACH      AROB     VOL    TWA   LEFT/RIGHT
    TIME     VLOB     VCH      VROB     XNL       XNCH     XNR      WTN    ELMIN      SSTA
    SLOPE    XLOBL    XLCH     XLOBR    ITRIAL    IDC      ICONT    CORAR  TOPWID     ENDST
 -

 -    5.92    14.96   880.96     0.0      0.0    880.96     0.00     0.02     0.00   877.20

      510.     64.      256.     190.     320.      432.    1284.      72.      36.   878.70
      1.43     0.20     0.59    0.15    0.065     0.050    0.075    0.046   866.00  9809.50
 - 0.000037    520.     520.     520.       2         0        1      0.0  1335.29 11144.79
 A

      6.00    14.98   880.98     0.0      0.0    880.98     0.01     0.02     0.00   877.20
      510.     68.      351.      91.     208.      433.     446.      88.      46.   878.70
      1.62     0.33     0.81    0.20    0.065     0.050    0.075    0.046   866.00  9947.15
 - 0.000070    440.     440.     440.       0         0        1      0.0   542.38 10489.53
 A
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 HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
 ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
 MODIFICATIONS 52,53,54,55,56,57,58,59
 **********************************************************

 T1       HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK
 T2       SILVER CREEK - 10YR,50YR,100YR, & 500YR - NATURAL
 T3       SILVER CREEK - 100 YEAR

 J1  ICHECK     INQ      NINV      IDIR      STRT     METRIC    HVINS      Q       WSEL      FQ
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     -10.        4.        0.        0.   0.006500      0.0       0.0        0.   862.800      0.0

 J2  NPROF     IPLOT     PREVS     XSECV     XSECH        FN     ALLDC       IBW     CHNIM    ITRACE

     3.000       0.0    -1.000       0.0       0.0       0.0       0.0       0.0       0.0       0.0

 CCHV#   0.100 CEHV#    0.300
-    SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS  BANK ELEV
         Q      QLOB       QCH      QROB      ALOB       ACH      AROB       VOL       TWA  LEFT/RIGHT
      TIME      VLOB       VCH      VROB       XNL      XNCH       XNR       WTN     ELMIN      SSTA
     SLOPE     XLOBL      XLCH     XLOBR    ITRIAL       IDC     ICONT     CORAR    TOPWID     ENDST

      4.34      4.78    862.88       0.0    862.80    863.25      0.37       0.0       0.0    862.40
      680.      172.      507.        1.      116.       91.        2.        0.        0.    862.70
       0.0      1.48      5.60      0.37     0.065     0.045     0.065       0.0    858.10   9884.26
- 0.006495        0.        0.        0.         0         0         5       0.0    208.61  10092.87
A

 CCHV#   0.300 CEHV#    0.500
      4.49      4.90    866.80       0.0       0.0    867.05      0.25      3.76      0.04    866.00
      680.       12.      666.        2.       17.      164.        3.        4.        3.    866.40
      0.06      0.74      4.06      0.46     0.065     0.045     0.065     0.045    861.90  10005.36
- 0.003563      800.      800.      800.         4         0         1       0.0    111.20  10116.56
A

 3685 20 TRIALS USED WSEL,CWSEL

 7185 MIN SPECIFIC ENERGY

 3720 ASSUMED CRITICAL DEPTH

     SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS  BANK ELEV
         Q      QLOB       QCH      QROB      ALOB       ACH      AROB       VOL       TWA  LEFT/RIGHT
      TIME      VLOB       VCH      VROB       XNL      XNCH       XNR       WTN     ELMIN      SSTA
-    SLOPE     XLOBL      XLCH     XLOBR    ITRIAL       IDC     ICONT     CORAR    TOPWID     ENDST

       499
      4.58      5.80    867.70    867.70       0.0    868.15      0.45      0.30       0.0    864.40
-     680.      203.      196.      281.       40.       24.      111.        4.        3.    864.40

      0.06      5.05      8.04      2.53     0.065     0.045     0.065     0.045    861.90  10124.67
- 0.012261       50.       50.       50.        30         9         1       0.0    167.40  10292.07
A

 7185 MIN SPECIFIC ENERGY

 3720 ASSUMED CRITICAL DEPTH

     SECNO     DEPTH     CWSEL     CRIWS     WSELK        EG        HV        HL     OLOSS  BANK ELEV
         Q      QLOB       QCH      QROB      ALOB       ACH      AROB       VOL       TWA  LEFT/RIGHT
      TIME      VLOB       VCH      VROB       XNL      XNCH       XNR       WTN     ELMIN      SSTA
     SLOPE     XLOBL      XLCH     XLOBR    ITRIAL       IDC     ICONT     CORAR    TOPWID     ENDST
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 3265 DIVIDED FLOW

        5.61     10.43    881.63      0.0       0.0     881.68     0.05      0.01      0.00    883.90
        600.       0.       600.       0.        0.       342.       0.        36.       13.    882.50
        0.64      0.0       1.75      0.00     0.065     0.040     0.065     0.045    871.20  10046.20
 - 0.000216       50.        50.       50.         0         0         1       0.0     61.52  10203.59
 A


 OVERBANK AREA ASSUMED NON-EFFECTIVE,ELLEA=      884.20 ELREA=      882.80

        5.73     10.29    881.79      0.0       0.0     881.84     0.05      0.16      0.00    884.20
        600.       0.       600.       0.        0.       335.       0.        41.       14.    882.80
 -      0.75      0.0       1.79      0.0      0.065     0.045     0.075     0.045    871.50  10046.52

 - 0.000291      650.       650.      650.         1         0         1       0.0     54.55  10101.07
 A

 -      5.82     12.97    881.87      0.0       0.0     881.87     0.00      0.02      0.00    881.60

        600.       0.       232.      368.        5.       493.     3019.       61.       23.    880.20
        1.24      0.02      0.47      0.12     0.065     0.045     0.075     0.045    868.90  10004.67
 - 0.000014      460.       460.      460.         2         0         1       0.0   1629.82  11634.48
 A

 CCHV=    0.100 CEHV=     0.300
    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID     ENDST


        5.92     15.87    881.87      0.0       0.0     881.87     0.00      0.01      0.00    877.20
        600.       89.      209.      302.      598.      491.     2295.      102.       42.    878.70
        1.85      0.15      0.43      0.13     0.065     0.050     0.075     0.046    866.00   9704.32
 - 0.000016      520.       520.      520.         2         0         1       0.0   1607.55  11311.88
 A

        6.00     15.88    881.88      0.0       0.0     881.89     0.00      0.01      0.00    877.20
        600.       94.      337.      169.      323.      492.      814.      128.       53.    878.70
        2.10      0.29      0.68      0.21     0.065     0.050     0.075     0.046    866.00   9918.52
 - 0.000042      440.       440.      440.         0         0         1       0.0    654.44  10572.96
 A
 -
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 ****************************************************
 HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
 ERROR CORRECTIONS 01,02,03,04,05,06,07,08,09,10
 MODIFICATIONS 52,53,54,55,56,57,58,59
 ****************************************************



 -T1      HUD FLOOD INSURANCE STUDY - CITY OF WOODSTOCK

  T2      SILVER CREEK - 10YR,50YR,100YR, & 500YR - NATURAL
  T3      SILVER CREEK - 500 YEAR
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J1  ICHECK    INQ      NINV      IDIR     STRT      METRIC    HVINS      Q       WSEL       FQ

     -10.       5.        0.        0.   0.007000     0.0       0.0       0.    863.200     0.0

J2  NPROF    IPLOT     PRFVS     XSECV     XSECH      FN      ALLDC      IBW     CHNIM     ITRACE

    15.000    0.0     -1.000      0.0       0.0       0.0      0.0       0.0       0.0       0.0

CCHV#   0.100 CEHV#    0.300
    SECNO     DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL      OLOSS   BANK ELEV
    Q         QLOB     QCH      QROB     ALOB       ACH      AROB     VOL     TWA    LEFT/RIGHT
    TIME      VLOB     VCH      VROB     XNL        XNCH     XNR      WTN     ELMIN      SSTA
    SLOPE     XLOBL    XLCH     XLOBR    ITRIAL     IDC      ICONT    CORAR   TOPWID     ENDST

     4.34     5.10   863.20     0.0    863.20    863.60     0.40     0.0      0.0     862.40
     950.     316.     615.     19.      174.       99.      23.       0.       0.     862.70
     0.0      1.82     6.20     0.84    0.065     0.045    0.065     0.0    858.10   9855.16
- 0.007037     0.       0.       0.        0         0        1      0.0    308.24  10163.39
A

CCHV#   0.300 CEHV#    0.500
     4.49     5.42   867.31     0.0      0.0    867.62     0.31     3.99     0.03    866.00
-    950.      55.     880.     14.       49.      191.      17.       5.       4.     866.40

     0.05     1.13     4.60     0.83    0.065     0.045    0.065    0.045   861.90   9959.90
- 0.003716    800.     800.     800.        4         0        1      0.0    178.20  10138.09
A
-

3685 20 TRIALS USED WSEL,CWSEL

7185 MIN SPECIFIC ENERGY

3720 ASSUMED CRITICAL DEPTH

    SECNO     DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL      OLOSS   BANK ELEV
    Q         QLOB     QCH      QROB     ALOB       ACH      AROB     VOL     TWA    LEFT/RIGHT
    TIME      VLOB     VCH      VROB     XNL        XNCH     XNR      WTN     ELMIN      SSTA
    SLOPE     XLOBL    XLCH     XLOBR    ITRIAL     IDC      ICONT    CORAR   TOPWID     ENDST

     4.50     6.08   867.98   867.98     0.0    868.47     0.49     0.33     0.0     864.40
     950.     260.     231.     459.      50.       26.     151.       5.       5.     864.40
     0.05     5.23     8.99     3.04    0.065     0.045    0.065    0.045   861.90  10101.81
- 0.014247     50.      50.      50.       30         8        1      0.0    200.78  10302.59
A

NORMAL BRIDGE,NRD#15 MIN ELTRD#  866.60 MAX ELLC#  870.00

     4.50     6.15   868.05   868.04     0.0    868.52     0.47     0.04     0.01    864.40
     950.      47.     115.     788.      16.       19.     143.       5.       5.     864.40
     0.05     2.89     6.08     5.51    0.025     0.025    0.025    0.045   861.90  10096.26
- 0.009003      4.       4.       4.        0        11        1   -61.89   208.89  10305.15
A

-   SECNO     DEPTH    CWSEL    CRIWS    WSELK      EG       HV       HL      OLOSS   BANK ELEV

    Q         QLOB     QCH      QROB     ALOB       ACH      AROB     VOL     TWA    LEFT/RIGHT
```

6.00	18.46	884.46	0.0	0.0	884.46	0.00	0.00	0.00	877.20
830.	161.	292.	377.	795.	660.	2282.	364.	108.	878.70
4.80	0.20	0.44	0.17	0.065	0.050	0.075	0.046	866.00	9836.79
- 0.000012	440.	440.	440.	0	0	1	0.0	974.30	10811.09

A

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SUMMARY PRINTOUT FOR MULTIPLE PROFILES

SILVER CREEK - 500 YEAR

SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
4.34	0.0	0.0	0.0	858.10	365.00	862.18	0.0	862.52	112.90	59.43	0.0	0.0
- 4.34	0.0	0.0	0.0	858.10	575.00	862.74	0.0	863.08	181.71	59.81	0.0	0.0
4.34	0.0	0.0	0.0	858.10	680.00	862.88	0.0	863.25	208.61	64.95	0.0	0.0
4.34	0.0	0.0	0.0	858.10	950.00	863.20	0.0	863.60	308.24	70.37	0.0	0.0
- 4.49	800.00	0.0	0.0	861.90	365.00	865.84	0.0	866.00	49.34	32.36	0.07	1.95
4.49	800.00	0.0	0.0	861.90	575.00	866.52	0.0	866.74	85.39	35.69	0.06	3.10
4.49	800.00	0.0	0.0	861.90	680.00	866.80	0.0	867.05	111.20	35.63	0.06	3.60
4.49	800.00	0.0	0.0	861.90	950.00	867.31	0.0	867.62	178.20	37.16	0.05	5.08
4.50	50.00	0.0	0.0	861.90	365.00	866.43	866.43	867.40	24.26	272.90	0.07	2.04
4.50	50.00	0.0	0.0	861.90	575.00	867.43	867.43	867.99	148.57	147.56	0.06	3.27
4.50	50.00	0.0	0.0	861.90	680.00	867.70	867.70	868.15	167.40	122.61	0.06	3.81
4.50	50.00	0.0	0.0	861.90	950.00	867.97	867.97	868.47	200.78	142.47	0.05	5.36
4.50	4.00	866.60	870.00	861.90	365.00	867.60	867.60	867.83	155.18	70.26	0.07	2.05
4.50	4.00	866.60	870.00	861.90	575.00	867.81	0.0	868.11	181.42	72.14	0.06	3.28
4.50	4.00	866.60	870.00	861.90	680.00	867.84	867.84	868.23	183.88	93.59	0.06	3.82
4.50	4.00	866.60	870.00	861.90	950.00	868.05	868.04	868.52	208.89	90.03	0.05	5.38
4.50	22.00	866.60	866.90	861.90	365.00	867.88	0.0	867.94	189.77	10.08	0.08	2.12
4.50	22.00	866.60	866.90	861.90	575.00	868.15	0.0	868.23	222.01	13.07	0.06	3.38
4.50	22.00	866.60	866.90	861.90	680.00	868.30	0.0	868.39	241.16	12.78	0.06	3.93
4.50	22.00	866.60	866.90	861.90	950.00	868.58	0.0	868.69	274.69	13.94	0.06	5.51
- 4.50	4.00	0.0	0.0	861.90	365.00	867.87	0.0	867.96	188.02	25.58	0.08	2.14
4.50	4.00	0.0	0.0	861.90	575.00	868.13	0.0	868.26	219.91	39.15	0.06	3.40
4.50	4.00	0.0	0.0	861.90	680.00	868.29	0.0	868.42	238.42	41.77	0.06	3.96
4.50	4.00	0.0	0.0	861.90	950.00	868.56	0.0	868.72	271.73	51.07	0.06	5.55
4.512	50.00	0.0	0.0	862.20	365.00	867.96	0.0	868.08	166.38	17.68	0.08	2.36
4.51	50.00	0.0	0.0	862.20	575.00	868.26	0.0	868.46	204.41	27.32	0.07	3.69
4.51	50.00	0.0	0.0	862.20	680.00	868.42	0.0	868.64	224.21	29.97	0.07	4.28
4.51	50.00	0.0	0.0	862.20	950.00	868.72	0.0	868.99	261.80	37.28	0.06	5.95
4.63	615.00	0.0	0.0	866.00	365.00	869.99	0.0	870.78	22.02	174.08	0.10	4.01
4.63	615.00	0.0	0.0	866.00	575.00	871.06	0.0	871.91	27.64	143.83	0.09	5.92
4.63	615.00	0.0	0.0	866.00	680.00	871.41	0.0	872.35	29.47	146.33	0.09	6.83
4.63	615.00	0.0	0.0	866.00	950.00	872.34	872.34	873.26	137.92	123.38	0.08	9.42
4.78	760.00	0.0	0.0	868.30	365.00	873.22	0.0	873.32	43.27	13.20	0.19	5.69

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4.78	760.00	0.0	0.0	868.30	575.00	874.27	0.0	874.40	97.04	13.58	0.16	8.45
4.78	760.00	0.0	0.0	868.30	680.00	874.68	0.0	874.82	103.48	13.33	0.16	9.80
4.78	760.00	0.0	0.0	868.30	950.00	875.50	0.0	875.66	110.02	13.53	0.15	13.87
4.91	710.00	0.0	0.0	869.00	365.00	874.28	0.0	874.36	45.35	16.29	0.27	8.13
4.91	710.00	0.0	0.0	869.00	575.00	875.35	0.0	875.46	98.04	16.00	0.24	12.20
4.91	710.00	0.0	0.0	869.00	680.00	875.75	0.0	875.86	108.96	15.87	0.24	14.22
4.91	710.00	0.0	0.0	869.00	950.00	876.58	0.0	876.70	213.84	15.39	0.23	19.87

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SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
~~4.92~~	50.00	0.0	0.0	869.10	365.00	874.35	0.0	874.51	24.25	27.49	0.28	8.29
4.92	50.00	0.0	0.0	869.10	575.00	875.39	0.0	875.66	25.29	38.12	0.25	12.42
4.92	50.00	0.0	0.0	869.10	680.00	875.77	0.0	876.09	25.67	44.17	0.24	14.47
4.92	50.00	0.0	0.0	869.10	950.00	876.53	0.0	877.02	27.25	60.46	0.23	20.21
℄ Melody Lane (SG)												
4.924	40.00	877.60	876.50	869.10	365.00	874.46	0.0	874.61	24.36	25.78	0.28	8.39
4.92	40.00	877.60	876.50	869.10	575.00	875.56	0.0	875.81	25.46	35.02	0.25	12.55
4.92	40.00	877.60	876.50	869.10	680.00	875.96	0.0	876.27	25.86	40.19	0.24	14.61
4.92	40.00	877.60	876.50	869.10	950.00	876.82	0.0	877.27	26.40	52.51	0.23	20.37
4.930	50.00	0.0	0.0	869.10	365.00	874.62	0.0	874.74	34.98	21.39	0.28	8.54
4.93	50.00	0.0	0.0	869.10	575.00	875.81	0.0	875.98	39.58	24.16	0.25	12.74
4.93	50.00	0.0	0.0	869.10	680.00	876.27	0.0	876.46	41.36	25.75	0.24	14.81
4.93	50.00	0.0	0.0	869.10	950.00	877.28	0.0	877.53	45.27	23.05	0.23	20.61
5.04	530.00	0.0	0.0	869.40	365.00	875.56	0.0	875.65	37.43	13.82	0.35	10.29
5.04	530.00	0.0	0.0	869.40	575.00	876.86	0.0	876.99	42.52	15.53	0.31	15.08
5.04	530.00	0.0	0.0	869.40	680.00	877.40	0.0	877.54	44.56	16.37	0.30	17.41
5.04	530.00	0.0	0.0	869.40	950.00	878.56	0.0	878.73	49.02	18.11	0.28	23.80
5.06	136.00	0.0	0.0	869.70	365.00	875.75	0.0	875.84	37.02	14.83	0.36	10.77
5.06	136.00	0.0	0.0	869.70	575.00	877.09	0.0	877.21	42.20	16.27	0.32	15.73
5.06	136.00	0.0	0.0	869.70	680.00	877.63	0.0	877.77	44.28	16.99	0.31	18.12
5.06	136.00	0.0	0.0	869.70	950.00	878.81	0.0	878.98	48.85	18.50	0.29	24.69
5.06 ~~5.07~~	50.00	0.0	0.0	869.90	365.00	875.82	0.0	875.92	25.37	14.41	0.37	10.94
5.07	50.00	0.0	0.0	869.90	575.00	877.16	0.0	877.32	25.59	19.59	0.32	15.95
5.07	50.00	0.0	0.0	869.90	680.00	877.70	0.0	877.89	25.68	22.28	0.31	18.37
5.07	50.00	0.0	0.0	869.90	950.00	878.87	0.0	879.15	25.87	29.12	0.29	24.98
℄ A Foot Bridge (SG)												
5.071	8.00	883.90	882.70	869.90	365.00	875.83	0.0	875.93	25.37	14.38	0.37	10.97
5.07	8.00	883.90	882.70	869.90	575.00	877.18	0.0	877.33	25.59	19.59	0.32	15.98
5.07	8.00	883.90	882.70	869.90	680.00	877.72	0.0	877.91	25.68	22.25	0.31	18.40
5.07	8.00	883.90	882.70	869.90	950.00	878.90	0.0	879.17	25.88	28.88	0.29	25.02
5.08	50.00	0.0	0.0	870.00	365.00	875.91	0.0	876.01	36.43	16.44	0.38	11.14
5.08	50.00	0.0	0.0	870.00	575.00	877.31	0.0	877.43	41.88	17.06	0.33	16.20
5.08	50.00	0.0	0.0	870.00	680.00	877.88	0.0	878.02	44.09	17.46	0.32	18.64
5.08	50.00	0.0	0.0	870.00	950.00	879.14	0.0	879.31	48.98	18.21	0.30	25.31
5.152	376.00	0.0	0.0	870.50	320.00	876.31	0.0	876.38	36.07	6.41	0.42	12.39
5.15	376.00	0.0	0.0	870.50	510.00	877.72	0.0	877.83	41.55	6.69	0.37	17.92
5.15	376.00	0.0	0.0	870.50	600.00	878.30	0.0	878.42	43.80	6.72	0.36	20.58
5.15	376.00	0.0	0.0	870.50	830.00	879.59	0.0	879.72	48.78	6.77	0.33	27.76
5.161	50.00	0.0	0.0	870.60	320.00	875.52	0.0	876.86	7.00	240.85	0.42	12.49

5.161	50.00	0.0	0.0	870.60	510.00	876.06	876.06	878.82	7.00	469.44	0.37	18.06
5.16	50.00	0.0	0.0	870.60	600.00	876.69	876.69	879.76	7.00	495.44	0.36	20.73
5.16	50.00	0.0	0.0	870.60	830.00	879.85	879.85	882.12	21.80	276.10	0.33	27.96

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SECTION -NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
5.165	8.00	888.00	895.10	870.60	320.00	875.63	0.0	876.91	7.00	32.19	0.42	12.50
5.16	8.00	888.00	895.10	870.60	510.00	876.71	0.0	878.92	7.00	49.90	0.37	18.07
5.16	8.00	888.00	895.10	870.60	600.00	877.39	0.0	879.87	7.00	53.24	0.36	20.74
5.16	8.00	888.00	895.10	870.60	830.00	878.84	878.32	882.25	9.83	97.38	0.33	27.98
℄ State Route 47 (NB)												
5.181	84.00	888.00	878.60	870.60	320.00	876.07	0.0	877.16	7.00	25.82	0.43	12.57
5.18	84.00	888.00	878.60	870.60	510.00	877.60	0.0	879.28	7.00	35.60	0.37	18.15
5.18	84.00	888.00	878.60	870.60	600.00	878.35	0.0	880.25	7.00	38.48	0.36	20.84
5.18	84.00	888.00	878.60	870.60	830.00	879.66	878.35	883.07	19.50	97.38	0.34	28.08
5.189	8.00	0.0	0.0	870.60	320.00	876.15	0.0	877.20	7.00	177.42	0.43	12.57
5.18	8.00	0.0	0.0	870.60	510.00	877.71	0.0	879.34	7.00	243.85	0.37	18.16
5.18	8.00	0.0	0.0	870.60	600.00	878.49	0.0	880.32	7.00	262.49	0.36	20.85
5.18	8.00	0.0	0.0	870.60	830.00	883.11	878.25	883.42	62.77	34.72	0.34	28.11
5.19	50.00	0.0	0.0	870.50	320.00	877.30	0.0	877.36	35.98	3.95	0.43	12.69
5.19	50.00	0.0	0.0	870.50	510.00	879.48	0.0	879.55	60.61	3.02	0.38	18.34
5.19	50.00	0.0	0.0	870.50	600.00	880.48	0.0	880.54	87.37	2.48	0.37	21.07
5.19	50.00	0.0	0.0	870.50	830.00	883.43	0.0	883.46	169.53	1.07	0.35	28.64
5.32	680.00	0.0	0.0	869.90	320.00	877.56	0.0	877.61	36.64	3.25	0.54	15.39
5.32	680.00	0.0	0.0	869.90	510.00	879.68	0.0	879.74	64.72	2.65	0.48	22.58
5.32	680.00	0.0	0.0	869.90	600.00	880.65	0.0	880.70	91.90	2.23	0.47	26.47
5.32	680.00	0.0	0.0	869.90	830.00	883.51	0.0	883.54	169.64	1.03	0.49	39.97
5.445	645.00	0.0	0.0	871.40	320.00	877.80	0.0	877.88	33.38	5.31	0.62	17.81
5.44	645.00	0.0	0.0	871.40	510.00	879.88	0.0	879.96	42.34	4.33	0.56	26.31
5.44	645.00	0.0	0.0	871.40	600.00	880.81	0.0	880.89	57.95	3.73	0.55	31.11
5.44	645.00	0.0	0.0	871.40	830.00	883.58	0.0	883.63	132.34	1.85	0.59	49.32
5.454	50.00	0.0	0.0	871.50	320.00	877.80	0.0	877.95	16.30	12.92	0.63	17.95
5.45	50.00	0.0	0.0	871.50	510.00	879.85	0.0	880.07	16.30	15.39	0.56	26.52
5.45	50.00	0.0	0.0	871.50	600.00	880.76	0.0	881.01	16.30	16.19	0.55	31.35
5.45	50.00	0.0	0.0	871.50	830.00	883.49	0.0	883.76	35.85	15.07	0.60	49.74
℄ — St. Johns Road (SB)												
5.47	90.00	883.90	882.80	871.50	320.00	877.92	0.0	878.07	16.30	12.30	0.64	18.16
5.47	90.00	883.90	882.80	871.50	510.00	879.99	0.0	880.20	16.30	14.70	0.57	26.80
5.47	90.00	883.90	882.80	871.50	600.00	880.92	0.0	881.15	16.30	15.51	0.56	31.66
5.47	90.00	883.90	882.80	871.50	830.00	883.59	0.0	883.86	38.93	14.57	0.60	50.17
5.475	50.00	0.0	0.0	871.70	320.00	878.07	0.0	878.13	36.28	4.80	0.64	18.31
5.47	50.00	0.0	0.0	871.70	510.00	880.21	0.0	880.28	44.14	3.71	0.58	27.02
5.47	50.00	0.0	0.0	871.70	600.00	881.17	0.0	881.23	47.63	3.29	0.57	31.92
5.47	50.00	0.0	0.0	871.70	830.00	883.89	0.0	883.95	351.36	2.05	0.61	50.55
5.52	205.00	0.0	0.0	872.60	320.00	878.17	0.0	878.27	33.38	8.16	0.66	18.99
5.52	205.00	0.0	0.0	872.60	510.00	880.29	0.0	880.38	41.12	5.66	0.60	28.08
5.52	205.00	0.0	0.0	872.60	600.00	881.23	0.0	881.32	44.57	4.85	0.59	33.18
5.52	205.00	0.0	0.0	872.60	830.00	883.93	0.0	884.00	54.44	2.91	0.63	52.56

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SECTION NUMBER	CHANNEL LENGTH	MIN EL OF ROADWAY	MAX EL OF LOW CHORD	MIN EL GROUND	DISCHARGE %CFS<	CWSEL	CRIWS	EG	TOPWID	10K*S	TIME	VOL
5.58	310.00	0.0	0.0	872.50	320.00	878.41	0.0	878.49	34.62	6.45	0.70	19.95
5.58	310.00	0.0	0.0	872.50	510.00	880.46	0.0	880.54	42.12	4.90	0.64	29.60
5.58	310.00	0.0	0.0	872.50	600.00	881.38	0.0	881.46	45.49	4.30	0.63	34.99
5.58	310.00	0.0	0.0	872.50	830.00	884.02	0.0	884.09	55.12	2.72	0.68	55.32
- 5.59 587	50.00	0.0	0.0	871.20	320.00	878.42	0.0	878.53	16.50	6.44	0.71	20.10
5.59	50.00	0.0	0.0	871.20	510.00	880.43	0.0	880.60	16.50	8.00	0.64	29.82
5.59	50.00	0.0	0.0	871.20	600.00	881.40	0.0	881.48	53.17	2.72	0.63	35.33
5.59	50.00	0.0	0.0	871.20	830.00	884.03	0.0	884.10	327.32	1.93	0.68	55.89
5.59 588	3.00	883.20	885.00	871.20	320.00	878.40	0.0	878.54	40.80	3.64	0.71	20.11
5.59	3.00	883.20	885.00	871.20	510.00	880.36	0.0	880.63	48.88	8.10	0.64	29.83
5.59	3.00	883.20	885.00	871.20	600.00	881.20	0.0	881.57	52.32	12.65	0.63	35.34
5.59	3.00	883.20	885.00	871.20	830.00	883.65	875.46	884.27	210.21	22.22	0.68	55.91
℄ - Water Plant Access Road (NB)												
598 ~~5.60~~	54.00	883.20	880.70	871.20	320.00	878.42	0.0	878.56	40.91	3.61	0.71	20.24
5.60	54.00	883.20	880.70	871.20	510.00	880.41	0.0	880.68	49.06	8.06	0.64	29.98
5.60	54.00	883.20	880.70	871.20	600.00	881.27	0.0	881.64	52.60	12.65	0.64	35.49
5.60	54.00	883.20	880.70	871.20	830.00	883.94	875.46	884.39	304.94	17.95	0.69	56.14
599 ~~5.60~~	3.00	0.0	0.0	871.20	320.00	878.46	0.0	878.57	16.50	6.35	0.71	20.24
5.60	3.00	0.0	0.0	871.20	510.00	880.52	0.0	880.69	16.50	7.78	0.64	29.99
5.60	3.00	0.0	0.0	871.20	600.00	881.59	0.0	881.67	53.93	2.53	0.64	35.51
5.60	3.00	0.0	0.0	871.20	830.00	884.37	0.0	884.43	346.85	1.61	0.69	56.17
- 5.61	50.00	0.0	0.0	871.20	320.00	878.55	0.0	878.59	42.25	2.91	0.72	20.42
5.61	50.00	0.0	0.0	871.20	510.00	880.67	0.0	880.72	51.16	2.40	0.65	30.24
5.61	50.00	0.0	0.0	871.20	600.00	881.63	0.0	881.68	61.52	2.16	0.64	35.90
5.61	50.00	0.0	0.0	871.20	830.00	884.43	0.0	884.44	590.32	0.71	0.70	57.33
5.73	650.00	0.0	0.0	871.50	320.00	878.77	0.0	878.81	41.90	3.87	0.83	23.27
5.73	650.00	0.0	0.0	871.50	510.00	880.85	0.0	880.90	50.65	3.22	0.75	34.55
5.73	650.00	0.0	0.0	871.50	600.00	881.79	0.0	881.84	54.55	2.91	0.75	40.95
5.73	650.00	0.0	0.0	871.50	830.00	884.45	0.0	884.45	1853.84	0.06	1.89	114.85
5.82	460.00	0.0	0.0	868.90	320.00	878.88	0.0	878.89	53.26	0.95	0.96	25.95
5.82	460.00	0.0	0.0	868.90	510.00	880.94	0.0	880.94	1450.56	0.33	1.04	47.15
5.82	460.00	0.0	0.0	868.90	600.00	881.86	0.0	881.87	1629.82	0.14	1.24	61.29
5.82	460.00	0.0	0.0	868.90	830.00	884.46	0.0	884.46	2510.00	0.03	3.04	196.70
5.92	520.00	0.0	0.0	866.00	320.00	878.94	0.0	878.96	125.13	1.80	1.10	29.91
5.92	520.00	0.0	0.0	866.00	510.00	880.96	0.0	880.96	1335.29	0.37	1.43	71.84
5.92	520.00	0.0	0.0	866.00	600.00	881.87	0.0	881.87	1607.55	0.16	1.85	102.47
5.92	520.00	0.0	0.0	866.00	830.00	884.46	0.0	884.46	2240.00	0.03	4.35	301.86
- 6.00	440.00	0.0	0.0	866.00	320.00	879.02	0.0	879.04	130.05	1.70	1.23	33.44
6.00	440.00	0.0	0.0	866.00	510.00	880.98	0.0	880.98	542.38	0.70	1.62	87.61
6.00	440.00	0.0	0.0	866.00	600.00	881.88	0.0	881.89	654.44	0.42	2.10	127.79
6.00	440.00	0.0	0.0	866.00	830.00	884.46	0.0	884.46	974.30	0.12	4.80	363.77

SECTION NUMBER	DISCHARGE CFS	CWSEL	CWSEL DIFF EACH Q	CWSEL DIFF EACH SECTION	CWSEL-WSELK	TOPWID	T.W. DIFF	LENGTH
4.340	365.000	862.180	0.0	0.0	0.0	112.898-	0.0	0.0
4.340	575.000	862.737	0.556	0.0	0.0	181.715	-68.816	0.0
4.340	680.000	862.878	0.141	0.0	0.0	208.605	-95.707	0.0

4.340	950.000	863.199	0.321	0.0	0.0	308.238	-195.340	0.0
4.490	365.000	865.842	0.0	3.661	0.0	49.336	0.0	800.000
4.490	575.000	866.520	0.678	3.783	0.0	85.391	-36.055	800.000
4.490	680.000	866.797	0.278	3.919	0.0	111.203	-61.867	800.000
4.490	950.000	867.314	0.517	4.115	0.0	178.195	-128.859	800.000
4.497	365.000	866.426	0.0	0.584	0.0	24.262	0.0	50.000
4.497	575.000	867.432	1.006	0.912	0.0	148.566	-124.305	50.000
4.497	680.000	867.699	0.268	0.902	0.0	167.398	-143.137	50.000
4.497	950.000	867.975	0.276	0.661	0.0	200.781	-176.520	50.000
4.499	365.000	867.598	0.0	1.173	0.0	155.184	0.0	4.000
4.499	575.000	867.805	0.208	0.374	0.0	181.422	-26.238	4.000
4.499	680.000	867.835	0.030	0.136	0.0	183.883	-28.699	4.000
4.499	950.000	868.051	0.215	0.076	0.0	208.891	-53.707	4.000
4.501	365.000	867.882	0.0	0.284	0.0	189.766	0.0	22.000
4.501	575.000	868.149	0.267	0.344	0.0	222.012	-32.246	22.000
4.501	680.000	868.301	0.152	0.466	0.0	241.164	-51.398	22.000
4.501	950.000	868.576	0.275	0.523	0.0	274.691	-84.926	22.000
4.503	365.000	867.870	0.0	-0.013	0.0	188.023	0.0	4.000
4.503	575.000	868.132	0.263	-0.017	0.0	219.906	-31.883	4.000
4.503	680.000	868.285	0.153	-0.016	0.0	238.422	-50.398	4.000
4.503	950.000	868.560	0.274	-0.016	0.0	271.730	-83.707	4.000
4.512	365.000	867.957	0.0	0.088	0.0	166.379	0.0	50.000
4.512	575.000	868.261	0.304	0.129	0.0	204.406	-38.027	50.000
4.512	680.000	868.420	0.159	0.134	0.0	224.211	-57.832	50.000
4.512	950.000	868.722	0.302	0.162	0.0	261.805	-95.426	50.000
4.630	365.000	869.994	0.0	2.037	0.0	22.016	0.0	615.000
4.630	575.000	871.064	1.070	2.803	0.0	27.641	-5.625	615.000
4.630	680.000	871.412	0.348	2.993	0.0	29.473	-7.457	615.000
4.630	950.000	872.337	0.925	3.616	0.0	137.918	-115.902	615.000
4.780	365.000	873.216	0.0	3.222	0.0	43.270	0.0	760.000
4.780	575.000	874.267	1.051	3.203	0.0	97.043	-53.773	760.000
4.780	680.000	874.676	0.408	3.263	0.0	103.484	-60.215	760.000
4.780	950.000	875.498	0.823	3.161	0.0	110.016	-66.746	760.000
4.907	365.000	874.280	0.0	1.064	0.0	45.352	0.0	710.000
4.907	575.000	875.355	1.075	1.088	0.0	98.043	-52.691	710.000
4.907	680.000	875.752	0.397	1.076	0.0	108.957	-63.605	710.000
4.907	950.000	876.583	0.831	1.085	0.0	213.840	-168.488	710.000
4.916	365.000	874.345	0.0	0.066	0.0	24.255	0.0	50.000
4.916	575.000	875.391	1.046	0.036	0.0	25.292	-1.037	50.000
4.916	680.000	875.767	0.376	0.015	0.0	25.667	-1.413	50.000
4.916	950.000	876.530	0.763	-0.053	0.0	27.253	-2.999	50.000
4.924	365.000	874.460	0.0	0.115	0.0	24.361	0.0	40.000
4.924	575.000	875.557	1.096	0.166	0.0	25.458	-1.098	40.000
4.924	680.000	875.962	0.406	0.196	0.0	25.864	-1.503	40.000
4.924	950.000	876.825	0.863	0.295	0.0	26.400	-2.040	40.000
4.933	365.000	874.624	0.0	0.164	0.0	34.980	0.0	50.000
4.933	575.000	875.813	1.188	0.256	0.0	39.578	-4.598	50.000

4.933	680.000	876.271	0.459	0.309	0.0	41.355	-6.375	50.000
4.933	950.000	877.282	1.011	0.458	0.0	45.270	-10.289	50.000
5.040	365.000	875.560	0.0	0.936	0.0	37.434	0.0	530.000
5.040	575.000	876.876	1.316	1.064	0.0	42.523	-5.090	530.000
5.040	680.000	877.404	0.528	1.133	0.0	44.559	-7.125	530.000
5.040	950.000	878.561	1.157	1.278	0.0	49.023	-11.590	530.000
5.060	365.000	875.751	0.0	0.191	0.0	37.020	0.0	136.000
5.060	575.000	877.089	1.338	0.213	0.0	42.203	-5.184	136.000
5.060	680.000	877.628	0.539	0.224	0.0	44.281	-7.262	136.000
5.060	950.000	878.807	1.179	0.247	0.0	48.848	-11.828	136.000
5.069	365.000	875.822	0.0	0.071	0.0	25.372	0.0	50.000
5.069	575.000	877.162	1.340	0.073	0.0	25.593	-0.221	50.000
5.069	680.000	877.699	0.538	0.071	0.0	25.681	-0.309	50.000
5.069	950.000	878.871	1.172	0.064	0.0	25.872	-0.500	50.000
5.071	365.000	875.833	0.0	0.011	0.0	25.373	0.0	8.000
5.071	575.000	877.177	1.344	0.016	0.0	25.593	-0.220	8.000
5.071	680.000	877.717	0.540	0.018	0.0	25.681	-0.309	8.000
5.071	950.000	878.897	1.179	0.026	0.0	25.876	-0.504	8.000
5.080	365.000	875.909	0.0	0.076	0.0	36.430	0.0	50.000
5.080	575.000	877.306	1.397	0.129	0.0	41.875	-5.445	[illegible]
5.080	680.000	877.877	0.571	0.159	0.0	44.086	-7.656	50.000
5.080	950.000	879.141	1.264	0.244	0.0	48.977	-12.547	50.000
5.152	320.000	876.306	0.0	0.397	0.0	36.070	0.0	376.000
5.152	510.000	877.723	1.417	0.417	0.0	41.551	-5.480	376.000
5.152	600.000	878.304	0.581	0.427	0.0	43.801	-7.730	376.000
5.152	830.000	879.589	1.286	0.448	0.0	48.777	-12.707	376.000
5.161	320.000	875.517	0.0	-0.789	0.0	7.000	0.0	50.000
5.161	510.000	876.061	0.544	-1.662	0.0	7.000	0.0	50.000
5.161	600.000	876.686	0.625	-1.618	0.0	7.000	0.0	50.000
5.161	830.000	879.849	3.163	0.260	0.0	21.797	-14.797	50.000
5.163	320.000	875.625	0.0	0.108	0.0	7.000	0.0	8.000
5.163	510.000	876.710	1.085	0.649	0.0	7.000	0.0	8.000
5.163	600.000	877.391	0.680	0.704	0.0	7.000	0.0	8.000
5.163	830.000	878.839	1.448	-1.011	0.0	9.828	-2.828	8.000
5.177	320.000	876.075	0.0	0.449	0.0	7.000	0.0	84.000
[illegible]	510.000	877.597	1.522	0.886	0.0	7.000	0.0	84.000
5.177	600.000	878.354	[illegible]	0.964	0.0	7.000	0.0	84.000
5.177	830.000	879.656	1.302	0.818	0.0	19.496	-12.496	84.000
5.179	320.000	876.150	0.0	0.075	0.0	7.000	0.0	8.000
5.179	510.000	877.712	1.563	0.116	0.0	7.000	0.0	8.000
5.179	600.000	878.489	0.776	0.134	0.0	7.000	0.0	8.000
5.179	830.000	883.111	4.622	3.454	0.0	62.773	-55.773	8.000
5.188	320.000	877.305	0.0	1.155	0.0	35.977	0.0	50.000
5.188	510.000	879.485	2.180	1.773	0.0	60.605	-24.629	50.000
5.188	600.000	880.482	0.998	1.994	0.0	87.371	-51.395	50.000
5.188	830.000	883.434	2.952	0.324	0.0	169.531	-133.555	50.000
5.320	320.000	877.555	0.0	0.251	0.0	36.645	0.0	680.000
5.320	510.000	879.682	2.127	0.198	0.0	64.723	-28.078	680.000

5.320	600.000	880.647	0.965	0.165	0.0	91.902	-55.258	680.000
5.320	830.000	883.507	2.859	0.073	0.0	169.645	-133.000	680.000
5.445	320.000	877.804	0.0	0.249	0.0	33.375	0.0	645.000
5.445	510.000	879.801	2.077	0.199	0.0	42.344	-8.969	645.000
5.445	600.000	880.812	0.931	0.164	0.0	57.949	-24.574	645.000
5.445	830.000	883.578	2.766	0.071	0.0	132.340	-98.965	645.000
5.454	320.000	877.804	0.0	0.0	0.0	16.297	0.0	50.000
5.454	510.000	879.849	2.044	-0.032	0.0	16.297	0.0	50.000
5.454	600.000	880.763	0.914	-0.049	0.0	16.297	0.0	50.000
5.454	830.000	883.486	2.723	-0.093	0.0	35.852	-19.555	50.000
5.466	320.000	877.924	0.0	0.120	0.0	16.297	0.0	90.000
5.466	510.000	879.994	2.069	0.145	0.0	16.297	0.0	90.000
5.466	600.000	880.916	0.922	0.153	0.0	16.297	0.0	90.000
5.466	830.000	883.594	2.678	0.108	0.0	38.934	-22.637	90.000
5.475	320.000	878.065	0.0	0.141	0.0	36.281	0.0	50.000
5.475	510.000	880.212	2.146	0.218	0.0	44.137	-7.855	50.000
5.475	600.000	881.167	0.955	0.251	0.0	47.625	-11.344	50.000
5.475	830.000	883.892	2.726	0.299	0.0	351.355	-315.074	50.000
5.520	320.000	878.170	0.0	0.104	0.0	33.375	0.0	205.000
5.520	510.000	880.287	2.117	0.075	0.0	41.117	-7.742	205.000
5.520	600.000	881.232	0.945	0.065	0.0	44.570	-11.195	205.000
5.520	830.000	883.930	2.698	0.037	0.0	54.441	-21.066	205.000
5.578	320.000	878.410	0.0	0.241	0.0	34.621	0.0	310.000
5.578	510.000	880.460	2.050	0.174	0.0	42.117	-7.496	310.000
5.578	600.000	881.381	0.921	0.149	0.0	45.488	-10.867	310.000
5.578	830.000	884.021	2.640	0.091	0.0	55.117	-20.496	310.000
5.587	320.000	878.420	0.0	0.009	0.0	16.500	0.0	50.000
5.587	510.000	880.428	2.008	-0.032	0.0	16.500	0.0	50.000
5.587	600.000	881.397	0.969	0.016	0.0	53.174	-36.674	50.000
5.587	830.000	884.031	2.634	0.009	0.0	327.325	-310.825	50.000
5.588	320.000	878.399	0.0	-0.021	0.0	40.800	0.0	3.000
5.588	510.000	880.361	1.962	-0.067	0.0	48.878	-8.078	3.000
5.588	600.000	881.198	0.837	-0.199	0.0	52.324	-11.524	3.000
5.588	830.000	883.646	2.448	-0.385	0.0	210.210	-169.411	3.000
5.598	320.000	878.420	0.0	0.021	0.0	40.912	0.0	54.000
5.598	510.000	880.406	1.986	0.044	0.0	49.056	-8.145	54.000
5.598	600.000	881.266	0.861	0.068	0.0	52.605	-11.693	54.000
5.598	830.000	883.938	2.672	0.293	0.0	304.937	-264.025	54.000
5.599	320.000	878.456	0.0	0.036	0.0	16.500	0.0	3.000
5.599	510.000	880.519	2.064	0.114	0.0	16.500	0.0	3.000
5.599	600.000	881.587	1.068	0.321	0.0	53.926	-37.426	3.000
5.599	830.000	884.374	2.788	0.436	0.0	346.850	-330.350	3.000
5.610	320.000	878.551	0.0	0.096	0.0	42.254	0.0	50.000
5.610	510.000	880.675	2.124	0.156	0.0	51.156	-8.902	50.000
5.610	600.000	881.634	0.959	0.047	0.0	61.520	-19.266	50.000
5.610	830.000	884.426	2.793	0.052	0.0	590.320	-548.066	50.000
5.730	320.000	878.767	0.0	0.216	0.0	41.902	0.0	650.000

5.730	510.000	880.854	2.087	0.179	0.0	50.648	-8.746	650.000
5.730	600.000	881.794	0.941	0.161	0.0	54.555	-12.652	650.000
5.730	830.000	884.455	2.661	0.029	0.0	1853.836	-1811.934	650.000
5.820	320.000	878.876	0.0	0.109	0.0	53.258	0.0	460.000
5.820	510.000	880.938	2.062	0.084	0.0	1450.563	-1397.305	460.000
5.820	600.000	881.865	0.927	0.071	0.0	1629.816	-1576.559	460.000
5.820	830.000	884.457	2.592	0.002	0.0	2510.000	-2456.742	460.000
5.920	320.000	878.942	0.0	0.066	0.0	125.129	0.0	520.000
5.920	510.000	880.957	2.015	0.019	0.0	1335.289	-1210.160	520.000
5.920	600.000	881.873	0.916	0.008	0.0	1607.555	-1482.426	520.000
5.920	830.000	884.458	2.585	0.001	0.0	2240.000	-2114.871	520.000
6.000	320.000	879.020	0.0	0.078	0.0	130.047	0.0	440.000
6.000	510.000	880.976	1.956	0.019	0.0	542.379	-412.332	440.000
6.000	600.000	881.881	0.905	0.008	0.0	654.441	-524.395	440.000
6.000	830.000	884.459	2.578	0.001	0.0	974.305	-844.258	440.000

DATA FOR LAST CROSS SECTION

PROFILE	TYPE ENC	TARGET	TOP WIDTH AREA-ACRES	TOP WIDTH AREA-DIFF
1	0.0	0.0	10.762	0.0
2	0.0	0.0	45.876	35.114
3	0.0	0.0	53.415	42.653
4	0.0	0.0	108.042	97.280

1

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HEC2 VERSION UPDATED AUG1976 -MOD. JAN 1977
ERROR CORRECTIONS 01+02+03+04+05+06+07+08+09+10
-MODIFICATIONS 52+53+54+55+56+57+58+59

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-ER
A
-IHC900I EXECUTION TERMINATING DUE TO ERROR COUNT FOR ERROR NUMBER  217
A
-IHC217I FIOCS - END OF DATA SET ON UNIT    5
A
-TRACEBACK  ROUTINE  CALLED FROM ISN   REG. 14   REG. 15   REG.  0   REG.  1
A
-         IBCOM                       00608380  00640F08  00000015  00000000
A
-           MAIN                      0003ED00  01605820  FD000008  00649FF8
A
-ENTRY POINT=  01605820
1
-SUMMARY OF ERRORS FOR THIS JOB   ERROR NUMBER   NUMBER OF ERRORS
A
-                                  217              1
I
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Illinois Department of Transportation

PRELIMINARY WATERWAY INFORMATION TABLE

Route: IL-47
Section:
County: McHenry
Date: 2/1/2010

Existing S.N. 056-0240
Proposed S.N. —
Waterway: Silver Creek
Prepared by: P.M.

Existing Low Grade Elev. = 891.0 at Sta. South of culvert
Proposed Low Grade = at Sta.

Drainage Area = 4.19 sq. mi

Flood	Freq. Yr.	Q Ft^3/s	Opening - ft^2 Existing	Opening - ft^2 Proposed	Natural H.W.E.	Head - ft. Existing	Head - ft. Proposed	Headwater Elevation Existing	Headwater Elevation Proposed
	10	320			874.8	0.25		875.05	
Design	50	510			876.1	2.37		878.47	
Base	100	600			876.8	2.83		879.63	
Overtop Existing	—								
Overtop Proposed	—								
Max. Calc.	500	830			878.2	4.79		882.99	

10 YEAR VELOCITY THROUGH EXISTING BRIDGE = 11.07 ft/s 10 YEAR VELOCITY THROUGH PROPOSED BRIDGE ft/s

ALL – TIME H.W.E. & DATE: 879.52 2/10/1966

Scope of Work:

EXISTING STRUCTURE

TYPE: Culvert, 7'(w) x 9'(h)
LENGTH: 84'
SPANS: 1
~~LOW BEAM~~: invert: 870.6
SKEW: —

PROPOSED STRUCTURE

TYPE:
LENGTH:
SPANS:
LOW BEAM:
SKEW:

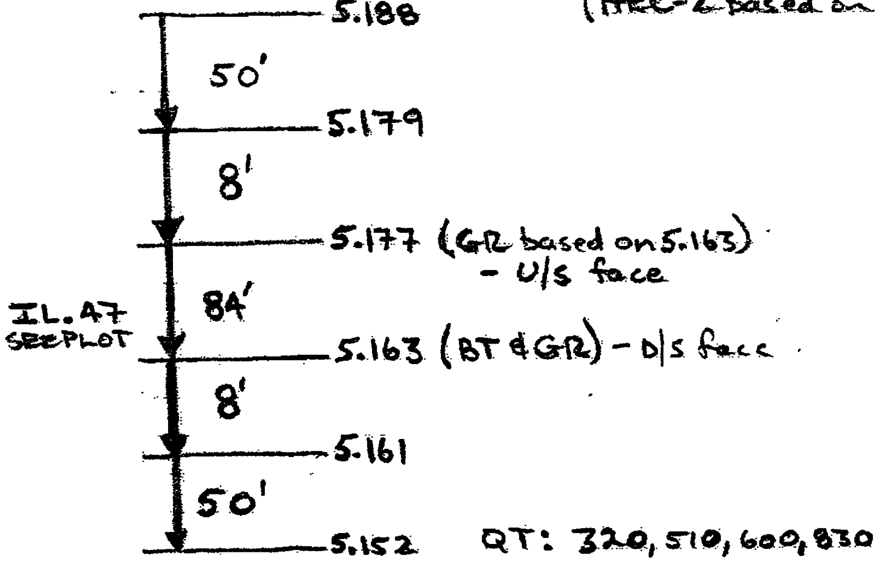
NOTE: PROPOSED STRUCTURE DETAILS ARE PRELIMINARY; SUBJECT TO REFINEMENT IN TSL STAGE.

DATUM TO FIS MODEL (NGVD 29)

Printed 2/1/2010 BBS 2730 (02/27/08)

PRELIMINARY WIT

(BASED ON FIS HEC-2)
(HEC-2 based on NGVD 29)



Recreate FIS model using HEC-RAS.
Based on plot of HEC-2 (FIS) estimate culvert size @ 8'(H) x 7'(W)
with flat invert @ 870.6 station is to be 5.177 so bounding
stations are 5.161 to 5.179, dist = 100'
D/s to U/s station = 8' culv. length = 84'
Use FIS elev. @ 5.152 for start cond.; 876.31, 877.72, 878.30, 879.59

Use upstream station as the approach (5.188)

f	Q	5.188 w/culv.	nat	C.H.	nat @ U/s face	H.W.E
10	320	877.68	877.43	0.25	874.8	875.05
50	510	880.21	877.84	2.37	876.1	878.47
100	600	881.25	878.42	2.83	876.8	879.63
500	830	884.50	879.71	4.79	878.2	882.99

* ten-yr culvert velocity: 11.07 ft/sec
All time high water: 879.52 from gage record & H.A. map
From HEC-RAS PLOT of B.T. data use Low grade in floodplain 891.0

FIS-MODEL
HEC-2

6.0
440
5.92
520
5.82
460
(I) 5.73
650
5.610
50
5.599
3
5.598
54
5.588 - BT (Water Plant)
3
5.587
50
5.578
310
(H) 5.520
205
5.475
50
5.466 - SB (St. John)
90
5.454
50
'G' 5.445
645
5.320
680
5.188
50
5.179
8
5.177
84
5.163 - BT (IL. 47)
8
5.161
50
5.152 Q: 320, 510, 600, 830

376
5.080
50
5.071 - SB (Footbridge)
8
5.069
50
5.060
530
('F') 5.040
50
4.933
40
4.924 - SB (Melody)
40
4.916
50
4.907
710
('E') 4.780
760
4.630
615
('D') 4.512
50
4.503
4
4.501
22
4.499 - BT Footbridge connecting Tappan St / W. Melody to School
4
4.497
50
('C') 4.49
800
4.34: Q: 365, 575, 680, 950
NGVD 29 862.18, 862.74, 862.9, 863.2

NGVD 29 - (0.15/0.18) = NAVD 88

FIS → HEC-2
- X-sect. dist based on channel length
- FIS Sta. interpreted based on channel length, min channel elev. vs FIS profile, aerial photo

9-197
(Nov. 1954)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File No. { Washington 5-5480.4
Field . . . . .

Description Prepared 8-6-64
(Date)
by O. L. Walter

WOODSTOCK 7.5 MINUTE QUAD.

Description of Gaging Station on Silver Creek at Woodstock, Ill.

(Prepare description in accordance with outline on back of Form 9-277. Plot cross section to scale. Use Form 9-213A or 9-213E for cross section. Use second page of this form for sketch if room is available, otherwise use Form 9-213C or 9-213H. Initial and date all sheets.)

Location.—Lat 42°20'06", long 88°26'35", in SE¼NW¼ sec. 32, T. 45 N., R. 7 E., at culvert on State Highway 47, at north edge of Woodstock.

Established.—June 18, 1964.

Drainage area.—

Gage.—Crest-stage gage; 6-ft length of 2-inch galvanized pipe mounted on left downstream wingwall.
Datum of gage, top of bottom cap, is 875.60 ft above mean sea level, datum of 1929.

Reference and bench marks.—R.P. 1 - Head of flush-shell bolt on downstream headwall, 2.5 ft from left end.

Cooperation.—Station is maintained under cooperative agreement with the Northeastern Illinois Metropolitan Area Planning Commission for flood-inundation studies.

9-176
(October 1952)
FLOOD DATA

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

File 05548040

Flood data for Silver Creek at Woodstock, IL
Drainage area .... square miles. Period of record ....
Flood data for momentary peak discharges greater than .... cfs.

WATER YEAR	DATE	GAGE HEIGHT (Feet)	DISCHARGE		ANNUAL FLOODS		PARTIAL DURATION SERIES		REMARKS
			CFS	Ratio to $Q_{2.33}$	Order (M)	Recurrence Interval (Years)	Order (M)	Recurrence Interval (Years)	
1965	02-06	2.80							
1966	02-10	3.92							
1967	06-11	1.49							
1968	08-17	2.45							
1969	06-09	1.00							
1970	07-23	1.25							
1971	02-19	1.25							
1972	07-14	1.81							
1973	04-22	1.63							
1974	05-16	2.21							
1975	---	b							
1976	---	c							
1977									

Graphical mean annual flood ($Q_{2.33}$) .... cfs for period ....

Sheet ...... of ...... Listed by .... Date .... Checked by .... Date ....

U. S. GOVERNMENT PRINTING OFFICE 16—67384-2

FEB-03-2009 12:47 1 217 344 0082 95% P.05

Sam Lahniers

From: Moline, Adam R. [Adam.Moline@strand.com]
Sent: Monday, May 10, 2010 2:04 PM
To: flin@lineng.com
Cc: Gabrisko, Darcie
Subject: IL Route 47 Hydraulic Reports

Hi Fred,

For the Illinois Route 47 project, the hydraulic surveys have been completed. I have uploaded the following files to our FTP site:

1. Survey base map and existing utilities DGN files
2. Geopak file
3. Tin file
4. Hydraulic survey notes and details for both locations
5. HEC2 output for silver creek from IDOT
6. Photos for both locations

The ftp is accessible from ftp://ftp.strand.com

Username: IL47LIN
Password: 91YELLOW

Please let me know if you need any more information or if you have any questions.

Also, could you please send us an anticipated schedule for this work?

Thanks,
Adam

Adam R. Moline
Strand Associates, Inc.
815.744.5867 Ext. 3314
Adam.Moline@strand.com

Illinois Department of Transportation

Division of Highways/Region One / District One
201 West Center Court/Schaumburg, Illinois 60196-1096

Hydraulics Section

Route:	Illinois Route 47
Limits:	Over Silver Creek
County:	McHenry

February 18, 2010

Mr. Al Wilson
Municipal Engineer
City of Woodstock
326 Washington Street
Woodstock, IL 60098

Dear Mr. Wilson:

This is to confirm the telephone conversation on February 2, 2010 between yourself and Perry Masouridis of my staff relative to the drainage study to be prepared as part of the Location Phase for the subject improvement (see attached map). We are requesting any appropriate drainage information for incorporation into the drainage study.

In particular, we request the following:

Storm sewer plans,
Combined sewer atlas,
Utility plans,
Contour mapping,
Proposed and current drainage improvements,
Identification of flooding experience associated with the highway or adjacent properties,
Local ordinance.

If you have any questions or need additional information, please contact Perry Masouridis P.E., Hydraulics and Hydrology Engineer, at (847) 705-4474.

Very truly yours,

Diane M. O'Keefe, P.E.
Deputy Director of Highways,
Region One Engineer

By: Richard F. Wojcik
Richard F. Wojcik, P.E.
Hydraulics Section Chief

Attachment

S:\Gen\WP\Program Development\DC\Other Docs\20090313_IL23OverCoonCreek_PM.doc

Illinois Department of Transportation

Memorandum

To:	James Stumpner	Attn:	Dennis Mahoney Sarah Wilson
From:	Pete Harmet		
Subject:	*Drainage Study		
Date:	February 16, 2010		

* Route: IL 47
Limits: Silver Creek
County: McHenry

We are in the process of collecting information from the various sources that pertain to flooding or erosion at the subject location. (Please refer to the attached location map for study limits.)

We have reviewed the Pavement Flooding Prioritization listing and

☐ the area is identified to have pavement flooding.

☒ the area is not included in the listing.

Please review your records and provide any additional information you may have regarding flooding, drainage complaints and/or erosion and siltation problems for the concerned area.

Because of the major drainage structure (SN:056-~~240~~ 0240) located within the project limits, please also have your Bridge Maintenance Section check their records for any flooding occurrences or drainage related problems such as debris and/or icing at the subject structure.

Your early consideration of this request is greatly appreciated.

By: Richard F. Wojcik
Richard F. Wojcik, P.E.
Hydraulics Section Chief

bcc: Michael Schivarelli

S:\Gen\WP\HYD\H&H\SB\Pavement Flooding IL 83 at Marion Hills Ditch.doc

Phone log: IDOT: Perry MAsouridis 2/2/2010
Woodstock: Al Wilson 815-338-6118
City Engineer

2- crossings

1-north of Cooney Dr.

- Drainage Dist. outfall - possibly 2-24"
just upstream

Greenwood Drainage District.
Leonard Schultz (815) 338-4663
2/2/10 - mailbox full

- possible outlet improvements.

- not in corporate limits

1 @ Silver Creek between St. Johns & Melody

- Debris has been an issue.

-

~~Municipal~~ City! Engineer

Al Wilson

815 338-6118

326 Washington St.

Mr. Donald Good
Highway Commissioner
Greenwood Township
5211 Miller Road
Wonder Lake IL 60097
(815) 648-2307

- left message for Township 2/2/10

EXHIBIT O

CD OF HYDRAULIC ANALYSES (HEC-RAS)

SUPPLEMENT 3.7-3
UNNAMED TRIBUTARY TO SILVER CREEK HYDRAULIC REPORT

Steve Schilke

Illinois Department of Transportation

Memorandum

To:	D. Carl Puzey	Attn:	Neil Vanbebber
From:	Issam Rayyan	By:	Perry Masouridis
Subject:	*Hydraulic Report		
Date:	January 4, 2019		

*Route:	Illinois Route 47 (IL 47)
County:	McHenry
Job No.:	P-91-007-09
Structure No.:	056-0239 (EX), 056-0335 (PR)
Over:	Silver Creek Tributary

Attached for your use are excerpts from the Hydraulic Report for the subject structure as prepared by the consultant, Lin Engineering, Ltd. A PDF copy of the report and the hydraulic models will be uploaded onto the SharePoint site. Attached are paper copies of excerpts from the Hydraulic Report:

1. Waterway Information Table (WIT)
2. Sketch showing existing and proposed waterway openings

The scope of work for this project consists of removal and replacement of the existing structure over Silver Creek Tributary to accommodate the widening of IL 47 and to provide additional hydraulic capacity. As part of these improvements, IL 47 will be widened in this location from a two-lane section to four lanes with a 22-foot median, paved shoulder, and 10-foot shared use path.

The existing structure is a reinforced concrete box culvert, 6 feet wide by 5 feet high. Downstream of the culvert, the creek flows approximately 1,500 feet to a marshy area which falls within the designated floodway of Silver Creek. Upstream of the culvert, a pond drains to a short length of channel before entering the culvert. The upstream drainage area is approximately 4.5 square miles with no defined channel and drains mostly through farm tiles through agricultural land and overflow from the pond.

The proposed improvement includes a 12 feet wide by 7 feet high box culvert with the bottom 1 foot of the culvert to be embedded, and an overflow structure measuring 6 feet wide by 7 feet high with a 2.8-foot weir wall.

The existing structure does not meet freeboard requirements. Under existing conditions, there is -0.74 feet of freeboard, with the roadway overtopping during the ~24-year event. The proposed improvements meet freeboard criteria. The proposed freeboard is 5.52 feet and meets the IDOT freeboard policy.

The Silver Creek Tributary is unmapped, and the upstream end of the culvert and most of the roadway is not within a regulatory floodway or floodplain. On the downstream end, construction of the new IL 47 roadway may encroach upon the flood fringe of Silver Creek but is not within the designated floodway. No compensatory storage to mitigate for fill within a designated floodway is proposed.

This project involves a full culvert replacement in an urban area in Northeastern Illinois with a drainage area over one square mile. There is a sensitive structure located on the pond upstream of IL 47 with a low entry elevation of 861.5. There has been no reported flooding at this location. The 100-year water surface elevation is being lowered in the proposed improvements from 865.0 to 861.4, below the low entry. Since the roadway is being significantly widened and the road profile is raised by more than three inches, SWP #12 does not apply. An IDNR-OWR Individual Permit will be processed by the District through the Bureau of Design during Phase II contract plan preparation and land acquisition.

If you have any questions or need additional information, please contact Michelle Lewis, P.E., Hydraulics and Hydrology Engineer, at (847) 705-4098.

Very truly yours,

Anthony J. Quigley, P.E.
Region One Engineer

By: E. Masouridis
E. Perry Masouridis, P.E.
Hydraulics Section Chief

Attachment

cc: Ken Eng (2 copies)
Steve Schilke (memo only)

HYDRAULIC REPORT

ROUTE:	FAP 326/ ILLINOIS ROUTE 47
WATERWAY:	UNNAMED TRIBUTARY TO SILVER CREEK
COUNTY:	MCHENRY
EX STRUCTURE #:	056-0239
PR STRUCTURE #:	056-0335
PTB/ITEM#:	149-008
JOB NO.:	P-91-007-09

Prepared for:

Illinois Department of Transportation
Division of Highways – District 1
Bureau of Programming
Hydraulic Section

Prepared By:

LIN ENGINEERING, LTD.
Consulting Engineers

3261 S. Meadowbrook Rd., Suite 500
Springfield, IL 62711
Phone: (217) 679-2928
Fax: (217) 679-2736

October 8, 2018

HYDRAULIC REPORT

IL 47 OVER UNNAMED SILVER CREEK TRIBUTARY

JOB NO. P-91-007-09

TABLE OF CONTENTS

HYDRAULIC REPORT

IL 47 OVER UNNAMED SILVER CREEK TRIBUTARY

JOB NO. P-91-007-09

VI. Exhibits (Back-up Calcs.) (continued…)

III. NARRATIVE

HYDRAULIC REPORT
IL 47 OVER SILVER CREEK TRIBUTARY

a. Project Description

The Illinois Department of Transportation is expanding Illinois Route 47 to four lanes through the city of Woodstock in McHenry County. As a result, a 6' wide by 5' high reinforced concrete box culvert carrying IL-47 over an Unnamed Silver Creek Tributary, north of Woodstock IL, is subject to replacement. This report analyzes the natural, existing, and proposed hydraulic conditions for the Illinois Route 47 culvert at the Unnamed Silver Creek Tributary. **Exhibit A** shows the project location on Hydrologic Investigations Map HA-256.

The culvert is located approximately 75 feet south of the Cooney Road and IL-47 intersection in Woodstock Illinois. The structure number of the existing culvert is 056-0239. Maintenance of the culvert is the responsibility of the Illinois Department of Transportation (IDOT).

The culvert was originally constructed in 1932; however existing culvert plans are unavailable at this time. The downstream concrete headwall has leeching and surface spalls showing evidence of age and deterioration.

The Unnamed Silver Creek Tributary, within the study area, flows in a western direction to a marshy swampland located approximately 1.5 miles northwest of Woodstock. Silver Creek eventually flows north to Nippersink Creek which drains to Wonder Lake in Greenwood Illinois.

At Illinois Route 47, the Silver Creek Tributary drains approximately 4.51 square miles of urbanized and rural areas. The Unnamed Silver Creek Tributary drains into the floodway of Silver Creek, which is located approximately 1,500 feet downstream (west) of IL Route 47. Silver Creek Tributary is approximately 30' to 50' wide from top of bank to top of bank at the project crossing. There is not a regulatory floodway within the study limits. See **Exhibit C** for Flood Insurance Rate Map

Structure Description

The existing box culvert is 6' wide by 5' high with an overall length of ±47.5' from face to face of headwall. The upstream and downstream faces are straight headwalls without wingwalls that measure 21.3' and 26.9' respectively.

IL Route 47 above the culvert is approximately 39.6' wide consisting of two 12' lanes; a 6.6' paved/aggregate/grass left shoulder, and an 8.8' paved/aggregate/grass right shoulder. The skew of the culvert is 0° with a negative 0.46% vertical grade going upstation along IL-47 (N. Seminary Rd.). IL-47 over the box culvert is on a normal crown with 2% cross-slope. The east edge of pavement located 50' north of the culvert was used as the existing low edge of pavement elevation location with an elevation of 863.84.

b. Historical Observations / Records

Strand and Associates conducted the field inspection of the culvert and study area in November of 2009. The photographs of the study area indicate that there wasn't any flow between the upstream pond and box culvert. Also, the water in the streambed appeared stagnant. The photographs of the culvert and surrounding area are included in **Exhibit B**. At this time, there aren't any records of flood waters overtopping IL Route 47.

Stream Survey
American Surveying and Engineering completed a stream survey for the Silver Creek Tributary culvert in December of 2009. Survey elevations are correlated with North American Vertical Datum (NAVD) 88. Field survey notes are included in **Exhibit L**.

Background Data
The following documents were utilized in developing this report:

Flood Insurance Rate Map, McHenry County, Illinois and Incorporated Areas, Map No. 17111C0177J, Panel 177 of 365; November 16, 2006.

FEMA Flood Profile for Silver Creek; from the Flood Insurance Rate Study for McHenry County, IL and Incorporated Areas.

William Saylor, CFM of the Institute of Natural Resource Sustainability was consulted regarding the existence of past FIS models on the Silver Creek Tributary. Existing FIS or regulatory studies do not exist for this location.

USGS Stream Gage
There are no records of stream gaging stations either past or present.

c. <u>Datum Correlation</u>

American Surveying and Engineering completed the hydraulic survey for this project in December of 2009. The elevations are based on the NAVD 88 vertical datum. The hydraulic report analysis including the HEC-RAS models, Waterway Information Tables, and all exhibits were prepared using the NAVD 88. The FEMA flood profile for Silver Creek, which was used as the starting tailwater in the HEC-RAS models, also used NAVD 88.

d. <u>Sensitive Flood Receptors</u>

There is one sensitive flood receptor that has been identified within the study limits. The sensitive flood receptor is a house located to the northeast of the culvert at 12507 Cooney Drive. The house has a surveyed low entry elevation of 861.5. The existing 100-year water surface elevation computed in HEC-RAS is 864.6, which is above the low entry (first floor) elevation.

The Flood Insurance Rate Map, shown in **Exhibit C,** show the floodplain boundary of the special flood hazard area (area subject to inundation by the 1% chance or 100-year flood) on the downstream or west side of IL-47. The computed 100-year flood elevations for the natural and existing profiles were plotted on the Cross Section Plan in **Exhibit F.** The sensitive flood receptor and first floor elevation is also identified on the Cross Section Plan in **Exhibit F**.

e. Hydrologic Methodology

Without the presence of a regulatory model, the peak discharge values were calculated independently. The Clark Unit Hydrograph Method was used for calculating the 10-yr, 50-yr, 100-yr, and 500-yr peak discharges. These discharge values were computed with the HEC-HMS 3.5 Hydrologic Modeling System. Each sub-basin within the basin model utilized the SCS Curve Number Method in computing precipitation loss, and the Clark Unit Hydrograph Method computing precipitation runoff.

The rainfall data used in the HEC-HMS model is based on Figure 21 (Frequency Distribution of 24-hour maximum rainfall (inches) six-county adjusted) of ISWS Bulletin 70; which are 24-hour rainfall isohyetal maps for the Chicago area that account for the "Chicago Effect". Table 18 of ISWS Bulletin 70 was used to extrapolate the 1-hour, 2-hour, 3-hour, 6-hour, 12-hour, and 48-hour rainfall amounts. All of the storm durations were computed for each frequency, with the highest discharge between all durations considered as the peak discharge. See sheet 26 of 30 in **Exhibit C** for a summary of the computed peak discharges.

Since the 500-year 24-hour rainfall amount is not graphically depicted in Figure 21, it was interpolated by graphing the rainfall amounts for all frequencies between 1 and 100 years, and adding a logarithmic trend-line and equation to the scatter plot (**See Exhibit C,** sheet 23 of 30). The 500-year 24-hour rainfall was calculated using the equation of the trend-line. The 500-year rainfall amounts for all other storm durations were calculated using the ratios from Table 18 of ISWS Bulletin 70.

The Huff Distributions (Circular 173, Table 3, pg. 14, Huff) were used as precipitation gages in the HEC-HMS model. The gages combined with rainfall amounts for all storm durations were the basis for the meteorological models used to compute peak discharge hydrographs.

Aerial imagery, a 7.5 minute series quad map of Woodstock, field checks, and USGS Illinois Streamstats were used to obtain land-use/surface characteristics, drainage boundaries, channel slopes and lengths. **Exhibit C** (sheet 1 of 30) shows the Location Drainage Map with six sub-basins and an overall drainage boundary of 4.51 square miles. This drainage map and sub-basin configuration, shown on sheet 1 of 30, was used in computing the peak discharge values to the culvert.

Exhibit C (sheets 27 through 29 of 30) shows the Illinois Streamstats drainage boundary exhibit and peak discharge calculations. The drainage boundary shown in Streamstats was edited to match the drainage boundary interpreted and delineated by IDOT Hydraulic Section and Consultant Engineers. Initially, the Illinois Streamstats program estimated a tributary area of 6.5 square miles to the study culvert; however, it was determined through a field visit along McHenry Ave./Greenwood Rd./Route 120 that a two square mile area south of McHenry Ave., west of Fleming Rd., and north of Country Club Road was not tributary to the culvert because the southeastern area never crosses McHenry Avenue.

A comparison of the Streamstats discharges (with the edited drainage area) and HEC-HMS discharges is listed in **Exhibit C** sheet 30 of 30. The computed flow rates were similar between the two methods with Streamstats being more conservative for the 10 and 50 year floods and the Clark Unit Hydrograph being more conservative with the 100 and 500 year floods. For the purposes of this study, the HEC-HMS peak discharge values computed with six (6) sub-basins was used in the analysis.

Also shown on the sheet 30 flow comparison table is the initial HEC-HMS Clark Unit Hydrograph analysis computed by IDOT ("In-House Model") considering only one sub-basin flowing to the culvert. The values computed by the one sub-basin model were extremely conservative; almost double the values of the other two methods. The peak discharge values computed by the one sub-basin model are shown for comparison purposes only and not used in the hydraulic analysis.

The Location Drainage Map, HEC-HMS input calculations, and a summary of the HEC-HMS output can be found in **Exhibit C**. All electronic HEC-HMS files are included on the CD in **Exhibit N**.

f. Hydraulic Methodology

All hydraulic analyses were performed using HEC-RAS version 4.1.0 Hydraulic Modeling Software. The source of starting water surface elevations in the HEC-RAS analysis is 'known water surface elevations' based on the FEMA Flood Profiles for Silver Creek (See **Exhibit C** sheet 3 of 30). Normal depth was also used as a boundary condition, and the computed flood profiles were compared to the profiles that utilized known water surface elevations. The results were very similar; however, the profiles using the Silver Creek flood elevations were slightly higher than the normal depth profiles; therefore, the FEMA flood profile elevations for Silver Creek were used as the starting water surface elevation for all HEC-RAS models.

The streambed slope used for normal depth was an average localized slope based on the ditch flow line data from the hydraulic survey (See **Exhibit D** for a streambed profile exhibit and slope calculation using linear regression analysis).

Cross sections were all based on surveyed data and the numbering convention begins with 0.0 at 1000' downstream of the culvert. On sections where the computed water surface elevations exceeded the surveyed ground elevations, the sections were extended using the 2' McHenry County contour data or the 7.5 minute series quad map of Woodstock, and horizontal measuring was done in Microstation. Cross section locations used in the HEC-RAS models are shown on the Cross Section Location Plan in **Exhibit F**.

Most hydraulic crossings have a well-defined stream on the upstream and downstream side of the crossing. This site is unique in that there is a small pond immediately upstream of the culvert that receives flow from a large floodplain/agricultural land, and two 24" sewer pipes. The 24" sewer pipes most likely drain the residential properties within the tributary area. There isn't a defined stream with a channel upstream of the culvert; therefore, the hydraulic surveyed sections terminate in the space between the upstream face of the culvert and the pond. The pond has a pipe culvert that drains flood water to the culvert and the pond overflows into the culvert during major storm events.

The analysis of the roughness coefficients followed the procedures outlined in the IDOT Drainage Manual; Chapter 5 on Open Channel Flow.

The photographs of the Silver Creek Tributary and floodplain taken in December of 2009 were referenced for general channel and floodplain descriptions (See **Exhibit B**). Additional visual resources used in the analysis included aerial photography (Sid files) and hydraulic survey notes (See **Exhibit L**).

Overall, there is one channel and three floodplain conditions within the area of the study. These items are as follows:

Channel 1 – Silver Creek tributary through entire study area. Conditions include relatively free flowing channel with brush/tall grass and small tree growth along the banks.

$n = (n_b + n_1 + n_2 + n_3 + n_4)m$

n_b = Base Value = firm soil material (range 0.025 to 0.032) use **0.029**

n_1 = Degree of channel irregularity – Minor; compares to carefully dredged channels in good condition with slightly eroded slopes (range 0.001 to 0.005) use **0.002**

n_2 = Variation in channel cross section – Gradual; Size and shape of channel cross-sections change gradually. Use **0.000**

n_3 = Effect of obstruction - Negligible; A few scattered obstructions, which include debris deposits, stumps, exposed roots, logs, piers, or isolated boulders, that occupy less than 5 percent of the cross-sectional area (range 0.000 to 0.004) use **0.002**

n_4 = Amount of vegetation = Medium; moderately dense vegetation growing along the banks and no significant vegetation along the channel bottoms where R exceeds 2’ (range 0.010 – 0.025) use **0.017**

m = Degree of meandering = Minor; Ratio of the channel length to valley is 1.0 to 1.2, calculated value – (1072/1052) = 1.02. Use **m = 1.00**

Channel Roughness Coefficient

$n = (n_b + n_1 + n_2 + n_3 + n_4)m$

$n = (0.029 + 0.002 + 0.000 + 0.002 + 0.017)1.00 = 0.05$

Floodplain 1 – Floodplain adjacent to the banks includes tall grass and brush mixed with saplings.

$n_{fp} = (n_b + n_1 + n_2 + n_3 + n_4)m$

n_b = Base Value = firm soil material (range 0.025 to 0.032) use **0.029**

n_1 = Degree of floodplain irregularity – Minor; floodplain slightly irregular in shape with a few rises and dips or sloughs visible. Urban floodplain is relatively flat except for ditches, paved surfaces and other elements of urban topography (range 0.001 to 0.005) use **0.003**

n_2 = Not applicable = use **0.000**

n_3 = Effect of obstruction – Minor; Obstructions occupy less than 15 percent of the cross-sectional area. Obstructions caused by boulders, stumps, or logs (range 0.005 to 0.019) use **0.010**

n_4 = Amount of vegetation = Medium; Turf grass growing where the average depth of flow is from one to two times the height of the vegetation, mixed with some brush and sparsely spaced trees. (range 0.011 to 0.025) use **0.018**

m = Degree of meandering = Not Applicable, use **1.00**

Floodplain Roughness Coefficient

$n_{fp} = (n_b + n_1 + n_2 + n_3 + n_4)m$

$n_{fb} = (0.029 + 0.003 + 0.000 + 0.010 + 0.018)1.00 = 0.060$

Floodplain 2 – Agricultural fields are located from 100' to 500' downstream of the culvert to the north and south of the Silver Creek tributary.

$n_{fp} = (n_b + n_1 + n_2 + n_3 + n_4)m$

n_b = Base Value = firm soil material (range 0.025 to 0.032) use **0.029**

n_1 = Degree of floodplain irregularity – Minor; floodplain slightly irregular in shape with a few rises and dips or sloughs visible. Urban floodplain is relatively flat except for ditches, paved surfaces and other elements of urban topography (range 0.001 to 0.005) use **0.002**

n_2 = Not applicable = use **0.000**

n_3 = Effect of obstruction – Negligible; A few scattered obstructions caused by crop residue which occupies less than five percent of the cross-sectional area (range 0.000 to 0.004) use **0.002**

n_4 = Amount of vegetation - Large; Turf grass growing where the average depth of flow is from one to two times the height of the vegetation, mixed with some brush and sparsely spaced trees. (range 0.025 to 0.050) use **0.040**

m = Degree of meandering = Not Applicable, use **1.00**

Floodplain Roughness Coefficient

$n = (n_b + n_1 + n_2 + n_3 + n_4)m$

$n_{fb} = (0.029 + 0.002 + 0.000 + 0.002 + 0.040)1.00 = 0.073$

Floodplain 3 – Wooded areas are located beyond the north and south overbanks of the Silver Creek tributary at 1000' downstream of the culvert.

$n_{fp} = (n_b + n_1 + n_2 + n_3 + n_4)m$

n_b = Base Value = firm soil material (range 0.025 to 0.032) use **0.029**

n_1 = Degree of floodplain irregularity – Minor; floodplain slightly irregular in shape with a few rises and dips or sloughs visible. Urban floodplain is relatively flat except for ditches, paved surfaces and other elements of urban topography (range 0.001 to 0.005) use **0.004**

n_2 = Not applicable = use **0.000**

n_3 = Effect of obstruction – Minor; Obstructions occupy less than 15 percent of the cross-sectional area. Obstructions caused by debris, logs, stumps, and isolated boulders (range 0.005 to 0.019) use **0.017**

n_4 = Amount of vegetation – Very Large; Heavy stand of timber with few down trees and little undergrowth with depth of flow below branches. (range 0.050 to 0.100) use **0.050**

m = Degree of meandering = Not Applicable, use **1.00**

Floodplain Roughness Coefficient

$n = (n_b + n_1 + n_2 + n_3 + n_4)m$

$n_{fb} = (0.029 + 0.004 + 0.000 + 0.017 + 0.050)1.00 = 0.100$

The following is a list of HEC-RAS plans under the natural and existing conditions:

Plan: Existing – Known WSE; Short ID: Existing FIS – Existing model with all geometry based on surveyed data. Boundary conditions are known water surface elevations based on the FEMA flood profiles of Silver Creek, which include the 10, 50, 100, and 500 year water surface elevations. Peak runoff obtained from Clark Unit Hydrograph Method (HEC-HMS).

Plan: Natural – Known WSE; Short ID: Natural – Natural model with all geometry based on surveyed data. Boundary conditions are known water surface elevations based on the FEMA flood profiles of Silver Creek, which include the 10, 50, 100, and 500 year water surface elevations. Peak runoff obtained from Clark Unit Hydrograph Method (HEC-HMS). The deck/roadway, culvert and embankment were removed from the geometric model.

See **Exhibit N** for electronic copies of all hydraulic models.

g. Summary of Natural and Existing Hydraulic Analyses

Existing Conditions

The existing geometric data was based on surveyed data only as there was not an old FIS model data to incorporate in the analysis. Starting water surface elevations were based on the FEMA flood profiles for Silver Creek, and the peak discharge values came from the HEC-HMS analysis using the Clark Unit Hydrograph method. The known water surface elevations at the downstream reach of the Silver Creek Tributary are as follows:

10-year – 857.2
50-year – 858.7

100-year – 859.0
500-year – 860.0
See page 3 of 30 in **Exhibit C** for the Silver Creek Flood Profiles.

Contraction and expansion coefficients for all cross sections that had flow within the influence of the culvert were 0.3 and 0.5, respectively. Ineffective area offsets for each cross-section were computed by using a 1:1 contraction rate upstream and 2:1 expansion rate downstream of IL-47. The existing model was run as a steady flow analysis with a subcritical flow regime. See input data in **Exhibit I** for the calculation worksheet used to compute the ineffective area offsets.

In the summary of errors and warnings, HEC-RAS recommended using more cross-sections because of the difference in conveyance ratio between consecutive surveyed sections. A test model was created to observe the effect of adding several interpolated cross sections between all of the surveyed sections in the model. For each frequency, the flood profiles did not change with the added cross-sections; therefore, additional interpolated sections downstream of the culvert were not incorporated into the analysis.

With the IL-47 culvert and embankment in place, the effect of the culvert on the natural condition is measured by comparing the water surface elevations at the approach section (station 1072) with the corresponding water surface elevations (station 1072) under the natural condition. The difference between these elevations is the existing created head. The existing created head plus the natural high water elevation at the face of the proposed culvert yields the existing headwater elevation at the culvert.

The existing model had flow overtopping the deck before the 50-year storm (flows in excess of 366 cfs overtopped the road). See the Existing Overtopping Frequency Calculation that follows the narrative and accompanies the WIT back-up calculations.

Consequently, the created head and freeboard requirements were not met under the existing conditions (See Waterway Information Table and supporting calculations). Since the structure is a culvert, low beam clearance requirements do not apply.

Natural Conditions

The natural condition differs from the existing condition in that the IL-47 culvert and corresponding embankment is removed from the existing model in order to measure the culvert's effect on the water surface, velocity and created head. The first step in analyzing the natural model was to calculate the natural high water elevation at the upstream face of the proposed IL-47 culvert. The proposed upstream culvert face is at station 1087.5, which is beyond the furthest surveyed upstream section at station 1072.0. In order to calculate the NHWE at the proposed upstream culvert face, the slopes of the flood profiles between stations 1072.0 and 971.8 were linearly projected upstream. This linear slope projection allows for the computation of the natural water surface elevations at the proposed upstream face (sta. 1087.5) and the furthest upstream section in the proposed model (station 1101.0).

The Back-up Calculation for WIT – Table 1.2 summarizes the NHWE calculation used in the hydraulic analysis. Also, the created head calculations are shown in Table 1.3.

h. <u>Description of Proposed Structure</u>

The proposed replacement culvert consists of a multi-celled reinforced concrete box culvert. The first cell, which handles the main channel flow, is 12' wide by 7' high. The second cell, which handles the overflow, is 6' wide by 7' high with a weir wall at the upstream end. The weir wall elevation of the overflow cell is set at 856.5, which is 0.2' above the surveyed "normal" water surface elevation of 856.3. The culvert will be approximately 114.0' long with zero skew to the centerline of IL-47 (See **Exhibit G** for Proposed Culvert Plan).

The proposed culvert shall have cast-in-place headwalls/retaining walls at the upstream and downstream faces. The centerline of the proposed main channel cell will be located at exactly the same station as the existing centerline. The overflow cell is adjacent to the main channel cell with a centerline at approximately 10' south

The downstream face of the proposed culvert will be located approximately 2' away from the surveyed section 971.8. This will require some proposed grading to take place at the downstream opening to accommodate the 12' wide box. See the Proposed Conditions Analysis in **Exhibit G** for a comparison of the existing section at 971.8 and the proposed re-graded section at the same location.

The proposed culvert will be placed with upstream and downstream inverts at 853.7 and 853.1, respectively. Approximately one foot of natural streambed material will fill the culvert and match into the upstream and downstream flowline elevations of 854.7 and 854.1, respectively. With the downstream flowline at 854.1, the rip rap outlet protection and proposed channel will need to be graded to about 20 to 25 feet downstream with a channel slope of approximately -0.7% to match into the existing channel. The details of the outlet protection will be determined in phase II.

Alternative Structure
A three-sided pre-cast concrete culvert placed on concrete footings has been considered as a viable option for this location. A three-sided alternative could consist of a single structure with a rise of four to six feet and a span between twelve and sixteen feet, depending on the manufacturer selected. The three-sided culvert would be approximately 114.0' in length, and it would have the same centerline as the standard precast concrete box culvert. In general, most three-sided culverts can be used with minimal cover, and are designed to handle vehicular loads. The appropriate size of the three-sided culvert would have to exceed the existing opening area and match the opening area of the selected alternative, given that the existing model overtopped before the 50-year storm. If the three-sided culvert is selected for the proposed design, it will be necessary to perform a scour analysis to evaluate the vulnerability of the crossing to scour.

Standard precast box culverts or precast three sided culverts tend to be more efficient in labor and construction costs relative to cast-in-place alternatives. The quality of concrete is typically better in precast structures, and they are easier to construct, allowing for more flexibility with regards to staging and scheduling.

The three-sided alternative will require additional design costs with regards to the footings. There are wetland areas on the downstream side of the existing culvert that may be less than ideal for a three-sided culvert with footings. Settlement and displacement could result from placing footings within saturated soil.

i. Proposed Hydraulic Analysis

One model was created for the proposed hydraulic analysis. The proposed geometric data was based on surveyed data. Since the proposed culvert was about 2.5 times longer than the existing, the existing upstream cross-section of 1072 would be theoretically buried under the fill of the roadway deck. The existing downstream section of 971.8 will be about 2' downstream of the new culvert face. As mentioned in the natural conditions analysis, a proposed cross section at station 1101 will replace station 1072 as the upstream section. Both sections have similar geometry, especially on the overbanks; however, the channel and side slopes of section 1101 will be based on the proposed grading plan. The new upstream and downstream cross-sections for the proposed culvert are 1101 and 978.1, respectively.

Like the existing model, starting water surface elevations were based on the FEMA flood profiles for Silver Creek, and the peak discharge values came from the HEC-HMS analysis using the Clark Unit Hydrograph method.

Contraction and expansion coefficients for all cross sections that had flow within the influence of the culvert were 0.3 and 0.5, respectively. Ineffective area offsets for each cross-section were computed by using a 1:1 contraction rate upstream and 2:1 expansion rate downstream of IL-47. The proposed model was run as a steady flow analysis with a subcritical flow regime.

Proposed created head values were computed by comparing the proposed water surface elevations at Sta. 1101 to the linearly projected natural water surface elevations at Sta. 1101, and taking the difference. The created head values were added to the natural water surface elevations to calculate the proposed created head values.

The results of the proposed HEC-RAS analysis show that the proposed 100-year flood elevation of 861.4 was below the first floor elevation (861.5) of the sensitive flood receptor. Also, the 500-year flood did not overtop IL-47 as it was 2.3' below the existing 500-year flood elevation. Neither of these criteria could have been met with a single cell 12'W x 7'H box culvert.

The freeboard requirement of 3' between the design (50-yr) headwater elevation and the low edge of pavement was met (5.52' of freeboard), and the 500-yr headwater elevation was 2.9 feet below the low edge of pavement (See Waterway Information Table and supporting calculations). Since the structure is a culvert, low beam clearance requirements do not apply.

The following is a description of the HEC-RAS plan under the proposed condition:

Plan: Proposed – Known WSE; Short ID: Proposed – Proposed model with all geometry based on surveyed data. Boundary conditions are known water surface elevations based on the FEMA flood profiles of Silver Creek, which include the 10, 50, 100, and 500 year water surface elevations. Peak runoff obtained from Clark Unit Hydrograph Method (HEC-HMS).

j. Compensatory Storage

Construction of the new IL-47 roadway may encroach upon the floodplain or flood fringe of the regulatory floodway of Silver Creek. The construction of IL-47 and replacement culvert will not require the placement of fill material in the regulatory floodway of Silver Creek. Per IDNR-OWR, providing compensatory storage for fill within the flood fringe of a regulatory floodway is not mandatory; therefore, compensatory storage will not be provided for the work that is done at this location.

k. IDNR-OWR Permit Requirements

The project involves a full culvert replacement in an urban area in northeastern Illinois with a drainage area of greater than one square mile. Some fill may be placed within the flood fringe of the regulatory floodway of Silver Creek. Since the roadway is widening significantly, and the road profile is changing by more than 3" cumulative inches; SWP #12 does not apply.

It is recommended that contact with IDNR-OWR is initiated to pursue an Individual Floodway Permit. The results of the proposed model indicate that the proposed opening is much larger than the existing opening and there shouldn't be any flood damages up to the 100-year flood. See the permit summary form attached in Exhibit K

l. Freeboard / Clearance

Since both existing and proposed structures are culverts, the design criterion for low beam clearance does not apply.

The existing freeboard of 3' between the low edge of pavement and 50-year existing headwater elevation was not met as the hydraulic analysis shows overtopping at about the 24-year storm.

The proposed freeboard was provided with 5.52' between the 50-year proposed headwater elevation and the low edge of pavement. It should be noted that the proposed low edge of pavement occurs at the vertical sag of proposed IL-47 station 327+60. The low edge of pavement (located on the upstream / east side of the pavement) is on the high side of the super-elevated section, which explains why the low EOP elevation of 865.7 is greater than the profile grade line elevation of 864.93.

m. Conclusion and Design Recommendations

It is recommended that the Silver Creek Tributary crossing at IL-47 be designed as shown in the proposed conditions analysis. It is anticipated that the Silver Creek Tributary will continue to act as floodplain storage for Silver Creek, and the larger culvert will provide increased conveyance, protection from flood damages, and lower flow velocities under IL-47. The larger culvert will also effectively accommodate peak runoff from future developments, assuming that the peak discharge values are detained to the current peak estimates. The additional lanes of IL-47 along with the pedestrian multi-use path should help relieve congestion and meet demands of future commercial and residential development.

IV. WATERWAY INFORMATION TABLE

Illinois Department of Transportation

Culvert Waterway Information Table
Table 1.1

Route: IL ROUTE 47
Waterway: SILVER CREEK TRIBUTARY
Section:
County: MCHENRY

Existing SN: 056-0239
Proposed SN: 056-0335
Prepared by: SGL Date: 11/11/2014
Checked by: FML Date: 11/11/2014

Drainage Area = 4.51 square miles
Existing Overtopping Elev. = 863.84 at Sta. 327+95
Proposed Overtopping Elev. = 865.70 at Sta. 327+60

Flood Event	Freq. Yr.	Discharge ft^3/s	Waterway Opening - ft^2		Natural H.W.E. - ft	Head - ft		Headwater Elevation – ft	
			Existing	Proposed		Existing	Proposed	Existing	Proposed
	10	201	18	51	858.1	2.5	0.0	860.6	857.7
Design	50	478	25	72	859.3	5.3	0.9	864.6	860.2
Base	100	686	29	84	860.0	5.0	1.4	865.0	861.4
Scour Design Check									
Overtop Existing	24	366							
Overtop Proposed									
Max. Calc.	500	925	29	94	860.5	4.6	2.3	865.1	862.8

Datum: NAVD88

All-Time H.W.E. & Date: N/A
Surveyed Normal Water Level: 856.3 ft

10-Year Velocity through Existing Structure = 10.26 ft/s
10-Year Velocity through Proposed Structure = 4.19 ft/s
2-Yr. Flow Rate = 40 ft^3/s

EXISTING STRUCTURE

Culvert Type: Reinforced Concrete Box Culvert
Cell Dimensions (WxH): 6' x 5'
Spans/Cells: 1
Length: 47.5'
Skew: 0 (relative to road)
Clearance:
Bridge Flow Line: (u/s) (d/s)
Low E.O.P: 863.84
Freeboard: -0.74'
Culvert Inverts: 855.0 (u/s) 855.0 (d/s)

EXISTING EMBEDMENT

Depth:
U/S Streambed Elev.:
D/S Streambed Elev.:

PROPOSED STRUCTURE

Culvert Type: Reinforced Concrete Box Culvert
Cell Dimensions (WxH): 12'W x 7'H; 6'W x 7'H w/ 2.8' weir wall @ inlet
Spans/Cells: 2 cells – 12'W x 7'H (main), 6'W x 7'H (overflow)
Length: 114.0'
Skew: 0 (relative to road)
Culvert Invert Elev.: 853.7(u/s) 853.1(d/s)
Low E.O.P: 865.70
Freeboard: 5.52'

PROPOSED EMBEDMENT

Depth: 1
U/S Streambed Elev.: 854.7
D/S Streambed Elev.: 854.1

NOTE: Proposed Structure Details Are Preliminary; Subject To Refinement In TSL Stage.

BACK-UP CALCULATIONS FOR WIT - Table 1.2

Route: IL Route 47
Waterway: Silver Creek Tributary

Computed: SGL   Date: 11/11/2014
Checked: FML   Date: 11/11/2014
Revised: SGL   Date: 5/4/2018

CALCUALTE CREATED HEAD

Frequency	Natural H.W.E. (ft)			Exist. Headwater Elev. (ft)		Prop. Headwater Elev. (ft)		Created Head (ft) @ Approach Section	
	Approach Sect. (21' U/S) 1072	Depart Sect. (32' D/S) 971.8	U/S Face of Structure 1087.5	U/S Face of Structure	Approach Sect. (21' U/S) 1072	U/S Face of Structure	Approach Sect. (13.5' U/S) 1101	Existing	Proposed
10-Year	858.04	857.56	858.11	860.64	860.57	858.14	858.20	2.53	0.02
50-Year	859.22	858.85	859.28	864.58	864.52	860.18	860.23	5.30	0.90
100-Year	859.85	859.19	859.95	864.90	864.80	861.32	861.41	4.95	1.37
500-Year	860.48	860.08	860.54	865.13	865.07	862.84	862.90	4.59	2.30

Natural H.W.E. is taken at the Proposed Upstream Culvert Face
PR Upstream Face Cross-Section Sta. 1087.5

The profile slope between Sta. 1072 and Sta 971.8 is linearly projected upstream to the PR U/S Face Sta. 1087.5 for the NHWE values.

Exist. opening areas measured in Microstation, Natural H.W.E. for each profile
Prop. opening areas calc'd by (NAT - Culv FL) x PR Width

CALCULATE FREEBOARD AND CLEARANCE

Low Edge of Pavement Elevation (ft)			
Existing	**Station**	**Proposed**	**Station**
863.84	327+70	865.70	327+60
Existing Freeboard (ft)			
10-Year	**50-Year**	**100-Year**	**500-Year**
3.20	-0.74	-1.06	-1.29
Proposed Freeboard (ft)			
10-Year	**50-Year**	**100-Year**	**500-Year**
7.56	5.52	4.38	2.86

2 ft. clearance policy does not apply to culvert and three-sided precast concrete structures per 1-305 IDOT D.M.

CALCULATE EFFECTIVE WATERWAY OPENING AREA FOR CULVERT

Existing Culvert Size - 6'W x 5'H			
Proposed Culvert Size - 12'W x 6'H & 6'W x 7'H; 1' Embed			
Existing Width	**Existing Height**	**Proposed Width**	**Proposed Height**
6'	5'	12' + 6' = 18'	7'
Culvert Flowline Elevation (ft)			
Existing		**Proposed**	
U/S	**D/S**	**U/S**	**D/S**
855.02	855.53	854.7	854.1
Waterway Opening Area (ft^2)			
Frequency	**Existing**	**Proposed**	
10-Year	17.75	50.66	
50-Year	24.77	71.59	
100-Year	28.79	83.74	
500-Year	29.21	94.35	

CREATED HEAD CALCULATIONS - Table 1.3

S.N. 056-0239

Route: IL Route 47
Waterway: Unnamed Trib to Silver Creek

Computed: SGL — Date: 11/11/2014
Checked: FML — Date: 11/11/2014
Revised: SGL — Date: 5/4/2018

10-Year Frequency

River Sta.	Natural WSE	Existing WSE	Proposed WSE	Existing Created Head	Proposed Created Head
1072.0	858.04	860.57	N/A	2.53	N/A
1101.0	858.18	N/A	858.2	N/A	0.02

50-Year Frequency

River Sta.	Natural WSE	Existing WSE	Proposed WSE	Existing Created Head	Proposed Created Head
1072.0	859.22	864.52	N/A	5.3	N/A
1101.0	859.33	N/A	860.23	N/A	0.90

100-Year Frequency

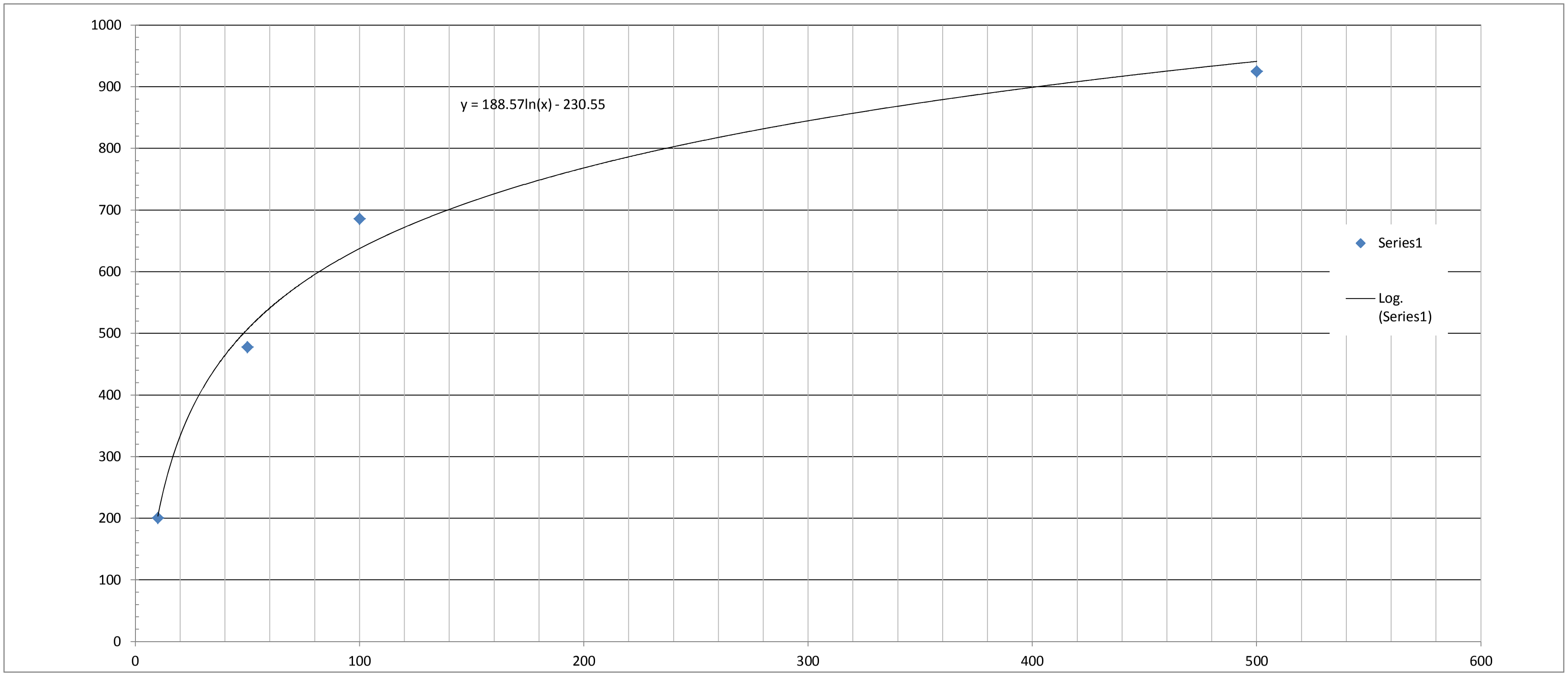
River Sta.	Natural WSE	Existing WSE	Proposed WSE	Existing Created Head	Proposed Created Head
1072.0	859.85	864.80	N/A	4.95	N/A
1101.0	860.04	N/A	861.41	N/A	1.37

500-Year Frequency

River Sta.	Natural WSE	Existing WSE	Proposed WSE	Existing Created Head	Proposed Created Head
1072.0	860.48	865.07	N/A	4.59	N/A
1101.0	860.60	N/A	862.9	N/A	2.30

EXISTING OVERTOPPING FREQUENCY CALCULATION

x	y
10	201
50	478
100	686
500	925



OVTE 366 CFS

366 = 188.57LN(X)-230.55
x = 24

OVTE= 50yr Q - 50yr WEIRQ

V. HYDRAULIC REPORT DATA SHEETS

Illinois Department of Transportation

Hydraulic Report Data Sheets

Route	F.A.P. 326 (IL 47)	P or D #	P-91-007-09
Section		PTB #	149-008
County	MCHENRY		
Exist SN	056-0239		
Prop SN	056-0335		

General Information

1. Stream name: SILVER CREEK TRIBUTARY

2. Structure location: SE ¼ of the NW ¼ of Section 29, Township 45N, Range 7E of the 3RD P.M.

3. Hydraulic Report Prepared By: ☒ Consultant Lin Engineering, Ltd. ☐ Prime ☒ Sub
   ☐ District

4. Hydraulic Report Approval Authority: ☒ District – Post PDF of HR to BBS Hydraulics SharePoint Server
   ☐ BBS Hydraulics - Submit 2 hard copies of HR to BBS Hydraulics

Site Design Data

5. Drainage Area (sq. mi.): 4.51

6. Highway Classification: ☐ Rural ☒ Urban ☐ Other
   ☒ Principal Arterial ☐ Minor Arterial ☐ Collector ☐ Local

7. Design Frequency: ☐ 30 yr ☒ 50 Yr. ☐ Other

8. Number of Waterway Information Tables (WIT): 1
   If more than one, explain:

Hydrologic & Hydraulic Analysis

9. Hydrology Modeling (check all that apply): ☐ USGS/Stream Stats ☐ FIS ☐ Gage Data
   ☒ Other Clark Unit Hydrograph Method (HEC-HMS)

10. Hydraulic Modeling (check all that apply):
    a. Method: ☒ HEC-RAS ☐ WSPRO ☐ Other
    b. Manning's "n" values determined per IDOT Drainage Manual Chap. 5? ☒ Yes ☐ No
    If no, explain:
    c. Source of Starting WSE: Known Water Surface Elevations – FEMA flood profiles for Silver Creek
    d. Non- IDOT encroachments in Survey? ☒ Yes ☐ No
    If yes, are they accounted for? ☒ Yes ☐ No
    e. Does a Tailwater Control exist? ☐ Yes ☒ No
    If yes, list:
    f. Were the Expansion/Contraction cones properly addressed? ☒ Yes ☐ No ☐ N/A
    If No or N/A, explain:

g. What Expansion and Contraction Rates were used? Expansion: 2 (X:1)
Contraction 1 (X:1)

IDNR – OWR Floodway Permit

11. Is area experiencing urbanization or expected to urbanize within 10 years? ☒ Yes ☐ No (Rural)

12. Are there any sensitive flood receptors located upstream within possible backwater influence? ☒ Yes ☐ No
If yes, list and describe critical upstream flood damageable properties and their elevations.
House located at 12507 Cooney Drive with a first floor / low entry elevation of 861.5

13. Is there any History of Flooding or Overtopping problems? ☐ Yes ☒ No
Sources & dates of Observed Highwater:
IDOT, FEMA, City of Woodstock

14. Is the structure hydraulically connected to or within the floodway of an IDNR-OWR designated Public Body of Water? ☒ No ☐ Yes. OWR 3704 Rules apply.

15. Required IDNR - OWR Permit type:
☒ Individual 3700 ☐ SWP #2 ☐ SWP #12 ☐ Floodway 3708
☐ None ☐ Other ______

Proposed Structure Data

16. Project Scope (check all that apply):
a. ☒ Complete Replacement
b. ☐ Superstructure Replacement
c: ☐ Superstructure Widening; Length of Pier Extension in the water:
U/S ______ D/S ______
d. ☐ Bridge ☒Culvert ☐ Three-sided Bridge
e. ☐ New Alignment
f. Work Planned Below Q_{100} HWE? ☒ Yes ☐ No
g. ☒ Profile Raise

17. If a bridge is proposed, supply:
Flow line elevation (ft): ______ Abutment type: ______
Preliminary low beam elevation (ft): ______ Skew (degrees): ______
Width of deck (ft): ______ Number of spans: ______
Total length from face to face of abutment (ft) ______

18. If a culvert is proposed, supply:
Type and size: 12’x7’, 6’x7’ Box Length (ft): 114.0’
Upstream invert elevation (ft): 853.7 Entrance type: Standard
Downstream invert elevation (ft): 853.1 Skew (degrees): 0
Note: Upstream and downstream elevations should reflect the elevations before the standard 3” drop (or other embedment) is applied

19. If a three-sided structure is proposed, supply:
U/S Flow line elevation (ft): ______ Skew (degrees): ______
Span (ft): ______ Length (ft): ______
Height (ft): ______ Number of spans: ______

20. a. Is the IDOT Clearance Policy met? ☐ Yes ☐ No ☒ NA Value (ft): ______
b. Is the IDOT Freeboard Policy met? ☒ Yes ☐ No ☐ NA Value (ft): 5.52

21. Type of streambed soil : ☒ Clay ☒ Silt ☒ Sand ☐ Loam ☐ ______

22. Scour/ Migration Problems: ☒ None/Minimal ☐ Significant ☐ Severe
Comments:

Ice Concerns: ☒ None/Minimal ☐ Significant ☐ Severe
Comments:

Debris Concerns: ☒ None/Minimal ☐ Significant ☐ Severe
Comments:

Proposed or Identified Countermeasures:

Existing Structure Data

		Structure U/S	Subject Structure	Structure D/S
23.	Distance from proposed (subject) structure: (ft.)		N/A	N/A
24.	Type of structure:	2-24” CMPs	6’x5’ RC Box	
25.	Low beam elevation:	N/A	N/A	
26.	Flow line elevation:	855.57	855	
27.	Maximum known high water elevation:	N/A	N/A	
28.	Date of maximum high water:	N/A	N/A	
29.	Cause (backwater, headwater, etc.):	N/A	N/A	
30.	Does structure carry entire design flood flow?	☒ Yes ☐ No	☒ Yes ☐ No	☐ Yes ☐ No
	If not, state area of additional waterway opening: (ft^2)			
31.	Type and size of existing overflow structures:	N/A	N/A	
32.	Has adverse scour occurred under or adjacent to the structure?	No	No	
33.	Classify type of scour and/or aggradation / degradation:	N/A	N/A	

Required Additional Data

34. Deviations from the General Procedures presented in IDOT Drainage Manual CH. 2, CH.6, and CH.7:

35. Information regarding high water from other streams, reservoirs, flood control projects, proposed channel changes, or other controls affecting proposed waterway area:

Silver Creek FEMA profiles from Cross Section J is the controlling tailwater used in the hydraulic analysis.

36. Site Inspection made by: Sam Lahniers Date: July, 2010

Remarks:

37. Prepared by: Sam Lahniers Date 11/14/2014

Signed (QA/QC): Date 10/08/2018

Hydraulic Report Checklist

The District or Consultant should complete the following checklist before submitting the Hydraulic Report for approval.

1. ☒ Title Page
2. ☒ Table of Contents
3. ☒ Narrative - (as outlined in Section 2-601.01 Item #3)
4. ☒ Waterway Information Table (WIT) - (as outlined in Section 2-601.01 Item #4)
5. ☒ Hydraulic Report Data Sheets
6. ☒ Location Map - should show the subject structure along with nearby location defining landmarks (cities, roads, highways, nearby structures over same stream, etc.)
7. ☒ USGS Hydrologic Atlas (historical data available on selected streams- District 1 only)
8. ☒ Photographs - (Minimum: U/S & D/S structure faces, U/S & D/S channel, U/S & D/S roadway across structure)
9. ☒ Hydrology (map, calculations and related exhibits)
10. ☒ Streambed Profile
11. ☒ Roadway Profile (existing and proposed)
12. ☒ Cross Section Plots - with plan layout preferably overlayed upon an aerial photo with the contours
13. ☒ Bridge Opening Plots
14. ☒ Natural Condition Analysis
15. ☒ Existing Condition Analysis
16. ☒ Proposed Condition Analysis

    When HEC-RAS modeling is being used, ALL Plans (Natural, Existing, & Proposed) shall be included in ONE Project File.

17. ☐ Scour Analysis – Existing and Proposed Conditions
18. ☐ Compensatory Storage Calculations (if required- District 1 only. Include permit summary form and related attachments.)
19. ☒ Survey Notes (if available, CADD plot of survey points. No Electronic Point Files)
20. ☒ EWSE Data - (per Section 2-402.06)
21. ☒ Correspondence Notes
22. ☒ CD with Project Files (Include pdf copy of the Hydraulic Report and working files for the hydrology and hydraulic analyses.)

VI. EXHIBITS

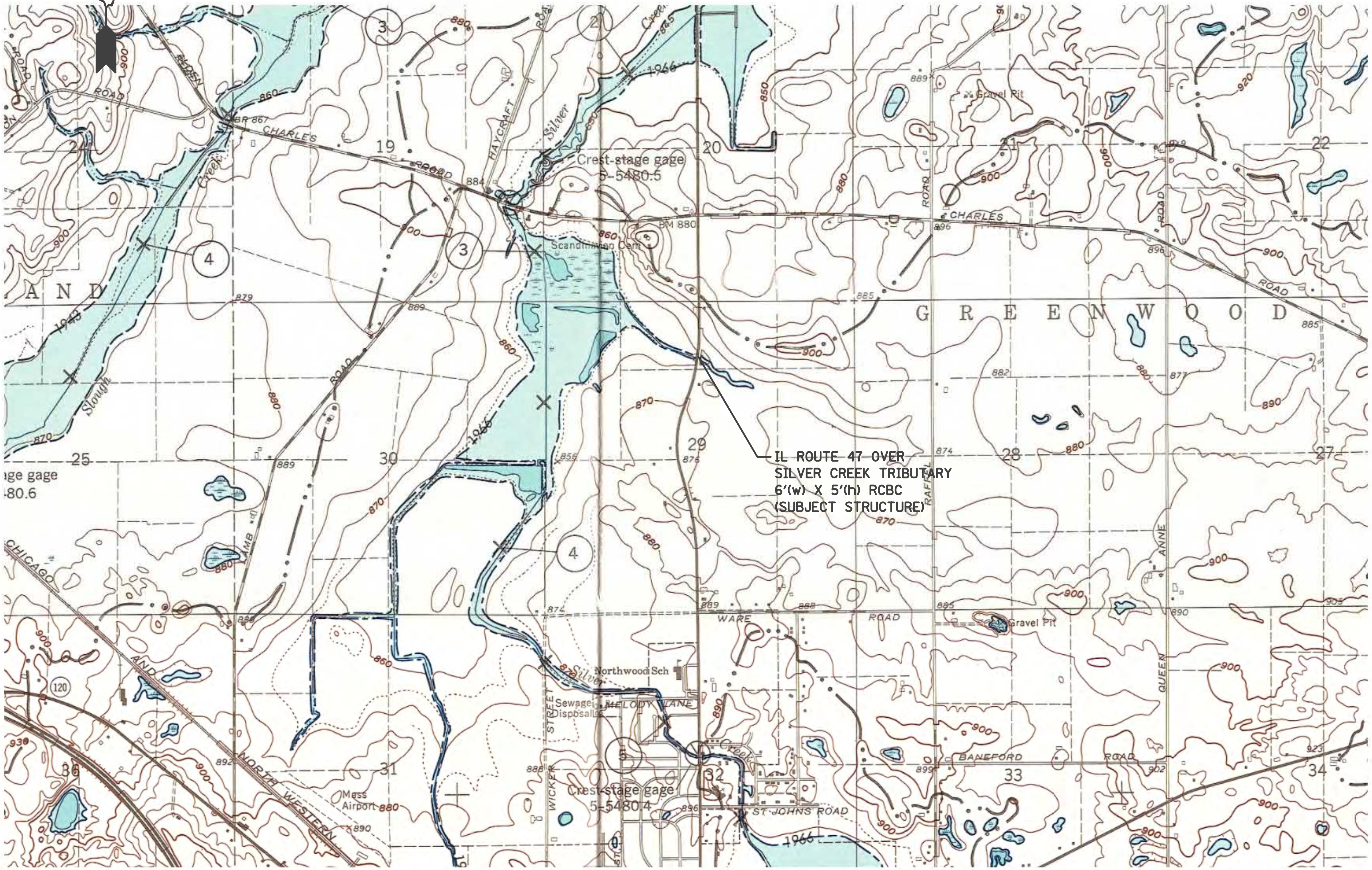
EXHIBIT A

PROJECT LOCATION ON HYDROLOGIC ATLAS MAP

IL ROUTE 47 OVER SILVER CREEK
MCHENRY COUNTY, ILLINOIS

SE $\frac{1}{4}$, NW $\frac{1}{4}$, SECTION 29, TOWNSHIP 45N, RANGE 7E OF 3RD P.M.

N



The Woodstock quadrangle location is shown in figure 1.

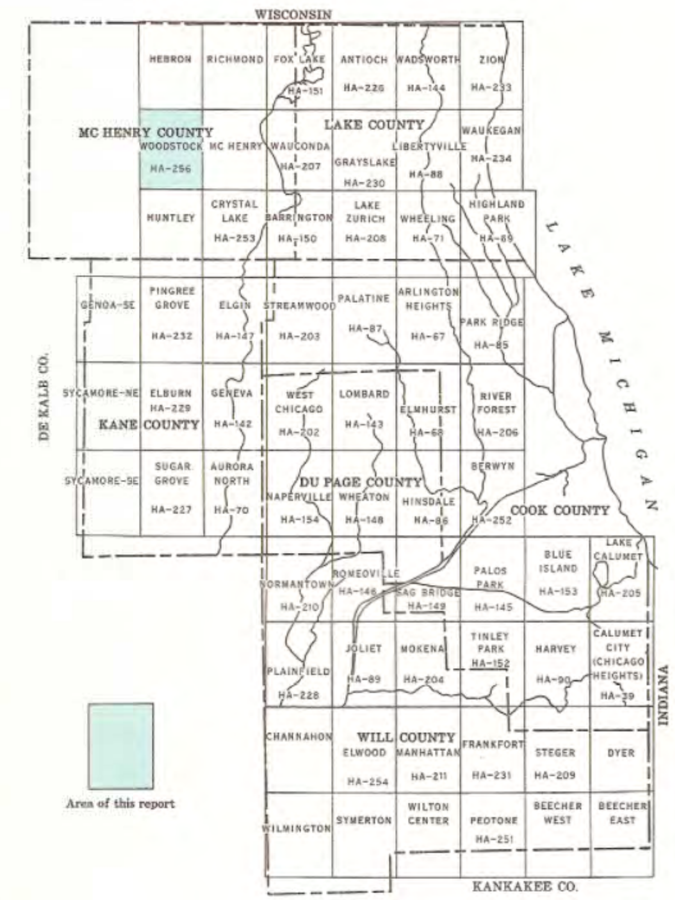


FIGURE 1.—*Index map of northeastern Illinois showing location of quadrangles included in flood-hazard mapping program.*

GAGE STATION:

NEITHER GAGE DATA NOR AN FIS MODEL ARE AVAILABLE AT THIS CROSSING.

SCALE 1:24 000

1 ½ 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

LIN ENGINEERING, LTD.
Consulting Engineers

PROJECT LOCATION MAP
ON HYDROLOGIC INVESTIGATIONS MAP HA–256

EXHIBIT B

PHOTOGRAPHS OF CULVERT AND HYDRAULIC STUDY LIMITS

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 1 – Standing at northwest side of pond looking south at 2-24” CMPs

Photo 2 – General view of pond located upstream (east) of 6’ x 5’ RCBC

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

<u>Photo 3 – Upstream face of 6' x 5' RCBC looking west</u>

<u>Photo 4 – Standing at upstream face of culvert looking upstream (east) toward pond</u>

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 5 – Standing at upstream face of culvert looking south

Photo 6 – Standing at upstream face of culvert looking north

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 7 – Standing above culvert on IL-47 looking north

Photo 8 – Standing above culvert on IL-47 looking south

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 9 – Standing above culvert on IL-47 looking upstream (east)

Photo 10 – Standing above culvert on IL-47 looking downstream (west)

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 11 – Standing at downstream face of culvert looking downstream (west)

Photo 12 – Standing south of the downstream face of culvert looking north

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 13 – Standing at downstream face of culvert looking south

Photo 14 – Downstream face of 6’ x 5’ Culvert looking upstream (east)

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 15 – Standing at downstream face of culvert looking downstream (west)

Photo 16 – 300' downstream section looking upstream (east)

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 17 – 300’ downstream section looking downstream (west)

Photo 18 – 300’ downstream section looking north

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 19 – 300' downstream section looking south

Photo 20 – 500' downstream section looking upstream (east)

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 21 – 500' downstream section looking downstream (west)

Photo 22 – 500' downstream section looking south

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 23 – 500' downstream section looking north

Photo 24 – 1000' downstream section looking upstream (east)

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 25 – 1000' downstream section looking downstream (west)

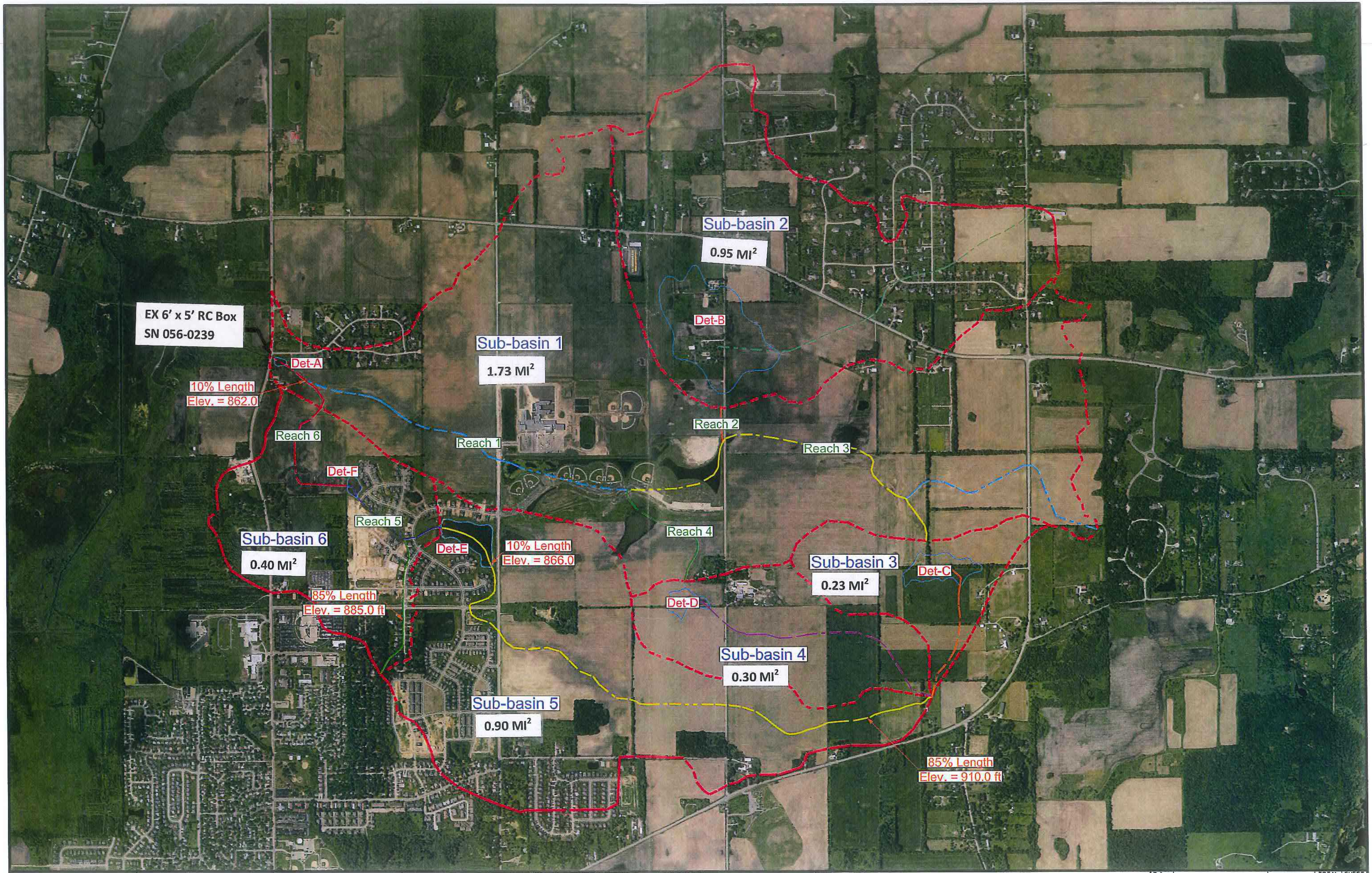
Photo 26 – 1000' downstream section looking south

EXHIBIT B
PHOTOGRAPHS TAKEN DECEMBER 7, 2009
IL 47 (N. SEMINARY AVE.) OVER SILVER CREEK TRIBUTARY

Photo 27 – 1000' downstream section looking north

EXHIBIT C

HYDROLOGY



IDOT DI Hydraulics Feb. 2014
Total Drainage Area = 4.51 mi^2

FILE NAME = S:\WP\HYD\consultant\FR\IL 47 @ Tributary to Silver Creek\FR HMS Model\IL 47 at tributary to silver creek.dgn	USER NAME = riosfj	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	LOCATION DRAINAGE MAP ILLINOIS ROUTE 47 OVER TRIBUTARY TO SILVER CREEK
		DRAWN -	REVISED -		SCALE: 1"=1,550' *
	PLOT SCALE = 1500.0000 '/ in.	CHECKED -	REVISED -		SHEET 1 OF 1 SHEETS
Default	PLOT DATE = 2/10/2014	DATE -	REVISED -		STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY	1	1
		CONTRACT NO.		
	ILLINOIS	FED. AID PROJECT		

* ON 11"X17" PAPER

MAP SCALE 1" = 500'

250 0 500 1000 FEET

0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

NFIP

PANEL 0177J

FIRM
FLOOD INSURANCE RATE MAP

McHENRY COUNTY, ILLINOIS
AND INCORPORATED AREAS

PANEL 177 OF 365

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MCHENRY COUNTY	170732	0177	J
WOODSTOCK, CITY OF	170488	0177	J

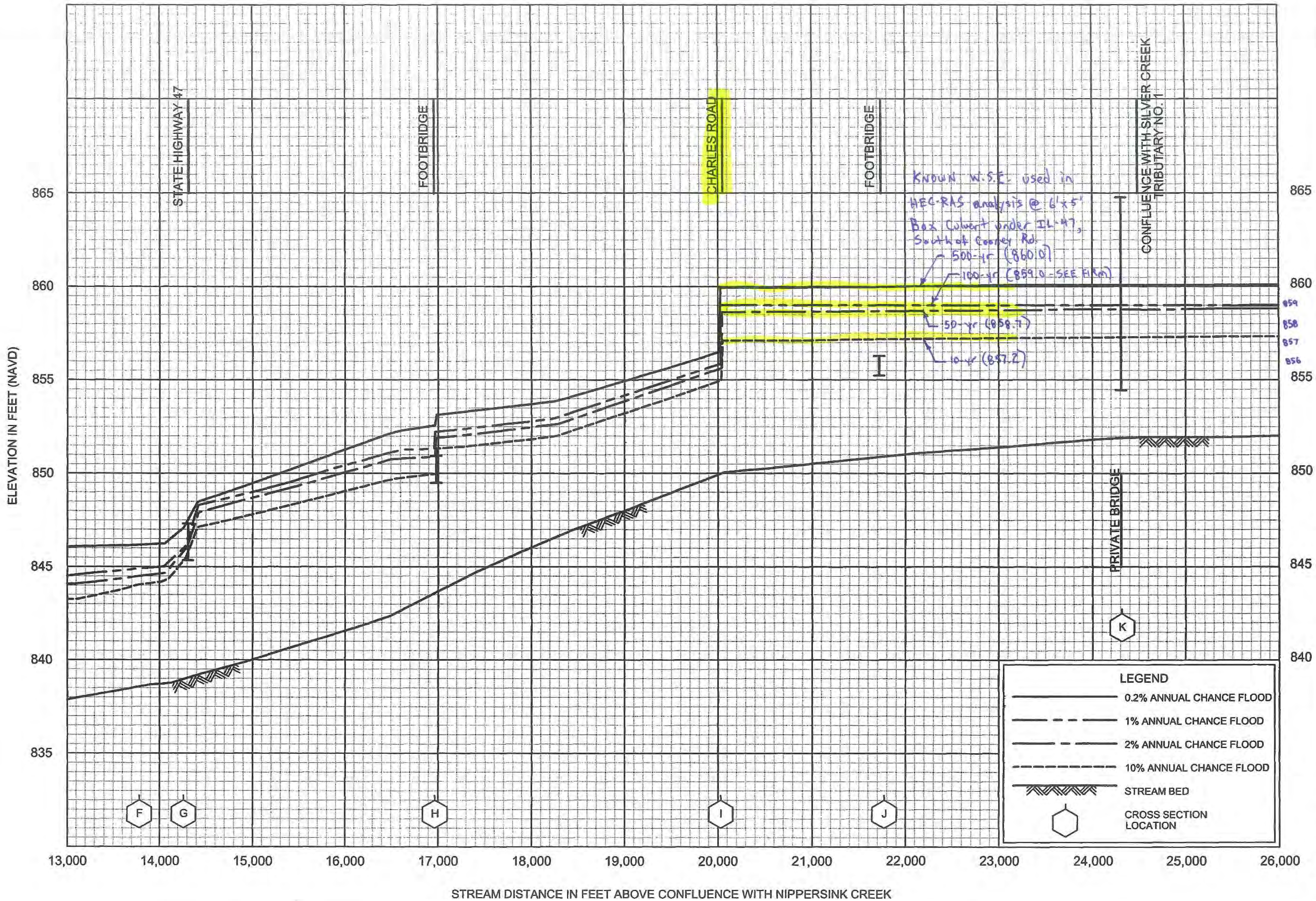
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
17111C0177J

EFFECTIVE DATE
NOVEMBER 16, 2006

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov



FLOOD PROFILES

SILVER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

MCHENRY COUNTY, IL

AND INCORPORATED AREAS

71P

Table 4 - Summary of Discharges (Continued)

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Percent-Annual-Chance	2-Percent-Annual-Chance	1-Percent-Annual-Chance	0.2-Percent-Annual-Chance
Railroad Creek					
At Main Street	0.65	160	250	290	*
Silver Creek					
Approximately 1.5 miles downstream of State Highway 47	34.10	1,801	2,642	3,054	4,586
Just downstream of Charles Road	13.30	849	1,289	1,512	2,371
At Wicker Street	5.38	365	575	680	950
At State Highway 47	4.19	340	540	635	880
Approximately 1,060 feet downstream of State Highway 120	3.53	320	510	600	830
At Private Drive approximately 300 feet upstream of the confluence of Silver Creek Tributary No. 1	2.80	224	340	400	628
At Private Drive approximately 300 feet upstream of the confluence of Silver Creek Tributary No. 1	2.80	224	340	400	628
Approximately 1.0 mile upstream of the confluence of Silver Creek Tributary No. 2	1.00	92	139	163	256
Silver Creek Tributary No. 1					
At the confluence with Silver Creek	1.30	118	179	210	330
Silver Creek Tributary No. 2					
At the confluence with Silver Creek	5.10	370	561	659	1,035
Slough Creek					
Approximately 0.3 miles upstream of State Highway 47	16.80	196	273	312	650
Approximately 200 feet upstream of Rose Farm Road	7.60	99	138	158	329
Approximately 0.5 miles upstream of Rose Farm Road	5.00	87	125	145	315
South Branch Kishwaukee River					
At Seeman Road	52.71	3,350	5,670	6,670	10,190

* Data not computed

Runoff Curve Number

Project	IL Route 47 & Cooney Rd.	By	FR (IDOT)	Date	2/24/2014
Location	Detention Basin A (Subbasin No. 1)	Checked	SGL (LIN)	Date	9/16/2014

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area Acres	Product of CN x area
B	Farmsteads - buildings, lanes, driveways, and surrounding lots.	74			137	10138.00
B	Small grain - Straight Row (SR)	75			980	73500.00
				Totals	1117	83638.00

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{83638.00}{1117.000} = 74.9$;

Use CN 75

<u>Watershed Characteristics & Clark Unit Hydrograph Parameters</u>

L =	16550	ft.
=	3.1	mi.
10% Elev.=	864	ft.
85% Elev.=	905	ft.

$$S = \frac{(85\%\ \text{Elev.} - 10\%\ \text{Elev.})}{0.75(L)}$$

S=	0.0033	ft/ft
=	17.44	ft/mi

TC= $1.54 * L^{0.875} * S^{-0.181}$ (9) L in miles, S in ft/mi

= 2.49 hr

R= $16.4 * L^{0.342} * S^{-0.790}$ (10)

= 2.53 hr

<u>Initial Abstraction</u>

CN = 75

Ia = 0.667 Table 4-1; Section II, v - SCS TR-55

<u>Drainage Area</u>

1117 Acres

1.7453 Sq. Mi.

Equation (9) and (10) are from <u>Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois</u> By Straub, Melching, and Kocher (2000)

Detention Basin A - Subbasin 1 - Stage vs. Storage Table

Elevation - Storage Table			
Elevation	Stage ft	Area Acres	Storage Ac-ft
846	0	0.25	0.00
847	1	0.27	0.26
848	2	0.29	0.54
849	3	0.32	0.85
850	4	0.34	1.18
851	5	0.37	1.53
852	6	0.39	1.91
853	7	0.42	2.32
854	8	0.45	2.75
855	9	0.48	3.22
856	10	0.51	3.71
857	11	0.54	4.24
858	12	0.66	4.84
859	13	0.80	5.57
860	14	0.97	6.45
861	15	1.59	7.73
862	16	2.22	9.64
863	17	2.84	12.17
864	18	3.47	15.32
865	19	4.09	19.10

$$V1,2 = \frac{(A1+A2)}{2} * d$$

Runoff Curve Number

Project IL Route 47 & Cooney Rd.	By FR (IDOT)	Date 2/24/2014
Location Detention Basin B (Subbasin No. 2)	Checked SGL (LIN)	Date 9/16/2014

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area Acres	Product of CN x area
B	Residential district (1 acre avg. lot size)	68			315	21420.00
B	Small grain - Straight Row (SR)	75			294	22050.00
				Totals	609	43470.00

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{43470.00}{609.000} = 71.4$;

Use CN 71

Watershed Characteristics & Clark Unit Hydrograph Parameters

L =	6391	ft.
=	1.2	mi.
10% Elev.=	877	ft.
85% Elev.=	915	ft.

$$S = \frac{(85\%\ \text{Elev.} - 10\%\ \text{Elev.})}{0.75(L)}$$

S=	0.0079	ft/ft
=	41.86	ft/mi

TC= $1.54 * L^{0.875} * S^{-0.181}$ (9) L in miles, S in ft/mi
= 0.93 hr

R= $16.4 * L^{0.342} * S^{-0.790}$ (10)
= 0.92 hr

Initial Abstraction

CN = 71
Ia = 0.817 Table 4-1; Section II, v - SCS TR-55

Drainage Area

609 Acres
0.952 Sq. Mi.

Equation (9) and (10) are from Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois By Straub, Melching, and Kocher (2000)

Detention Basin B - Subbasin 2 - Stage vs. Storage Table

Elevation - Storage Table			
Elevation	**Stage ft**	**Area Acres**	**Storage Ac-ft**
876	0	9.95	0.00
877	1	18.39	14.17
878	2	29.43	38.08
879	3	42.91	74.25
880	4	58.38	124.90
881	5	90.15	199.16
882	6	96.89	292.68
883	7	103.63	392.94
884	8	110.36	499.94
885	9	117.11	613.67

$$V1,2 = \frac{(A1+A2)}{2} * d$$

Runoff Curve Number

Project: IL Route 47 & Cooney Rd.	By: FR (IDOT)	Date: 2/24/2014	
Location: Detention Basin C (Subbasin No. 3)	Checked: SGL (LIN)	Date: 9/16/2014	

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area Acres	Product of CN x area
B	Farmsteads - buildings, lanes, driveways, and surrounding lots.	74			6.0	444.00
B	Small grain - Straight Row (SR)	75			142	10650.00
				Totals 148	11094.00	

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{11094.00}{148.000} = 75.0$;

Use CN 75

Watershed Characteristics & Clark Unit Hydrograph Parameters

L =	2498	ft.
=	0.47	mi.
10% Elev.=	888	ft.
85% Elev.=	921	ft.

$$S=\frac{(85\%\text{ Elev.} - 10\%\text{ Elev.})}{0.75(L)}$$

S=	0.0176	ft/ft
=	93.00	ft/mi

$TC = 1.54*L^{0.875}*S^{-0.181}$ (9) L in miles, S in ft/mi

= 0.35 hr

$R = 16.4*L^{0.342}*S^{-0.790}$ (10)

= 0.35 hr

Initial Abstraction

CN = 75

Ia = 0.667 Table 4-1; Section II, v - SCS TR-55

Drainage Area

148 Acres

0.231 Sq. Mi.

Equation (9) and (10) are from Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois By Straub, Melching, and Kocher (2000)

Detention Basin C - Subbasin 3 - Stage vs. Storage Table

Elevation - Storage Table			
Elevation	**Stage ft**	**Area Acres**	**Storage Ac-ft**
886	0	0.20	0.00
887	1	1.67	0.94
888	2	4.02	3.78
889	3	7.16	9.37
890	4	11.00	18.45
891	5	14.36	31.13
892	6	17.72	47.17
893	7	21.08	66.57
894	8	24.44	89.33
895	9	27.80	115.45

$$V1,2 = \frac{(A1+A2)}{2} * d$$

Runoff Curve Number

Project	IL Route 47 & Cooney Rd.	By	FR (IDOT)	Date	2/24/2014
Location	Detention Basin D (Subbasin No. 4)	Checked	SGL (LIN)	Date	9/16/2014

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/]			Area	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4	Acres	
B	Farmsteads - buildings, lanes, driveways, and surrounding lots.	74			13	962.00
B	Small grain - Straight Row (SR)	75			176	13200.00
				Totals	189	14162.00

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{14162.00}{189.000} = 74.9$;

Use CN 75

Watershed Characteristics & Clark Unit Hydrograph Parameters

L =	4971	ft.
=	0.94	mi.
10% Elev.=	880	ft.
85% Elev.=	911	ft.

$$S = \frac{(85\%\ \text{Elev.} - 10\%\ \text{Elev.})}{0.75(L)}$$

S=	0.0083	ft/ft
=	43.90	ft/mi

$TC = 1.54 * L^{0.875} * S^{-0.181}$ (9) L in miles, S in ft/mi

= 0.74 hr

$R = 16.4 * L^{0.342} * S^{-0.790}$ (10)

= 0.81 hr

Initial Abstraction

CN = 75

Ia = 0.667 Table 4-1; Section II, v - SCS TR-55

Drainage Area

189 Acre

0.295 Sq. Mi.

Equation (9) and (10) are from Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois By Straub, Melching, and Kocher (2000)

Detention Basin D - Subbasin 4 - Stage vs. Storage Table

Elevation - Storage Table			
Elevation	Stage ft	Area Acres	Storage Ac-ft
876	0	0.05	0.00
877	1	0.49	0.27
878	2	1.42	1.22
879	3	2.89	3.37
880	4	4.75	7.19
881	5	7.17	13.15
882	6	9.00	21.24
883	7	10.83	31.15
884	8	12.66	42.90
885	9	14.49	56.47

$$V1,2 = \frac{(A1+A2)}{2} * d$$

Runoff Curve Number

Project IL Route 47 & Cooney Rd.	By FR (IDOT)	Date 2/24/2014
Location Detention Basin E (Subbasin No. 5)	Checked SGL (LIN)	Date 9/16/2014

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area Acres	Product of CN x area
B	Residential districts (1/2 acre)	70			214	14980.00
B	Small grain (SR)	75			298	22350.00
B	Brush	48			64	3072.00
				Totals 576		40402.00

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{40402.00}{576.000} = 70.1$;

Use CN 70

Watershed Characteristics & Clark Unit Hydrograph Parameters

L =	11145	ft.
=	2.11	mi.
10% Elev.=	864	ft.
85% Elev.=	910	ft.

$$S = \frac{(85\%\ \text{Elev.} - 10\%\ \text{Elev.})}{0.75(L)}$$

S=	0.0055	ft/ft
=	29.06	ft/mi

TC= $1.54 * L^{0.875} * S^{-0.181}$ (9) L in miles, S in ft/mi

= 1.61 hr

R= $16.4 * L^{0.342} * S^{-0.790}$ (10)

= 1.48 hr

Initial Abstraction

CN =	70	
Ia =	0.857	Table 4-1; Section II, v - SCS TR-55

Drainage Area

576 Acre

0.900 Sq. Mi.

Equation (9) and (10) are from Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois By Straub, Melching, and Kocher (2000)

Detention Basin E - Subbasin 5 - Storage vs. Discharge Table

Storage - Discharge Table				
Elevation	Storage Ac-ft	Orifice flow (cfs)	Weir flow (cfs)	Discharge (cfs)
865.00	0.00	0.00	0.00	0.00
865.24	2.14	0.00	0.00	0.00
865.48	4.32	0.00	0.00	0.00
865.72	6.54	2.26	0.00	2.26
865.74	6.73	2.36	0.00	2.36
866.00	9.19	3.33	0.00	3.33
866.50	14.06	4.67	0.00	4.67
867.00	19.11	5.70	0.00	5.70
867.50	24.35	6.57	0.00	6.57
868.00	29.78	7.34	0.00	7.34
868.20	32.04	7.62	42.79	50.41
868.50	35.62	8.03	169.14	177.17
869.00	44.93	8.67	478.40	487.07
869.50	58.73	9.27	878.88	888.14
870.00	73.18	9.83	1353.12	1362.95

Orifice Area (sq-ft) = 0.72
Weir Length (ft) = 184.00

Orifice centroid (ft) = 865.48
Weir invert (ft) = 868.00

Runoff Curve Number

Project	IL Route 47 & Cooney Rd.	By	FR (IDOT)	Date	2/24/2014
Location	Detention Basin F (Subbasin No. 6)	Checked	SGL (LIN)	Date	9/16/2014

Present Conditions

1. Runoff curve number

Soil name and hydrologic group (Appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN[1/] Table 2-2	CN[1/] Figure 2-3	CN[1/] Figure 2-4	Area Acres	Product of CN x area
B	Residential districts (1/2 acre)	70			120	8400.00
B	Small grain (SR)	75			54	4050.00
B	Brush	48			82	3936.00
				Totals 256		16386.00

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{16386.00}{256.000} = 64.0$;

Use CN 64

Watershed Characteristics & Clark Unit Hydrograph Parameters

L =	7125	ft.
=	1.3	mi.
10% Elev.=	865	ft.
85% Elev.=	885	ft.

$$S = \frac{(85\%\ \text{Elev.} - 10\%\ \text{Elev.})}{0.75(L)}$$

S=	0.0037	ft/ft
=	19.76	ft/mi

$TC = 1.54 * L^{0.875} * S^{-0.181}$ (9) L in miles, S in ft/mi

= 1.17 hr

$R = 16.4 * L^{0.342} * S^{-0.790}$ (10)

= 1.72 hr

Initial Abstraction

CN = 64
Ia = 1.125 Table 4-1; Section II, v - SCS TR-55

Drainage Area

256 Acres
0.400 Sq. Mi.

Equation (9) and (10) are from Equations for Estimating Clark Unit-Hydrograph Parameters for Small Rural Watersheds in Illinois By Straub, Melching, and Kocher (2000)

Detention Basin F - Subbasin 6 - Stage vs. Storage Table

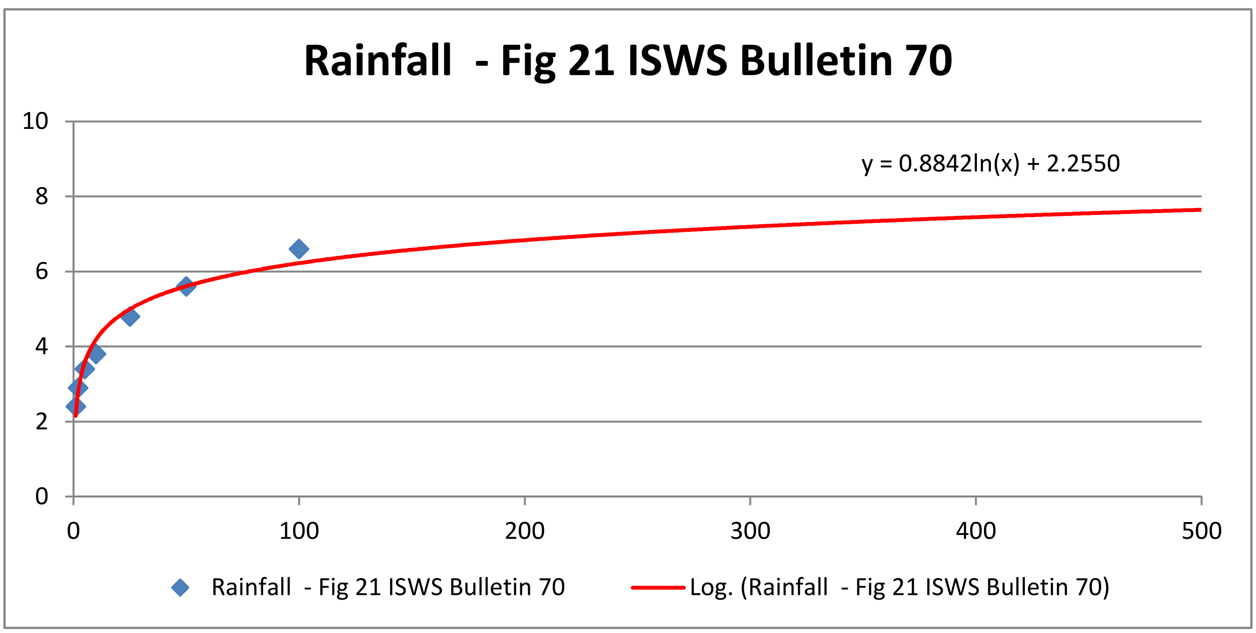
Storage - Discharge Table				
Elevation	Storage Ac-ft	Orifice flow (cfs)	Weir flow (cfs)	Discharge (cfs)
860.00	0.00	0.00	0.00	0.00
860.15	0.20	0.00	0.00	0.00
860.60	0.81	5.16	0.00	5.16
861.05	1.43	12.09	0.00	12.09
861.07	1.46	12.31	0.00	12.31
861.20	1.65	13.64	0.00	13.64
861.50	2.08	16.31	0.00	16.31
862.00	2.81	19.97	0.00	19.97
862.50	3.57	23.06	0.00	23.06
863.00	4.36	25.78	0.00	25.78
863.50	5.16	28.24	0.00	28.24
864.00	5.99	30.51	0.00	30.51
864.20	6.33	31.37	40.00	71.37
864.50	6.85	32.61	158.11	190.72
865.00	6.85	34.59	447.20	481.79
865.50	6.85	36.46	821.56	858.02
866.00	6.85	38.24	1264.87	1303.12
866.50	6.85	39.94	1767.71	1807.66

Orifice Area (sq-ft) = 2.54
Weir Length (ft) = 172

Orifice centroid (ft) = 860.50
Weir invert (ft) = 864.00

Duration (HR)	Duration (Min)	Ratio x-hr/24 hr	10-Year Rainfall Amt (IN) Fig 21, Bulletin 70	50-Year Rainfall Amt (IN) Fig 21, Bulletin 70	100-Year Rainfall Amt (IN) Fig 21, Bulletin 70	500-Year Rainfall Amt (IN) from Log Graph
0.08	5	0.12	0.46	0.67	0.79	0.93
0.17	10	0.21	0.84	1.18	1.39	1.63
0.25	15	0.27	1.03	1.51	1.78	2.09
0.50	30	0.37	1.41	2.07	2.44	2.87
1	60	0.47	1.79	2.63	3.10	3.64
2	120	0.58	2.20	3.25	3.83	4.50
3	180	0.64	2.43	3.58	4.22	4.96
6	360	0.75	2.85	4.20	4.95	5.81
12	720	0.87	3.31	4.87	5.74	6.74
18	1080	0.94	3.57	5.26	6.20	7.29
24	1440	1.00	3.80	5.60	6.60	7.75
48	2880	1.08	4.10	6.05	7.13	8.37

Note: (1) The 10-yr, 50-yr, and 100-yr 24 hour rainfall amounts were obtained from the isohyetal maps shown in Figure 21 of ISWS Bulletin 70.
(2) The 500-year 24 hour rainfall amount was interpolated from a log graph using the 1-yr, 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, and 100-yr rainfall amounts.



Year	Rain (Inches)
1	2.4
2	2.9
5	3.4
10	3.8
25	4.8
50	5.6
100	6.6

500 year rainfall amount = 7.75 in

Huff 1Q - 1H (3m)		Huff 1Q - 2H (6m)		Huff 1Q - 3H (10m)		Huff 1Q - 6H (15m)		Huff 2Q - 12H (30m)	
Time	Precip (IN)	Time	Precip (IN)	Time	Precip (IN)	Time	Precip (IN)	Time	Precip (IN)
0:00	0.00	0:00	0.00	0:00	0.00	0:00	0.00	0:00	0.00
0:03	0.16	0:06	0.16	0:10	0.18	0:15	0.13	0:30	0.02
0:06	0.33	0:12	0.33	0:20	0.35	0:30	0.27	1:00	0.06
0:09	0.43	0:18	0.43	0:30	0.46	0:45	0.38	1:30	0.10
0:12	0.52	0:24	0.52	0:40	0.56	1:00	0.46	2:00	0.13
0:15	0.60	0:30	0.60	0:50	0.63	1:15	0.53	2:30	0.17
0:18	0.66	0:36	0.66	1:00	0.69	1:30	0.60	3:00	0.22
0:21	0.71	0:42	0.71	1:10	0.74	1:45	0.65	3:30	0.28
0:24	0.75	0:48	0.75	1:20	0.79	2:00	0.69	4:00	0.36
0:27	0.79	0:54	0.79	1:30	0.82	2:15	0.73	4:30	0.45
0:30	0.82	1:00	0.82	1:40	0.84	2:30	0.76	5:00	0.55
0:33	0.84	1:06	0.84	1:50	0.86	2:45	0.80	5:30	0.63
0:36	0.86	1:12	0.86	2:00	0.89	3:00	0.82	6:00	0.70
0:39	0.88	1:18	0.88	2:10	0.91	3:15	0.84	6:30	0.75
0:42	0.90	1:24	0.90	2:20	0.93	3:30	0.85	7:00	0.79
0:45	0.92	1:30	0.92	2:30	0.95	3:45	0.87	7:30	0.83
0:48	0.94	1:36	0.94	2:40	0.97	4:00	0.89	8:00	0.86
0:51	0.96	1:42	0.96	2:50	0.98	4:15	0.90	8:30	0.88
0:54	0.97	1:48	0.97	3:00	1.00	4:30	0.92	9:00	0.91
0:57	0.98	1:54	0.98			4:45	0.94	9:30	0.93
1:00	1.00	2:00	1.00			5:00	0.95	10:00	0.94
						5:15	0.96	10:30	0.96
						5:30	0.97	11:00	0.97
						5:45	0.98	11:30	0.98
						6:00	1.00	12:00	1.00

Huff 3Q - 24H (1hr)		Huff 2Q - 12H (30m)		Huff 3Q - 24H (1hr)		Huff 4Q - 48H (2hr)	
Time	Precip (IN)	Time	Precip (IN)	Time	Precip (IN)	Time	Precip (IN)
0:00	0.00	0:00	0.00	0:00	0.00	0:00	0.00
1:00	0.02	0:30	0.02	1:00	0.02	2:00	0.02
2:00	0.05	1:00	0.06	2:00	0.05	4:00	0.04
3:00	0.08	1:30	0.10	3:00	0.08	6:00	0.06
4:00	0.10	2:00	0.13	4:00	0.10	8:00	0.09
5:00	0.12	2:30	0.17	5:00	0.12	10:00	0.10
6:00	0.15	3:00	0.22	6:00	0.15	12:00	0.13
7:00	0.18	3:30	0.28	7:00	0.18	14:00	0.16
8:00	0.22	4:00	0.36	8:00	0.22	16:00	0.18
9:00	0.25	4:30	0.45	9:00	0.25	18:00	0.20
10:00	0.29	5:00	0.55	10:00	0.29	20:00	0.23
11:00	0.33	5:30	0.63	11:00	0.33	22:00	0.26
12:00	0.38	6:00	0.70	12:00	0.38	0:00	0.28
13:00	0.44	6:30	0.75	13:00	0.44	2:00	0.31
14:00	0.53	7:00	0.79	14:00	0.53	4:00	0.34
15:00	0.64	7:30	0.83	15:00	0.64	6:00	0.37
16:00	0.73	8:00	0.86	16:00	0.73	8:00	0.41
17:00	0.80	8:30	0.88	17:00	0.80	10:00	0.46
18:00	0.85	9:00	0.91	18:00	0.85	12:00	0.51
19:00	0.88	9:30	0.93	19:00	0.88	14:00	0.58
20:00	0.91	10:00	0.94	20:00	0.91	16:00	0.68
21:00	0.94	10:30	0.96	21:00	0.94	18:00	0.78
22:00	0.96	11:00	0.97	22:00	0.96	20:00	0.87
23:00	0.98	11:30	0.98	23:00	0.98	22:00	0.93
0:00	1.00	12:00	1.00	0:00	1.00	0:00	1.00

	Met Name:	Description:	Total Depth (IN)
1	**010Y 01H 1Q**	Huff 10 Year 1 Hour 1st Quartile	1.79
2	**010Y 02H 1Q**	Huff 10 Year 2 Hour 1st Quartile	2.20
3	**010Y 03H 1Q**	Huff 10 Year 3 Hour 1st Quartile	2.43
4	**010Y 06H 1Q**	Huff 10 Year 6 Hour 1st Quartile	2.85
5	**010Y 12H 2Q**	Huff 10 Year 12 Hour 2nd Quartile	3.31
6	**010Y 24H 3Q**	Huff 10 Year 24 Hour 3rd Quartile	3.80
7	**010Y 48H 4Q**	Huff 10 Year 48 Hour 4th Quartile	4.10
8	**050Y 01H 1Q**	Huff 50 Year 1 Hour 1st Quartile	2.63
9	**050Y 02H 1Q**	Huff 50 Year 2 Hour 1st Quartile	3.25
10	**050Y 03H 1Q**	Huff 50 Year 3 Hour 1st Quartile	3.58
11	**050Y 06H 1Q**	Huff 50 Year 6 Hour 1st Quartile	4.20
12	**050Y 12H 2Q**	Huff 50 Year 12 Hour 2nd Quartile	4.87
13	**050Y 24H 3Q**	Huff 50 Year 24 Hour 3rd Quartile	5.60
14	**050Y 48H 4Q**	Huff 50 Year 48 Hour 3rd Quartile	6.05
15	**100Y 01H 1Q**	Huff 100 Year 1 Hour 1st Quartile	3.10
16	**100Y 02H 1Q**	Huff 100 Year 2 Hour 1st Quartile	3.83
17	**100Y 03H 1Q**	Huff 100 Year 3 Hour 1st Quartile	4.22
18	**100Y 06H 1Q**	Huff 100 Year 6 Hour 1st Quartile	4.95
19	**100Y 12H 2Q**	Huff 100 Year 12 Hour 2nd Quartile	5.74
20	**100Y 24H 3Q**	Huff 100 Year 24 Hour 3rd Quartile	6.60
21	**100Y 48H 4Q**	Huff 100 Year 48 Hour 4th Quartile	7.13
22	**500Y 01H 1Q**	Huff 500 Year 1 Hour 1st Quartile	3.64
23	**500Y 02H 1Q**	Huff 500 Year 2 Hour 1st Quartile	4.50
24	**500Y 03H 1Q**	Huff 500 Year 3 Hour 1st Quartile	4.96
25	**500Y 06H 1Q**	Huff 500 Year 6 Hour 1st Quartile	5.81
26	**500Y 12H 2Q**	Huff 500 Year 12 Hour 2nd Quartile	6.74
27	**500Y 24H 3Q**	Huff 500 Year 24 Hour 3rd Quartile	7.75
28	**500Y 48H 4Q**	Huff 500 Year 48 Hour 4th Quartile	8.37

Peak Discharge (Q) 10 Year	
Control (HR)	Q (CFS)
1	87.9
2	140.9
3	163.2
6	168.7
12	198.6
24	200.5
48	178.8

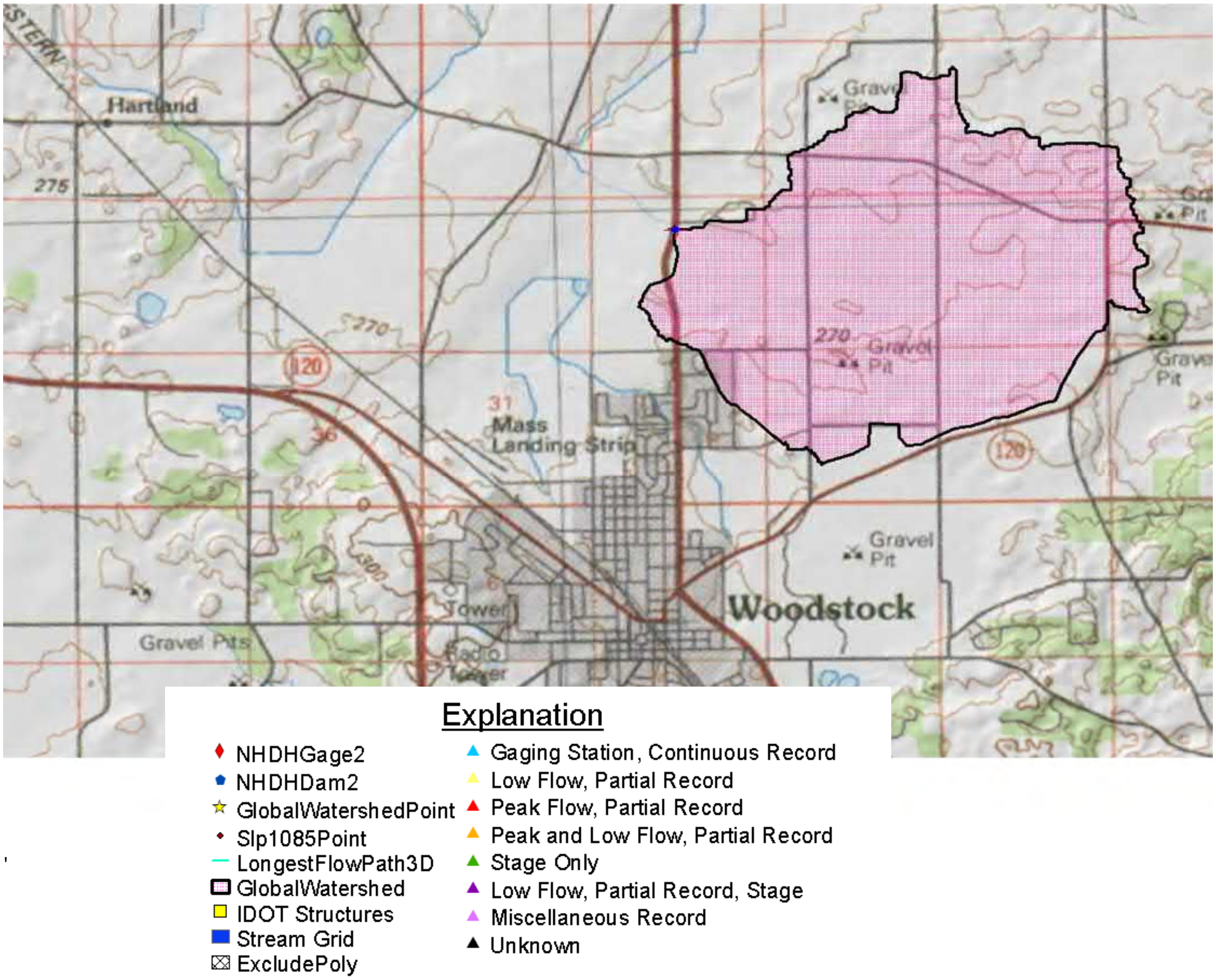
Peak Discharge (Q) 50 Year	
Control (HR)	Q (CFS)
1	230.0
2	337.5
3	369.0
6	387.2
12	461.3
24	478.0
48	382.9

Peak Discharge (Q) 100 Year	
Control (HR)	Q (CFS)
1	327.0
2	464.4
3	500.7
6	643.1
12	685.9
24	670.6
48	517.3

Peak Discharge (Q) 500 Year	
Control (HR)	Q (CFS)
1	449.8
2	647.7
3	742.7
6	885.2
12	925.4
24	913.7
48	642.4

USGS
Illinois StreamStats

IL 47 at Tributary to Silver Creek



USGS Illinois StreamStats

Basin Characteristics Report

Date: Thu Jan 30 2014 12:18:08 Mountain Standard Time
NAD27 Latitude: 42.3532 (42 21 12)
NAD27 Longitude: -88.4433 (-88 26 36)
NAD83 Latitude: 42.3533 (42 21 12)
NAD83 Longitude: -88.4434 (-88 26 36)

Basin has been edited

Parameter	Value
Area in square miles	4.53
Unadjusted 10-85 slope in feet per mile	15.736
Adjusted 10-85 slope in feet per mile	14.706
Unadjusted Basin Length ArcHydro Method in miles	3.14
Adjusted Basin Length ArcHydro Method in miles	3.42
Average soil permeability	2.347
Percent of area covered by open water	0.732

USGS
Illinois StreamStats

Streamstats Ungaged Site Report

Date: Thu Jan 30 2014 12:21:37 Mountain Standard Time
Site Location: Illinois
NAD27 Latitude: 42.3532 (42 21 12)
NAD27 Longitude: -88.4433 (-88 26 36)
NAD83 Latitude: 42.3533 (42 21 12)
NAD83 Longitude: -88.4434 (-88 26 36)
Drainage Area: 4.53 mi2

Basin has been edited

Peak Flow Basin Characteristics

100% Region 2 AMS (4.53 mi2)

Parameter	Value	Regression Equation Valid Range	
		Min	Max
Drainage Area (square miles)	4.53	0.03	9554
Stream Slope 10 and 85 Method (feet per mi)	14.706	0.81	317
Percent Open Water AND Herb Wetland (percent)	0.732	0	8

Peak Flow Streamflow Statistics

Statistic	Flow (ft^3/s)	Prediction Error (percent)	Equivalent years of record	90-Percent Prediction Interval	
				Minimum	Maximum
PK2	181	40	2.6	95.7	342
PK5	304	41	3.1	160	577
PK10	391	42	3.8	202	756
PK25	497	45	4.6	247	998
PK50	579	47	5.2	279	1200
PK100	653	49	5.6	305	1400
PK500	830	55	6.2	359	1920

IL 47 at Unnamed Tributary to Silver Creek
Peak Flow Comparison

Frequency (yr)	**Streamstats (cfs)**			**HEC-HMS Values (cfs)**	
	90% Min	Calculated	90% Max	IDOT In-House Model (1 sub-basin)	Lin Model (6 sub-basin)
10	202	391	756	401 (24 hr)	201 (24 hr)
50	279	579	1200	786 (24 hr)	478 (24 hr)
100	305	653	1400	1032 (12 hr)	686 (12 hr)
500	359	830	1920	1339 (12 hr)	925 (12 hr)

<u>EXHIBIT D</u>

STREAMBED PROFILE

STREAMBED SLOPE DETERMINATION

Point Number	Northing	Easting	Dist. Between	Station	Elevation	River Sta.	Edge of Water
			ft	x	y		
34976	2071996.0862	953665.6938	0.0000	0.00	851.43	0.0	853.18
34972	2071934.3093	953735.9844	93.5797	93.58	852.05		853.17
34970	2071870.3730	953808.7523	96.8660	190.45	852.25		853.39
34968	2071800.6715	953881.3638	100.6515	291.10	852.49		853.60
34966	2071739.2829	953969.4379	107.3574	398.45	852.53		853.74
34949	2071702.9402	954060.8186	98.3424	496.80	852.83	496.8	854.02
34940	2071668.9720	954153.4949	98.7053	595.50	852.50		854.01
34932	2071634.3119	954246.1443	98.9203	694.42	852.86	694.4	854.31
34918	2071594.9836	954337.1456	99.1360	793.56	853.31		854.40
34915	2071559.9475	954428.9750	98.2861	891.84	853.44		854.45
34913	2071546.7351	954480.2597	52.9593	944.80	853.95		854.65
34911	2071532.8255	954495.3536	20.5257	965.33	853.75		854.50
23852	2071531.9655	954501.7743	6.4780	971.81	853.75	971.8	854.91
23855	2071536.8987	954527.7286	26.4190	998.23	855.56		855.85
34909	2071537.2240	954531.2261	3.5126	1001.74	855.50		855.98
23848	2071537.4737	954532.9483	1.7402	1003.48	855.02		855.98
23710	2071530.8390	954579.7840	47.3033	1050.78	855.02		856.20
23711	2071530.6662	954579.9902	0.2690	1051.05	854.99		856.20
23709	2071523.3541	954599.6741	20.9982	1072.05	855.05	1072.0	856.27
23721	2071519.3572	954605.0331	6.6854	1078.74	855.13		857.39

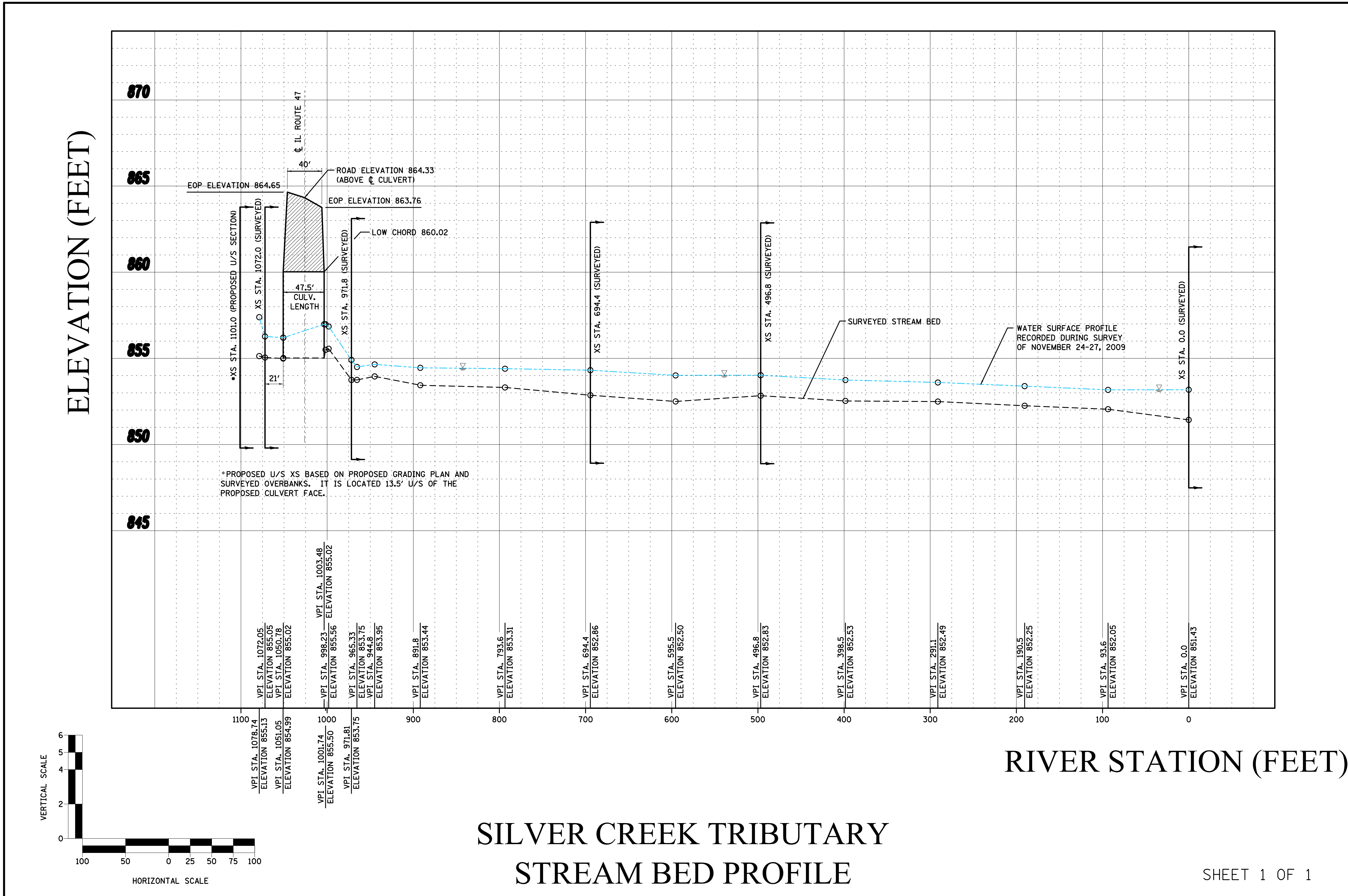
SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.901130897
R Square	0.812036893
Adjusted R Square	0.801594498
Standard Error	0.575542759
Observations	20

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	25.75910919	25.75910919	77.763474	5.95989E-08
Residual	18	5.962490414	0.331249467		
Total	19	31.72159961			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	851.3114029	0.296881275	2867.514642	2.141E-52	850.6876785	851.94	850.6876785	851.9351273
X Variable 1	0.003235442	0.000366898	8.818360025	5.96E-08	0.002464617	0.00	0.002464617	0.004006267

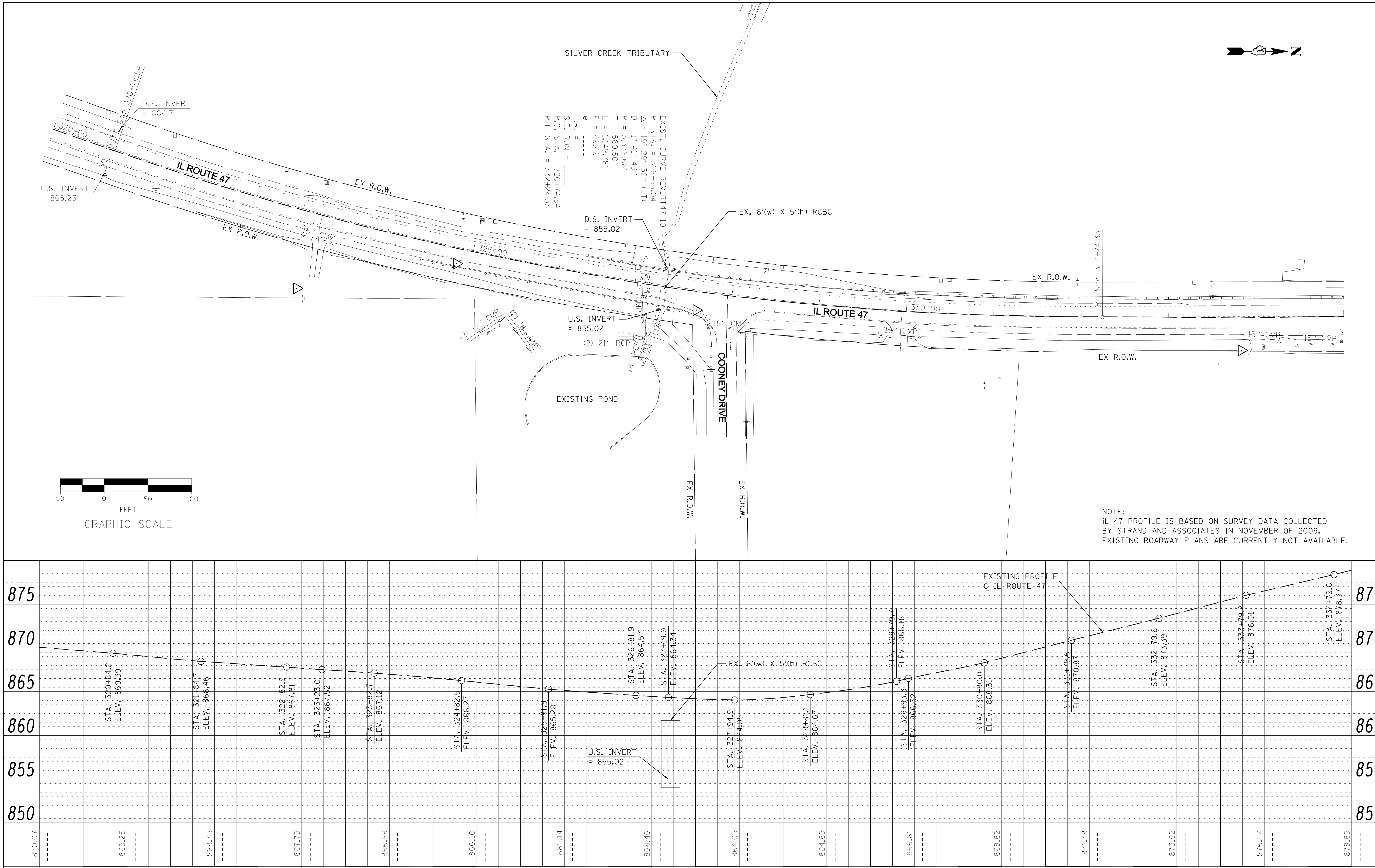


SILVER CREEK TRIBUTARY STREAM BED PROFILE

SHEET 1 OF 1

<u>EXHIBIT E</u>

ILLINOIS ROUTE 47 (N. SEMINARY AVE.)
ROADWAY PLAN AND PROFILE



NOTE:
IL-47 PROFILE IS BASED ON SURVEY DATA COLLECTED BY STRAND AND ASSOCIATES IN NOVEMBER OF 2009. EXISTING ROADWAY PLANS ARE CURRENTLY NOT AVAILABLE.

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		DRAWN - SGL	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -
	PLOT DATE = $DATE$	DATE - 7/2010	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL ROUTE 47 (N. SEMINARY AVE.)
ROADWAY PLAN AND PROFILE

SCALE: 1" = 50' | SHEET NO. 1 OF 1 SHEETS | STA. 320+00 TO STA. 335+00

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
----		MCHENRY	1	1

CONTRACT NO. _____
ILLINOIS FED. AID PROJECT

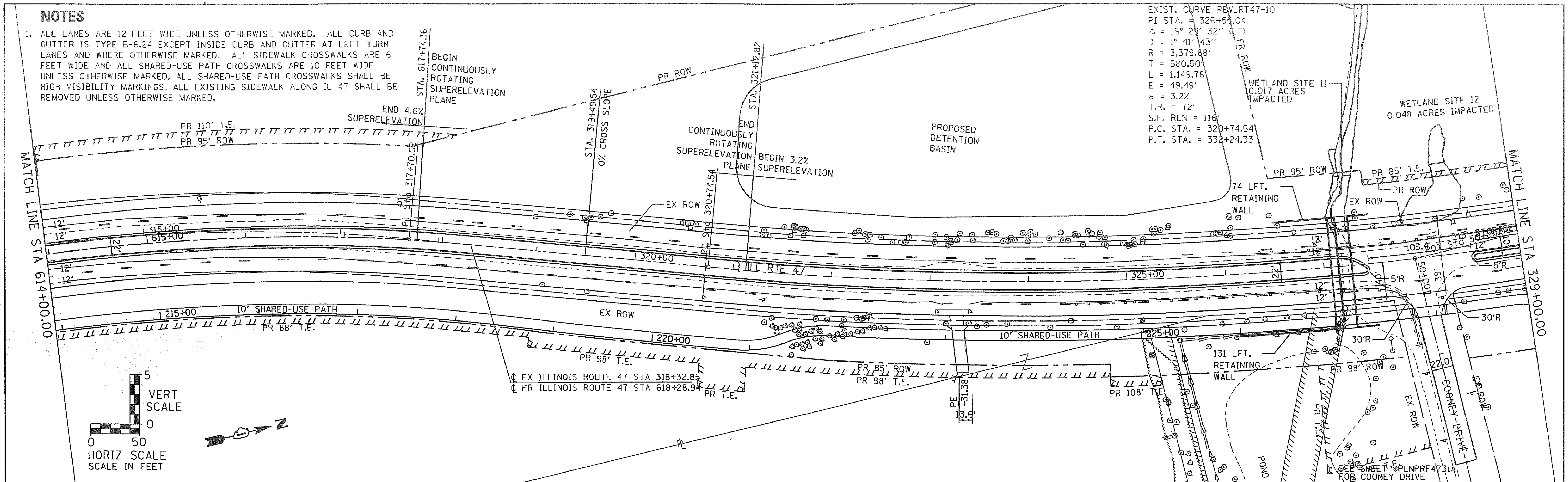
PLAN: SURVEYED, PLOTTED, ALIGNMENT CHECKED, R.O.W. CHECKED, CADD FILE NAME, NOTE BOOK, NO.

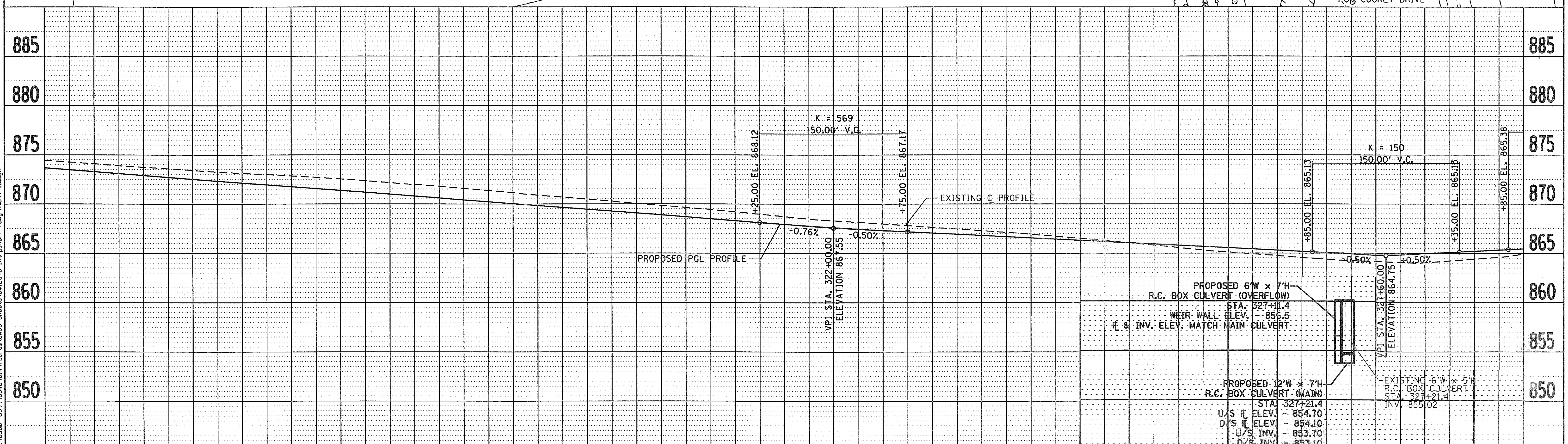
PROFILE: SURVEYED, PLOTTED, GRADES CHECKED, BM. NOTED, STRUCTURE NOTATNS CHKD, NOTE BOOK, NO.

BY DATE

NOTES

1. ALL LANES ARE 12 FEET WIDE UNLESS OTHERWISE MARKED. ALL CURB AND GUTTER IS TYPE B-6.24 EXCEPT INSIDE CURB AND GUTTER AT LEFT TURN LANES AND WHERE OTHERWISE MARKED. ALL SIDEWALK CROSSWALKS ARE 6 FEET WIDE AND ALL SHARED-USE PATH CROSSWALKS ARE 10 FEET WIDE UNLESS OTHERWISE MARKED. ALL SHARED-USE PATH CROSSWALKS SHALL BE HIGH VISIBILITY MARKINGS. ALL EXISTING SIDEWALK ALONG IL 47 SHALL BE REMOVED UNLESS OTHERWISE MARKED.





874.42	874.08	873.74	873.42	873.12	872.85	872.53	872.15	871.78	871.37	870.89	870.48	870.04	869.64	869.19	868.73	868.30	867.98	867.63	867.29	866.92	866.51	866.05	865.56	865.11	864.74	864.39	864.16	864.03	864.41	864.92
873.66	873.27	872.89	872.51	872.13	871.75	871.36	870.98	870.60	870.22	869.84	869.46	869.08	868.70	868.31	867.94	867.60	867.31	867.05	866.80	866.55	866.30	866.05	865.80	865.55	865.30	865.06	864.94	864.99	865.20	865.46

FILE NAME = S:\JOL\6300--6399\6346\014\Micros\CADD Sheets\DM12345-sht-plnprf-rdwy-Rte47-16.dgn

STRAND ASSOCIATES®
1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200

USER NAME = BillP	DESIGNED -	REVISED -
	DRAWN -	REVISED -
PLOT SCALE = 100.0000 '/ in.	CHECKED -	REVISED -
PLOT DATE = 8/23/2017	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

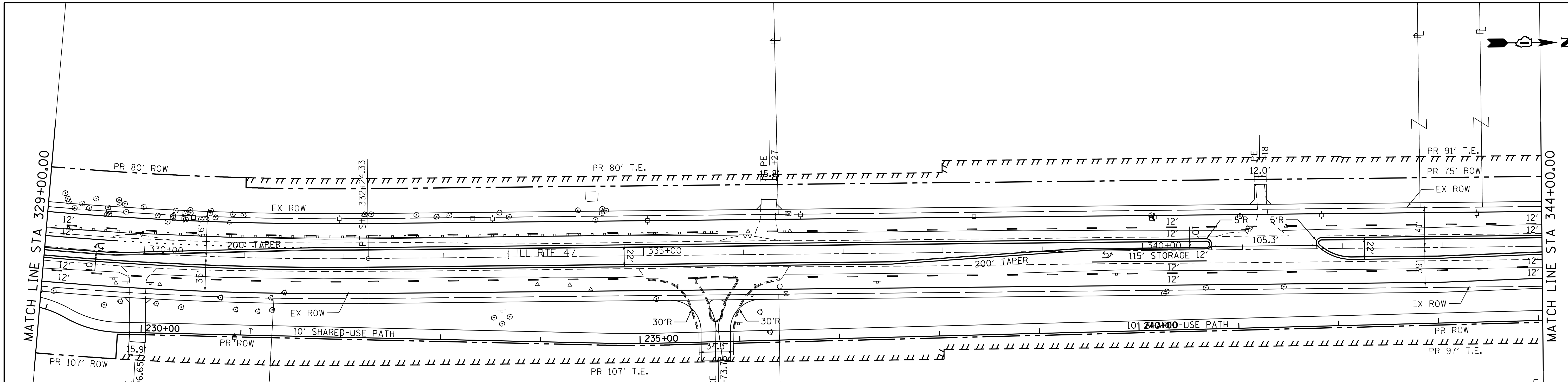
PLAN & PROFILE
ILLINOIS ROUTE 47

SCALE: 1" = 50' | SHEET | OF | SHEETS | STA. | TO STA.

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY		SPLNPRF4716

CONTRACT NO.
ILLINOIS FED. AID PROJECT

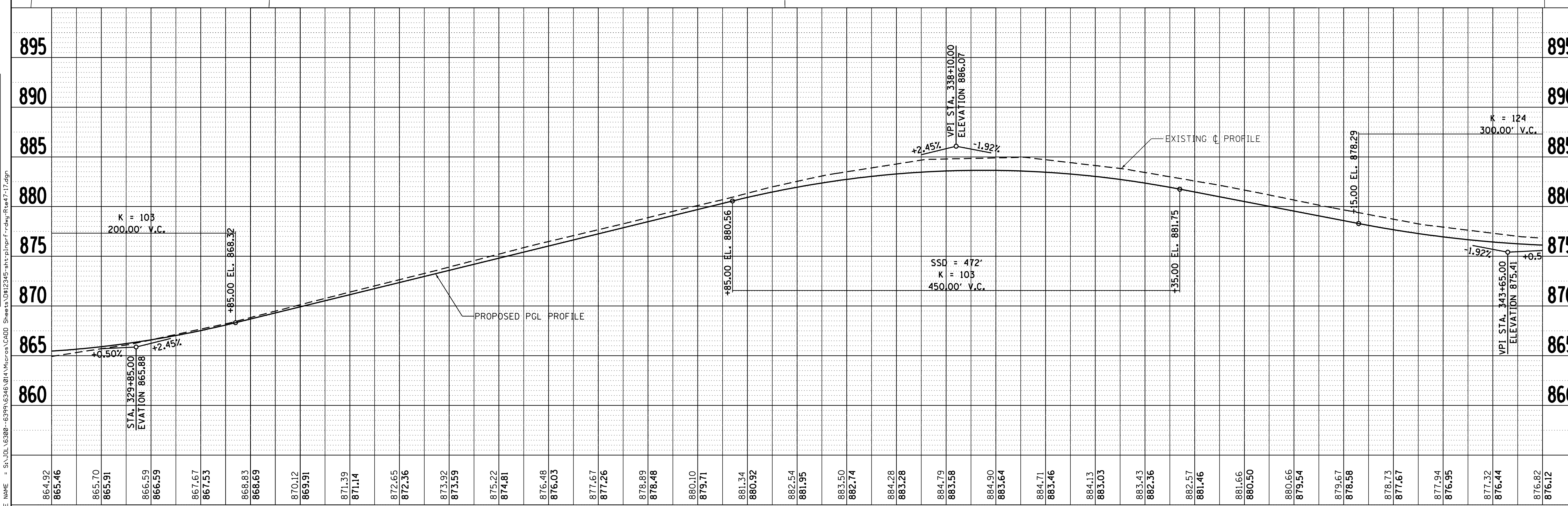
Default



NOTES

1. ALL LANES ARE 12 FEET WIDE UNLESS OTHERWISE MARKED. ALL CURB AND GUTTER IS TYPE B-6.24 EXCEPT INSIDE CURB AND GUTTER AT LEFT TURN LANES AND WHERE OTHERWISE MARKED. ALL SIDEWALK CROSSWALKS ARE 6 FEET WIDE AND ALL SHARED-USE PATH CROSSWALKS ARE 10 FEET WIDE UNLESS OTHERWISE MARKED. ALL SHARED-USE PATH CROSSWALKS SHALL BE HIGH VISIBILITY MARKINGS. ALL EXISTING SIDEWALK ALONG IL 47 SHALL BE REMOVED UNLESS OTHERWISE MARKED.

VERT SCALE 0 5
HORIZ SCALE 0 50
SCALE IN FEET



STRAND ASSOCIATES	USER NAME = BillP	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	PLAN & PROFILE ILLINOIS ROUTE 47	F.A.P. RTE. 326	SECTION	COUNTY MCHENRY	TOTAL SHEETS	SHEET NO.
1170 SOUTH HOUBOLT ROAD JOLIET, ILLINOIS 60431 (815) 744-4200	PLOT SCALE = 100.0000 ' / in.	DRAWN -	REVISED -		SCALE: 1" = 50' SHEET OF SHEETS STA. TO STA.			CONTRACT NO.		
	PLOT DATE = 8/23/2017	CHECKED -	REVISED -			ILLINOIS FED. AID PROJECT				
		DATE -	REVISED -							

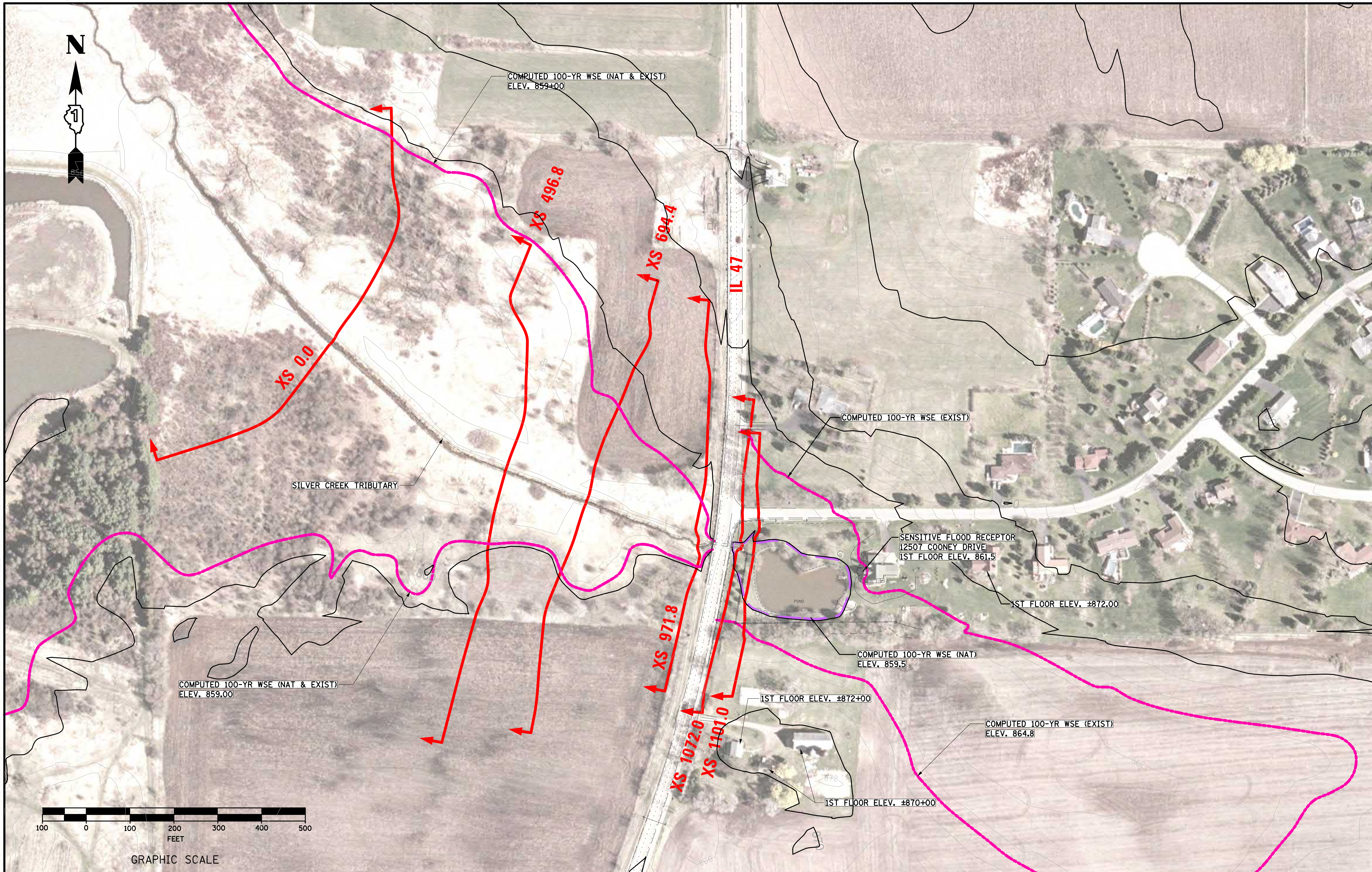
$PLNPRF4717

FILE NAME = S:\JOL\6300--6399\6346\014\Micros\CADD Sheets\D#12345-sht-plnprf-rdwy-Rte47-17.dgn

Default

EXHIBIT F

CROSS SECTIONS



FILE NAME = $FILEL$

USER NAME = $USER$

PLOT SCALE = $SCALE$

PLOT DATE = $DATE$

DESIGNED -
DRAWN -
CHECKED -
DATE -

REVISED -
REVISED -
REVISED -
REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

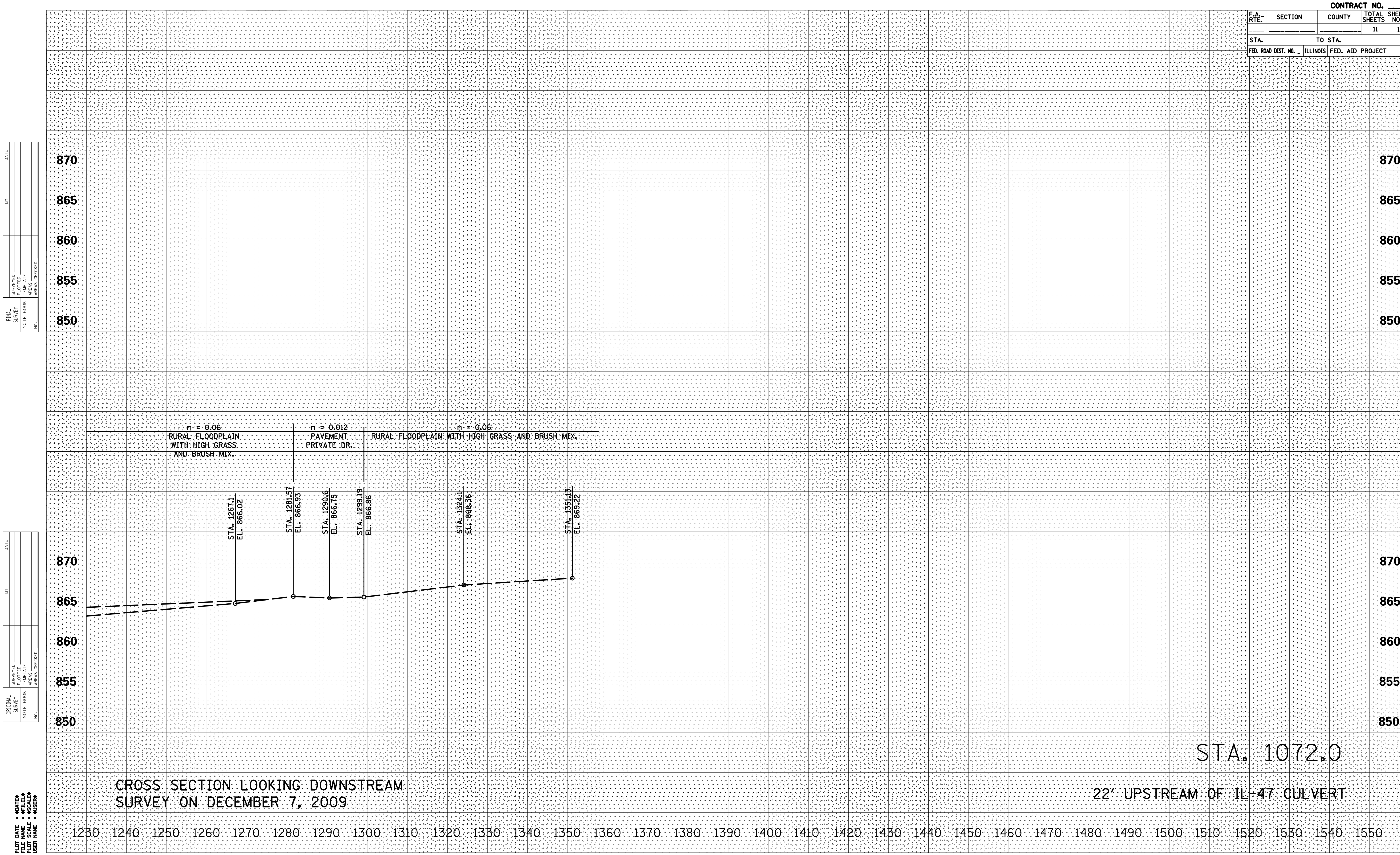
EXHIBIT F
CROSS SECTION LOCATION PLAN

SCALE: 1" = 200' SHEET NO. __ OF __ SHEETS STA. ______ TO STA. ______

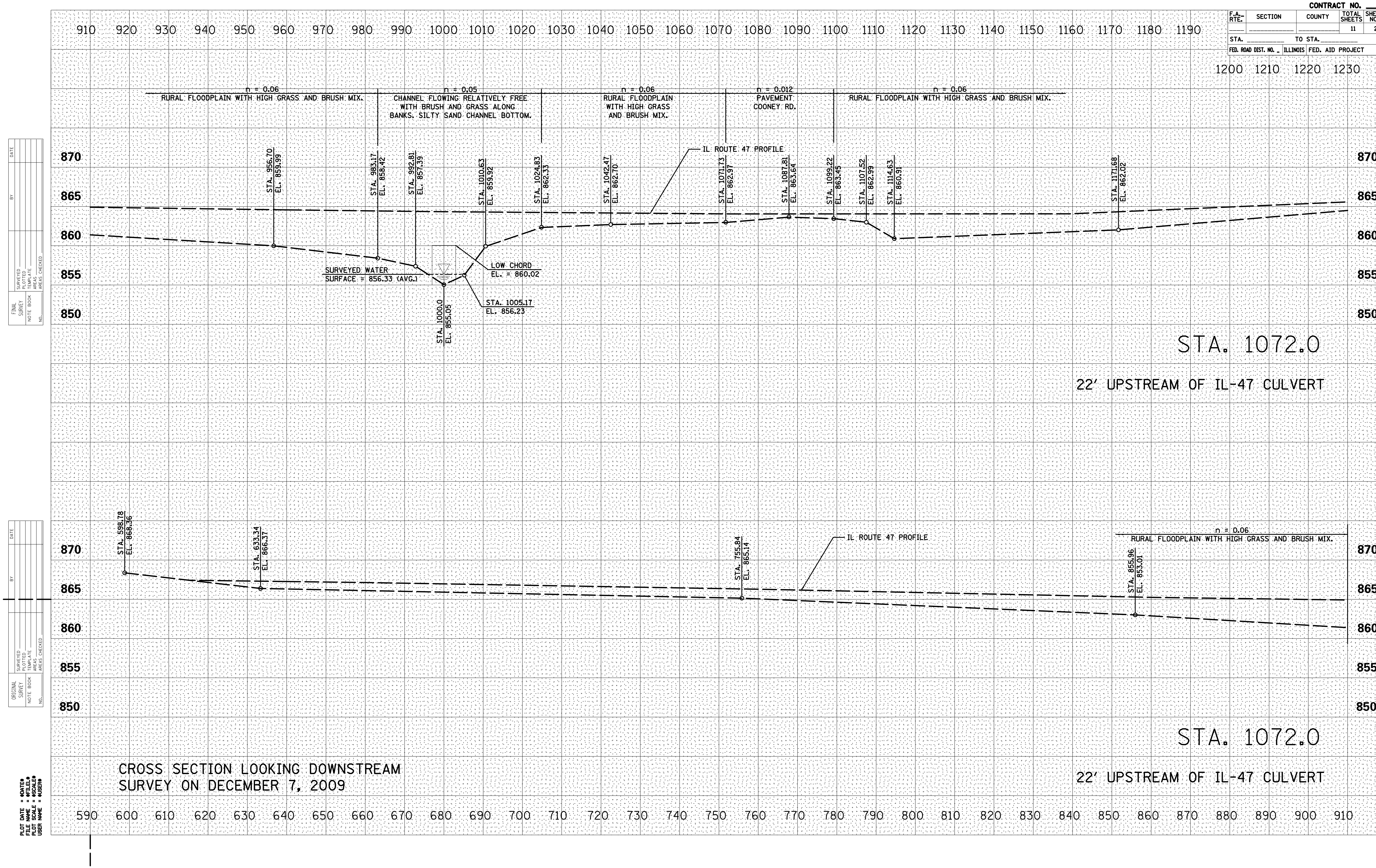
F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		

CONTRACT NO. ____

ILLINOIS FED. AID PROJECT



CONTRACT NO.
F.A. RTE.
SECTION
COUNTY
TOTAL SHEETS
SHEET NO.
11
1
STA.
TO STA.
FED. ROAD DIST. NO.
ILLINOIS
FED. AID PROJECT
870
865
860
855
850
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
n = 0.012
PAVEMENT PRIVATE DR.
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
STA. 1267.1 EL. 866.02
STA. 1281.57 EL. 866.93
STA. 1290.6 EL. 866.75
STA. 1299.19 EL. 866.86
STA. 1324.1 EL. 868.36
STA. 1351.13 EL. 869.22
870
865
860
855
850
STA. 1072.0
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009
22' UPSTREAM OF IL-47 CULVERT
1230 1240 1250 1260 1270 1280 1290 1300 1310 1320 1330 1340 1350 1360 1370 1380 1390 1400 1410 1420 1430 1440 1450 1460 1470 1480 1490 1500 1510 1520 1530 1540 1550
FINAL SURVEY
ORIGINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NOTE BOOK
NO.
BY
DATE
PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

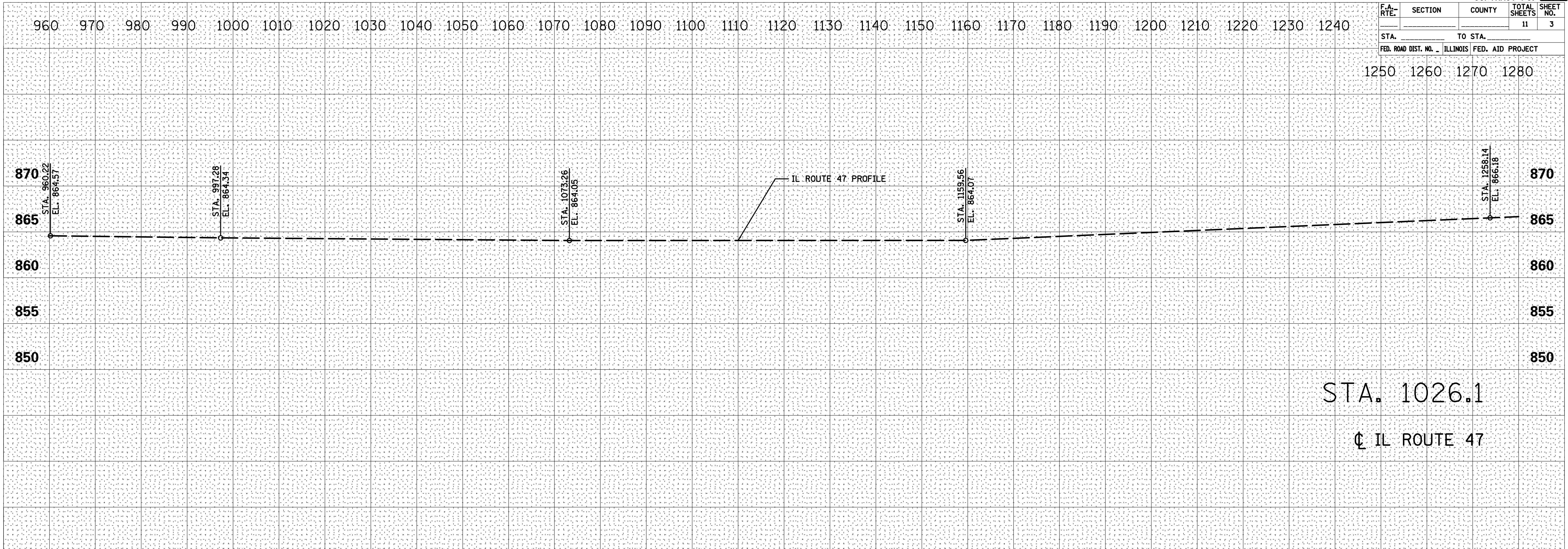

CONTRACT NO.
F.A. RTE. | SECTION | COUNTY | TOTAL SHEETS 11 | SHEET NO. 2
STA. TO STA.
FED. ROAD DIST. NO. | ILLINOIS | FED. AID PROJECT
910 920 930 940 950 960 970 980 990 1000 1010 1020 1030 1040 1050 1060 1070 1080 1090 1100 1110 1120 1130 1140 1150 1160 1170 1180 1190
1200 1210 1220 1230
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
n = 0.05
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND GRASS ALONG BANKS. SILTY SAND CHANNEL BOTTOM.
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
n = 0.012
PAVEMENT COONEY RD.
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
IL ROUTE 47 PROFILE
870 865 860 855 850
STA. 956.70 EL. 859.99
STA. 983.17 EL. 858.42
STA. 992.81 EL. 857.39
STA. 1010.63 EL. 859.92
STA. 1024.83 EL. 862.33
STA. 1042.47 EL. 862.70
STA. 1071.73 EL. 862.97
STA. 1087.81 EL. 863.64
STA. 1099.22 EL. 863.45
STA. 1107.52 EL. 862.99
STA. 1114.63 EL. 860.91
STA. 1171.68 EL. 862.02
SURVEYED WATER SURFACE = 856.33 (AVG.)
LOW CHORD EL. = 860.02
STA. 1005.17 EL. 856.23
STA. 1000.0 EL. 855.05
STA. 1072.0
22' UPSTREAM OF IL-47 CULVERT
STA. 598.78 EL. 868.36
STA. 633.34 EL. 866.37
STA. 755.84 EL. 865.14
IL ROUTE 47 PROFILE
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
STA. 855.96 EL. 853.01
870 865 860 855 850
STA. 1072.0
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009
22' UPSTREAM OF IL-47 CULVERT
590 600 610 620 630 640 650 660 670 680 690 700 710 720 730 740 750 760 770 780 790 800 810 820 830 840 850 860 870 880 890 900 910
FINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE
ORIGINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE
PLOT DATE = #DATE#
FILE NAME = #FILE#
PLOT SCALE = #SCALE#
USER NAME = #USER#

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			11	3

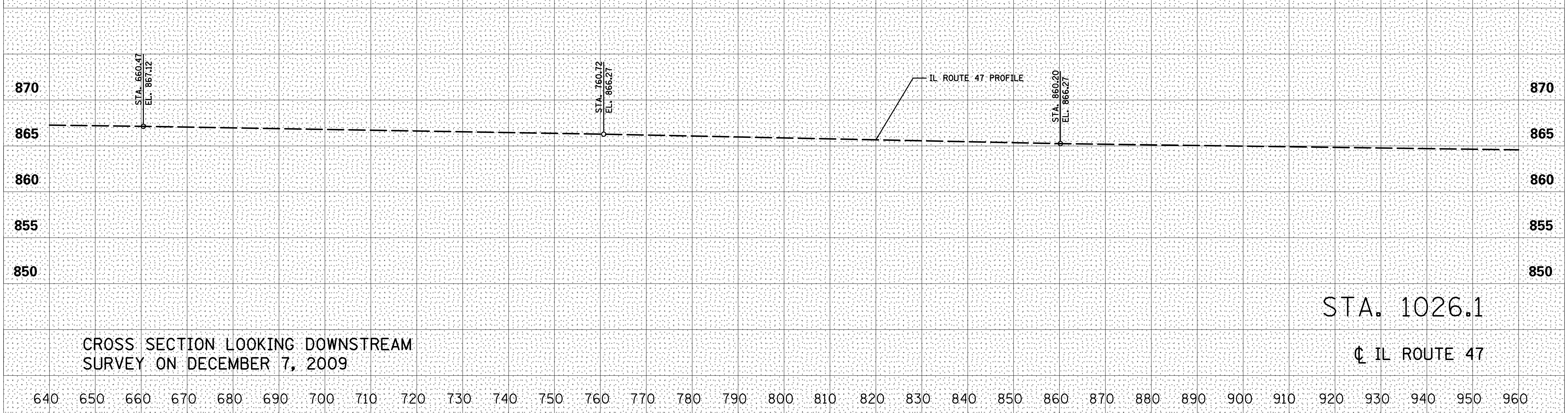
CONTRACT NO.

STA. ______ TO STA. ______

FED. ROAD DIST. NO. _ | ILLINOIS | FED. AID PROJECT

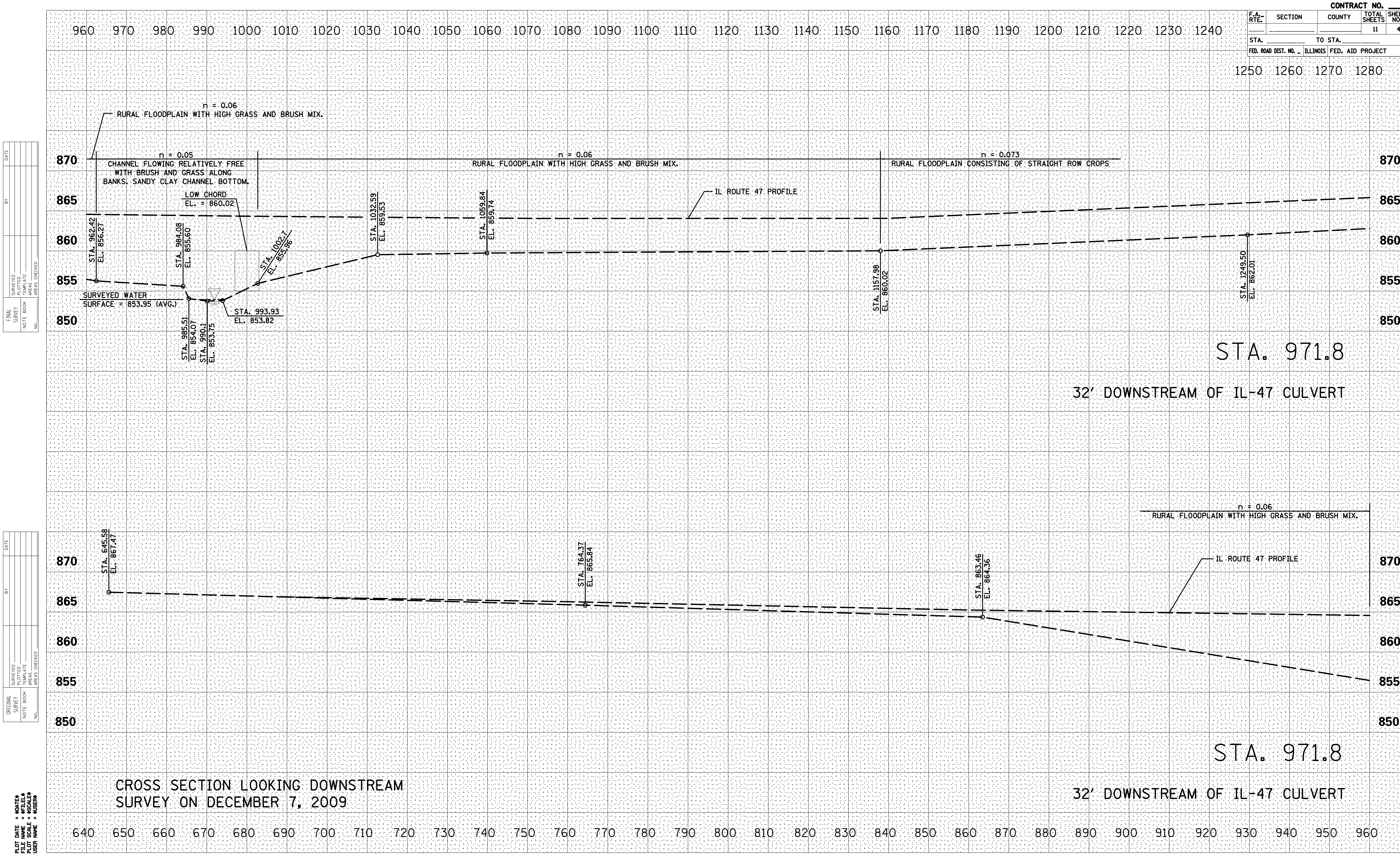


FINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE



ORIGINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

PLOT DATE = $DATE$
FILE NAME = $FILEL$
PLOT SCALE = $SCALE$
USER NAME = $USER$

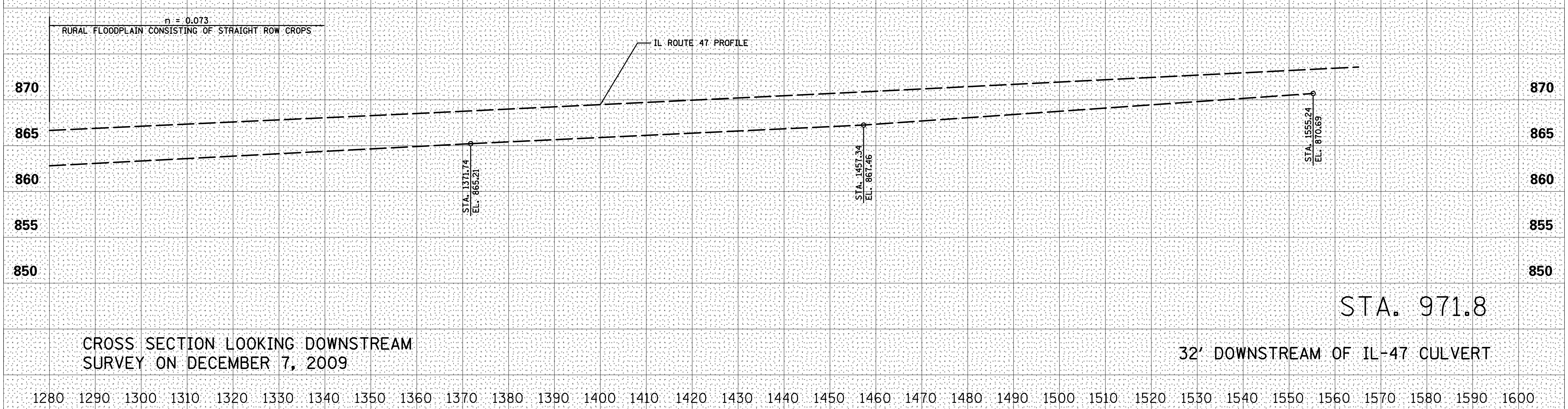

CONTRACT NO.
F.A. RTE.
SECTION
COUNTY
TOTAL SHEETS 11
SHEET NO. 4
STA.
TO STA.
FED. ROAD DIST. NO.
ILLINOIS
FED. AID PROJECT
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
n = 0.05
CHANNEL FLOWING RELATIVELY FREE WITH BRUSH AND GRASS ALONG BANKS. SANDY CLAY CHANNEL BOTTOM.
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
n = 0.073
RURAL FLOODPLAIN CONSISTING OF STRAIGHT ROW CROPS
LOW CHORD
EL. = 860.02
IL ROUTE 47 PROFILE
STA. 962.42 EL. 856.27
STA. 984.08 EL. 855.60
STA. 1002.7 EL. 855.96
STA. 1032.59 EL. 859.53
STA. 1059.84 EL. 859.74
STA. 1157.98 EL. 860.02
STA. 1249.50 EL. 862.01
SURVEYED WATER SURFACE = 853.95 (AVG.)
STA. 993.93 EL. 853.82
STA. 985.51 EL. 854.07
STA. 990.1 EL. 853.75
STA. 971.8
32' DOWNSTREAM OF IL-47 CULVERT
FINAL SURVEY
NOTE BOOK NO.
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
BY
DATE
STA. 645.58 EL. 867.47
STA. 764.37 EL. 865.84
STA. 863.46 EL. 864.36
n = 0.06
RURAL FLOODPLAIN WITH HIGH GRASS AND BRUSH MIX.
IL ROUTE 47 PROFILE
ORIGINAL SURVEY
STA. 971.8
32' DOWNSTREAM OF IL-47 CULVERT
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009
PLOT DATE = #DATE#
FILE NAME = #FILEL#
PLOT SCALE = #SCALE#
USER NAME = #USER#

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			11	5

CONTRACT NO.

STA. TO STA.

FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT



STA. 971.8

CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009

32' DOWNSTREAM OF IL-47 CULVERT

FINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

ORIGINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

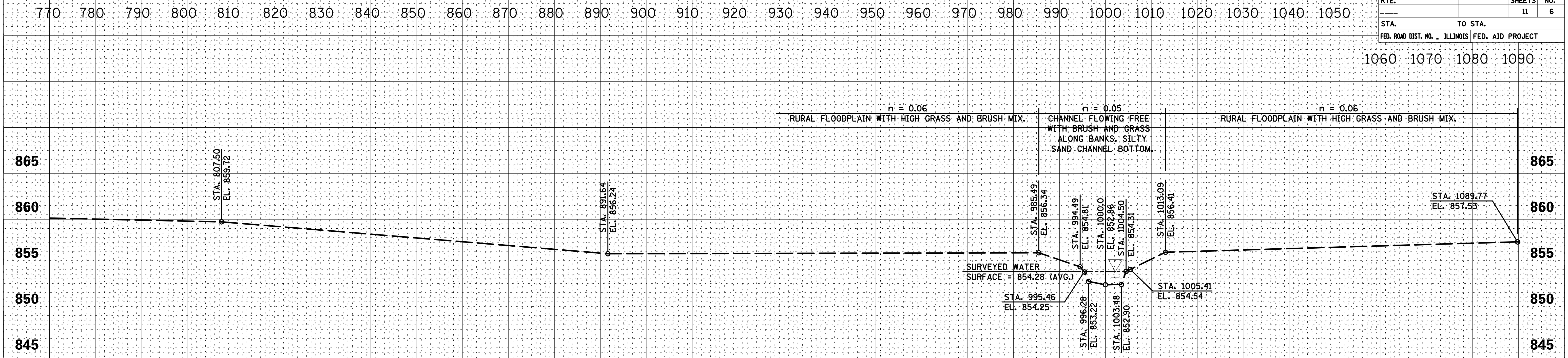
PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			11	6

CONTRACT NO.

STA. ______ TO STA. ______

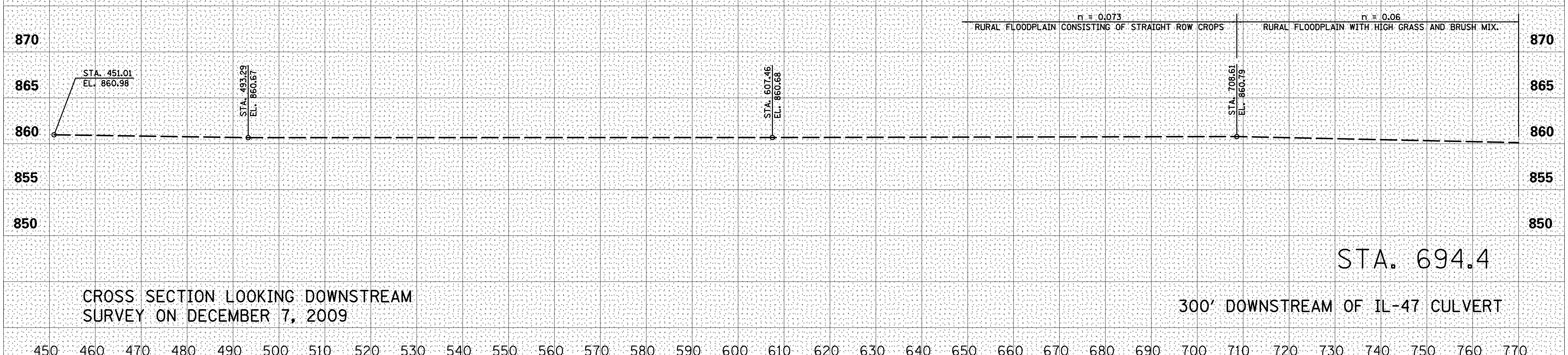
FED. ROAD DIST. NO. _ ILLINOIS FED. AID PROJECT



STA. 694.4

300' DOWNSTREAM OF IL-47 CULVERT

FINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE



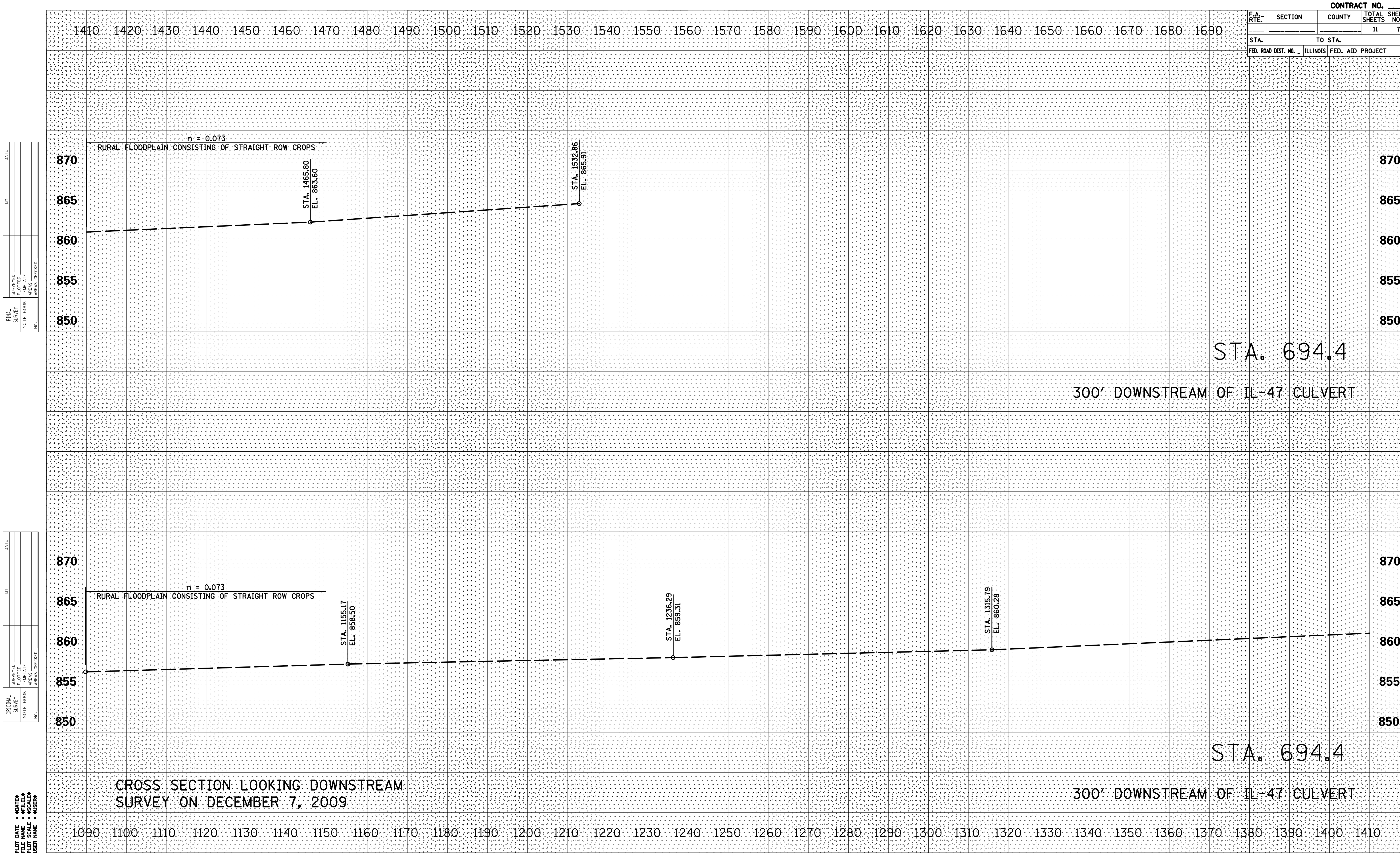
STA. 694.4

300' DOWNSTREAM OF IL-47 CULVERT

CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009

ORIGINAL SURVEY | NOTE BOOK | NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

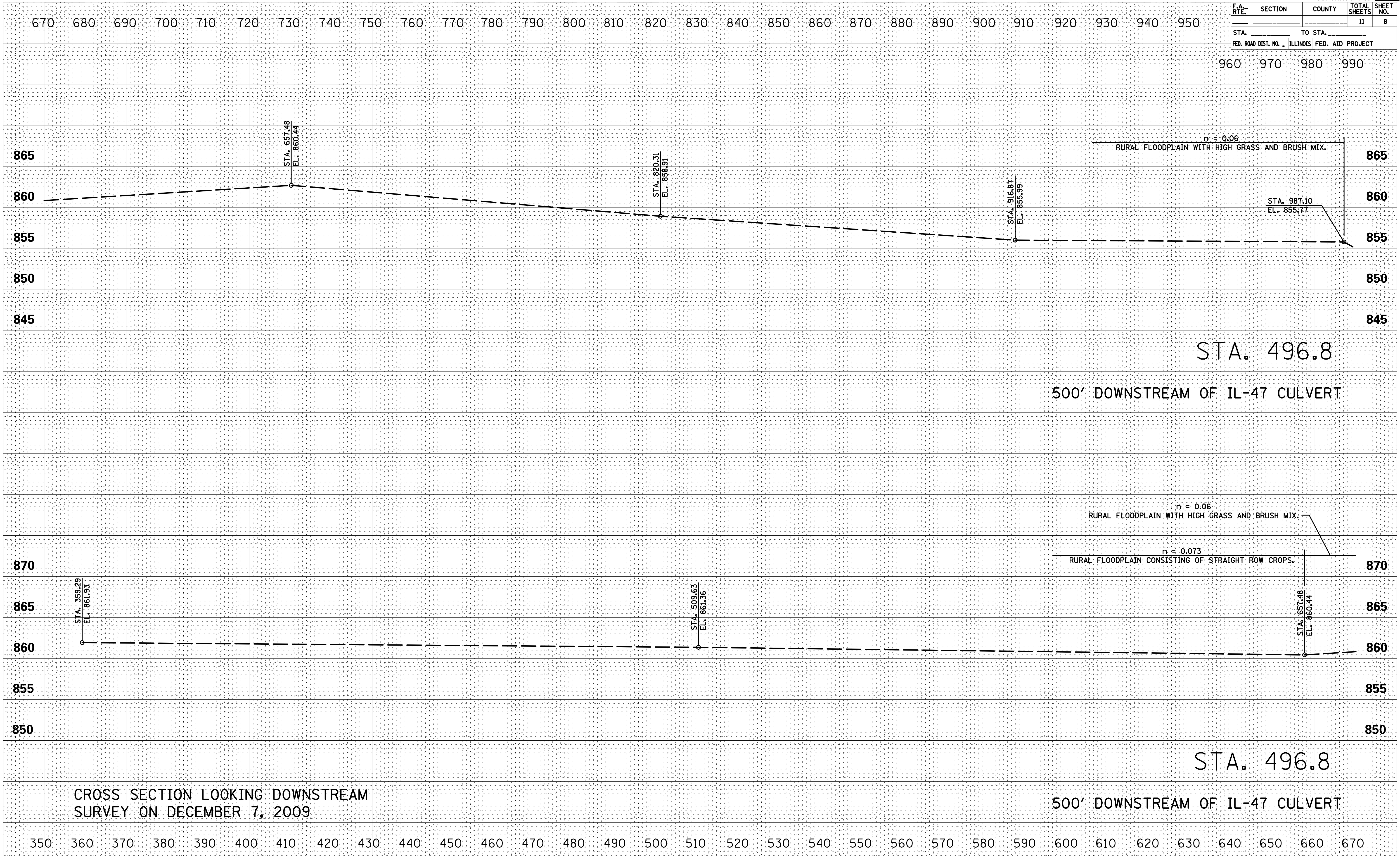

CONTRACT NO.
F.A. RTE. | SECTION | COUNTY | TOTAL SHEETS 11 | SHEET NO. 7
STA. TO STA.
FED. ROAD DIST. NO. ILLINOIS FED. AID PROJECT
n = 0.073
RURAL FLOODPLAIN CONSISTING OF STRAIGHT ROW CROPS
STA. 1465.80 EL. 863.60
STA. 1532.86 EL. 865.91
STA. 694.4
300' DOWNSTREAM OF IL-47 CULVERT
FINAL SURVEY
NOTE BOOK NO.
SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED
BY DATE
n = 0.073
RURAL FLOODPLAIN CONSISTING OF STRAIGHT ROW CROPS
STA. 1155.17 EL. 858.50
STA. 1236.29 EL. 859.31
STA. 1315.79 EL. 860.28
STA. 694.4
300' DOWNSTREAM OF IL-47 CULVERT
CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009
ORIGINAL SURVEY
NOTE BOOK NO.
PLOT DATE = #DATE#
FILE NAME = #FILE#
PLOT SCALE = #SCALE#
USER NAME = #USER#

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			11	8

CONTRACT NO.

STA. ______ TO STA. ______

FED. ROAD DIST. NO. _ ILLINOIS FED. AID PROJECT



FINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
NO.	TEMPLATE		
	AREAS		
	AREAS CHECKED		

ORIGINAL SURVEY	SURVEYED	BY	DATE
NOTE BOOK	PLOTTED		
NO.	TEMPLATE		
	AREAS		
	AREAS CHECKED		

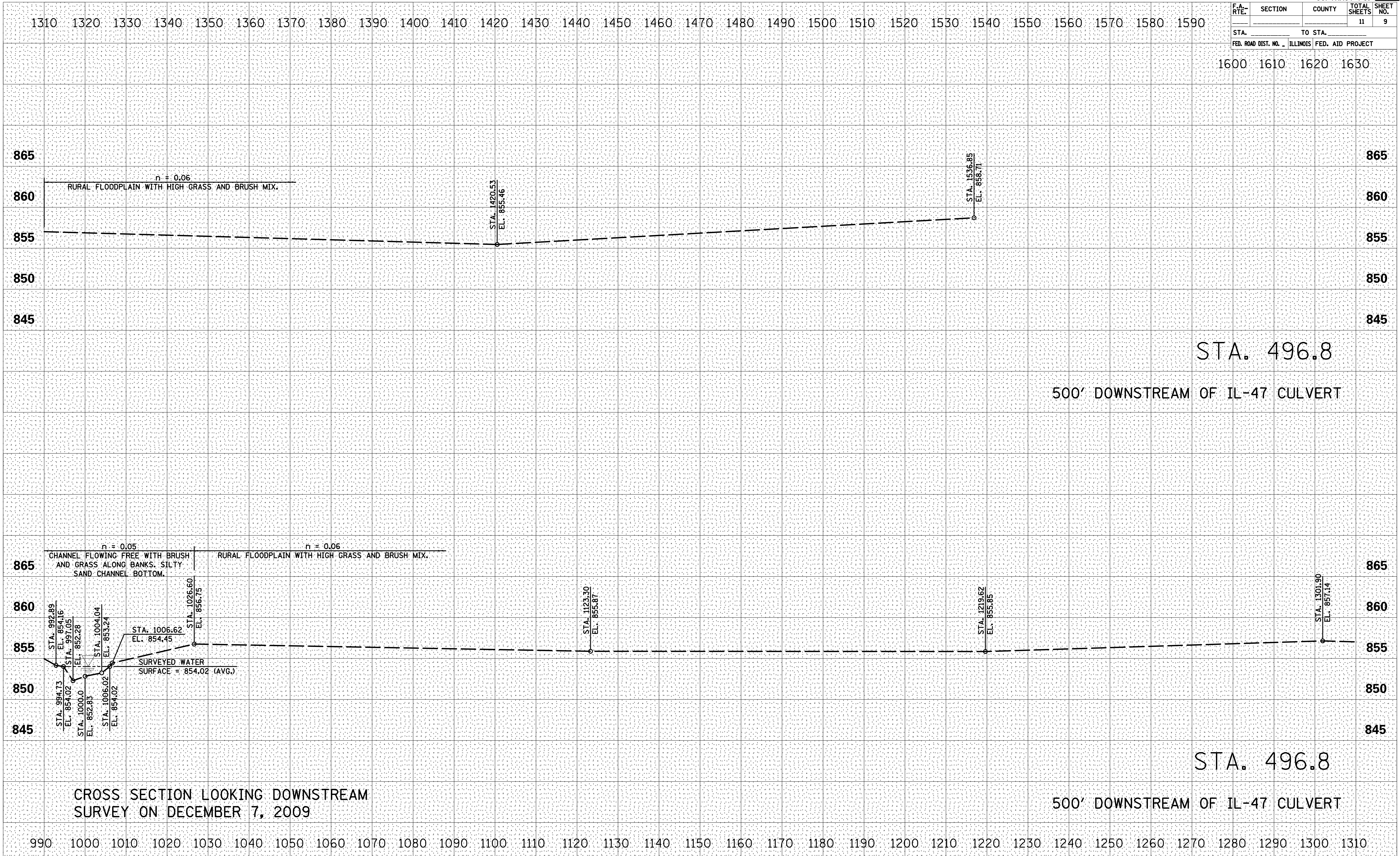
PLOT DATE = $DATE$
FILE NAME = $FILEL$
PLOT SCALE = $SCALE$
USER NAME = $USER$

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
			11	9

CONTRACT NO.

STA. ________ TO STA. ________

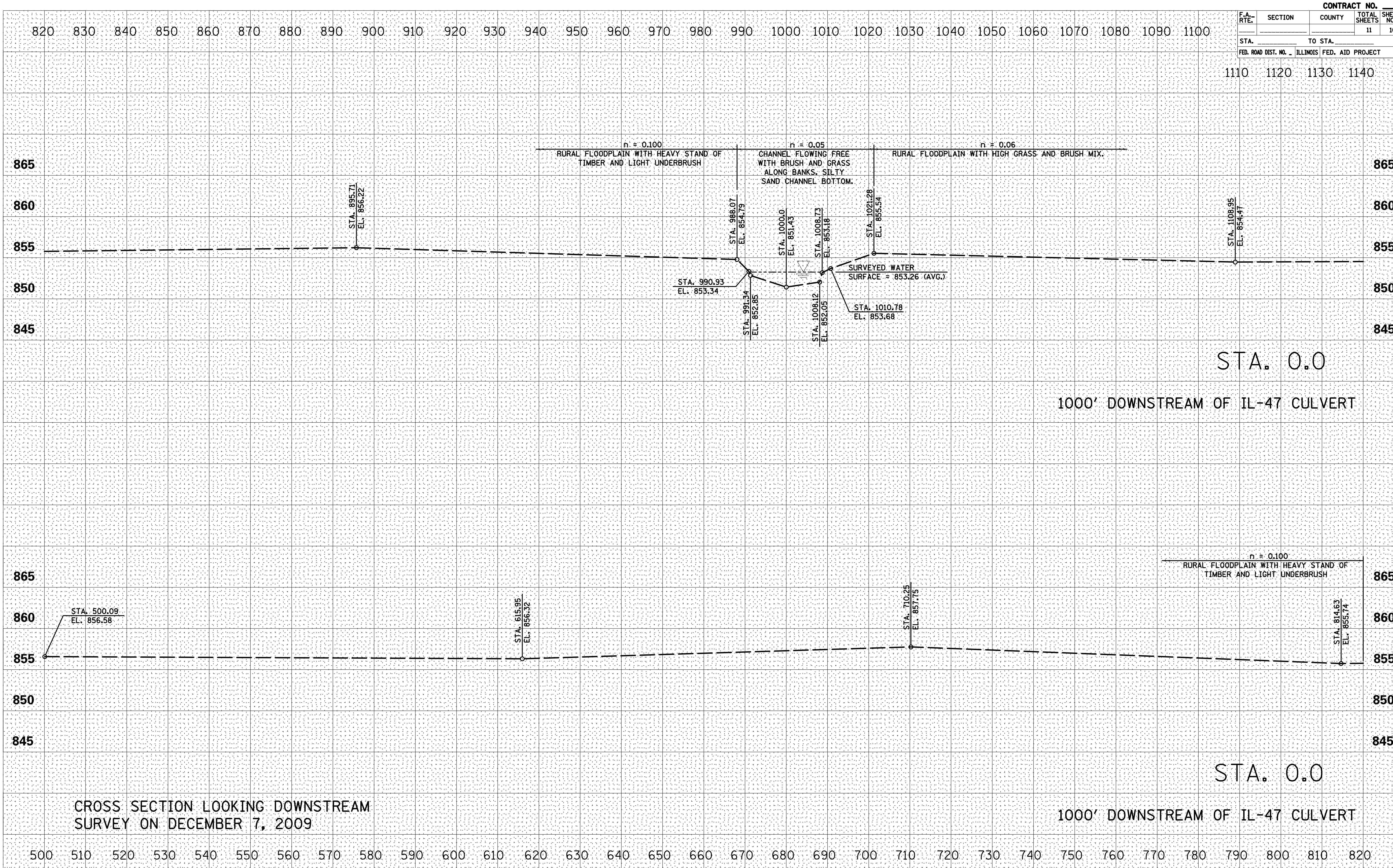
FED. ROAD DIST. NO. _ ILLINOIS FED. AID PROJECT



FINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

ORIGINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

PLOT DATE = $DATE$ FILE NAME = $FILE$ PLOT SCALE = $SCALE$ USER NAME = $USER$

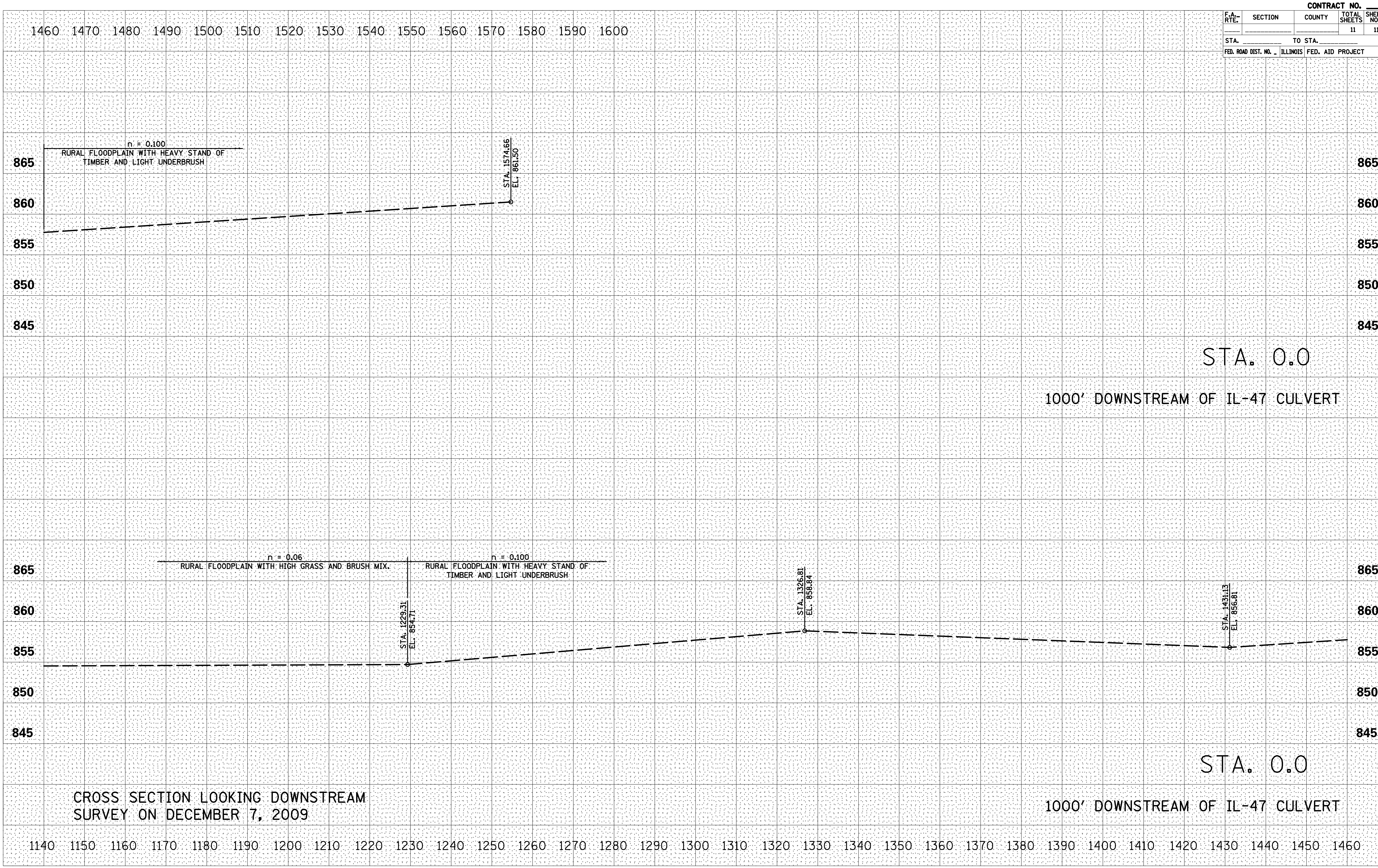


CROSS SECTION LOOKING DOWNSTREAM
SURVEY ON DECEMBER 7, 2009

FINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

ORIGINAL SURVEY | NOTE BOOK NO. | SURVEYED | PLOTTED | TEMPLATE | AREAS | AREAS CHECKED | BY | DATE

PLOT DATE = #DATE#
FILE NAME = #FILEL#
PLOT SCALE = #SCALE#
USER NAME = #USER#



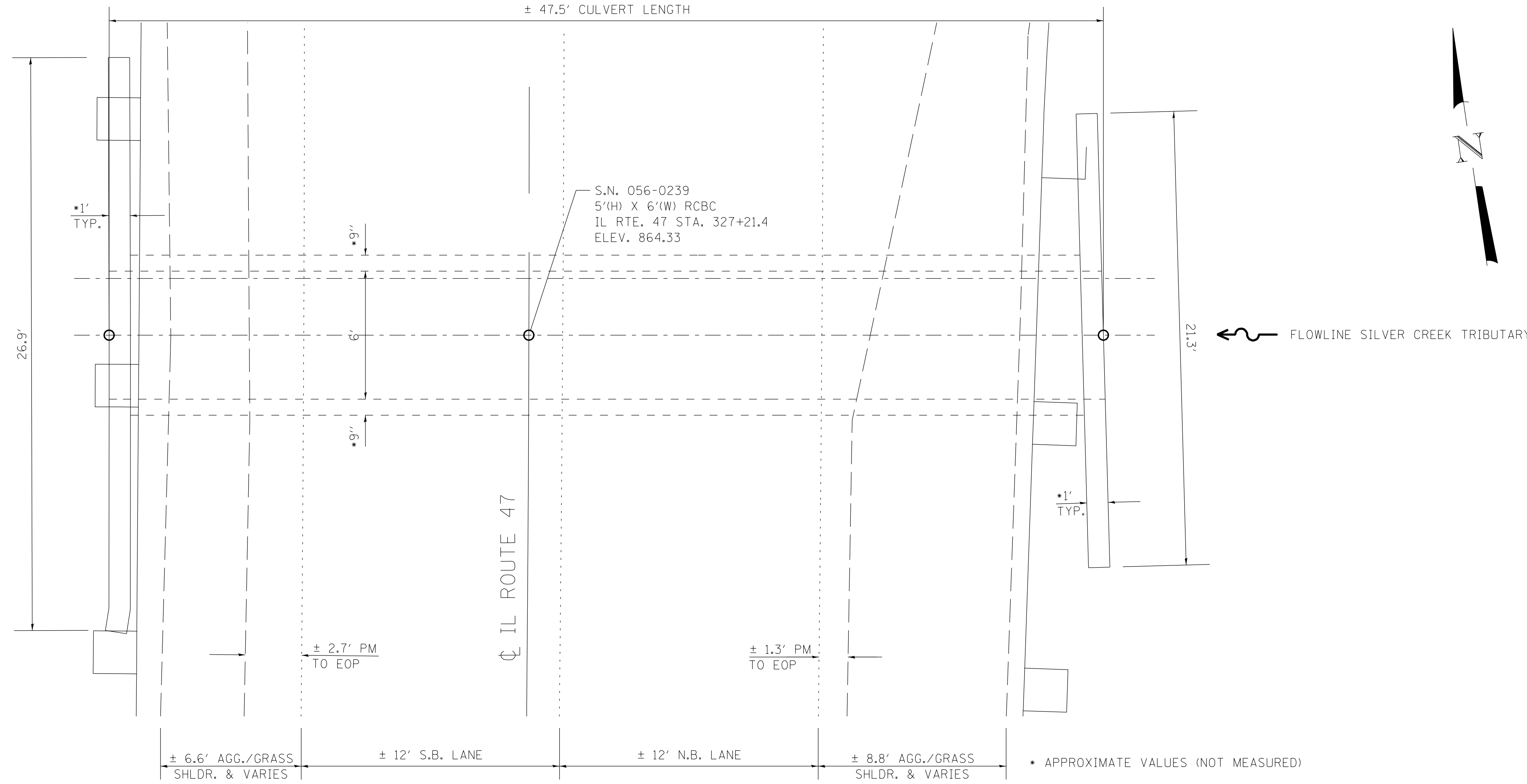
FINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

ORIGINAL SURVEY NOTE BOOK NO. SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED BY DATE

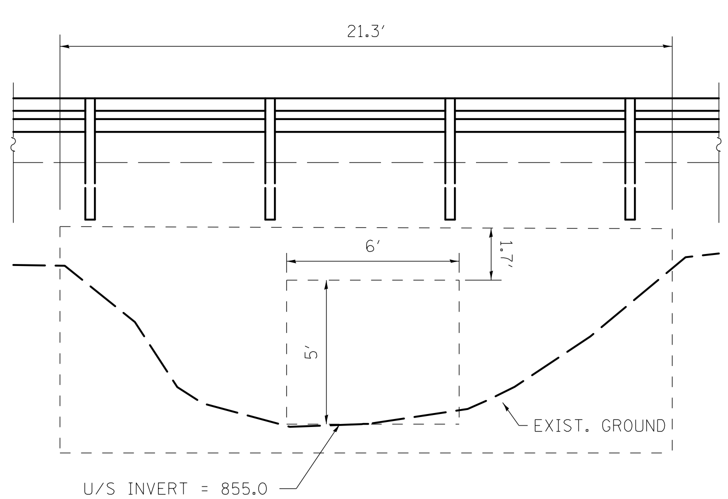
PLOT DATE = $DATE$
FILE NAME = $FILE$
PLOT SCALE = $SCALE$
USER NAME = $USER$

EXHIBIT G

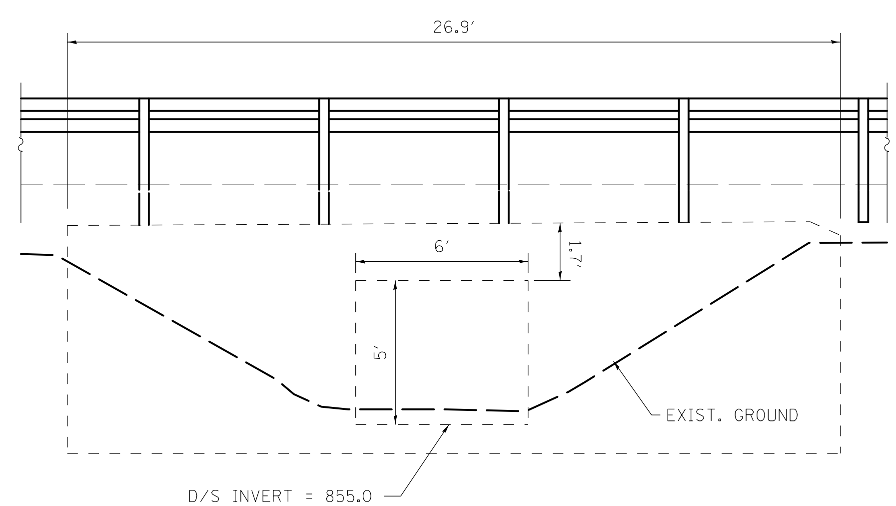
CULVERT OPENING PLOTS (EXISTING AND PROPOSED)



<u>PLAN</u>



<u>*ELEVATION*</u>
(UPSTREAM FACE)

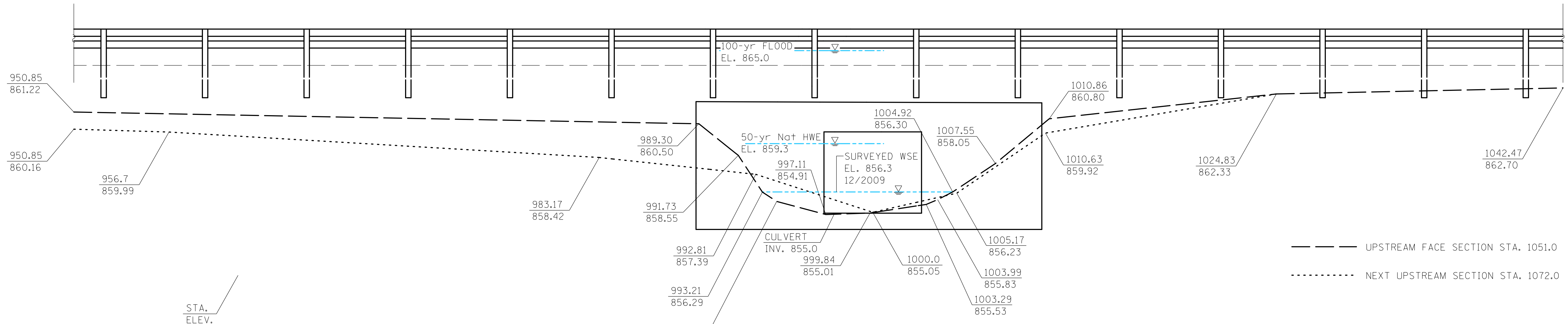


<u>*ELEVATION*</u>
(DOWNSTREAM FACE)

NOTES:

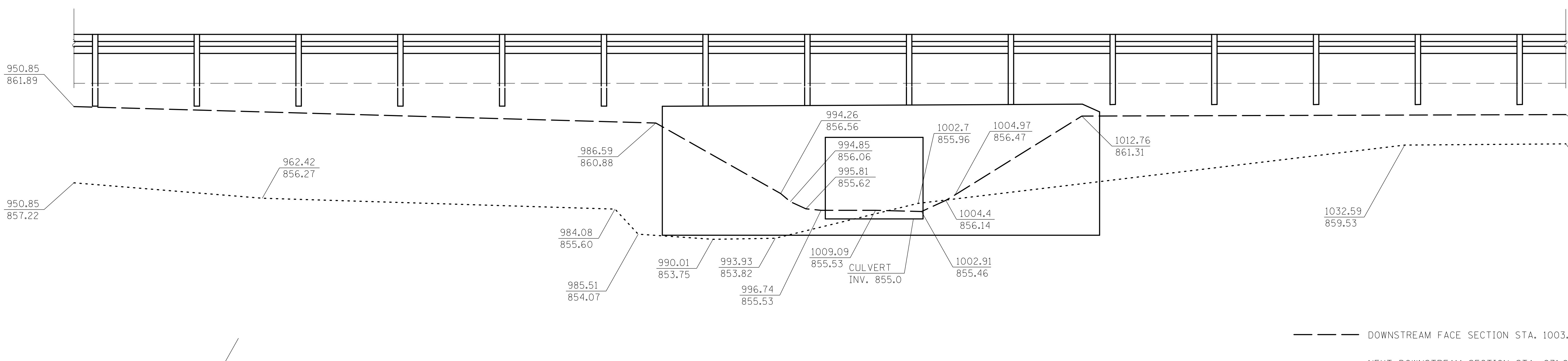
1. EXISTING PLANS FOR THIS CULVERT ARE CURRENTLY UNAVAILABLE.
2. THIS EXHIBIT IS BASED ON SURVEY DATA COLLECTED BY STRAND.
3. CULVERT WALL THICKNESS AND LENGTH OF UPSTREAM EXTENSION WERE NOT MEASURED AND ARE ASSUMED VALUES.

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	EXISTING STRUCTURAL PLAN IL ROUTE 47 OVER SILVER CREEK TRIBUTARY	F.A. RTE. / SECTION / COUNTY: MCHENRY / TOTAL SHEETS / SHEET NO.
		DRAWN - SGL	REVISED -			CONTRACT NO.
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -			
	PLOT DATE = $DATE$	DATE - 07/2010	REVISED -		SCALE: N.T.S. / SHEET NO. __ OF __ SHEETS / STA. ____ TO STA. ____	ILLINOIS FED. AID PROJECT



UPSTREAM CULVERT OPENING

(LOOKING DOWNSTREAM)

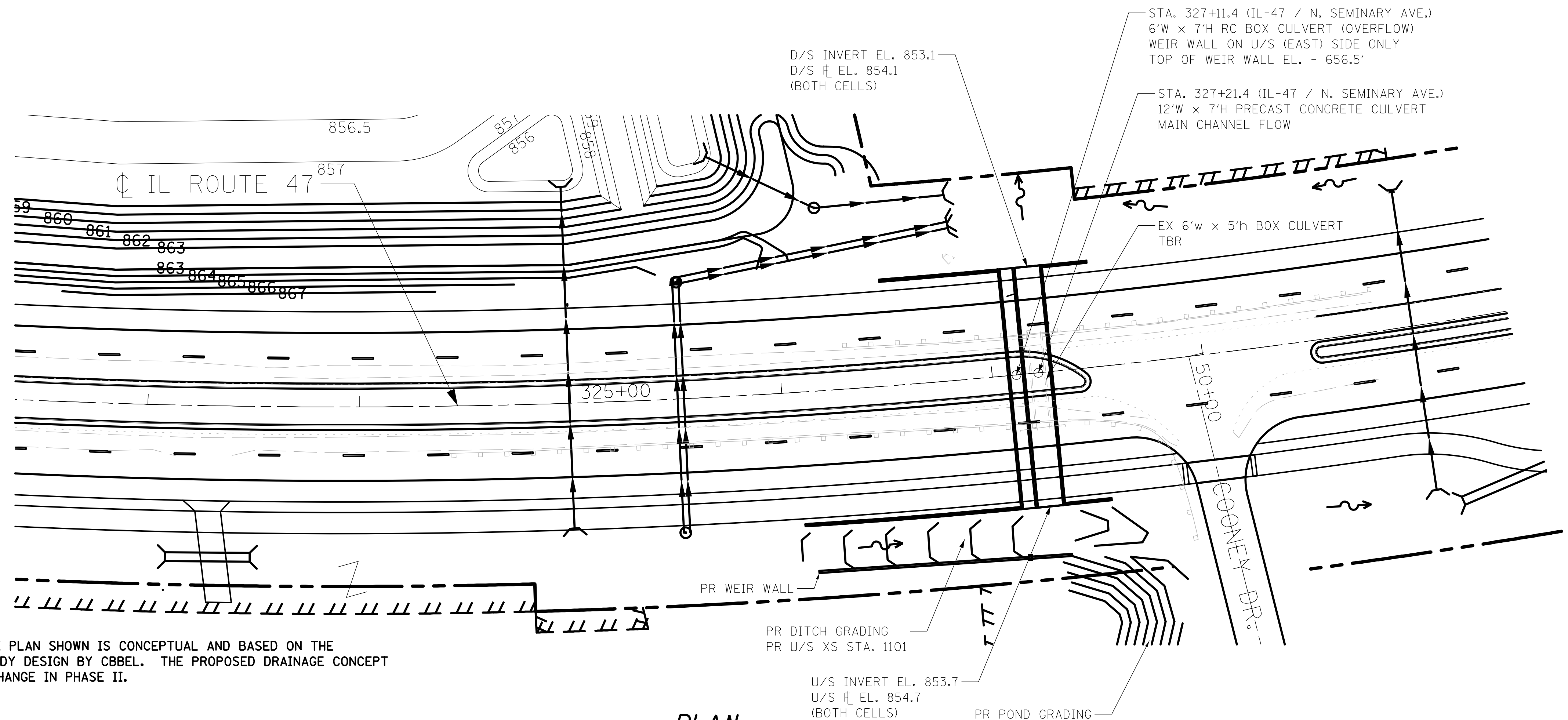


DOWNSTREAM CULVERT OPENING

(LOOKING DOWNSTREAM)

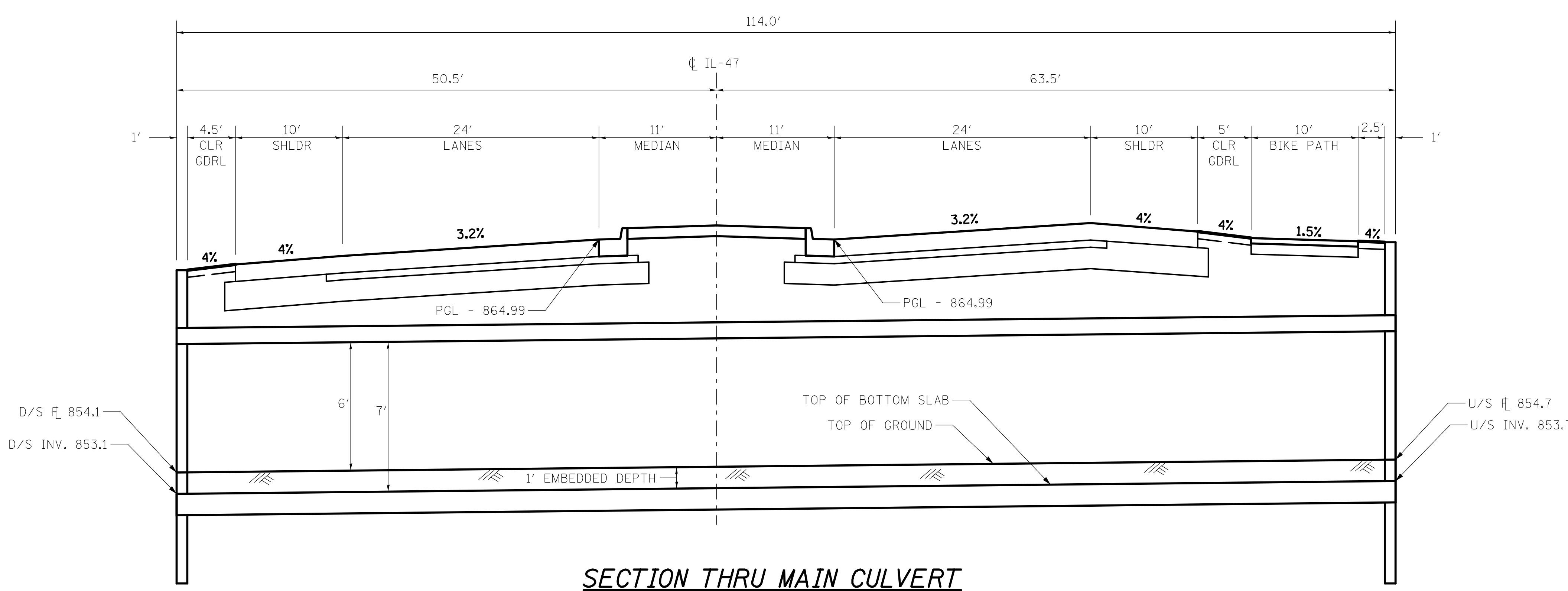
FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED - SGL 05/2018	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	EXISTING CONDITIONS ANALYSIS IL ROUTE 47 OVER SILVER CREEK TRIBUTARY
		DRAWN - SGL	REVISED -		
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -		
	PLOT DATE = $DATE$	DATE - 07/2010	REVISED -		SCALE: N.T.S. SHEET NO. __ OF __ SHEETS STA. ____ TO STA. ____

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		
		CONTRACT NO. ____		
	ILLINOIS FED. AID PROJECT			



THE PROPOSED DRAINAGE PLAN SHOWN IS CONCEPTUAL AND BASED ON THE LOCATION DRAINAGE STUDY DESIGN BY CBBEL. THE PROPOSED DRAINAGE CONCEPT MAY BE SUBJECT TO CHANGE IN PHASE II.

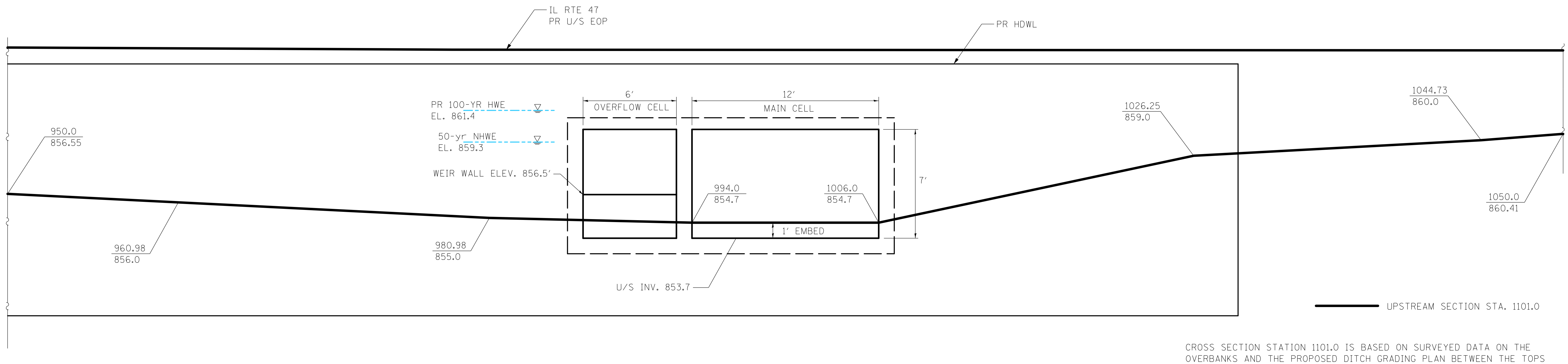
PLAN



SECTION THRU MAIN CULVERT

(LOOKING UPSTATION / NORTH)

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	PROPOSED CULVERT PLAN IL ROUTE 47 OVER SILVER CREEK TRIBUTARY	F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		DRAWN - SGL	REVISED -					MCHENRY		
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -			CONTRACT NO.				
	PLOT DATE = $DATE$	DATE - 11/2014	REVISED -		SCALE: N.T.S. SHEET NO. __ OF __ SHEETS STA. ___ TO STA. ___	ILLINOIS FED. AID PROJECT				

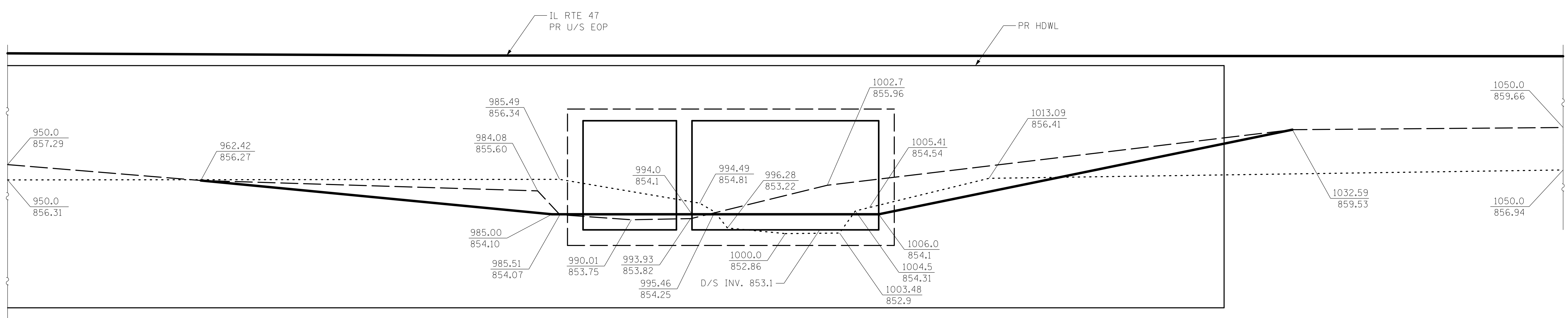


UPSTREAM SECTION STA. 1101.0

CROSS SECTION STATION 1101.0 IS BASED ON SURVEYED DATA ON THE OVERBANKS AND THE PROPOSED DITCH GRADING PLAN BETWEEN THE TOPS OF BANKS. STATION 1101.0 IS LOCATED 13.5' UPSTREAM OF THE PROPOSED UPSTREAM CULVERT FACE.

UPSTREAM CULVERT OPENING

(LOOKING DOWNSTREAM)



DOWNSTREAM CULVERT OPENING

(LOOKING DOWNSTEAM)

PR RE-GRADED DOWNSTREAM SECTION STA. 971.8
(PR 1.7' D/S FACE SECTION)

EXISTING DOWNSTREAM SECTION STA. 971.8
(EX 32' D/S SECTION)

NEXT DOWNSTREAM SECTION STA. 694.4

FILE NAME = $FILEL$	USER NAME = $USER$	DESIGNED - SGL	REVISED -
		DRAWN - SGL	REVISED -
	PLOT SCALE = $SCALE$	CHECKED - FML	REVISED -
	PLOT DATE = $DATE$	DATE - 07/2010	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

PROPOSED CONDITIONS ANALYSIS
IL ROUTE 47 OVER SILVER CREEK TRIBUTARY

SCALE: N.T.S. | SHEET NO. ___ OF ___ SHEETS | STA. ________ TO STA. ________

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
		MCHENRY		

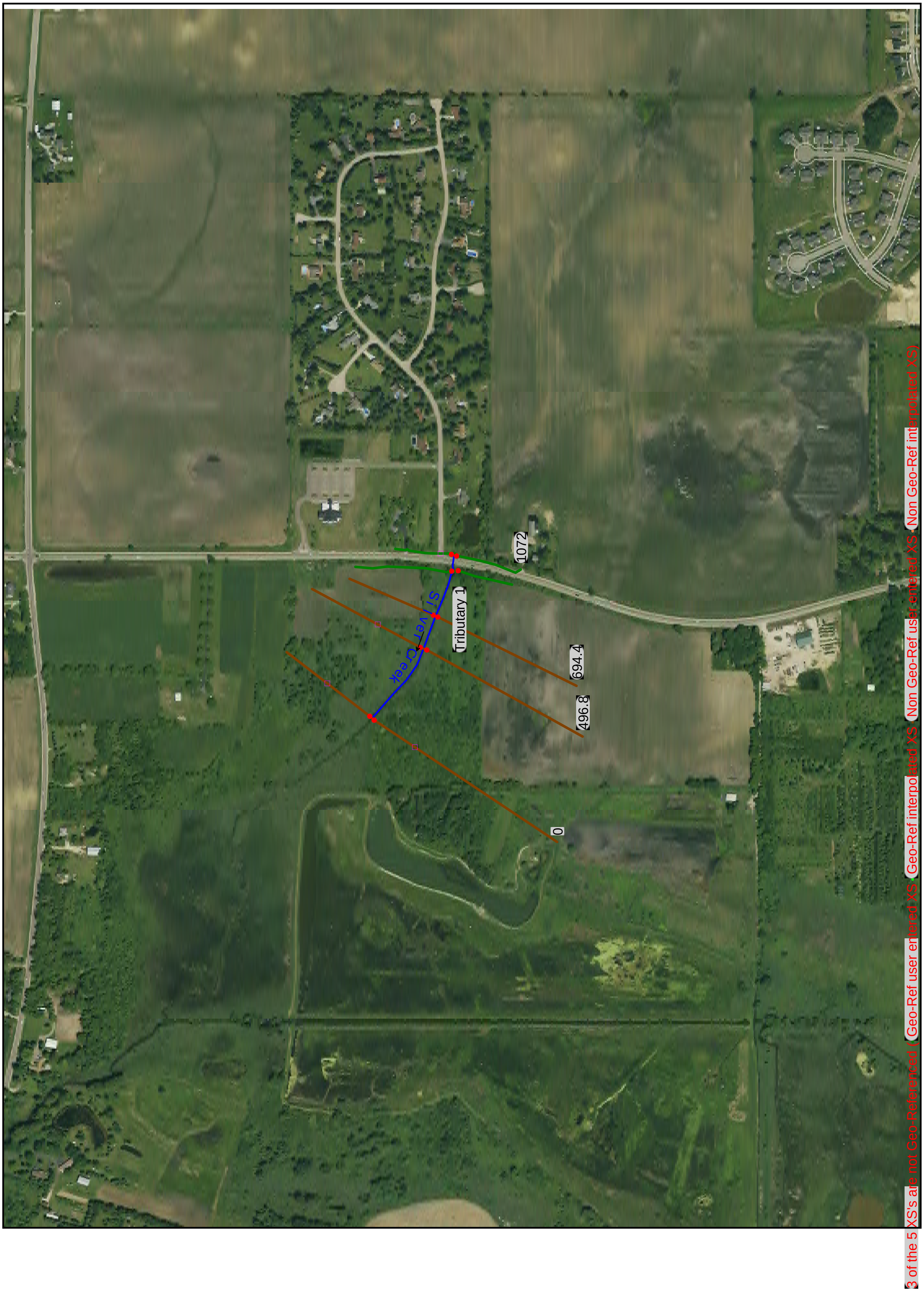
CONTRACT NO. ______

ILLINOIS FED. AID PROJECT

EXHIBIT H

NATURAL CONDITIONS HYDRAULIC MODEL AND RESULTS

Plan: Natural - Known WSE



```
                 HEC-RAS Version 4.1.0 Jan 2010
                  U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California


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

****

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:15:22 PM

Project in English units

****

PLAN DATA

Plan Title: Natural - Known WSE
Plan File : e:\0829\HECRAS\CooneyRd.p14

Geometry Title: Natural_Final_Cooney Rd.
Geometry File : e:\0829\HECRAS\CooneyRd.g07

Flow Title   : HECHMS-Clark-FIS WSE-Ex
Flow File   : e:\0829\HECRAS\CooneyRd.f08

```
Plan Summary Information:
Number of:  Cross Sections =    5    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:     Subcritical Flow
```

****

FLOW DATA

Flow Title: HECHMS-Clark-FIS WSE-Ex
Flow File : e:\0829\HECRAS\CooneyRd.f08

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Tributary 1	1072	201	478	686	925

Boundary Conditions

River	Reach	Profile	Upstream	Downstream

```
* Silver Creek    Tributary 1     10-yr           *                                    Known WS = 857.2 *
* Silver Creek    Tributary 1     50-yr           *                                    Known WS = 858.7 *
* Silver Creek    Tributary 1     100-yr          *                                      Known WS = 859 *
* Silver Creek    Tributary 1     500-yr          *                                      Known WS = 860 *
*****************************************************************************************************

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

GEOMETRY DATA

Geometry Title: Natural_Final_Cooney Rd.
Geometry File : e:\0829\HECRAS\CooneyRd.g07

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 1072

INPUT
Description: 22' Upstream
Station Elevation Data    num=      24
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
  598.78  868.36  633.34  866.37  755.84  865.14  855.96  863.01   956.7  859.99
  983.17  858.42  992.81  857.39    1000  855.05 1005.17  856.23 1010.63  859.92
 1024.83  862.33 1042.47   862.7 1071.73  862.97 1087.81  863.64 1099.22  863.45
 1107.52  862.99 1114.63  860.91 1171.68  862.02  1267.1  866.06 1281.57  866.93
  1290.6  866.75 1299.19  866.86  1324.1  868.36 1351.13  869.22

Manning's n Values        num=       7
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************************************************
  598.78     .06  983.17     .05 1024.83     .06 1071.73    .012 1099.22     .06
 1281.57    .012 1299.19     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        983.17 1024.83            100.2   100.2   100.2             .1       .3
Right Levee     Station= 1087.81      Elevation=  863.64

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 971.8

INPUT
Description: 32' Downstream
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
  645.58  867.47  764.37  865.84  863.46  864.36  962.42  856.27  984.08   855.6
  985.51  854.07   990.1  853.75  993.93  853.82  1002.7  855.96 1032.59  859.53
 1059.84  859.74 1157.98  860.02  1249.5  862.01 1371.74  865.21 1457.34  867.46
 1555.24  870.69

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*****************************************************************
  645.58     .06  962.42     .05  1002.7     .06 1157.98    .073

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42  1002.7            277.4   277.4   277.4             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 694.4

INPUT
Description: 300' Downstream
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
```

```
  105.17     866  238.53     864  388.99     862  451.01  860.98  493.29  860.67
  607.46  860.68  708.61  860.79   807.5  859.72  891.64  856.24  985.49  856.34
  994.49  854.81  995.46  854.25  996.28  853.22    1000  852.86 1003.48   852.9
  1004.5  854.31 1005.41  854.54 1013.09  856.41 1089.77  857.53 1155.17   858.5
 1236.29  859.31 1315.79  860.28 1395.83  861.69  1465.8   863.6 1532.86  865.91

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  105.17    .073  708.61     .06  985.49     .05 1013.09     .06 1089.77    .073

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        985.49 1013.09            197.6   197.6   197.6             .1       .3

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 496.8

INPUT
Description: 500'  Downstream
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  -26.92     866  101.38     864  285.29     862  359.29  861.93  509.63  861.36
  657.48  860.44  730.28  862.67  820.31  858.91  916.87  855.99   987.1  855.77
  992.89  854.16  994.73  854.02  997.05  852.28    1000  852.83 1004.04  853.24
 1006.02  854.02 1006.62  854.45  1026.6  856.75  1123.3  855.87 1219.62  855.85
  1301.9  857.14 1420.53  855.46 1536.85  858.71 1605.01     860    1664     862
 1725.66     864

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
  -26.92    .073  657.48     .06   987.1     .05  1026.6     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         987.1  1026.6            496.8   496.8   496.8             .1       .3
Right Levee     Station=  1301.9      Elevation=  857.14

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 0

INPUT
Description: 1000' Downstream
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
 -261.82     864 -220.23     862  165.38     860  241.76     860  371.12     858
  500.09  856.58  615.95  856.32  710.25  857.75  814.63  855.74  895.71  856.22
  988.07  854.79  990.93  853.34  991.34  852.85    1000  851.43 1008.12  852.05
 1008.73  853.18 1010.78  853.68 1021.28  855.54 1108.95  854.47 1229.31  854.71
 1326.81  858.84 1431.13  856.81 1574.66   861.5 1584.49     862 1617.98     864

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
 -261.82      .1  988.07     .05 1021.28     .06 1229.31      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        988.07 1021.28             .1       .3
Left Levee      Station=  710.25      Elevation=  857.75
Right Levee     Station= 1326.81      Elevation=  858.84

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

SUMMARY OF MANNING'S N VALUES

River:Silver Creek
**************************************************************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *   n4    *   n5    *   n6    *   n7    *
```

Tributary 1	1072	.06	.05	.06	.012	.06	.012	.06
Tributary 1	971.8	.06	.05	.06	.073			
Tributary 1	694.4	.073	.06	.05	.06	.073		
Tributary 1	496.8	.073	.06	.05	.06			
Tributary 1	0	.1	.05	.06	.1			

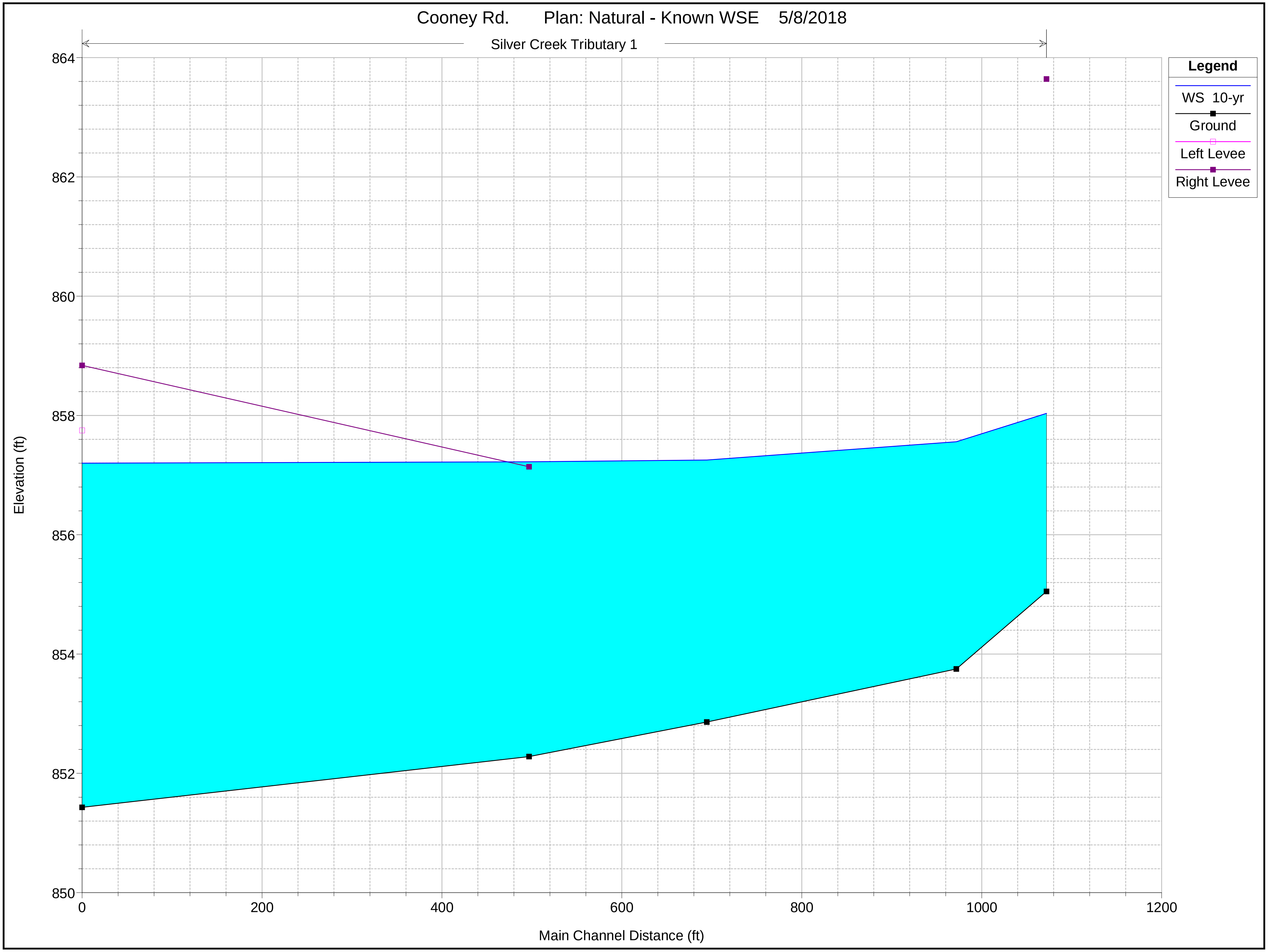
SUMMARY OF REACH LENGTHS

River: Silver Creek

Reach	River Sta.	Left	Channel	Right
Tributary 1	1072	100.2	100.2	100.2
Tributary 1	971.8	277.4	277.4	277.4
Tributary 1	694.4	197.6	197.6	197.6
Tributary 1	496.8	496.8	496.8	496.8
Tributary 1	0			

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

Reach	River Sta.	Contr.	Expan.
Tributary 1	1072	.1	.3
Tributary 1	971.8	.1	.3
Tributary 1	694.4	.1	.3
Tributary 1	496.8	.1	.3
Tributary 1	0	.1	.3


Cooney Rd. Plan: Natural - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 10-yr
Ground
Left Levee
Right Levee
Elevation (ft)
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

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U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:15:22 PM

Project in English units

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	10-yr	858.74	858.04	0.71	0.41	0.20		201.00		21.07
Tributary 1	971.8	10-yr	857.62	857.56	0.06	0.33	0.01	7.21	185.05	8.74	69.44
Tributary 1	694.4	10-yr	857.28	857.25	0.03	0.05	0.01	71.62	118.92	10.46	203.57
Tributary 1	496.8	10-yr	857.22	857.22	0.00	0.02	0.00	32.27	56.45	112.28	607.50
Tributary 1	0	10-yr	857.20	857.20	0.00			27.29	51.46	122.25	549.28

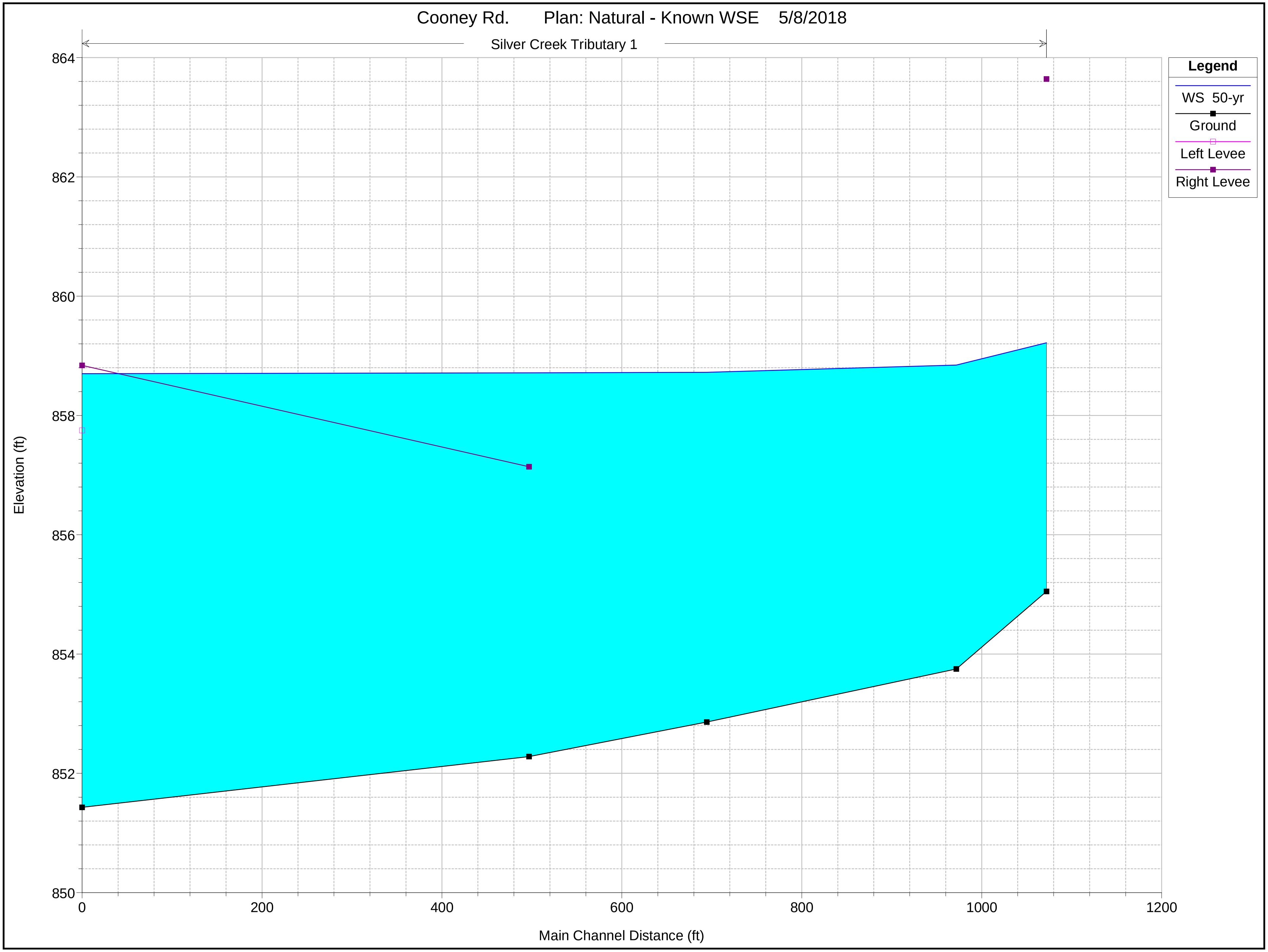
Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	10-yr	201.00	855.05	858.04	858.04	858.74	0.034745	6.75	29.79	21.07	1.00
Tributary 1	971.8	10-yr	201.00	853.75	857.56		857.62	0.001478	1.98	114.57	69.44	0.23
Tributary 1	694.4	10-yr	201.00	852.86	857.25		857.28	0.000959	1.66	198.39	203.57	0.18
Tributary 1	496.8	10-yr	201.00	852.28	857.22	855.18	857.22	0.000108	0.56	664.04	607.50	0.06
Tributary 1	0	10-yr	201.00	851.43	857.20	853.62	857.20	0.000026	0.38	1027.11	549.28	0.03

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural

River: Silver Creek Reach: Tributary 1 RS: 1072 Profile: 10-yr

```
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 10-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```


Cooney Rd.   Plan: Natural - Known WSE   5/8/2018
Silver Creek Tributary 1
Legend
WS 50-yr
Ground
Left Levee
Right Levee
Elevation (ft)
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

```
                HEC-RAS Version 4.1.0 Jan 2010
                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

****

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:15:22 PM

Project in English units

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	50-yr	860.16	859.22	0.94	0.39	0.25	11.53	466.47		39.89
Tributary 1	971.8	50-yr	858.94	858.85	0.09	0.18	0.02	46.08	389.33	42.60	95.93
Tributary 1	694.4	50-yr	858.74	858.72	0.01	0.02	0.00	221.48	152.87	103.65	345.93
Tributary 1	496.8	50-yr	858.72	858.71	0.00	0.01	0.00	81.36	75.28	321.36	710.27
Tributary 1	0	50-yr	858.70	858.70	0.00			146.13	78.20	253.66	997.66

Profile Output Table - Standard Table 1

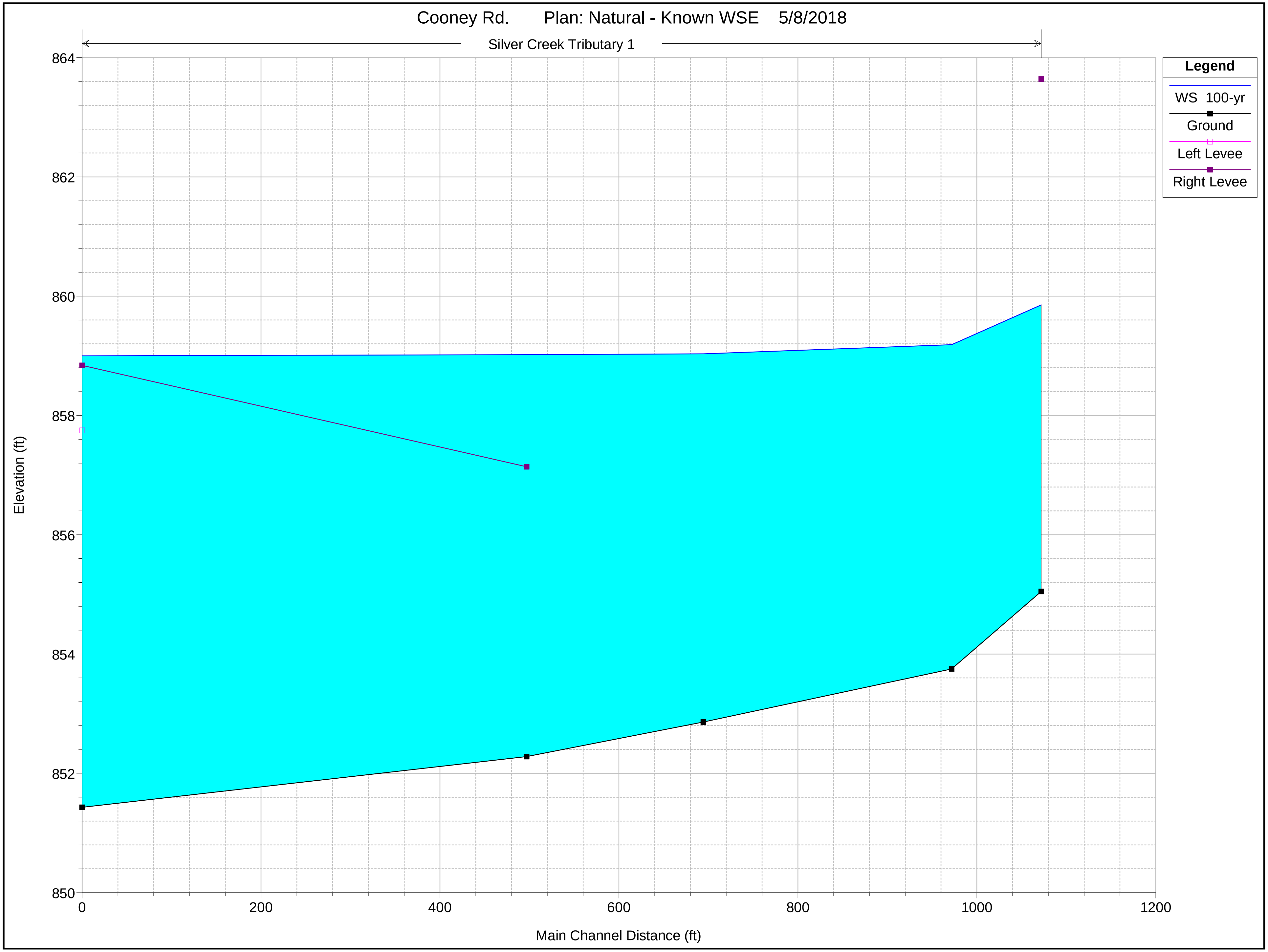
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	50-yr	478.00	855.05	859.22	859.22	860.16	0.025588	7.86	64.71	39.89	0.92
Tributary 1	971.8	50-yr	478.00	853.75	858.85		858.94	0.001509	2.68	220.89	95.93	0.25
Tributary 1	694.4	50-yr	478.00	852.86	858.72		858.74	0.000354	1.36	598.21	345.93	0.12
Tributary 1	496.8	50-yr	478.00	852.28	858.71	856.35	858.72	0.000041	0.47	1646.72	710.27	0.04
Tributary 1	0	50-yr	478.00	851.43	858.70	855.09	858.70	0.000021	0.42	2527.97	997.66	0.03

****

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural

River: Silver Creek Reach: Tributary 1   RS: 1072   Profile: 50-yr

```
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 50-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```



Cooney Rd.   Plan: Natural - Known WSE   5/8/2018
Silver Creek Tributary 1
Legend
WS 100-yr
Ground
Left Levee
Right Levee
Elevation (ft)
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

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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: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:15:22 PM

Project in English units

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	100-yr	860.86	859.85	1.01	0.50	0.26	50.38	635.62		51.53
Tributary 1	971.8	100-yr	859.34	859.19	0.15	0.24	0.04	76.75	540.66	68.59	102.99
Tributary 1	694.4	100-yr	859.05	859.03	0.02	0.03	0.01	319.32	200.47	166.21	384.43
Tributary 1	496.8	100-yr	859.02	859.02	0.00	0.02	0.00	119.43	101.57	465.00	735.56
Tributary 1	0	100-yr	859.00	859.00	0.00			218.92	103.05	364.03	1191.71

Profile Output Table - Standard Table 1

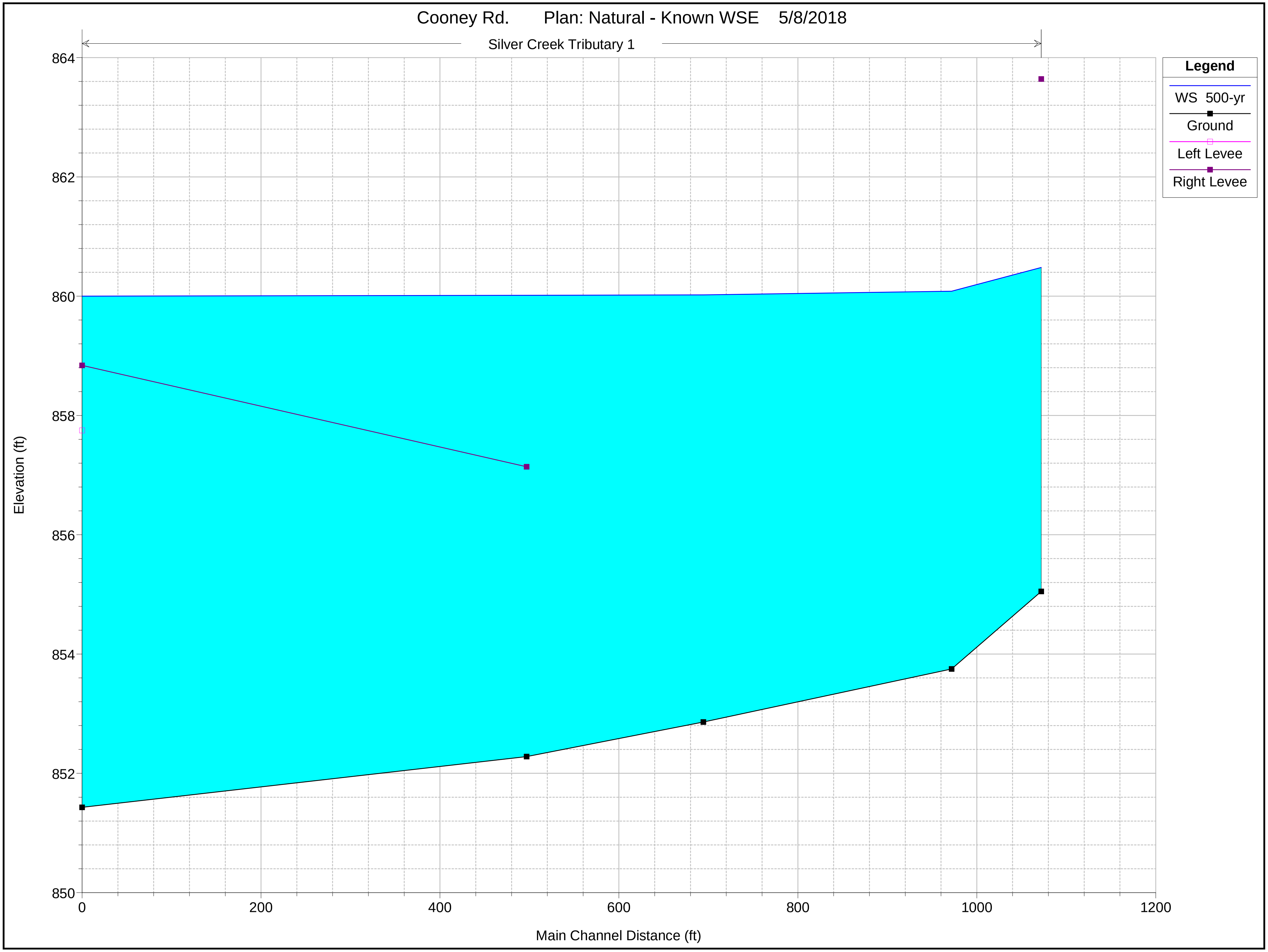
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	100-yr	686.00	855.05	859.85	859.85	860.86	0.021569	8.32	93.72	51.53	0.88
Tributary 1	971.8	100-yr	686.00	853.75	859.19		859.34	0.002152	3.39	254.93	102.99	0.30
Tributary 1	694.4	100-yr	686.00	852.86	859.03		859.05	0.000476	1.66	711.31	384.43	0.14
Tributary 1	496.8	100-yr	686.00	852.28	859.02	856.52	859.02	0.000059	0.59	1868.09	735.56	0.05
Tributary 1	0	100-yr	686.00	851.43	859.00	855.32	859.00	0.000031	0.52	3026.89	1191.71	0.04

****

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural

River: Silver Creek Reach: Tributary 1   RS: 1072   Profile: 100-yr

```
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 100-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```



Cooney Rd. Plan: Natural - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 500-yr
Ground
Left Levee
Right Levee
Elevation (ft)
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:15:22 PM

Project in English units

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	500-yr	861.48	860.48	1.00	0.43	0.25	120.79	804.21		73.61
Tributary 1	971.8	500-yr	860.24	860.08	0.16	0.16	0.04	144.26	699.18	81.57	245.14
Tributary 1	694.4	500-yr	860.04	860.02	0.01	0.02	0.00	409.71	217.20	298.09	515.07
Tributary 1	496.8	500-yr	860.02	860.01	0.00	0.01	0.00	172.46	116.95	635.58	811.54
Tributary 1	0	500-yr	860.00	860.00	0.00			334.06	114.75	476.19	1287.00

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	500-yr	925.00	855.05	860.48	860.48	861.48	0.019718	8.50	132.36	73.61	0.85
Tributary 1	971.8	500-yr	925.00	853.75	860.08		860.24	0.001821	3.58	386.56	245.14	0.29
Tributary 1	694.4	500-yr	925.00	852.86	860.02		860.04	0.000283	1.47	1150.89	515.07	0.11
Tributary 1	496.8	500-yr	925.00	852.28	860.01	856.68	860.02	0.000039	0.56	2637.04	811.54	0.04
Tributary 1	0	500-yr	925.00	851.43	860.00	855.50	860.00	0.000023	0.50	4266.25	1287.00	0.03

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Natural

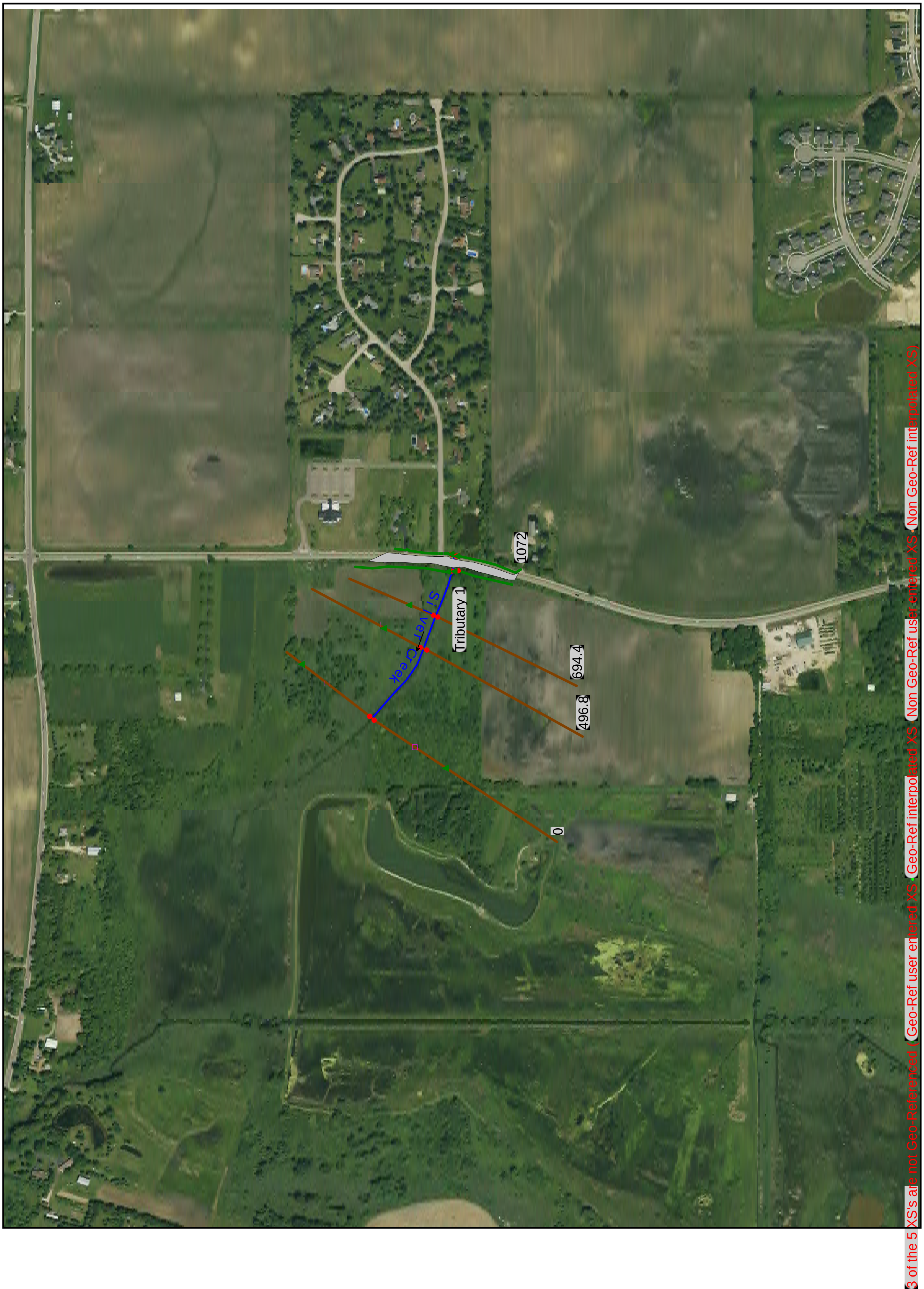
River: Silver Creek Reach: Tributary 1 RS: 1072 Profile: 500-yr

```
     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.
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 500-yr
     Warning:The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
             This may indicate the need for additional cross sections.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```

EXHIBIT I

EXISTING CONDITIONS HYDRAULIC MODEL AND RESULTS

Plan: Existing-Known WSE



```
                     HEC-RAS Version 4.1.0 Jan 2010
                      U.S. Army Corps of Engineers
                     Hydrologic Engineering Center
                           609 Second Street
                           Davis, California


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


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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:36:47 PM

Project in English units

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

PLAN DATA

Plan Title: Existing - Known WSE
Plan File : e:\0829\HECRAS\CooneyRd.p10

           Geometry Title: Existing_Final_Cooney Rd.
           Geometry File : e:\0829\HECRAS\CooneyRd.g03

           Flow Title    : HECHMS-Clark-FIS WSE-Ex
           Flow File     : e:\0829\HECRAS\CooneyRd.f08

Plan Summary Information:
Number of:  Cross Sections =    5    Multiple Openings  =    0
            Culverts       =    1    Inline Structures  =    0
            Bridges        =    0    Lateral Structures =    0

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

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


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

FLOW DATA

Flow Title: HECHMS-Clark-FIS WSE-Ex
Flow File : e:\0829\HECRAS\CooneyRd.f08

Flow Data (cfs)
*****************************************************************************************************************
* River           Reach           RS      *           10-yr           50-yr           100-yr           500-yr *
* Silver Creek    Tributary 1     1072    *             201             478              686              925 *
*****************************************************************************************************************

Boundary Conditions
************************************************************************************************************
* River           Reach           Profile         *            Upstream                  Downstream    *
************************************************************************************************************
```

```
* Silver Creek    Tributary 1     10-yr           *                                     Known WS = 857.2 *
* Silver Creek    Tributary 1     50-yr           *                                     Known WS = 858.7 *
* Silver Creek    Tributary 1     100-yr          *                                       Known WS = 859 *
* Silver Creek    Tributary 1     500-yr          *                                       Known WS = 860 *
****************************************************************************************************

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

GEOMETRY DATA

Geometry Title: Existing_Final_Cooney Rd.
Geometry File : e:\0829\HECRAS\CooneyRd.g03

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 1072

INPUT
Description: 21' Upstream
Station Elevation Data    num=      24
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
********************************************************************************
  598.78   868.36   633.34   866.37   755.84   865.14   855.96   863.01    956.7   859.99
  983.17   858.42   992.81   857.39     1000   855.05  1005.17   856.23  1010.63   859.92
 1024.83   862.33  1042.47    862.7  1071.73   862.97  1087.81   863.64  1099.22   863.45
 1107.52   862.99  1114.63   860.91  1171.68   862.02   1267.1   866.06  1281.57   866.93
  1290.6   866.75  1299.19   866.86   1324.1   868.36  1351.13   869.22

Manning's n Values        num=       7
     Sta    n Val      Sta    n Val      Sta    n Val      Sta    n Val      Sta    n Val
********************************************************************************
  598.78      .06   983.17      .05  1024.83      .06  1071.73     .012  1099.22      .06
 1281.57     .012  1299.19      .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        983.17 1024.83            100.2   100.2   100.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  598.78     976  864.47       F
    1024 1351.13  864.25       F
Right Levee     Station= 1087.81      Elevation=  863.64

CULVERT


RIVER: Silver Creek
REACH: Tributary 1        RS: 1026.1

INPUT
Description: Existing 6' x 5' Box Culvert under IL Route 47
Distance from Upstream XS =      21
Deck/Roadway Width        =    47.5
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
************************************************************************
  601.21  867.52     845  660.47  867.12     845  760.72  866.27     845
   860.2  865.25     845  960.22  864.57     845  997.28  864.34     845
 1073.26  864.05     845 1159.56  864.07     845 1258.14  866.18     845
 1273.79  866.52     845 1358.46  868.31     845    1458  870.87     845
 1558.07  873.39     845

Upstream Bridge Cross Section Data
Station Elevation Data    num=      31
     Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev      Sta     Elev
********************************************************************************
  598.78   868.36   633.34   866.37   755.84   865.14   855.96   863.01    989.3    860.5
  991.73   858.55   993.21   856.29   994.09   855.72      997   854.94   997.11   854.91
  999.84   855.01     1003   855.49  1003.29   855.53  1003.99   855.83  1004.92    856.3
 1007.55   858.05  1010.86    860.8  1024.83   862.33  1042.47    862.7  1071.73   862.97
 1087.81   863.64  1099.22   863.45  1107.52   862.99  1114.63   860.91  1171.68   862.02
  1267.1   866.06  1281.57   866.93   1290.6   866.75  1299.19   866.86   1324.1   868.36
```

```
 1351.13  869.22

Manning's n Values        num=       9
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  598.78     .06  991.73     .05     997    .013    1003     .05 1024.83     .06
 1071.73    .012 1099.22     .06 1281.57    .012 1299.19     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        989.3 1010.86             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  598.78     976  864.47       F
    1024 1351.13  864.25       F
Right Levee     Station= 1087.81      Elevation=  863.64

Downstream  Deck/Roadway Coordinates
    num=      13
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
  601.21  867.52     845  660.47  867.12     845  760.72  866.27     845
   860.2  865.25     845  960.22  864.57     845  997.28  864.34     845
 1073.26  864.05     845 1159.56  864.07     845 1258.14  866.18     845
 1273.79  866.52     845 1358.46  868.31     845    1458  870.87     845
 1558.07  873.39     845

Downstream Bridge Cross Section Data
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  645.58  867.47  764.37  865.84  863.46  864.36  986.59  860.88  994.26  856.56
  994.85  856.06  995.81  855.62  996.74  855.53     997  855.53 1000.09  855.53
 1002.91  855.46    1003   855.5  1004.4  856.14 1004.97  856.47 1012.76  861.31
  1249.5  862.01 1371.74  865.21 1457.34  867.46 1555.24  870.69

Manning's n Values        num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  645.58     .06  986.59     .05     997    .013    1003     .05 1012.76     .06
  1249.5    .073

Bank Sta: Left   Right    Coeff Contr.   Expan.
       986.59 1012.76             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  645.58     981     862       F
    1019 1555.24     862       F

Upstream Embankment side slope             =       0 horiz. to 1.0 vertical
Downstream Embankment side slope           =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
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       5       6
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
                 21    47.5     .013     .013        0                   .5                1
Upstream   Elevation =  855
           Centerline Station =  1000
Downstream Elevation =  855
           Centerline Station =  1000

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 971.8
```

INPUT
Description: 32' Downstream
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
645.58	867.47	764.37	865.84	863.46	864.36	962.42	856.27	984.08	855.6
985.51	854.07	990.1	853.75	993.93	853.82	1002.7	855.96	1032.59	859.53
1059.84	859.74	1157.98	860.02	1249.5	862.01	1371.74	865.21	1457.34	867.46
1555.24	870.69								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
645.58	.06	962.42	.05	1002.7	.06	1157.98	.073

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
962.42	1002.7	277.4	277.4	277.4	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
645.58	981	862	F
1019	1555.24	862	F

CROSS SECTION

RIVER: Silver Creek
REACH: Tributary 1 RS: 694.4

INPUT
Description: 300' Downstream
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
105.17	866	238.53	864	388.99	862	451.01	860.98	493.29	860.67
607.46	860.68	708.61	860.79	807.5	859.72	891.64	856.24	985.49	856.34
994.49	854.81	995.46	854.25	996.28	853.22	1000	852.86	1003.48	852.9
1004.5	854.31	1005.41	854.54	1013.09	856.41	1089.77	857.53	1155.17	858.5
1236.29	859.31	1315.79	860.28	1395.83	861.69	1465.8	863.6	1532.86	865.91

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
105.17	.073	708.61	.06	985.49	.05	1013.09	.06	1089.77	.073

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
985.49	1013.09	197.6	197.6	197.6	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
105.17	842	862	F
1158	1532.86	862	F

CROSS SECTION

RIVER: Silver Creek
REACH: Tributary 1 RS: 496.8

INPUT
Description: 500' Downstream
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-26.92	866	101.38	864	285.29	862	359.29	861.93	509.63	861.36
657.48	860.44	730.28	862.67	820.31	858.91	916.87	855.99	987.1	855.77
992.89	854.16	994.73	854.02	997.05	852.28	1000	852.83	1004.04	853.24
1006.02	854.02	1006.62	854.45	1026.6	856.75	1123.3	855.87	1219.62	855.85
1301.9	857.14	1420.53	855.46	1536.85	858.71	1605.01	860	1664	862
1725.66	864								

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-26.92	.073	657.48	.06	987.1	.05	1026.6	.06

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
987.1	1026.6	496.8	496.8	496.8	.3	.5

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
1256	1725.66	862	F

Right Levee Station= 1301.9 Elevation= 857.14

CROSS SECTION

RIVER: Silver Creek
REACH: Tributary 1 RS: 0

INPUT
Description: 1000' Downstream
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-261.82	864	-220.23	862	165.38	860	241.76	860	371.12	858
500.09	856.58	615.95	856.32	710.25	857.75	814.63	855.74	895.71	856.22
988.07	854.79	990.93	853.34	991.34	852.85	1000	851.43	1008.12	852.05
1008.73	853.18	1010.78	853.68	1021.28	855.54	1108.95	854.47	1229.31	854.71
1326.81	858.84	1431.13	856.81	1574.66	861.5	1584.49	862	1617.98	864

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
-261.82	.1	988.07	.05	1021.28	.06	1229.31	.1

Bank Sta: Left	Right	Coeff Contr.	Expan.
988.07	1021.28	.1	.3

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
-261.82	495	862	F
1505	1617.98	862	F

Left Levee Station= 710.25 Elevation= 857.75
Right Levee Station= 1326.81 Elevation= 858.84

****

SUMMARY OF MANNING'S N VALUES

River:Silver Creek

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7
Tributary 1	1072	.06	.05	.06	.012	.06	.012	.06
Tributary 1	1026.1	Culvert						
Tributary 1	971.8	.06	.05	.06	.073			
Tributary 1	694.4	.073	.06	.05	.06	.073		
Tributary 1	496.8	.073	.06	.05	.06			
Tributary 1	0	.1	.05	.06	.1			

****

SUMMARY OF REACH LENGTHS

River: Silver Creek

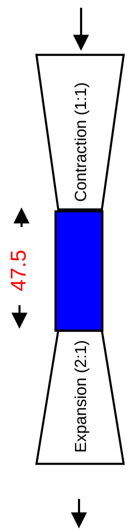
Reach	River Sta.	Left	Channel	Right
Tributary 1	1072	100.2	100.2	100.2
Tributary 1	1026.1	Culvert		
Tributary 1	971.8	277.4	277.4	277.4
Tributary 1	694.4	197.6	197.6	197.6
Tributary 1	496.8	496.8	496.8	496.8
Tributary 1	0			

****

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

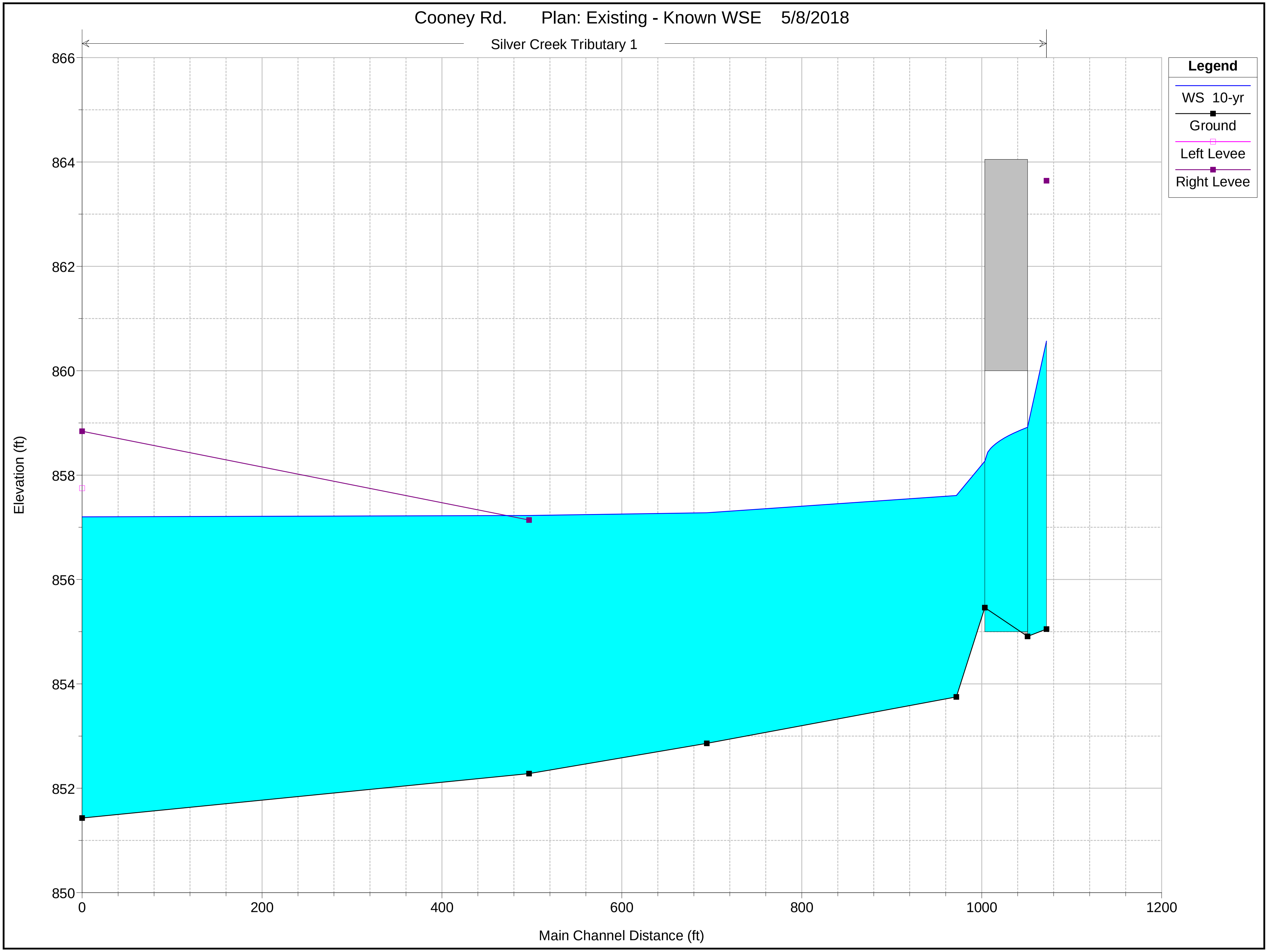
Reach	River Sta.	Contr.	Expan.
Tributary 1	1072	.3	.5
Tributary 1	1026.1	Culvert	
Tributary 1	971.8	.3	.5
Tributary 1	694.4	.3	.5
Tributary 1	496.8	.3	.5
Tributary 1	0	.1	.3

INEFFECTIVE AREA OFFSET CALCS
EXISTING CONDITIONS



IL-47 at Cooney Rd. (Existing)

R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
1072.0	21.0	1000	**976.0**	**1024.0**	100.2	997	1003		1072.0
1051.0		1000.0	**997.0**	**1003.0**	21.0	997.0	1003.0		1051.0
1027.3									1027.3
1003.5		1000.0	**997.0**	**1003.0**	32.0	997.0	1003.0		1003.5
971.8	15.9	1000	**981.0**	**1019.0**	277.4	997	1003		971.8
694.4	154.6	1000	**842.0**	**1158.0**	197.6	997	1003		694.4
496.8	253.4	1000	**744.0**	**1256.0**	496.8	997	1003		496.8
0.0	501.8	1000	**495.0**	**1505.0**	0.0	997	1003		0.0



Cooney Rd.   Plan: Existing - Known WSE   5/8/2018
Silver Creek Tributary 1
Legend
WS 10-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

```
                 HEC-RAS Version 4.1.0 Jan 2010
                  U.S. Army Corps of Engineers
                 Hydrologic Engineering Center
                       609 Second Street
                       Davis, California

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

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:36:47 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	10-yr	201.00	855.05	860.57	858.04	860.62	0.000965	1.90	111.10	76.99	0.19
Tributary 1	1026.1		Culvert									
Tributary 1	971.8	10-yr	201.00	853.75	857.61	855.98	857.73	0.002295	2.89	76.84	70.45	0.29
Tributary 1	694.4	10-yr	201.00	852.86	857.28	855.63	857.31	0.000901	1.62	203.76	206.00	0.18
Tributary 1	496.8	10-yr	201.00	852.28	857.23	855.18	857.23	0.000167	0.70	479.74	607.68	0.08
Tributary 1	0	10-yr	201.00	851.43	857.20	853.62	857.20	0.000026	0.38	1027.11	549.28	0.03

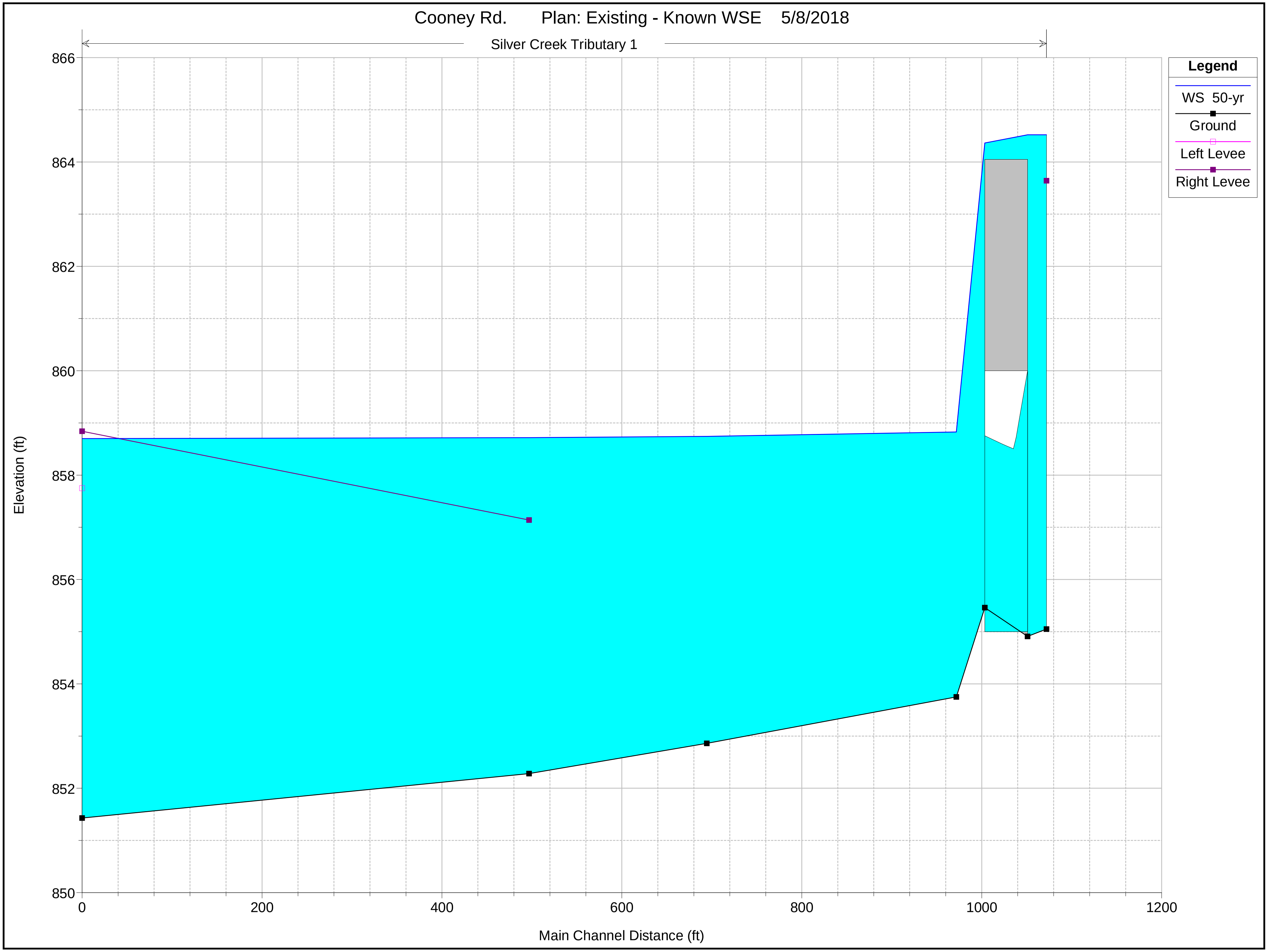
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	10-yr	860.62	860.57	0.05			16.55	184.45		76.99
Tributary 1	1026.1		Culvert								
Tributary 1	971.8	10-yr	857.73	857.61	0.12	0.38	0.05		189.19	11.81	70.45
Tributary 1	694.4	10-yr	857.31	857.28	0.03	0.06	0.01	72.73	117.26	11.00	206.00
Tributary 1	496.8	10-yr	857.23	857.23	0.00	0.03	0.00	40.30	70.36	90.34	607.68
Tributary 1	0	10-yr	857.20	857.20	0.00			27.29	51.46	122.25	549.28

****

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Existing-FIS

```
River: Silver Creek  Reach: Tributary 1     RS: 1072     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```



Cooney Rd. Plan: Existing - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 50-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:36:47 PM

Project in English units

Profile Output Table - Standard Table 1

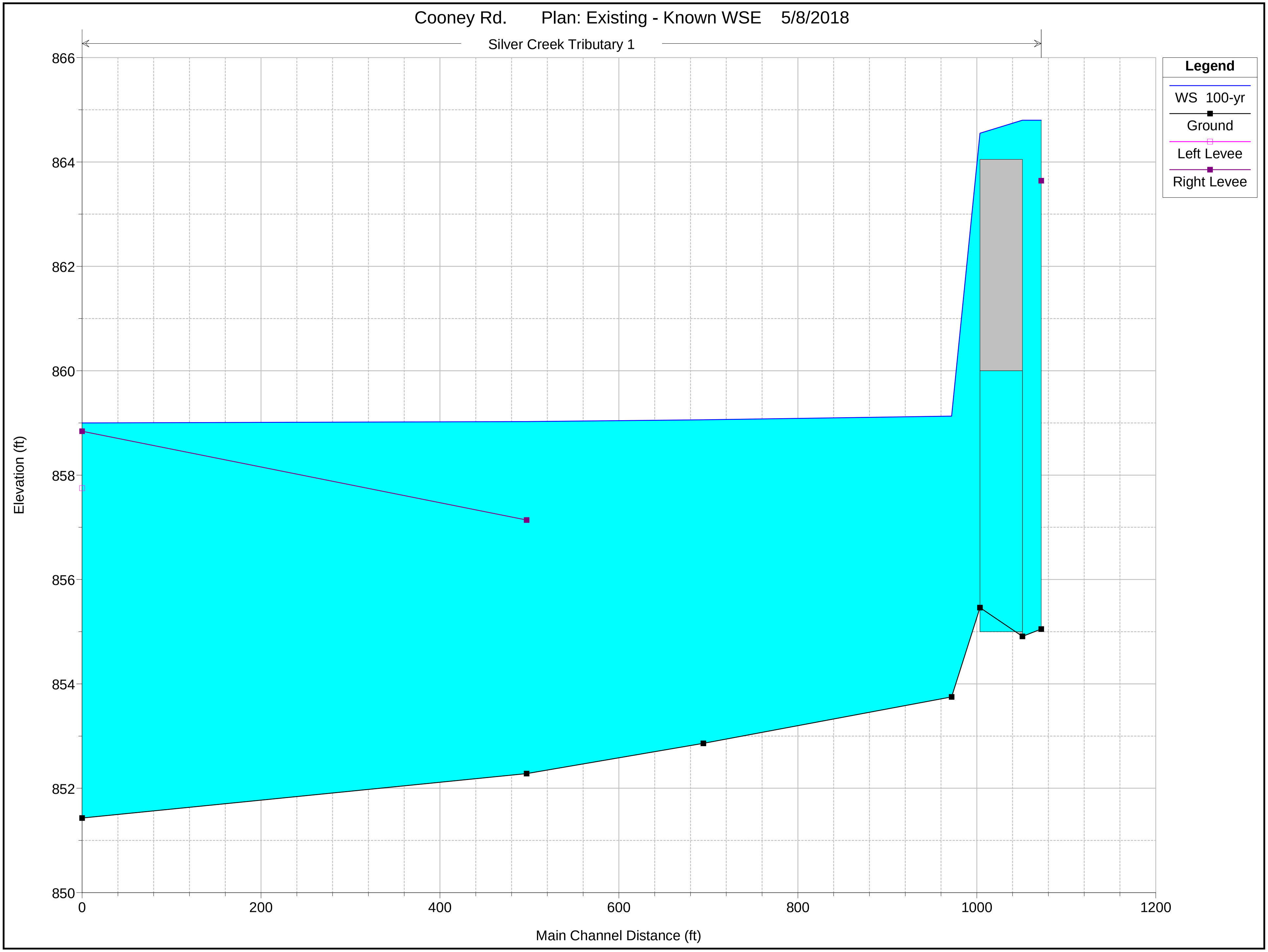
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	50-yr	478.00	855.05	864.52	859.20	864.52	0.000053	0.70	1143.57	445.71	0.05
Tributary 1	1026.1		Culvert									
Tributary 1	971.8	50-yr	478.00	853.75	858.83	857.12	859.10	0.003473	4.46	122.72	95.53	0.38
Tributary 1	694.4	50-yr	478.00	852.86	858.74	856.89	858.76	0.000331	1.32	599.88	348.22	0.12
Tributary 1	496.8	50-yr	478.00	852.28	858.72	856.35	858.72	0.000082	0.67	1083.73	710.59	0.06
Tributary 1	0	50-yr	478.00	851.43	858.70	855.09	858.70	0.000022	0.43	2340.93	997.66	0.03

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	50-yr	864.52	864.52	0.00			166.49	176.95	134.57	445.71
Tributary 1	1026.1		Culvert								
Tributary 1	971.8	50-yr	859.10	858.83	0.28	0.21	0.13		409.46	68.54	95.53
Tributary 1	694.4	50-yr	858.76	858.74	0.01	0.03	0.01	225.12	149.09	103.79	348.22
Tributary 1	496.8	50-yr	858.72	858.72	0.00	0.02	0.00	114.99	106.30	256.71	710.59
Tributary 1	0	50-yr	858.70	858.70	0.00			140.62	79.50	257.88	997.66

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Existing-FIS

```
River: Silver Creek  Reach: Tributary 1     RS: 1072     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 1026.1     Profile: 50-yr     Culv: Culvert #1
     Note:   The flow in the culvert is entirely supercritical.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```



Cooney Rd. Plan: Existing - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 100-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

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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: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:36:47 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	100-yr	686.00	855.05	864.80	859.74	864.81	0.000082	0.90	1271.81	465.59	0.06
Tributary 1	1026.1		Culvert									
Tributary 1	971.8	100-yr	686.00	853.75	859.13	857.79	859.60	0.005454	5.85	134.26	101.79	0.48
Tributary 1	694.4	100-yr	686.00	852.86	859.06	857.14	859.08	0.000437	1.60	700.21	387.69	0.13
Tributary 1	496.8	100-yr	686.00	852.28	859.03	856.52	859.03	0.000118	0.84	1217.44	735.99	0.07
Tributary 1	0	100-yr	686.00	851.43	859.00	855.32	859.00	0.000032	0.54	2786.19	1191.71	0.04

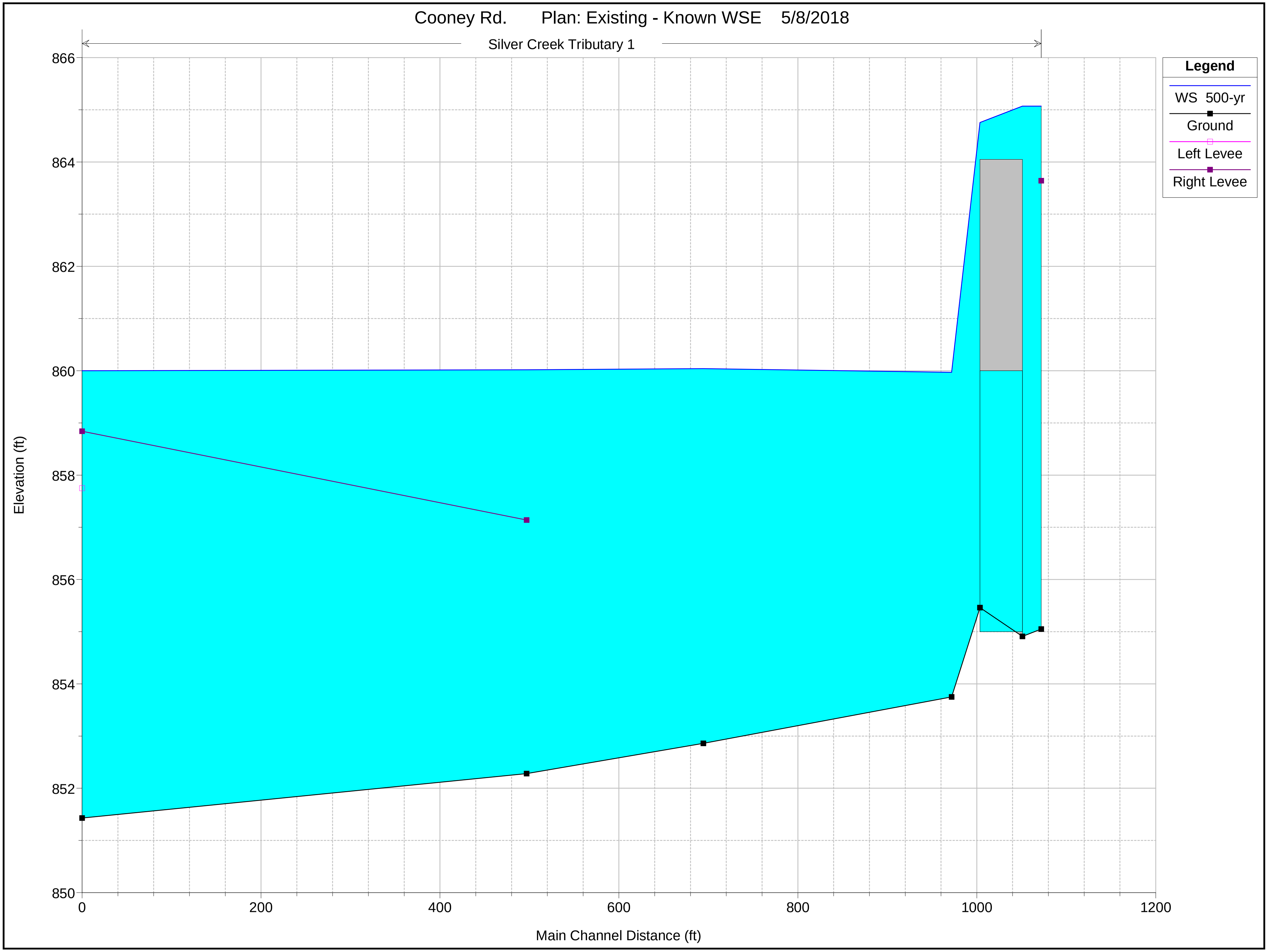
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	100-yr	864.81	864.80	0.01			237.47	236.81	211.71	465.59
Tributary 1	1026.1		Culvert								
Tributary 1	971.8	100-yr	859.60	859.13	0.47	0.29	0.22		575.93	110.07	101.79
Tributary 1	694.4	100-yr	859.08	859.06	0.02	0.04	0.01	326.39	193.98	165.64	387.69
Tributary 1	496.8	100-yr	859.03	859.03	0.01	0.03	0.00	170.16	144.48	371.36	735.99
Tributary 1	0	100-yr	859.00	859.00	0.00			208.90	105.26	371.84	1191.71

****

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Existing-FIS

```
River: Silver Creek  Reach: Tributary 1     RS: 1072     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 1026.1     Profile: 100-yr     Culv: Culvert #1
     Note:   Culvert critical depth exceeds the height of the culvert.
     Note:   During the supercritical calculations a hydraulic jump occurred inside of the culvert.
     Note:   The culvert inlet is submerged and the culvert flows full over part or all of its length.  Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded.  The outlet answer will be used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```



Cooney Rd. Plan: Existing - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 500-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
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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: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 1:36:47 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1072	500-yr	925.00	855.05	865.07	860.33	865.08	0.000114	1.09	1399.63	484.59	0.07
Tributary 1	1026.1		Culvert									
Tributary 1	971.8	500-yr	925.00	853.75	859.97	858.41	860.51	0.005136	6.36	166.18	223.06	0.48
Tributary 1	694.4	500-yr	925.00	852.86	860.04	857.36	860.06	0.000262	1.42	1010.15	518.19	0.11
Tributary 1	496.8	500-yr	925.00	852.28	860.02	856.67	860.02	0.000083	0.81	1664.49	811.78	0.06
Tributary 1	0	500-yr	925.00	851.43	860.00	855.50	860.00	0.000025	0.52	3795.43	1287.00	0.03

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1072	500-yr	865.08	865.07	0.01			318.91	299.80	306.29	484.59
Tributary 1	1026.1		Culvert								
Tributary 1	971.8	500-yr	860.51	859.97	0.55	0.19	0.26		741.73	183.27	223.06
Tributary 1	694.4	500-yr	860.06	860.04	0.02	0.03	0.01	444.33	209.99	270.68	518.19
Tributary 1	496.8	500-yr	860.02	860.02	0.01	0.02	0.00	250.92	170.01	504.07	811.78
Tributary 1	0	500-yr	860.00	860.00	0.00			310.72	118.70	495.58	1287.00

ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Existing-FIS

```
River: Silver Creek  Reach: Tributary 1     RS: 1072     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 1026.1     Profile: 500-yr     Culv: Culvert #1
     Note:   Culvert critical depth exceeds the height of the culvert.
     Note:   During the supercritical calculations a hydraulic jump occurred inside of the culvert.
     Note:   The culvert inlet is submerged and the culvert flows full over part or all of its length.  Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded.  The outlet answer will be used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```

EXHIBIT J

PROPOSED CONDITIONS HYDRAULIC MODEL AND RESULTS

Plan: Proposed-Known WSE

3 of the 6 XS's are not Geo-Referenced (Geo-Ref user entered XS , Geo-Ref interpolated XS , Non Geo-Ref user entered XS , Non Geo-Ref interpolated XS)

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```
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: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 4:00:31 PM

Project in English units

****

PLAN DATA

Plan Title: Proposed - Known WSE
Plan File : e:\0829\HECRAS\CooneyRd.p13

Geometry Title: Proposed_Final_Cooney Rd.
Geometry File : e:\0829\HECRAS\CooneyRd.g05

Flow Title   : HECHMS-Clark-FIS WSE-PR
Flow File   : e:\0829\HECRAS\CooneyRd.f09

Plan Summary Information:

Number of:					
	Cross Sections	= 6	Multiple Openings	=	0
	Culverts	= 1	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

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

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

****

FLOW DATA

Flow Title: HECHMS-Clark-FIS WSE-PR
Flow File : e:\0829\HECRAS\CooneyRd.f09

Flow Data (cfs)

River	Reach	RS	10-yr	50-yr	100-yr	500-yr
Silver Creek	Tributary 1	1101	201	478	686	925

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Silver Creek	Tributary 1	10-yr		Known WS = 857.2
Silver Creek	Tributary 1	50-yr		Known WS = 858.7
Silver Creek	Tributary 1	100-yr		Known WS = 859
Silver Creek	Tributary 1	500-yr		Known WS = 860

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

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

GEOMETRY DATA

Geometry Title: Proposed_Final_Cooney Rd.
Geometry File : e:\0829\HECRAS\CooneyRd.g05

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 1101

INPUT
Description: 13.5' Upstream
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
  658.84  868.87  791.35  865.85  802.75  865.64  814.35  865.26  837.86  863.56
  880.95     860  900.98     859  920.98     858  940.98     857  960.98     856
  980.98     855     994   854.7    1000   854.7    1006   854.7 1026.25     859
 1044.73     860 1063.47  861.47 1074.03  862.75 1085.28  863.26 1097.29  862.75
 1148.92   863.2 1192.22  864.81 1267.89  867.04

Manning's n Values        num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************************************************
  658.84     .06  791.35      .1  814.35     .06  880.95     .05 1074.03    .012
 1097.29     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        880.95 1026.25            129.2   129.2   129.2             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  658.84     974   865.8       F
    1020 1267.89   865.7       F
Right Levee     Station= 1085.28      Elevation=  863.26

CULVERT


RIVER: Silver Creek
REACH: Tributary 1        RS: 1030.5

INPUT
Description: Proposed 12'w x 6'h Precast box Culvert under IL Route 47
Distance from Upstream XS =    13.5
Deck/Roadway Width        =     114
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=      11
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
***********************************************************************
   578.6  867.82           678.6  867.32           778.6  866.82
   878.6  866.32           978.6  865.83          1078.6  865.76
  1178.6  866.23          1278.6  867.36          1378.6  869.46
  1478.6  871.82          1578.6   873.6

Upstream Bridge Cross Section Data
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*******************************************************************************
  658.84  868.87  791.35  865.85  802.75  865.64  814.35  865.26  837.86  863.56
  880.95     860  900.98     859  920.98     858  940.98     857  960.98     856
  980.98     855     994   854.7    1000   854.7    1006   854.7 1026.25     859
 1044.73     860 1063.47  861.47 1074.03  862.75 1085.28  863.26 1097.29  862.75
 1148.92   863.2 1192.22  864.81 1267.89  867.04

Manning's n Values        num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*******************************************************************************
  658.84     .06  791.35      .1  814.35     .06  880.95     .05 1074.03    .012
 1097.29     .06

Bank Sta: Left   Right    Coeff Contr.   Expan.
        880.95 1026.25             .3       .5
Ineffective Flow     num=       2
```

Sta L	Sta R	Elev	Permanent
658.84	974	865.8	F
1020	1267.89	865.7	F

Right Levee Station= 1085.28 Elevation= 863.26

Downstream Deck/Roadway Coordinates
num= 11

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
578.6	866.28		678.6	865.78		778.6	865.28	
878.6	864.78		978.6	864.29		1078.6	864.23	
1178.6	864.7		1278.6	865.83		1378.6	867.92	
1478.6	870.46		1578.6	873.11				

Downstream Bridge Cross Section Data
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
645.58	867.47	764.37	865.84	863.46	864.36	962.42	856.27	985	854.1
994	854.1	1006	854.1	1032.59	859.53	1059.84	859.74	1157.98	860.02
1249.5	862.01	1371.74	865.21	1457.34	867.46	1555.24	870.69		

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
645.58	.06	962.42	.05	1032.59	.06	1157.98	.073

Bank Sta: Left	Right	Coeff Contr.	Expan.
962.42	1032.59	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
645.58	986	862	F
1007	1555.24	862	F

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

Number of Culverts = 2

Culvert Name	Shape	Rise	Span
Culvert #2	Box	7	6

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
13.5	114	.013	.035	2.8	.5	1

Upstream Elevation = 853.7
Centerline Station = 990
Downstream Elevation = 853.1
Centerline Station = 990

Culvert Name	Shape	Rise	Span
Culvert #1	Box	7	12

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
13.5	114	.013	.035	1	.5	1

Upstream Elevation = 853.7
Centerline Station = 1000
Downstream Elevation = 853.1
Centerline Station = 1000

CROSS SECTION

RIVER: Silver Creek
REACH: Tributary 1 RS: 971.8

INPUT
Description: 2' Downstream PR CULV FACE (Regraded)
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
  645.58  867.47  764.37  865.84  863.46  864.36  962.42  856.27     985   854.1
     994   854.1    1006   854.1 1032.59  859.53 1059.84  859.74 1157.98  860.02
  1249.5  862.01 1371.74  865.21 1457.34  867.46 1555.24  870.69

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
  645.58     .06  962.42     .05 1032.59     .06 1157.98    .073

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42 1032.59                10      10      10              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  645.58     986     862       F
    1007 1555.24     862       F

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 961.8

INPUT
Description: 12' Downstream PR CULV FACE (Regraded)
Station Elevation Data    num=      14
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  645.58  867.47  764.37  865.84  863.46  864.36  962.42  856.27     985     854
     994     854    1006     854 1032.59  859.53 1059.84  859.74 1157.98  860.02
  1249.5  862.01 1371.74  865.21 1457.34  867.46 1555.24  870.69

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
  645.58     .06  962.42     .05 1032.59     .06 1157.98    .073

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        962.42 1032.59             267.4   267.4   267.4              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  645.58     981     862       F
    1012 1555.24     862       F

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 694.4

INPUT
Description: 300' Downstream
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  105.17     866  238.53     864  388.99     862  451.01  860.98  493.29  860.67
  607.46  860.68  708.61  860.79   807.5  859.72  891.64  856.24  985.49  856.34
  994.49  854.81  995.46  854.25  996.28  853.22    1000  852.86 1003.48   852.9
  1004.5  854.31 1005.41  854.54 1013.09  856.41 1089.77  857.53 1155.17   858.5
 1236.29  859.31 1315.79  860.28 1395.83  861.69  1465.8   863.6 1532.86  865.91

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
********************************************************************************
  105.17    .073  708.61     .06  985.49     .05 1013.09     .06 1089.77    .073

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        985.49 1013.09             197.6   197.6   197.6              .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
  105.17     847     862       F
    1146 1532.86     862       F

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 496.8

INPUT
```

```
Description: 500'  Downstream
Station Elevation Data    num=      26
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
  -26.92     866  101.38     864  285.29     862  359.29  861.93  509.63  861.36
  657.48  860.44  730.28  862.67  820.31  858.91  916.87  855.99   987.1  855.77
  992.89  854.16  994.73  854.02  997.05  852.28    1000  852.83 1004.04  853.24
 1006.02  854.02 1006.62  854.45  1026.6  856.75  1123.3  855.87 1219.62  855.85
  1301.9  857.14 1420.53  855.46 1536.85  858.71 1605.01     860    1664     862
 1725.66     864

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
  -26.92    .073  657.48     .06   987.1     .05  1026.6     .06

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         987.1  1026.6            496.8   496.8   496.8             .3       .5
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
    1244 1725.66     862       F
Right Levee     Station=  1301.9      Elevation=  857.14

CROSS SECTION


RIVER: Silver Creek
REACH: Tributary 1        RS: 0

INPUT
Description: 1000' Downstream
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
********************************************************************************
 -261.82     864 -220.23     862  165.38     860  241.76     860  371.12     858
  500.09  856.58  615.95  856.32  710.25  857.75  814.63  855.74  895.71  856.22
  988.07  854.79  990.93  853.34  991.34  852.85    1000  851.43 1008.12  852.05
 1008.73  853.18 1010.78  853.68 1021.28  855.54 1108.95  854.47 1229.31  854.71
 1326.81  858.84 1431.13  856.81 1574.66   861.5 1584.49     862 1617.98     864

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
****************************************************************
 -261.82      .1  988.07     .05 1021.28     .06 1229.31      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
        988.07 1021.28             .1       .3
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
 -261.82     500     862       F
    1493 1617.98     862       F
Left Levee      Station=  710.25      Elevation=  857.75
Right Levee     Station= 1326.81      Elevation=  858.84

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

SUMMARY OF MANNING'S N VALUES

River:Silver Creek
*******************************************************************************************
*     Reach      *   River Sta.   *   n1    *   n2    *   n3    *   n4    *   n5    *   n6    *
*******************************************************************************************
*Tributary 1     *    1101        *      .06*      .1*      .06*      .05*     .012*      .06*
*Tributary 1     *    1030.5      *Culvert  *        *        *        *        *
*Tributary 1     *    971.8       *      .06*     .05*      .06*     .073*        *        *
*Tributary 1     *    961.8       *      .06*     .05*      .06*     .073*        *        *
*Tributary 1     *    694.4       *     .073*     .06*      .05*      .06*     .073*        *
*Tributary 1     *    496.8       *     .073*     .06*      .05*      .06*        *        *
*Tributary 1     *    0           *       .1*     .05*      .06*       .1*        *        *
*******************************************************************************************

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

SUMMARY OF REACH LENGTHS

River: Silver Creek
*****************************************************************
*     Reach      *   River Sta.   *  Left   * Channel *  Right  *
*****************************************************************
```

```
*Tributary 1     *    1101        *    129.2*    129.2*    129.2*
*Tributary 1     *    1030.5      *Culvert  *         *         *
*Tributary 1     *    971.8       *       10*       10*       10*
*Tributary 1     *    961.8       *    267.4*    267.4*    267.4*
*Tributary 1     *    694.4       *    197.6*    197.6*    197.6*
*Tributary 1     *    496.8       *    496.8*    496.8*    496.8*
*Tributary 1     *    0           *         *         *         *
*****************************************************************

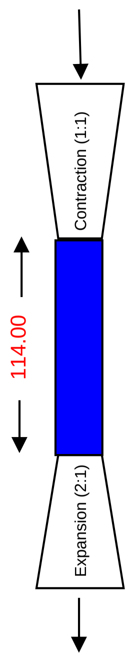
********************************************************************************

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Silver Creek

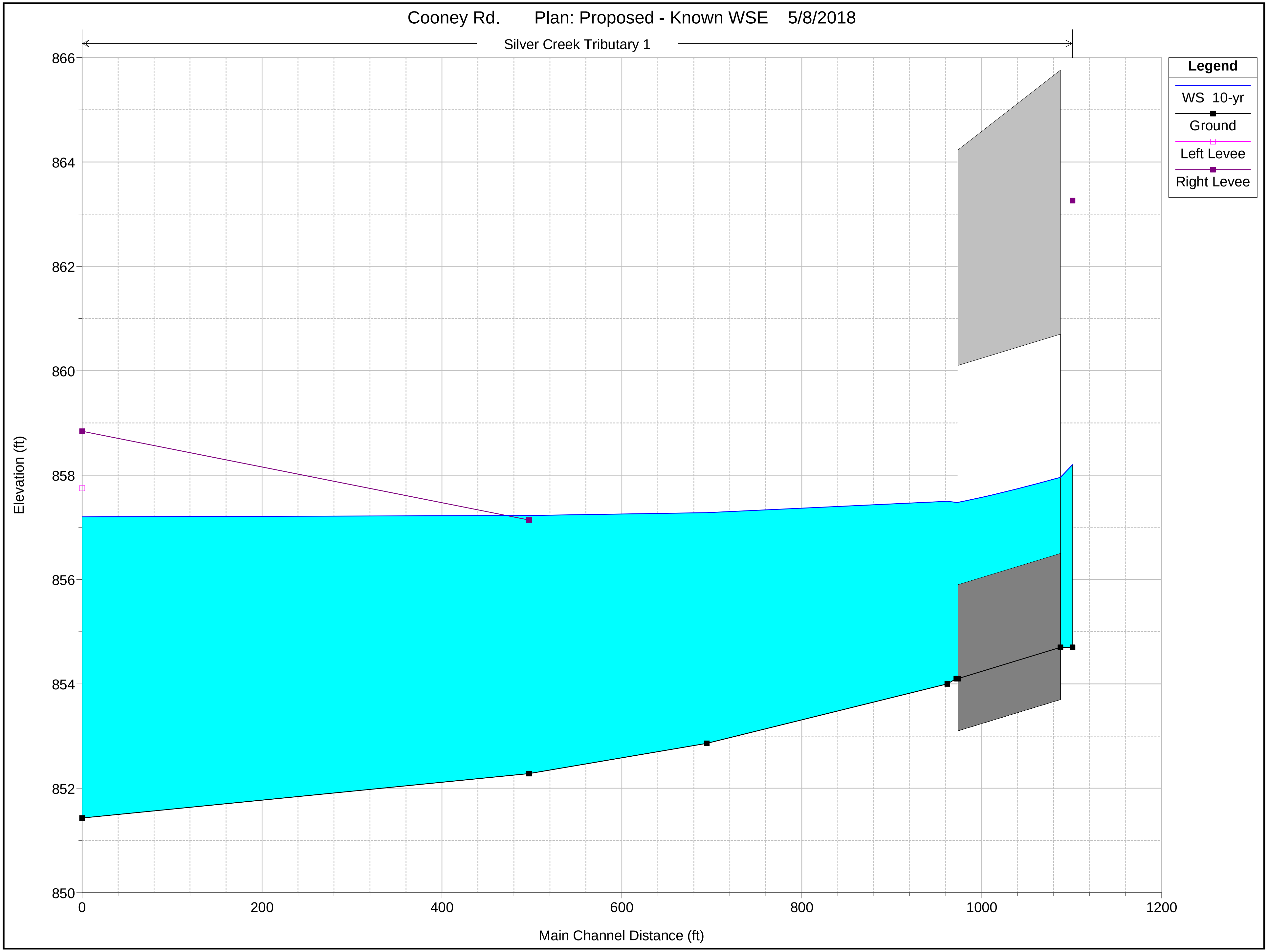
*******************************************************
*     Reach      *   River Sta.   * Contr.  * Expan.  *
*******************************************************
*Tributary 1     *    1101    *       .3*       .5*
*Tributary 1     *    1030.5  *Culvert  *         *
*Tributary 1     *    971.8   *       .3*       .5*
*Tributary 1     *    961.8   *       .3*       .5*
*Tributary 1     *    694.4   *       .3*       .5*
*Tributary 1     *    496.8   *       .3*       .5*
*Tributary 1     *    0       *       .1*       .3*
*******************************************************
```

INEFFECTIVE AREA OFFSET CALCS
PROPOSED CONDITION

IL-47 at Cooney Rd. (Proposed)



R.S.	Δ Exp/Cont	CL Station	Ineffective Area Offsets LT	RT	D/S Reach Length	Lt Bank Sta	Rt Bank Sta	Remarks	XS
1101.0	13.5	996.5	**974.0**	**1020.0**	129.2	987	1006		1101.0
1087.5		996.5	**987.0**	**1006.0**	13.5	987.0	1006.0		1087.5
1030.5									1030.5
973.5		996.5	**987.0**	**1006.0**	1.7	987.0	1006.0		973.5
971.8	0.9	996.5	**986.0**	**1007.0**	10.0	987	1006		971.8
961.8	5.9	996.5	**981.0**	**1012.0**	267.4	987	1006		961.8
694.4	139.6	996.5	**847.0**	**1146.0**	197.6	987	1006		694.4
496.8	238.4	996.5	**749.0**	**1244.0**	496.8	987	1006		496.8
0.0	486.8	996.5	**500.0**	**1493.0**	0.0	987	1006		0.0



Cooney Rd. Plan: Proposed - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 10-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

```
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                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 4:00:31 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1101	10-yr	201.00	854.70	858.20	855.89	858.23	0.000604	1.49	134.91	105.49	0.15
Tributary 1	1030.5		Culvert									
Tributary 1	971.8	10-yr	201.00	854.10	857.48	855.52	857.60	0.001807	2.84	70.81	74.88	0.27
Tributary 1	961.8	10-yr	201.00	854.00	857.50	855.24	857.56	0.000850	1.93	103.90	75.43	0.19
Tributary 1	694.4	10-yr	201.00	852.86	857.28	855.63	857.31	0.000898	1.62	204.09	206.15	0.18
Tributary 1	496.8	10-yr	201.00	852.28	857.23	855.18	857.23	0.000173	0.71	469.02	607.69	0.08
Tributary 1	0	10-yr	201.00	851.43	857.20	853.62	857.20	0.000026	0.38	1027.11	549.28	0.03

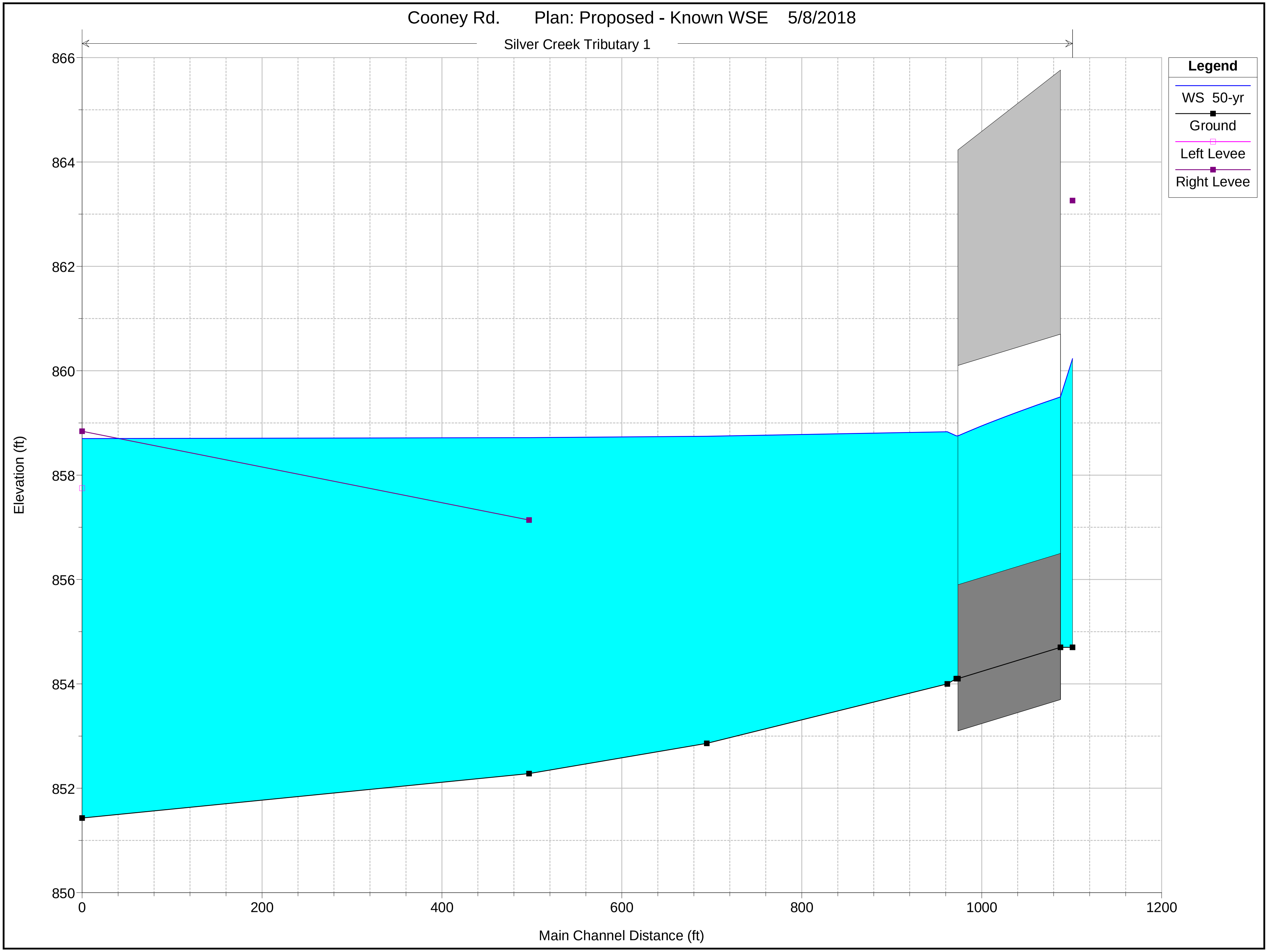
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1101	10-yr	858.23	858.20	0.03				201.00		105.49
Tributary 1	1030.5		Culvert								
Tributary 1	971.8	10-yr	857.60	857.48	0.13	0.01	0.03		201.00		74.88
Tributary 1	961.8	10-yr	857.56	857.50	0.06	0.23	0.02		201.00		75.43
Tributary 1	694.4	10-yr	857.31	857.28	0.03	0.07	0.01	72.80	117.16	11.04	206.15
Tributary 1	496.8	10-yr	857.23	857.23	0.00	0.03	0.00	40.93	71.45	88.61	607.69
Tributary 1	0	10-yr	857.20	857.20	0.00			27.29	51.46	122.25	549.28

****

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed

River: Silver Creek  Reach: Tributary 1     RS: 1101     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 961.8     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 10-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 10-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```


Cooney Rd.   Plan: Proposed - Known WSE   5/8/2018
Silver Creek Tributary 1
Legend
WS 50-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

```
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                 U.S. Army Corps of Engineers
                Hydrologic Engineering Center
                      609 Second Street
                      Davis, California

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 4:00:31 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1101	50-yr	478.00	854.70	860.23	856.66	860.30	0.000592	2.09	228.33	169.51	0.17
Tributary 1	1030.5		Culvert									
Tributary 1	971.8	50-yr	478.00	854.10	858.75	856.63	859.12	0.003509	4.90	97.58	96.71	0.40
Tributary 1	961.8	50-yr	478.00	854.00	858.83	856.10	859.00	0.001575	3.29	145.21	98.13	0.27
Tributary 1	694.4	50-yr	478.00	852.86	858.74	856.89	858.76	0.000328	1.32	594.00	348.37	0.12
Tributary 1	496.8	50-yr	478.00	852.28	858.72	856.34	858.72	0.000086	0.68	1055.16	710.62	0.06
Tributary 1	0	50-yr	478.00	851.43	858.70	855.09	858.70	0.000022	0.43	2330.47	997.66	0.03

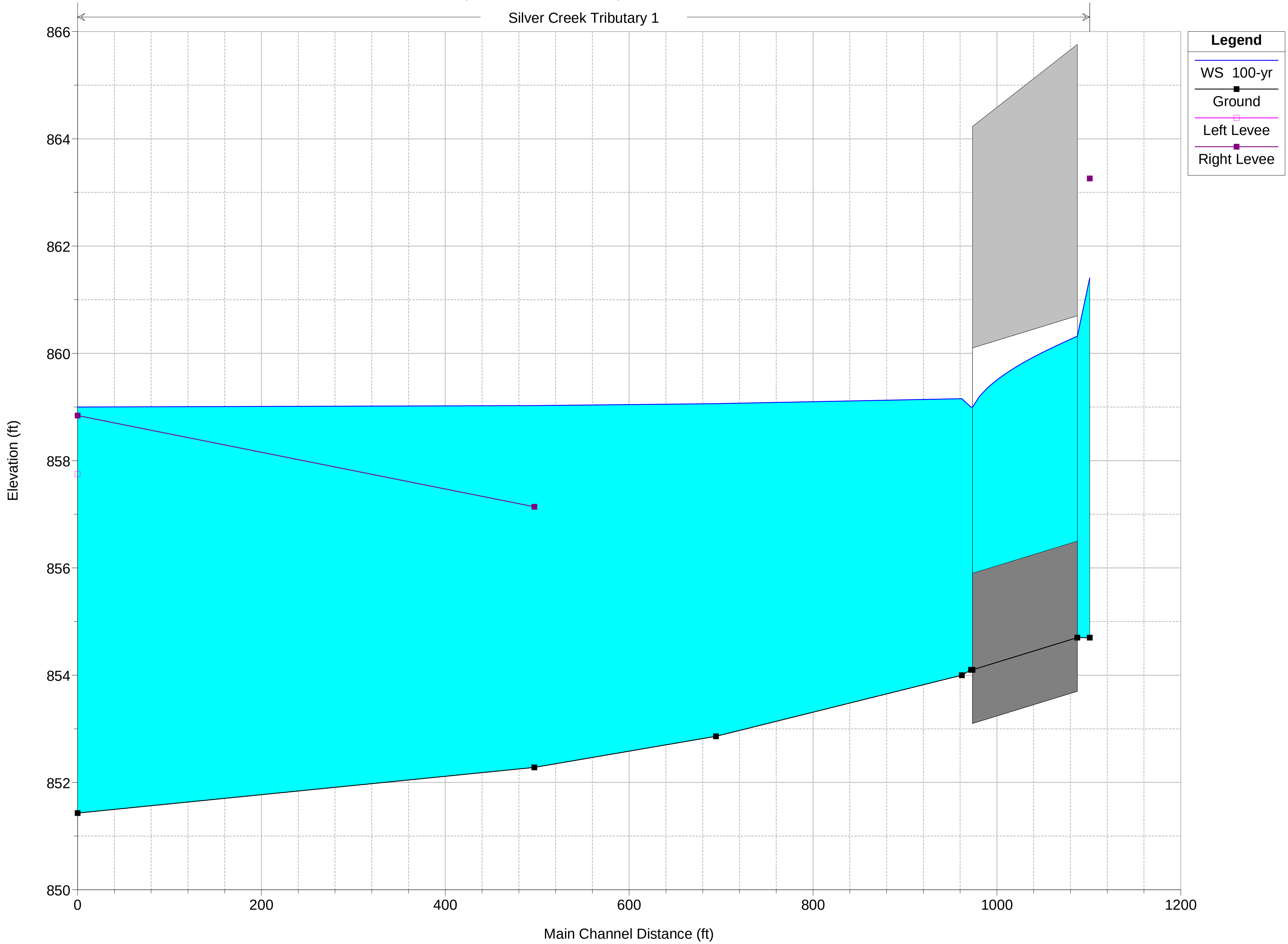
Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1101	50-yr	860.30	860.23	0.07				478.00		169.51
Tributary 1	1030.5		Culvert								
Tributary 1	971.8	50-yr	859.12	858.75	0.37	0.02	0.10		478.00		96.71
Tributary 1	961.8	50-yr	859.00	858.83	0.17	0.17	0.08		478.00		98.13
Tributary 1	694.4	50-yr	858.76	858.74	0.01	0.03	0.00	226.11	148.43	103.46	348.37
Tributary 1	496.8	50-yr	858.72	858.72	0.00	0.02	0.00	117.82	108.90	251.29	710.62
Tributary 1	0	50-yr	858.70	858.70	0.00			139.78	79.70	258.52	997.66

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed

River: Silver Creek  Reach: Tributary 1     RS: 1101     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 961.8     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 50-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 50-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```

Cooney Rd. Plan: Proposed - Known WSE 5/8/2018



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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: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 4:00:31 PM

Project in English units

Profile Output Table - Standard Table 1

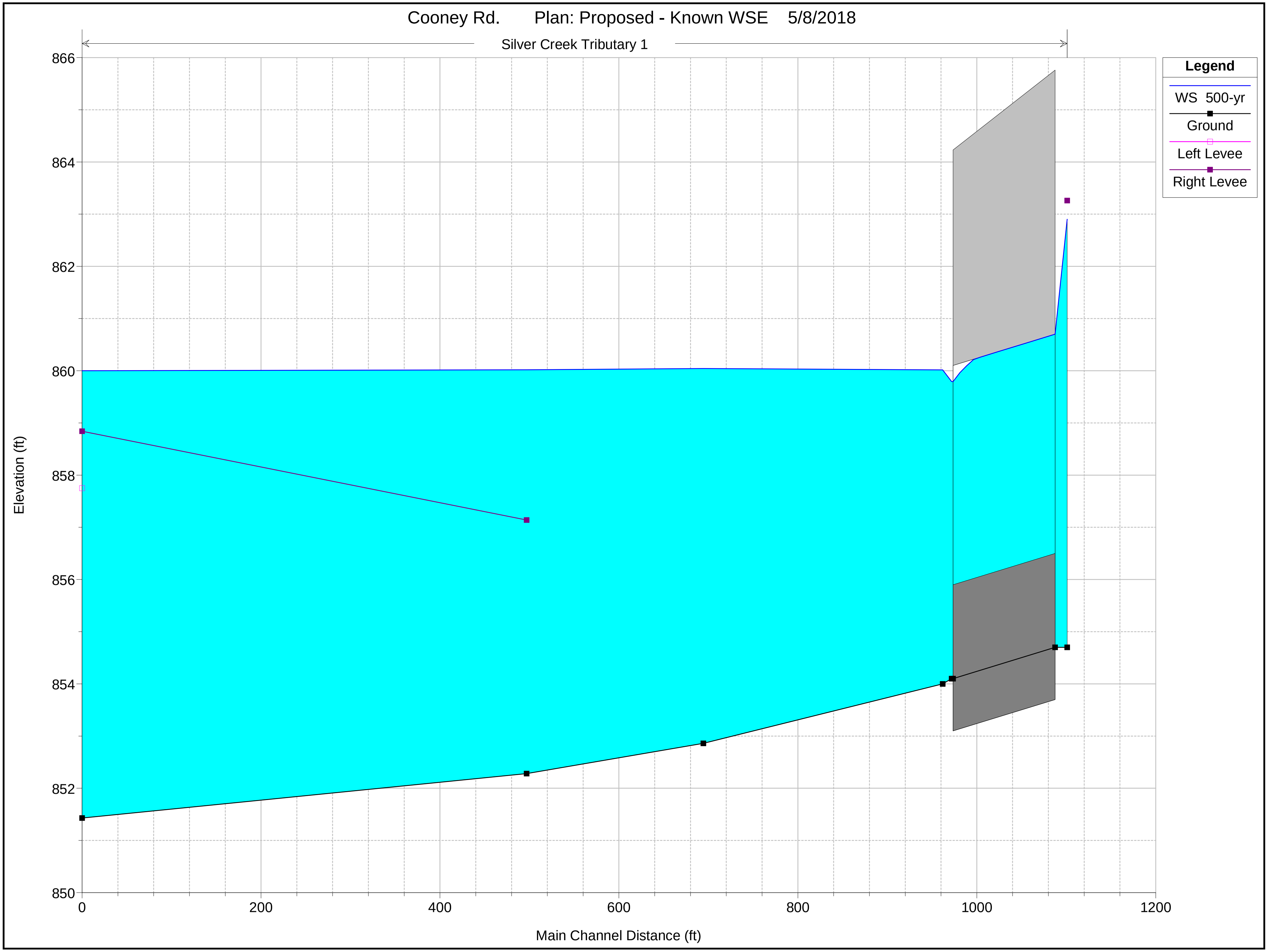
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1101	100-yr	686.00	854.70	861.41	857.11	861.50	0.000599	2.43	282.47	198.76	0.17
Tributary 1	1030.5		Culvert									
Tributary 1	971.8	100-yr	686.00	854.10	859.00	857.32	859.69	0.006083	6.68	102.75	100.93	0.53
Tributary 1	961.8	100-yr	686.00	854.00	859.15	856.63	859.46	0.002598	4.42	155.23	103.64	0.35
Tributary 1	694.4	100-yr	686.00	852.86	859.06	857.14	859.08	0.000437	1.60	689.08	387.90	0.13
Tributary 1	496.8	100-yr	686.00	852.28	859.03	856.52	859.03	0.000124	0.86	1185.20	736.02	0.07
Tributary 1	0	100-yr	686.00	851.43	859.00	855.32	859.00	0.000033	0.54	2773.80	1191.71	0.04

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1101	100-yr	861.50	861.41	0.09				686.00		198.76
Tributary 1	1030.5		Culvert								
Tributary 1	971.8	100-yr	859.69	859.00	0.69	0.04	0.19		686.00		100.93
Tributary 1	961.8	100-yr	859.46	859.15	0.30	0.23	0.14		686.00		103.64
Tributary 1	694.4	100-yr	859.08	859.06	0.02	0.04	0.01	327.64	194.09	164.27	387.90
Tributary 1	496.8	100-yr	859.03	859.03	0.01	0.03	0.00	174.45	148.11	363.44	736.02
Tributary 1	0	100-yr	859.00	859.00	0.00			207.49	105.45	373.06	1191.71

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed

River: Silver Creek  Reach: Tributary 1     RS: 1101     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 961.8     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 100-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 100-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```


Cooney Rd. Plan: Proposed - Known WSE 5/8/2018
Silver Creek Tributary 1
Legend
WS 500-yr
Ground
Left Levee
Right Levee
Elevation (ft)
866
864
862
860
858
856
854
852
850
0
200
400
600
800
1000
1200
Main Channel Distance (ft)

```
               HEC-RAS Version 4.1.0 Jan 2010
                U.S. Army Corps of Engineers
               Hydrologic Engineering Center
                     609 Second Street
                     Davis, California

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

PROJECT DATA
Project Title: Cooney Rd.
Project File : CooneyRd.prj
Run Date and Time: 5/8/2018 4:00:31 PM

Project in English units

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Tributary 1	1101	500-yr	925.00	854.70	862.90	857.58	863.01	0.000527	2.63	351.23	231.57	0.17
Tributary 1	1030.5		Culvert									
Tributary 1	971.8	500-yr	925.00	854.10	859.79	858.03	860.72	0.006698	7.74	119.44	158.86	0.57
Tributary 1	961.8	500-yr	925.00	854.00	860.02	857.17	860.42	0.002782	5.08	181.95	239.95	0.37
Tributary 1	694.4	500-yr	925.00	852.86	860.04	857.36	860.06	0.000268	1.43	982.22	518.42	0.11
Tributary 1	496.8	500-yr	925.00	852.28	860.02	856.67	860.02	0.000087	0.83	1620.32	811.80	0.06
Tributary 1	0	500-yr	925.00	851.43	860.00	855.50	860.00	0.000025	0.52	3766.80	1287.00	0.03

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Tributary 1	1101	500-yr	863.01	862.90	0.11				925.00		231.57
Tributary 1	1030.5		Culvert								
Tributary 1	971.8	500-yr	860.72	859.79	0.93	0.04	0.27		925.00		158.86
Tributary 1	961.8	500-yr	860.42	860.02	0.40	0.17	0.19		925.00		239.95
Tributary 1	694.4	500-yr	860.06	860.04	0.02	0.03	0.01	446.41	212.65	265.94	518.42
Tributary 1	496.8	500-yr	860.02	860.02	0.01	0.02	0.00	257.54	174.49	492.97	811.80
Tributary 1	0	500-yr	860.00	860.00	0.00			308.81	119.04	497.14	1287.00

```
ERRORS WARNINGS AND NOTES
Errors Warnings and Notes for Plan : Proposed

River: Silver Creek  Reach: Tributary 1     RS: 1101     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 1030.5     Profile: 500-yr     Culv: Culvert #2
     Note:   The normal depth exceeds the height of the culvert.  The program assumes that the normal depth is equal to the height
             of the culvert.
River: Silver Creek  Reach: Tributary 1     RS: 1030.5     Profile: 500-yr     Culv: Culvert #1
     Note:   The normal depth exceeds the height of the culvert.  The program assumes that the normal depth is equal to the height
             of the culvert.
     Note:   The culvert inlet is submerged and the culvert flows full over part or all of its length.  Therefore, the culvert
             inlet equations are not valid and the supercritical result has been discarded.  The outlet answer will be used.
River: Silver Creek  Reach: Tributary 1     RS: 971.8     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was
             used.
River: Silver Creek  Reach: Tributary 1     RS: 961.8     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 694.4     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 496.8     Profile: 500-yr
     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:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
River: Silver Creek  Reach: Tributary 1     RS: 0     Profile: 500-yr
     Note:   Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.
```

EXHIBIT K

PERMIT SUMMARY

Illinois Department of Transportation

Permit Summary for Floodway Construction in Northeast Illinois

Applicant Agency:	Illinois Department of Transportation	County:	McHenry
Route:	Illinois Route 47 / N. Seminary Rd.	Stream:	Unnamed Silver Creek Tributary
Section:		SN:	056-0239

General Description (bridge length, bridge width, number of spans, abutment type, proposed scope of work within floodway, etc.):
Existing Facility: IL-47 over Silver Creek Tributary with 6'(W) x 5'(H) Reinforced Concrete Box Culvert
Proposed Improvement: Widening of IL-47; removal and replacement of existing culvert with reinforced concrete box culvert Main Cell - 12'(W) x 7'(H), Overflow Cell – 6'(W) x 7'(H)

1. Is the proposed work classified as repairs such as deck replacement, pavement resurfacing, or the armoring or filling of a scour hole? ☐ Yes ☒ No

2. Does the proposed work only consist of modifications to the existing structure which will occur above the regulatory 100-year flood profile? ☐ Yes ☒ No

Note: If the answer to question 1 or 2 is yes, no permit is required and questions 3 through 12 may be omitted.

3. Does the proposed work below the regulatory 100-year flood profile consist of widening of the existing structure by 12 feet or less? ☐ Yes ☒ No

Note: If yes, Regional Permit No. 2 applies and questions 4 through 9 may be omitted.

4. Is the proposed improvement, including the approach roadway, more restrictive to normal and flood flows than the existing structure? ☐ Yes ☒ No

5. Is a Channel Modification proposed? ☐ Yes ☒ No

6. Are there any buildings or structures located upstream in the 100-year floodplain within the influence of the structure backwater? ☒ Yes ☐ No

   6a. If no, does the backwater of the proposed improvement exceed the backwater of the existing structure by more than 0.1 foot? ☐ Yes ☐ No

   6b. If yes, does the proposed backwater exceed the natural high water elevation by more than 0.1 foot? ☒ Yes ☐ No

7. Are transitions required for this project? ☐ Yes ☒ No

8. Is the flood profile at the project site impacted by backwater from a downstream receiving stream? ☒ Yes ☐ No

   If yes, list frequency of starting elevation for analysis: 10, 50, 100, 500 year profiles for Silver Creek. The tributary area for the backwater is less than 3 times greater than the tributary area of the crossing.

9. Is backwater from a downstream structure affecting the flood profile at the project site? ☐ Yes ☒ No

9a. Was the existing downstream structure used in the analysis for determining flood profile at the project site? years? (Attach documentation) ☐ Yes ☐ No

9b. Is the downstream structure scheduled for improvement in the next 5 ☐ Yes ☐ No

9c. Was the proposed downstream improvement used in the analysis? ☐ Yes ☐ No

10. Is a floodway map change required due to the proposed project? ☐ Yes ☒ No

11. Will fill or material be placed in the floodway due to the proposed work? ☐ Yes ☒ No

11a. If yes, is compensatory storage provided at the project location? (Attach a copy of completed Attachment A) ☐ Yes ☐ No

11b. If the answer to 11a is no, is compensatory storage provided at another location? If yes, give location and attach a copy of completed Attachment A. ☐ Yes ☒ No

11c. Has compensatory storage relief been granted? (Attach Documentation) ☐ Yes ☐ No

12. Coordination based on Memorandum of Agreement has occurred with Agency(ies) (Attach documentation):. ☒ Yes ☐ No

---

All engineering analysis has been performed by me or under my direct supervision.

Signature: [signature] IL/P.E. #: 062.061690

Date: 5/8/2018 P.E. Expiration Date: 11/30/2019

FOR DEPARTMENTAL USE ONLY

Is a permit required for this project? ☐ Yes ☐ No

If yes, specify type of permit: ☐ Floodway, ☐ Regional 1, ☐ Regional 2

<u>EXHIBIT L</u>

SURVEY NOTES

208165 SILVER CREEK TRIB2

X-SECTIONS

File # 8165TRB2

	π @ 329 BS 328
	Hi = 5.22 R.H. = 5.46
34891	SET 600
34919	103 - 328
	π 34891 BS 329
	Hi = 5.33 R.H. 4.92
34920	103 - 329
34958	103 - 329
	Rebacksite
34959	SET 600
34960	↓
34961	↓
34962	
34963	103 - 329
	π @ 34960 BS @ 34959
	Hi = 5.06 R.H. 4.83
34964	103 - 34959
34984	SET 600
34985	103 - 34959
	π @ 34984 BS @ 34959
	Hi = 5.14 R.H. = 7.50
34988	103 - 34959
34990	103 - 34959

TR BK STRAND 47 50/1

12-07-09

SNOWING

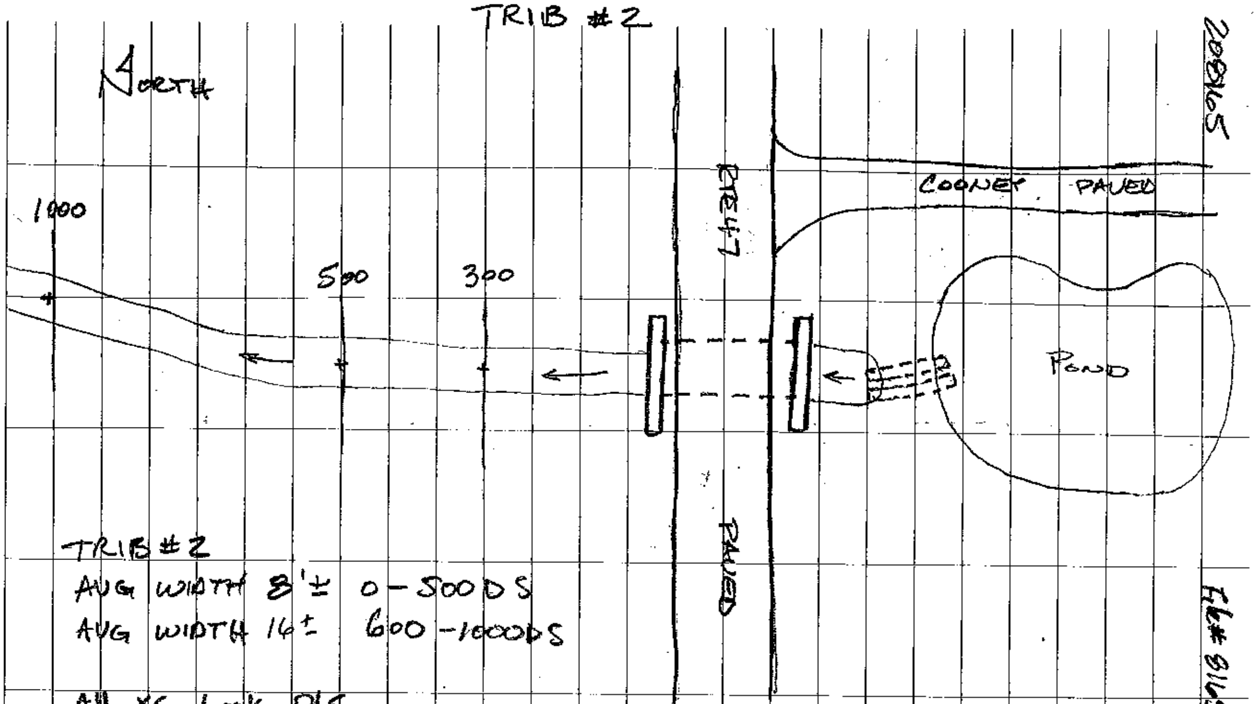
32°

π

PICS

AT POND	#'s 48-49	
AT E CULVERT	#'s 51-54	
℄ 47	#'s 55-58	
AT W. CULVERT	#'s 59-63	
300 D/S	#'s 64-67	EWNS
500 D/S	#'s 68-71	EWSN
1000 DS	#'s 72-75	EWSN

TRIB #2

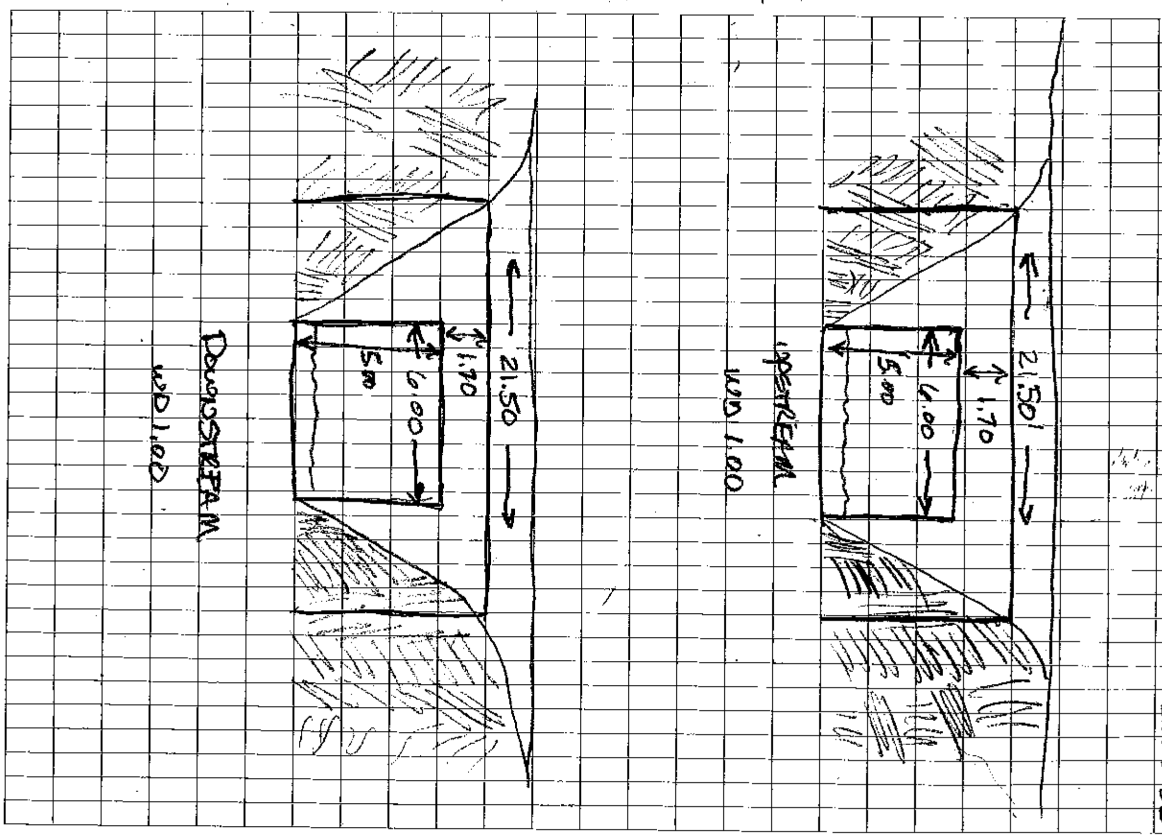


TRIB #2
AVG WIDTH 8'± 0-500 DS
AVG WIDTH 16± 600-1000 DS

All XS Look D/S

2008165

File# 8165TRIB2



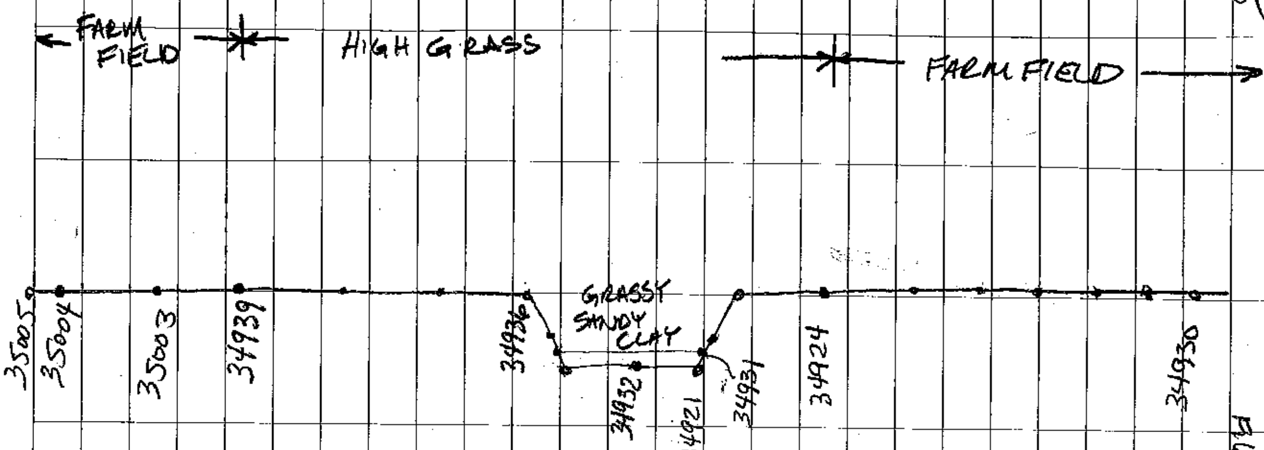
TL BK

STRAND/47

12-7-09

SNOW 32°

SILVER CREEK TRIB #2

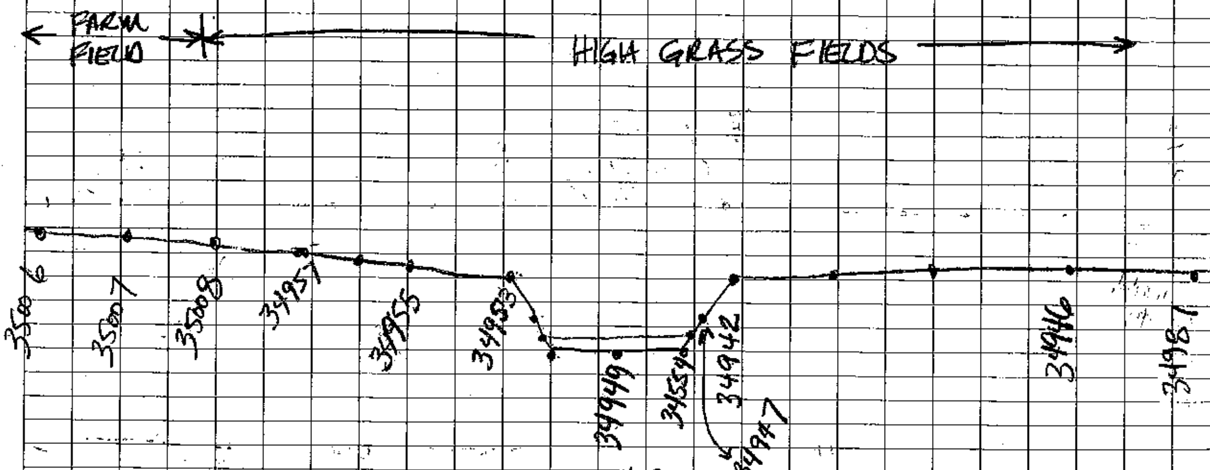


WD 1.80

XS - 300

FL# 816 STR82

SILVER CREEK TRIB #2



WD 1.50

XS - 500

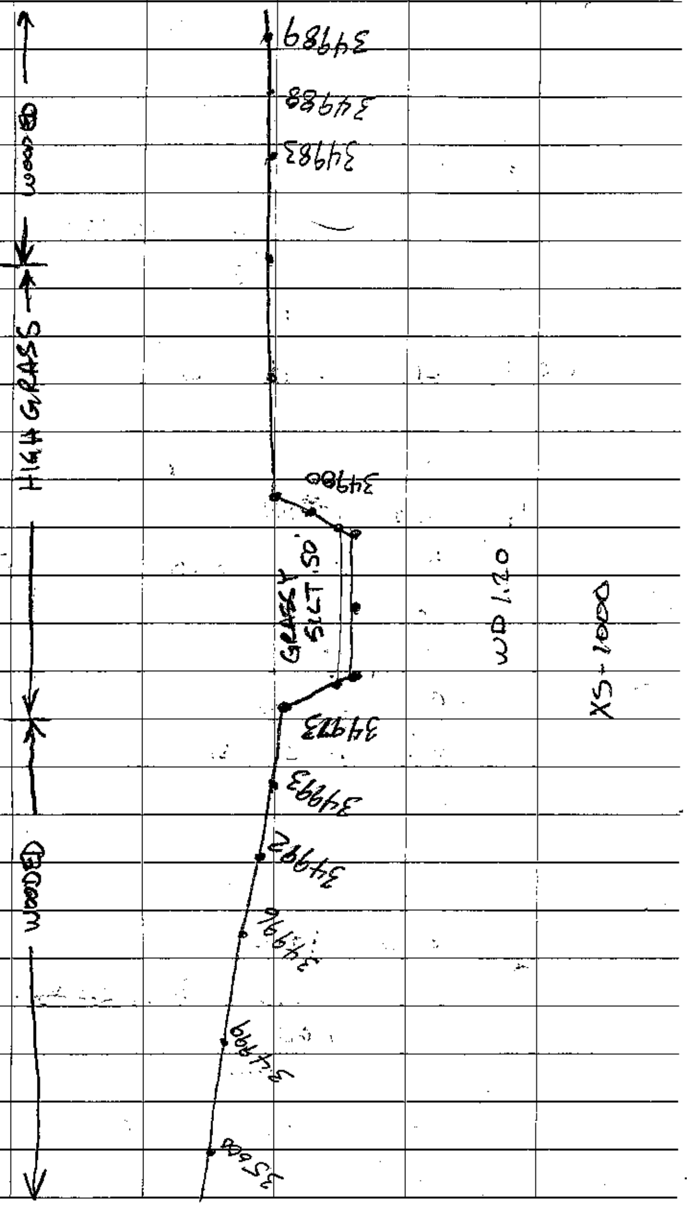
STRAND/47

12-07-07

1/25

208165 File # 8165TRB2

SILVER CREEK TRIB 2



TRBK STRAND/47 12-07-09 53/1

000 D/S	WL(N)	34910	
	℄	34909	Rock Bottom
	W/D	0.50	
100 D/S	WL(N)	34916	Rock Bottom
	℄	34915	
	W/D	.50	
200 D/S	WL(N)	34917	GRASSY CLAY Bottom
	℄	34918	
	W/D	.80	
400 D/S	WL(N)	34941	
	℄	34940	SANDY CLAY w/GRASS
	W/D	1.40	
600 D/S	WL(N)	34965	
	℄	34966	
	W/D	1.30	SILTY GRASS
700 D/S	WL(N)	34967	
	℄	34968	
	W/D	1.30	SILTY GRASS
800 D/S	WL(N)	34969	
	℄	34970	SILTY GRASS
	W/D	1.00	
900 D/S	WL(N)	34971	
	℄	34972	SILTY GRASS
	W/D	1.20	

208165 File #8165TRB2

Silver Creek Trib. #2

X-Sections

π@ 34961 BS@ 34962

Hi = 5.32 R.H = 6.82

34991	SET GOOD
34994	103 - 34963
	π@ 34991 BS@ 34961
	Hi = 5.23 R.H. 4.83
34995	SET GOOD
34997	103 - 34963
	π@ 34995 BS 34991
	Hi 5.18 RH. 4.83
34998	103 - 34991
35001	103 - 34991
	π@ 328 BS@ 329
	Hi = 5.26 R.H. 4.83
35002	103 - 329
35009	103 - 329
	π@ 329 BS 328
	Hi = 5.41 RH = 4.83
35010	103 - 328
35012	LAST # USED

TRIBK STRAND/47 12-08-09

SNOW

<u>EXHIBIT M</u>

CORRESPONDENCE

Perry

Illinois Department of Transportation

Division of Highways/Region One / District One
201 West Center Court/Schaumburg, Illinois 60196-1096

Hydraulics Section
Route: Illinois Route 47
Limits: Over Unnamed Tributary to Silver Creek
County: McHenry

March 1, 2010

Mr. Leonard Schultz
Greenwood Drainage District
11006 Route 120
Woodstock, IL 60098

Dear Mr. Schultz:

This is to confirm the telephone conversation on February 16, 2010 between yourself and Perry Masouridis of my staff relative to the drainage study to be prepared as part of the Location Phase for the subject improvement (see attached map). We are requesting any appropriate drainage information for incorporation into the drainage study.

In particular, we request the following:

Storm sewer plans,
Combined sewer atlas,
Utility plans,
Contour mapping,
Proposed and current drainage improvements,
Identification of flooding experience associated with the highway or adjacent properties,
Local ordinance.

If you have any questions or need additional information, please contact Perry Masouridis P.E., Hydraulics and Hydrology Engineer, at (847) 705-4474.

Very truly yours,

Diane M. O'Keefe, P.E.
Deputy Director of Highways,
Region One Engineer

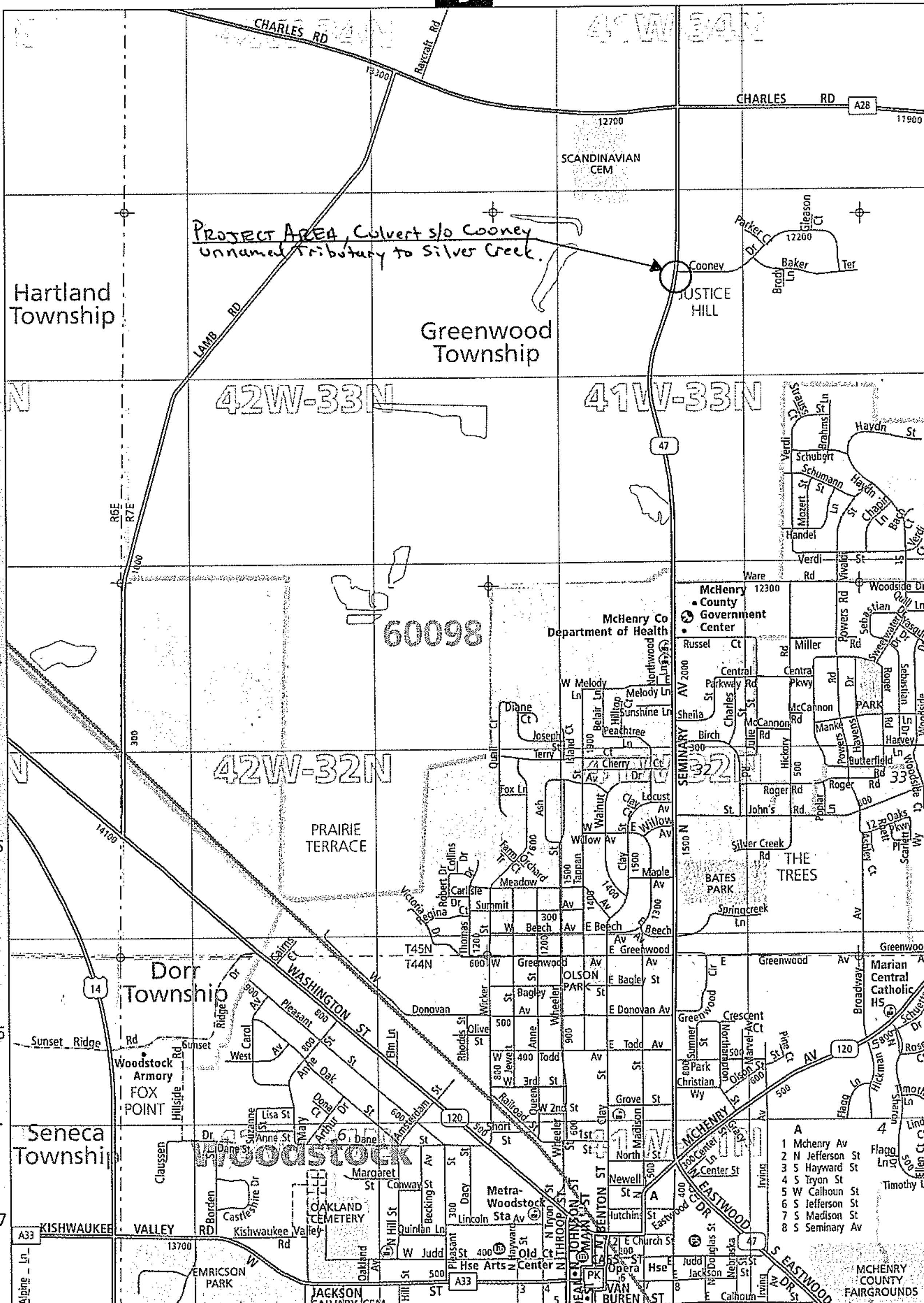
By: Richard F. Wojcik
Richard F. Wojcik, P.E.
Hydraulics Section Chief

Attachment

S:\Mgr1\Gen\WP\Program Development\DC\Other Docs\20090313_UnnamedTrib Silver Ck_PM.doc

1:24,000
1 in. = 2000 ft.
0 0.25 0.5
miles

SEE B MAP



SEE B MAP

SEE 2525 MAP

RAND McNALLY

SEE 2581 MAP

Perry

Illinois Department of Transportation

Division of Highways/Region One / District One
201 West Center Court/Schaumburg, Illinois 60196-1096

Hydraulics Section
Route: Illinois Route 47
Limits: Over Unnamed Tributary to Silver Creek
County: McHenry

February 26, 2010

Mr. Donald Goad
Highway Commissioner
Greenwood Township
5211 Miller Road
Wonder Lake, IL 60097

Dear Mr. Goad:

This is to confirm the telephone conversation on February 16, 2010 between yourself and Perry Masouridis of my staff relative to the drainage study to be prepared as part of the Location Phase for the subject improvement (see attached map). We are requesting any appropriate drainage information for incorporation into the drainage study.

In particular, we request the following:

- Storm sewer plans,
- Combined sewer atlas,
- Utility plans,
- Contour mapping,
- Proposed and current drainage improvements,
- Identification of flooding experience associated with the highway or adjacent properties,
- Local ordinance.

If you have any questions or need additional information, please contact Perry Masouridis P.E., Hydraulics and Hydrology Engineer, at (847) 705-4474.

Very truly yours,

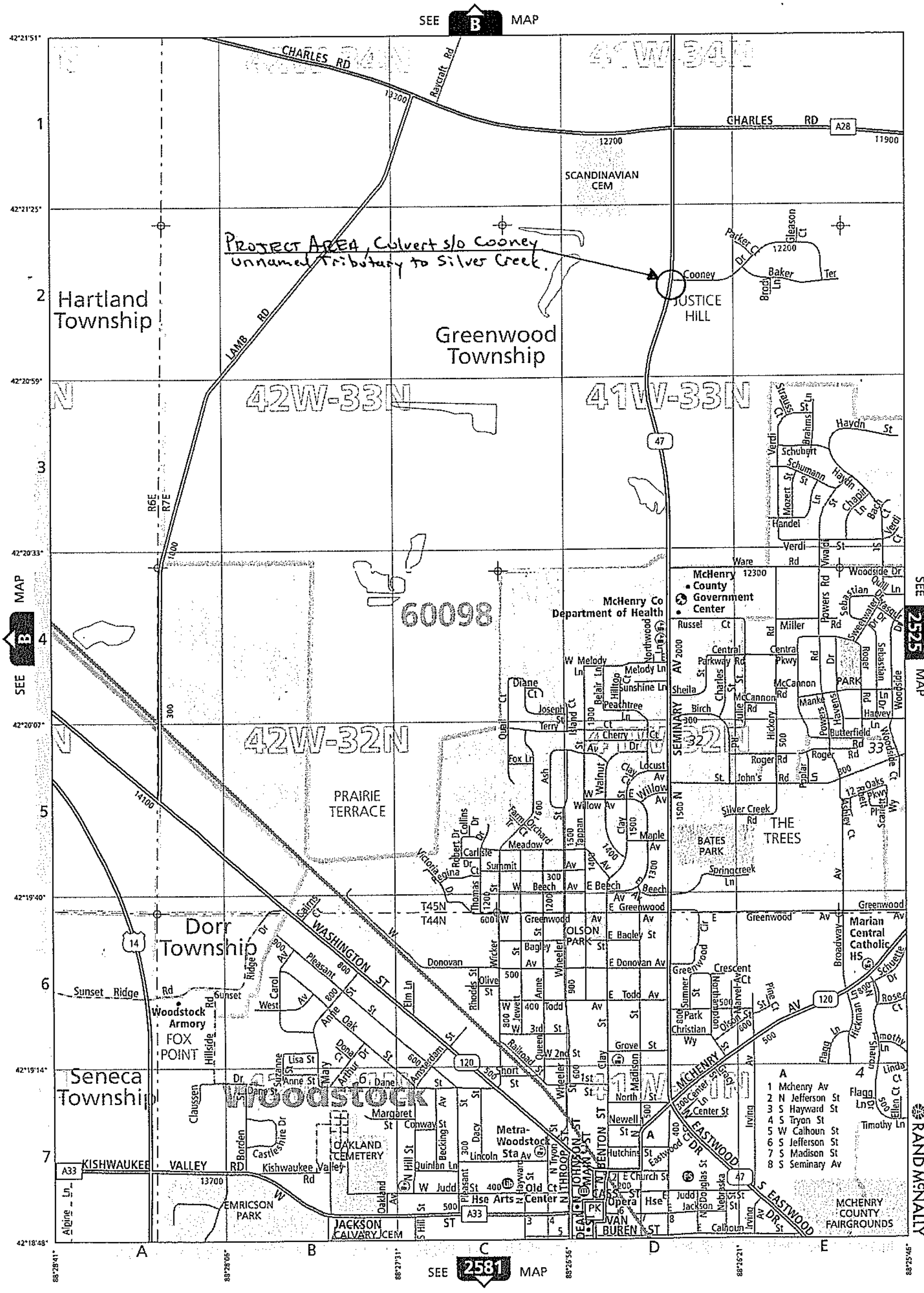
Diane M. O'Keefe, P.E.
Deputy Director of Highways,
Region One Engineer

By: Richard F. Wojcik
Richard F. Wojcik, P.E.
Hydraulics Section Chief

Attachment

S:\Mgr1\Gen\WP\Program Development\DC\Other Docs\20090313_IL47Unnamed Trib Silver Creek_PM.doc

1:24,000
1 in. = 2000 ft.
0 0.25 0.5
miles



Phone L[illegible]: IDOT: Perry Maso[illegible]idis
Greenwood Drainage District.: Leonard Schultz
(815)338-4663

- Culvert is old. 2/16/2010
  probably will need replacement in his opinion

Raffle Rd. - new tiles, some other improvements planned

- 1890 is inception of Drainage Dist.

Leonard Schultz

- smallest main 14" up to 24"

Greenwood Drainage Dist.
11006 Route 120
Woodstock, IL. 60098
815 338-4663

Check. If their is a website for Leonard.

2/16/2010

- Leonard returned my call from earlier today.
- This D.D. has some upstream improvements planned.
- Their existing outfall is u/s of IL. 47
- Main concerns are the age - structural adequacy and the capacity. It should be properly sized.
- I explained that the hydraulic evaluation will include an analysis to study whether or not the existing culvert needs to be enlarged.
- They have drainage atlas information that can be provided.
- I thanked him for the information, requested ~~any~~ data and said I would send a follow up letter that he could respond to.

Phone log: 2/16/2010

IDOT: Perry Masouridis

Greenwood Township Highway Dept: Don Goad
Commissioner
(815) 648-2307

I called Don to discuss the IL. 47 improvement at the existing culvert location near Cooney Dr.

He is familiar with the existing culvert which is located near an existing pond. He has seen highwater in the pond but not on the roadway. Flow through the culvert can be rapid but dissupates downstream where the area is subject to overbank flooding. I noted this area is located in a floodplain.

His main concern is that this culvert be appropriately sized for proposed conditions, as it recieves flow from a sizable upstream area and he does not want water to back up more than it does now. He also feels that there can be high groundwater levels in the area which should be accounted for during design of the roadway improvements.

He also confirmed, similar to the Woodstock Engineer that the Drainage District outfall is located in this area.

I told him that I would send a follow-up letter to which he could respond and provide additional comment.

Perry
2/16/2010

MINUTES OF MEETING

September 4, 2014

TO: All Attendees, File

FROM: David Kleinwachter, Christopher B. Burke Engineering, LTD. (CBBEL)

SUBJECT: IL-47 Drainage Coordination Meeting

ATTENDEES: Darcie Gabrisko (Strand Associates)
Bill Plant (Strand Associates)
David Kleinwachter (CBBEL)
Jonathan O'Connell (CBBEL)
Sam Lahniers (Lin Engineering)
John Baldauf (IDOT-Programming)
Kyle Bochte (IDOT-Programming)
Steven Schilke (IDOT-Programming)
Francisco Rios (IDOT-Hydraulics)
Agar Shirani (IDOT- Hydraulics)
Perry Masouridis (IDOT- Hydraulics)

The meeting was held on September 4, 2014 at 3:00 PM at the IDOT District 1 offices in Schaumburg. The purpose of this meeting was twofold: To gain IDOT concurrence on the drainage area pertaining to the culvert under IL-47 at Cooney Drive conveying the Tributary to Silver Creek; and to discuss and confirm the conceptual proposed drainage plan with respect to proposed storm sewers, utilized outlets, and proposed detention facilities.

The drainage area for the culvert under IL-47 at Cooney drive was first discussed.

- No evidence of overtopping exists within records, however the local residents should be contacted to verify.
- With current Hydraulic Report elevations, the IL-47 profile would need to be raised approximately 4 feet to meet freeboard requirements, and would impact approximately 1100 feet of the roadway profile based on the required vertical curves. There would also be additional impacts to Cooney Drive and adjacent riparian area.
- Additional survey would also be required due to the potential impacts on the upstream detention pond and residence.
- A large drainage area, approximately 6 square miles, was first obtained using McHenry County 2-foot contours; however, a large portion approximately 2 square miles in area south of IL-120 was discussed. ~~No history of roadway overtopping has occurred, and~~ since the initial delineations were based on contour mapping, IDOT performed field visits and concluded that ~~show~~ this area does not overtop into the Cooney Drive culvert basin.
- IDOT has agreed to the tributary area of 4.53 square miles ok (omitting the previously stated 2 square mile area), which is more than the first estimate shown in the Hydraulic Report and less than the first estimate in the LDS. The cross culvert on IL.120 east of Queen Anne Rd appears to accommodate flow from north to south. Lin Engineering will update the Cooney Drive Hydraulic Report to reflect this modification and to address other remaining IDOT comments.

CHRISTOPHER B. BURKE ENGINEERING, LTD.
9575 W Higgins Road, Suite 600 Rosemont, Illinois 60018-4920 Tel (847) 823-0500 Fax (847) 823-0520

MINUTES OF MEETING

IDOT, Hydraulics

~~Perry~~ stated that since there is no overtopping history at this location, 50-yr design HWE 3ft freeboard requirements may potentially be waived as long as there is still 100-yr EOP protection. Justification should be included in the Hydraulic Report. This may be a good option in order to minimize ~~the profile raising~~ impacts associated with raising the profile to meet ~~freeboard~~ freeboard.

The second discussion item included the conceptual proposed drainage plans.

- An addendum to the ESRF will be made to include all 6 detention basin locations, which currently reside outside ESRF boundaries.
- CBBEL will confirm all proposed outlet flow routes offsite to confirm the outlets are suitable.
- CBBEL will incorporate water quality/ infiltration basins and other BMP's into the proposed drainage plan. Required water quality volumes shall be quantified based on the McHenry County ordinance.
- Ditches should be considered at all practical locations for stormwater quality and infiltration, especially north of Ware Road where sufficient ROW appears to exist.

The meeting was adjourned at 4:52 PM.

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Meeting Minutes

DATE: March 21, 2017

SUBJECT: Drainage Review Meeting
03/21/17 at 9:30 am

LOCATION: IDOT District 1, Schaumburg Illinois

ATTENDEES: Attached

1) Introductions were made and Strand Associates, Inc. (Strand) discussed the overview of the project. This is a Phase I project studying IL 47 from US 14 to Charles Road in Woodstock. The preferred alternative from US 14 to Ware Road has been selected and consists of two lanes in each direction separated by a barrier median, outside curb and gutter with storm sewer, a shared-use path on the east side of the road, and a sidewalk on the west side of the road. The preferred alternative from Ware Road to Charles Road consists of a rural cross section with two lanes in each direction separated by a mountable median, 10-foot wide outside paved shoulders, outside ditches, and a shared-use path outside of the ditch on the east side of the roadway. This project was last discussed with the Illinois Department of Transportation (IDOT) drainage personnel at a meeting on December 9, 2014. The project study team also met with the Army Corps of Engineers on October 14, 2014 to discuss some of the drainage concepts proposed.

2) The project team hosted ten small group business owner meetings for the project spanning from December 2016 through February 2017. Business and property owners were invited to a specific meeting based on the location of their property within the project limits. The purpose of the meetings was to discuss individual property needs and impacts associated with the preferred alternative. The detention area near IL 47 and Lake Avenue and McConnell Road was discussed. As part of the preferred alternative, the project team is proposing dual lane roundabouts at the intersections of IL 47 with Lake Avenue and McConnell Road. The project study team was also proposing a large detention basin at the northwest corner of IL 47 and Lake Avenue, which is currently undeveloped. Through the recent business owner meetings, the project study team learned that the property owner is looking to maintain ownership of the lot for future development. The City of Woodstock also supports the idea of the parcel being developed because Lake Avenue leads toward downtown Woodstock and is an important route for their business development. Christopher B. Burke, Ltd. (CBBEL) explained that the proposed detention basin on this site was housing detention volume for a large portion of the IL 47 improvements to the south, and would need to be relocated. Oversized detention sewers were not feasible due to the large amount of detention volume needed, approximately 1.2 acre-feet for the 10-year flood event. Oversized detention sewers of this magnitude would add dramatic costs to the project and would likely create many utility conflicts within the corridor.

   The alternate detention location studied is on the southeast corner of IL 47 and McConnell Road. This parcel alone would not be large enough to fit the 10-year detention storage volume, so a small piece of the two adjacent parcels immediately east of the site will also be purchased and utilized. Neither adjacent parcels will require impacts to their existing parking lot or building. The two adjacent parcels are owned by different property owners. The property directly east of the corner parcel is owned by the McHenry County Farm Bureau and leased by the University of Illinois. The new proposed detention alternative would require a small garden area on the property to be relocated. After speaking to the property manager, relocating the garden area as well as purchasing the west portion of their parcel would not be detrimental to their property. The property owner of the parcel located southeast of the corner property has not been contacted but the property is so large, the project study team does not anticipate the impacts will be critical.

IDOT-programming explained the construction impacts of the new pedestrian tunnel proposed underneath the railroad east of IL 47 affect the existing Mambo Car Wash building on the southeast corner of IL 47 and McConnell and will require relocation even if the detention basin is not moved. It was explained that the parcel may not be developable following the construction because the existing detention area on the parcel must be removed to accommodate the roundabout and would likely result in property flooding. It was explained that the current property owner has requested the project study team purchase his property as a part of this project. IDOT-hydraulics agreed to the concept, stating the open detention basins have BMP qualities that are encouraged. As part of the preferred alternative, all water in this portion of the corridor still outlets to the east of IL 47 between McConnell Road and Country Club Road. The Proposed Drainage Plan must include a statement that the property owner at the southwest corner of McConnell Road has requested his property be purchased for the project. The land acquisition for the three parcels is not anticipated to be an issue.

CBBEL also mentioned that the previous detention location allowed for a significant amount of offsite area be kept separate from the IL 47 system. The constricting railroad abutments on IL 47 will now cause the water to be comingled prior to entering the relocated detention basin. IDOT prefers no comingling of offsite water, however all agreed that it must be done where necessary. An explanation of why the water must be comingled will be included in the Location Drainage Study. IDOT stated CBBEL must verify the sizing the proposed detention basin orifice correctly, to pass all offsite water and detain only the IDOT water. IDOT pointed out that this has been miscalculated in the past on different jobs, and has caused issues with flooding and basin overtopping. It was clarified that any overtopping at the detention basin will run north along IL 47 rather than along McConnell Road. IDOT asked CBBEL to consider a split flow chamber prior to the detention basin.

3) Strand explained the new geometric modifications north of Ware Road. The existing roadway north of Ware Road consists of one lane in each direction and a 55 mph speed limit. The previous proposed typical section was an urban corridor with a 45mph design speed. However, as a result of the speed study conducted for the roadway segment, it was determined that a 50mph design speed should be used for the segment. The proposed

typical section has now been revised to a rural cross section with two lanes in each direction separated by a mountable median, 10-foot wide outside paved shoulders, outside ditches, and a shared-use path outside of the ditch on the east side of the roadway. Future development is anticipated north of Ware Road. This requires IL 47 stormwater be collected primarily in ditches in lieu of storm sewers. CBBEL has designed a preliminary concept of the ditches and presented it to IDOT. Where feasible, ditches convey stormwater to their respective outlets, with a large regional detention facility planned near the ultimate outlet of the Tributary to Silver Creek near Cooney Drive. The existing cross road culverts located along IL 47 north of Ware Road primarily outlet offsite stormwater. Storm sewers will still be necessary to convey the ditches past a large wetland area to avoid impacts, and through a profile high point near Station 610+00. All existing outlets will be maintained.

IDOT requested the use of ditch checks and ditch detention as often as feasible to reduce the overall volume of the large detention facility near Cooney Drive. The ditch checks would also add a BMP treatment to the stormwater as an additional water quality measure. CBBEL will study the ditch systems to verify locations of possible ditch checks, and revise the detention concept on a more distributed level. Ditch checks shall not be included at residential properties because they are difficult to maintain/ mow around.

4) Changes are necessary for the Tributary to Silver Creek culvert located near Cooney Drive. The new wider roadway cross section impacts the locally owned existing detention basin east of the culvert. To the project study team’s knowledge, no flooding has occurred near the culvert. All parties agreed that the existing detention basin hydraulics, including the outflow pipe size and invert, as well as the overtopping berm elevation, must be maintained in the new proposed design. Only part of the basin has been surveyed; additional survey will be necessary to verify critical aspects of the basin. CBBEL/Strand will send a marked-up area of the required survey to IDOT, who will complete the survey.

   A portion of the existing basin will need to be filled due to the widening of the road. All filled volume in the pond must be compensated and excavated elsewhere to maintain the original pond volume. Excavation areas appear to be possible on the north and south sides of the basin. The additional survey will shed light on the feasibility. IDOT-Programming believes the pond aesthetics is important to the local owner, and recommended minimizing any tree removals and large scale operations. Regardless of the drainage design selected, frontage right-of-way is necessary on the property due to the roadway widening. IDOT hydraulics discussed simplifying the design by taking the twin 24” local pipes previously routed through the culvert and instead bypassing the culvert, outletting into the Tributary to Silver Creek at the downstream end of the culvert. This strategy was agreed upon, as it would also help with minimizing impacts to the pond on the east side of the road.

   The hydraulic model of the culvert was completed using HEC-RAS software. The existing conditions Hydraulic Report for the culvert in question did not separately model flows from the twin 24" local pipes. The pond and it's overtopping elevations were modeled and must remain the same. Due to its large tributary area (±4.5 sq. mi), and the small impact of the twin 24" local pipe, the flows in the culvert model can remain the same. IDOT agreed that the only changes needed to the proposed conditions Hydraulic Report are the updated length and possible upstream invert to the culvert; it is not necessary to further break out flows from the pipes, basin, and the berm overtopping as long as they are maintained in the proposed drainage plan. Lin Engineering will update the Hydraulic report with these changes once a plan has been made.

5) Strand stated the target draft EA submittal is April 28th, 2017. The public hearing is targeted for Fall of 2017, and Design Approval for the end of 2017.

These notes represent the preparer's understanding of the items discussed and are not a verbatim account of the discussion. They are intended to generally document the discussions held; if any portion of these Minutes is found incomplete or inaccurate, please notify the preparer in writing within five business days from the receipt of the Minutes.

EXHIBIT N

CD OF HEC-HMS AND HEC-RAS MODELS

SUPPLEMENT 3.16-1
TREE SURVEY

CHRISTOPHER B. BURKE ENGINEERING, LTD.
9575 West Higgins Road Suite 600 Rosemont, Illinois 60018 TEL (847) 823-0500 FAX(847) 823-0520

July 29, 2010

Strand Associates, Inc.
1170 South Houbolt Road
Joliet, Illinois 60431

Attention: Adam Moline

Subject: Tree Inventory Listing for the Route 47 Improvement Project from U.S. 14 to Charles Road in McHenry County, Illinois
(CBBEL Project No. 08-0483)

Dear Mr. Moline:

As requested, Christopher B. Burke Engineering, Ltd. (CBBEL) completed the identification of tagged and professionally field surveyed trees within the Route 47 improvement project study area in McHenry County, Illinois. A complete tree inventory is included with this letter report listing size, species, condition, form and general comments regarding the quality of the identified trees. Note that the enclosed inventory list includes only trees tagged and professionally field surveyed by others as depicted in the tree survey locations provided by your office.

During the tree inventory, each tree was evaluated on a scale rating from 1 – 5. These ratings were based on general observations at the time of the inventory. A rating of 5 (poor) has the lowest value in terms of protection or preservation. A rating of 1 (excellent) has the highest value and are the highest quality trees found.

For example:

A. (5 = worst condition) A rating of 5 was given to a tree that has significant deadwood, bad sweep or lean, disease or damage by insect pests and larvae, lightning damage, split, or other physical damage.

B. (4 = bad condition) A rating of 4 was given to a tree that has some deadwood, minor sweep or lean, distorted shape, trunk or bark damage, multiple stems, or poor physical quality.

C. (3 = typical condition) A rating of 3 was given to a tree that is average in condition, form, physical state, appearance, and health.

D. (2 = above average) A rating of 2 was given to a tree that has little or no damage, sound, good shape and form, and is good in overall physical quality.

E. (1 = excellent condition) A rating of 1 was given to a tree that is excellent in appearance, condition and form, balanced branching and healthy.

Please feel free to contact us with any questions or comments you may have.

Sincerely,

Thomas McArdle
Head, Environmental Resources Department

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TREE INVENTORY LISTING
ROUTE 47 PROJECT SITE
CBBEL PROJECT NO. 08-0483

NOTE:

1. INVENTORY LIST INCLUDES ONLY TREES TAGGED AND LOCATED BY OTHERS AS COLLECTED BY CBBEL IN JULY, 2010.
2. VALUES ASSIGNED FOR CONDITION AND FORM OF TREES ARE SHOWN IN RIGHT COLUMN BELOW. RATINGS ARE BASED ON GENERAL OBSERVATIONS AND ON A SCALE OF 1 (EXCELLENT) TO 5 (POOR).

TAG NO.	BOTANICAL CODE	COMMON NAME	SIZE (inches)	CONDITION/ FORM	COMMENTS
1	PIST	WHITE PINE	8	2/2	
2	PIAB	NORWAY SPRUCE	10	2/2	
3	PIPU	BLUE SPRUCE	6	2/2	
4	PIAB	NORWAY SPRUCE	12	2/2	
5	QUMA	BUR OAK	14	3/3	
6	PINI	AUSTRIAN PINE	13	3/3	
7	PINI	AUSTRIAN PINE	11	3/3	
8	QUMA	BUR OAK	36	2/3	
9	PISY	SCOTCH PINE	8	3/4	
10	PINI	AUSTRIAN PINE	5	3/3	
11	PINI	AUSTRIAN PINE	6	3/3	
12	PINI	AUSTRIAN PINE	6	3/3	
13	PINI	AUSTRIAN PINE	8	3/4	
14	PINI	AUSTRIAN PINE	5	3/4	
15	QURU	RED OAK	14	3/3	
16	JUNI	BLACK WALNUT	11	3/3	
17	JUNI	BLACK WALNUT	10	2/3	
18	JUNI	BLACK WALNUT	6	3/3	
19	JUNI	BLACK WALNUT	11	3/3	
20	JUNI	BLACK WALNUT	13	2/2	
21	JUNI	BLACK WALNUT	4	2/3	
22	JUNI	BLACK WALNUT	15	3/2	
23	JUNI	BLACK WALNUT	14	3/3	
24	JUNI	BLACK WALNUT	11	3/3	
25	JUNI	BLACK WALNUT	14	3/2	
26	JUNI	BLACK WALNUT	13	3/3	
27	CASP	CATALPA	16, 4	3/3	
28	MOAL	WHITE MULBERRY	14, 15	3/3	
29	JUNI	BLACK WALNUT	17	3/2	
30	JUNI	BLACK WALNUT	22	2/2	
31	JUNI	BLACK WALNUT	24	3/3	
32	QUMA	BUR OAK	27	3/3	
33	MAPU	CRABAPPLE	15	3/3	
34	ACNE	BOX ELDER	11	3/3	
35	ACSAI	SILVER MAPLE	9	3/3	
36	ACPL	NORWAY MAPLE	5	2/3	
37	ACSAI	SILVER MAPLE	14	2/2	
38	QURU	RED OAK	8	3/3	

39	CAOV	SHAGBARK HICKORY	5	2/3	
40	QURU	RED OAK	14	3/3	
41	ACNE	BOX ELDER	11	3/4	LEAN
42	MOAL	WHITE MULBERRY	11	3/3	
43	PRSE	BLACK CHERRY	12	3/3	
44	PINI	AUSTRIAN PINE	5	3/3	
45	PINI	AUSTRIAN PINE	6	3/3	
46	QURU	RED OAK	28	4/4	DEADWOOD
47	ULAM	AMERICAN ELM	24	3/3	
48	TIAM	BASSWOOD	15	2/2	
49	DEAD	DEAD			
50	MAPU	CRABAPPLE	12	3/4	TOPPED
51	QURU	RED OAK	28	3/3	
52	RHCA	BUCKTHORN	4, 2	3/3	
53	MOAL	WHITE MULBERRY	17, 13	3/3	
54	RHCA	BUCKTHORN	3	4/3	
55	ACSAI	SILVER MAPLE	17	3/3	
56	ACNE	BOX ELDER	18	3/4	LEAN
57	MOAL	WHITE MULBERRY	23	2/2	
58	ACPL	NORWAY MAPLE	4	3/3	
59	MOAL	WHITE MULBERRY	15, 11	3/3	
60	PRSE	BLACK CHERRY	11	3/3	
61	PRSE	BLACK CHERRY	11	3/3	
62	THOC	WHITE CEDAR	4	3/3	
63	THOC	WHITE CEDAR	4, 5, 6	3/3	
64	THOC	WHITE CEDAR	6	3/3	
65	THOC	WHITE CEDAR	12	3/3	
66	THOC	WHITE CEDAR	10	3/3	
67	THOC	WHITE CEDAR	6	3/3	
68	THOC	WHITE CEDAR	7	3/3	
69	THOC	WHITE CEDAR	11	3/3	
70	THOC	WHITE CEDAR	15	3/3	
71	MOAL	WHITE MULBERRY	7, 5, 4	3/3	
72	GLTR	HONEY LOCUST	26	3/2	
73	MAPU	CRABAPPLE	7	4/3	
74	PIPU	BLUE SPRUCE	17	3/2	
75	MAPU	CRABAPPLE	6, 7, 4	4/3	
76	PIST	WHITE PINE	12	4/3	
77	PIST	WHITE PINE	17	3/3	
78	MOAL	WHITE MULBERRY	23, 12, 8	3/3	
79	PINI	AUSTRIAN PINE	10	3/3	
80	PINI	AUSTRIAN PINE	12	3/3	
81	ACPL	NORWAY MAPLE	10	2/2	
82	MAPU	CRABAPPLE	4	3/3	
83	ACNE	BOX ELDER	16	3/4	LEAN
84	ACNE	BOX ELDER	6	3/4	LEAN
85	ACNE	BOX ELDER	3	4/4	TOPPED
86	ACNE	BOX ELDER	7	4/4	LEAN
87	ACNE	BOX ELDER	19	3/3	
88	ACNE	BOX ELDER	18	3/3	
89	DEAD	DEAD			
90	ACNE	BOX ELDER	14	3/3	

91	ACNE	BOX ELDER	13	3/3	
92	ACNE	BOX ELDER	10	3/3	
93	ULAM	AMERICAN ELM	28	2/2	
94	ACSAI	SILVER MAPLE	30	2/3	
95	ACSAI	SILVER MAPLE	28	3/4	TOPPED
96	JUNI	BLACK WALNUT	28	3/3	
97	ACSAI	SILVER MAPLE	27	4/3	DEADWOOD
98	JUNI	BLACK WALNUT	27	3/3	
99	MAPU	CRABAPPLE	6	3/3	
100	MAPU	CRABAPPLE	5	3/3	
101	PIAB	NORWAY SPRUCE	12	2/2	
102	ACRU	RED MAPLE	12	2/2	
103	JUVI	RED CEDAR	7	3/3	
104	PIAB	NORWAY SPRUCE	10	2/2	
105	PIPU	BLUE SPRUCE	18	1/1	
106	PIPU	BLUE SPRUCE	16	1/1	
107	QUMA	BUR OAK	4	2/3	
108	CAOV	SHAGBARK HICKORY	4	2/2	
109	QUMA	BUR OAK	3	2/2	
110	PIAB	NORWAY SPRUCE	13	2/2	
111	ACSAI	SILVER MAPLE	28	2/2	
112	ACSAI	SILVER MAPLE	33	2/2	
113	PIAB	NORWAY SPRUCE	9	2/2	
114	PIAB	NORWAY SPRUCE	12	2/2	
115	ACSAI	SILVER MAPLE	17	2/2	
116	ACSAI	SILVER MAPLE	26	2/2	
117	ACSAI	SILVER MAPLE	24	3/3	DEADWOOD
118	ACSAI	SILVER MAPLE	38	2/3	
119	ACSAI	SILVER MAPLE	25	2/3	
120	ACSAI	SILVER MAPLE	12	2/2	
121	PRSE	BLACK CHERRY	25	3/4	DEADWOOD
122	MOAL	WHITE MULBERRY	24	3/3	
123	MOAL	WHITE MULBERRY	25, 18, 20	3/4	DEADWOOD
124	BENI	RIVER BIRCH	5, 4, 3	2/2	
125	PINI	AUSTRIAN PINE	3	2/3	
126	PINI	AUSTRIAN PINE	3	2/3	
127	PINI	AUSTRIAN PINE	3	2/3	
128	ACJA	JAPANESE MAPLE	4, 4, 4, 3, 3	3/3	
129	PINI	AUSTRIAN PINE	10	3/3	
130	PINI	AUSTRIAN PINE	13	3/3	
131	PIPU	BLUE SPRUCE	11	2/2	
132	PIPU	BLUE SPRUCE	11	2/2	
133	PIPU	BLUE SPRUCE	10	2/2	
134	PIPU	BLUE SPRUCE	8	2/2	
135	PIPU	BLUE SPRUCE	8	2/2	
136	PIPU	BLUE SPRUCE	7	2/2	
137	PIPU	BLUE SPRUCE	7	2/2	
138	PIPU	BLUE SPRUCE	8	2/2	
139	PIPU	BLUE SPRUCE	8	2/2	
140	PIPU	BLUE SPRUCE	8	2/2	
141	PIPU	BLUE SPRUCE	12	2/2	
142	CRMO	HAWTHORN	4	3/3	

143	ACRU	RED MAPLE	3	2/2	
144	ACRU	RED MAPLE	3	2/2	
145	ACRU	RED MAPLE	3	2/2	
146	ACSAI	SILVER MAPLE	25	3/3	
147	ACSAI	SILVER MAPLE	34	3/3	
148	GONE	NO TREE PRESENT			
149	GONE	NO TREE PRESENT			
150	GONE	NO TREE PRESENT			
151	GONE	NO TREE PRESENT			
152	ACPL	NORWAY MAPLE	5	4/4	DEADWOOD
153	ACPL	NORWAY MAPLE	7	3/3	
154	GONE	NO TREE PRESENT			
155	GONE	NO TREE PRESENT			
156	DEAD	DEAD			
157	MAPU	CRABAPPLE	8, 7, 5, 4	3/3	
158	MAPU	CRABAPPLE	7, 4	3/3	
159	PYCA	BRADFORD PEAR	9	3/3	
160	PYCA	BRADFORD PEAR	9	3/3	
161	PIST	WHITE PINE	7	3/2	
162	PIST	WHITE PINE	5	4/4	DEADWOOD
163	PIST	WHITE PINE	7	3/3	
164	PIST	WHITE PINE	7	3/4	LEAN
165	QUMA	BUR OAK	27	2/2	
166	PISY	SCOTCH PINE	6	3/3	
167	CAOV	SHAGBARK HICKORY	21	2/2	
168	PIPU	BLUE SPRUCE	9	2/2	
169	ACSAI	SILVER MAPLE	25	2/2	
170	JUVI	RED CEDAR	10, 3	3/3	
171	JUVI	RED CEDAR	6	3/3	
172	JUVI	RED CEDAR	5, 3	3/3	
173	PISY	SCOTCH PINE	7	3/3	
174	ACPL	NORWAY MAPLE	3	3/3	
175	GLTR	HONEY LOCUST	13	2/2	
176	ACNE	BOX ELDER	12	3/4	LEAN
177	ULPU	SIBERIAN ELM	5	3/3	
178	ULPU	SIBERIAN ELM	14, 7	3/3	
179	ULPU	SIBERIAN ELM	14	3/3	
180	ACNE	BOX ELDER	5	3/3	
181	MOAL	WHITE MULBERRY	4	3/3	
182	PIPU	BLUE SPRUCE	13	2/2	
183	PIPU	BLUE SPRUCE	15	2/2	
184	PIPU	BLUE SPRUCE	5	2/2	
185	PIPU	BLUE SPRUCE	5	2/2	
186	MAPU	CRABAPPLE	8	3/3	
187	MAPU	CRABAPPLE	7	3/3	
188	PIPU	BLUE SPRUCE	8	2/2	
189	QURU	RED OAK	3	2/2	
190	AMLA	SERVICEBERRY	1	3/4	
191	MAPU	CRABAPPLE	6	3/3	
192	GLTR	HONEY LOCUST	13	2/2	
193	ELUM	AUTUMN OLIVE	8, 7, 7, 3	3/4	
194	BENI	RIVER BIRCH	3, 3, 2	3/3	

195	BENI	RIVER BIRCH	3, 3, 2	3/3	
196	PISY	SCOTCH PINE	14	3/3	
197	GLTR	HONEY LOCUST	14	2/2	
198	MAPU	CRABAPPLE	6, 4, 4	3/4	
199	MAPU	CRABAPPLE	10	3/3	
200	AMLA	SERVICEBERRY	7	4/5	DEADWOOD
201	ROPS	BLACK LOCUST	10	3/3	
202	PODE	COTTONWOOD	23	3/3	
203	ULPU	SIBERIAN ELM	15	3/3	
204	ACNE	BOX ELDER	5	3/4	LEAN
205	PODE	COTTONWOOD	33	2/2	
205	ACNE	BOX ELDER	4	3/4	LEAN
206	PODE	COTTONWOOD	17	3/3	
207	ULPU	SIBERIAN ELM	6	3/3	
208	PODE	COTTONWOOD	18	3/3	
209	ACNE	BOX ELDER	4	3/3	
210	DEAD	DEAD			
211	ACPL	NORWAY MAPLE	13	3/3	
212	PIPU	BLUE SPRUCE	17	2/2	
213	PIPU	BLUE SPRUCE	16	3/3	
214	PIPU	BLUE SPRUCE	14	2/2	
215	DEAD	DEAD			
216	PIPU	BLUE SPRUCE	15	2/2	
217	PIPU	BLUE SPRUCE	15	2/2	
218	PIPU	BLUE SPRUCE	15	3/3	
219	JUNI	BLACK WALNUT	24	3/3	
220	FRPE	GREEN ASH	30	3/3	
221	ULAM	AMERICAN ELM	33	3/4	
222	ACSAI	SILVER MAPLE	24	3/3	
223	FRPE	GREEN ASH	18	3/3	
224	ULAM	AMERICAN ELM	5, 4, 3	3/4	
225	FRPE	GREEN ASH	7	3/3	
226	ACPL	NORWAY MAPLE	19	2/3	
227	FRPE	GREEN ASH	15	4/4	SPLIT
228	FRPE	GREEN ASH	24	3/3	
229	FRPE	GREEN ASH	16	3/3	
230	FRPE	GREEN ASH	8	3/4	
231	FRPE	GREEN ASH	12	3/4	LEAN
232	FRPE	GREEN ASH	12	3/3	
233	ACSAI	SILVER MAPLE	26	3/3	
234	ACSAI	SILVER MAPLE	24	3/3	
235	JUNI	BLACK WALNUT	24	2/2	
236	ACPL	NORWAY MAPLE	13	2/2	
237	ACPL	NORWAY MAPLE	14	2/3	
238	ACPL	NORWAY MAPLE	14	3/3	
239	FRPE	GREEN ASH	24	2/3	
240	ACPL	NORWAY MAPLE	9	2/2	
241	FRPE	GREEN ASH	9	3/3	
242	FRPE	GREEN ASH	13	3/3	
243	FRPE	GREEN ASH	9	3/3	
244	ULPU	SIBERIAN ELM	13, 9, 9, 9	3/4	
245	ACPL	NORWAY MAPLE	7	2/2	

246	ACPL	NORWAY MAPLE	32	3/3	
247	MAPU	CRABAPPLE	4	3/4	
248	TICO	LINDEN	17	2/2	
249	QUMA	BUR OAK	30	2/2	
250	ROPS	BLACK LOCUST	28	3/3	
251	MAPU	CRABAPPLE	13	4/4	STEM ROT
252	MAPU	CRABAPPLE	9	4/4	STEM ROT
253	GONE	NO TREE PRESENT			
253	MAPU	CRABAPPLE	13	3/3	
254	PIPU	BLUE SPRUCE	17	2/2	
255	PIPU	BLUE SPRUCE	14	2/3	
256	ACSAI	SILVER MAPLE	28	3/3	
257	ACPL	NORWAY MAPLE	15	3/3	
258	ACPL	NORWAY MAPLE	17	3/3	
259	JUVI	RED CEDAR	8	3/3	
260	FRPE	GREEN ASH	13	3/3	
261	FRPE	GREEN ASH	10	3/3	
262	ACSAI	SILVER MAPLE	27	3/3	
263	MAAC	MAGNOLIA	4, 3, 2	3/3	
264	ACPL	NORWAY MAPLE	27	3/4	DEADWOOD
265	PIPU	BLUE SPRUCE	14	2/2	
266	ACPL	NORWAY MAPLE	7	2/2	
267	GLTR	HONEY LOCUST	26	3/3	
268	CASP	CATALPA	27	3/3	
269	JUNI	BLACK WALNUT	3	2/2	
270	ACPL	NORWAY MAPLE	10	2/2	
271	PISY	SCOTCH PINE	8	3/3	
272	PISY	SCOTCH PINE	6	3/3	
273	PISY	SCOTCH PINE	10	3/4	
274	FRPE	GREEN ASH	6	3/3	
275	PIPU	BLUE SPRUCE	13	3/3	
276	ACPL	NORWAY MAPLE	20	3/3	
277	ACPL	NORWAY MAPLE	17	3/3	
278	PIPU	BLUE SPRUCE	12	2/2	
279	AMLA	SERVICEBERRY	2, 2, 2, 2, 2	3/4	
280	QURU	RED OAK	14	2/2	
281	ACSAI	SILVER MAPLE	26	3/3	
282	ACPL	NORWAY MAPLE	25	3/3	
283	ACNE	BOX ELDER	3	3/3	
283	ULPU	SIBERIAN ELM	15	3/3	
284	JUNI	BLACK WALNUT	10	2/2	
285	PISY	SCOTCH PINE	6	3/4	
286	THOC	WHITE CEDAR	15	3/3	
287	FRPE	GREEN ASH	3	3/3	
288	ULPU	SIBERIAN ELM	16	3/3	
289	ULPU	SIBERIAN ELM	3	3/3	
290	ACPL	NORWAY MAPLE	12	3/3	
291	QUMA	BUR OAK	27	2/2	
292	PIPU	BLUE SPRUCE	12	2/2	
293	MAPU	CRABAPPLE	3	3/3	
294	ULPU	SIBERIAN ELM	6	3/3	
295	ULPU	SIBERIAN ELM	15	3/3	

296	PIAB	NORWAY SPRUCE	13	2/2	
297	PIAB	NORWAY SPRUCE	13	2/2	
298	QUMA	BUR OAK	32	3/3	
299	QUMA	BUR OAK	22	3/3	
300	QUAL	WHITE OAK	24	3/3	
301	FRPE	GREEN ASH	18	3/4	LEAN
302	ACSAI	SILVER MAPLE	23	3/3	
303	ACSAI	SILVER MAPLE	17	3/3	
304	ACPL	NORWAY MAPLE	5	3/3	
305	QURU	RED OAK	30	3/4	TOPPED
306	GLTR	HONEY LOCUST	16	2/2	
307	ULPU	SIBERIAN ELM	4	3/3	
308	ULPU	SIBERIAN ELM	25	3/3	
309	ACRU	RED MAPLE	4	5/5	STEM ROT
310	FRPE	GREEN ASH	7	2/2	
311	ACPL	NORWAY MAPLE	24	2/2	
312	ACSAI	SILVER MAPLE	24	3/3	
313	CEOC	HACKBERRY	7	2/2	
314	GLTR	HONEY LOCUST	14	2/2	
315	ACPL	NORWAY MAPLE	14	3/4	TOPPED
316	MAPU	CRABAPPLE	8, 7	3/3	
317	ACPL	NORWAY MAPLE	16	3/3	
318	ACRU	RED MAPLE	3	2/2	
319	TICO	LINDEN	2	4/4	STEM ROT
320	ACRU	RED MAPLE	3	3/3	
321	TICO	LINDEN	12	2/2	
322	ACPL	NORWAY MAPLE	18	2/2	
323	MAPU	CRABAPPLE	4	3/3	
324	LALA	LARCH	5	2/2	
325	LALA	LARCH	5	2/2	
326	LALA	LARCH	5	2/2	
327	ACSAC	SUGAR MAPLE	22	2/2	
328	ACSAI	SILVER MAPLE	20	3/3	
329	ACSAI	SILVER MAPLE	25	3/3	
330	PIPU	BLUE SPRUCE	7	2/2	
331	FRPE	GREEN ASH	16	2/2	
332	AMLA	SERVICEBERRY	2, 2, 3, 3, 3	3/4	
333	PIPU	BLUE SPRUCE	6	2/2	
334	AMLA	SERVICEBERRY	2, 3, 2, 3, 2	3/4	
335	AMLA	SERVICEBERRY	2, 2, 2, 2	3/4	
336	PIPU	BLUE SPRUCE	4	2/2	
337	TICO	LINDEN	5	3/3	
338	AMLA	SERVICEBERRY	2, 2, 2, 2, 2	3/3	
339	MOAL	WHITE MULBERRY	5, 5	3/4	
340	JUVI	RED CEDAR	4	4/4	DEADWOOD
341	FRPE	GREEN ASH	5, 2	3/4	LEAN
342	PIPU	BLUE SPRUCE	13	2/2	
343	PIPU	BLUE SPRUCE	12	2/2	
344	ULAM	AMERICAN ELM	5	3/3	
345	DEAD	DEAD			
346	PRSE	BLACK CHERRY	2	3/3	
347	MAPU	CRABAPPLE	3	3/3	

348	PRSE	BLACK CHERRY	10	4/4	DEADWOOD
349	MOAL	WHITE MULBERRY	6	3/3	
350	MOAL	WHITE MULBERRY	4, 4	3/3	
351	PIPU	BLUE SPRUCE	4	2/2	
352	PIPU	BLUE SPRUCE	2	2/2	
353	AMLA	SERVICEBERRY	2, 2, 2, 2	3/4	
354	AMLA	SERVICEBERRY	2, 2, 2, 2, 2	3/3	
355	TIAM	BASSWOOD	13	3/4	
356	MOAL	WHITE MULBERRY	3	3/3	
357	ACNE	BOX ELDER	2, 2	3/4	
358	AMLA	SERVICEBERRY	2, 2, 2, 2, 2	3/4	
359	JUVI	RED CEDAR	4, 3	3/3	
360	AMLA	SERVICEBERRY	2, 2, 2, 2, 2	3/4	
361	TIAM	BASSWOOD	2	3/3	
362	PIPU	BLUE SPRUCE	4	2/2	
363	AMLA	SERVICEBERRY	2, 2, 2, 2	3/3	
364	TIAM	BASSWOOD	13	2/2	
365	ALGU	EUROPEAN ALDER	14	3/3	
366	QUMA	BUR OAK	12	3/3	
367	QUPA	PIN OAK	14	3/3	
368	QUPA	PIN OAK	13	3/3	
369	QUPA	PIN OAK	11	3/3	
370	CRMO	HAWTHORN	4, 4, 5	3/4	SPLIT
371	AMLA	SERVICEBERRY	5	3/3	
372	LITU	TULIP TREE	8, 3	2/2	
373	TADI	BALD CYPRESS	10	2/2	
374	TADI	BALD CYPRESS	12	2/2	
375	TADI	BALD CYPRESS	10	2/2	
376	TADI	BALD CYPRESS	9	2/2	
377	TADI	BALD CYPRESS	12	2/2	
378	PISY	SCOTCH PINE	6	3/3	
379	PISY	SCOTCH PINE	7	3/3	
380	PYCA	BRADFORD PEAR	14	3/3	
381	PYCA	BRADFORD PEAR	14	3/3	
382	PYCA	BRADFORD PEAR	13	3/3	
383	PYCA	BRADFORD PEAR	14	3/3	
384	PIPU	BLUE SPRUCE	13	2/2	
385	ACPL	NORWAY MAPLE	3	4/4	
386	ACPL	NORWAY MAPLE	3	4/4	
387	ACPL	NORWAY MAPLE	4	4/4	DEADWOOD
388	PIPU	BLUE SPRUCE	13	3/3	
389	PYCA	BRADFORD PEAR	12	3/2	
390	PYCA	BRADFORD PEAR	12	3/2	
391	MOAL	WHITE MULBERRY	3	3/3	
392	MOAL	WHITE MULBERRY	2	3/3	
393	MOAL	WHITE MULBERRY	5	3/3	
394	MOAL	WHITE MULBERRY	3	3/3	
395	GLTR	HONEY LOCUST	3	3/3	
396	GLTR	HONEY LOCUST	3	3/3	
397	GLTR	HONEY LOCUST	3	3/3	
398	GLTR	HONEY LOCUST	3	3/3	
399	GLTR	HONEY LOCUST	3	3/3	

400	GLTR	HONEY LOCUST	3, 3	3/3	
		NO TAGS 401 - 499			
500	GLTR	HONEY LOCUST	14	2/2	
501	GLTR	HONEY LOCUST	13	3/3	
502	PIPU	BLUE SPRUCE	11	2/2	
503	PISY	SCOTCH PINE	11	3/3	
503	MOAL	WHITE MULBERRY	9	3/3	
504	FRPE	GREEN ASH	15	2/2	
504	MOAL	WHITE MULBERRY	5	3/3	
505	MAPU	CRABAPPLE	6, 6	3/3	
506	GLTR	HONEY LOCUST	14	3/3	
507	GLTR	HONEY LOCUST	15	3/3	
508	QURU	RED OAK	14	3/3	
509	ACSAC	SUGAR MAPLE	11	3/4	DEADWOOD
510	QURU	RED OAK	18	3/3	
511	QURU	RED OAK	18	3/3	
512	DEAD	DEAD			
513	THOC	WHITE CEDAR	4	3/3	
514	QUMA	BUR OAK	14	3/2	
515	MOAL	WHITE MULBERRY	12	3/4	
516	MOAL	WHITE MULBERRY	10	3/4	
517	ACNE	BOX ELDER	10	3/3	
518	ACNE	BOX ELDER	6	3/3	
519	ACNE	BOX ELDER	6	3/3	
520	MOAL	WHITE MULBERRY	6	3/4	LEAN
521	ACNE	BOX ELDER	12	4/4	LEAN
522	ACNE	BOX ELDER	13	3/4	LEAN
523	ACNE	BOX ELDER	16	3/3	
524	MOAL	WHITE MULBERRY	6	3/3	
525	GLTR	HONEY LOCUST	17	3/4	
526	GLTR	HONEY LOCUST	19	3/4	
527	ACPL	NORWAY MAPLE	15	2/2	
528	FRPE	GREEN ASH	12	3/3	
529	FRPE	GREEN ASH	8, 8, 7	3/4	
530	PIAB	NORWAY SPRUCE	14	2/2	
531	GLTR	HONEY LOCUST	17	3/4	
532	GONE	NO TREE PRESENT			
533	PIAB	NORWAY SPRUCE	23	2/2	
534	GLTR	HONEY LOCUST	22	3/4	
535	GLTR	HONEY LOCUST	17	3/4	
536	GLTR	HONEY LOCUST	22	3/4	
537	GLTR	HONEY LOCUST	18	3/4	
538	GLTR	HONEY LOCUST	21	3/4	STEM ROT
539	PIPU	BLUE SPRUCE	6	2/2	
540	PIPU	BLUE SPRUCE	5	2/2	
541	PIPU	BLUE SPRUCE	4	2/2	
542	PIPU	BLUE SPRUCE	4	2/2	
543	FRPE	GREEN ASH	34	3/3	
544	PIPU	BLUE SPRUCE	10	2/2	
545	ACPL	NORWAY MAPLE	7	3/3	
546	ACPL	NORWAY MAPLE	7	3/3	
547	ACPL	NORWAY MAPLE	6	3/3	

548	ACPL	NORWAY MAPLE	7	3/3	
549	GLTR	HONEY LOCUST	8, 7	3/4	LEAN
550	GLTR	HONEY LOCUST	7	3/4	LEAN
551	ACNE	BOX ELDER	7	3/3	
552	ACNE	BOX ELDER	6	3/3	
553	ACNE	BOX ELDER	8	3/4	LEAN
554	ACNE	BOX ELDER	10, 8	3/4	LEAN
555	ACNE	BOX ELDER	13, 12	3/4	
556	ACNE	BOX ELDER	11, 7	3/4	
557	PISY	SCOTCH PINE	10	3/3	
558	PISY	SCOTCH PINE	10	3/3	
559	GLTR	HONEY LOCUST	14	2/2	
560	FRPE	GREEN ASH	10	2/2	
561	ACPL	NORWAY MAPLE	23	2/2	
562	ACPL	NORWAY MAPLE	27	2/2	
563	ACPL	NORWAY MAPLE	16	2/2	
564	ACPL	NORWAY MAPLE	18	2/2	
565	ACPL	NORWAY MAPLE	16	2/2	
566	ACPL	NORWAY MAPLE	16	2/2	
567	DEAD	DEAD			
568	QUMA	BUR OAK	3	2/3	
569	QUMA	BUR OAK	36	2/2	
570	BENI	RIVER BIRCH	1	4/4	TOPPED
571	BENI	RIVER BIRCH	1	2/2	
572	BENI	RIVER BIRCH	1	3/3	
573	BENI	RIVER BIRCH	1	3/3	
574	GONE	NO TREE PRESENT			
575	BENI	RIVER BIRCH	1	3/3	
576	GLTR	HONEY LOCUST	2	2/2	
577	FRAM	WHITE ASH	2	3/4	LEAN
578	GONE	NO TREE PRESENT			
579	GONE	NO TREE PRESENT			
580	GONE	NO TREE PRESENT			
581	ACRU	RED MAPLE	2	3/3	
582	GLTR	HONEY LOCUST	12	2/2	
583	GLTR	HONEY LOCUST	14	2/2	
584	GLTR	HONEY LOCUST	13	2/2	
585	GLTR	HONEY LOCUST	13	2/2	
586	PODE	COTTONWOOD	15	2/2	
587	PIAB	NORWAY SPRUCE	6	2/2	
588	ULPU	SIBERIAN ELM	14	3/3	
589	ULPU	SIBERIAN ELM	26	3/3	
591	QURU	RED OAK	13	3/4	DEADWOOD
592	AMLA	SERVICEBERRY	2, 2, 1, 1	3/3	
593	ACRU	RED MAPLE	9	4/4	SPLIT
594	PIPU	BLUE SPRUCE	7	4/4	DEADWOOD
595	CRMO	HAWTHORN	2, 3, 2, 3	3/3	
596	ACPL	NORWAY MAPLE	5	2/2	
597	ACPL	NORWAY MAPLE	3	2/2	
598	PYCA	BRADFORD PEAR	3	2/2	
599	GLTR	HONEY LOCUST	3	2/2	
600	ACRU	RED MAPLE	3	2/2	

601	FRPE	GREEN ASH	25	3/4	DEADWOOD
602	FRPE	GREEN ASH	24	3/4	DEADWOOD
603	ACRU	RED MAPLE	11	2/2	
604	ACSAI	SILVER MAPLE	30	3/3	
605	ACPL	NORWAY MAPLE	4	3/3	
606	PIPU	BLUE SPRUCE	8	2/2	
607	PIPU	BLUE SPRUCE	8	2/2	
608	PIPU	BLUE SPRUCE	10	2/2	
609	ACPL	NORWAY MAPLE	17	3/3	
610	ACRU	RED MAPLE	8	2/2	
611	PIPU	BLUE SPRUCE	14	2/2	
612	PIPU	BLUE SPRUCE	14	2/2	
613	PIPU	BLUE SPRUCE	14	2/2	
614	PIPU	BLUE SPRUCE	12	2/2	
615	PINI	AUSTRIAN PINE	12	3/3	
616	PIPU	BLUE SPRUCE	10	2/2	
617	PIPU	BLUE SPRUCE	10	2/2	
618	PIPU	BLUE SPRUCE	9	2/2	
619	PIPU	BLUE SPRUCE	10	3/3	
620	PIPU	BLUE SPRUCE	12	2/2	
621	ACNE	BOX ELDER	20	3/3	
622	QUMA	BUR OAK	14	2/2	
623	ULPU	SIBERIAN ELM	26	3/3	
624	ULPU	SIBERIAN ELM	38	3/3	
625	ACSAI	SILVER MAPLE	21	3/3	
626	GLTR	HONEY LOCUST	24	2/2	
627	MISSING	MISSING TAG			
628	MISSING	MISSING TAG			
629	BEPA	PAPER BIRCH	12	3/3	
630	BEPA	PAPER BIRCH	11	3/3	
631	ACPL	NORWAY MAPLE	11	3/3	
632	FRPE	GREEN ASH	10	3/3	
633	MISSING	MISSING TAG			
634	ACPL	NORWAY MAPLE	13	3/4	STEM ROT
635	PIPU	BLUE SPRUCE	12	3/4	DEADWOOD
636	ACSAI	SILVER MAPLE	11	3/3	
637	ACRU	RED MAPLE	4	3/3	
638	CECA	REDBUD	8	2/2	
639	ACPL	NORWAY MAPLE	16	3/3	
640	ACPL	NORWAY MAPLE	15	3/3	
641	PINI	AUSTRIAN PINE	9	3/3	
642	PINI	AUSTRIAN PINE	13	3/3	
643	PINI	AUSTRIAN PINE	10	3/3	
644	PINI	AUSTRIAN PINE	9	3/3	
645	PINI	AUSTRIAN PINE	13	3/3	
646	PINI	AUSTRIAN PINE	11	3/3	
647	PINI	AUSTRIAN PINE	9	3/3	
648	PINI	AUSTRIAN PINE	9	3/3	
649	PINI	AUSTRIAN PINE	9	3/3	
650	PINI	AUSTRIAN PINE	10	3/3	
651	PINI	AUSTRIAN PINE	11	3/3	
652	PINI	AUSTRIAN PINE	9	3/3	

653	PINI	AUSTRIAN PINE	6	3/3	
654	PINI	AUSTRIAN PINE	10	3/3	
655	PINI	AUSTRIAN PINE	13	3/3	
656	ACRU	RED MAPLE	10	2/2	
657	ACPL	NORWAY MAPLE	22	2/2	
658	FRPE	GREEN ASH	20	3/3	
659	ACSAI	SILVER MAPLE	22	3/3	
660	MAPU	CRABAPPLE	4	3/3	
661	MAPU	CRABAPPLE	3	3/3	
662	FRPE	GREEN ASH	21	3/3	
663	ULPU	SIBERIAN ELM	6, 6	3/3	
664	FRPE	GREEN ASH	21	3/3	
665	ACPL	NORWAY MAPLE	6	2/2	
666	ACPL	NORWAY MAPLE	7	3/3	
667	PIPU	BLUE SPRUCE	8	2/2	
668	PIPU	BLUE SPRUCE	8	2/2	
669	ULPU	SIBERIAN ELM	23	3/3	
670	ULPU	SIBERIAN ELM	23	3/3	
671	FRPE	GREEN ASH	7	3/3	
672	ULPU	SIBERIAN ELM	24	3/3	
673	ACPL	NORWAY MAPLE	16, 14	3/3	
674	PIPU	BLUE SPRUCE	15	2/2	
675	PIPU	BLUE SPRUCE	12	2/2	
676	PIPU	BLUE SPRUCE	13	2/2	
677	FRAM	WHITE ASH	9	2/2	
678	FRAM	WHITE ASH	10	2/2	
679	FRAM	WHITE ASH	10	2/2	
680	PINI	AUSTRIAN PINE	12	3/3	
681	PINI	AUSTRIAN PINE	12	3/3	
682	GLTR	HONEY LOCUST	14	2/2	
683	MAPU	CRABAPPLE	7	4/4	DEADWOOD
684	FRAM	WHITE ASH	10	2/2	
685	FRAM	WHITE ASH	11	2/2	
686	QURU	RED OAK	14	4/4	DEADWOOD
687	ACRU	RED MAPLE	16	2/2	
688	GLTR	HONEY LOCUST	22	2/2	
689	GLTR	HONEY LOCUST	24	2/2	
690	GLTR	HONEY LOCUST	25	2/2	
691	ULPU	SIBERIAN ELM	8, 5	3/3	
692	FRPE	GREEN ASH	20	2/2	
693	MAPU	CRABAPPLE	7	3/4	
694	MAPU	CRABAPPLE	7	3/4	
695	MAPU	CRABAPPLE	11	3/4	
696	TIAM	BASSWOOD	22	3/3	
697	FRAM	WHITE ASH	11	2/2	
698	PIPU	BLUE SPRUCE	10	3/3	
699	JUVI	RED CEDAR	11	3/3	
700	FRPE	GREEN ASH	14	2/2	
		NO TAGS 701 - 724			
725	GONE	NO TREE PRESENT			
726	ACPL	NORWAY MAPLE	12	3/3	
727	ACSAI	SILVER MAPLE	18	3/3	

728	ACSAC	SUGAR MAPLE	14	2/2	
729	ACSAI	SILVER MAPLE	24	3/3	
730	ACPL	NORWAY MAPLE	14	3/3	
731	PIPU	BLUE SPRUCE	2	2/2	
732	GONE	NO TREE PRESENT			
733	ACRU	RED MAPLE	9	3/3	
734	ROPS	BLACK LOCUST	32	4/4	SPLIT
735	ACSAI	SILVER MAPLE	18	4/4	STEM ROT
736	ROPS	BLACK LOCUST	17	4/4	SPLIT
737	ROPS	BLACK LOCUST	15	3/3	
738	ROPS	BLACK LOCUST	14	3/4	LEAN
739	ROPS	BLACK LOCUST	13	3/4	LEAN
740	ACNE	BOX ELDER	15	3/4	LEAN
741	ROPS	BLACK LOCUST	15	3/4	
742	ROPS	BLACK LOCUST	16	3/3	
743	ROPS	BLACK LOCUST	13	4/4	STEM ROT
744	ACNE	BOX ELDER	22	3/3	
745	ROPS	BLACK LOCUST	11	3/3	
746	ROPS	BLACK LOCUST	12	3/3	
747	ROPS	BLACK LOCUST	8	3/4	LEAN
748	ROPS	BLACK LOCUST	13	3/4	LEAN
749	ROPS	BLACK LOCUST	13	3/3	
750	PINI	AUSTRIAN PINE	14	3/3	
751	PINI	AUSTRIAN PINE	14	3/3	
752	PINI	AUSTRIAN PINE	17	3/3	
753	PIPU	BLUE SPRUCE	6	3/3	
754	PIPU	BLUE SPRUCE	9	3/3	
755	PIPU	BLUE SPRUCE	8	3/3	
756	PIPU	BLUE SPRUCE	4	3/3	
757	PIPU	BLUE SPRUCE	8	3/3	
758	YEW	YEW	6, 4, 3, 3	3/4	
759	ACRU	RED MAPLE	5	3/4	
760	ACRU	RED MAPLE	8	3/3	
761	ULAM	AMERICAN ELM	26	3/3	
762	MAPU	CRABAPPLE	13	3/3	
763	PIPU	BLUE SPRUCE	6	2/2	
764	ACPL	NORWAY MAPLE	14	3/2	
765	ACRU	RED MAPLE	7	3/3	
766	QUMA	BUR OAK	21	2/2	
767	QUMA	BUR OAK	38	3/3	
768	PIAB	NORWAY SPRUCE	12	3/3	
769	PIAB	NORWAY SPRUCE	13	3/3	
770	PIPU	BLUE SPRUCE	11	3/3	
771	ACPL	NORWAY MAPLE	10	2/2	
772	ROPS	BLACK LOCUST	17	3/3	
773	QUMA	BUR OAK	39	3/3	
774	ACPL	NORWAY MAPLE	9	3/3	
775	PISY	SCOTCH PINE	6	3/4	
776	ACPL	NORWAY MAPLE	10	3/3	
777	ACRU	RED MAPLE	3	2/2	
778	RHCA	BUCKTHORN	2, 2, 2	3/4	
779	ACSAI	SILVER MAPLE	24	3/3	

780	ACPL	NORWAY MAPLE	5	3/3	
781	ULPU	SIBERIAN ELM	13, 8	3/3	
782	ULPU	SIBERIAN ELM	15, 13	3/3	
783	ULPU	SIBERIAN ELM	27	3/4	LEAN
784	PISY	SCOTCH PINE	11	3/4	
785	PISY	SCOTCH PINE	10	3/4	
786	ACPL	NORWAY MAPLE	23	2/2	
787	ACSAI	SILVER MAPLE	30	3/3	
788	ACSAI	SILVER MAPLE	30	4/4	STEM ROT
789	ACPL	NORWAY MAPLE	22	3/3	
790	ACSAI	SILVER MAPLE	22	3/3	
791	ACSAI	SILVER MAPLE	22	3/3	
792	ACSAI	SILVER MAPLE	18	3/3	
793	PIPU	BLUE SPRUCE	9	2/2	
794	PIPU	BLUE SPRUCE	8	2/2	
795	MAPU	CRABAPPLE	7	3/3	
796	ACSAI	SILVER MAPLE	22	3/3	
797	ACSAI	SILVER MAPLE	23	3/3	
798	ACSAI	SILVER MAPLE	24	3/3	
799	ACRU	RED MAPLE	8	2/2	
800	FRPE	GREEN ASH	23	3/3	
801	ULPU	SIBERIAN ELM	6	3/3	
802	ULPU	SIBERIAN ELM	6	3/3	
803	ULPU	SIBERIAN ELM	8	3/3	
804	ULPU	SIBERIAN ELM	6	3/3	
805	JUNI	BLACK WALNUT	7	2/2	
806	ULPU	SIBERIAN ELM	7	3/3	
807	FRPE	GREEN ASH	25	3/3	
808	FRPE	GREEN ASH	28	3/4	
809	QUMA	BUR OAK	26	2/2	
810	PIPU	BLUE SPRUCE	12	2/2	
811	PIPU	BLUE SPRUCE	13	2/2	
812	PIPU	BLUE SPRUCE	14	2/2	
813	MOAL	WHITE MULBERRY	5	3/4	
814	PIGL	WHITE SPRUCE	4	2/2	
815	GONE	NO TREE PRESENT			
816	MOAL	WHITE MULBERRY	5	3/4	
817	QURU	RED OAK	3	2/2	
818	JUNI	BLACK WALNUT	13	2/2	
819	QURU	RED OAK	34	2/2	
820	ULPU	SIBERIAN ELM	22, 7	4/4	DEADWOOD
821	LOTA	HONEYSUCKLE	3, 3, 2, 2	3/4	
822	ULPU	SIBERIAN ELM	25	3/4	DEADWOOD
823	ULPU	SIBERIAN ELM	29	4/4	DEADWOOD
824	JUNI	BLACK WALNUT	10	2/2	
825	JUNI	BLACK WALNUT	13	2/2	
826	ROPS	BLACK LOCUST	9, 5	3/3	
827	ROPS	BLACK LOCUST	12, 10	3/3	
828	ROPS	BLACK LOCUST	14	3/3	
829	ROPS	BLACK LOCUST	15, 6	3/4	
830	ROPS	BLACK LOCUST	8, 5	3/3	
831	ROPS	BLACK LOCUST	5	3/3	

832	ROPS	BLACK LOCUST	2	3/3	
833	GLTR	HONEY LOCUST	14	3/3	
834	ROPS	BLACK LOCUST	8, 9	3/4	
835	RHCA	BUCKTHORN	3	3/3	
836	ROPS	BLACK LOCUST	3	3/3	
837	GLTR	HONEY LOCUST	15	3/3	
838	ROPS	BLACK LOCUST	8	3/3	
839	RHCA	BUCKTHORN	4, 4, 3	3/3	
840	RHCA	BUCKTHORN	4	3/3	
841	ROPS	BLACK LOCUST	4	3/3	
842	ROPS	BLACK LOCUST	8, 4	3/3	
843	ROPS	BLACK LOCUST	3	3/3	
844	ROPS	BLACK LOCUST	7	3/3	
845	ROPS	BLACK LOCUST	7	3/3	
846	ROPS	BLACK LOCUST	5	3/3	
847	ROPS	BLACK LOCUST	5	3/3	
848	ROPS	BLACK LOCUST	4	3/3	
849	ROPS	BLACK LOCUST	2	3/4	
850	ROPS	BLACK LOCUST	7	3/3	
851	ROPS	BLACK LOCUST	3	3/3	
852	ROPS	BLACK LOCUST	5	3/3	
853	ROPS	BLACK LOCUST	6, 3	3/3	
854	ROPS	BLACK LOCUST	4	3/3	
855	ROPS	BLACK LOCUST	3	4/4	
856	ROPS	BLACK LOCUST	3	3/3	
857	ROPS	BLACK LOCUST	3	3/4	
858	ROPS	BLACK LOCUST	5	3/3	
859	ROPS	BLACK LOCUST	7	3/3	
860	ROPS	BLACK LOCUST	8	3/3	
861	ROPS	BLACK LOCUST	7	3/3	
862	ROPS	BLACK LOCUST	7	3/3	
863	ROPS	BLACK LOCUST	9	3/3	
864	ROPS	BLACK LOCUST	7	3/3	
865	ROPS	BLACK LOCUST	11	3/3	
866	ROPS	BLACK LOCUST	7	3/3	
867	ROPS	BLACK LOCUST	5	3/3	
868	ROPS	BLACK LOCUST	4	3/3	
869	ROPS	BLACK LOCUST	5	3/3	
870	ROPS	BLACK LOCUST	8, 8	3/3	
871	ROPS	BLACK LOCUST	7	3/3	
872	ROPS	BLACK LOCUST	6	3/3	
873	ROPS	BLACK LOCUST	8, 3	3/3	
874	ROPS	BLACK LOCUST	7	3/3	
875	ACNE	BOX ELDER	3	3/4	LEAN
876	ROPS	BLACK LOCUST	7	3/3	
877	ROPS	BLACK LOCUST	3	3/3	
878	ROPS	BLACK LOCUST	3	3/3	
879	ROPS	BLACK LOCUST	11	3/3	
880	ROPS	BLACK LOCUST	3	3/3	
881	ROPS	BLACK LOCUST	17, 9	3/3	
882	TADI	BALDCYPRESS	12	2/2	
883	TADI	BALDCYPRESS	12	3/3	

886	DEAD	DEAD			
887	ULPU	SIBERIAN ELM	7	3/3	
888	ULPU	SIBERIAN ELM	7	3/3	
889	CAOV	SHAGBARK HICKORY	15, 15	2/2	
890	PIPU	BLUE SPRUCE	15	2/2	
891	JUVI	RED CEDAR	8	3/3	
892	CAOV	SHAGBARK HICKORY	25	2/2	
893	ACRU	RED MAPLE	5, 5	3/3	
894	ACRU	RED MAPLE	7, 5	3/3	
895	ACRU	RED MAPLE	5	3/3	
896	ACRU	RED MAPLE	6	3/3	
897	ACRU	RED MAPLE	6, 4	3/3	
898	ACRU	RED MAPLE	13	3/3	
899	ACRU	RED MAPLE	6	3/3	
900	GLTR	HONEY LOCUST	7	3/3	
		NO TAGS 901 - 1000			
1001	ULPU	SIBERIAN ELM	7	3/3	
1002	ULPU	SIBERIAN ELM	4	3/3	
1003	ACSAI	SILVER MAPLE	6	3/3	
1004	ULPU	SIBERIAN ELM	3	3/3	
1005	ULPU	SIBERIAN ELM	4	3/3	
1006	ULPU	SIBERIAN ELM	7	3/3	
1007	ACNE	BOX ELDER	5	3/3	
1008	ULPU	SIBERIAN ELM	5	3/3	
1009	ULPU	SIBERIAN ELM	7, 3	3/3	
1010	ULPU	SIBERIAN ELM	4	3/3	
1011	ULPU	SIBERIAN ELM	5	3/3	
1012	PODE	COTTONWOOD	12	3/3	
1013	ULPU	SIBERIAN ELM	5	3/3	
1014	ULPU	SIBERIAN ELM	4	3/3	
1015	ULPU	SIBERIAN ELM	7	3/3	
1016	ULPU	SIBERIAN ELM	4	3/3	
1017	ULPU	SIBERIAN ELM	6	3/3	
1018	PODE	COTTONWOOD	8	3/3	
1019	ULPU	SIBERIAN ELM	3	3/3	
1020	ULPU	SIBERIAN ELM	3	3/3	
1021	PODE	COTTONWOOD	11	3/3	
1022	PODE	COTTONWOOD	16	3/4	
1023	ULPU	SIBERIAN ELM	5	3/3	
1024	ULPU	SIBERIAN ELM	4	3/3	
1025	ULPU	SIBERIAN ELM	5	3/3	
1026	ULPU	SIBERIAN ELM	8	3/3	
1027	ULPU	SIBERIAN ELM	5, 3	3/3	
1028	ULPU	SIBERIAN ELM	3	3/3	
1029	ULPU	SIBERIAN ELM	4	3/3	
1030	ULPU	SIBERIAN ELM	6	3/3	
1031	ULPU	SIBERIAN ELM	4	3/3	
1032	ULPU	SIBERIAN ELM	4	3/3	
1033	ULPU	SIBERIAN ELM	13	3/3	
1034	ULPU	SIBERIAN ELM	5	3/3	
1035	ULPU	SIBERIAN ELM	7	3/3	
1036	ULPU	SIBERIAN ELM	9	3/3	

1037	ULPU	SIBERIAN ELM	4, 4	3/3	
1038	ULPU	SIBERIAN ELM	10	3/3	
1039	ULPU	SIBERIAN ELM	4	3/3	
1040	ULPU	SIBERIAN ELM	5	3/3	
1041	ULPU	SIBERIAN ELM	9	3/3	
1042	ULPU	SIBERIAN ELM	8	3/3	
1043	ULPU	SIBERIAN ELM	9	3/3	
1044	ULPU	SIBERIAN ELM	4	3/3	
1045	GLTR	HONEY LOCUST	24	3/3	
1046	ULPU	SIBERIAN ELM	15	3/3	
1047	ULPU	SIBERIAN ELM	10	3/3	
1048	ULPU	SIBERIAN ELM	23	3/3	
1049	PODE	COTTONWOOD	5	3/3	
1050	PODE	COTTONWOOD	10	3/3	
1051	PODE	COTTONWOOD	10	3/3	
1052	GLTR	HONEY LOCUST	12	3/3	
1053	ULPU	SIBERIAN ELM	6	3/3	
1054	ACNE	BOX ELDER	6, 6, 6, 5, 5	3/4	
1055	ACNE	BOX ELDER	5, 4	3/3	
1056	FRPE	GREEN ASH	7	3/3	
1057	RHCA	BUCKTHORN	4, 4	3/4	
1058	FRPE	GREEN ASH	7	3/3	
1059	FRPE	GREEN ASH	10	3/3	
1060	FRPE	GREEN ASH	6	3/3	
1061	FRPE	GREEN ASH	6	3/3	
1062	FRPE	GREEN ASH	7	3/3	
1063	FRPE	GREEN ASH	6, 6	3/3	
1064	ACNE	BOX ELDER	5, 5	3/3	
1065	ACNE	BOX ELDER	3, 3	3/3	
1066	ACNE	BOX ELDER	6, 6, 6, 5, 4	3/4	
1067	ACNE	BOX ELDER	4, 2, 2	3/4	
1068	ACNE	BOX ELDER	3, 3	3/4	
1069	ACNE	BOX ELDER	4	3/3	
1070	ACNE	BOX ELDER	5	3/3	
1071	ACNE	BOX ELDER	3, 3, 3	3/4	
1072	ACNE	BOX ELDER	6	3/3	
1073	ACNE	BOX ELDER	5, 4, 3	3/4	
1074	ACNE	BOX ELDER	5, 5	3/4	
1075	ACNE	BOX ELDER	4	3/4	
1076	ACNE	BOX ELDER	4	3/4	
1077	ULPU	SIBERIAN ELM	11	3/3	
1078	ACNE	BOX ELDER	5, 4	3/4	
1079	ACNE	BOX ELDER	3	3/3	
1080	ULPU	SIBERIAN ELM	8	3/3	
1081	ACNE	BOX ELDER	3, 3, 4, 3	3/4	
1082	ACNE	BOX ELDER	5, 4, 3, 2	3/4	
1083	ULPU	SIBERIAN ELM	7	3/3	
1084	ACNE	BOX ELDER	4, 4, 3, 3, 2	3/4	
1085	ULPU	SIBERIAN ELM	6	3/3	
1086	ACNE	BOX ELDER	5, 4	3/4	
1087	ULPU	SIBERIAN ELM	5	3/3	
1088	ACNE	BOX ELDER	3, 3	3/4	

1089	ULPU	SIBERIAN ELM	4	3/3	
1090	ACNE	BOX ELDER	6, 5	3/4	
1091	ACNE	BOX ELDER	4, 4	3/4	
1092	ACNE	BOX ELDER	5	3/3	
1093	ULPU	SIBERIAN ELM	5	3/3	
1094	ULPU	SIBERIAN ELM	7	3/3	
1095	ACNE	BOX ELDER	6	3/3	
1096	ULPU	SIBERIAN ELM	5	3/3	
1097	ACNE	BOX ELDER	3, 4	3/4	
1098	ULPU	SIBERIAN ELM	6, 4	3/4	
1099	ULPU	SIBERIAN ELM	6	3/3	
1100	ACNE	BOX ELDER	4, 4	3/4	
1101	ULPU	SIBERIAN ELM	8	3/3	
1102	ACNE	BOX ELDER	3	3/3	
1103	ULPU	SIBERIAN ELM	5	3/3	
1104	MOAL	WHITE MULBERRY	5	3/3	
1105	ACNE	BOX ELDER	6, 3, 3	3/4	
1106	ACNE	BOX ELDER	6, 6	3/4	
1107	GLTR	HONEY LOCUST	4, 3	3/3	
1108	GLTR	HONEY LOCUST	4, 3	3/4	
1109	GONE	NO TREE PRESENT			
1110	GONE	NO TREE PRESENT			
1111	ULAM	AMERICAN ELM	11	3/3	
1112	AMLA	SERVICEBERRY	6, 6, 5	3/4	
1113	ULPU	SIBERIAN ELM	9	3/3	
1114	SANI	BLACK WILLOW	19	3/4	DEADWOOD
1115	SANI	BLACK WILLOW	8	3/3	
1116	ACSAC	SUGAR MAPLE	32	3/3	
1117	PINI	AUSTRIAN PINE	4	3/3	
1118	PINI	AUSTRIAN PINE	4	3/3	
1119	PINI	AUSTRIAN PINE	4	3/3	
1120	PINI	AUSTRIAN PINE	4	3/3	
1121	PINI	AUSTRIAN PINE	6	3/3	
1122	PINI	AUSTRIAN PINE	5	3/3	
1123	PINI	AUSTRIAN PINE	6	3/3	
1124	PINI	AUSTRIAN PINE	3	3/3	
1125	PINI	AUSTRIAN PINE	4	3/3	
1126	PINI	AUSTRIAN PINE	6	3/3	
1127	PINI	AUSTRIAN PINE	5	3/3	
1128	PINI	AUSTRIAN PINE	5	3/3	
1129	PINI	AUSTRIAN PINE	6	3/3	
1130	PINI	AUSTRIAN PINE	4	3/3	
1131	PINI	AUSTRIAN PINE	5	3/3	
1132	PINI	AUSTRIAN PINE	3	3/3	
1133	PINI	AUSTRIAN PINE	5	3/3	
1134	PINI	AUSTRIAN PINE	6	3/3	
1135	PINI	AUSTRIAN PINE	7	3/3	
1136	PINI	AUSTRIAN PINE	5	3/3	
1137	PINI	AUSTRIAN PINE	4	3/3	
1138	PINI	AUSTRIAN PINE	7	3/3	
1139	PINI	AUSTRIAN PINE	5	3/3	
1140	PINI	AUSTRIAN PINE	5	3/3	

1141	PINI	AUSTRIAN PINE	6	3/3	
1142	PINI	AUSTRIAN PINE	6	3/3	
1143	PINI	AUSTRIAN PINE	6	3/3	
1144	PINI	AUSTRIAN PINE	4	3/3	
1145	PINI	AUSTRIAN PINE	6	3/3	
1146	PINI	AUSTRIAN PINE	5	3/3	
1147	PINI	AUSTRIAN PINE	4	3/3	
1148	PINI	AUSTRIAN PINE	6	3/3	
1149	PINI	AUSTRIAN PINE	6	3/3	
1150	PINI	AUSTRIAN PINE	6	3/3	
1151	PINI	AUSTRIAN PINE	4	3/3	
1152	PINI	AUSTRIAN PINE	3	3/3	
1153	PINI	AUSTRIAN PINE	4	3/3	
1154	ACPL	NORWAY MAPLE	13	2/2	
1155	GLTR	HONEY LOCUST	17	2/2	
1156	ACPL	NORWAY MAPLE	6	2/2	
1157	ACNE	BOX ELDER	17	3/4	
1158	RHCA	BUCKTHORN	2, 2, 2, 2	3/4	
1159	ACNE	BOX ELDER	4, 3	3/4	
1160	ACNE	BOX ELDER	6, 4	3/4	
1161	ACNE	BOX ELDER	4, 4, 3	3/4	
1162	ULPU	SIBERIAN ELM	8	3/3	
1163	FRPE	GREEN ASH	4, 4	3/3	
1164	ACNE	BOX ELDER	3, 3	3/4	
1165	ACNE	BOX ELDER	6, 2	3/4	
1166	ACNE	BOX ELDER	4, 3	3/4	
1167	ACNE	BOX ELDER	4, 3, 3	3/4	
1168	GLTR	HONEY LOCUST	4, 4	3/3	
1169	FRPE	GREEN ASH	4	3/3	
1170	ULPU	SIBERIAN ELM	7	3/3	
1171	GLTR	HONEY LOCUST	3, 3	3/3	
1172	GLTR	HONEY LOCUST	3, 2, 2	3/4	
1173	GLTR	HONEY LOCUST	6, 3, 3	3/4	
1174	ACNE	BOX ELDER	4, 3, 3	3/4	
1175	ACNE	BOX ELDER	13	3/4	LEAN
1176	ACNE	BOX ELDER	4	3/4	LEAN
1177	ACNE	BOX ELDER	5	3/4	LEAN
1178	ACNE	BOX ELDER	4	3/4	LEAN
1179	GLTR	HONEY LOCUST	13	3/3	
1180	FRPE	GREEN ASH	7	3/3	
1181	ACNE	BOX ELDER	4	3/4	LEAN
1182	ACNE	BOX ELDER	6	3/4	LEAN
1183	ACNE	BOX ELDER	6	3/4	LEAN
1184	ACNE	BOX ELDER	4, 3	3/4	LEAN
1185	ACNE	BOX ELDER	4	3/4	LEAN
1186	ACNE	BOX ELDER	5	3/4	LEAN
1187	PINI	AUSTRIAN PINE	9	3/3	
1188	PINI	AUSTRIAN PINE	5, 4	4/4	
1189	PINI	AUSTRIAN PINE	10	3/3	
1190	PINI	AUSTRIAN PINE	8	3/3	
1191	PINI	AUSTRIAN PINE	9	3/3	
1192	CRMO	HAWTHORN	6, 6, 5	3/4	

1193	FRPE	GREEN ASH	12	3/3	
1194	FRPE	GREEN ASH	5	3/3	
1195	FRPE	GREEN ASH	7	3/3	
1196	FRPE	GREEN ASH	8	3/3	
1197	FRPE	GREEN ASH	5	3/3	
1198	FRPE	GREEN ASH	12	3/3	
1199	FRPE	GREEN ASH	6	3/3	
1200	ACNE	BOX ELDER	2, 2, 2, 3	3/4	
1201	ACNE	BOX ELDER	6	3/3	
1202	ACNE	BOX ELDER	5	3/3	
1203	MOAL	WHITE MULBERRY	4	3/3	
1204	RHCA	BUCKTHORN	4	3/3	
1205	ACNE	BOX ELDER	3	3/3	
1206	ACNE	BOX ELDER	3	3/3	
1207	FRPE	GREEN ASH	6, 4	3/3	
1208	ACNE	BOX ELDER	4, 2	3/4	
1209	ACNE	BOX ELDER	6, 7, 5	3/4	
1210	ACNE	BOX ELDER	4, 2	3/4	
1211	FRPE	GREEN ASH	6	3/3	
1212	GLTR	HONEY LOCUST	4	3/3	
1213	GLTR	HONEY LOCUST	5	3/3	
1214	GLTR	HONEY LOCUST	5	3/3	
1215	GLTR	HONEY LOCUST	5	3/3	
1216	GLTR	HONEY LOCUST	3	3/3	
1217	GLTR	HONEY LOCUST	6, 5, 4, 4	3/4	
1218	GLTR	HONEY LOCUST	6, 6, 5, 5, 4	3/4	
1219	ACNE	BOX ELDER	4, 4	3/3	
1220	ACNE	BOX ELDER	4	3/3	
1221	ACNE	BOX ELDER	4	3/3	
1222	ACNE	BOX ELDER	5, 2	3/4	
1223	RHCA	BUCKTHORN	4, 3, 3	3/4	
1224	ACNE	BOX ELDER	4	3/3	
1225	GLTR	HONEY LOCUST	6, 4	3/3	
1226	RHCA	BUCKTHORN	3, 3, 3, 3	3/4	
1227	GLTR	HONEY LOCUST	4, 3	3/3	
1228	GLTR	HONEY LOCUST	4, 3	3/3	
1229	GLTR	HONEY LOCUST	4	3/3	
1230	FRPE	GREEN ASH	4, 4, 3, 3, 3	3/4	
1231	ACNE	BOX ELDER	6, 6, 3, 3	3/4	
1232	RHCA	BUCKTHORN	2, 2, 2	3/4	
1233	GLTR	HONEY LOCUST	5	3/3	
1234	GLTR	HONEY LOCUST	4, 4	3/3	
1235	GLTR	HONEY LOCUST	5	3/3	
1236	GLTR	HONEY LOCUST	12	3/3	
1237	ACNE	BOX ELDER	4	3/3	
1238	ACNE	BOX ELDER	4	3/3	
1239	PIPU	BLUE SPRUCE	2	2/2	
1240	PIPU	BLUE SPRUCE	2	2/2	
1241	ACSAI	SILVER MAPLE	16	3/3	
1242	PIPU	BLUE SPRUCE	14	2/2	
1243	PIPU	BLUE SPRUCE	3	2/2	
1244	PIPU	BLUE SPRUCE	1	2/2	

1245	ACSAI	SILVER MAPLE	23	3/3	
1246	PIAB	NORWAY SPRUCE	14	3/3	
1247	PIPU	BLUE SPRUCE	10	2/2	
1248	ACSAI	SILVER MAPLE	32	3/3	
1249	ACSAI	SILVER MAPLE	24	3/3	
1250	JUNI	BLACK WALNUT	7	2/2	
1251	ACSAI	SILVER MAPLE	22	3/3	
1252	JUNI	BLACK WALNUT	7	2/2	
1253	ACSAI	SILVER MAPLE	23	2/2	
1254	MAPU	CRABAPPLE	4, 4, 3, 3	3/3	
1255	ACSAI	SILVER MAPLE	24	3/3	
1256	ACSAI	SILVER MAPLE	27	3/3	
1257	JUNI	BLACK WALNUT	8	3/2	
1258	PISY	SCOTCH PINE	12	3/3	
1259	MAPU	CRABAPPLE	2	3/3	
1260	MAPU	CRABAPPLE	2	3/3	
1261	MAPU	CRABAPPLE	2	3/3	
1262	FRPE	GREEN ASH	6	3/3	
1263	GLTR	HONEY LOCUST	7	3/3	
1264	GLTR	HONEY LOCUST	6	3/3	
1265	GLTR	HONEY LOCUST	4	3/3	
1266	GLTR	HONEY LOCUST	7	3/3	
1267	GLTR	HONEY LOCUST	7, 7, 6	3/3	
1268	ACNE	BOX ELDER	5	3/4	LEAN
1269	RHCA	BUCKTHORN	3, 3	3/4	
1270	ACNE	BOX ELDER	5, 3	3/4	
1271	RHCA	BUCKTHORN	3, 3, 3	3/4	
1272	ACNE	BOX ELDER	6	3/3	
1273	RHCA	BUCKTHORN	2, 3	3/3	
1274	ACSAI	SILVER MAPLE	15	3/3	
1275	PIPU	BLUE SPRUCE	3	2/2	
1276	PIPU	BLUE SPRUCE	3	2/2	
1277	FRPE	GREEN ASH	9, 9, 7	3/3	
1278	FRPE	GREEN ASH	6, 6, 6	3/3	
1279	FRPE	GREEN ASH	6	3/3	
1280	GLTR	HONEY LOCUST	8	3/3	
1281	FRPE	GREEN ASH	5	3/3	
1282	FRPE	GREEN ASH	7	3/3	
1283	FRPE	GREEN ASH	9	3/3	
1284	FRPE	GREEN ASH	7	3/4	LEAN
1285	FRPE	GREEN ASH	8	3/3	
1286	FRPE	GREEN ASH	3, 3	3/3	
1287	FRPE	GREEN ASH	7	3/3	
1288	FRPE	GREEN ASH	7	3/3	
1289	FRPE	GREEN ASH	6	3/3	
1290	FRPE	GREEN ASH	5, 4, 4	3/4	
1291	PRSE	BLACK CHERRY	6, 6, 5, 8	3/3	
1292	FRPE	GREEN ASH	6, 6, 4	3/4	
1293	FRPE	GREEN ASH	5, 4	3/3	
1294	FRPE	GREEN ASH	4	3/3	
1295	FRPE	GREEN ASH	6	3/3	
1296	FRPE	GREEN ASH	4	3/4	

1297	FRPE	GREEN ASH	4	3/4	
1298	FRPE	GREEN ASH	6	3/3	
1299	FRPE	GREEN ASH	4	3/3	
1300	FRPE	GREEN ASH	5	3/3	
1301	FRPE	GREEN ASH	4	3/3	
1302	FRPE	GREEN ASH	5	3/3	
1303	FRPE	GREEN ASH	6, 6	3/3	
1304	FRPE	GREEN ASH	4	3/3	
1305	FRPE	GREEN ASH	7	3/3	
1306	FRPE	GREEN ASH	8	3/3	
1307	GLTR	HONEY LOCUST	5, 5, 4	3/4	
1308	GLTR	HONEY LOCUST	10	3/3	
1309	ACPL	NORWAY MAPLE	10	2/2	
1310	FRPE	GREEN ASH	14	2/3	
1311	GLTR	HONEY LOCUST	11	3/3	
1312	QURU	RED OAK	6	2/2	
1313	GLTR	HONEY LOCUST	9	2/2	
1314	GLTR	HONEY LOCUST	8	3/3	
1315	GLTR	HONEY LOCUST	6	3/3	
1316	GLTR	HONEY LOCUST	5, 4	3/3	
1317	GLTR	HONEY LOCUST	9	3/3	
1318	GLTR	HONEY LOCUST	8	3/3	
1319	GLTR	HONEY LOCUST	3, 3	3/3	
1320	GLTR	HONEY LOCUST	8	3/3	
1321	GLTR	HONEY LOCUST	4, 3	3/3	
1322	GLTR	HONEY LOCUST	7, 7, 8	3/4	
1323	GLTR	HONEY LOCUST	6, 7	3/3	
1324	GLTR	HONEY LOCUST	8	3/3	
1325	GLTR	HONEY LOCUST	8	3/3	
1326	GLTR	HONEY LOCUST	10, 8, 8	3/3	
1327	GLTR	HONEY LOCUST	12, 10, 7	3/3	
1328	GLTR	HONEY LOCUST	12	3/3	
1329	GLTR	HONEY LOCUST	12	3/3	
1330	MOAL	WHITE MULBERRY	5	3/3	
1331	FRPE	GREEN ASH	3	3/3	
1332	GLTR	HONEY LOCUST	9	3/3	
1333	GLTR	HONEY LOCUST	7	3/3	
1334	GLTR	HONEY LOCUST	12, 7, 6	3/3	
1335	GLTR	HONEY LOCUST	4	3/3	
1336	GLTR	HONEY LOCUST	4	3/3	
1337	GLTR	HONEY LOCUST	7, 4	3/3	
1338	GLTR	HONEY LOCUST	10	3/3	
1339	FRPE	GREEN ASH	6	3/3	
1340	FRPE	GREEN ASH	13	3/3	
1341	FRPE	GREEN ASH	11, 6, 6, 6	3/4	
1342	FRPE	GREEN ASH	12	3/3	
1343	GLTR	HONEY LOCUST	6	3/3	
1344	FRPE	GREEN ASH	8, 7	3/3	
1345	PRSE	BLACK CHERRY	7	3/3	
1346	GLTR	HONEY LOCUST	3	3/3	
1347	FRPE	GREEN ASH	4	3/3	
1348	GLTR	HONEY LOCUST	4, 5	3/3	

1349	PRSE	BLACK CHERRY	6	3/4	LEAN
1350	PRSE	BLACK CHERRY	7	3/3	
1351	PRSE	BLACK CHERRY	8	3/3	
1352	GLTR	HONEY LOCUST	13	3/3	
1353	GLTR	HONEY LOCUST	9	3/3	
1354	GLTR	HONEY LOCUST	4	3/3	
1355	GLTR	HONEY LOCUST	13, 13	3/3	
1356	GLTR	HONEY LOCUST	13	3/3	
1357	GLTR	HONEY LOCUST	12	3/3	
1358	GLTR	HONEY LOCUST	4	3/3	
1359	GLTR	HONEY LOCUST	17	3/3	
1360	GLTR	HONEY LOCUST	16, 12	3/3	
1361	GLTR	HONEY LOCUST	6	3/3	
1362	GLTR	HONEY LOCUST	24	3/4	LEAN
1363	GLTR	HONEY LOCUST	13	3/3	
1364	GLTR	HONEY LOCUST	21	3/3	
1365	ACNE	BOX ELDER	14	3/4	LEAN
1366	GLTR	HONEY LOCUST	6	3/4	
1367	GLTR	HONEY LOCUST	4	3/4	
1368	ACNE	BOX ELDER	17	3/4	LEAN
1369	GLTR	HONEY LOCUST	6, 6	3/3	
1370	ACNE	BOX ELDER	4	3/4	
1371	ACNE	BOX ELDER	4	3/4	
1372	GLTR	HONEY LOCUST	13	3/3	
1373	GLTR	HONEY LOCUST	21	3/4	LEAN
1374	ACPL	NORWAY MAPLE	12	2/2	
1375	GYDI	KENTUCKY COFFEETREE	9	2/2	
1376	GLTR	HONEY LOCUST	26	3/3	
1377	GLTR	HONEY LOCUST	6, 6, 6	3/4	
1378	FRPE	GREEN ASH	12, 10, 5	3/3	
1379	GLTR	HONEY LOCUST	27	3/3	
1380	FRPE	GREEN ASH	7, 6	3/4	
1381	GLTR	HONEY LOCUST	7	2/2	
1382	GLTR	HONEY LOCUST	11	2/2	
1383	GLTR	HONEY LOCUST	13	2/2	
1384	GLTR	HONEY LOCUST	5	2/2	
1385	MAPU	CRABAPPLE	8	3/3	
1386	ULPU	SIBERIAN ELM	4	3/3	
1387	PIPU	BLUE SPRUCE	4	2/2	
1388	PIPU	BLUE SPRUCE	7	2/2	
1389	ULPU	SIBERIAN ELM	10, 9, 17	3/3	
1390	PIPU	BLUE SPRUCE	12	2/2	
1391	QUMA	BUR OAK	13	2/2	
1392	JUVI	RED CEDAR	5	3/3	
1393	JUVI	RED CEDAR	5	3/3	
1394	GINKGO	GINKGO	10	3/3	
1395	JUVI	RED CEDAR	6	3/3	
1396	ACPL	NORWAY MAPLE	15	3/3	
1397	MAPU	CRABAPPLE	13	4/3	DEADWOOD
1398	PIST	WHITE PINE	8, 8	2/3	
1399	GINKGO	GINKGO	5	3/3	
1400	GINKGO	GINKGO	6	2/3	

1401	QUMA	BUR OAK	38	2/2	
1402	MOAL	WHITE MULBERRY	5, 4, 3, 3	3/3	
1403	MAPU	CRABAPPLE	9	3/3	
1404	AMLA	SERVICEBERRY	3	3/3	
1405	ACSAI	SILVER MAPLE	14	5/5	DEADWOOD
1406	ACSAI	SILVER MAPLE	34, 20	3/5	STEM ROT
1407	ACSAI	SILVER MAPLE	52	3/3	DEADWOOD
1408	PRDO	PLUM	3	2/2	
1409	ROPS	BLACK LOCUST	11	3/3	
1410	ROPS	BLACK LOCUST	11	3/3	
1411	ROPS	BLACK LOCUST	11	3/3	
1412	MAPU	CRABAPPLE	8	3/3	
1413	MAPU	CRABAPPLE	8	3/3	
1414	MAPU	CRABAPPLE	8	3/3	
1415	AMLA	SERVICEBERRY	3, 3	3/3	
1416	MAPU	CRABAPPLE	8	3/3	
1417	GLTR	HONEY LOCUST	4	3/4	
1418	GLTR	HONEY LOCUST	4	3/3	
1419	GLTR	HONEY LOCUST	4	3/3	
1420	GLTR	HONEY LOCUST	4	2/2	
1421	GLTR	HONEY LOCUST	5	2/2	
1422	GLTR	HONEY LOCUST	7	2/2	
1423	FRAM	WHITE ASH	5	2/2	
1424	TICO	LINDEN	11	2/2	
1425	TICO	LINDEN	10	2/2	
1426	TICO	LINDEN	10	2/2	
1427	ACRU	RED MAPLE	4	2/2	
1428	ACRU	RED MAPLE	7	2/2	
1429	FRPE	GREEN ASH	14	3/4	LEAN
1430	MAPU	CRABAPPLE	11	3/3	
1431	FRPE	GREEN ASH	13	2/2	
1432	ACRU	RED MAPLE	3	2/2	
1433	PIPU	BLUE SPRUCE	15	2/2	
1434	PIAB	NORWAY SPRUCE	13	2/2	
1435	QUMA	BUR OAK	26	2/2	
1436	QUMA	BUR OAK	24	2/2	
1437	AMLA	SERVICEBERRY	2, 2, 2	3/3	
1438	AMLA	SERVICEBERRY	2, 2, 2	3/3	
1439	PIPU	BLUE SPRUCE	14	2/2	
1440	QUMA	BUR OAK	37	2/2	
1441	ACRU	RED MAPLE	3	2/2	
1442	GLTR	HONEY LOCUST	4	2/2	
1443	FRAM	WHITE ASH	5	2/2	
1444	GLTR	HONEY LOCUST	5	2/2	
1445	AMLA	SERVICEBERRY	1, 1, 1	3/4	
1446	ACPL	NORWAY MAPLE	6	2/2	
1447	GLTR	HONEY LOCUST	11	2/2	
1448	FRAM	WHITE ASH	13	2/2	
1449	TICO	LINDEN	5	2/2	
1450	FRAM	WHITE ASH	6	2/2	
1451	GLTR	HONEY LOCUST	3	2/2	
1452	QURO	ENGLISH OAK	12	2/2	

1453	FRAM	WHITE ASH	10	2/3	
1454	GLTR	HONEY LOCUST	15	2/2	
1455	ACPL	NORWAY MAPLE	5	3/3	LEAN
1456	ULPU	SIBERIAN ELM	36	3/4	
1457	MAPU	CRABAPPLE	6	3/3	
1458	QURO	ENGLISH OAK	11	2/2	
1459	QUMA	BUR OAK	10	2/2	
1460	ACRU	RED MAPLE	2	3/4	STEM ROT
1461	GLTR	HONEY LOCUST	2	2/2	
1462	GLTR	HONEY LOCUST	4	3/3	
1463	GLTR	HONEY LOCUST	4	3/3	
1464	GLTR	HONEY LOCUST	4	3/3	
1465	GYDI	KENTUCKY COFFEETREE	2	2/2	
1466	GYDI	KENTUCKY COFFEETREE	2	2/2	
1467	GYDI	KENTUCKY COFFEETREE	2	2/2	
1468	GLTR	HONEY LOCUST	12	3/3	
1469	ULPU	SIBERIAN ELM	14, 14	3/3	
1470	GLTR	HONEY LOCUST	16	2/2	
1471	FRPE	GREEN ASH	1	3/3	
1472	MOAL	WHITE MULBERRY	4	3/3	
1473	FRPE	GREEN ASH	10	2/2	
1474	GYDI	KENTUCKY COFFEETREE	2	2/2	
1475	GYDI	KENTUCKY COFFEETREE	2	2/2	
1476	GYDI	KENTUCKY COFFEETREE	2	2/2	
1477	GLTR	HONEY LOCUST	6	2/2	
1478	GLTR	HONEY LOCUST	4	2/2	
1479	GLTR	HONEY LOCUST	5	2/2	
1480	PIPU	BLUE SPRUCE	2	3/3	
1481	TIAM	BASSWOOD	2	2/2	
1482	ACPL	NORWAY MAPLE	2	2/2	
1483	PIPU	BLUE SPRUCE	3	2/2	
1484	ULPU	SIBERIAN ELM	22	3/4	SPLIT
1485	QUMA	BUR OAK	44	2/2	
1486	PODE	COTTONWOOD	38	2/2	
1487	GLTR	HONEY LOCUST	7	2/2	
1488	BENI	RIVER BIRCH	6, 2	3/3	
1489	ROPS	BLACK LOCUST	31	3/3	
1490	TIAM	BASSWOOD	25	2/2	
1491	ROPS	BLACK LOCUST	32	3/3	
1492	ROPS	BLACK LOCUST	27	3/3	
1493	ROPS	BLACK LOCUST	32	3/3	
1494	ACNE	BOX ELDER	20	3/3	
1495	JUNI	BLACK WALNUT	20	2/2	
1496	JUNI	BLACK WALNUT	12	2/3	
1497	FRPE	GREEN ASH	12	3/3	
1498	FRPE	GREEN ASH	23, 22	3/3	
1499	ROPS	BLACK LOCUST	23	3/4	LEAN
1500	ACPL	NORWAY MAPLE	19	2/2	
1501	FRPE	GREEN ASH	29	2/2	
1502	FRPE	GREEN ASH	14	2/2	
1503	FRPE	GREEN ASH	12	2/2	
1504	FRPE	GREEN ASH	21	2/2	

1505	JUVI	RED CEDAR	7	3/3	
1506	ACSAI	SILVER MAPLE	24	3/3	
1507	GONE	NO TREE PRESENT			
1508	FRPE	GREEN ASH	28	3/3	
1509	ACPL	NORWAY MAPLE	13	3/3	
1510	FRPE	GREEN ASH	15	3/4	LEAN
1511	ACPL	NORWAY MAPLE	34	3/3	
1512	ACPL	NORWAY MAPLE	26	2/2	
1513	ACSAI	SILVER MAPLE	30	3/3	
1514	GLTR	HONEY LOCUST	22	2/2	
1515	MOAL	WHITE MULBERRY	14, 17	3/4	
1516	JUNI	BLACK WALNUT	26	2/2	
1517	ACPL	NORWAY MAPLE	18	4/4	SPLIT
1518	ACRU	RED MAPLE	7	3/3	
1519	ACRU	RED MAPLE	4	3/3	
1520	PIPU	BLUE SPRUCE	14	2/2	
1521	BENI	RIVER BIRCH	14, 13	2/2	
1522	QUMA	BUR OAK	33	2/2	
1523	ACPL	NORWAY MAPLE	12	2/2	
1524	PIPU	BLUE SPRUCE	3	3/3	
1525	CRMO	HAWTHORN	3	2/2	
1526	PIPU	BLUE SPRUCE	3	2/2	
1527	ACPL	NORWAY MAPLE	20	3/4	DEADWOOD
1528	ACPL	NORWAY MAPLE	8	2/2	
1529	PIPU	BLUE SPRUCE	6	2/2	
1530	ACPL	NORWAY MAPLE	24	3/4	DEADWWOD
1531	ACRU	RED MAPLE	11	3/4	
1532	PIPU	BLUE SPRUCE	7	2/2	
1533	JUVI	RED CEDAR	5	2/4	LEAN
1534	JUVI	RED CEDAR	4, 2	3/3	
1535	TICO	LINDEN	4	2/2	
1536	MAPU	CRABAPPLE	7	3/3	
1537	ULPU	SIBERIAN ELM	34	3/3	
1538	THOC	WHITE CEDAR	6, 5	3/4	
1539	THOC	WHITE CEDAR	5, 5	3/3	
1540	PIAB	NORWAY SPRUCE	25	2/2	
1541	PIAB	NORWAY SPRUCE	7	4/4	DEADWOOD
1542	PIST	WHITE PINE	24	2/2	
1543	PIAB	NORWAY SPRUCE	27	2/2	
1544	TICO	LINDEN	8	2/2	
1545	ACPL	NORWAY MAPLE	25	3/3	
1546	MOAL	WHITE MULBERRY	18	3/4	LEAN
1547	ACPL	NORWAY MAPLE	18	2/2	
1548	MAPU	CRABAPPLE	6	3/3	
1549	GLTR	HONEY LOCUST	2	2/2	
1550	GLTR	HONEY LOCUST	7	2/2	
1551	PINI	AUSTRIAN PINE	6	3/3	
1552	QUBI	SWAMP WHITE OAK	3	2/2	
1553	QUBI	SWAMP WHITE OAK	3	2/2	
1554	GONE	NO TREE PRESENT			
1555	PIPU	BLUE SPRUCE	2	2/2	
1556	PIPU	BLUE SPRUCE	3	3/3	

1557	ULAC	ELM HYBRID	3	3/3	
1558	ULAC	ELM HYBRID	2	3/3	
1559	ULAC	ELM HYBRID	3	3/3	
1560	ULAC	ELM HYBRID	4	3/3	
1561	ULAC	ELM HYBRID	4	4/4	
1562	ULAC	ELM HYBRID	2	3/3	
1563	ACPL	NORWAY MAPLE	14	2/2	
1564	JUVI	RED CEDAR	6, 5, 5	4/3	
1565	JUVI	RED CEDAR	6, 5, 5, 5	4/3	
1566	ACSAI	SILVER MAPLE	25	2/2	
1567	PRSE	BLACK CHERRY	9, 10	3/4	
1568	PRSE	BLACK CHERRY	15	4/3	
1569	PRSE	BLACK CHERRY	13, 8	5/4	DEADWOOD
1570	PIAB	NORWAY SPRUCE	3	2/2	
1571	ACPL	NORWAY MAPLE	4	3/3	
1572	PIAB	NORWAY SPRUCE	4	2/2	
1573	PINI	AUSTRIAN PINE	11	3/3	
1574	ACPL	NORWAY MAPLE	11	2/2	
1575	ACPL	NORWAY MAPLE	11	2/2	
1576	TICO	LINDEN	5	2/2	
1577	TICO	LINDEN	5	3/3	
1578	TICO	LINDEN	5	2/2	
1579	FRAM	WHITE ASH	4	2/2	
1580	PIPU	BLUE SPRUCE	5	2/2	
1581	FRAM	WHITE ASH	3	2/2	
1582	PIPU	BLUE SPRUCE	5	2/2	
1583	FRAM	WHITE ASH	3	3/3	
1584	ULPU	SIBERIAN ELM	38	3/4	DEADWOOD
1585	ULPU	SIBERIAN ELM	29	3/3	
1586	ACPL	NORWAY MAPLE	16	3/3	
1587	JUVI	RED CEDAR	6	3/3	
1588	GLTR	HONEY LOCUST	14	2/2	
1589	PISY	SCOTCH PINE	5, 3	3/3	
1590	DEAD	DEAD			
1591	MAPU	CRABAPPLE	5	3/3	
1592	MAPU	CRABAPPLE	8	3/3	
1593	GONE	NO TREE PRESENT			
1594	GONE	NO TREE PRESENT			
1595	GONE	NO TREE PRESENT			
1596	GONE	NO TREE PRESENT			
1597	GINKGO	GINKGO	7	3/3	
1598	JUVI	RED CEDAR	5	3/3	
1599	JUVI	RED CEDAR	5	3/3	
1600	JUVI	RED CEDAR	6	4/3	DEADWOOD
1601	FRPE	GREEN ASH	7	3/3	
1602	FRPE	GREEN ASH	7	3/3	
1603	FRPE	GREEN ASH	6	3/3	
1604	ACNE	BOX ELDER	6	3/3	
1605	ACNE	BOX ELDER	6	3/3	
1606	ACNE	BOX ELDER	8	3/3	
1607	ACNE	BOX ELDER	8	3/3	
1608	ACNE	BOX ELDER	7	3/3	

1609	ACNE	BOX ELDER	8	3/4	
1610	ACNE	BOX ELDER	7	3/4	
1611	DEAD	DEAD			
1612	ULPU	SIBERIAN ELM	5	3/3	
1613	ULPU	SIBERIAN ELM	6	3/3	
1614	ULPU	SIBERIAN ELM	5	3/3	
1615	ULPU	SIBERIAN ELM	6	3/3	
1616	ULPU	SIBERIAN ELM	10	3/3	
1617	ULPU	SIBERIAN ELM	5	3/3	
1618	ULPU	SIBERIAN ELM	4	3/3	
1619	ULPU	SIBERIAN ELM	6	3/3	
1620	ULPU	SIBERIAN ELM	8	3/3	
1621	ULPU	SIBERIAN ELM	7	3/3	
1622	ULPU	SIBERIAN ELM	10, 4	3/3	
1623	FRPE	GREEN ASH	3	3/3	
1624	FRPE	GREEN ASH	3	3/3	
1625	GONE	NO TREE PRESENT			
1626	ULPU	SIBERIAN ELM	3	3/3	
1627	ACNE	BOX ELDER	30	3/3	
1628	PIST	WHITE PINE	6	2/2	
1629	QURU	RED OAK	29	2/3	
1630	QURU	RED OAK	30	2/3	
1631	PIST	WHITE PINE	3	2/2	
1632	PIST	WHITE PINE	2	2/2	
1633	PIST	WHITE PINE	3	2/2	
1634	JUNI	BLACK WALNUT	16	2/2	
1635	ACNE	BOX ELDER	13	3/3	
1636	ACSAI	SILVER MAPLE	12	2/2	
1637	ACSAI	SILVER MAPLE	36	3/3	
1638	PIPU	BLUE SPRUCE	24	2/2	
1639	PODE	COTTONWOOD	40	3/3	
1640	PIPU	BLUE SPRUCE	7	2/2	
1641	PIPU	BLUE SPRUCE	7	2/2	
1642	FRAM	WHITE ASH	6	2/2	
1643	JUNI	BLACK WALNUT	16	3/3	
1644	ACPL	NORWAY MAPLE	26	2/2	
1645	ACPL	NORWAY MAPLE	23	2/2	
1646	ACPL	NORWAY MAPLE	17	3/3	
1647	JUNI	BLACK WALNUT	7	2/3	
1648	JUNI	BLACK WALNUT	7	2/3	
1649	ACPL	NORWAY MAPLE	6	3/3	
1650	ULAM	AMERICAN ELM	6	3/3	
1651	MOAL	WHITE MULBERRY	14	3/4	SPLIT
1652	ROPS	BLACK LOCUST	21	3/3	
1653	ULAM	AMERICAN ELM	6	3/3	
1654	MOAL	WHITE MULBERRY	13	3/4	LEAN
1655	ROPS	BLACK LOCUST	14	3/3	
1656	PIPU	BLUE SPRUCE	2	3/4	
1657	PIPU	BLUE SPRUCE	2	3/3	
1658	PIPU	BLUE SPRUCE	4	3/3	
1659	JUNI	BLACK WALNUT	13	2/2	
1660	JUNI	BLACK WALNUT	32	2/2	

1661	FRPE	GREEN ASH	10	3/3	
1662	ULAM	AMERICAN ELM	6	3/3	
1663	ULAM	AMERICAN ELM	11	3/3	
1664	ULAM	AMERICAN ELM	10	3/3	
1665	AIAL	TREE OF HEAVEN	12	4/4	SPLIT
1666	AIAL	TREE OF HEAVEN	5	3/3	
1667	ULAM	AMERICAN ELM	4	3/3	
1668	ULAM	AMERICAN ELM	4, 3, 3, 3	3/4	
1669	FRPE	GREEN ASH	3, 3, 3	3/3	
1670	FRPE	GREEN ASH	3, 3, 3, 3	3/3	
1671	FRPE	GREEN ASH	3, 3	3/3	
1672	JUNI	BLACK WALNUT	3	3/3	
1672	FRPE	GREEN ASH	3	3/3	
1673	ACPL	NORWAY MAPLE	11	2/2	
1674	JUNI	BLACK WALNUT	3	3/3	
1675	GLTR	HONEY LOCUST	15	3/3	
1676	MOAL	WHITE MULBERRY	5, 4	3/4	
1677	MOAL	WHITE MULBERRY	3	4/4	
1678	ULAM	AMERICAN ELM	13	3/3	
1679	ACNE	BOX ELDER	10	3/4	
1680	FRPE	GREEN ASH	6	3/3	
1681	ACNE	BOX ELDER	4	3/3	
1682	FRPE	GREEN ASH	4	3/3	
1683	FRPE	GREEN ASH	5, 4, 3	3/3	
1684	FRPE	GREEN ASH	5, 5, 6	3/3	
1685	ACPL	NORWAY MAPLE	22	3/3	
1686	ACPL	NORWAY MAPLE	22	3/3	
1687	ULAM	AMERICAN ELM	4, 4	3/3	
1688	MOAL	WHITE MULBERRY	6	3/4	
1689	MOAL	WHITE MULBERRY	11	3/3	
1690	ULAM	AMERICAN ELM	6, 5	3/3	
1691	JUNI	BLACK WALNUT	11	2/2	
1692	ACNE	BOX ELDER	11	3/3	
1693	MOAL	WHITE MULBERRY	18	3/4	
1694	ACPL	NORWAY MAPLE	17	2/2	
1695	PIPU	BLUE SPRUCE	13	2/2	
1696	GONE	NO TREE PRESENT			
1697	MAPU	CRABAPPLE	8	3/3	
1698	POAL	WHITE POPLAR	42	3/4	
1699	ACPL	NORWAY MAPLE	21	2/2	
1700	PRSE	BLACK CHERRY	24	3/3	
1701	PYCA	BRADFORD PEAR	5	2/3	
1702	GLTR	HONEY LOCUST	3	3/3	
1703	ACPL	NORWAY MAPLE	3	2/2	
1704	GLTR	HONEY LOCUST	3	3/3	
1705	PYCA	BRADFORD PEAR	5	3/3	
1706	GLTR	HONEY LOCUST	8	3/3	
1707	GLTR	HONEY LOCUST	10	3/3	
1708	ACPL	NORWAY MAPLE	12	2/2	
1709	ACPL	NORWAY MAPLE	8	2/2	
1710	TICO	LINDEN	14	2/2	
1711	ACRU	RED MAPLE	8	4/4	DEADWOOD

1712	ACRU	RED MAPLE	8	3/3	
1713	ACRU	RED MAPLE	8	3/3	
1714	BEPA	PAPER BIRCH	4, 4, 3, 3	3/3	
1715	BEPA	PAPER BIRCH	5, 5, 5, 5, 5	3/3	
1716	TICO	LINDEN	13	2/2	
1717	BENI	RIVER BIRCH	7	3/3	
1718	PYCA	BRADFORD PEAR	14	3/3	
1719	BENI	RIVER BIRCH	7, 6	3/3	
1720	ACRU	RED MAPLE	7	3/3	
1721	ACRU	RED MAPLE	6	4/3	
1722	ACRU	RED MAPLE	6	2/2	
1723	ACPL	NORWAY MAPLE	8	3/3	
1724	GLTR	HONEY LOCUST	11	3/2	
1725	GLTR	HONEY LOCUST	10	4/3	DEADWOOD
1726	MAPU	CRABAPPLE	7	4/3	
1727	ACPL	NORWAY MAPLE	8	2/3	
1728	ACPL	NORWAY MAPLE	7	3/3	
1729	MAPU	CRABAPPLE	7	3/3	
1730	MAPU	CRABAPPLE	3	3/3	
1731	TICO	LINDEN	10	2/3	
1732	OSVI	HOP HORNBEAM	3	3/3	
1733	GLTR	HONEY LOCUST	9	3/3	
1734	GLTR	HONEY LOCUST	9	3/3	
1735	GLTR	HONEY LOCUST	8	3/3	
1736	GLTR	HONEY LOCUST	8	3/3	
1737	PINI	AUSTRIAN PINE	14	3/3	
1738	PINI	AUSTRIAN PINE	8	2/3	
1739	MAAC	MAGNOLIA	3, 3, 2, 2	3/3	
1740	MAPU	CRABAPPLE	3, 3, 3, 3	3/3	
1741	MAPU	CRABAPPLE	3, 4, 3, 3, 3	3/3	
1742	GLTR	HONEY LOCUST	9	2/2	
1743	GLTR	HONEY LOCUST	7	2/2	
1744	GLTR	HONEY LOCUST	9	2/2	
1745	GLTR	HONEY LOCUST	7	2/2	
1746	GLTR	HONEY LOCUST	7	2/2	
1747	GLTR	HONEY LOCUST	7	2/3	
1748	PISY	SCOTCH PINE	9	3/3	
1749	PISY	SCOTCH PINE	14	3/3	
1750	MAPU	CRABAPPLE	8	3/3	
1751	FRAM	WHITE ASH	4	2/2	
1752	FRAM	WHITE ASH	4	2/2	
1753	FRAM	WHITE ASH	3	2/3	
1754	ULAC	ELM HYBRID	4	3/3	
1755	GONE	NO TREE PRESENT			
1756	FRPE	GREEN ASH	3	3/3	
1757	TICO	LINDEN	3	3/3	
1758	GLTR	HONEY LOCUST	3	3/2	
1759	GLTR	HONEY LOCUST	3	3/3	
1760	ACPL	NORWAY MAPLE	7	2/2	
1761	FRPE	GREEN ASH	22	2/2	
1762	FRPE	GREEN ASH	23	3/3	
1763	FRPE	GREEN ASH	24	3/2	

1764	ACRU	RED MAPLE	4	2/2	
1765	ACRU	RED MAPLE	4	2/2	
1766	ACRU	RED MAPLE	4	1/2	
1767	ACRU	RED MAPLE	2	3/3	
1768	PYCA	BRADFORD PEAR	3	2/2	
1769	PIPU	BLUE SPRUCE	6	2/2	
1770	PIPU	BLUE SPRUCE	5	2/2	
1771	ULAC	ELM HYBRID	6	2/3	
1772	TICO	LINDEN	2	3/3	
1773	GONE	NO TREE PRESENT			
1774	GONE	NO TREE PRESENT			
1775	GONE	NO TREE PRESENT			
1776	GONE	NO TREE PRESENT			
1777	TICO	LINDEN	3	2/3	
1778	TICO	LINDEN	3	3/3	
1779	PIPU	BLUE SPRUCE	3	3/3	
1780	PIPU	BLUE SPRUCE	3	3/3	
1781	FRAM	WHITE ASH	3	2/3	
1782	PIPU	BLUE SPRUCE	3	2/2	
1783	TICO	LINDEN	2	4/3	
1784	MAPU	CRABAPPLE	6	3/4	
1785	GLTR	HONEY LOCUST	14	3/3	
1786	GLTR	HONEY LOCUST	14	3/3	
1787	GLTR	HONEY LOCUST	14	3/3	
1788	GLTR	HONEY LOCUST	13	3/3	
1789	JUVI	RED CEDAR	10	3/4	
1790	JUVI	RED CEDAR	4, 2	3/4	
1791	ULPU	SIBERIAN ELM	12	3/3	
1792	GLTR	HONEY LOCUST	12	3/3	
1793	GLTR	HONEY LOCUST	13	3/3	
1794	GLTR	HONEY LOCUST	13	2/3	
1795	GLTR	HONEY LOCUST	10	3/3	
1796	GLTR	HONEY LOCUST	8	3/3	
1797	GLTR	HONEY LOCUST	6	3/3	
1798	PYCA	BRADFORD PEAR	11	3/3	
1799	MAPU	CRABAPPLE	9	3/3	
1800	ACPL	NORWAY MAPLE	13	3/3	
1801	ACPL	NORWAY MAPLE	8	2/2	
1802	ACPL	NORWAY MAPLE	10	2/2	
1803	MAPU	CRABAPPLE	6, 7	3/3	
1804	MAPU	CRABAPPLE	12	3/3	
1805	ACSAI	SILVER MAPLE	34	3/3	
1806	ACSAI	SILVER MAPLE	27	3/3	
1807	ACPL	NORWAY MAPLE	17	3/3	
1808	ACPL	NORWAY MAPLE	26	2/2	
1809	PODE	COTTONWOOD	20	3/3	
1810	PODE	COTTONWOOD	17	3/3	
1811	PODE	COTTONWOOD	13	3/4	
1812	PODE	COTTONWOOD	24	3/2	
1814	ELUM	AUTUMN OLIVE	15	3/3	
1815	ACPL	NORWAY MAPLE	13	2/2	
1816	MAPU	CRABAPPLE	6, 5, 5	3/3	

1817	ACPL	NORWAY MAPLE	6	2/2	
1818	ULPU	SIBERIAN ELM	16	3/3	
1819	ACPL	NORWAY MAPLE	8	2/2	
1820	ULPU	SIBERIAN ELM	32	3/3	
1821	ACRU	RED MAPLE	10	3/3	
1822	ACPL	NORWAY MAPLE	26	3/2	
1823	PIPU	BLUE SPRUCE	16	2/2	
1824	PINI	AUSTRIAN PINE	11	3/2	
1825	PINI	AUSTRIAN PINE	11	3/3	
1826	PINI	AUSTRIAN PINE	12	4/3	
1827	ACRU	RED MAPLE	14	3/3	
1828	ACPL	NORWAY MAPLE	14	3/2	
1830	PYCA	BRADFORD PEAR	7	3/3	
1831	JUVI	RED CEDAR	14, 8	3/3	
1832	THOC	WHITE CEDAR	13	4/4	DEADWOOD
1833	ACPL	NORWAY MAPLE	16	2/2	
1834	ULPU	SIBERIAN ELM	11, 11, 9	3/3	

SUPPLEMENT 3.20-1
TRAFFIC NOISE ANALYSIS REPORT

TRAFFIC NOISE ANALYSIS REPORT

IL Route 47
US-14 to Charles Road
McHenry County, IL

Prepared for

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Illinois Department of Transportation

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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

The traffic noise study was prepared to evaluate the effect of the proposed roadway improvements on traffic noise along IL Route 47 within the proposed project limits. The proposed improvements will reconstruct IL Route 47 from a 3-lane section to a 5-lane section, with associated intersection improvements including signalized intersections or roundabouts. In addition to improvements on IL Route 47, the project proposes improvements on several intersecting roads to tie back into existing conditions. The project study area is shown in Figure 1.

IL Route 47 from US-14 to Charles Road improvement project was assessed for traffic noise using the typical assessment procedures as outlined in IDOT's Policy found in Chapter 26-6.05(c) (Traffic Noise Analysis) of the BDE Manual and the Highway Traffic Noise Assessment Manual (2011). The project is considered a Type I noise project since the proposed improvements include roadway reconstruction with the addition of through-traffic lanes. The study evaluated existing and future traffic noise conditions, and potential noise abatement options.

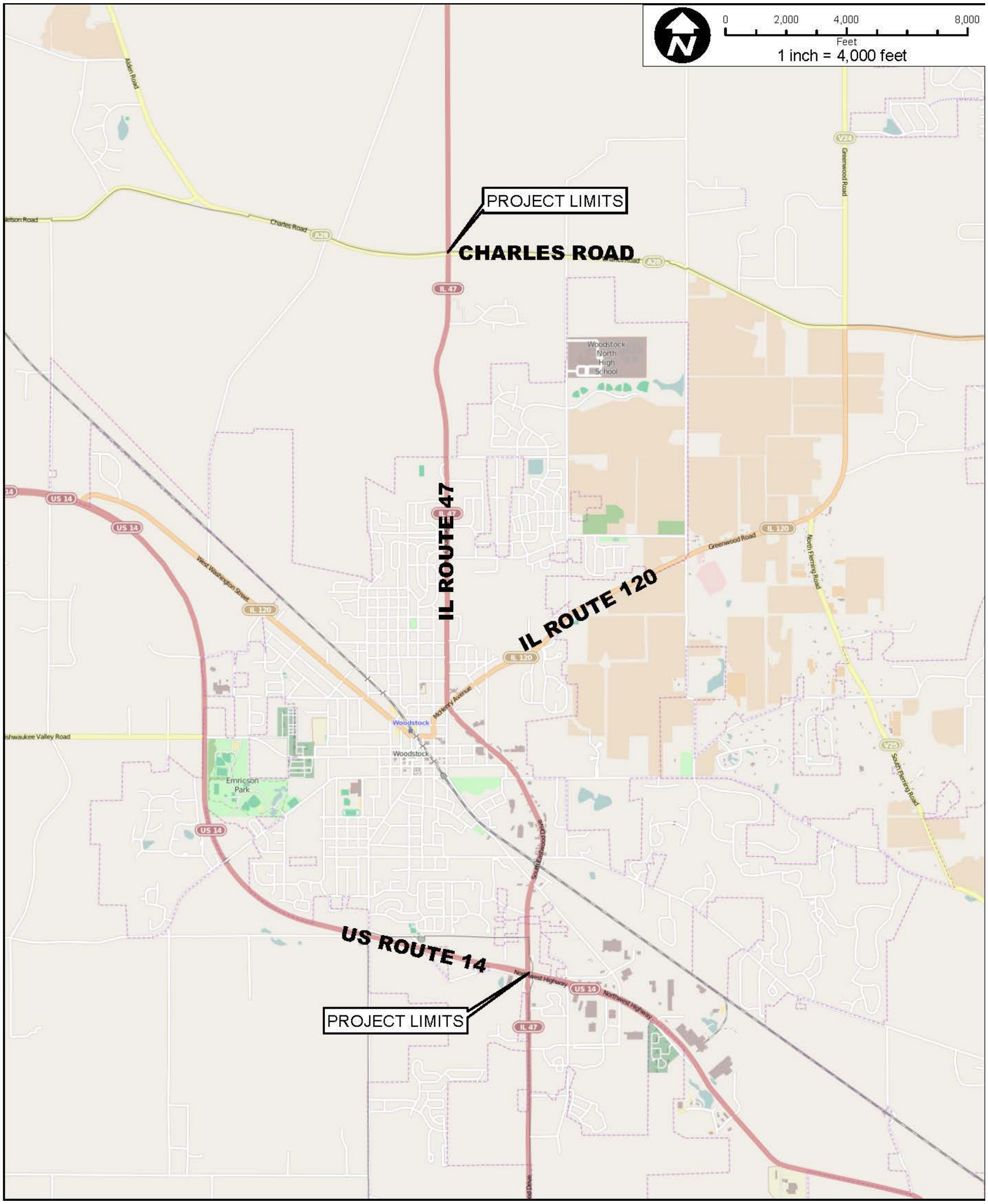
The traffic noise study was completed using the Federal Highway Administration (FHWA) approved Traffic Noise Model Version 2.5 (TNM). This modeling program is the only model approved by FHWA, and is used on all FHWA approved traffic noise analyses throughout the country. Field noise measurements were obtained as part of the analysis in select locations to validate the noise levels predicted using TNM for the existing conditions. A receptor is a discrete or representative location of a common noise environment (CNE) for noise-sensitive land uses. Thirty-two receptor locations were identified as representative of the study area within 500 feet of IL Route 47.

The federal and state noise regulations are discussed in Section 0. The identified noise sensitive receptors are discussed in Section 2.0. The noise analysis methodology, field noise measurement results, and TNM modeling results are discussed in Section 3.0. The noise abatement analysis is discussed in Section 4.0. Construction noise is discussed in Section 5.0, and the noise analysis conclusions are discussed in Section 6.0.

1.2 TRAFFIC NOISE DEFINITION

Sound is produced when pressure waves generated by a vibrating source travel through the air and are of sufficient strength to be capable of causing an auditory response in the human ear and brain. Sound is composed of a wide range of frequencies. However, the human ear is not uniformly sensitive to all frequencies. Therefore, the "A" weighted decibel scale was devised to correspond with the ear's sensitivity. The resulting unit of measurement is the dB(A).

Figure 1. Location Map



The equivalent sound level is the steady state, A-weighted sound level, which contains the same amount of acoustic energy as the actual time-varying, A-weighted sound level over a specified period of time. If the time period is 1 hour, the descriptor is the hourly equivalent sound level or L_{eq}(h), which is widely used by state highway agencies as a descriptor of traffic noise. L_{eq}(h) is based on the energy average, not a noise level average. Highway traffic noise can be relatively constant, but does contain peaks and valleys over a specified period of time depending on the vehicle composition, spacing, and other variables.

Noise can negatively affect human quality of life if it becomes strong enough to interfere with thought, conversation, and/or sleep.

For the average human with normal hearing, a 3 dB(A) change in noise level is not discernable, especially if the change occurs gradually over time. A 5 dB(A) change in noise level is perceptible if the change occurs within a short span of time, but less discernible if the change occurs gradually over a longer span of time. A 10 dB(A) increase or decrease in noise level within a short span of time is discernible and subjectively described by most humans as “twice as loud” or “twice as soft” as the original level.

1.3 TRAFFIC NOISE REGULATIONS

Traffic noise analyses are required for all Type I projects. The federal regulations define Type I projects as follows:

- The construction of a highway on new location
- The physical alteration of an existing highway where there is either a substantial horizontal alteration (A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition), or a substantial vertical alteration (A project that removes shielding, therefore exposing the line-of-sight between the receptor and the traffic noise source)
- The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High-Occupancy Vehicle (HOV) lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane
- The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane
- The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange
- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane
- The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza

This proposed improvement of IL Route 47 would be characterized as a Type I noise project because it includes reconstruction with the addition of through-traffic lanes.

Traffic noise levels for Type I noise projects are predicted using the FHWA approved TNM, as required by the FHWA regulations. The use of TNM is the only FHWA approved method for determining future traffic noise levels, and version 2.5 is the latest available. Field noise measurements are required as part of the analysis to validate the noise levels predicted using TNM for the existing scenario. If the field noise measurements are within 3 dB(A) of the TNM results for the existing scenario, then TNM is considered to be validated.

The federal regulations also establish TNM predicted noise levels where noise abatement should be evaluated. Five separate noise abatement criteria (NAC) based upon land use are used by the FHWA to assess potential noise impacts. A traffic noise impact occurs when noise levels approach or exceed the NAC listed in Table 1. In determining the applicable noise activity category for the study area, existing land use was reviewed.

Table 1. Noise Abatement Criteria – Hourly Weighted Sound Level

Activity Category [1]	Leq(h)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67	Exterior	Residential.
C	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

1. From the Figure 2 legend – Residential = Category B; Institutional = Category C; Commercial = Category E or F.

Based on the FHWA regulations, State Highway Authorities are allowed to establish the noise level determined to approach the NAC and the increase in noise levels determined to be a substantial increase. The Illinois Department of Transportation (IDOT) defines noise impacts as follows:

- Design-year traffic noise levels approach, meet or exceed the NAC, with approach defined as 1 dB(A) less than NAC
- Design-year traffic noise levels are a substantial increase over existing traffic generated noise levels, defined as an increase greater than 14 dB(A)

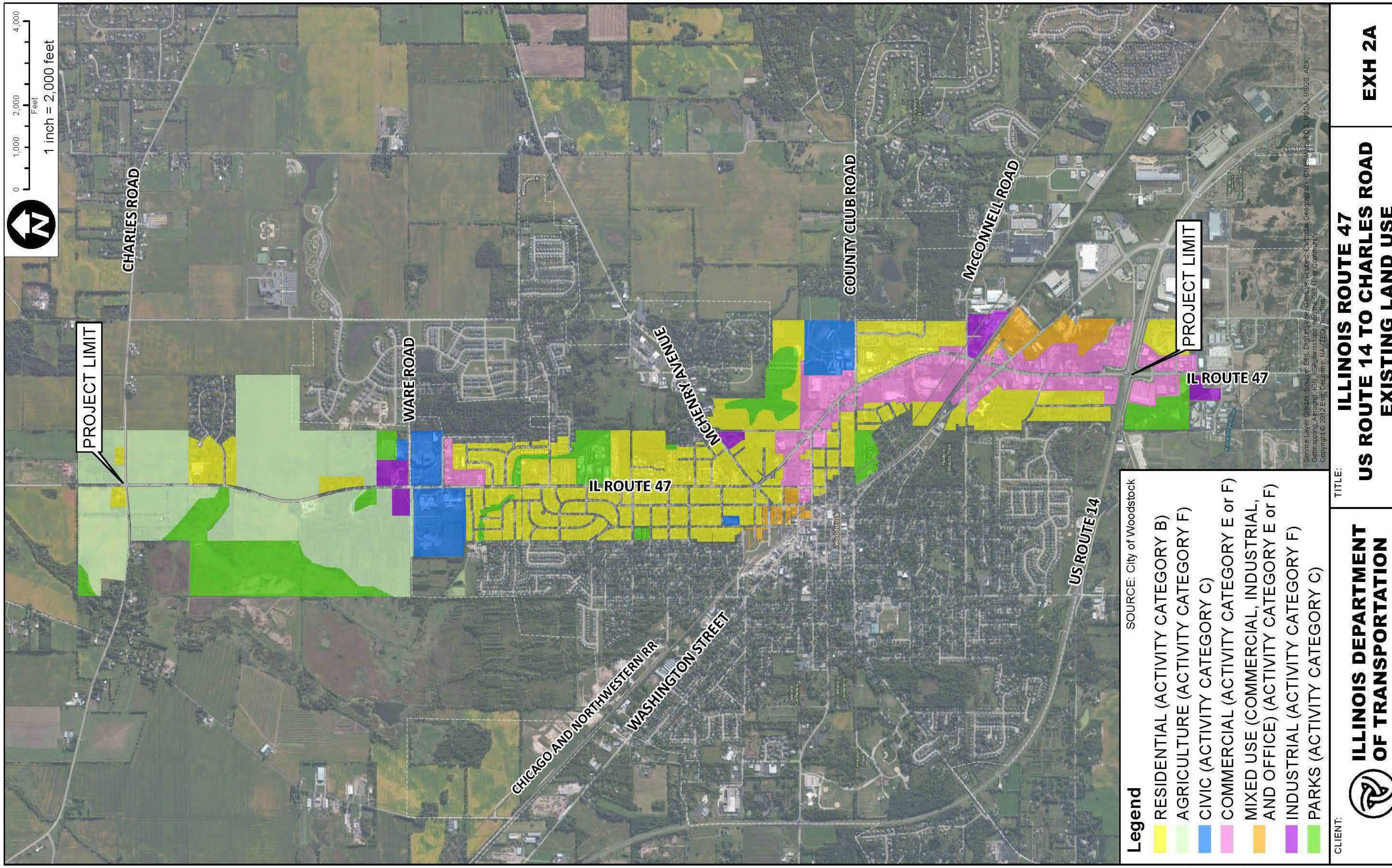
IL Route 47 is under the jurisdiction of IDOT. To be eligible for Federal funds, the IL Route 47 improvement project will satisfy IDOT policy.

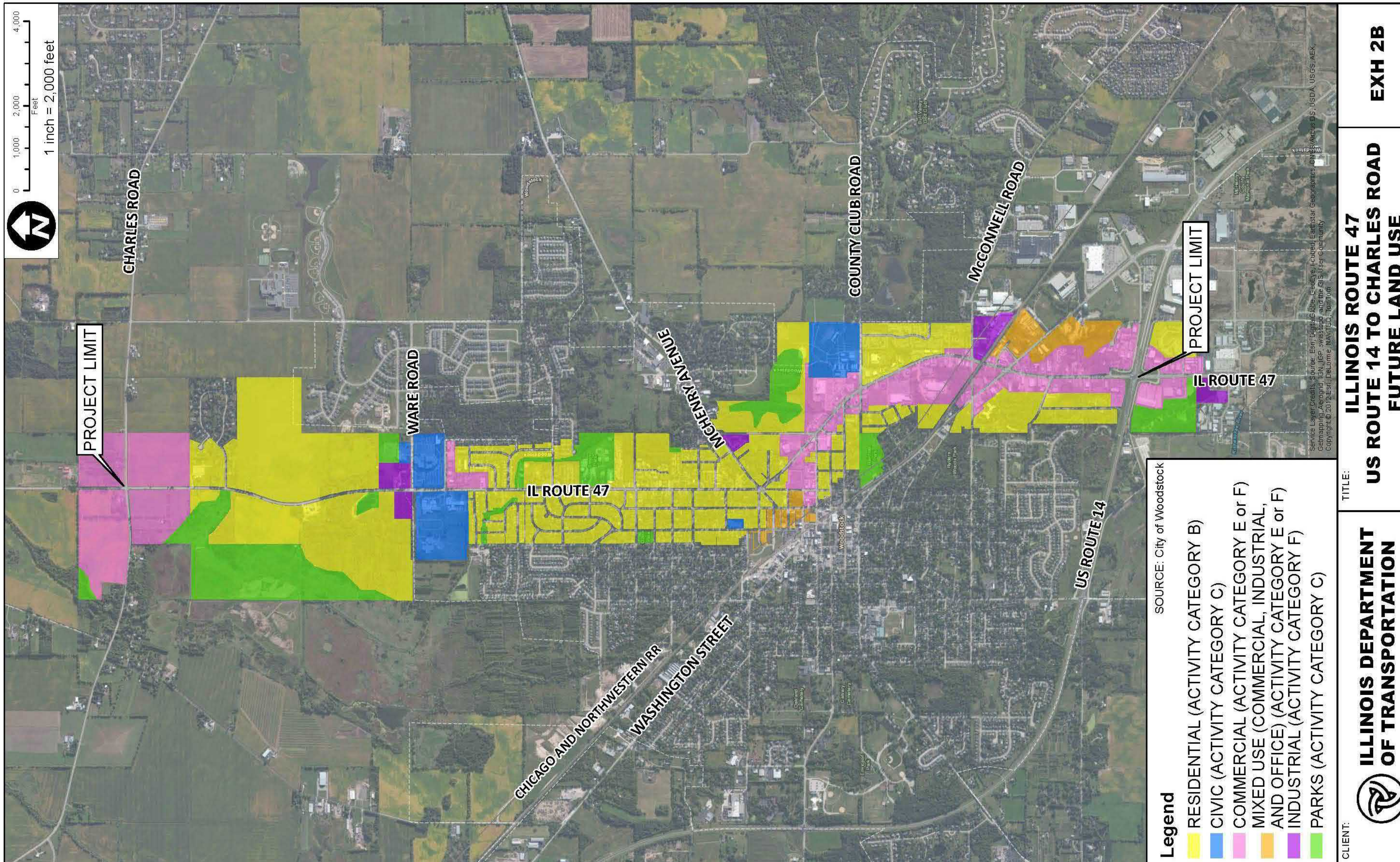
2.0 NOISE RECEPTOR SELECTION

IL Route 47 is a main route through the Village of Woodstock, McHenry County, Illinois. The existing land use adjacent to IL Route 47 varies through the corridor. The primary land use toward the south end of the corridor is commercial and light industrial with some multi-family units further from the roadway. The first row of buildings is commercial until close to IL Route 120 (McHenry Avenue). The land use is primarily residential with some multi-family units and public facilities between McHenry Avenue and Ware Road. From Ware Road to Charles Road, the land use opens to agricultural land with scattered residential. The existing land use is shown in Figure 2A.

Undeveloped areas were reviewed to determine if there are any existing permits for development. According to the City of Woodstock Department for Community and Economic Development, a proposed retail site is being processed through permitting. The proposed development is located on the east side of IL Route 47 between McConnell Road and Country Club Road, in an existing commercial area. There are no anticipated changes to the land use. According to the McHenry County Planning and Development Department, there are no plans for development in unincorporated areas at this time. While the existing land use is agricultural with scattered residential north of Ware Road, the future land use is primarily zoned for residential along IL Route 47 with commercial zoning centered at the intersection with Charles Road. The future land use is shown in Figure 2B.

Figure 2. Existing and Proposed Land Use





1 inch = 2,000 feet
0 1,000 2,000 4,000 Feet
CHARLES ROAD
PROJECT LIMIT
WARE ROAD
IL ROUTE 47
MCHENRY AVENUE
COUNTY CLUB ROAD
McCONNELL ROAD
PROJECT LIMIT
IL ROUTE 47
US ROUTE 14
WASHINGTON STREET
CHICAGO AND NORTHWESTERN RR
SOURCE: City of Woodstock
Legend
RESIDENTIAL (ACTIVITY CATEGORY B)
CIVIC (ACTIVITY CATEGORY C)
COMMERCIAL (ACTIVITY CATEGORY E or F)
MIXED USE (COMMERCIAL, INDUSTRIAL, AND OFFICE) (ACTIVITY CATEGORY E or F)
INDUSTRIAL (ACTIVITY CATEGORY F)
PARKS (ACTIVITY CATEGORY C)
CLIENT:
ILLINOIS DEPARTMENT OF TRANSPORTATION
TITLE:
ILLINOIS ROUTE 47
US ROUTE 14 TO CHARLES ROAD
FUTURE LAND USE
EXH 2B

Based on the existing land use along the project corridor, representative receptors were selected for land uses with established NAC. For this project, this includes the residential areas (land use activity category B), community areas (places of worship, parks, etc. - land use activity category C), and restaurants (land use activity category E). The remaining commercial and light industrial facilities along the project corridor are characterized as land use activity category F, which does not have an established NAC. Activity categories and their descriptions are included in Table 1.

The traffic noise study evaluates the study area using CNEs. Within each of the CNEs, the receptor located closest to the roadway was selected to represent the CNE, thereby representing the worst-case traffic noise condition. If there is no impact at the representative receptor, it is unlikely that there will be an impact at any of the other remaining receptors in the CNE. CNEs and noise receptors were located a maximum of 500 feet from the edge of IL Route 47, as roadway noise impacts (if present) are typically within this distance. Figure 3 depicts the aerial photograph of the study area with the representative receptors and CNEs. Representative receptor locations are between 50 feet and 356 feet from the project centerline in areas of frequent outdoor activity (i.e. backyards gathering areas, patios, playgrounds). Generally, if noise monitoring is to be completed, between 25 and 50 percent of the receptor locations selected for noise modeling purposes should be evaluated by noise monitoring. Noise monitoring was completed at 10 receptors ***bolded and italicized*** in Table 2 in order to include approximately 30 percent of the receptor locations. The selected receptors are spread from north to south throughout the corridor and include residential, public, and commercial (i.e. restaurants) receptor locations.

Table 2. Noise Receptor Locations

Receptor / CNE	Receptor Type [1]	Activity Category/ Noise Abatement Criterion (dB(A))	Distance from Existing IL Route 47 Centerline (ft)	Represented Receptors
1	SFR	B/67	99	1
2	SFR	B/67	117 [2]	2
3	Church	B/67	230	1
4	SFR	B/67	217	3
5	***SFR***	***B/67***	***111***	***3***
6	***Civic***	***C/67***	***110***	***1***
7	***School***	***C/67***	***261***	***2***
8	Adult Daycare	E/72	171	1
9	SFR	C/67	71	26
10	SFR/MFR	C/67	78	26
11	***Church***	***C/67***	***214***	***1***
12	Church	C/67	356	1
13	***SFR***	***B/67***	***58***	***101***

Receptor / CNE	Receptor Type [1]	Activity Category/ Noise Abatement Criterion (dB(A))	Distance from Existing IL Route 47 Centerline (ft)	Represented Receptors
14	MFR	B/67	109	17
15	***Park***	***C/67***	***245***	***1***
16	Church	C/67	327	1
17	***Restaurant***	***E/72***	***50***	***1***
18	SFR	B/67	109	3
19	Restaurant	E/72	110	1
20	***MFR***	***B/67***	***80***	***60***
21	SFR	B/67	86	36
22	***SFR***	***B/67***	***82***	***102***
23	MFR	E/72	180	2
24	SFR/MFR	E/72	132	44
25	Fairgrounds	E/72	89 [2]	1
26	Restaurant	E/72	199	1
27	Restaurant	E/72	60	2
28	Restaurant	E/72	142	1
29	MFR	B/67	191	22
30	***Restaurant***	***E/72***	***84***	***1***
31	Restaurant	E/72	147	1
32	Restaurant	E/72	103	2

Bold and italics indicates noise monitoring locations

1. SFR = Single-Family Residence; MFR = Multi-Family Residence
2. Distance from side street centerline

Figure 3. Noise Receptor Locations

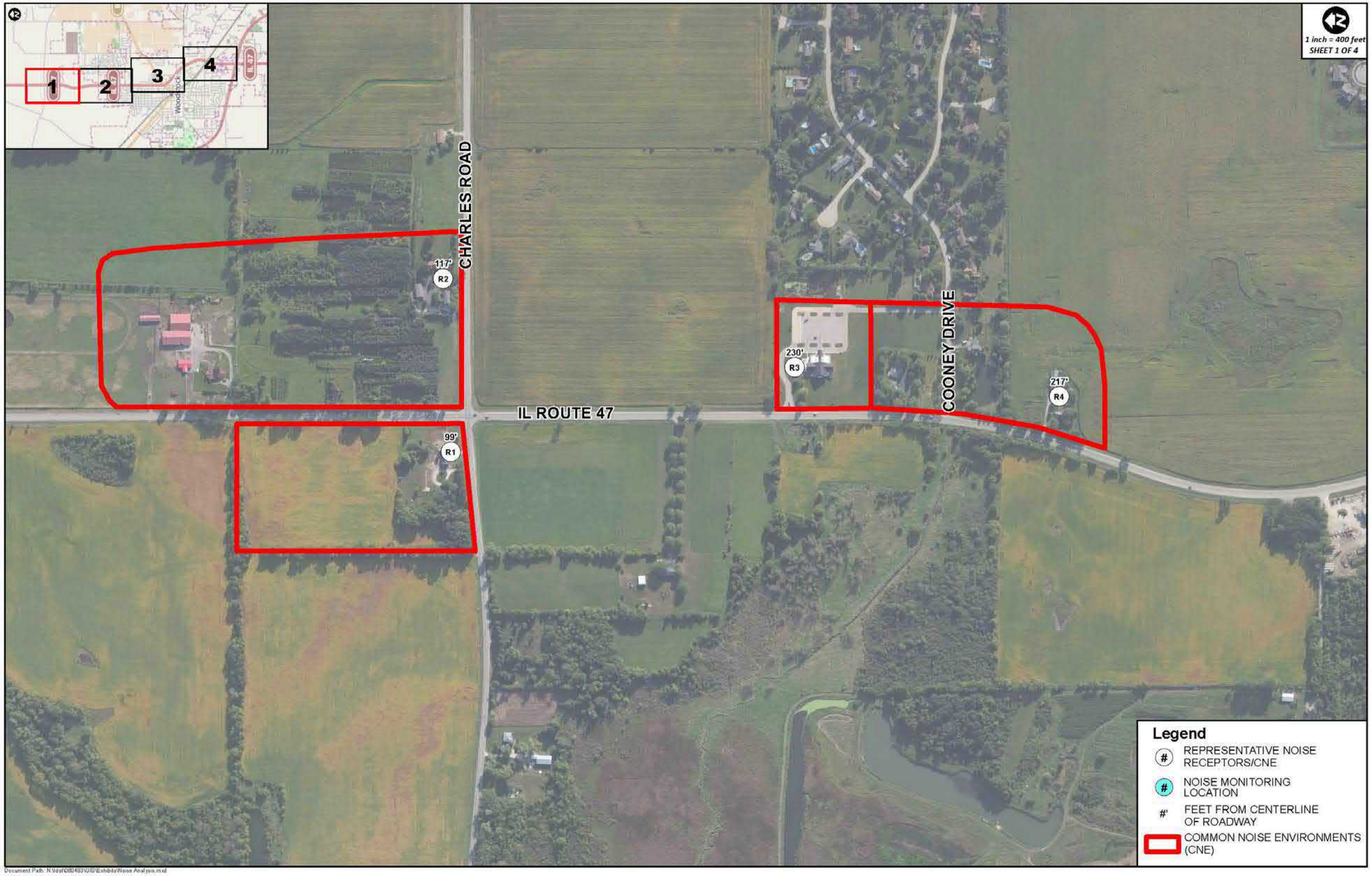


Figure 3. Noise Receptor Locations (continued)

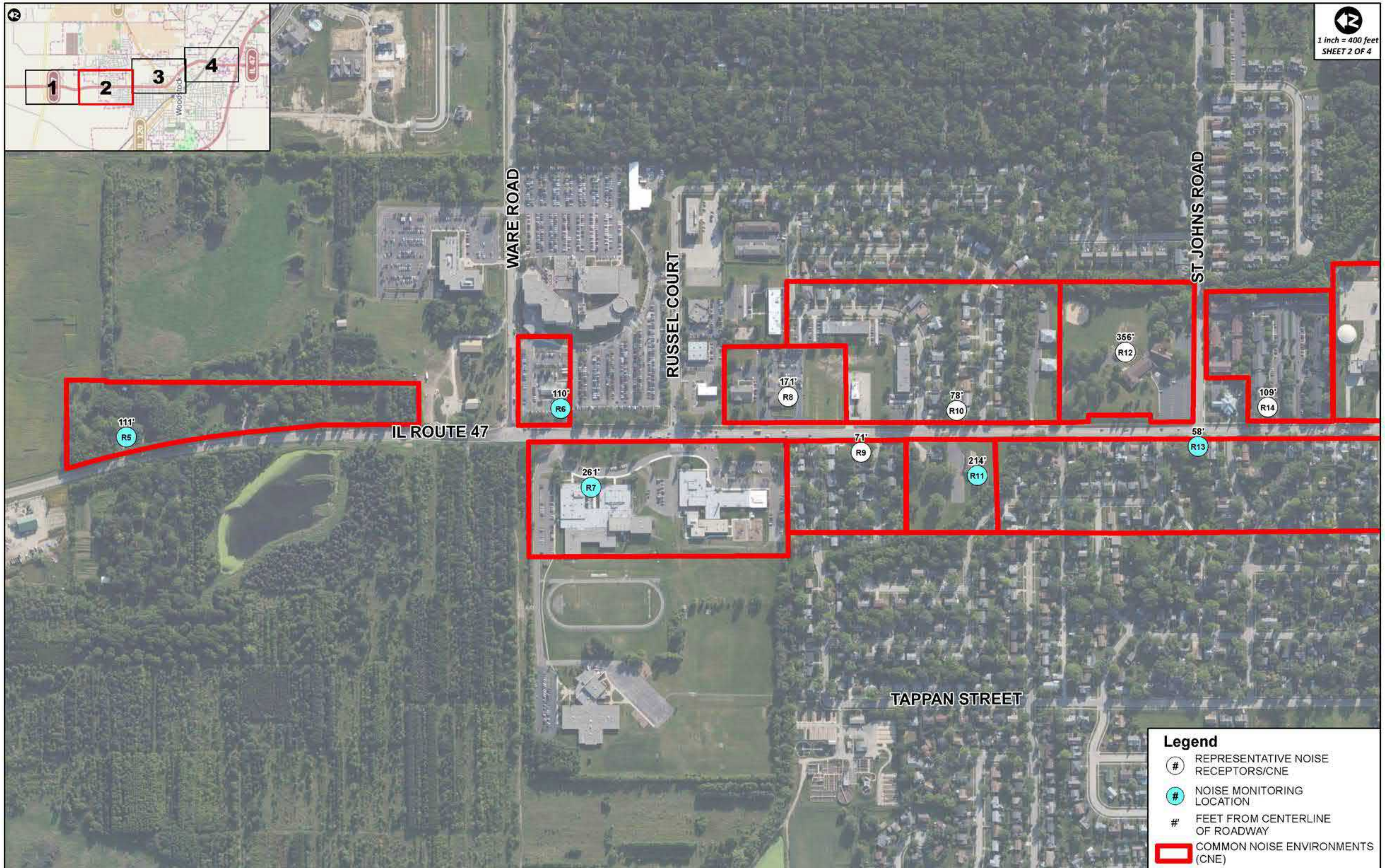


Figure 3. Noise Receptor Locations (continued)

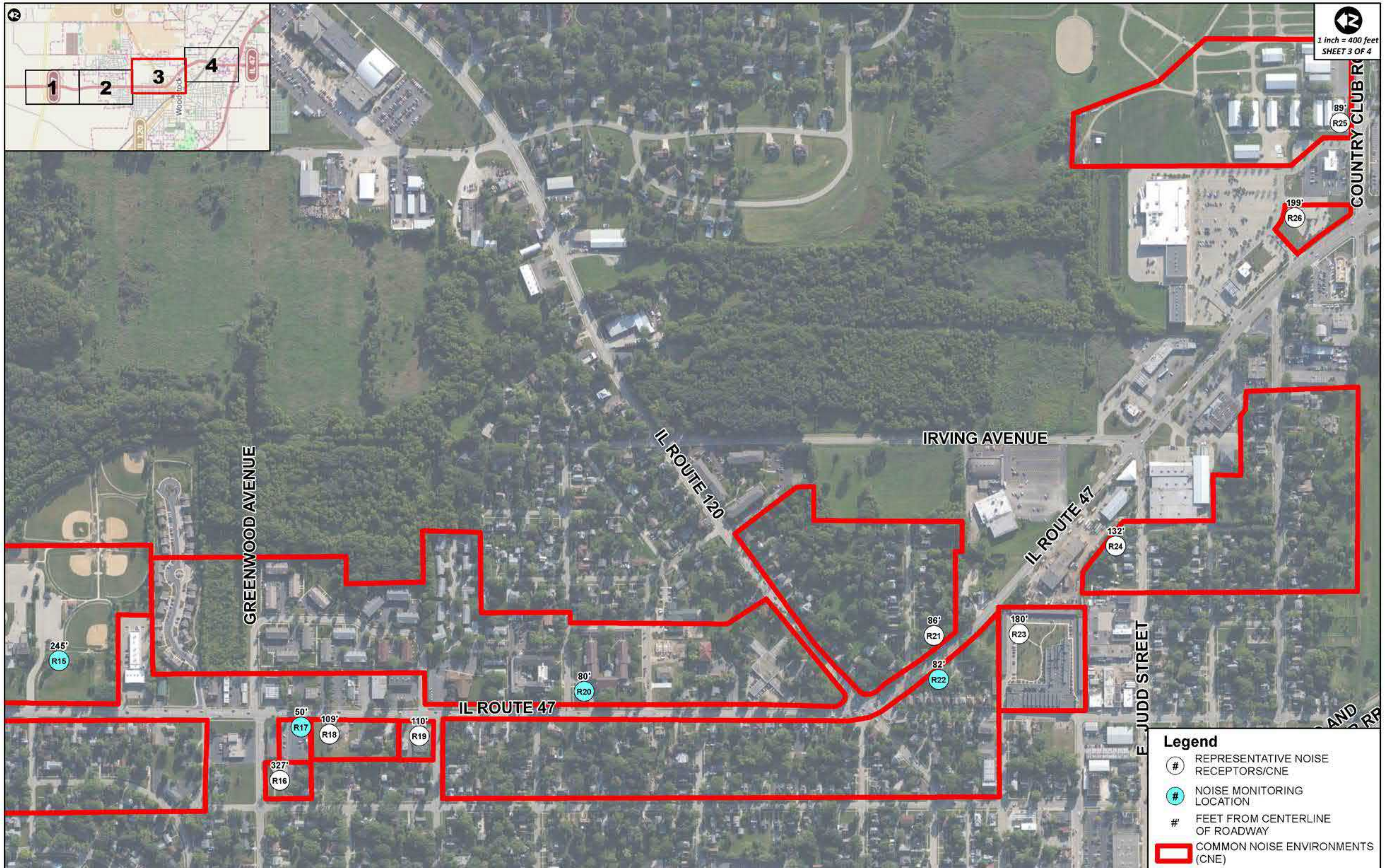
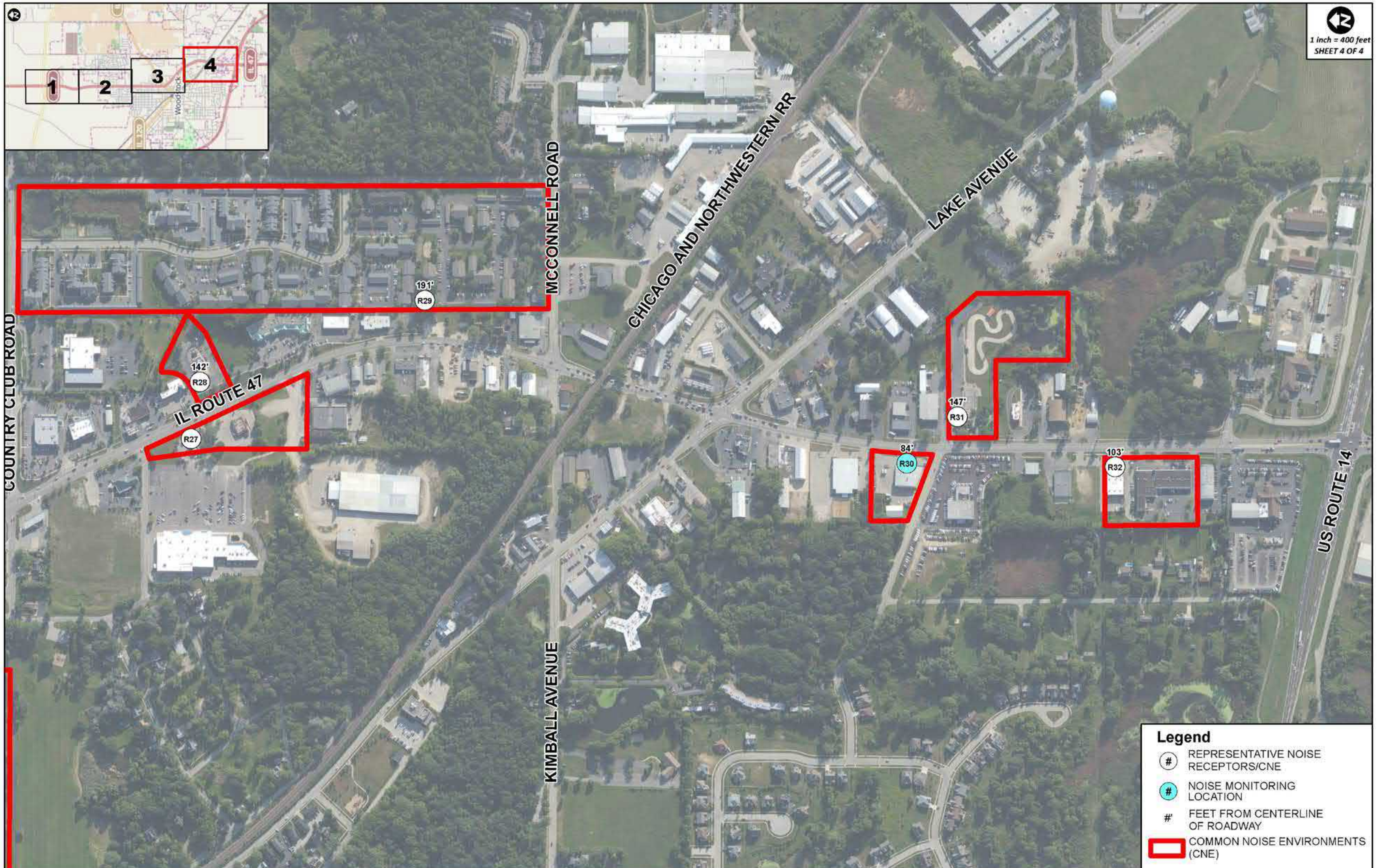


Figure 3. Noise Receptor Locations (continued)



3.0 NOISE ANALYSIS

3.1 FIELD NOISE MEASUREMENTS

Noise level measurements at representative locations are used to characterize existing noise conditions, and are used to validate the TNM for analysis of future No-Build and Build conditions. Traffic noise levels recorded during field measurement are representative of the traffic characteristics (volume, speed and composition) for the time period measured, and need to be considered when evaluating noise levels as typical for the area. In addition, the noise levels are also influenced by other noise sources in the area other than the traffic noise and the characteristics of the location, such as existing berms or structures blocking sound. Generally, if noise monitoring is to be completed, between 25 and 50 percent of the receptor locations selected for noise modeling purposes should be evaluated by noise monitoring. Noise monitoring was completed at ten receptors in order to include 30 percent of the receptor locations. The selected receptors are spread from north to south throughout the corridor and include four residential, three public (civic, school, and church), one park, and two commercial (restaurants) receptor locations.

3.1.1 Instrumentation

A Larson Davis 831 Class I precision sound level meter was used for monitoring the actual noise level. The L_{eq} was recorded for the "A" weighted scale. L_{eq} is the equivalent level of sound (in decibels or dB(A)) which represents the level of sound held constant over a specified period of time. This reflects the same amount of energy as the actual fluctuating noise over that time period. The sound level meter was positioned on a tripod approximately five (5) feet above the ground surface and at least 10 feet from any reflecting surface. The sound level meter was set in a location where outdoor human activity would typically occur. One 12-minute noise measurements was taken at each receptor. The sound level meter was calibrated at the beginning and end of each monitoring session.

3.1.2 Traffic Volumes

Traffic volumes along IL Route 47 were counted during field monitoring at the receptors. The number of cars and trucks were recorded separately along with any other noise sources observed during monitoring. The traffic volumes were counted for each direction during the 12-minute noise monitoring period. The traffic volumes counted were extrapolated from the 12-minute volumes to an hour (60 minutes) to estimate the hourly traffic. The resulting traffic volumes were compared to the traffic counts used in the TNM model in Section 3.2.1.

3.1.3 Time and Day for Measurements

Noise monitoring is attempted during periods of peak travel times when volumes are higher, but not necessarily during stop and go traffic. Traffic may be stop and go during a typical rush-hour period at a reduced travel speed or stopped and therefore not producing peak noise. Noise monitoring was completed between the hours of 8 am to 12 pm and 1 pm to 4 pm. Traffic was moving steadily through the corridor during the measurements.

3.1.4 Weather Conditions

The weather conditions during the field noise monitoring are shown in Table 3. Weather conditions can affect the noise measurement readings. Monitoring cannot be performed when there is snow cover or when the pavement is wet due to rain or snow. Noise measurements cannot be taken if the wind speed exceeds 12 mph. A wind screen was used at all times during the monitoring to reduce wind noise. The conditions during the monitoring are summarized as follows:

Table 3. Weather Conditions During the Noise Monitoring

Condition	Required	Actual
Pavement	Dry	Dry
Humidity	Less than 90%	32% to 57%
Temperature	14 to 112 degrees F	62 to 79 degrees F
Wind Speed	Less than 12 m.p.h.	0 to 4 m.p.h.

The weather conditions during the noise monitoring were within the recommended ranges for all parameters listed.

3.1.5 Noise Monitoring Results

Table 4 summarizes the noise monitoring results for the 10 locations monitored in the field. The monitored noise levels ranged from 53 dB(A) to 70 dB(A). The monitoring results were compared to the existing conditions TNM results to validate the TNM model for use in analyzing the 2040 No-Build and Build conditions. In general, noise monitoring results should be within ±3 dB(A) of the TNM generated results for the model to be considered validated. Refer to Section 3.3.1 for further discussion on this validation.

Table 4. Noise Monitoring Results

Receptor	Distance from Existing IL Route 47 Centerline (ft)	Noise Level Monitored, dB(A) [1]
R5	111	59
R6	110	62
R7	261	56
R11	214	53

Receptor	Distance from Existing IL Route 47 Centerline (ft)	Noise Level Monitored, dB(A) [1]
R13	58	66
R15	245	59
R17	50	70
R20	80	65
R22	82	66
R30	84	66

1. Rounded to nearest whole dB(A)

3.2 NOISE ANALYSIS METHODOLOGY

Traffic noise levels modeling at the 32 receptors located within the project limits was completed using TNM. Prediction of noise levels is one step in assessing potential noise impacts and abatement strategies. Traffic noise levels for the 32 receptor sites were predicted using existing and future (2040) traffic volumes. For future (2040) traffic volumes, both No-Build (no roadway improvements made) and Build (proposed roadway improvements made) conditions were evaluated.

Inputs into TNM include traffic volume, traffic mix (cars, medium trucks, and heavy trucks), receptor distance, elevation, and average speeds during free flowing conditions. Information sources used in the analysis are briefly described in the following subsections.

3.2.1 Traffic Volumes

IL Route 47 and side road AM and PM peak-hour traffic volumes for existing and proposed (2040) Build conditions were obtained from Strand Associates. The traffic volumes were greatest in the PM peak hour. The peak-hour traffic volumes for proposed (2040) No-Build conditions were calculated from provided Build and No-Build Average Daily Traffic (ADT) projections for the roadways.

The traffic volume estimates from the noise monitoring sessions were compared to the PM peak-hour traffic volumes used for the noise modeling. The automobile volumes counted at the sites during the monitoring ranged from 55% to 126% of the estimated peak-hourly volumes used in the TNM existing scenario model. The medium truck volumes ranged from 15% to 117% of the estimated peak-hourly volumes used in the TNM existing scenario model. The heavy truck volumes ranged from 31% to 181% of the estimated peak-hourly volumes used in the TNM existing scenario model. Totaling the 10 sites, the amount of vehicles estimated from the noise monitoring was approximately 85% of the TNM existing scenario model traffic counts. Trucks accounted for 6.3% of the traffic during noise monitoring and 7.0% of the traffic during the traffic counts used in the model.

3.2.2 Traffic Composition

Three types of vehicles, including cars, medium trucks, and heavy trucks, are input into TNM. Truck composition for the roadway was determined based on the Existing peak-hour traffic volumes. There are different traffic compositions for northbound and southbound traffic and each of the side streets. The percentage of trucks along IL Route 47 ranges from 3.6% southbound at Ware Road to 13.7% northbound at Charles Road. Based on the noise monitoring observations, the truck volume distribution was approximately split between medium and heavy trucks.

3.2.3 Receptor Distance/ Elevation

Table 2 includes the distances of the receptors from the IL Route 47 existing centerline. The selected representative receptors include single-family and multi-family residences, community facilities, and commercial restaurants. The distance and elevation of each receptor directly affects the predicted traffic noise level. These distances vary from 50 feet at Receptor R17 to 356 feet at Receptor R12.

3.2.4 Speed Conditions

The average speed during free flow conditions was used for the noise analysis. The average speed was approximately 5 mph over the posted speed limit at all noise monitoring locations, and has been input into the model as the design speed. The design speed varies throughout the IL Route 47 corridor and may vary from existing to proposed conditions. The Charles Road existing and proposed design speed is 60 mph. For IL Route 47 near Charles Road, the existing and proposed design speed is 60 mph. Near Ware Road, the north leg of IL Route 47 existing and proposed design speed is 50 mph. The Ware Road existing design speed is 40 mph and the proposed design speed is 35 mph. For IL Route 47 between Ware Road and Greenwood Drive, the existing and proposed design speed is 40 mph. Between Greenwood Drive and IL Route 120, the existing and proposed design speed is 35 mph. Between IL Route 120 and US-14, the existing and proposed design speed is 40 mph. The Judd Street existing and proposed design speed is 45 mph. The IL Route 120, County Club Road, and McConnell Road existing and proposed design speed is 35 mph.

3.3 TNM RESULTS

Based on the above methodology, Existing, No-Build (2040), and Build (2040) traffic noise levels were predicted for the 32 receptor sites using TNM.

3.3.1 Existing Conditions and TNM Validation

The TNM existing scenario output results were compared to the traffic noise monitoring results for the 10 monitored receptors to validate the accuracy of the TNM model, which is shown in Table 5. Since the monitored noise levels are within 3 dB(A) of the TNM predicted noise levels for existing conditions, the TNM model is validated. The difference between the monitored and modeled ranges between -3 and 3 dB(A).

Table 5. Noise Monitoring Results and TNM Validation

Receptor	Distance from Existing IL Route 47 Centerline (ft)	Modeled Existing Noise Level, dB(A)[1]	Monitored Existing Noise Level, dB(A)[1]	Difference Between Modeled and Monitored Noise Level, dB(A)[1]
R5	111	56	59	3
R6	110	62	62	0
R7	261	56	56	0
R11	214	56	53	-3
R13	58	67	66	-1
R15	245	56	59	3
R17	50	67	70	3
R20	80	64	65	1
R22	82	65	66	1
R30	84	65	66	1

1. Rounding to the nearest whole dB(A)

3.3.2 2040 No-Build and Build Conditions

Table 6 presents the predicted 2040 No-Build and Build condition noise levels for the 32 receptor sites, along with the predicted noise levels for existing conditions.

The existing noise levels range from 51 dB(A) at R12 and R16 to 67 dB(A) at R13 and R17. The projected 2040 No-Build traffic noise levels range from 51 dB(A) at R16 to 68 dB(A) at R13 and R22. Generally, receptor noise levels increase approximately 0 to 4 dB(A) from the existing scenario to the No-Build scenario due to an increase in traffic volumes.

The projected 2040 Build traffic noise levels range from 54 dB(A) at R16 to 72 dB(A) at R13. Generally, receptor noise levels increase between 1 dB(A) to 5 dB(A) from the existing scenario due to an increase in traffic volumes and roadway widening. Nine receptor locations (R6, R9, R10, R13, R14, R17, R20, R21, and R22) approach, meet, or exceed the FHWA NAC, and therefore warrant a noise abatement analysis. In addition to traffic noise levels approaching the NAC, a noise abatement analysis is warranted if traffic noise levels increase more than 14 dB(A) between the existing and build scenarios at a receptor, regardless if the NAC is approached. None of the receptors meet this criteria as the largest increase is 5 dB(A).

Table 6. Noise Impact Summary – TNM Modeling Results

Receptor / CNE	Distance from Existing IL Route 47 Centerline (ft)	Existing Noise Level, dB(A)	2040 No-Build Noise Level, dB(A)	2040 Build Noise Level, dB(A) [1]	Increase in Build Noise Levels over Existing Noise Levels, dB(A)
1	99	60	61	61	1
2	117	56	59	58	2
3	230	59	63	64	5
4	217	60	64	65	5
5	111	56	60	62	6
6	***110***	***62***	***64***	***66***	***4***
7	261	56	59	61	5
8	171	60	61	64	4
9	***71***	***65***	***66***	***69***	***4***
10	***78***	***64***	***65***	***68***	***4***
11	214	56	57	58	2
12	356	51	52	55	4
13	***58***	***67***	***68***	***72***	***5***
14	***109***	***63***	***64***	***67***	***4***
15	245	56	57	60	4
16	327	51	51	54	3
17	***50***	***67***	***67***	***70***	***3***
18	109	62	62	64	2
19	110	61	61	63	2
20	***80***	***64***	***64***	***66***	***2***
21	***86***	***65***	***66***	***67***	***2***
22	***82***	***66***	***68***	***68***	***2***
23	180	58	59	59	1
24	132	59	61	61	2
25	89 [2]	59	60	60	1
26	199	60	60	62	2
27	60	65	65	68 [2]	3
28	142	59	59	63	4
29	191	58	58	62	4
30	84	65	65	68 [2]	3

Receptor / CNE	Distance from Existing IL Route 47 Centerline (ft)	Existing Noise Level, dB(A)	2040 No-Build Noise Level, dB(A)	2040 Build Noise Level, dB(A) [1]	Increase in Build Noise Levels over Existing Noise Levels, dB(A)
31	147	64	64	66 [2]	2
32	103	62	62	65	3

1. ***Boldface*** indicates the noise levels approach, meet or exceed the NAC in the 2040 Build condition
2. Activity Category E NAC = 72 dB(A)

3.4 REVIEW OF POTENTIAL DEVELOPMENT AND INFORMATION FOR LOCAL OFFICIALS

Undeveloped areas were reviewed to determine if there are any existing permits for development. According to the City of Woodstock Department for Community and Economic Development, a proposed retail site is being processed through permitting. The proposed development is located on the east side of IL Route 47 between McConnell Road and Country Club Road, in an existing commercial area. There are no anticipated changes to the land use. According to the McHenry County Planning and Development Department, there are no plans for development in unincorporated areas at this time. While the existing land use is agricultural with scattered residential north of Ware Road, the future land use is primarily zoned for residential along IL Route 47 with commercial zoning centered at the intersection with Charles Road. The future land use is shown in Figure 2B.

Traffic noise levels were estimated for undeveloped areas to determine the distance from the roadway under the 2040 Build condition for which the activity Category B or C NAC (67 dB(A)) or Category E NAC (72 dB(A)) is approached for the appropriate land use. Therefore, the 66 dB(A) noise level contour was estimated for undeveloped activity category B and C land uses and the 71 dB(A) noise level contour was estimated for undeveloped activity category E land uses. Appendix B includes the letter sent to the City of Woodstock and McHenry County providing this information, along with the noise contour exhibit that was an attachment to the letter.

4.0 NOISE ABATEMENT ANALYSIS

4.1 ABATEMENT ALTERNATIVES

Traffic noise abatement measures were considered for the nine impacted receptors shown in Figure 3 that approach, meet, or exceed the appropriate FHWA NAC.

The most feasible noise abatement measure for this project would be a noise barrier wall based on the substantially greater right-of-way width required to accommodate an earthen berm, or to accommodate the depth and density of landscaping that would be required to provide noise abatement. Noise barriers placed adjacent to the roadway would attenuate traffic-related noise and would be the most practical noise abatement measure for this project. An effective noise barrier must be tall enough to break the line-of-sight between the receptor and source. The length of an effective noise barrier typically extends beyond the last receptor four times the distance between the receptor and noise barrier. Noise barriers have a zone of effectiveness, or shadow zone, which is generally within 200 feet of the noise barrier. Therefore, less noise reduction is achieved as the distance between the receptor and the noise barrier increases.

TNM was used to perform the noise barrier feasibility and reasonability evaluation for the impacted receptors. When determining if an abatement measure is feasible and reasonable, the noise reduction achieved, number of benefited residences, total cost, and total cost per benefited residence are considered.

4.2 FEASIBILITY AND REASONABILITY

Noise abatement options were analyzed in conformance with FHWA requirements at Title 23 Code of Federal Regulations Part 772 for each of the impacted receptors. In order for a noise abatement option to be constructed, it must meet both the feasibility and reasonability criterion, described below.

4.2.1 Feasibility

The feasibility evaluation of a noise abatement measure considers a combination of acoustical and engineering factors. The acoustical portion of the IDOT policy, as required by FHWA regulations, considers noise abatement to be feasible if it can be constructed and would achieve at least a 5 dB(A) traffic noise reduction at an impacted receptor.

4.2.2 Reasonability

Per FHWA regulations, a noise abatement measure is determined to be reasonable when all three of the following factors are met:

- IDOT's traffic noise reduction design goal of 8 dB(A) at a minimum of one benefited receptor is achieved
- The highway traffic noise abatement measure is cost effective
- The viewpoints of the benefited receptors (property owners and residents) are considered, if all other criterion are achieved

A noise abatement measure is considered cost-effective to construct if the noise wall construction cost per benefited receptor is less than the allowable cost per benefited receptor. A benefited receptor is the recipient of an abatement measure that receives a noise reduction of 5 dB(A) or greater. The FHWA regulations allow each State Highway Authority to establish cost criteria for determining cost effectiveness.

IDOT policy establishes the actual cost per benefited receptor. The current unit cost used by IDOT to determine the estimated build cost for noise barriers is $25 per square foot, which includes engineering, materials, and installation. The estimated build cost does not include utility relocation, drainage, and

Right-of-Way costs to accommodate the barriers. The base value allowable cost per benefited receptor is $24,000 per benefited receptor, which can be increased based on three factors as summarized below:

- The absolute noise level of the benefited receptors in the design year build scenario before noise abatement
- The incremental increase in noise level between the existing noise level at the benefited receptor and the predicted build noise level before noise abatement
- The date of development compared to the construction date of the highway

These factors are considered for all benefited receptors. Table 7,

Table 8, and Table 9 present the allowable adjustments for each factor.

Table 7. Absolute Noise Level Consideration

Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 70 dB(A)	$0
70 to 74 dB(A)	$1,000
75 to 79 dB(A)	$2,000
80 dB(A) or greater	$4,000

Table 8. Increase in Noise Level Consideration

Incremental Increase in Noise Level Between the Existing Noise Level and the Predicted Build Noise Level Before Noise Abatement	Dollars Added to Base Value Cost per Benefited Receptor
Less than 5 dB(A)	$0
5 to 9 dB(A)	$1,000
10 to 14 dB(A)	$2,000
15 dB(A) or greater	$4,000

Table 9. New Alignment/ Construction Date Consideration

Project is on new alignment OR the receptor existed prior to the original construction of the highway	Dollars Added to Base Value Cost per Benefited Receptor
No for both	$0
Yes for either	$5,000

No single optional reasonableness factor shall be used to determine that a noise abatement measure is unreasonable. If a noise abatement option is feasible, achieves the IDOT noise reduction design goal, and achieves the cost-effective criterion, then the benefited receptors will be solicited for their opinion on the construction of the noise wall.

4.3 NOISE WALL ANALYSIS

Due to the frequency of driveways and the need to maintain access in proposed conditions, noise barrier walls were not considered feasible at five impacted receptors: R13, R17, R20, R21, and R22. Driveways occur at least every 100 feet or more frequently in these areas. An area within CNE 22 without driveway breaks at the southwest corner of IL Route 47 and IL Route 120 still presents an engineering challenge to meet feasibility requirements. Sidewalk connections from the intersection to the cul-de-sac and space constraints at the church front entrance at IL Route 120 prevent a continuous noise wall. An aerial photograph of the intersection showing the sidewalks and church is provided in Figure 4.

Figure 4. Seminary Avenue Cul-de-Sac to IL Route 47 and IL Route 120

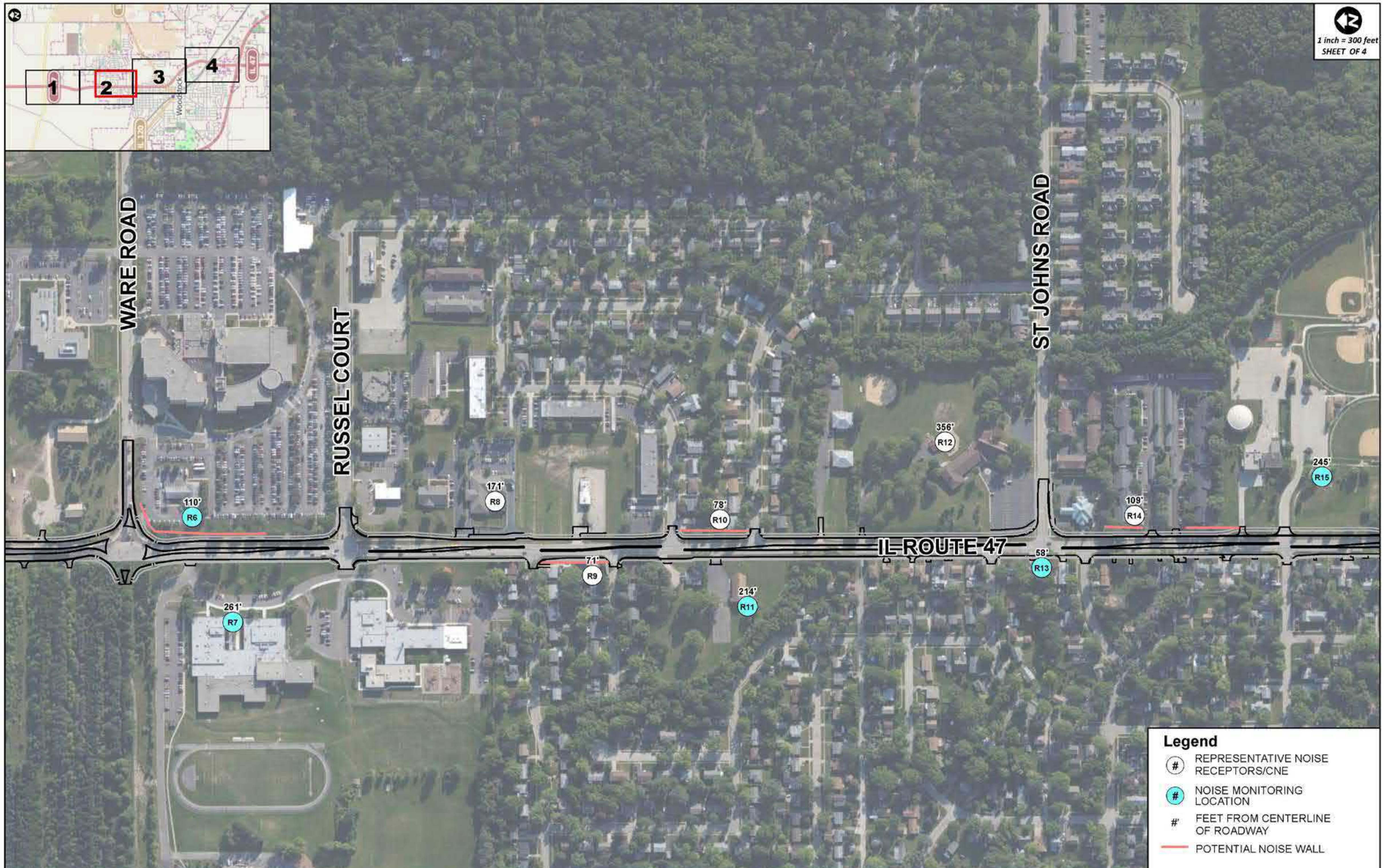
Noise walls were considered at four impacted receptors: R6, R9, R10, and R14. TNM was used to perform the noise wall feasibility and reasonability check for the four impacted receptors. When determining if an abatement measure is feasible and reasonable, the noise reductions achieved, number of benefited residences, total cost, and total cost per benefited residence are considered.

The four evaluated noise walls are shown on Figure 5. The noise walls were modeled at the proposed right-of-way, and are described below:

- A 515-foot long noise wall was considered along IL Route 47 at R6 since access is on Ware Road. Two 135-foot and 190-foot long noise walls separated by two driveways were considered along IL Route 47 at R14 since this is a multi-family residence.
    - The R6 and R14 noise walls were considered feasible since they provided at least a 5 dB(A) traffic noise reduction at R6 and R14, respectively.
    - The R6 and R14 noise walls were not considered reasonable since they do not provide at least an 8 dB(A) traffic noise reduction for at least one benefited receptor at R6 and R14, respectively.
- 240-foot long noise walls were considered at R9 and R10 since the homes adjacent to IL Route 47 have driveway access from the side roads instead of IL Route 47.
    - The noise walls were considered feasible since each provides at least a 5 dB(A) traffic noise reduction at one impacted receptor.
    - The noise walls were considered reasonable based on the noise reduction design goal since each would provide at least an 8 dB(A) traffic noise reduction for at least one benefited receptor.

The R9 and R10 noise walls were then evaluated for cost-effectiveness.

Figure 5. Evaluated Noise Wall Locations



Based on the evaluation of CNE 9 presented in Table 10 and

Table 11, the R9 noise wall would not be considered economically reasonable since the actual cost per benefited receptor exceeds the average adjusted allowable cost per benefited receptor assuming $25 per square foot of noise wall. R9-1 and R9-2 represent the first row of homes protected by the noise wall. R9-3 and R9-4 represent the second row, and R9-5 and R9-6 represent the third row.

Table 10. CNE 9 Adjusted Cost Per Benefited Receptor Calculations

Receptor Number within CNE 9	Build Noise Level, dB(A)	With Barrier Noise Level, dB(A)	Benefited Receptor[1] Base Value	Adjustments[2]		Adjusted Allowable Cost per Benefited Receptor
				Absolute Noise Level Factor ≥70 dB(A)	Noise Increase Factor ≥5 dB(A)	
R9-1	69	60	$24,000	$0	$0	$24,000
R9-2	68	61	$24,000	$0	$0	$24,000
R9-3	63	60	$0	$0	$0	$0
R9-4	62	59	$0	$0	$0	$0
R9-5	60	58	$0	$0	$0	$0
R9-6	60	59	$0	$0	$0	$0
Average						$24,000

1. Receptor receives a noise reduction of 5 dB(A) or greater when a noise barrier is modeled in the Build scenario.
2. The project is not on a new alignment nor did any receptors exist prior to the original construction of the highway.

Table 11. CNE 9 Noise Wall Cost Reasonableness Evaluation

Barrier	Benefited Receptors	Length, ft	Average Height, ft	Estimated Total Noise Wall Cost	Estimated Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor
R9	2	240	10.0	$60,000	$30,000	$24,000

Based on the evaluation of CNE 10 presented in Table 12 and Table 13, the R10 noise wall would not be considered economically reasonable since the actual cost per benefited receptor exceeds the average adjusted allowable cost per benefited receptor. R10-1 and R10-2 represent the first row of homes protected by the noise wall. R10-3 and R10-4 represent the second row, and R10-5 and R10-6 represent the third row.

Table 12. CNE 10 Adjusted Cost Per Benefited Receptor Calculations

Receptor Number within CNE 10	Build Noise Level, dB(A)	With Barrier Noise Level, dB(A)	Benefited Receptor[1] Base Value	Adjustments[2]		Adjusted Allowable Cost per Benefited Receptor
				Absolute Noise Level Factor ≥70 dB(A)	Noise Increase Factor ≥5 dB(A)	
R10-1	68	58	$24,000	$0	$0	$24,000
R10-2	66	60	$24,000	$0	$0	$24,000
R10-3	63	60	$0	$0	$0	$0
R10-4	63	60	$0	$0	$0	$0
R10-5	61	58	$0	$0	$0	$0
R10-6	61	59	$0	$0	$0	$0
Average						$24,000

1. Receptor receives a noise reduction of 5 dB(A) or greater when a noise barrier is modeled in the Build scenario.
2. The project is not on a new alignment nor did any receptors exist prior to the original construction of the highway.

Table 13. CNE 10 Noise Wall Cost Reasonableness Evaluation

Barrier	Benefited Receptors	Length, ft	Average Height, ft	Estimated Total Noise Wall Cost	Estimated Cost per Benefited Receptor	Adjusted Allowable Cost per Benefited Receptor
R10	2	240	10.0	$60,000	$30,000	$24,000

5.0 CONSTRUCTION NOISE

Trucks and machinery used for construction produce noise which may affect some land uses and activities during the construction period. Residents along the alignment will at some time experience perceptible construction noise from implementation of the project. To minimize or eliminate the effect of construction noise on these receptors, mitigation measures have been incorporated into the IDOT’s Standard Specifications for Road and Bridge Construction as Article 107.35.

6.0 SUMMARY

The existing noise levels range from 51 dB(A) at R12 and R16 to 67 dB(A) at R13 and R17. The projected 2040 No-Build traffic noise levels range from 51 dB(A) at R16 to 68 dB(A) at R13 and R22. Generally, receptor noise levels increase approximately 0 to 4 dB(A) from the existing scenario to the No-Build scenario due to an increase in traffic volumes.

The projected 2040 Build traffic noise levels range from 54 dB(A) at R16 to 72 dB(A) at R13. Generally, receptor noise levels increase between 1 dB(A) to 6 dB(A) from the existing scenario due to an increase in traffic volumes and roadway widening. Nine receptor locations (R6, R9, R10, R13, R14, R17, R20, R21, and R22) approach, meet, or exceed the FHWA NAC, and therefore warrant a noise abatement analysis. In addition to traffic noise levels approaching the NAC, a noise abatement analysis is warranted if traffic noise levels increase more than 14 dB(A) between the existing and build scenarios at a receptor, regardless if the NAC is approached. None of the receptors meet this criteria as the largest increase is 5 dB(A).

Noise walls were considered feasible noise abatement measures at four (R6, R9, R10, and R14) of these nine locations since each provides at least a 5 dB(A) traffic noise reduction at an impacted receptor.

With regard to reasonableness, noise walls would provide at least an 8 dB(A) traffic noise reduction for at least one benefited receptor at two (R9 and R10) of the remaining four locations. However, based on the evaluations of CNE 9 and CNE 10, the noise walls would not be economically reasonable since the estimated cost per benefited receptor exceeds the average adjusted allowable cost per benefited receptor.

Based on this noise analysis, no noise walls would be feasible and reasonable for this project.

Coordination with local officials having jurisdiction over adjacent lands within the project area will occur prior to the Public Hearing to present the results of the traffic noise study.

Appendix A

TNM

Input and Output Files

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47 from US-14 to Charles
RUN: Sheet 1 Existing Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	59.5	66	59.5	14	----	59.5	0.0	8	-8.0
Receiver2	2	1	0.0	56.0	66	56.0	14	----	56.0	0.0	8	-8.0
Receiver3	4	1	0.0	58.9	66	58.9	14	----	58.9	0.0	8	-8.0
Receiver4	5	1	0.0	60.0	66	60.0	14	----	60.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47 from US-14 to Charles
RUN: Sheet 1 No Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	61.1	66	61.1	14	----	61.1	0.0	8	-8.0
Receiver2	2	1	0.0	58.6	66	58.6	14	----	58.6	0.0	8	-8.0
Receiver3	4	1	0.0	62.7	66	62.7	14	----	62.7	0.0	8	-8.0
Receiver4	5	1	0.0	63.8	66	63.8	14	----	63.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47 from US-14 to Charles
RUN: Sheet 1 Proposed Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver1	1	1	0.0	61.0	66	61.0	14	----	61.0	0.0	8	-8.0
Receiver2	2	1	0.0	57.6	66	57.6	14	----	57.6	0.0	8	-8.0
Receiver3	4	1	0.0	64.0	66	64.0	14	----	64.0	0.0	8	-8.0
Receiver4	5	1	0.0	65.4	66	65.4	14	----	65.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	4	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 2 Existing Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver5	1	1	59.0	56.2	66	-2.8	14	----	56.2	0.0	8	-8.0
Receiver6	3	1	62.0	61.6	66	-0.4	14	----	61.6	0.0	8	-8.0
Receiver7	5	1	56.0	56.3	66	0.3	14	----	56.3	0.0	8	-8.0
Receiver8	6	1	0.0	60.2	66	60.2	14	----	60.2	0.0	8	-8.0
Receiver9	7	1	0.0	65.4	66	65.4	14	----	65.4	0.0	8	-8.0
Receiver10	9	1	0.0	64.4	66	64.4	14	----	64.4	0.0	8	-8.0
Receiver11	10	1	53.0	56.0	66	3.0	14	----	56.0	0.0	8	-8.0
Receiver12	12	1	0.0	50.5	66	50.5	14	----	50.5	0.0	8	-8.0
Receiver13	13	1	66.0	66.8	66	0.8	14	Snd Lvl	66.8	0.0	8	-8.0
Receiver14	15	1	0.0	63.2	66	63.2	14	----	63.2	0.0	8	-8.0
Receiver15	16	1	59.0	56.2	66	-2.8	14	----	56.2	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	11	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS

IDOT Phase I IL-47, US-14 to Charles Rd

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS

PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd

RUN: Sheet 2 2040 No Build Conditions

BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver5	1	1	59.0	60.1	66	1.1	14	----	60.1	0.0	8	-8.0
Receiver6	3	1	62.0	64.4	66	2.4	14	----	64.4	0.0	8	-8.0
Receiver7	5	1	56.0	58.6	66	2.6	14	----	58.6	0.0	8	-8.0
Receiver8	6	1	0.0	61.0	66	61.0	14	----	61.0	0.0	8	-8.0
Receiver9	7	1	0.0	66.1	66	66.1	14	Snd Lvl	66.1	0.0	8	-8.0
Receiver10	9	1	0.0	65.1	66	65.1	14	----	65.1	0.0	8	-8.0
Receiver11	10	1	53.0	56.7	66	3.7	14	----	56.7	0.0	8	-8.0
Receiver12	12	1	0.0	52.3	66	52.3	14	----	52.3	0.0	8	-8.0
Receiver13	13	1	66.0	68.1	66	2.1	14	Snd Lvl	68.1	0.0	8	-8.0
Receiver14	15	1	0.0	64.4	66	64.4	14	----	64.4	0.0	8	-8.0
Receiver15	16	1	59.0	57.3	66	-1.7	14	----	57.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	11	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

RESULTS: SOUND LEVELS

IDOT Phase I IL-47, US-14 to Charles Rd

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 2 Proposed Barrier Analysis
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver5	1	1	0.0	62.4	66	62.4	14	----	62.4	0.0	8	-8.0
Receiver6	3	1	0.0	66.0	66	66.0	14	Snd Lvl	59.1	6.9	8	-1.1
Receiver7	5	1	0.0	61.0	66	61.0	14	----	60.9	0.1	8	-7.9
Receiver8	6	1	0.0	63.7	66	63.7	14	----	63.7	0.0	8	-8.0
Receiver9-1	7	1	0.0	68.8	66	68.8	14	Snd Lvl	60.3	8.5	8	0.5
Receiver10-1	9	1	0.0	67.9	66	67.9	14	Snd Lvl	58.3	9.6	8	1.6
Receiver11	10	1	0.0	57.7	66	57.7	14	----	57.6	0.1	8	-7.9
Receiver12	12	1	0.0	55.0	66	55.0	14	----	54.9	0.1	8	-7.9
Receiver13	13	1	0.0	71.9	66	71.9	14	Snd Lvl	71.9	0.0	8	-8.0
Receiver14	15	1	0.0	67.1	66	67.1	14	Snd Lvl	61.6	5.5	8	-2.5
Receiver15	16	1	0.0	60.2	66	60.2	14	----	60.0	0.2	8	-7.8
Receiver9-2	18	1	0.0	68.1	66	68.1	14	Snd Lvl	60.8	7.3	8	-0.7
Receiver9-3	19	1	0.0	63.2	66	63.2	14	----	60.2	3.0	8	-5.0
Receiver9-4	20	1	0.0	61.9	66	61.9	14	----	59.3	2.6	8	-5.4
Receiver9-5	21	1	0.0	59.5	66	59.5	14	----	57.8	1.7	8	-6.3
Receiver9-6	22	1	0.0	60.3	66	60.3	14	----	58.7	1.6	8	-6.4
Receiver10-2	23	1	0.0	65.5	66	65.5	14	----	59.6	5.9	8	-2.1
Receiver10-3	24	1	0.0	62.8	66	62.8	14	----	59.7	3.1	8	-4.9
Receiver10-4	25	1	0.0	63.1	66	63.1	14	----	59.6	3.5	8	-4.5
Receiver10-5	26	1	0.0	60.6	66	60.6	14	----	58.3	2.3	8	-5.7
Receiver10-6	27	1	0.0	60.6	66	60.6	14	----	58.5	2.1	8	-5.9

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max

		dB	dB	dB
All Selected	21	0.0	3.1	9.6
All Impacted	6	0.0	6.3	9.6
All that meet NR Goal	2	8.5	9.1	9.6

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: BARRIER DESIGN

PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 2 Proposed Barrier Analysis
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Selected Receivers

Name	No.	Calc LAeq1h	Noise Reduction Calc	Goal	Calc-Goal	Barrier Reviewed	Important Segments Name	No.	Height	Partial LAeq1h
		dBA	dB	dB	dB				ft	dBA
Receiver5	1	62.4	-0.0	8	-8.0					
Receiver6	3	59.1	6.9	8	-1.1	Barrier6	point13	13	11.0	55.5
						Barrier6	point2	2	13.0	50.3
						Barrier6	point1	1	8.0	48.2
						Barrier6	point14	14	10.0	47.5
						Barrier10	point7	7	10.0	7.5
Receiver7	5	60.9	0.1	8	-7.9	Barrier6	point13	13	11.0	41.3
						Barrier6	point1	1	8.0	34.4
						Barrier9	point5	5	10.0	31.6
						Barrier6	point2	2	13.0	27.7
						Barrier6	point14	14	10.0	10.5
Receiver8	6	63.7	0.0	8	-8.0	Barrier10	point7	7	10.0	34.5
						Barrier6	point14	14	10.0	28.8
						Barrier6	point1	1	8.0	25.4
						Barrier6	point2	2	13.0	25.0
Receiver9-1	7	60.3	8.5	8	0.5	Barrier9	point5	5	10.0	57.8
						Barrier6	point1	1	8.0	24.3
						Barrier6	point2	2	13.0	21.4
						Barrier6	point14	14	10.0	19.9
						Barrier10	point7	7	10.0	16.6

RESULTS: BARRIER DESIGN

IDOT Phase I IL-47, US-14 to Charles Rd

						Barrier6	point13	13	11.0	16.5
Receiver10-1	9	58.3	9.6	8	1.6	Barrier10	point7	7	10.0	56.6
						Barrier6	point1	1	8.0	21.5
						Barrier6	point14	14	10.0	17.2
						Barrier6	point13	13	11.0	-41.1
Receiver11	10	57.6	0.1	8	-7.9	Barrier9	point5	5	10.0	39.1
						Barrier6	point1	1	8.0	20.1
						Barrier6	point2	2	13.0	17.0
Receiver12	12	54.9	0.1	8	-7.9	Barrier10	point7	7	10.0	35.3
						Barrier14a	point9	9	10.0	35.2
						Barrier14b	point11	11	10.0	34.4
						Barrier6	point1	1	8.0	26.7
						Barrier6	point14	14	10.0	23.2
						Barrier6	point13	13	11.0	19.9
						Barrier6	point2	2	13.0	11.9
Receiver13	13	71.9	0.0	8	-8.0					
Receiver14	15	61.6	5.5	8	-2.5	Barrier14a	point9	9	10.0	56.1
						Barrier14b	point11	11	10.0	42.9
						Barrier10	point7	7	10.0	14.6
Receiver15	16	60.0	0.2	8	-7.8	Barrier14b	point11	11	10.0	41.5
						Barrier14a	point9	9	10.0	37.6
						Barrier10	point7	7	10.0	8.8
Receiver9-2	18	60.8	7.3	8	-0.7	Barrier9	point5	5	10.0	57.1
						Barrier6	point1	1	8.0	25.4
						Barrier6	point2	2	13.0	21.9
						Barrier6	point14	14	10.0	19.5
						Barrier6	point13	13	11.0	17.6
						Barrier10	point7	7	10.0	17.1
Receiver9-3	19	60.2	3.0	8	-5.0	Barrier9	point5	5	10.0	53.9
						Barrier6	point1	1	8.0	24.2
						Barrier6	point2	2	13.0	22.3
						Barrier6	point13	13	11.0	19.0
						Barrier6	point14	14	10.0	17.9
						Barrier10	point7	7	10.0	8.2
Receiver9-4	20	59.3	2.6	8	-5.4	Barrier9	point5	5	10.0	53.3
						Barrier6	point1	1	8.0	23.5

							Barrier6	point2	2	13.0	21.5
							Barrier6	point13	13	11.0	18.3
							Barrier6	point14	14	10.0	17.3
Receiver9-5	21	57.8	1.7	8	-6.3		Barrier9	point5	5	10.0	51.0
							Barrier6	point1	1	8.0	23.9
							Barrier6	point2	2	13.0	23.1
							Barrier6	point13	13	11.0	19.9
							Barrier6	point14	14	10.0	17.3
Receiver9-6	22	58.7	1.6	8	-6.4		Barrier9	point5	5	10.0	51.1
							Barrier6	point1	1	8.0	24.5
							Barrier6	point2	2	13.0	24.1
							Barrier6	point13	13	11.0	21.1
							Barrier6	point14	14	10.0	18.2
Receiver10-2	23	59.6	5.9	8	-2.1		Barrier10	point7	7	10.0	56.3
							Barrier6	point2	2	13.0	22.6
							Barrier6	point1	1	8.0	20.7
Receiver10-3	24	59.7	3.1	8	-4.9		Barrier10	point7	7	10.0	53.5
							Barrier6	point13	13	11.0	26.6
							Barrier6	point2	2	13.0	24.5
							Barrier6	point14	14	10.0	23.2
							Barrier6	point1	1	8.0	20.9
							Barrier14a	point9	9	10.0	17.2
Receiver10-4	25	59.6	3.5	8	-4.5		Barrier10	point7	7	10.0	52.7
							Barrier6	point13	13	11.0	26.8
							Barrier6	point2	2	13.0	22.1
							Barrier6	point1	1	8.0	20.4
							Barrier6	point14	14	10.0	18.8
							Barrier14a	point9	9	10.0	16.3
							Barrier14b	point11	11	10.0	13.9
Receiver10-5	26	58.3	2.3	8	-5.7		Barrier10	point7	7	10.0	50.8
							Barrier6	point14	14	10.0	27.8
							Barrier6	point13	13	11.0	25.3
							Barrier14a	point9	9	10.0	23.9
							Barrier14b	point11	11	10.0	23.8
							Barrier6	point1	1	8.0	20.4
							Barrier6	point2	2	13.0	19.9

Receiver10-6	27	58.5	2.1	8	-5.9	Barrier10	point7	7	10.0	51.9
						Barrier6	point14	14	10.0	27.9
						Barrier6	point13	13	11.0	26.0
						Barrier14a	point9	9	10.0	23.5
						Barrier6	point1	1	8.0	22.6
						Barrier6	point2	2	13.0	21.7
						Barrier14b	point11	11	10.0	21.4
Total Cost, All Barriers (including additional cost(s))					$359488					

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E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 3 Existing Conditions
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver16	1	1	0.0	51.2	66	51.2	14	----	51.2	0.0	8	-8.0
Receiver17	2	1	70.0	67.0	66	-3.0	14	Snd Lvl	67.0	0.0	8	-8.0
Receiver18	3	1	0.0	61.9	66	61.9	14	----	61.9	0.0	8	-8.0
Receiver19	4	1	0.0	60.7	66	60.7	14	----	60.7	0.0	8	-8.0
Receiver20	5	1	64.0	63.8	66	-0.2	14	----	63.8	0.0	8	-8.0
Receiver21	6	1	0.0	65.3	66	65.3	14	----	65.3	0.0	8	-8.0
Receiver22	7	1	65.0	66.3	66	1.3	14	Snd Lvl	66.3	0.0	8	-8.0
Receiver23	8	1	0.0	58.0	66	58.0	14	----	58.0	0.0	8	-8.0
Receiver24	9	1	0.0	59.3	66	59.3	14	----	59.3	0.0	8	-8.0
Receiver26	10	1	0.0	59.5	66	59.5	14	----	59.5	0.0	8	-8.0
Receiver25	11	1	0.0	59.1	66	59.1	14	----	59.1	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	11	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 3 2040 No Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver16	1	1	0.0	51.4	66	51.4	14	----	51.4	0.0	8	-8.0
Receiver17	2	1	70.0	67.2	66	-2.8	14	Snd Lvl	67.2	0.0	8	-8.0
Receiver18	3	1	0.0	62.1	66	62.1	14	----	62.1	0.0	8	-8.0
Receiver19	4	1	0.0	60.9	66	60.9	14	----	60.9	0.0	8	-8.0
Receiver20	5	1	64.0	64.0	66	0.0	14	----	64.0	0.0	8	-8.0
Receiver21	6	1	0.0	66.4	66	66.4	14	Snd Lvl	66.4	0.0	8	-8.0
Receiver22	7	1	65.0	67.5	66	2.5	14	Snd Lvl	67.5	0.0	8	-8.0
Receiver23	8	1	0.0	59.0	66	59.0	14	----	59.0	0.0	8	-8.0
Receiver24	9	1	0.0	60.9	66	60.9	14	----	60.9	0.0	8	-8.0
Receiver26	10	1	0.0	60.4	66	60.4	14	----	60.4	0.0	8	-8.0
Receiver25	11	1	0.0	59.8	66	59.8	14	----	59.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	11	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 3 Proposed Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver16	1	1	0.0	54.3	66	54.3	14	----	54.3	0.0	8	-8.0
Receiver17	2	1	0.0	69.7	66	69.7	14	Snd Lvl	69.7	0.0	8	-8.0
Receiver18	3	1	0.0	64.1	66	64.1	14	----	64.1	0.0	8	-8.0
Receiver19	4	1	0.0	63.4	66	63.4	14	----	63.4	0.0	8	-8.0
Receiver20	5	1	0.0	65.6	66	65.6	14	----	65.6	0.0	8	-8.0
Receiver21	6	1	0.0	67.0	66	67.0	14	Snd Lvl	67.0	0.0	8	-8.0
Receiver22	7	1	0.0	68.1	66	68.1	14	Snd Lvl	68.1	0.0	8	-8.0
Receiver23	8	1	0.0	59.3	66	59.3	14	----	59.3	0.0	8	-8.0
Receiver24	9	1	0.0	61.1	66	61.1	14	----	61.1	0.0	8	-8.0
Receiver26	10	1	0.0	61.6	66	61.6	14	----	61.6	0.0	8	-8.0
Receiver25	11	1	0.0	60.0	66	60.0	14	----	60.0	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	11	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 4 Existing Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver27	1	1	0.0	65.1	66	65.1	14	----	65.1	0.0	8	-8.0
Receiver28	2	1	0.0	59.2	66	59.2	14	----	59.2	0.0	8	-8.0
Receiver29	3	1	0.0	58.3	66	58.3	14	----	58.3	0.0	8	-8.0
Receiver30	5	1	66.0	65.3	66	-0.7	14	----	65.3	0.0	8	-8.0
Receiver31	6	1	0.0	63.6	66	63.6	14	—	63.6	0.0	8	-8.0
Receiver32	7	1	0.0	61.7	66	61.7	14	----	61.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 4 2040 No Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver27	1	1	0.0	65.3	66	65.3	14	----	65.3	0.0	8	-8.0
Receiver28	2	1	0.0	59.4	66	59.4	14	----	59.4	0.0	8	-8.0
Receiver29	3	1	0.0	58.4	66	58.4	14	----	58.4	0.0	8	-8.0
Receiver30	5	1	66.0	65.3	66	-0.7	14	----	65.3	0.0	8	-8.0
Receiver31	6	1	0.0	63.6	66	63.6	14	----	63.6	0.0	8	-8.0
Receiver32	7	1	0.0	61.7	66	61.7	14	----	61.7	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

CBBEL
E Anderson

11 December 2014
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: IDOT Phase I IL-47, US-14 to Charles Rd
RUN: Sheet 4 Proposed Build Conditions
BARRIER DESIGN: INPUT HEIGHTS

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Receiver27	1	1	0.0	68.1	66	68.1	14	Snd Lvl	68.1	0.0	8	-8.0
Receiver28	2	1	0.0	62.8	66	62.8	14	----	62.8	0.0	8	-8.0
Receiver29	3	1	0.0	61.6	66	61.6	14	----	61.6	0.0	8	-8.0
Receiver30	5	1	0.0	68.0	66	68.0	14	Snd Lvl	68.0	0.0	8	-8.0
Receiver31	6	1	0.0	66.4	66	66.4	14	Snd Lvl	66.4	0.0	8	-8.0
Receiver32	7	1	0.0	65.3	66	65.3	14	----	65.3	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	6	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

Appendix B

TNM 2040 Noise Contours

&

Letter to Adjacent Jurisdictions

Letters to Adjacent Jurisdictions to occur near the Public Hearing

SUPPLEMENT 3.22-1
TRANSPORTATION MANAGEMENT PLAN

Illinois Department of Transportation

Transportation Management Plan

Region No:	1	Project No:	P-91-007-09	Contract No:	TBD
District No:	1	County:	McHenry	Program Yr.:	TBD
Route:	FAP 326 (Illinois Route 47)	Project Limits:	US Route 14 to Charles Road		

The stated mobility goals of the Safety Engineering Policy Memorandum Safety 3-07 are:

1. Delays caused by work zones should not exceed more than 5 minutes per mile of project length with a maximum of 30 minutes above the normal recurring traffic delay.
2. Queues caused by work zones should be no more than 1.5 miles beyond pre-existing queues.

Please check the appropriate box explaining the Traffic Control Case:

☐ Significant Route Project: Based on current impact analysis and construction strategies, the stated goals are not expected to be met. See attachments for details. *In addition, complete and attach the 'Request for Exception to Compliance with the Work Zone Safety and Mobility Rule' (BSPE WZ 2) form.* **(IDOT – District 1 Traffic Operations Bureau Chief, Springfield, and FHWA approval required) –** Route Name/Number if applicable:

☒ Significant Route Long-Term Project that meets expectations **(IDOT – District 1 Traffic Operations Bureau Chief approval required) –** Route Name/Number if applicable: **Illinois Route 47**

☐ Non-significant Project; No exceptions requested **(IDOT – District 1 Traffic Operations Bureau Chief approval required)**

Attachments shall:

1. Provide a brief description of the project.
2. Include a brief discussion of strategies considered and the reasons these strategies will not be utilized, which could include a listing of pros/cons, cost, delays and queues.
3. Describe the recommended strategies which will be utilized identifying the delays and queues. The mitigation measures to reduce the impacts on the project will be fully described.
4. Include a location map with project limits and applicable parts of the plan.

Submitted by District Representative:	Phase I Corey Smith, P.E. 03/25/2019	Phase II Type Name and Date
Approved by:	D1- Bureau of Traffic Operations Lisa Heaven - Baum 4/9/19	D1- Bureau of Traffic Operations

District No.: **1** Contract No.: **TBD** Letting Date: **TBD**
Route: **FAP 326 (IL Route 47)** Section: **P-91-007-09** Program Cost: $85,000,000
Project Location: **City of Woodstock and McHenry County**
County: **McHenry**

Scope of Work
Widen and reconstruct IL Route 47 from US 14 to Charles Road. Roundabouts will be included at the intersections of IL Route 47 with Lake Avenue, McConnell Road, Judd Street/Irving Avenue, Ware Road, and Charles Road. Signals will be included at the intersections of IL Route 47 with US Route 14, Country Club Road, IL Route 120 (McHenry Avenue), St. John's Road, and Russel Court.

Facility type: **Strategic Regional Arterial**
Area type (Urban, Suburban, or Rural): Us Route 14 to Ware Road Urban, Ware Road to Charles Road Rural
Project length (miles): **5 miles**
Project duration (months): 24 months

				Number of Lanes		Speed Limit			
#	Route	Description	Segment	Exist	Work Zone	Posted	Work Zone	Design Speed	ADT
1	**FAP 326 (IL Route 47)**	**Arterial (ART)**	**US Route 14 to IL Route 120**	**3 (12' through)**	**3 (11' through)**	**35**	**35**	**40**	**15200-26200**
2	**FAP 326 (IL Route 47)**	**Arterial (ART)**	**IL Route 120 to Greenwood Drive**	**3 (12' through)**	**3 (11' through)**	**30**	**30**	**35**	**15600**
3	**FAP 326 (IL Route 47)**	**Arterial (ART)**	**Greenwood Drive to Ware Road**	**3 (12' through)**	**3 (11' through)**	**35**	**35**	**40**	**10800-15600**
4	**FAP 326 (IL Route 47)**	**Arterial (ART)**	**Ware Road to .5mi north of Ware Road**	**2 (12' through)**	**2 (11' through)**	**45**	**45**	**50**	**8100**
5	**FAP 326 (IL Route 47)**	**Arterial (ART)**	**.5mi north of Ware Road to Charles Road**	**2 (12' through)**	**2 (11' through)**	**50**	**45**	**50**	**8100**

Phase I

1. A. Temporary Traffic Control Plan: Strategies anticipated to be utilized (Applicable strategies are marked):

☒ 1 Use of temporary widening **1-5** ☐ 6 Spec. Events Restrictions (Specify):
☐ 2 Use of night work ☐ 7 Signing &/or improving alt. routes
☐ 3 Permanent lane closures ☐ 8 Detour
☒ 4 Temp/ Restricted Lane closure ☒ 9 Pedestrian accommodations **1-3**
☒ 5 Railroad coordination **1** ☐ 10 Other (Specify):

Comments:
Railroad pedestrian tunnel shall be constructed prior to roadway work at railroad.

1.B. Transportation Operation Plan: Strategies anticipated to be utilized (Applicable strategies are marked)

☒ 1 Signal Coordination **1-3** ☐ 5 State Police Hirebacks
☐ 2 Turn restrictions ☐ 6 Temporary Surveillance
☐ 3 Service Patrol ☐ 7 Smart WZ
☐ 4 Parking restrictions ☐ 8 Other (Specify):

Comments:

Design Approval: **Anticipated June 2019**

Phase II

Does the proposed Maintenance of Traffic (MOT) in Phase II match what was proposed in Phase I? ☐ Yes ☐ No

Specify & Describe Changes (if applicable): ______

2.A. Temporary Traffic Control Plan: Strategies anticipated to be utilized (Applicable strategies are marked):

☐ 1 Use of temporary widening	______	☐ 7 Improving & signing alternate routes	______
☐ 2 Use of night work	______	☐ 8 Detour	______
☐ 3 Permanent lane closures	______	☐ 9 Pedestrian accommodations	______
☐ 4 Temp/Restricted Lane closure	______	☐ 10 Incentive/Disincentive clauses	______
☐ 5 Railroad coordination	______	☐ 11 Bus stop coordination	______
☐ 6 Spec. Events Restrictions (Specify):	______	☐ 12 Other (Specify):	______

Comments:

2.B. Transportation Operation Plan: Strategies anticipated to be utilized (Applicable strategies are marked):

☐ 1 Signal Coordination	______	☐ 8 Speed Limit Reduction	______
☐ 2 Turn restrictions	______	☐ 9 Increased WZ violations penalties	______
☐ 3 Service Patrol	______	☐ 10 Coord w/ adj. construction sites	______
☐ 4 Parking restrictions	______	☐ 11 Speed Indicator Signs	______
☐ 5 State Police Hirebacks	______	☐ 12 Incidence response coord	______
☐ 6 Traffic Control Surveillance	______	☐ 13 Other (Specify):	______
☐ 7 Smart Work Zone	______		

Comments:

2.C. Public Information Plan: Strategies anticipated to be utilized (Applicable strategies are marked):

☐ 1 Media Press Release	______	☐ 4 Static Message Signs	______
☐ 2 Web Page	______	☐ 5 Brochures/Flyers	______
☐ 3 Changeable Message Signs	______	☐ 6 Other (Specify):	______

Comments:

Phase III

To be completed by Resident Engineer and sent to the D-1Traffic Control Supervisor and the Bureau of Safety Programs and Engineering within thirty (30) days of essential completion of the project. The information provided will be used to measure TMP performance and determine appropriate strategies for future contracts.

Were the limits and scope included on the second page of this report included in the construction contract?

☐ Yes ☐ No

If no, list limits and scope below:

3.A. Temporary Traffic Control Plan: Phase II of this report included the strategies that were planned to be used as part of the work for which the contractor was responsible for during construction. The following strategies were utilized (Please check all that apply):

☐ 1 Use of temporary widening		☐ 7 Improving & signing alternate routes	
☐ 2 Use of night work		☐ 8 Detour	
☐ 3 Permanent lane closures		☐ 9 Pedestrian accommodations	
☐ 4 Temp/Restricted Lane closure		☐ 10 Incentive/Disincentive clauses	
☐ 5 Railroad coordination		☐ 11 Bus stop coordination	
☐ 6 Spec. Events Restrictions		☐ 12 Other (Specify):	

List any changes made to the plan, explain briefly:

Evaluate the success of the plan:

3.B. Transportation Operation Plan: Phase II of this report included the strategies that were planned to be used that involve changes that directly affected the roadway users during construction. The following strategies were utilized (Please check all that apply):

☐ 1 Signal Coordination		☐ 8 Speed Limit Reduction	
☐ 2 Turn restrictions		☐ 9 Increased WZ violations penalties	
☐ 3 Service Patrol		☐ 10 Coord w/ adj. construction sites	
☐ 4 Parking restrictions		☐ 11 Speed Indicator Signs	
☐ 5 State Police Hirebacks		☐ 12 Incidence response coord	
☐ 6.Traffic Control Surveillance		☐ 13 Other (Specify):	
☐ 7 Smart Work Zone			

List any changes made to the plan, explain briefly:

Evaluate the success of the plan:

3.C. Public Information Plan: Phase II of this report included the strategies that were planned to be used for the outreach to the public about the project. The following strategies were utilized (Please check all that apply):

☐ 1 Media: Press Release		☐ 4 Static Message Signs	
☐ 2 Web Page		☐ 5 Brochures/Flyers	
☐ 3 Changeable Message Signs		☐ 6 Other (Specify):	

List any changes made to the plan, explain briefly:

Evaluate the success of the plan:

Provide a description of any changes made to the traffic control due to crashes occurring within the project limits during construction and if the action taken improved safety. Did it have any other effect on the roadway users (i.e. improved wait time or increased delay)?

Recommendations, if any, for changes to IDOT’s standards, specifications, policies, or procedures.

Traffic Management Plan – Instructions

Cover Page/Signature Page

Region Number
Project Number
Contract Number
District Number
County – Specify county or counties; if more than 3 counties, enter as “Various.”
Program Year
Route(s) – Identify by name or number, including US or IL designation.
Project Limits – Include brief description of project limits.
Traffic Control Case – Check the appropriate box that explains the Traffic Control Case(s); if more than one case is applicable because of multiple routes in the contract, then specify the route name(s) or number(s) in the space provided
Provide attachments where appropriate – Use exhibits when applicable.
Submitted by District Representative – This should be completed with the typed name and signature of the IDOT Project Manager before the TMP is submitted for review.
Approved By – After review and approval of the TMP, it will require a signoff from the IDOT District 1 Officials.

Phase I

District Number
Contract Number
Letting Date – Indicate the letting date for which the contract is being submitted.
Route – Identify by name or number, including US or IL designation.
Section
Program Cost
Project Location – Include municipality, project limits, and other relevant information.
County – Specify the county or counties, if more than 3 counties, enter as “Various.”
Scope of Work – Include a brief description of the type of work involved in this contract.
Facility Type – Identify route(s) as Principal Arterial, Minor Arterial, Major Collector, etc.
Area Type – Urban, Suburban, or Rural.
Project Length – Specify the Project length in miles; also specify in feet for smaller jobs.
Project Duration – Provide estimated time in months for project completion.

Route Information Table Instructions
– Sequential serial number for this form, which can be used as shorthand to designate particular routes in all sections of this form, including the Temporary Traffic Control Plan, Transportation Operation Plan, and Public Information Plan; the serial numbers can be used for all phases of the form.
Route – Identify by name or number, including US or IL designation.
Description – Choose one of the following, which should be abbreviated with the letters in parenthesis behind each item: Expressways (EXPWY), Arterial (ART), or Other Significant Route (OSR); note that an Other Significant Route deemed significant based on engineering judgment but that is not under IDOT jurisdiction.
Segment – Specify limits of the roadway section being described. If at an intersection, specify north, south, east, or west leg.
Number of Lanes

1. Exist – Existing number of travel and turning lanes in each direction. Separate the directions with dashes: northbound/ eastbound lanes, then southbound/ westbound lanes. Place number of turning lanes and direction of turning in parenthesis following the number of general travel lanes [e.g. 3(2L1R)-3(1L) means 3 lanes northbound with 2 left turn lanes and 1 right turn lane, 3 lanes southbound with 1 left turn lane].
2. Work Zone – Number of lanes being maintained during construction; see above for proper documentation convention.

Speed Limit

1. Exist – Existing posted speed limit.
2. Work Zone – Speed limit that will be established in the work zone; follow IDOT’s most current version of the ‘Policy on Establishing and Posting Speed Limits on the State Highway System.’

Design Speed
ADT – Include average daily traffic and year of data

1.A Temporary Traffic Control Plan (TCP)
If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if temporary widening will be utilized.
2. Check box if contract will require work to be completed during allowable hours in the night. Note that this will require approval from all the appropriate Local agencies.
3. Check box if permanent lane closures will be required.
4. Check box if temporary lane closures will be implemented during specified allowable hours.
5. Check box if the contract will require coordination with a railroad agency.
6. Check box if contract will require restrictions during a special event. Briefly state restriction(s).
7. This strategy should be checked only if special conditions will exist that warrant the implementation of an alternate route. The alternate route should be identified in Phase I; IDOT and appropriate Local agencies should be notified for coordination and approval.
8. Check box if a detour route will be required; IDOT and appropriate Local agencies should be notified for coordination and approval.
9. Check box if any special pedestrian accommodations (e.g. pedestrian detour, protective canopy, etc.) will be required.
10. If this box is being checked, include a brief description of any additional contract specific TCP strategy(s) proposed in the space to the right of the strategy, following the listing of any routes if necessary

Comments – Include additional information that may be necessary in support of the strategies used in the TCP.

1.B Transportation Operation Plan (TOP)
If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if signal coordination will be required.
2. Check box if turn restrictions will be implemented. Specify location(s). Appropriate local agencies should be notified for coordination.
3. Check box if service patrol will be required.
4. Check box if parking restrictions will be implemented. This should be approved by the appropriate Local Agency.
5. This strategy requires coordination with the Illinois State Police and if proposed to be implemented, should be approved in Phase I.
6. Check box if traffic control surveillance will be required.
7. Check box if Smart Work Zones related technologies such as queue detection, real time changeable message signs, etc. will be required.
8. If this box is being checked, include a brief description of any additional contract specific TOP strategy(s) proposed in the space to the right, following the listing of the route(s).

Comments – Include additional information that may be necessary in support of the strategies used in the TOP.

Design Approval – Include data for Phase 1 Design Approval or Target Design Approval

<u>Phase II</u>

For all contracts that do not have a Phase I: Skip the Phase I portion on Page 2 and the first two lines on Page 3. Begin with Section 2.A. on Page 3.

Phase II Plans Match Phase I – Do the Phase II plans match plans submitted for Phase I?
Specify & Describe Changes – If major changes have been made to the plans, briefly describe and justify them.

2.A Temporary Traffic Control Plan (TCP)
If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if temporary widening is proposed in the plans.
2. Check box if the plans show work being completed during night time. Special provision that specifies the allowable work hours is required in the contract documents.
3. Check box if permanent lane closures are proposed in the plans.
4. Check box if temporary lane closures are proposed in the plans. Special provision that specifies allowable work hours is required in the contract documents.
5. Check box if the contract requires coordination with a railroad agency.
6. Check box if contract requires restrictions during a special event. Briefly state restriction(s). Special provision is required in the contract documents.

7. Check box if the plans include alternate route(s). Ensure that the proposed route(s) has been approved by the IDOT Detour Committee and/or the appropriate local agencies.
8. Check box if the plans include detour(s). Ensure that the proposed route(s) has been approved by the IDOT Detour Committee and/or the appropriate local agencies.
9. Check box if plans show any special pedestrian accommodation.
10. Check box if there is any monetary compensation/penalty for early/late completion of work associated with the contract in the plans.
11. Check box if the contract requires coordination with a bus agency during construction. This includes bus stop relocation, bus rerouting, etc.
12. If this box is being checked, include a brief description of any additional contract specific TCP strategy(s) proposed in the space to the right, following the listing of the route(s).

Comments – Include additional information that may be necessary in support of the strategies used in the TCP.

2.B Transportation Operation Plan (TOP)

If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if signal coordination is required. Special provision and pay item are required in the contract documents.
2. Check box if the plans include turn restrictions.
3. Check box if the plans include service patrol. Special provision and pay item are required in the contract documents.
4. Check box if the plans include parking restrictions.
5. Check box if the plans include State Police Hirebacks – requires prior approval.
6. Check box if the plans include traffic control surveillance. Special provision and pay item are required in the contract documents.
7. Check box if the plans include the use of Smart Work Zone related technologies such as queue detection, real time changeable message signs, etc.
8. Check box if there is a speed reduction associated with any of the routes. See ‘Route Information Table’ in Phase I. If there is a design deviation from IDOT’s policy based on engineering judgment, it has to be brought to the attention of the Bureau of Traffic in this stage. Follow the policy to determine if the difference between the Proposed Work Zone Speed Limit and the Existing Posted Speed Limit warrants the change to be documented and approved by the District 1 Traffic Operations Bureau Chief.
9. Check box if a work zone speed limit is being established on the route(s).
10. Check box if there are other contract(s) within the vicinity of the ‘Subject’ contract with which coordination is required. List Contract number(s) on the right side. Special provision is required in the contract documents.
11. Check box if speed indicators sign(s) is needed. Special provision and pay item are required in the contract documents.
12. Check box if Incidence Response Coordination meetings are required with Emergency Responders.
13. If this box is being checked, include a brief description of any additional contract specific TOP strategy(s) proposed in the space to the right, following the listing of the route(s).

Comments – Include additional information that may be necessary in support of the strategies used in the TOP.

2.C Public Information Plan (PIM)

If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if there is a Media Press Release proposed for the contract.
2. Check box if there is a web page with traffic staging related information set up for the contract.
3. Check box if the plans propose the use of Changeable Message Sign. Special provision and pay item are required in the contract documents.
4. Check Box if the plans include static message signs. Pay item is required in the contract documents.
5. Check box if brochures/flyers are scheduled to be distributed as part of the contract.
6. If this box is being checked, include a brief description of any additional contract specific TOP strategy(s) proposed in the space to the right, following the listing of the route(s).

Comments – Include additional information that may be necessary in support of the strategies used in the TOP.

Phase III

Limits and Scope – Choose whether or not the limits and scope were included in the construction contract; if not, list them.

3.A Temporary Traffic Control Plan (TCP)

If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if temporary pavement was constructed as part of the contract.
2. Check box if there was work performed within allowable hours during the night.
3. Check box if permanent lane closures were implemented as part of the contract.
4. Check box if there was temporary/restricted lane closures implemented during allowable hours.
5. Check box if there was coordination with a Railroad agency during the construction process.
6. Check box if contract required work restriction during a special event.
7. Check box if alternate route(s) was set up as part of the construction process.
8. Check box if detour route(s) was set up as part of the construction process.
9. Check box if any special pedestrian accommodation was provided.
10. Check box if there was any monetary compensation/penalty for early/late completion of work associated with the contract.
11. If this box is being checked, include a brief description of any additional contract specific TCP strategy(s) implemented in the space to the right, following the listing of the route(s).

Changes made to the plan – Include information on TCP strategy changes.
Briefly evaluate the success of the plan.

3.B Transportation Operation Plan (TOP)
If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if signal coordination was provided during construction.
2. Check box if there were turn restrictions implemented.
3. Check box if there was service patrol during construction.
4. Check box if there were parking restrictions during construction.
5. Check box if there were state police hirebacks during construction.
6. Check box if there was traffic control surveillance performed during construction.
7. Check box if Smart Work Zone related technologies such as queue detection, real time changeable message signs, etc. were used during construction.
8. Check box if there was a speed reduction posted in the work zone during construction.
9. Check box if there were penalties issued for work zone speed violations.
10. Check box if there was coordination required between contract(s) during construction.
11. Check box if speed indicators sign(s) were used in the work zone.
12. Check box if there was incidence response coordination during construction.
13. If this box is being checked, include a brief description of any additional contract specific TOP strategy(s) implemented in the space to the right, following the listing of the route(s).

Changes made to the plan – Include information on TOP strategy changes.
Briefly evaluate the success of the plan.

3.C Public Information Plan (PIP)
If there is more than one Significant Route included in the contract, indicate the Route(s) in the space following the checked strategy; any additional required information should be included following the routes.

1. Check box if there was a Media Press Release.
2. Check box if a web page with traffic staging related information was set up for the contract.
3. Check box if Changeable Message Sign(s) were used.
4. Check Box if static message sign(s) were used.
5. Check box if brochures/flyers were scheduled for distribution.
6. If this box is being checked, include a brief description of any additional contract specific TOP strategy(s) implemented in the space to the right, following the listing of the route(s).

Changes made to the plan – Include information on PIP strategy changes.
Briefly evaluate the success of the plan.
Description of Traffic Control Changes.
Recommendations

TRAFFIC MANAGEMENT PLAN

ROUTE: FAP 326 IL Route 47
US 14 to Charles Road
McHenry County

Job No: P-91-007-09
PTB #: 149-008

Illinois Department of Transportation
District 1

March 2019

Contact Information

Job Number: P-91-007-09

Project: Reconstruction of IL Route 47 from US Route 14 to Charles Road

Location: Woodstock, Illinois

IDOT Unit Head: Steve Schilke, P.E.

Phone: 847-705-4125

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EXHIBITS

TABLES

FIGURES

1.0 EXECUTIVE SUMMARY

Illinois Route 47 is a Strategic Regional Arterial (SRA) and a Class II truck route running north-south through the City of Woodstock and unincorporated McHenry County, Illinois. The limits for this study extend from US Route 14 approximately five miles north to Charles Road. These represent logical termini because US Route 14 is an arterial and a major source of traffic for the corridor. Charles Road, the northern terminus, also is a designated SRA route and represents the northern edge of the urban area beyond which corridor traffic volumes decrease substantially. A Project Location Map is included in Exhibit 1.1-1.

The Illinois Route 47 corridor improvement involves reconstruction of the existing three-lane roadway into a four-lane roadway separated by a barrier median. Construction is anticipated to take two years.

Illinois Route 47 is listed on the Department's Significant Route Locations Map dated 2013 at the following link. This map is included in Exhibit 1.1-2. Within the Project limits, Illinois Route 47 crosses Illinois Route 120 which is also considered a Significant Route.

https://idot.illinois.gov/Assets/uploads/files/Travel-Information/Pamphlets-&-Brochures/IDOT_SignificantRoutes_2013.pdf

The Illinois Route 47 status as a significant route, coupled with its full reconstruction scope, considers this project a Significant Project–Long Term and requires the preparation of this Traffic Management Plan (TMP). The Illinois Route 47 TMP includes a Traffic Control Plan (TCP), a Transportation Operations Plan (TOP), and a Public Information Plan (PIP). Details of those plans will be finalized during Phase II engineering design, and those component plans will cover safety and congestion mitigation strategies.

The Traffic Management Plan (TMP) as described in this document meets the requirements of the Work Zone Safety and Mobility Rule.

2.0 PROJECT DESCRIPTION

Illinois Route 47 is the only continuous north-south route and arterial roadway in the City of Woodstock. It also is one of only three continuous north-south routes in McHenry County. As a result, this roadway is a major component of the local and regional transportation system and is vital to the economic development of the area. In addition to being an important route for through-traffic, the roadway provides local access to businesses and residents fronting the roadway.

Increased travel demands on Illinois Route 47 are creating safety and operational deficiencies along the immediate roadway and its adjacent arterials and intersections. The insufficient capacity of the roadway to manage travel demands creates congestion, limits mobility, hinders safe access to adjacent properties and businesses, and leads to safety issues for motorists, bicyclists, and pedestrians.

Land use is diverse along the corridor and is split into three distinct sections. The southern section, from US Route 14 to Illinois Route 120, is an urban section with primarily commercial and industrial buildings. In this section, Illinois Route 47 passes under the Union Pacific (UP) Railroad bridge that also carries the Metra UP/Northwest line. The middle section, extending from Illinois Route 120 to Ware Road, is an urban section of primarily residential neighborhoods mixed with commercial, healthcare, and institutional usage. The northern section, from Ware Road to Charles Road, is a rural section with residential and agricultural usage.

A detour alternative was considered but was abandoned since more than 70 percent of the traffic entering the corridor at the south exits the corridor within the project construction limits. Also considered was maintaining traffic with a one lane in each direction and no center turn lane. This was abandoned because there are approximately 190 driveways and 31 intersections within this corridor. No accommodations for left turns would provide unacceptable delays.

Phase II (Design) of the Project is funded. Land Acquisition and Construction funding for this Project is not included in IDOT's *Fiscal Year 2019-2024 Proposed Highway Improvement Program*. However, this Project will be evaluated for inclusion in future highway programs. Interaction with other projects will be determined at that time.

3.0 DESCRIPTION OF EXISTING CONDITIONS

3.1 Typical Sections

The existing typical section along Illinois Route 47 from US Route 14 to Ware Road is a three-lane roadway consisting of one 12-foot lane in each direction separated by a 12-foot bidirectional left-turn lane. Curb and gutter runs on both sides of the roadway. From Ware Road to Charles Road, there is one 12-foot lane in each direction with an 8-foot outside shoulder on both sides. There are existing sidewalks along Illinois Route 47 in intermittent locations. The existing and proposed typical sections are included in Exhibit 3.1-1.

3.2 Traffic Data

The existing traffic data and projected Future No-Build traffic data with anticipated levels of services are included in Figure 3.2-1.

Overall, the existing intersection geometry and 2009 traffic volumes result in intersection level of service (LOS) ranges from C to D. The 2040 no-build scenario, intersection LOS ranges from C to F. A summary of the AM and PM LOS and delay for 2009 and the future no-build scenario at each intersection is provided in Table 3.2-1.

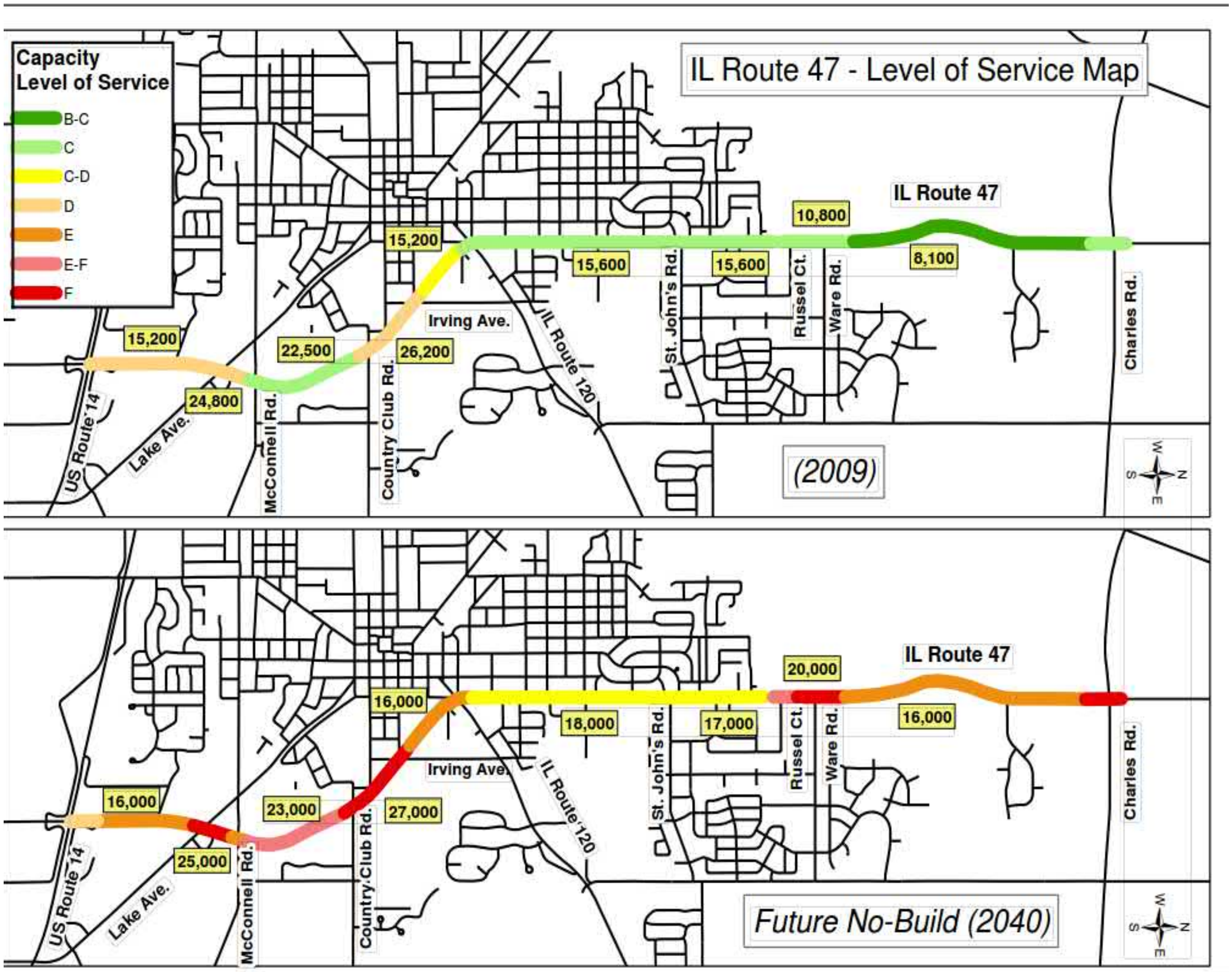


Figure 3.2-1 2009 and Projected ADT and the Resulting Impact on Congestion and Delay

	AM Peak Hour				PM Peak Hour			
	2009		2040 No-Build		2009		2040 No-Build	
Intersection	**Delay (seconds/ vehicle)**	**LOS**	**Delay (seconds/ vehicle)**	**LOS**	**Delay (seconds/ vehicle)**	**LOS**	**Delay (seconds/ vehicle)**	**LOS**
US Route 14	32.7	C	45.7	D	35.8	D	45.6	D
Lake Avenue	34.2	C	100.8	F	41.8	D	135.4	F
McConnell Road	24.8	C	56.3	E	22.9	C	50.0	D
Country Club Road	32.5	C	99.2	F	37.9	D	131.7	F
Judd Street/ Irving Avenue	31.9	C	136.9	F	38.4	D	184.2	F
Illinois Route 120/ McHenry Avenue	34.6	C	53.8	D	34.0	C	41.4	D
Russel Court	22.9	C	53.7	D	20.8	C	25.4	C

Table 3.2-1 AM and PM 2009 and Future No-Build (2040) LOS and Delay by Intersection

3.3 Crash Data and Analysis

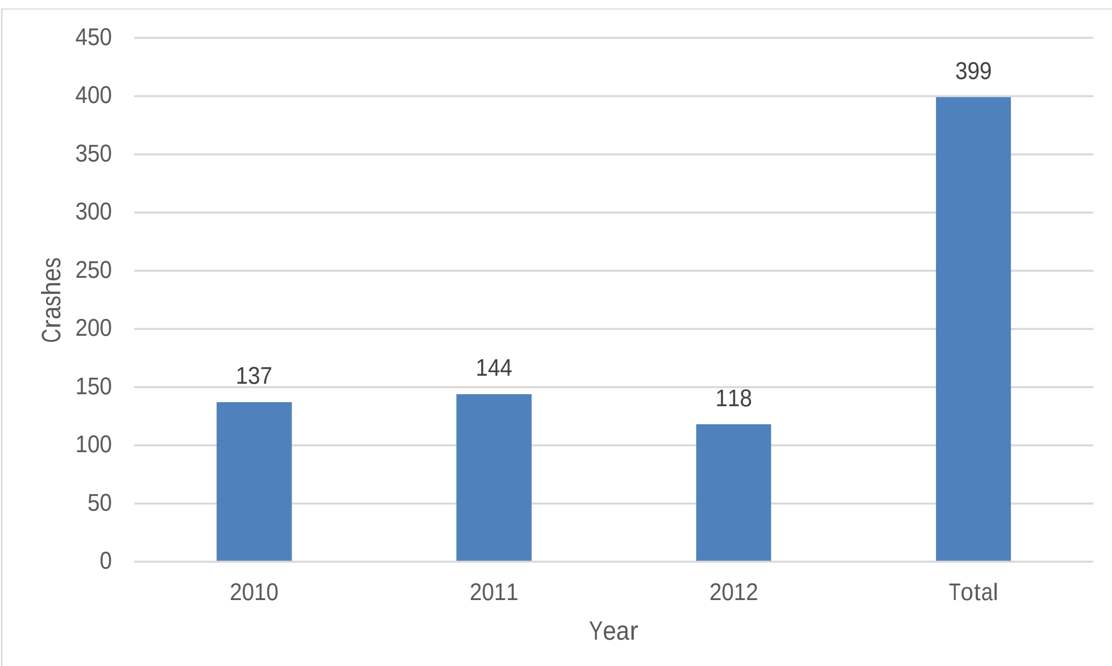


Figure 3.3-1 Annual Crashes 2010 to 2012

Crash data was collected from for years 2010, 2011, and 2012. The total number of crashes for the study period was 399, as shown in Figure 3.3-1.

Figure 3.3-2 describes the 399 crashes by crash type. The predominant crash types for the study period were rear-end (61 percent), turning (17 percent), angle (13 percent), and sideswipe of cars traveling in the same direction (3 percent). Other types of crashes included animal, head-on, sideswipe of vehicles in opposite directions, and fixed objects. Additionally, from 2010 to 2012, there were 210 mid-block crashes in the Illinois Route 47 corridor. Of these, 62.4 percent were rear-end or turning crashes. The lack of access management on Illinois Route 47 negatively affects operations and leads to a high incidence of conflicts and, ultimately, crashes.

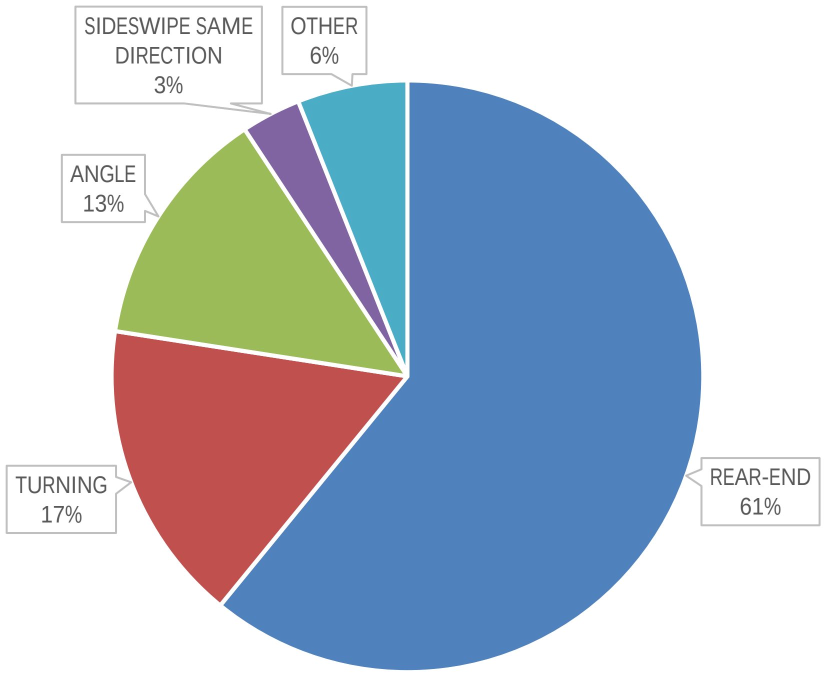


Figure 3.3-2 Crashes by Type 2010 to 2012

4.0 TRAFFIC CONTROL PLAN (TCP) STRATEGIES

The details of the TCP will be finalized during Phase II engineering design and will cover safety and congestion mitigation strategies.

IDOT uses various TCP strategies including signal phasing adjustments within the project limits, lane shifts, channelizing devices, temporary pavement markings, flaggers/traffic control officers, temporary signals as needed, lighting devices as needed, temporary lane closures, temporary signage, incentive/disincentive clauses in the contract documents, coordination with local stakeholders and adjacent projects, restrictions for special events as requested by local municipalities, improvement and/or signing of alternate routes, and pedestrian accommodations among others. Traffic control plans will be in conformance with State standards that will be in effect at the time of letting.

The following safety and congestion mitigation strategies will be implemented for the Illinois Route 47 corridor improvement:

Traffic control devices will conform to the Illinois Manual on Uniform Traffic Control Devices (ILMUTCD). Temporary traffic signals will include emergency preemption and communication devices. Temporary traffic signal controllers will be supplied by one of the District-approved closed-loop equipment manufacturers.

Traffic signal management systems shall be maintained in operation as indicated by the plans or as directed by the Resident Engineer. To mitigate traffic queues, detection at temporary traffic signals shall be included for all approaches of the existing signalized intersections unless stated otherwise in the temporary traffic signal plans.

Signs, barricades, and temporary striping will conform to the ILMUTCD and applicable State standards. Vehicular access to local businesses and properties will be maintained at all times during construction, except when paving operations occur directly on or in front of entrances. In those cases, flag persons will be used to direct traffic. In the case of multi-entrance businesses, at least one entrance will remain open at all times. Property and business owners will be notified in advance of any temporary closures. All properties will have access at the end of every workday.

The Illinois Route 47 staging conditions reflect the existing conditions with minimal deviation, providing one 11-foot through lane in each direction and a 10-foot bidirectional left turn lane. This configuration will not increase delays significantly over the existing traffic conditions.

Illinois Route 120 is also considered a Significant Route in the area of Illinois Route 47. The Illinois Route 120 staging conditions reflect the existing conditions with minimal deviation and will not increase delays significantly over the existing traffic conditions.

The Illinois Route 47 corridor maintenance of traffic (MOT) plan is divided into two distinct sections, US 14 to Ware Road and Ware Road to Charles Road. These sections were determined based on their unique roadway characteristics and land use. Following is a description of the proposed staging. MOT typical sections are included in Exhibit 4.1-1.

<u>Illinois Route 47–US 14 to Ware Road</u>

The first MOT section is from US 14 to Ware Road. From US 14 to IL 120, Illinois Route 47 is an urban section with primarily commercial and industrial buildings. Illinois Route 47 from IL 120 to Ware Road is an urban section of primarily residential neighborhoods mixed with commercial, healthcare, and institutional usage. Many driveways are located along each side of Illinois Route 47 from US 14 to Ware Road. The existing roadway consists of one lane in each direction separated by a two-way left-turn lane with sporadic sidewalk on each side of Illinois Route 47. The Illinois Route 47 reconstruction from US Route 14 to Ware Road will be performed in three primary stages.

Pre-Stage 1 will consist of removing the existing curb and gutter along the west side of Illinois Route 47 and installing temporary pavement approximately 14 feet wide. Temporary striping, signals, and drainage will also be performed during the pre-stage.

Stage 1 from US 14 to Ware Road consists of maintaining one lane in each direction separated by a two-way left-turn lane (TWLTL). Southbound traffic will be shifted onto the temporary pavement constructed during Pre-Stage 1. The existing southbound lane will be used for a TWLTL. Northbound traffic will use the existing TWLTL. Stage 1 operations will include construction of the two permanent northbound travel lanes, curb and gutter running along the outside edge of northbound pavement, a shared-use path located east of the roadway, earthwork, the proposed drainage system, temporary drainage pipes, roadway lighting, and signal posts. Stage 1a, prior to Stage 2, from US 14 to Ware will be used to construct temporary widening along the inside edge of the newly constructed northbound lanes. Constructing the temporary widening along the northbound lanes in this stage reduces the amount of temporary widening needed along the west side of the Illinois Route 47 southbound lanes in Pre-Stage 1. Stage 1a consists of maintaining one lane in each direction on their respective sides of the roadway with left turn lanes. The construction zone would be located in the roadway median. Southbound traffic will remain in the same location as Stage 1. Northbound traffic will use the outside permanent northbound lane constructed in Stage 1.

Stage 2 from US 14 to Ware Road consists of maintaining one lane in each direction separated by a TWLTL. Northbound traffic will use the outside permanent northbound lane constructed in Stage 1. The inside permanent northbound lane will be used for a TWLTL. Southbound traffic will use a combination of the inside permanent northbound travel lane and temporary pavement. Temporary wedges will be necessary to connect the inside permanent northbound travel lane to the existing pavement where vertical grades are different. Stage 2 operations will include construction of the two permanent southbound travel lanes, curb and gutter running along the southbound outside edge of pavement, a sidewalk located west of the roadway, earthwork, the proposed drainage system, temporary drainage pipes, roadway lighting, and signal posts.

Stage 3 from US 14 to Ware Road consists of maintaining one lane in each direction and will include left-turn lanes for each travel direction. Northbound traffic will use the outside permanent northbound lane constructed in Stage 1. The inside permanent northbound lane will be used as a left-turn lane for northbound traffic. Southbound traffic will use the outside permanent southbound lane constructed in Stage 2. The inside permanent southbound lane will be used as a left-turn lane for southbound traffic. Stage 3 operations will include construction of the proposed barrier median and inside curb and gutter, earthwork, the proposed drainage system, and signal posts.

Illinois Route 47–Ware Road to Charles Road

Illinois Route 47 from Ware Road to Charles Road is a rural section with residential and agricultural usage. Sporadic driveways are located along Illinois Route 47. The existing roadway consists of one lane in each direction with outside aggregate shoulders. The Illinois Route 47 reconstruction from Ware Road to Charles Road will be performed in two primary stages.

Pre-Stage 1 will consist of installing temporary pavement approximately six feet wide. Temporary striping will also be performed during the pre-stage. It is anticipated that the temporary widening would be constructed under a moving lane closure with flaggers.

Stage 1 from Ware Road to Charles Road consists of maintaining one lane in each direction. Southbound traffic will use the temporary pavement constructed during Pre-Stage 1 and a portion of the existing southbound travel lane. Northbound traffic will use a combination of the existing southbound travel lane and the existing northbound travel lane. Stage 1 operations will include construction of the two permanent northbound travel lanes, asphalt shoulder running along the northbound pavement, a shared-use path located east of the roadway, earthwork, and roadway lighting.

Stage 2 from US 14 to Ware Road consists of maintaining one lane in each direction. Northbound traffic will use the outside asphalt shoulder along the east side of Illinois Route 47 constructed in Stage 1. Southbound traffic will use the outside northbound travel lane constructed in Stage 1. Stage 2 operations will include the construction of the inside 4-foot shoulder, mountable median, two permanent southbound travel lanes, asphalt shoulder running along the southbound pavement, earthwork, and roadway lighting.

Illinois Route 47 Roundabout MOT

There are roundabouts proposed at five Illinois Route 47 intersections. Roundabouts will be included at Lake Avenue, McConnell Road, Judd Street/Irving Avenue, Ware Road, and Charles Road. The roundabouts will generally be constructed as follows:

The Stage 1 construction of Illinois Route 47 will involve removing and replacing the northbound lanes. The east side of the roundabout intersections will be built during Stage 1 along with the roadway portion of the project. Side streets on the east side of Illinois Route 47 will be constructed in quarter sections to maintain full side-street access. Some temporary pavement may be needed on the side streets to accommodate traffic during construction. Side-streets on the west side of Illinois Route 47 can be left open. To maintain turning movements and future staging options, the central island curbing in the roundabout and splitter island curbing on the side streets will not be installed during Stage 1 or Stage 2 construction. Instead, temporary asphalt, intersection control and pavement markings will be installed to maintain traffic movements.

Stage 2 construction of Illinois Route 47 will involve shifting traffic to the newly improved roadway and southbound Illinois Route 47 will be constructed. Roundabout intersection construction will involve building the west side roadway and exterior curbing for the roundabout in conjunction with the mainline. Side-streets will be constructed in quarter sections to maintain full side-street access. Some temporary pavement may be needed on the side-streets to accommodate traffic during construction. To maintain turning movements and future staging options, the central island curbing in the roundabout and splitter island curbing on the side streets will not be installed during Stage 1 or Stage 2 construction. Instead, temporary asphalt, intersection control, and pavement markings will be installed to maintain traffic movements.

Once mainline Illinois Route 47 is completed, traffic will be shifted in Stage 3 to provide one lane of traffic in each direction along Illinois Route 47 and the side-streets. Stage 3 will provide space for removal of the temporary pavement and installation of the side-street splitter island and central island curbing at each roundabout. Once the curbing is complete, the central islands and splitter islands can be fully restored.

5.0 PUBLIC INFORMATION PLAN

IDOT uses various PIP strategies depending on the level of public involvement within the project, population and traveling public density, and overall resource availability within the project area. The strategies used can include brochures/mailers, press releases and media advisories, paid advertisements, telephone hot lines, websites, Public Hearings and/or Meetings, press conferences, Community Task Forces, coordination with media outlets, municipalities, schools and emergency services, work zone education campaigns, and signage among others. Details of the PIP will be finalized during Phase II engineering design.

6.0 TRANSPORTATION OPERATIONS PLAN

IDOT uses various TOP strategies, which can include traffic radio, portable changeable message signs, speed limit reduction initiatives, high occupancy vehicle (HOV) lanes, variable work hours, signal timing/coordination improvements, temporary traffic signals, alternate route improvements, parking and turn restrictions, reversible lanes, heavy vehicle restrictions, coordination with adjacent projects, incidence response coordination, Intelligent Transportation System (ITS) monitoring, surveillance through closed circuit TV (CCTV) and loop detectors, traffic screens, and local detour routes, among others. Details of the TOP will be finalized during Phase II engineering design.

7.0 TRAFFIC MANAGEMENT PLAN IMPLEMENTATION AND MONITORING

The TMP will be revisited and updated as the project enters the design and construction phases. Appropriate monitoring strategies will be developed at that time.

8.0 CONCLUSION

The proposed right-of-way along Illinois Route 47 and its crossroads is sufficient to implement the project under the suggested MOT operations summarized above. Traffic can remain open on all crossroads.

Providing one 11-foot through lane in each direction and a 10-foot bidirectional left turn lane reflects the existing conditions and will not increase delays significantly over the existing traffic conditions. Therefore, the proposed MOT for the Significant Routes meet the stated mobility goals.

The TMP as described in this document meets the requirements of the Work Zone Safety and Mobility Rule.

EXHIBITS

PROJECT LOCATION MAP
ILLINOIS ROUTE 47 - US ROUTE 14 TO CHARLES ROAD

ILLINOIS 47
US Route 14 to Charles Road

Exhibit 1.1-1
Project Location Map

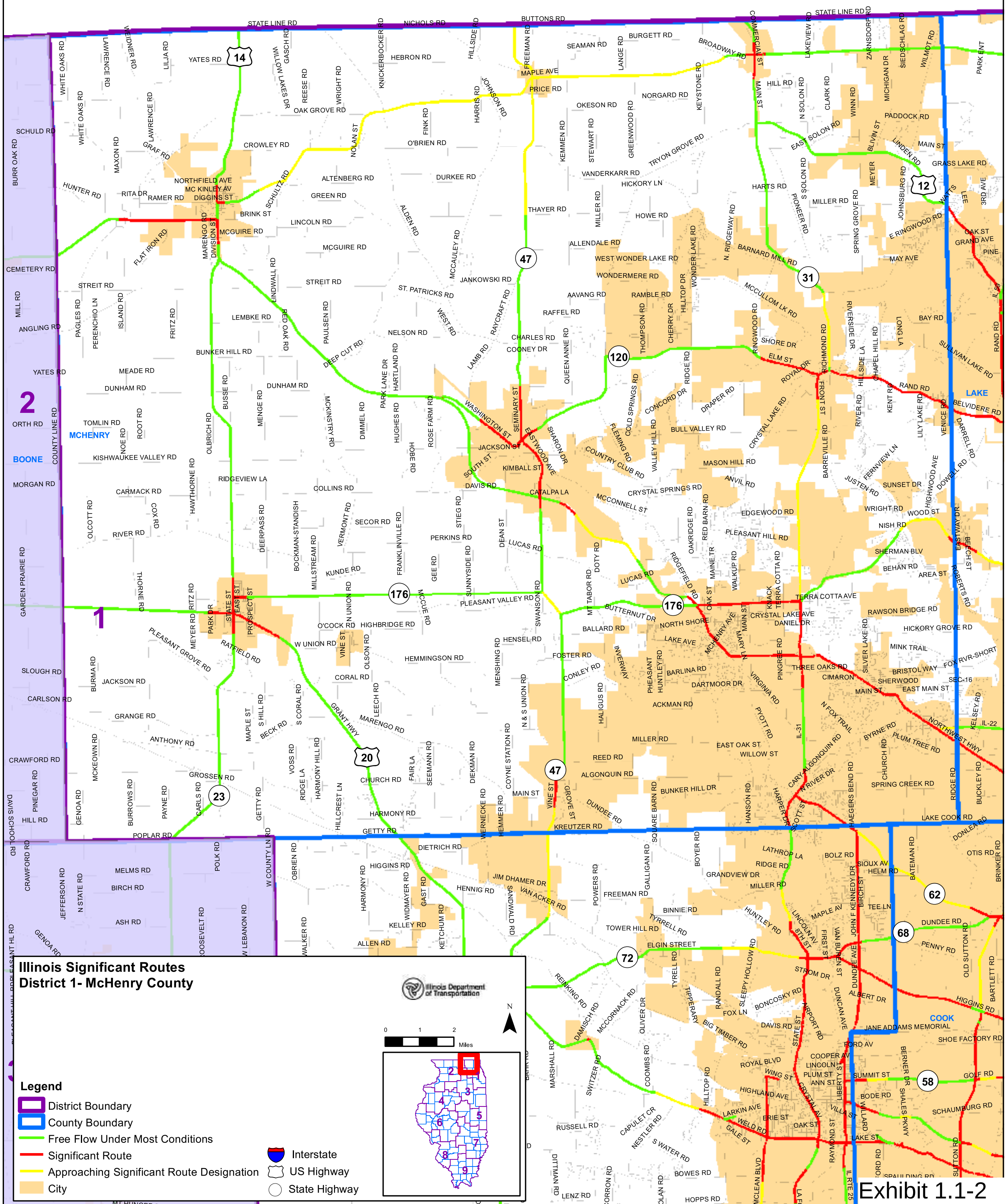
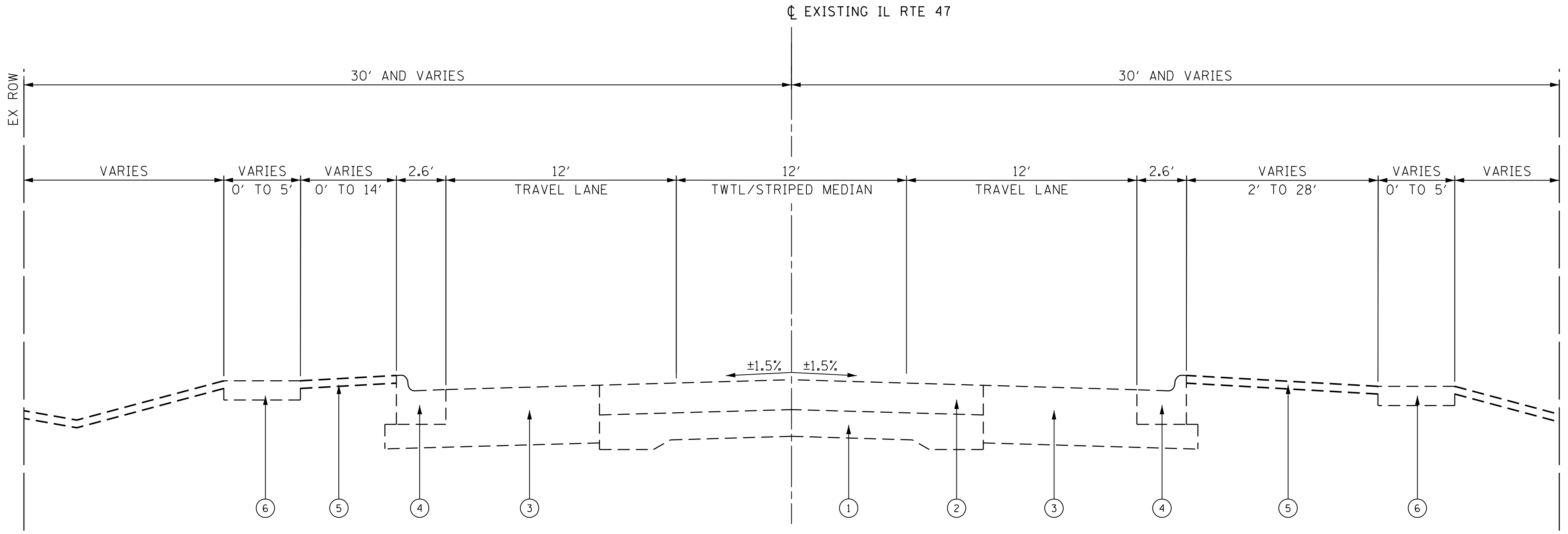


Exhibit 1.1-2
Significant Route Map



EXISTING LEGEND

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2. EX. HMA PAVEMENT, OVERLAY, 7.75"
3. EX. HMA PAVEMENT, 15"
4. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.24
5. EX. TURF AREA
6. EX. P.C.C. SIDEWALK-INTERMITTENT
7. EX. AGGREGATE SHOULDER, TYPE B
8. EX. ASPHALT SHOULDER
9. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.12

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STA. 123+00.00 TO STA. 136+00.00
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STA. 173+00.00 TO STA. 280+00.00
STA. 283+00.00 TO STA. 288+00.00

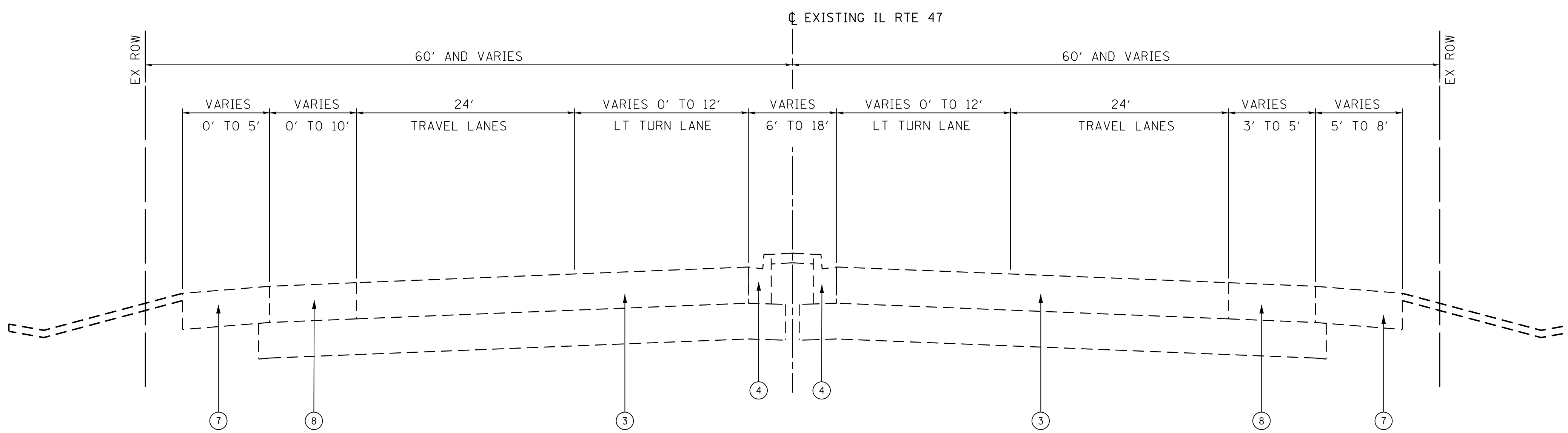

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Exhibit 3.1-1
Typical Sections

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STRAND ASSOCIATES®
1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200

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	DRAWN MKM	REVISED -	
PLOT SCALE = 40.0000 ' / in.	CHECKED DWG	REVISED -	
PLOT DATE = 1/24/2019	DATE 3/10/17	REVISED -	

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL-47 TYPICAL SECTIONS

SCALE: N-T-S | SHEET 1 OF 9 SHEETS | STA. N/A TO STA. N/A

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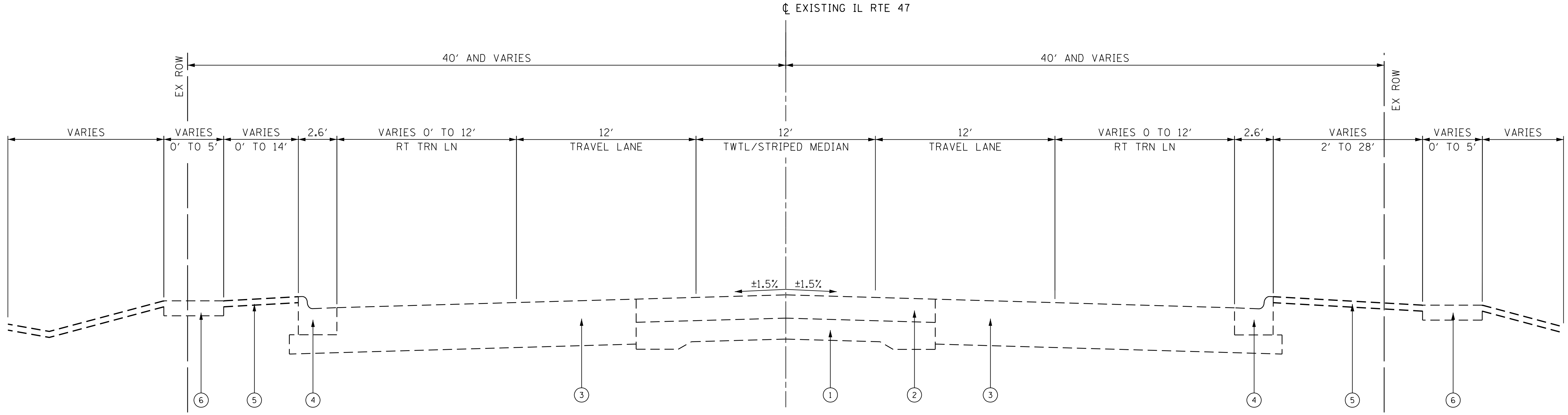
CONTRACT NO.

ILLINOIS FED. AID PROJECT

Typical Sections



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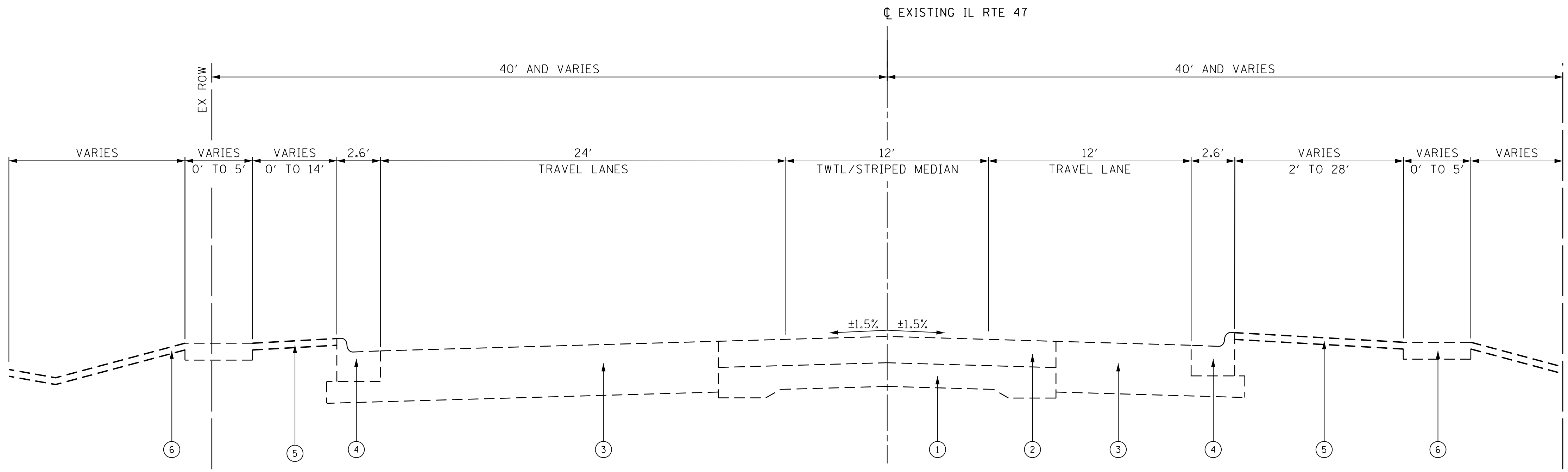
STA. 280+00.00 TO STA. 283+00.00



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2. EX. HMA PAVEMENT, OVERLAY, 7.75"
3. EX. HMA PAVEMENT, 15"
4. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.24
5. EX. TURF AREA
6. EX. P.C.C. SIDEWALK-INTERMITTENT
7. EX. AGGREGATE SHOULDER, TYPE B
8. EX. ASPHALT SHOULDER
9. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.12

Exhibit 3.1-1
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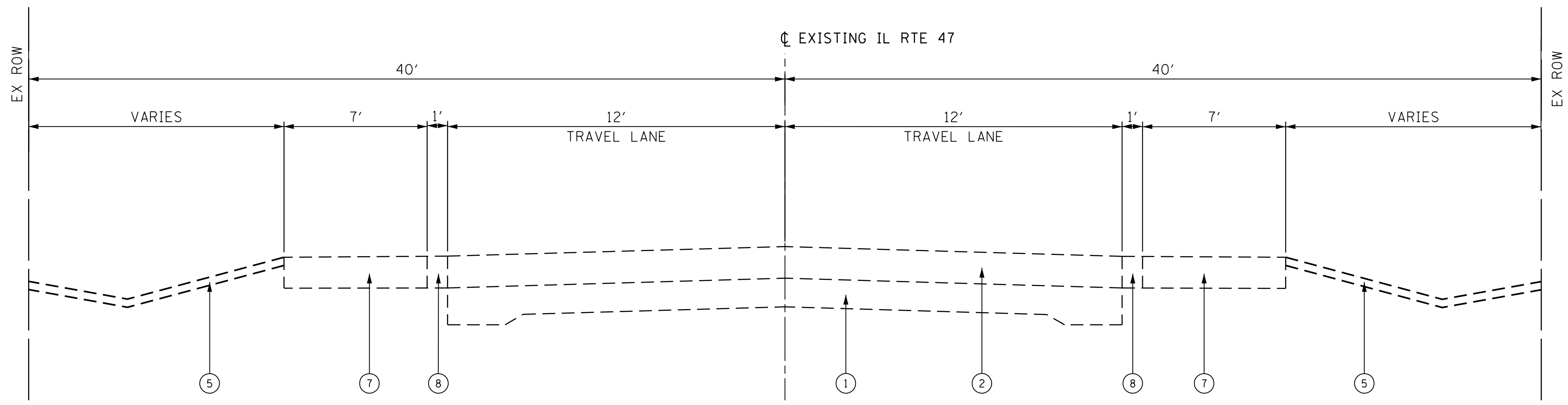

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4. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.24
5. EX. TURF AREA
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8. EX. ASPHALT SHOULDER
9. EX. COMB. CONC. CURB AND GUTTER, TYPE B-6.12

Exhibit 3.1-1
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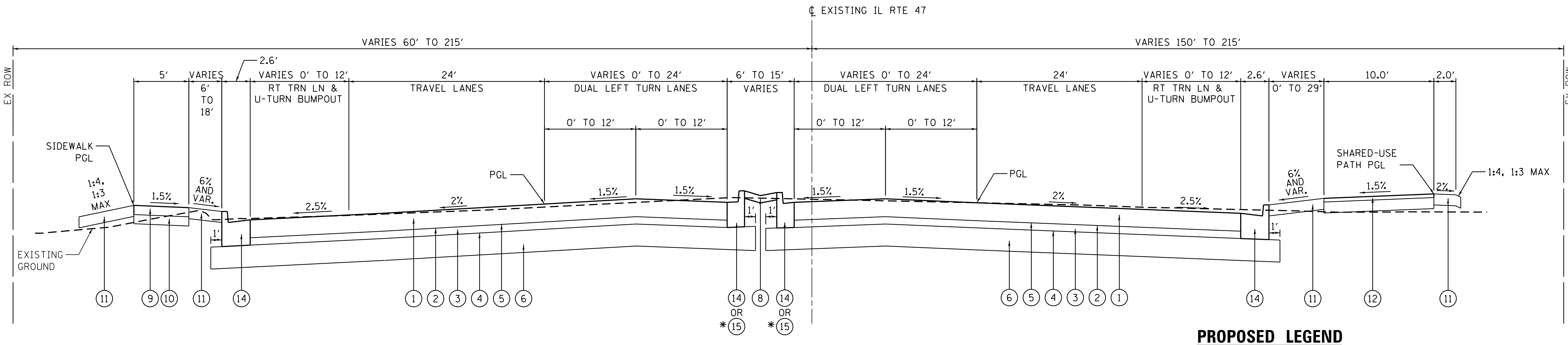

*ADJACENT TO TURN LANE WITHIN 6' MEDIAN

PROPOSED TYPICAL SECTION

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PROPOSED LEGEND

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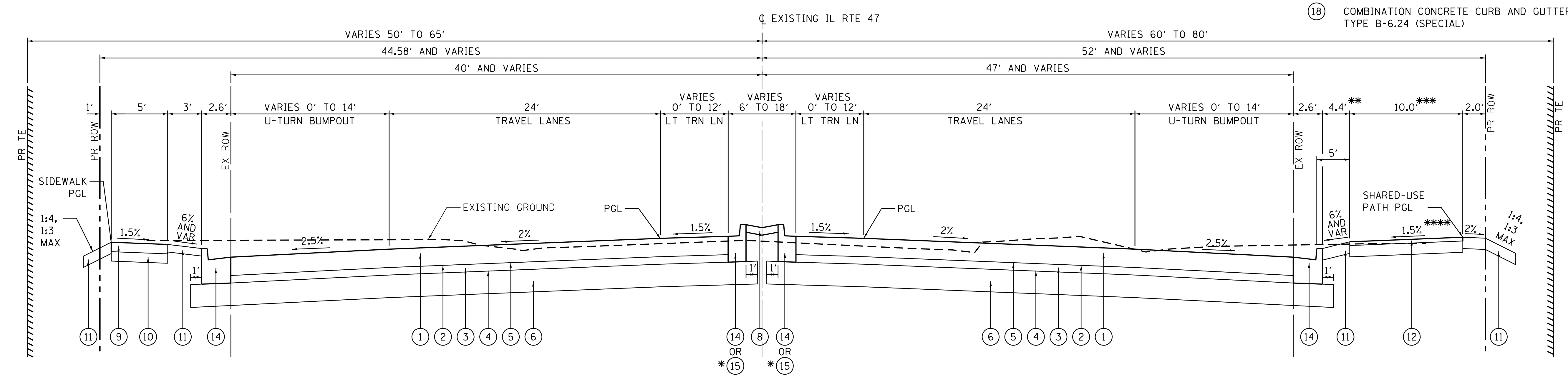
2. BITUMINOIS MATERIALS (TACK COAT)
3. HOT-MIX ASPHALT STABLIZED SUBBASE, 4"
4. BITUMINOUS MATERIALS (PRIME COAT)
5. AGGREGATE (PRIME COAT)
6. AGGREGATE SUBGRADE, 12"
7. ROUNDABOUT TRUCK APRON
8. CONCRETE MEDIAN SURFACE, 4"
9. PORTLAND CEMENT CONCRETE SIDEWALK, 5"
10. SUBBASE GRANULAR MATERIAL, TYPE B 6"
11. TOPSOIL FURNISH AND PLACE, 4"
12. SHARED USE PATH
HOT-MIX ASPHALT SURFACE COURSE, 3"
AGGREGATE BASE COURSE, 6"
13. COMBINATION CONCRETE CURB AND GUTTER, TYPE M-4.24
14. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
15. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
16. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-9.12
17. COMBINATION CONCRETE CURB AND GUTTER, TYPE M (MODIFIED)
18. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24 (SPECIAL)



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STA. 210+71.00 TO STA. 271+35.93
STA. 274+54.22 TO STA. 280+41.86

*ADJACENT TO TURN LANE WITHIN 6' MEDIAN

**SHARED-USE PATH OFFSET VARIES STA. 237+05.51 TO STA. 243+49.83

***SHARED-USE PATH WIDTH VARIES 8-10 FT FROM STA. 121+39.51 TO STA. 127+18.74

****SHARED-USE PATH AND EAST PARKWAY SLOPE AWAY FROM ROADWAY IN FOLLOWING STATION RANGES:
- STA. 167+81.62 TO STA. 173+50.00
- STA. 184+55.54 TO STA. 192+50.00
- STA. 238+00.00 TO STA. 242+77.05
- STA. 257+00.00 TO STA. 258+47.50

Exhibit 3.1-1
Typical Sections

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STRAND ASSOCIATES
1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200

USER NAME = MattG	DESIGNED WRP	REVISED -
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PLOT SCALE = 10.0000 ' / in.	CHECKED DWG	REVISED -
PLOT DATE = 1/24/2019	DATE 3/10/17	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

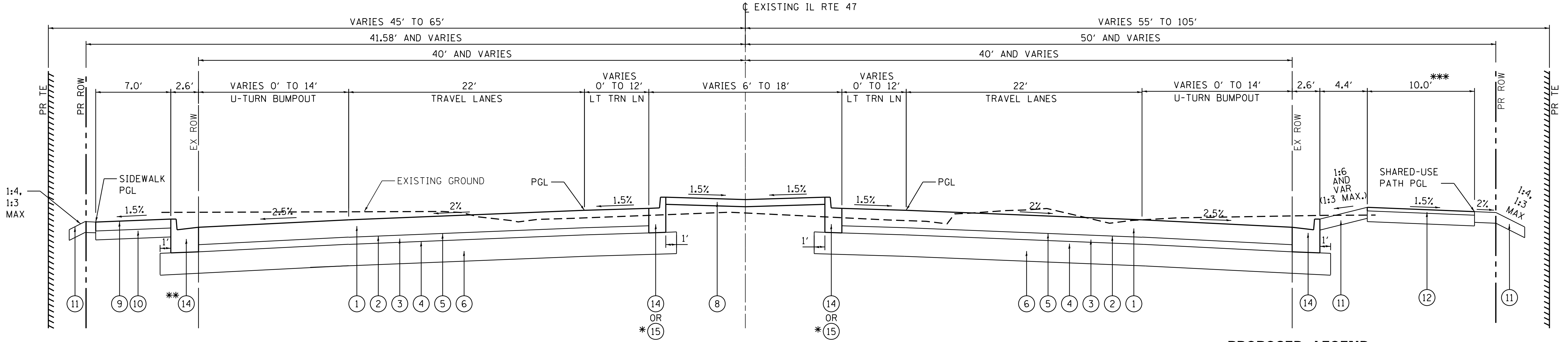
IL-47 TYPICAL SECTIONS

SCALE: N-T-S | SHEET 5 OF 9 SHEETS | STA. N/A TO STA. N/A

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	9	5

CONTRACT NO.
ILLINOIS FED. AID PROJECT

Typical Sections



* ADJACENT TO TURN LANE WITHIN 6' MEDIAN

** M-6.24 MOUNTABLE CURB FROM STATION 786+00.00 TO 789+50.00.

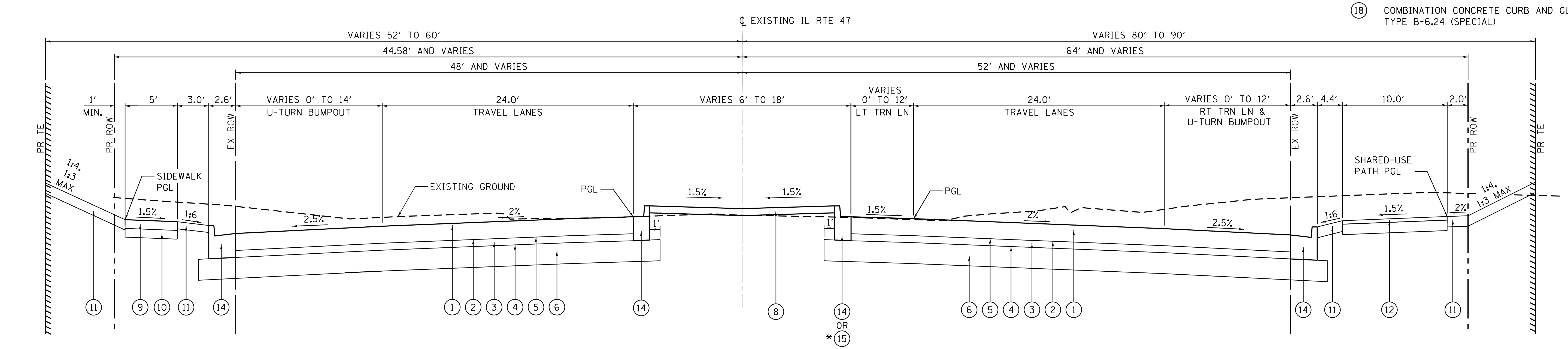
*** SHARED-USE PATH WIDTH VARIES 8-10 FT FROM STA. 202+30.14 TO STA. 211+63.07

PROPOSED TYPICAL SECTION

STA. 187+45.80 TO STA. 210+71.00

PROPOSED LEGEND

1. PORTLAND CEMENT CONCRETE PAVEMENT (JOINTED), 9.75"
2. BITUMINOIS MATERIALS (TACK COAT)
3. HOT-MIX ASPHALT STABLIZED SUBBASE, 4"
4. BITUMINOUS MATERIALS (PRIME COAT)
5. AGGREGATE (PRIME COAT)
6. AGGREGATE SUBGRADE, 12"
7. ROUNDABOUT TRUCK APRON
8. CONCRETE MEDIAN SURFACE, 4"
9. PORTLAND CEMENT CONCRETE SIDEWALK, 5"
10. SUBBASE GRANULAR MATERIAL, TYPE B 6"
11. TOPSOIL FURNISH AND PLACE, 4"
12. SHARED USE PATH HOT-MIX ASPHALT SURFACE COURSE, 3" AGGREGATE BASE COURSE, 6"
13. COMBINATION CONCRETE CURB AND GUTTER, TYPE M-4.24
14. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
15. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
16. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-9.12
17. COMBINATION CONCRETE CURB AND GUTTER, TYPE M (MODIFIED)
18. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24 (SPECIAL)



PROPOSED TYPICAL SECTION

STA. 271+35.93 TO STA. 274+54.22

* ADJACENT TO TURN LANE WITHIN 6' MEDIAN

Exhibit 3.1-1
Typical Sections

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STRAND ASSOCIATES® 1170 SOUTH HOUBOLT ROAD JOLIET, ILLINOIS 60431 (815) 744-4200

USER NAME = MattG	DESIGNED WRP	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION
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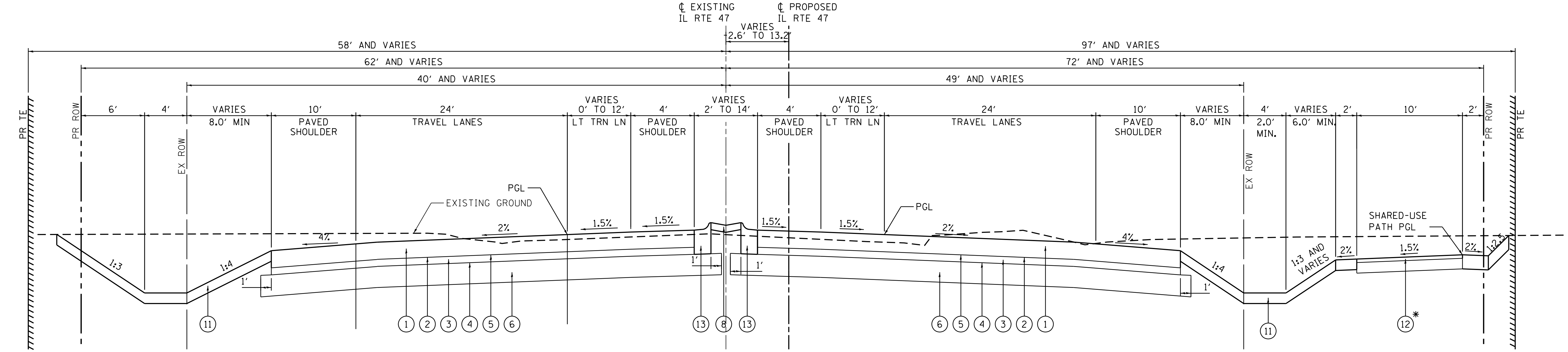
PLOT SCALE = 10.0000 ' / in.	CHECKED DWG	REVISED -	
PLOT DATE = 1/24/2019	DATE 3/10/17	REVISED -	

IL-47 TYPICAL SECTIONS

SCALE: N-T-S | SHEET 6 OF 9 SHEETS | STA. N/A TO STA. N/A

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	9	6
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

Typical Sections



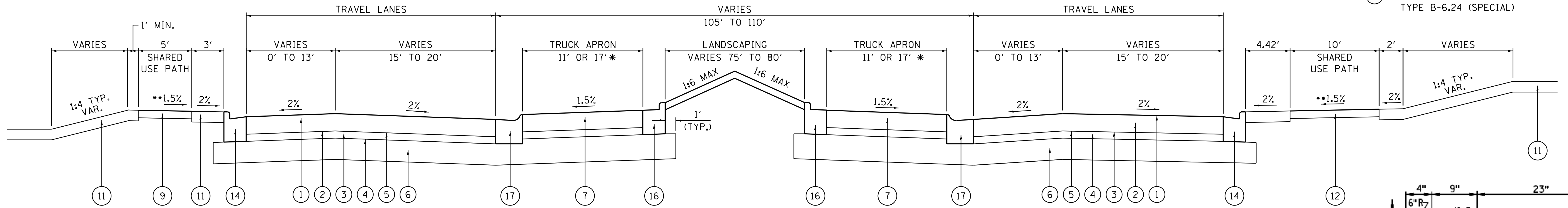
PROPOSED TYPICAL SECTION

STA. 285+84.74 TO STA. 348+50.43

*SHARED-USE PATH LOCATED 5 FEET FROM PAVED SHOULDER AND SLOPED AWAY FROM ROADWAY IN FOLLOWING STATION RANGE:
- STA. 294+00 TO STA. 303+00
- STA. 322+00 TO STA. 329+00

PROPOSED LEGEND

1. PORTLAND CEMENT CONCRETE PAVEMENT (JOINTED), 9.75"
2. BITUMINOIS MATERIALS (TACK COAT)
3. HOT-MIX ASPHALT STABLIZED SUBBASE, 4"
4. BITUMINOUS MATERIALS (PRIME COAT)
5. AGGREGATE (PRIME COAT)
6. AGGREGATE SUBGRADE, 12"
7. ROUNDABOUT TRUCK APRON
8. CONCRETE MEDIAN SURFACE, 4"
9. PORTLAND CEMENT CONCRETE SIDEWALK, 5"
10. SUBBASE GRANULAR MATERIAL, TYPE B 6"
11. TOPSOIL FURNISH AND PLACE, 4"
12. SHARED USE PATH HOT-MIX ASPHALT SURFACE COURSE, 3" AGGREGATE BASE COURSE, 6"
13. COMBINATION CONCRETE CURB AND GUTTER, TYPE M-4.24
14. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
15. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
16. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-9.12
17. COMBINATION CONCRETE CURB AND GUTTER, TYPE M (MODIFIED)
18. COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24 (SPECIAL)



TYPICAL SECTION THROUGH ROUNDABOUTS

*17' TRUCK APRON ONLY AT LAKE AVENUE ROUNDABOUT
**SHARED USE PATH SLOPES AWAY FROM ROADWAY AT CHARLES ROAD

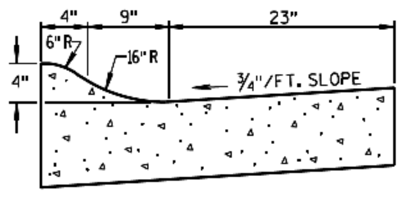


Exhibit 3.1-1
Typical Sections

DETAIL: COMBINATION CONCRETE CURB & GUTTER TYPE M (MODIFIED)

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	PLOT SCALE = 10.0000 ' / in.	CHECKED DWG	REVISED -	
	PLOT DATE = 1/24/2019	DATE 3/10/17	REVISED -	

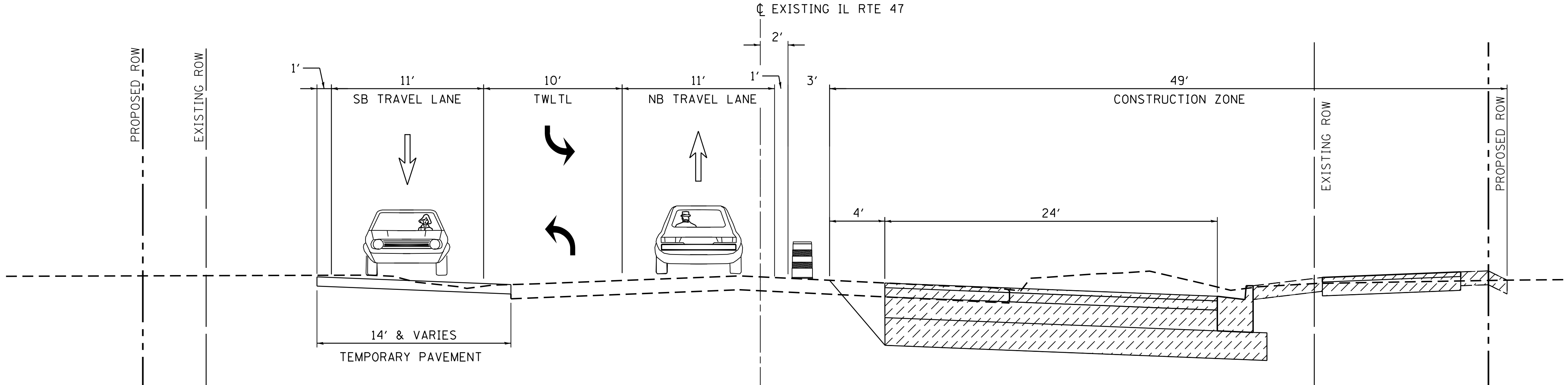
IL-47 TYPICAL SECTIONS

SCALE: N-T-S | SHEET 7 OF 9 SHEETS | STA. N/A TO STA. N/A

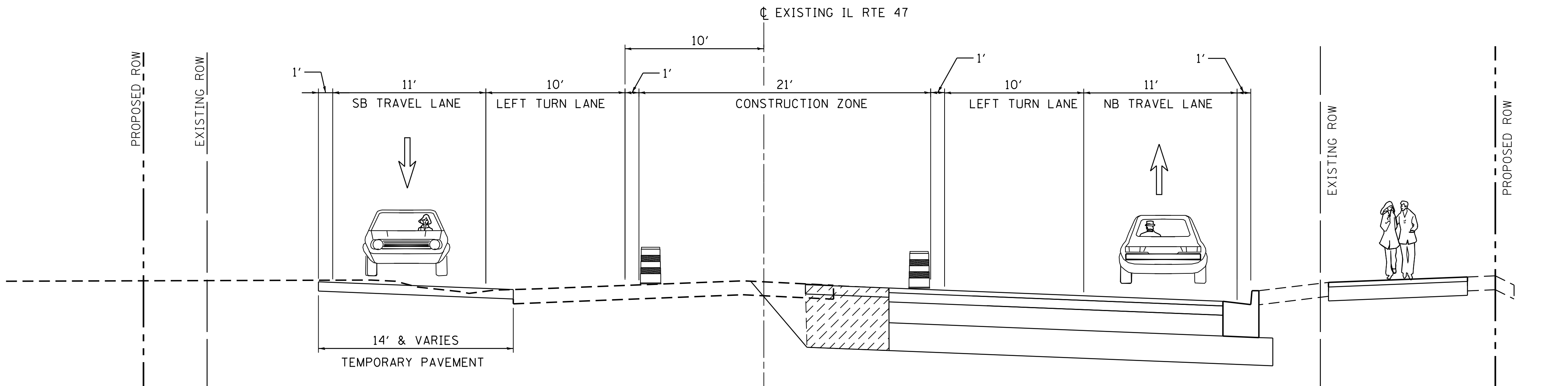
F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY	9	7

CONTRACT NO.
ILLINOIS FED. AID PROJECT

Typical Sections



PROPOSED MOT TYPICAL SECTION – STAGE 1



PROPOSED MOT TYPICAL SECTION – STAGE 1A

LEGEND

- – – – EXISTING GROUND
- ——— PREVIOUSLY CONSTRUCTED GROUND
- ////// CONSTRUCTION ZONE

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PLOT SCALE = 10.0000 ' / in.	CHECKED -	REVISED -	
PLOT DATE = 3/1/2019	DATE -	REVISED -	

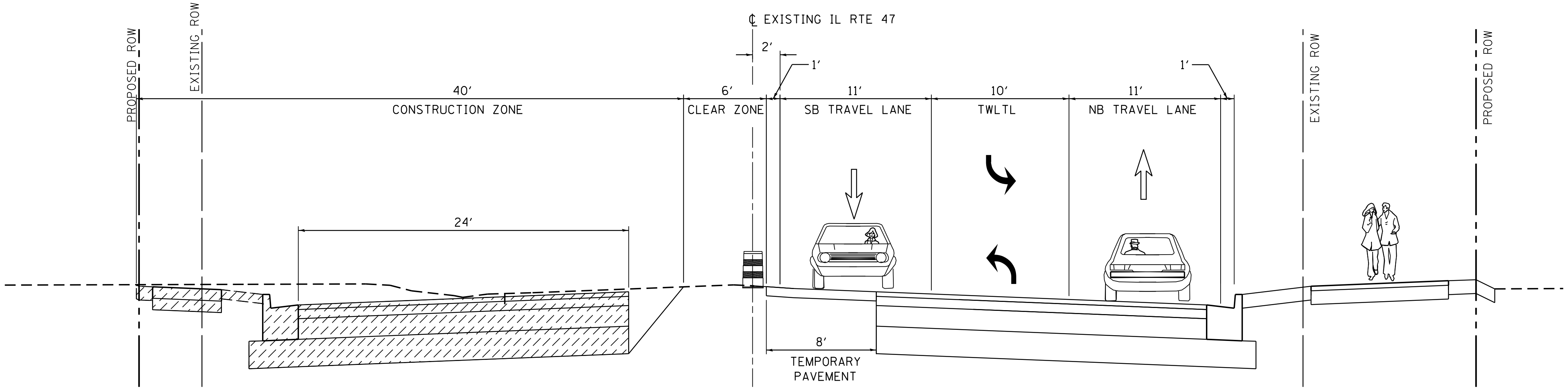
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL 47 – US 14 TO WARE ROAD MOT

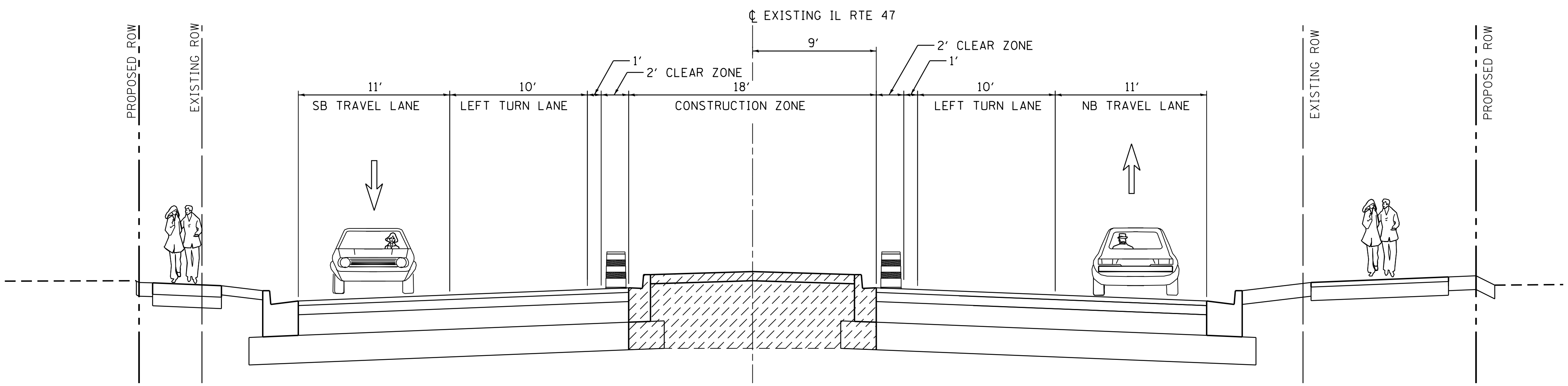
SCALE: N-T-S | SHEET 1 OF 1 SHEETS | STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY		
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			

Default



PROPOSED MOT TYPICAL SECTION – STAGE 2



PROPOSED MOT TYPICAL SECTION – STAGE 3

LEGEND

- – – – EXISTING GROUND
- ——— PREVIOUSLY CONSTRUCTED GROUND
- CONSTRUCTION ZONE

Exhibit 4.1-1
MOT Typical Sections

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	DRAWN -	REVISED -
PLOT SCALE = 10.0000 ' / in.	CHECKED -	REVISED -
PLOT DATE = 3/1/2019	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

IL 47 – US 14 TO WARE ROAD MOT

SCALE: N-T-S | SHEET 1 OF 1 SHEETS | STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY		

CONTRACT NO.

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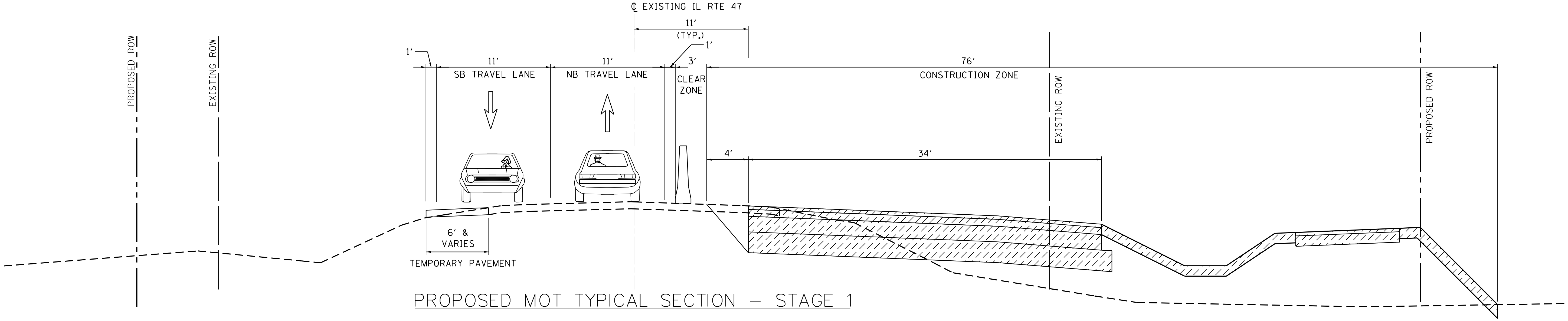
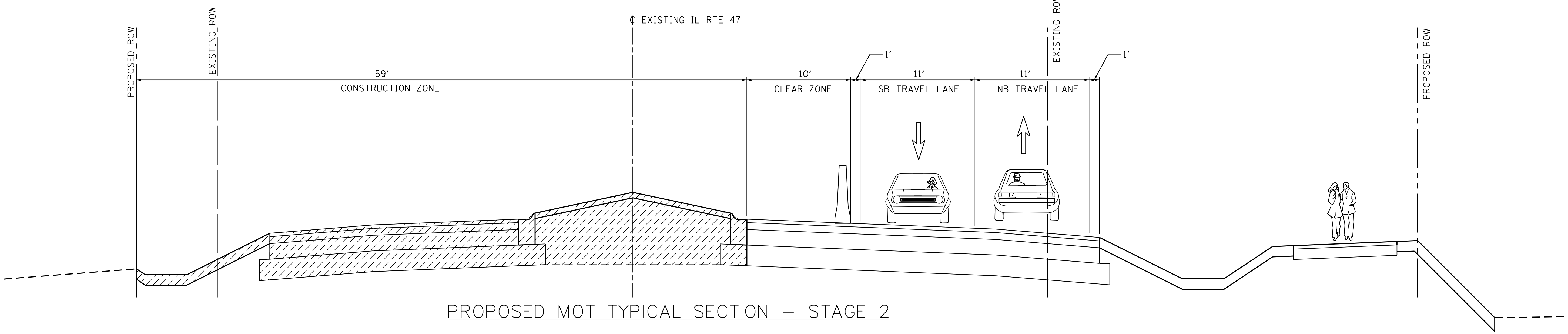


PROPOSED MOT TYPICAL SECTION – STAGE 1



PROPOSED MOT TYPICAL SECTION – STAGE 2

LEGEND

- EXISTING GROUND (dashed line)
- PREVIOUSLY CONSTRUCTED GROUND (solid line)
- CONSTRUCTION ZONE (hatched)

Exhibit 4.1-1
MOT Typical Sections

FILE NAME = S:\JOL\6300--6399\6346\014\Micros\CADD Drawings\IL47-MOT Typical.Revised 2018.11.01.dgn

STRAND ASSOCIATES 1170 SOUTH HOUBOLT ROAD JOLIET, ILLINOIS 60431 (815) 744-4200	USER NAME = MattG	DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	IL 47 – WARE ROAD TO CHARLES ROAD MOT
		DRAWN -	REVISED -		
	PLOT SCALE = 10.0000 ' / in.	CHECKED -	REVISED -		
	PLOT DATE = 3/1/2019	DATE -	REVISED -		SCALE: N-T-S SHEET 1 OF 1 SHEETS STA. TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326		MCHENRY		
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

Default

SUPPLEMENT 3.26-1
VALUE ENGINEERING REPORT AND RESPONSE

Value Engineering Study Final Report

IL 47 from US 14 to Charles Rd.
McHenry County, Illinois
Project No. P-91-007-09

Prepared for:

IDOT District 1 Headquarters, Schaumburg, Illinois

101 West Center Court, Schaumburg, Illinois 60196

9/21/2018

Value Engineering Study Final Report

IL 47 from US 14 to Charles Rd.
McHenry County, Illinois
Project No. P-91-007-09

Prepared for:

IDOT District 1 Headquarters, Schaumburg, Illinois
101 West Center Court, Schaumburg, Illinois 60196

Prepared by:

Wood Environment & Infrastructure Solutions, Inc.
8745 West Higgins Road
Suite 300
Chicago, Illinois 60631
T: 773-693-6030
F: 773-693-6039

9/21/2018

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Table of contents

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Disclaimer

This Value Engineering (VE) report presents recommendations for consideration by the design team for alternate methods of completing the current design that may be acceptable to both the design team and the owner. In most cases, each recommendation contains a cost estimate to help evaluate each recommendation on a cost-effective basis including both capital and life cycle costs. These estimates are generated whenever possible using the design team's best estimate of cost and mark-ups for quantities and/or unit costs for items proposed to be changed. Using this method, a comparison can be made of the cost estimates for each item by evaluating the original design concept against the proposed change in the VE recommendation. The VE recommendation cost estimates are developed based on the information provided by the design team during the study. At this stage of design and considering the limited time available for a VE study, the costs should be considered as order of magnitude costs only and do not reflect the final design estimated costs or actual construction costs. The difference in the original design concept and proposed VE recommendation reflects the potential cost change that may be considered by decision makers.

Finally, the VE recommendations and associated cost estimates are for consideration by only the design team and owner. The VE Team does not make decisions as to which, if any, of the recommendations are incorporated into the project design. A decision to incorporate a VE recommendation is the responsibility of the design team. Also, the VE recommendations do not have to be accepted as presented in the VE study report. The recommendations should be considered a concept that can be improved and/or modified by the design team to result in a design modification that is acceptable to the design team and owner.

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1.0 Executive Summary

1.1 Introduction

This report documents the results of a Value Engineering (VE) Study conducted according to guidelines of the Illinois Department of Transportation (IDOT), the Federal Highway Administration (FHWA), and the American Association of Highway and Transportation Officials (AASHTO). The report provides the Value Engineering Team's recommendations and supporting documentation for consideration by the decision-makers of the Illinois Department of Transportation regarding to the Illinois Route 47 from U.S. Route 14 to Charles Road in McHenry County, Illinois. The Executive Summary includes a description of each recommendation. The Study Identification section contains information about the project and the Team. The VE Recommendations section presents a more detailed description and support information about each recommendation. Finally, the Appendix includes a complete record of the Team's activities and findings. The reader is encouraged to review all sections of the report to obtain a complete understanding of the VE process. The key statistics for this study are shown below in Table 1-1 below:

Table 1-1 – Key Statistics

Item	Important Information
Original Engineer's Estimate*	**Recommended Alternative ≈** $83.8 million
Number of Recommendations	3
Number of Design Suggestions	5
Recommended Cost Savings	$1.2 million
Recommended Value Added	0
Total Number of Team Members	3
Federal Employees	0
IDOT Employees	0
Others	3
Facilitator	Wood

**Illinois Department of Transportation District 1 P-91-007-09 (prepared 05/29/2018)*

1.2 Project Description

The Illinois Department of Transportation (IDOT), in cooperation with the City of Woodstock and McHenry County proposes the improvements of Illinois Route 47 from US Route 14 approximately five miles north of Charles Road. This project is part of the District 1 Program which helps fund priority projects in the local area. The project consists of two different types of roadway section improvements, both urban and suburban, and is approximately 8.5 miles long. Illinois Route 47 is a Strategic Regional Arterial (SRA) and Class II truck route heading north-south. US Route 14 and Charles Road are both designated SRA routes. The proposed corridor improvement consists of reconstruction and widening approximately five miles of Illinois Route 47 from US Route 14 to Charles Road. The segment from US Route 14 to Ware Road, will include two lanes in each direction with a raised median. From Ware Road to Charles Road, the corridor will consist of two lanes in each direction separated by a mountable median. The project also includes a shared-use path located on the east side of the roadway along the entire length of the project and a sidewalk along the west side of the roadway from US Route 14 to Ware Road. The proposed corridor is needed to address the existing roadway geometry and alignment, coupled with increasing congestion due to population and economic growth in the City of Woodstock, have caused safety and mobility concerns. It is currently projected that this area will be substantially affected by an increase in population and traffic volume. At the time of this Value Engineering Study, the proposed corridor was being considered based on its lesser potential of environmental, right-of-way, and displacement impacts.

The purpose and needs of the proposed project includes:

- Improve Safety
- Improve capacity/operations
- Improve access management
- Accommodate bicycle/pedestrian
- Reduce geometric deficiencies

The project goal and objectives include:

- Improve safety
- Increase mobility
- Feasibility and design
- Cost effective
- Economic factors

The proposed project is tentatively anticipated that the project would be constructed in several phases as right-of-way is procured and funding becomes available. A public hearing was held in June 7, 2018.

This project design currently includes:

- **Project Phase:** Currently under environmental analysis and design phase I
- **Project Limits:** From US 14 to Charles Rd.
- **Length:** 5 miles
- **Classifications:** Minor Arterial - Urban and Suburban
- **Design Speeds:** Urban SRA 30 to 40 mph / Suburban SRA 45 mph / Rural SRA 60 mph

Collaborative effort between agencies:

- The City of Woodstock
- IDOT
- McHenry County
- Greenwood Township
- Dorr Township

Major contract work items for this project include: property impacts and relocations, roadway, interchanges, roundabout, drainage, environmental, earthwork and landscape, miscellaneous construction items, the pedestrian tunnel underneath of the Union Pacific Railway, the existing Union Pacific bridge and lighting, signing, and markings. Based on the cost estimate documentation, construction cost of the project is estimated to be $83.8 million

1.3 Study Objectives

The objective of this Value Engineering Study was to:

- Evaluate documents provided by IDOT and the design consultant, to include the IL 47 Improvement Environmental Assessment, design criteria, project maps (location, environmental constraints, and crash data), public meeting materials and comments, Purpose and Need statement, schedule, and traffic data,
- To provide innovative ideas or techniques for consideration to reduce costs where possible and to improve value.
- Evaluate the IDOT cost estimate documentation, and statewide bidding averages, for potential areas to reduce costs and improve value.
- Evaluate project constructability issues and provide innovative ideas or techniques for consideration during construction.
- Evaluate design of and construction on adjoining projects for consistency.
- Develop feasible alternatives and quantify impacts and cost

1.4 Constraints

Project constraints include:

- Right-of-Way (ROW) footprint
- Raised median
- Horizontal alignment
- Facility type
- Share-Use Path Tunnel
- Wetland

1.5 Results Obtained

The VE Team focused their efforts on careful review of the overall design and estimates, and on innovative ideas that might decrease costs, improve quality and performance, and enhance driver satisfaction for the project. Through use of the Function Analysis and "brainstorming" techniques, the VE Team generated 48 ideas with 12 ideas identified for additional evaluation. Project elements and areas analyzed were:

- Pavement (A)
- Miscellaneous (Signs, Lighting, Median, Erosion Control and Landscape (B)
- Earthwork (C)
- Transportation Management Plan Cost (D)
- Clear and Grubbing (minor removal and demolition) (E)
- Structures (F)
- Grade Separations (Share-Use Path Tunnel (G)

After further evaluation of the ideas, the Value Engineering Team developed **3 Recommendations** and **5 Design Suggestions**. The Summary of Recommendations is provided in Table 1-2. Highlights of each recommendation are provided on the pages following Table 1-2. Additional detailed information of the recommendation and of additional design suggestions is provided in the VE Recommendations section beginning on page 6 of this report.

Table 1-2 Summary of Recommendation Savings / Added Value

Recommendation Number	Description	Potential Cost Savings	Potential Added Value
A-6	Provide flexible pavement instead of concrete pavement for cross streets.	$240,000	
G-2	Eliminate the shared-use-path tunnel crossing the UPRR and maintain 5' wide sidewalk at street level with fence separating traffic.	$972,000	
G-5	Decrease the width of the shared path at the railroad tunnel (alternative option not included in the total *)	$414,000 *	
TOTAL POTENTIAL SAVINGS / VALUE ADDED IMPACT:		**$1.2 million**	

1.5.1 VE Recommendation Highlights

Idea No.	Description:
A-6	Provide flexible pavement instead of concrete pavement for cross streets.
Advantages:	• Cost effective. The cost of the cross-street pavement could be reduced since HMA is typically cheaper. • The new pavement can be constructed in a shorter time since HMA does not require 7 days for curing. High early strength concrete could be provided but typically cost substantially more than regular concrete. • Asphalt resurfacing can be cost-effective and extend the lifespan of the pavement where concrete needs to be replaced at the end of its life span. • Reduce MOT duration for cross streets.
Disadvantages:	• Higher life cycle cost

Potential Cost Savings:
$240,000

Idea No.	Description:
G-2	Eliminate the shared-use-path tunnel crossing the UPRR and maintain 5' wide sidewalk at street level with fence separating traffic.
Advantages:	• Eliminate cost of boring underneath the railroad tracks and obtaining a permit from the Union Pacific Railroad. • Eliminate cost to design, manufacturer and deliver 17' diameter concrete pipe to the site. A concrete plant would need to be selected that is located relatively close to the project site. The route for delivery would have to provide enough vertical clearance for the outside height of the pipe and truck trailer. The vertical clearance of existing bridge underpasses, utility lines, traffic signals, and other similar items could prevent the delivery of the pipe to the site. • Eliminate liability of boring underneath the railroad tracks and disrupting railroad operations if settlement occurs. • Eliminate railroad flaggers, obtaining insurance and performance bond; performing vibratory and construction monitoring and additional protections required by the railroad. • Eliminate obtaining a permanent easement from the railroad which could reduce the time needed for ROW acquisition. • As example, a 12' x 12' box culvert could be more constructible to fabricate, deliver and install.
Disadvantages:	• The width of the multi-use path will be less than 10-feet.

Potential Cost Savings:
$972,000

Idea No.	Description:
G-5	Decrease the width of the shared path at the railroad tunnel
Advantages:	• Per the current concept, the temporary easement on the south side of the railroad is not large enough to accommodate the push pit. Therefore, the push pit needs to be relocated on the north side. • Increases constructability and material handling- The current concept of a 17' out to out diameter pipe will not fit under the rail road bridge unless it is laid on its side. If it is assumed the width of the shared use path is reduced from 10' to 8'-6" then the out to out diameter can be reduced to 14'. A 14' out to out diameter pipe could be delivered to the north side of the bridge after the pavement in removed. An analysis of the route from the pre-caster to the site will need to be reviewed for other bridge clearance issues. • There is a reduction in cost reducing the pipe size from 17' to 14'.
Disadvantages:	• Decreases the width of the shared use path. Creates a non-uniform path.

Potential Cost Saving:
$414,000

1.5.2 Design Suggestions

In addition to the specific Recommendations overviewed on the previous pages, the VE Team spent considerable time discussing other ideas. These ideas were restricted due to time constraints and are shown as Design Suggestions. The following Design Suggestions, shown with their corresponding Creative Idea item number, were agreed to and developed by the VE Team as additional areas where overall impacts could be offset, if implemented, to move the project construction forward.

A)-Pavement

A-9 Reduce the number of median openings.

B)-Miscellaneous Items (signals, landscape, erosion control, lighting, etc.)

B-1/4 Eliminate the use of grass (sod) in the median, use salt tolerant native plants and permeable pavers.

D)-Transportation Management Plan

D-5 Close side streets for roundabout construction.

F)-Structures

F-1 Use precast elements as much as possible.

G)-Share-Use Path Tunnel

G-6 Use alternative materials (Box Culver)

2.0 Study Identification

Project: IL 47 from US 14 to Charles Rd.	**Date:** **September 17 – September 21, 2018**
Location: McHenry, Illinois	

2.1 VE Team Members

Team Member Name	Organization	Title / Expertise	Telephone	e-Mail
Frederick Nazar	Wood	Constructability	773-693-6030	frederick.nazar@woodplc.com
Alejandro Pesa	Wood	Roadway	773-380-8860	alejandro.pesa@woodplc.com
Steve Schuessler	SE3	Drainage	630-209-0307	sschuessler@se3.us
Alexander Rojas	Wood	VE Team Co-Facilitator	561-242-7713	alexander.rojas@woodplc.com
Salvador Mercado	Wood	VE Team Facilitator	956-286-8090	salvador.mercado@woodplc.com

VE Study Sign-In / Attendance: (PLEASE PRINT)

IL 47 from US route 14 to Charles Road Value Engineering Study
Project No: P-91-007-09
September 17, 2018 to September 21, 2018
Bureau of Materials Laboratory Training Conference Room
IDOT District 1 Headquarters, Schaumburg, Illinois

wood.

Mo Sep 17 Day 1	Tu Sep 18 Day 2	W Sep 19 Day 3	Th Sep 20 Day 4	F Sep 21 Day 5	Last Name	First Name	Role / Title	Organization	Office #	Cell #	E-Mail
					VE Team Members						
X	X	X	X	X	Pesa	Alejandro	Roadway	Wood	(773) 693-3060		alejandro.pesa@woodplc.com
X	X	X	X	X	SCHUESSLER	STEVE	DRAINAGE	SEJ	(630) 641-9500	(630) 269-6307	SSCHUESSLER@SEJ.US
X	X	X	X	X	NAZAR	FRED	CONSTRUCTABILITY	WOOD	773-693-6030		FREDERICK.NAZAR@WOODPLC.COM
					[OTHER STAKEHOLDERS]						
X					BOENTE	KYLE	IDOT - PROGRAMMING	IDOT	(847) 705-4088	—	KYLE.BOENTE@ILLINOIS.GOV
X					SMITH	COREY	IDOT-PROG	IDOT	847 705-4093		corey.smith@illinois.gov
X					Schumacher	Jonathan	IDOT CONST	IDOT	847 705-4260	847 846 7292	jonathan.schumacher@illinois.gov
X					DARCIE GABRISKO		PM	STRAND	815-744-4200		DARCIE.GABRISKO@STRAND.COM
X					Patton	James	IDOT-design	IDOT			James.Patton@illinois.gov
X					Guge	Dennis	IDOT-Traffic	IDOT	847-705-4511		dennis.guge@illinois.gov
X					Dominguez	Jose	IDOT-Design	IDOT	847-705-4585		Jose.Dominguez@illinois.gov
X					Zenki	Omar	IDOT-Elec.	IDOT	847-705-4460		omar.zenki@illinois.gov
X					Steve	Schilke	IDOT		847 705 4404		Steven.Schilke@illinois.gov
					Wood VE Team						
X	X	X	X	X	Mercado	Salvador	VE Study Facilitator	Wood		956-286-8090	salvador.mercado@woodplc.com
X	X	X	X	X	Rojas	Alexander	VE Study Coordinator	Wood	561-242-7713	305-345-7166	alexander.rojas@woodplc.com
					[OTHERS]						

Wood project/4840180005

VE Study Sign-In / Attendance: (PLEASE PRINT)

IL 47 from US route 14 to Charles Road Value Engineering Study
Project No. P-91-007-09
September 17, 2018 to September 21, 2018
Bureau of Materials Laboratory Training Conference Room
IDOT District 1 Headquarters, Schaumburg, Illinois

wood.

Mo Sep 17 Day 1	Tu Sep 18 Day 2	W Sep 19 Day 3	Th Sep 20 Day 4	F Sep 21 Day 5	Last Name	First Name	Role / Title	Organization	Office #	Cell #	E-Mail
					[OTHER STAKEHOLDERS]						
				✓	Baker	Gary	Sr. Principal	WOOD E&IS	773-693-6030	312-617-8578	gary.baker@woodplc.com
				✓	BYUN	SUNG	PROJ. ENGR	IDOT/CSS	847-705-4288		sung.byun@illinois.gov
					Patton	James	Engineer	IDOT			James.Patton@illinois.gov
					Boente	KYLE	PROJ ENGINEER	IDOT	847 705-4088	–	Kyle.Boente@illinois.gov
					Harvey	Kim	IDOT-Design PM	IDOT	847-705-4055		Kim.Harvey@illinois.gov
					SMITH	COREY	IDOT - PROG	IDOT	847-705-4103		corey.smith@illinois.gov
					Dominguez	Jose	IDOT	Design	847-705-4385		Jose.Dominguez@illinois.gov
					Masoudkhalis	PERRY	IDOT	PROG	847-705-4474		[illegible]@illinois.gov
					Steve	Schilke	IDOT	Prog	847 705-4125		Steve.Schilke@illinois.gov
					SHIRANI	AGAR	IDOT	PROG.	847-705-4766		AGAR.SHIRANI@ILLINOIS.GOV
					[OTHERS]						

Wood project/4840180005

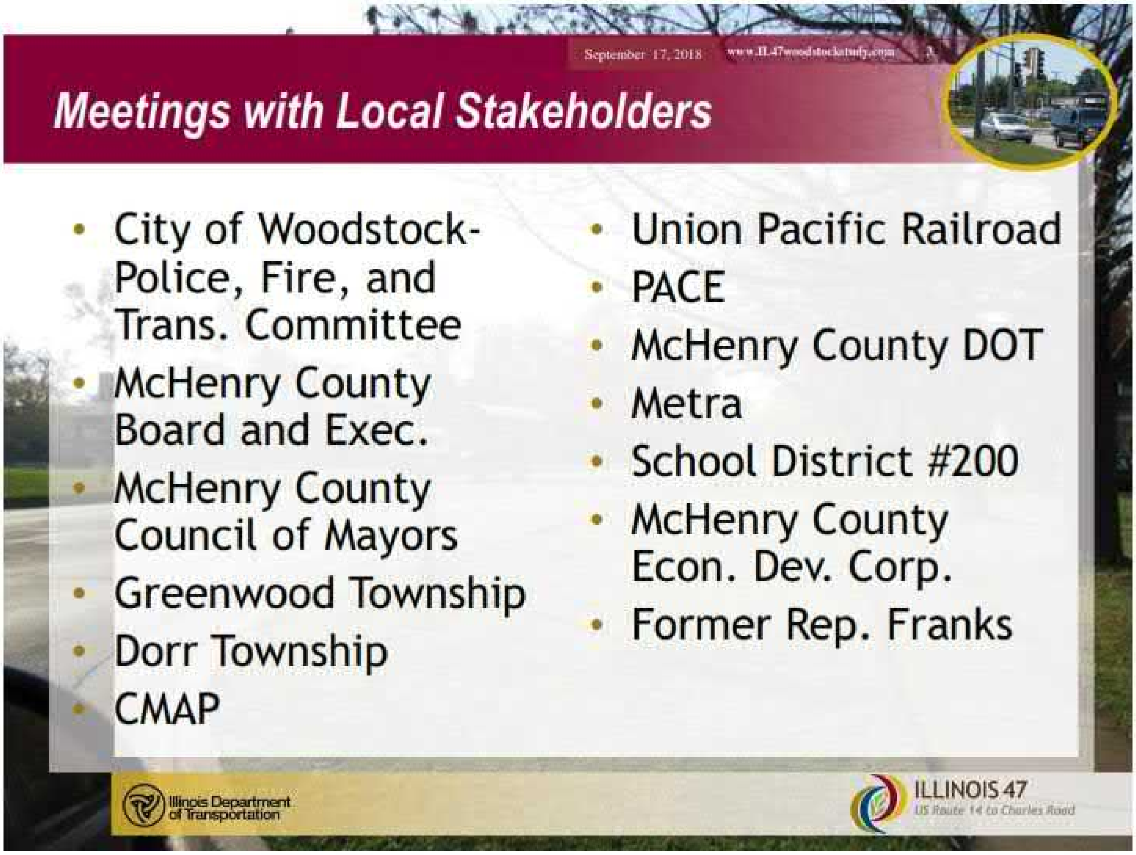
2.2 Project Briefing

Information regarding the project was provided by Designer at the IDOT District 1 office location.

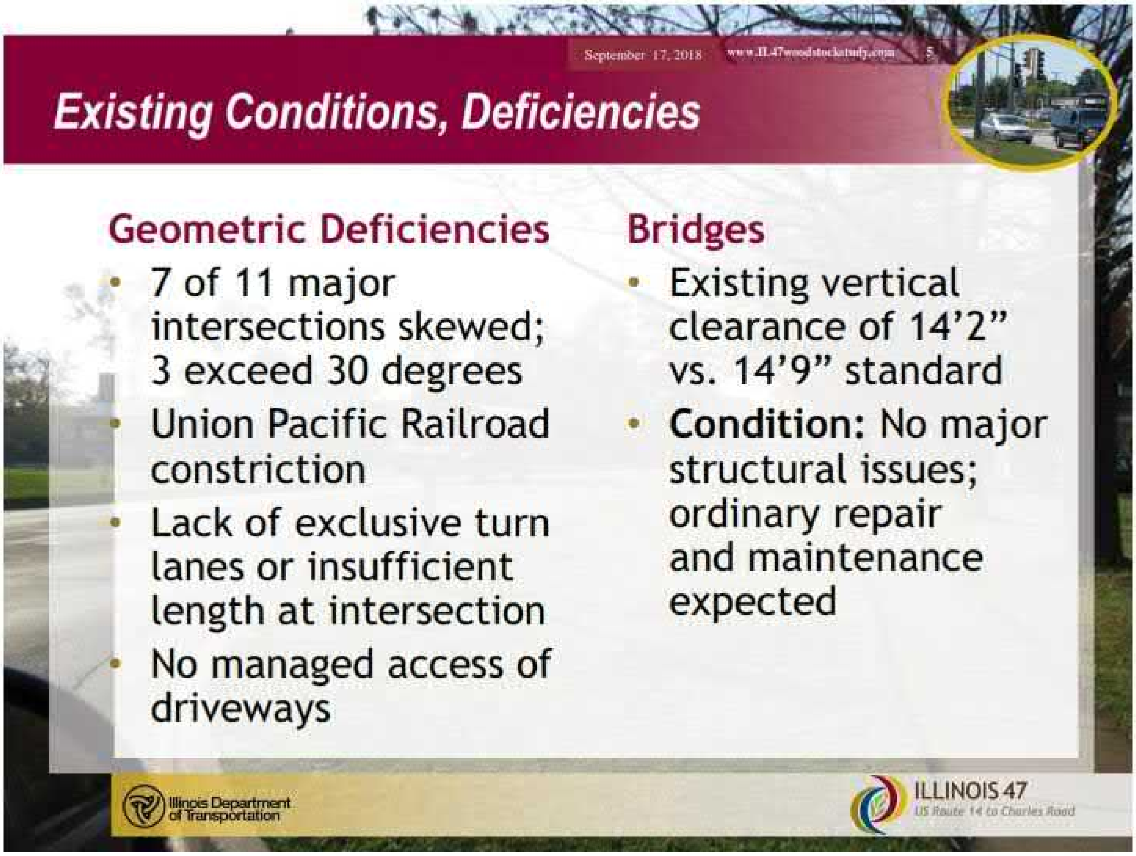
Project Overview
Value Engineering Study **IDOT District 1** **Illinois 47 from U.S. Road 14 to Charles Road** **Project No. P-91-007-09** **September 17 – September 21, 2018** **101 West Center Court, Schaumburg, Illinois 60196** Introductions among IDOT staff, Strand Associates, Inc., and VE Study Team Members. **Project Introduction (Darcie Gabrisko, Strand Associates)** (Presentation slides provided by Strand Associates, Inc.)


ILLINOIS 47
US Route 14 to Charles Road
Illinois Route 47
Value Engineering
Presentation
September 17, 2018
Illinois Department of Transportation
SOUTH
ILLINOIS
47
Il Rte 47
Charles Rd


September 17, 2018
Project Study Area
End Project
Charles Rd
McHenry County
WOODSTOCK
NORTH
Begin Project
Country Club Rd
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
Meetings with Local Stakeholders
City of Woodstock-Police, Fire, and Trans. Committee
McHenry County Board and Exec.
McHenry County Council of Mayors
Greenwood Township
Dorr Township
CMAP
Union Pacific Railroad
PACE
McHenry County DOT
Metra
School District #200
McHenry County Econ. Dev. Corp.
Former Rep. Franks
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
www.IL47woodstockstudy.com
4
Public Involvement
CAG Meetings
#1 January 21, 2010
#2 March 18, 2010
#3 September 1, 2010
#4 May 12, 2011
#5 March 21, 2012
#6 May 15, 2014
#7 October 19, 2017
Public Meetings
#1 February 3, 2010
#2 September 15, 2010
#3 July 9, 2014
Public Hearing
June 7, 2018
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
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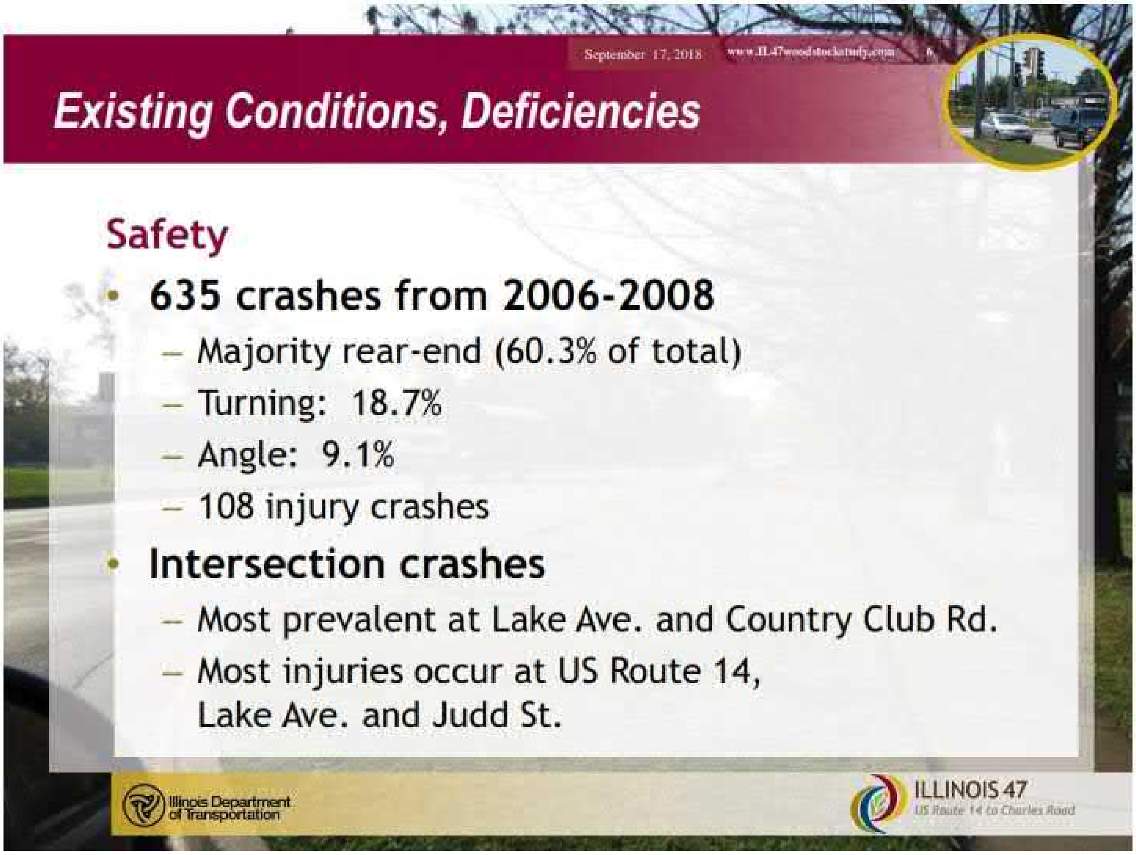
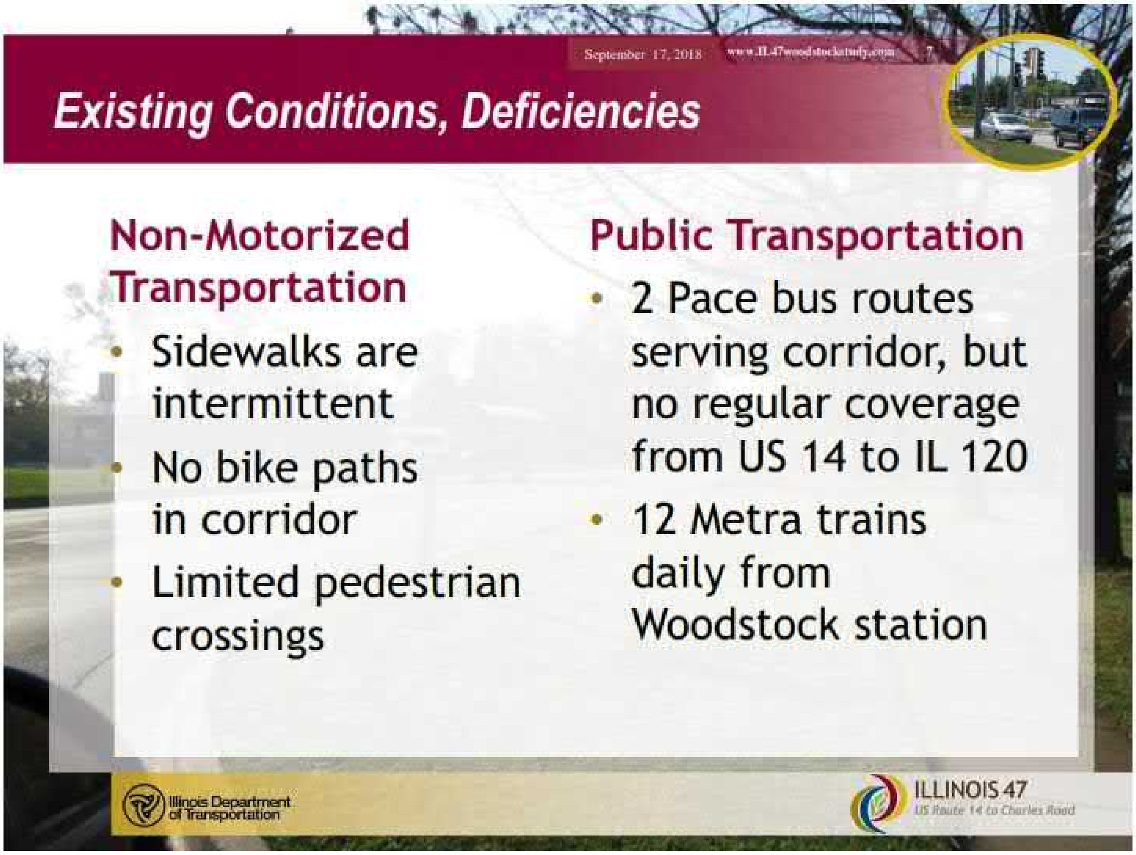
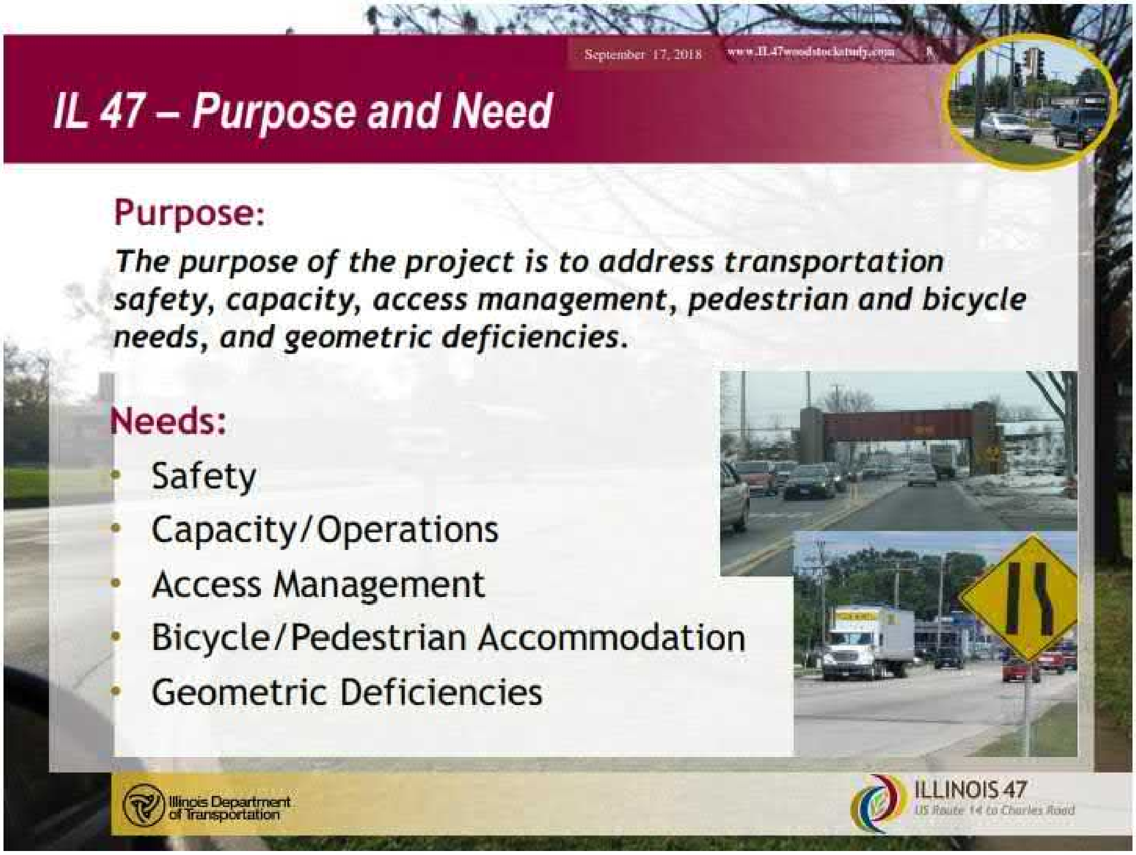
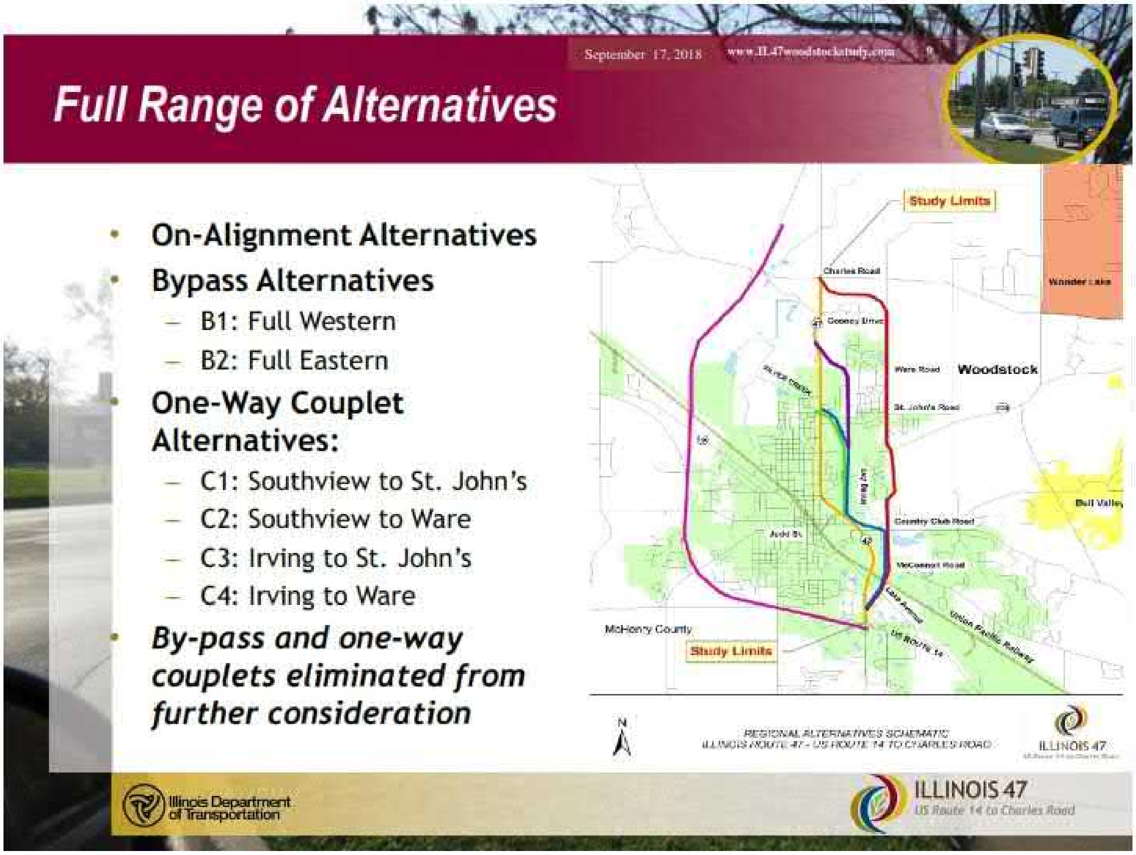
5
Existing Conditions, Deficiencies
Geometric Deficiencies
• 7 of 11 major intersections skewed; 3 exceed 30 degrees
• Union Pacific Railroad constriction
• Lack of exclusive turn lanes or insufficient length at intersection
• No managed access of driveways
Bridges
• Existing vertical clearance of 14'2" vs. 14'9" standard
• Condition: No major structural issues; ordinary repair and maintenance expected
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
Existing Conditions, Deficiencies
Safety
• 635 crashes from 2006-2008
– Majority rear-end (60.3% of total)
– Turning: 18.7%
– Angle: 9.1%
– 108 injury crashes
• Intersection crashes
– Most prevalent at Lake Ave. and Country Club Rd.
– Most injuries occur at US Route 14,
Lake Ave. and Judd St.
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
www.IL47woodstockstudy.com
7
Existing Conditions, Deficiencies
Non-Motorized Transportation
Sidewalks are intermittent
No bike paths in corridor
Limited pedestrian crossings
Public Transportation
2 Pace bus routes serving corridor, but no regular coverage from US 14 to IL 120
12 Metra trains daily from Woodstock station
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
IL 47 – Purpose and Need
Purpose:
The purpose of the project is to address transportation safety, capacity, access management, pedestrian and bicycle needs, and geometric deficiencies.
Needs:
Safety
Capacity/Operations
Access Management
Bicycle/Pedestrian Accommodation
Geometric Deficiencies
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
Full Range of Alternatives
On-Alignment Alternatives
Bypass Alternatives
B1: Full Western
B2: Full Eastern
One-Way Couplet Alternatives:
C1: Southview to St. John's
C2: Southview to Ware
C3: Irving to St. John's
C4: Irving to Ware
By-pass and one-way couplets eliminated from further consideration
Study Limits
Charles Road
Wonder Lake
Woodstock
Ware Road
St. John's Road
Country Club Road
McConnell Road
Bull Valley
McHenry County
Study Limits
Union Pacific Railway
US Route 14
REGIONAL ALTERNATIVES SCHEMATIC
ILLINOIS ROUTE 47 - US ROUTE 14 TO CHARLES ROAD
ILLINOIS 47
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


September 17, 2018
www.IL47woodstockstudy.com
10
Typical Section Rendering
U.S. 14 to Ware Road - Looking North from IL 120
5'
3'
Sidewalk
11'-12'
Travel Lane
11'-12'
Travel Lane
18'
Barrier Median/ Turn Lane
11'-12'
Travel Lane
11'-12'
Travel Lane
3'
10'
Shared-use Path
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


Typical Section Rendering
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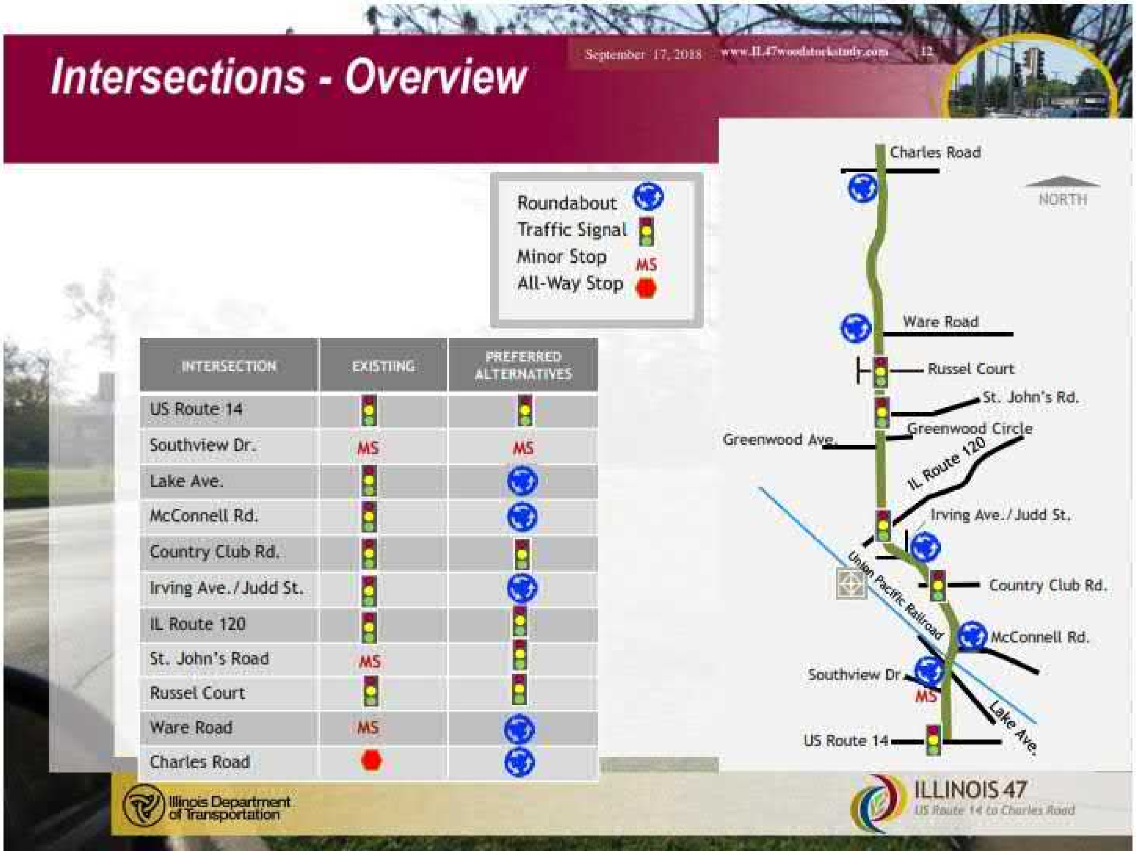
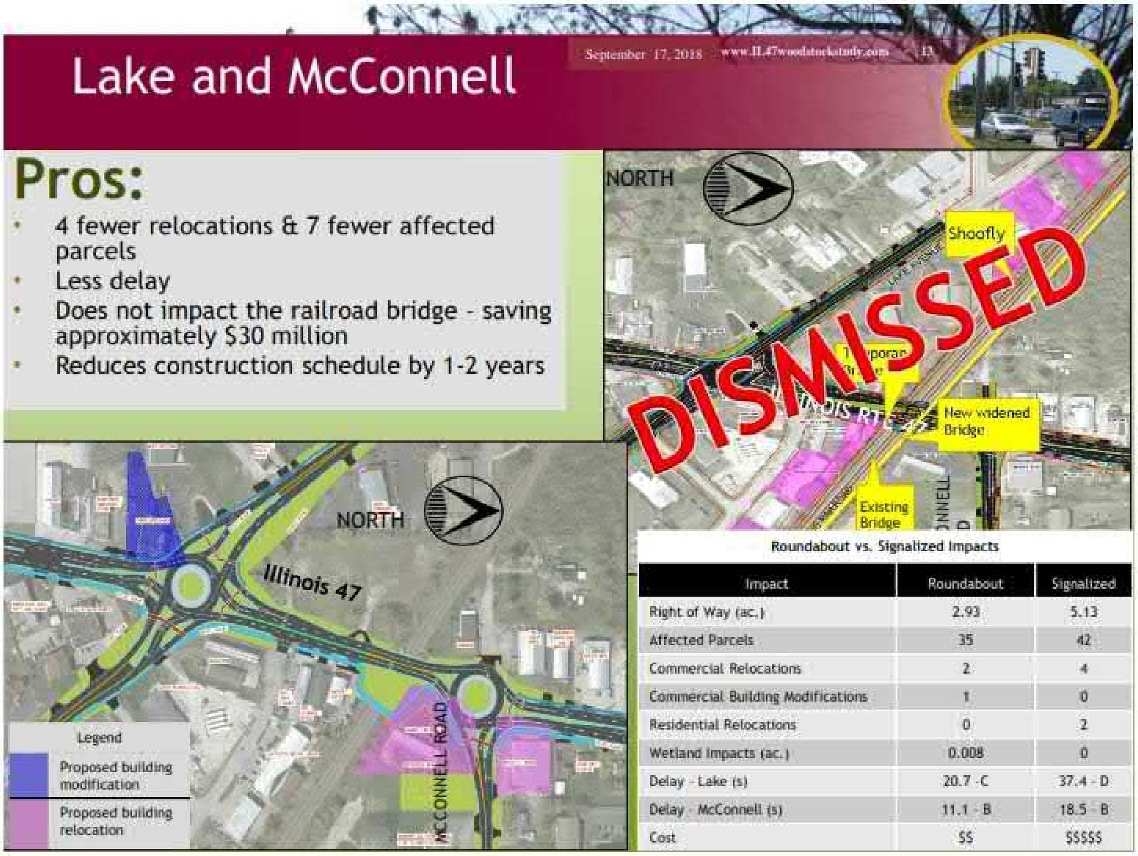
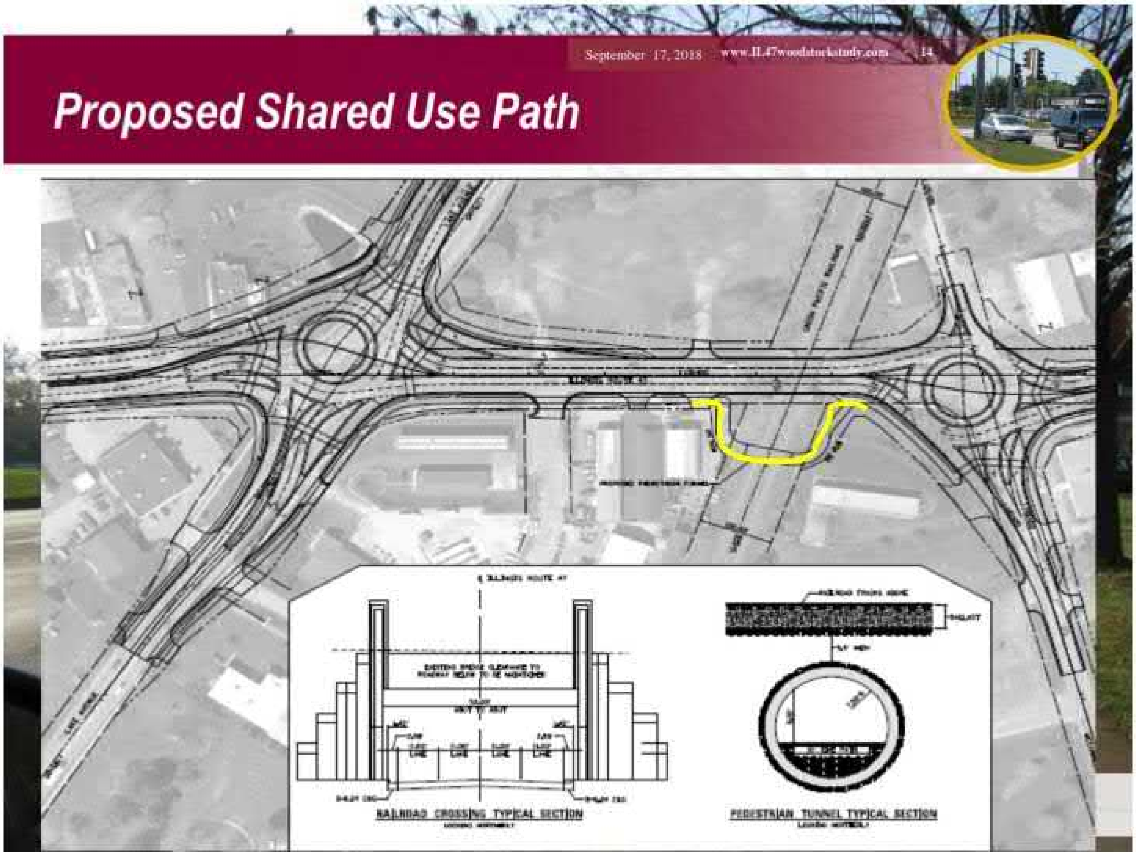
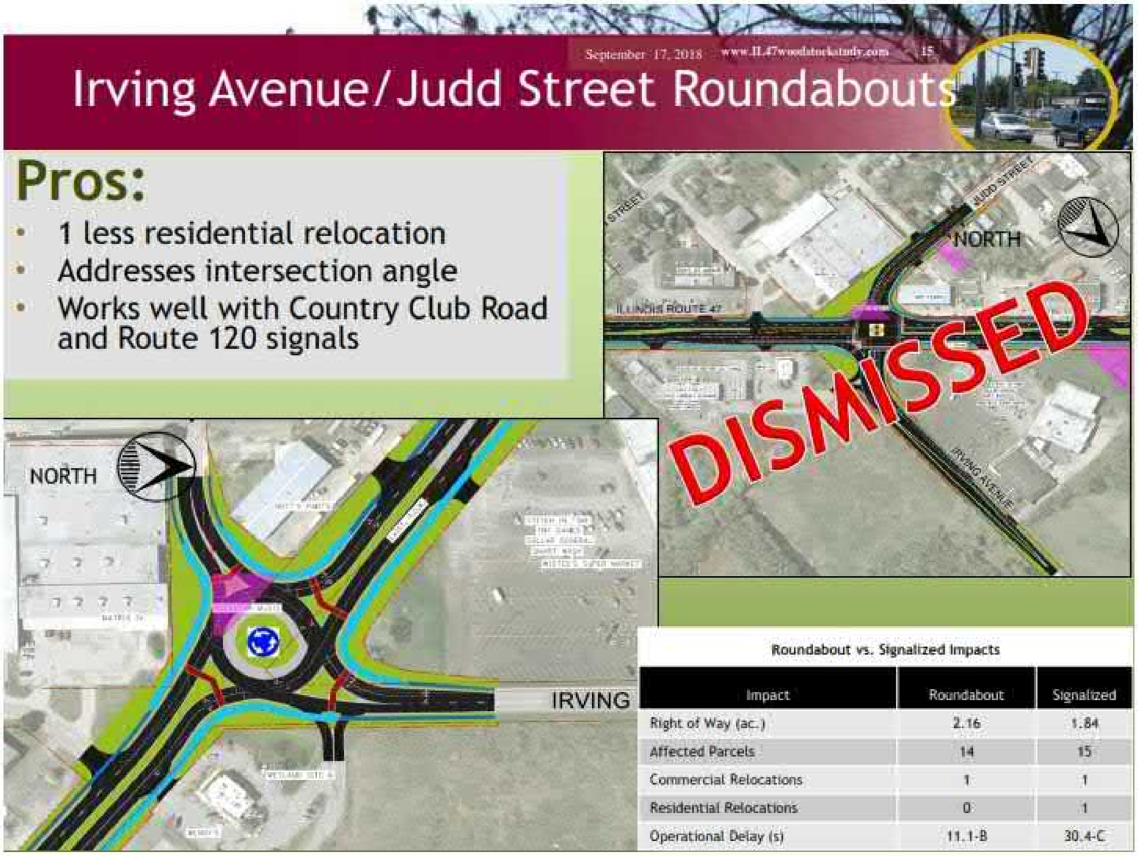
11
Ware Rd to Charles Rd - Looking North from Ware Rd
Drainage Ditch
10' Paved shoulder
12' Travel Lane
12' Travel Lane
22' Mountable Median/ Turn Lane
12' Travel Lane
12' Travel Lane
10' Paved shoulder
Drainage Ditch
10' Shared-use path
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


Intersections - Overview
September 17, 2018
Roundabout
Traffic Signal
Minor Stop
MS
All-Way Stop
INTERSECTION
EXISTING
PREFERRED ALTERNATIVES
US Route 14
Southview Dr. MS MS
Lake Ave.
McConnell Rd.
Country Club Rd.
Irving Ave./Judd St.
IL Route 120
St. John's Road MS
Russel Court
Ware Road MS
Charles Road
Charles Road
NORTH
Ware Road
Russel Court
St. John's Rd.
Greenwood Circle
Greenwood Ave.
IL Route 120
Irving Ave./Judd St.
Union Pacific Railroad
Country Club Rd.
McConnell Rd.
Southview Dr.
MS
Lake Ave.
US Route 14
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


Lake and McConnell
September 17, 2018
Pros:
• 4 fewer relocations & 7 fewer affected parcels
• Less delay
• Does not impact the railroad bridge - saving approximately $30 million
• Reduces construction schedule by 1-2 years
NORTH
Shoofly
DISMISSED
New widened Bridge
Existing Bridge
NORTH
Illinois 47
MCCONNELL ROAD
Legend
Proposed building modification
Proposed building relocation
Roundabout vs. Signalized Impacts

Impact	Roundabout	Signalized
Right of Way (ac.)	2.93	5.13
Affected Parcels	35	42
Commercial Relocations	2	4
Commercial Building Modifications	1	0
Residential Relocations	0	2
Wetland Impacts (ac.)	0.008	0
Delay - Lake (s)	20.7 - C	37.4 - D
Delay - McConnell (s)	11.1 - B	18.5 - B
Cost	$$	$$$$$


September 17, 2018
www.IL47woodstockstudy.com
14
Proposed Shared Use Path
RAILROAD CROSSING TYPICAL SECTION
PEDESTRIAN TUNNEL TYPICAL SECTION


September 17, 2018
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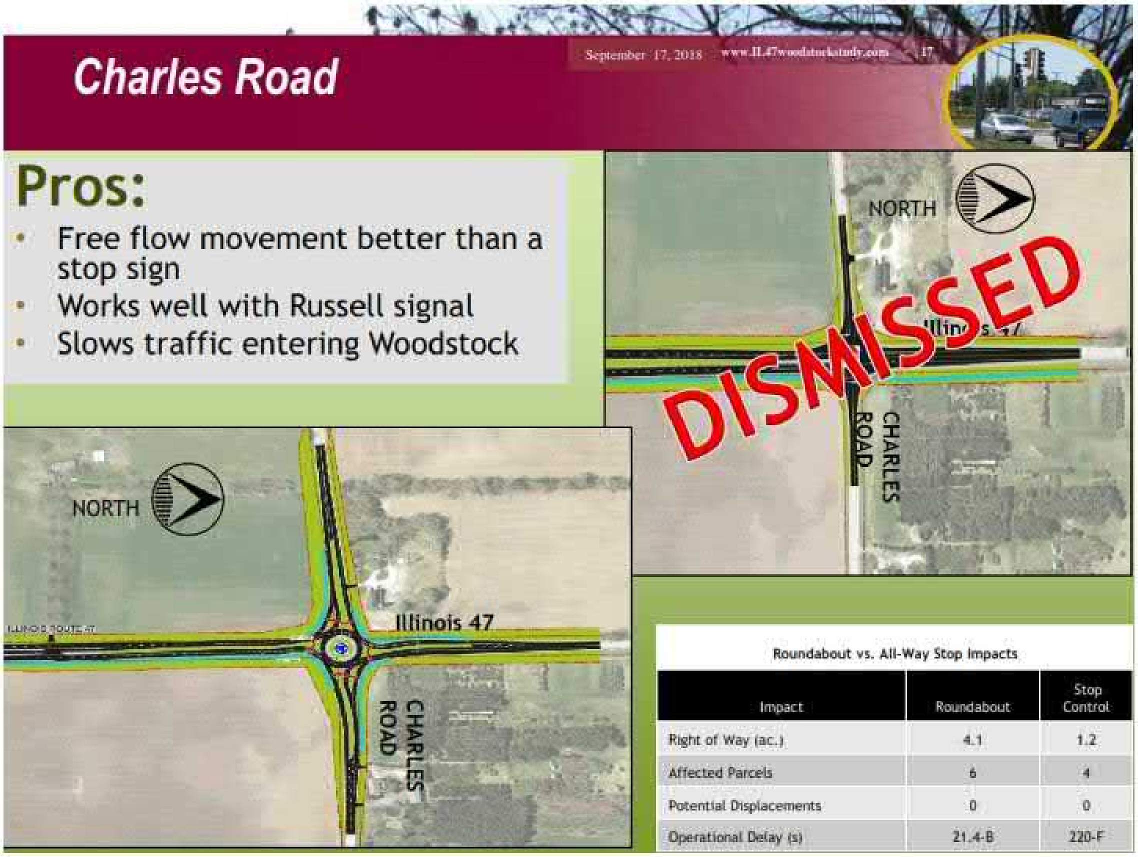
15
Irving Avenue/Judd Street Roundabouts
Pros:
• 1 less residential relocation
• Addresses intersection angle
• Works well with Country Club Road and Route 120 signals
JUDD STREET
NORTH
ILLINOIS ROUTE 47
DISMISSED
IRVING AVENUE
NORTH
IRVING
Roundabout vs. Signalized Impacts

Impact	Roundabout	Signalized
Right of Way (ac.)	2.16	1.84
Affected Parcels	14	15
Commercial Relocations	1	1
Residential Relocations	0	1
Operational Delay (s)	11.1-B	30.4-C

Impact	Roundabout	Stop Control
Right of Way (ac.)	1.15	0.83
Affected Parcels	5	5
Potential Displacements	0	0
Operational Delay (s)	16-B	>300-F



Impact	Roundabout	Stop Control
Right of Way (ac.)	4.1	1.2
Affected Parcels	6	4
Potential Displacements	0	0
Operational Delay (s)	21.4-B	220-F


September 17, 2018
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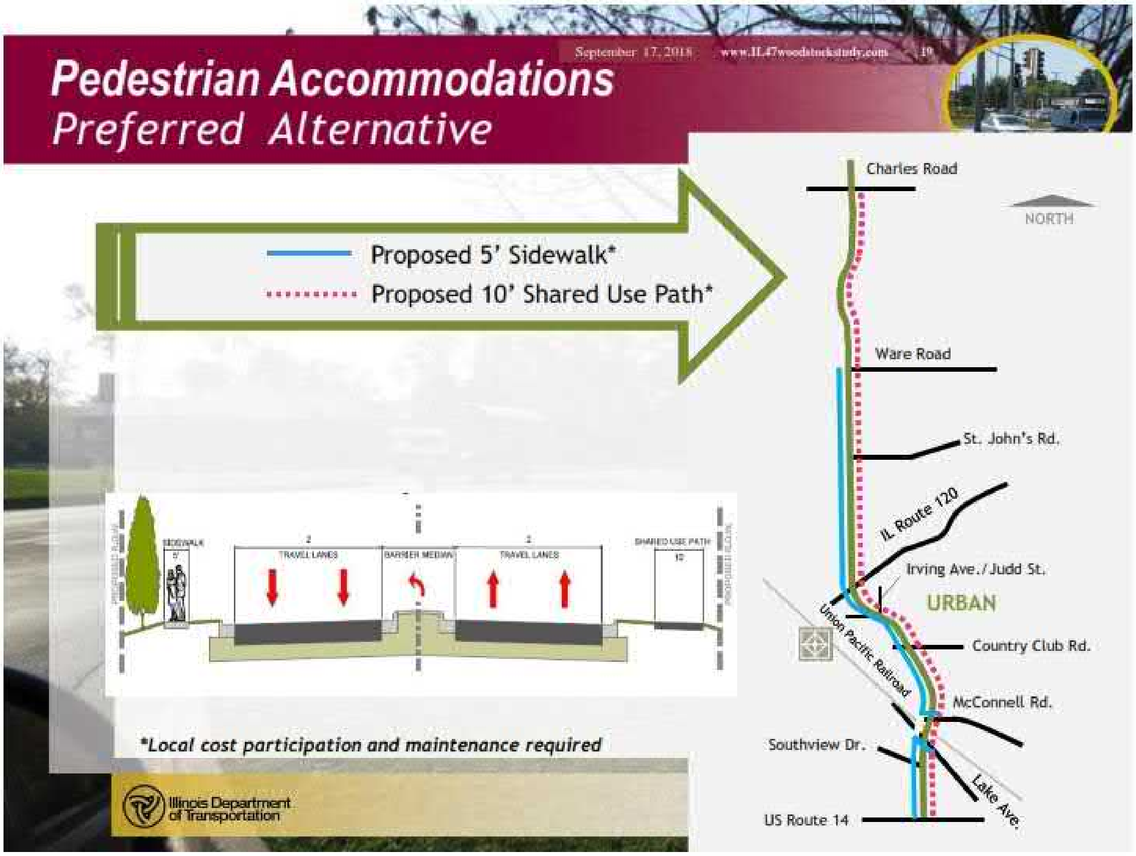
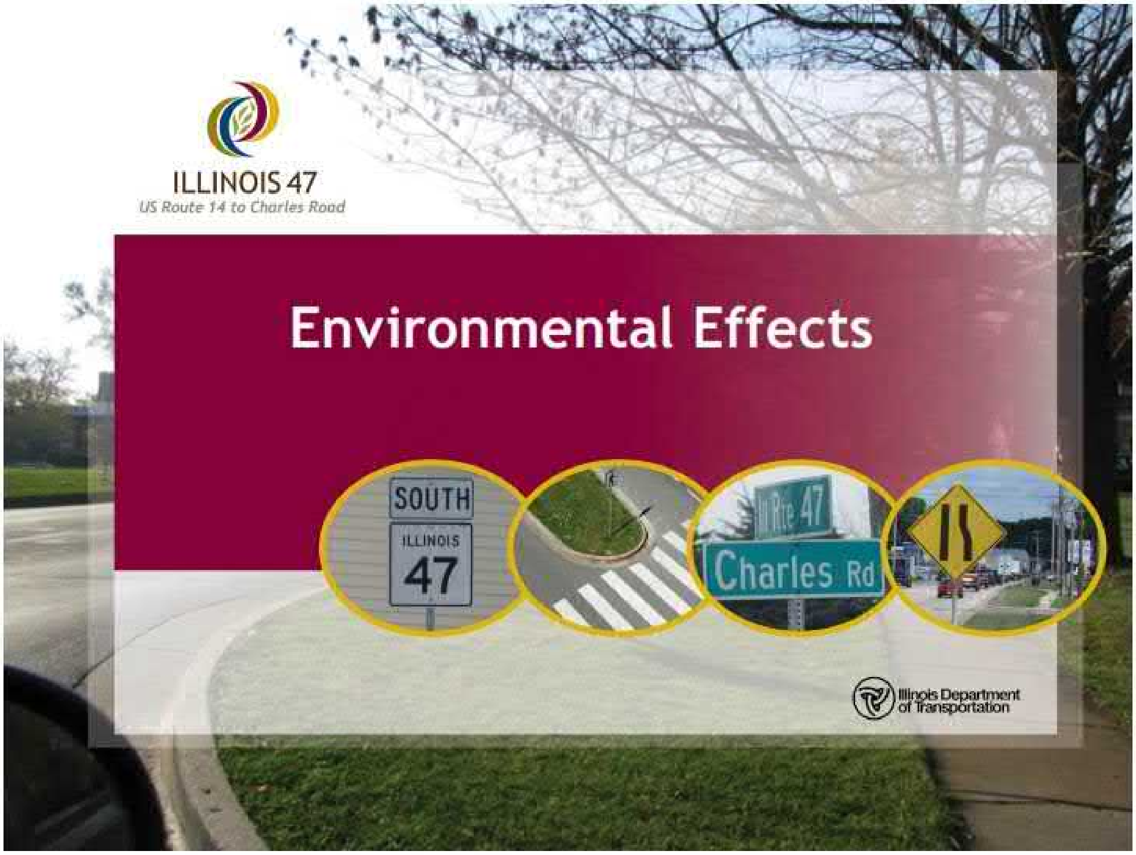
18
Existing Pedestrian Accommodations
Intermittent sidewalk
No handicap accessibility
No bike paths
Woodstock
Illinois Department of Transportation


September 17, 2018
www.IL47woodstockstudy.com
19
Pedestrian Accommodations
Preferred Alternative
Proposed 5' Sidewalk*
Proposed 10' Shared Use Path*
*Local cost participation and maintenance required
Illinois Department of Transportation
Charles Road
NORTH
Ware Road
St. John's Rd.
IL Route 120
Irving Ave./Judd St.
URBAN
Country Club Rd.
Union Pacific Railroad
McConnell Rd.
Southview Dr.
Lake Ave.
US Route 14
SIDEWALK
TRAVEL LANES
BARRIER MEDIAN
SHARED USE PATH


ILLINOIS 47
US Route 14 to Charles Road
Corridor Walkthrough
SOUTH
ILLINOIS
47
Il Rte 47
Charles Rd
Illinois Department of Transportation


ILLINOIS 47
US Route 14 to Charles Road
Environmental Effects
SOUTH
ILLINOIS
47
Il Rte 47
Charles Rd
Illinois Department of Transportation


Water Resources
September 17, 2018
www.IL47woodstockstudy.com
22
Illinois Route 120
Judd Street
Country Club Road
McConnell Road
Illinois Route 47
Lake Avenue
US Route 14
Charles Drive
Cooney Drive
Ware Road
St. Johns Road
Legend
Outfalls
Detention Basins
Impacted Wetlands


Water Resources
September 17, 2018
www.IL47woodstockstudy.com
23
Study Limits
Silver Creek
Charles Road
Unnamed Silver Creek Tributary
Cooney Drive
Deepwater Aquatic Habitat
Ware Road
East Branch Silver Creek
St. John's Road
McHenry Avenue
Irving Ave
Judd St.
Country Club Road
Ditch
McConnell Road
Union Pacific Railway
Lake Avenue
US ROUTE 14
Study Limits
Legend
Stream
Water
N


Wetland Inventory
September 17, 2018
www.IL47woodstockstudy.com
24
McConnell Road
Site 4
Site 3
Site 2
Lake Avenue
Illinois Route 47
Site 1
US Route 14
Legend
Wetland Sites
Non Wetland NWI Sites

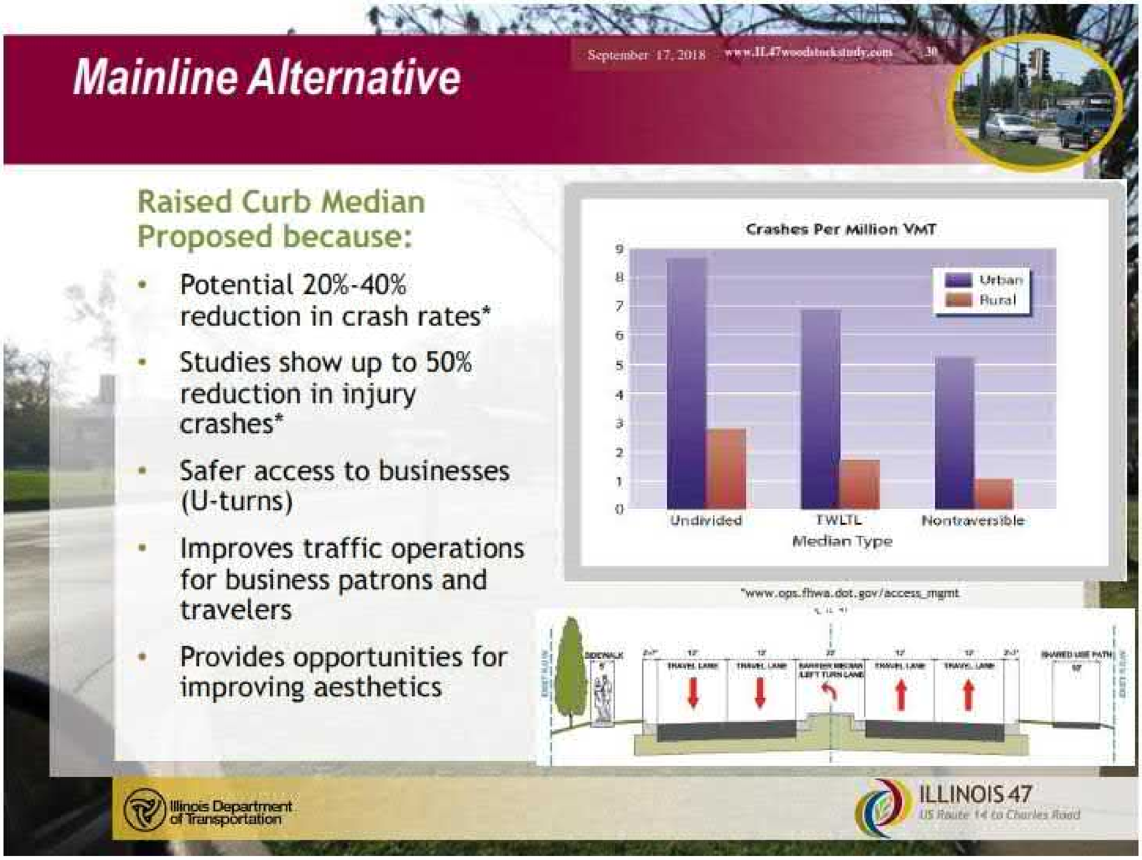

Wetland Inventory
September 17, 2018
www.IL47woodstockstudy.com
25
N
Site 7
Irving Avenue
Site 6
Site 5
Country Club Road
Site 23
Legend
Wetland Sites
Non Wetland NWI Sites

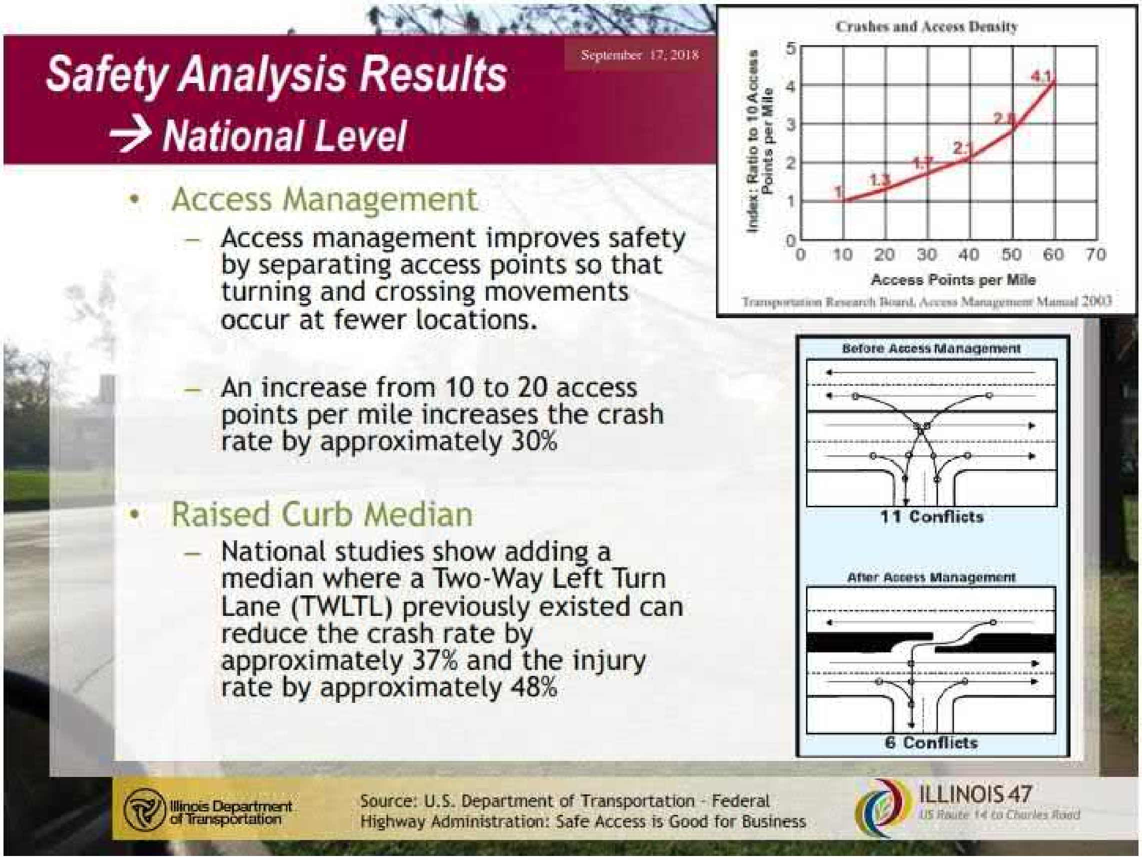

Wetland Inventory
September 17, 2018
www.IL47woodstockstudy.com
26
Site 12
Cooney Drive
Site 11
Site 10
IL Route 47
Site 9
Site 8
Legend
Wetland Sites
Non Wetland NWI Sites
N

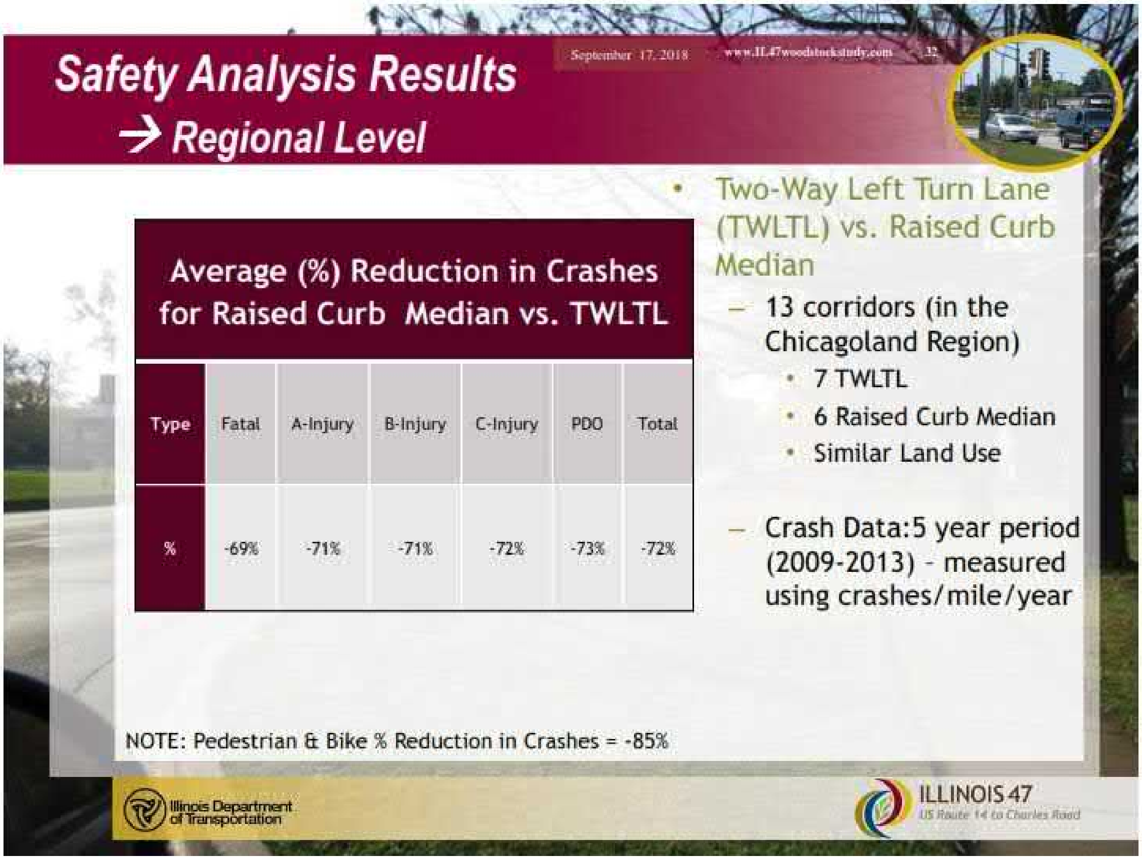

Wetland Inventory
September 17, 2018
www.IL47woodstockstudy.com
27
Site 14
Site 13
IL Route 47
Charles Road
Site 15
Legend
Wetland Sites
Non Wetland NWI Sites
N


September 17, 2018
Environmental Impacts
Natural Environmental Impacts
Wetlands
0.31 Acres
Best Management Practices
• Outfalls
• Detention Basins
• Bioswales
Human Environment Impacts
Proposed ROW Total
33.1 Acres
Farmland
17.9 Acres
7 Commercial Building Relocations
3 Residential Relocations
No impacts are anticipated to cultural and historic resources or to threatened and endangered species.
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


ILLINOIS 47
US Route 14 to Charles Road
Thank You!
SOUTH
ILLINOIS
47
Il Rte 47
Charles Rd
Illinois Department of Transportation


Mainline Alternative
September 17, 2018
Raised Curb Median Proposed because:
Potential 20%-40% reduction in crash rates*
Studies show up to 50% reduction in injury crashes*
Safer access to businesses (U-turns)
Improves traffic operations for business patrons and travelers
Provides opportunities for improving aesthetics
Crashes Per Million VMT
Urban
Rural
Undivided
TWLTL
Nontraversible
Median Type
*www.ops.fhwa.dot.gov/access_mgmt
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road


Safety Analysis Results
→ National Level
September 17, 2018
• Access Management
– Access management improves safety by separating access points so that turning and crossing movements occur at fewer locations.
– An increase from 10 to 20 access points per mile increases the crash rate by approximately 30%
• Raised Curb Median
– National studies show adding a median where a Two-Way Left Turn Lane (TWLTL) previously existed can reduce the crash rate by approximately 37% and the injury rate by approximately 48%
Crashes and Access Density
Index: Ratio to 10 Access Points per Mile
Access Points per Mile
Transportation Research Board, Access Management Manual 2003
Before Access Management
11 Conflicts
After Access Management
6 Conflicts
Illinois Department of Transportation
Source: U.S. Department of Transportation - Federal Highway Administration: Safe Access is Good for Business
ILLINOIS 47
US Route 14 to Charles Road


Safety Analysis Results
→ Regional Level
Average (%) Reduction in Crashes for Raised Curb Median vs. TWLTL

Type	Fatal	A-Injury	B-Injury	C-Injury	PDO	Total
%	-69%	-71%	-71%	-72%	-73%	-72%

• Two-Way Left Turn Lane (TWLTL) vs. Raised Curb Median
– 13 corridors (in the Chicagoland Region)
• 7 TWLTL
• 6 Raised Curb Median
• Similar Land Use
– Crash Data:5 year period (2009-2013) - measured using crashes/mile/year
NOTE: Pedestrian & Bike % Reduction in Crashes = -85%
Illinois Department of Transportation
ILLINOIS 47
US Route 14 to Charles Road

2.3 Project Site

2.4 Project Map

VE Recommendations

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3.0 Development Phase – Recommendations

Project:	IL 47 from US 14 to Charles Road	
Idea No.;	**Sheet No.:**	**Creative Idea:**
A-6	1 of 4	Provide flexible pavement instead of concrete pavement for cross streets.

Comp. by:	AMP	**Date:**	9/21/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
The pavement structure for side streets consist of the following:
PCC Pavement Jointed 9.75"
HMA stabilized subbase 4"
Aggregate subgrade 12"

VE Change:
The pavement structure for side streets consist of the following:
HMA surface course Mix "D" N50 2"
HMA binder course Mix "D" N50 4"
HMA base course 9"
Aggregate subgrade 12"

Justification:

- Asphalt pavement can be constructed more rapidly than concrete pavement
- Asphalt pavement construction reduces construction stages.
- Consistent side streets pavement type.
- Cost effective solution for existing ADT.

This recommendation to asphalt pavement is applied for the following side streets:

Southview Dr. 1,400 sy	Mc Connell Rd. 800 sy
South St. 1,120 sy	Calhoun St. 400 sy
Country Club Rd. 1,200 sy	Judd St. 400 sy
Irving Ave. 800 sy	Greenwood Ave. 800 sy
St John's Rd. 5,400 sy	Russel Ct. 1,250 sy
Ware Rd. 1,120 sy	Cooney Dr. 400 sy
Charles Rd. 3,200 sy	

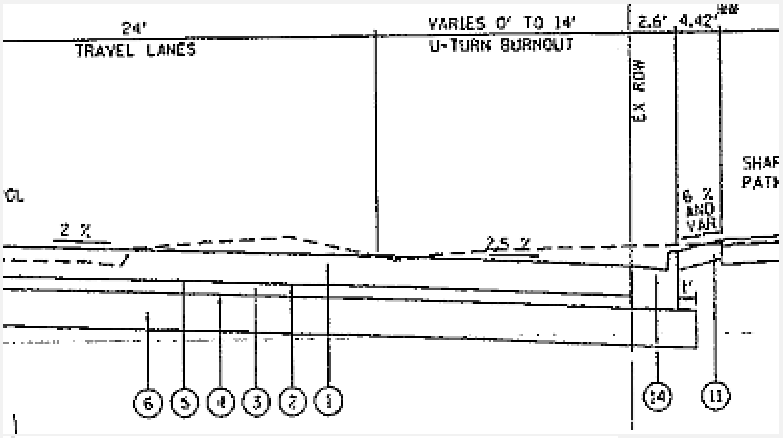
Total surface area considered for side streets pavement is 18,290 SY

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:	$1,425,000		
Proposed:	$1,185,000		
Savings*:	$240,000		$240,000
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**$240,000**

SKETCH

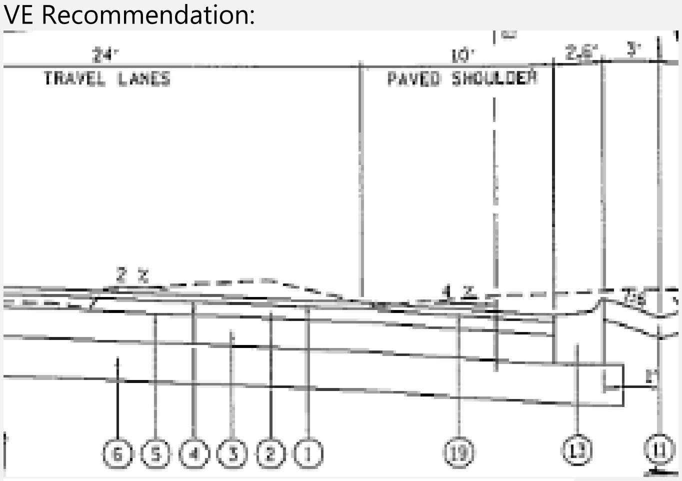
Project:	IL 47 from US 14 to Charles Road	Idea No.	A-6
		Sheet	2 of 4

Original Design:



1. PORTLAND CEMENT CONCRETE PAVEMENT (JOINTED), 9.75"
2. BITUMINOUS MATERIALS (TACK COAT)
3. HOT-MIX ASPHALT STABLIZED SUBBASE, 4"
4. BITUMINOUS MATERIALS (PRIME COAT)
5. AGGREGATE (PRIME COAT)
6. AGGREGATE SUBGRADE, 12"

VE Recommendation:



1. HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N50, 2"
2. HOT-MIX ASPHALT BINDER COURSE, IL19.0, N50, 4"
3. HOT-MIX ASPHALT BASE COURSE, 9"
4. BITUMINOUS MATERIALS (PRIME COAT)
5. AGGREGATE (PRIME COAT)
6. AGGREGATE SUBGRADE, 12"

COST WORKSHEET

Project:	IL 47 from US 14 to Charles Road	Idea No.	A-6
		Sheet	3 of 4

CONSTRUCTION COST		ORIGINAL ESIMATE			NEW ESTIMATE		
Item	Unit	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design:							
PCC Pavement Jointed 9.75	SY	18,290	$55	$1,005,950			
HMA stabilized subbase 4"	SY	18,290	$23	$420,670			
VE Design:							
HMA surface course Mix "D" N50 2"	TON				2,048	$90	$184,320
HMA binder course Mix "D" N50 4"	TON				4,096	$65	$266,240
HMA base course 9"	SY				18,290	$40	$731,600
Subtotal				$1,426,620			$1,182,160
Total Cost				$1,426,620			$1,182,160
Total Cost Rounded				$1,425.000			$1,185,000

SUPPORTING CALCULATIONS

Project:	IL 47 from US 14 to Charles Road	Idea No.	A-6
		Sheet	4 of 4

[Show all calculations used to develop quantities for the recommendation cost shown on the Cost Worksheet. State all assumptions you have made.]

Total Area = 18,290 SY

Asphalt application Rate 112 lb/sy/in

HMA SC “D” N50 2” = 112 lb/sy/in x 18,290 sy x 2 in/ 2000 lb/ton

= 2,048 ton

HMA BC “D” N50 4” = 112 lb/sy/in x 18,290 sy x 4 in/ 2000 lb/ton

= 4,096 ton

Development Phase – Recommendations

Project:	IL 47 from US 14 to Charles Road						
Idea No.;	**Sheet No.:**	**Creative Idea:**					
G-2	1 of 4	Eliminate the shared-use-path tunnel crossing the UPRR and maintain 5′ wide sidewalk at street level with handrail separating traffic					
Comp. by:	SMS	**Date:**	9/21/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
Construct a pedestrian tunnel underneath the Union Pacific railroad tracks. A 18-foot-wide (outside) diameter concrete pipe would be jacked underneath the railroad tracks and contain a 10-foot-wide bike path.

VE Change:
Eliminate the pedestrian tunnel and revise the IL 47 pavement section underneath the railroad bridge to provide four 11-foot-wide travel lanes along with a 5.8' wide sidewalk. See Exhibit 1 for detailed sketch of pavement section.

Justification:

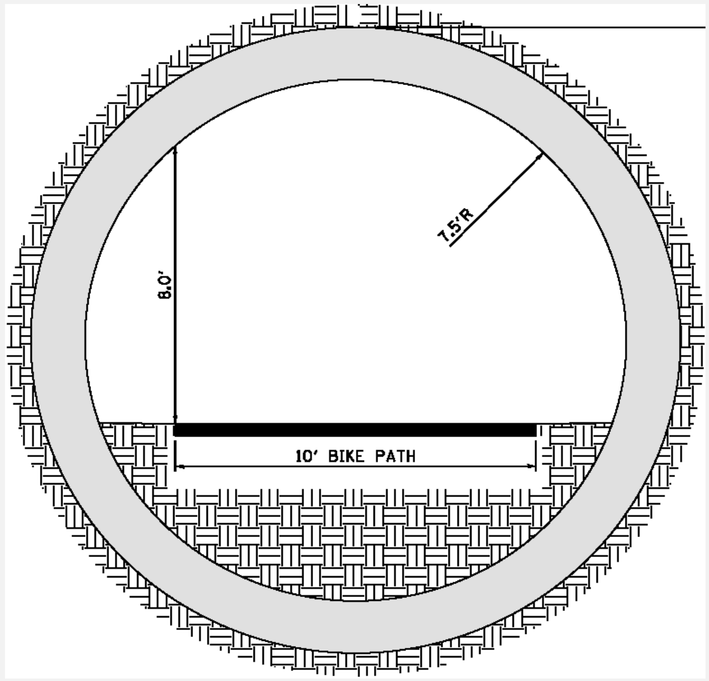
- Eliminate cost to design, manufacture, deliver and install 18′ outside diameter concrete pipe.
- Eliminate liability of disrupting railroad operations if settlement occurs during jacking operation.
- Eliminate obtaining a construction permit from the UPRR in addition to eliminating the need for railroad protective liability insurance, railroad flaggers and construction monitoring.
- Delivery of the pipe from the concrete manufacturer to the project site may be impractical due to the clearance of existing bridge underpasses, utility lines and high voltage lines.
- When the UPRR reconstructs the bridge at the end of its life span, the bridge could be widened to accommodate the full 10′ wide bike path. The cost share for widening the bridge for the full width bike path would be less than constructing the pedestrian tunnel.
- The Belmont Road railroad underpass in Downers Grove is a similar location with 4 lanes of traffic and sidewalk adjacent to the back of curb. The traffic volumes along Belmont Road (22,000 ADT) are similar to IL 47 (24,800 ADT). See Exhibit 2.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:	$983,528.12		
Proposed:	$11,480		
Savings:	$972,048.12		$972,048
Future Cost Savings (when applicable)		N/A	N/A
		TOTAL PRESENT WORTH SAVINGS:	**$972,000**

SKETCH

Project:	IL 47 from US 14 to Charles Road	Idea No.	G-2
		Sheet	2 of 4

Original Design:



PEDESTRIAN TUNNEL TYPICAL SECTION
LOOKING NORTHERLY

SKETCH

Project:	IL 47 from US 14 to Charles Road	Idea No.	G-2
		Sheet	3 of 4

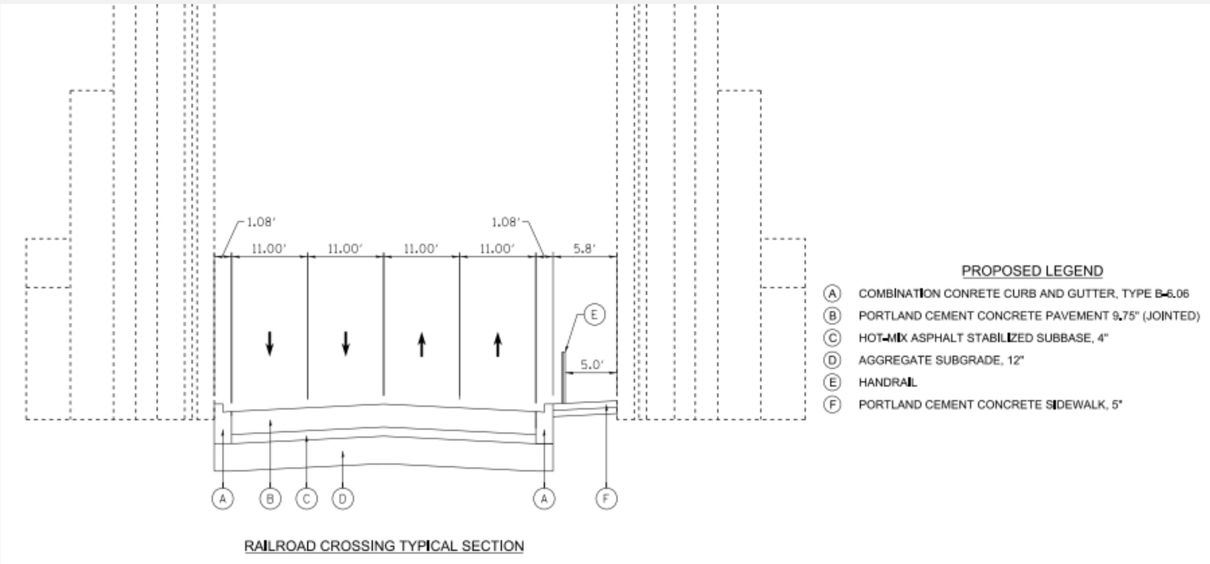


Exhibit 1 - Proposed roadway section at UPRR bridge (N.T.S)

Exhibit 2 - Belmont Road railroad underpass in Downers Grove

COST WORKSHEET

Project:	IL 47 from US 14 to Charles Road	Idea No.	D-2
		Sheet	4 of 4

CONSTRUCTION COST		ORIGINAL ESIMATE			NEW ESTIMATE		
Item	Unit	No. Units	Cost/Unit	Total Cost	No. Units	Cost/Unit	Total Cost
Original Design:							
Conc Jack Pipe Tunnel	LF	60	$16,392/LF	$983,528			
VE Design:							
Conc Jack Pipe Tunnel							$0
PCC Sidewalk, 5"					580	$6/SQ FT	$3,480
Handrail					80	$100/LF	$8,000
Subtotal				$983,528			$11,480
Total Cost				$983,528			$11,480
Total Cost Rounded				$984,000			$11,500

Development Phase – Recommendations

Project:	IL 47 from US 14 to Charles Road						
Idea No.;	**Sheet No.:**	**Creative Idea:**					
G-5	1 of 3	Decrease the width of the shared use path through the pedestrian tunnel					
Comp. by:	FJN	**Date:**	9/19/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
Maintain the 10-foot-wide shared use path through a 15-foot diameter pipe and maintain an 8-foot minimum height clearance. It is assumed the out to out diameter of the reinforced concrete pipe will be 17 to 18 feet in diameter.

VE Change:
Similar to the Kane County South Street Trail, Randall Road Underpass (IDOT Contract 63667), reduce the width of the shared use path from 10′ to 8′ – 6″ through the pedestrian tunnel. The reduction in width of the path will reduce the out-to-out diameter of the pipe to 14 feet.

Justification:
Reduce construction cost and schedule
Simplify constructability

- Pre-existing forms to fabricate the 14′ diameter pipe
- Fewer impacts to deliver pipe due to clearance conflicts at overpass bridges and overhead cables.
- Reduced weight per section of pipe will reduce crane capacity needed to unload and install pipe.
- Increase cover between top of pipe to rail. Decrease potential of settlement of rail over the pipe.

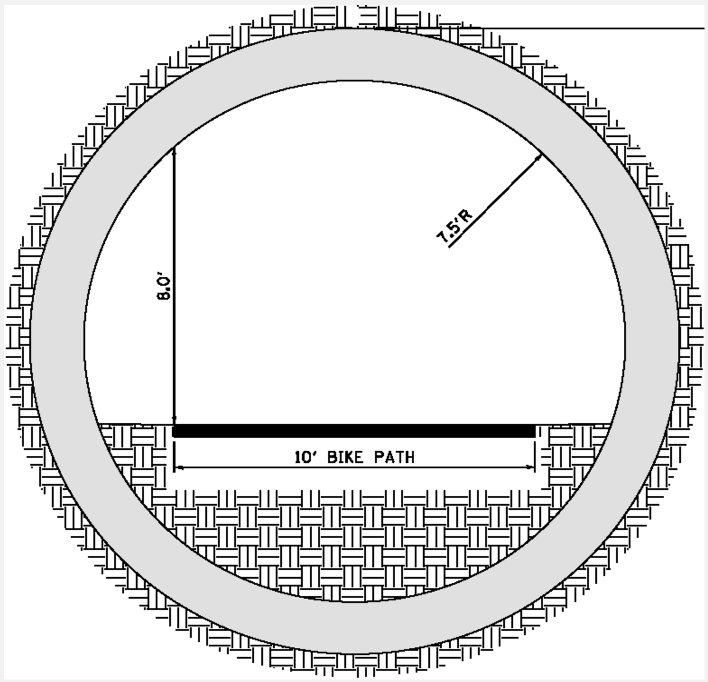
Note: Additional drainage system should be considered inside the Share-Use Path Tunnel

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:	$983,528		
Proposed:	$569,340		
Added Cost	$414,188		$414,188
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVING:	**$414,000**

SKETCH

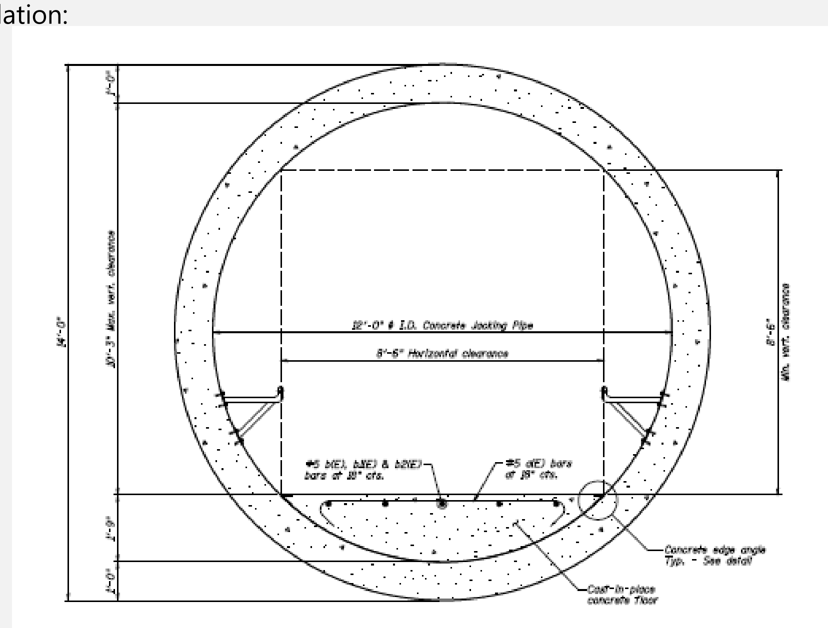
Project:	IL 47 from US 14 to Charles Road	**Idea No.**	G-5
		Sheet	2 of 3

Original Design:



<u>PEDESTRIAN TUNNEL TYPICAL SECTION</u>
LOOKING NORTHERLY

VE Recommendation:



SECTION THROUGH TUNNEL

COST WORKSHEET

Project:	IL 47 from US 14 to Charles Road	Idea No.	G-5
		Sheet	3 of 3

CONSTRUCTION COST		ORIGINAL ESIMATE			NEW ESTIMATE		
Item	**Unit**	**No. Units**	**Cost/Unit**	**Total Cost**	**No. Units**	**Cost/Unit**	**Total Cost**
Original Design:	foot	60	$16,392	$983,528			
VE Design:					60	$9489	$569,340
Subtotal				984,000			$569,340
Total Cost				984,000			$569,340
Total Cost Rounded				$980,000			$570,000

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4.0 Development and Recommendation Phase – Design Suggestions

Project:	IL 47 from US 14 to Charles Road						
Idea No.;	**Sheet No.:**	**Creative Idea:**					
A-9	1 of 1	**Design Suggestion:** Reduce the number of median openings					
Comp. by:	AMP	**Date:**	9/19/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
Raised median openings between Ware Rd. and Charles Rd., were provided in four locations.

VE Change:
Reduce the median openings by continuing the raised median at station 296+00 and at station 341+00.

Justification:
The main advantage is removing point of conflicts between Ware Rd. and Charles Rd.
Raised median openings can serve more residents at once.
Eliminating two openings improve traffic flow through this segment.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:			
Proposed:			
Savings:			
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**Design Suggestion**

Development and Recommendation Phase – Design Suggestions

Project:	IL 47 from US 14 to Charles Road	
Idea No.;	**Sheet No.:**	**Creative Idea:**
B-1/4	1 of 1	**Design Suggestion:** Use Geogrid or other material to increase structural number

Comp. by:	AMP	**Date:**	9/19/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
During the project briefing, it was stated that the raised median will be a grass raised median in lieu of raised concrete median surface 4'.

VE Change:
Use permeable pavers from US Rte. 14 to St. John's Rd. (business areas).
Use salt tolerant native plants from St. John's Rd. to Charles Rd. (rural area).

Justification:

Eliminate grass maintenance and mowing
Increase safety by eliminating the need of maintenance workers to be exposed to traffic by having to stage maintenance equipment in the lane adjacent to the median.

Since segment from St. John's Rd to Charles Rd. includes the Silver creek crossing, several wetlands on the side of the road, a huge proposed detention basin, and a tributary to Silver creek crossing, this segment is more receptible to introduce the salt tolerant native plants.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:			
Proposed:			
Savings:			
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**Design Suggestion**

Development and Recommendation Phase – Design Suggestions

Project:	IL 47 from US 14 to Charles Road						
Idea No.;	**Sheet No.:**	**Creative Idea:**					
D-5	1 of 1	**Design Suggestion:** Close and detour the local residential streets during construction of the roundabouts.					
Comp. by:	FJN	**Date:**	9/20/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
Detailed construction phasing of roundabouts not complete.

VE Change:
Suggest to close and detour McConnell Road via Zimmerman/Country Club Roads.
Suggest to Close and detour Judd St/Irving Ave via Madison/ RT 120

By closing the local street, and maintaining traffic on Il 47, the roundabout can be constructed in halves, rather than quarters.

Suggest to look at the potential detour routes and operational impacts of closing:
Lake Avenue
Ware Road
Charles Road

Justification:
To increase constructability, construction efficiency (schedule) and decrease construction joints, suggest constructing the roundabouts in halves, rather than quarters.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:			
Proposed:			
Savings:			
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**Design Suggestion**

Development and Recommendation Phase – Design Suggestions

Project:	IL 47 from US 14 to Charles Rd.						
Idea No.;	**Sheet No.:**	**Creative Idea:**					
F-1	1 of 1	**Design Suggestion:** Use precast elements as much as possible.					
Comp. by:	TBD	**Date:**	9/20/2018	**Checked by:**	AR/SW	**Date:**	9/21/2018

Original Concept:
N/A

VE Change:
We recommend using precast element throughout the project.

Justification:
Expedite construction, simplify installation.
Less impact to residents and business.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:			
Proposed:			
Savings:			
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**Design Suggestion**

Development and Recommendation Phase – Design Suggestions

Project:	IL 47 from US 14 to Charles Road	
Idea No.;	**Sheet No.:**	**Creative Idea:**
G-6	1 of 1	**Design Suggestion:** Use alternate material for the pedestrian tunnel (Steel, Concrete Box Culvert, etc.…)

Comp. by:	FJN	**Date:**	9/20/2018	**Checked by:**	SM/AR	**Date:**	9/21/2018

Original Concept:
Install an 18 foot out-to- out diameter reinforced concrete pipe to maintain the 10-foot shared use path under the railroad.

VE Change:
Similar to IDOT Contract 63450, Deerfield Metra Station Pedestrian Underpass Tunnel, install a 12′ x 12′ box culvert under the railroad.

Justification:

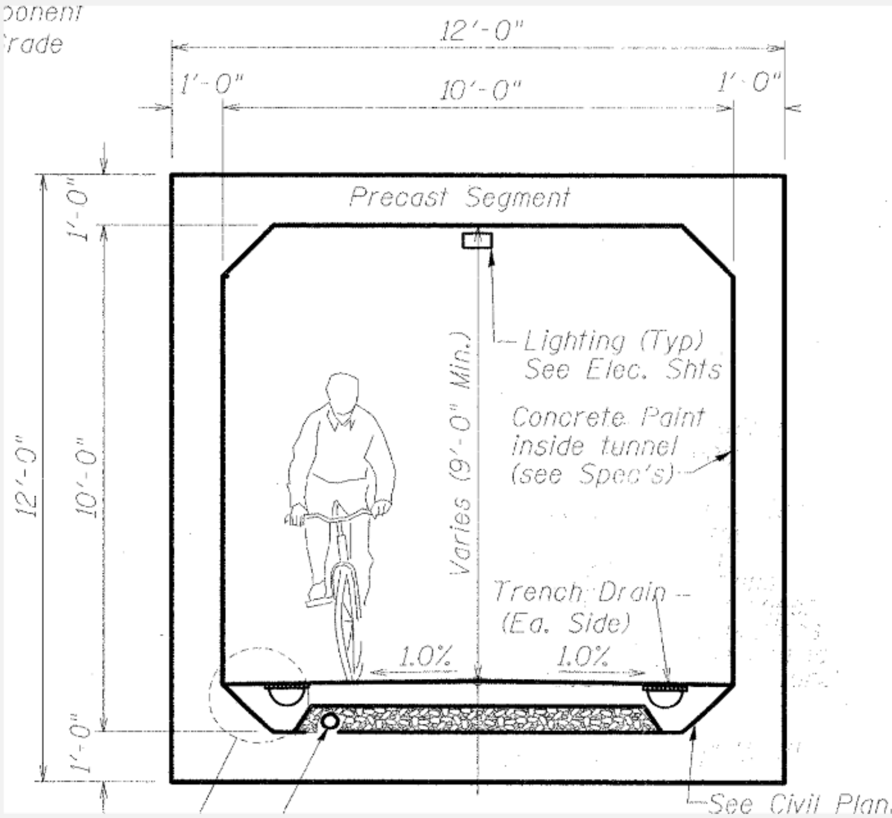
- Provides the same function as the 18′ diameter pipe
- Standard box culvert size – no special forms required for fabrication
- Delivery of culvert to the site less complicated than the 18′ diameter pipe.
    - Less overhead conflicts with bridges and aerial cables
    - Different permit requirements.
- Less weight per foot than the 18′ diameter pipe, therefore less joints in tunnel
- Increased cover from top of box to track, less potential for settlement.

Cost Summary	Initial Cost	Future Cost	Total Life Cycle Cost Savings
Original:			
Proposed:			
Savings:			
Future Cost Savings (when applicable)			
		TOTAL PRESENT WORTH SAVINGS:	**Design Suggestion**

SKETCH

Project:	IL 47 from US 14 to Charles Road	Idea No.	G-6
		Sheet	2 of 2

VE Recommendation:



Location: Deerfield Metra Station

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Appendix

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Sources

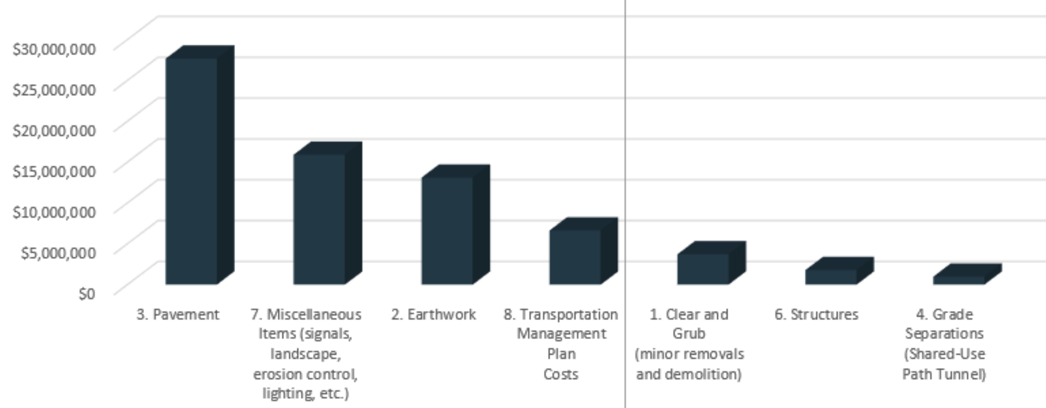
Approving / Authorizing Persons		
Name	**Position**	**Telephone**
Steve Schilke, P.E.	IDOT Unit Head	847-705-4125
Tom Heraty	Utility Concrete Products, Morris IL	

Documents / Abstracts	
Reference	**Reference**
Illinois Route 47 from US 14 to Charles Rd. Project Report, June 2018	Environmental Assessment, Route: FAP 326 Illinois Route 47, Section: US 14 to Charles Road, Mc Henry County Job No: P-91-007-09, March 2018
Illinois 47, Existing Drainage Plan, Plot Date 11/6/2014	Location Maps: location, project limits, crash hot spots, environmental constraints
Estimate Documentation – IDOT District 1, P-91-007-09	Purpose and Need statement
Hydraulic Report, IL 47 over Unnamed Silver Creek Tributary, May 15, 2018	Illinois Route 47 – US 14 to Charles Rd., On-Alignment Alternative, June 07, 2018
Hydraulic Report, IL 47 (N. Seminary Ave.) over Silver Creek, May 15, 2018	Illinois Route 47 – Plan Profile, May 18, 2018
(DRAFT) Proposed Drainage Plan and Profile, IL 47, May 2018	

Cost Model

IDOT District 1

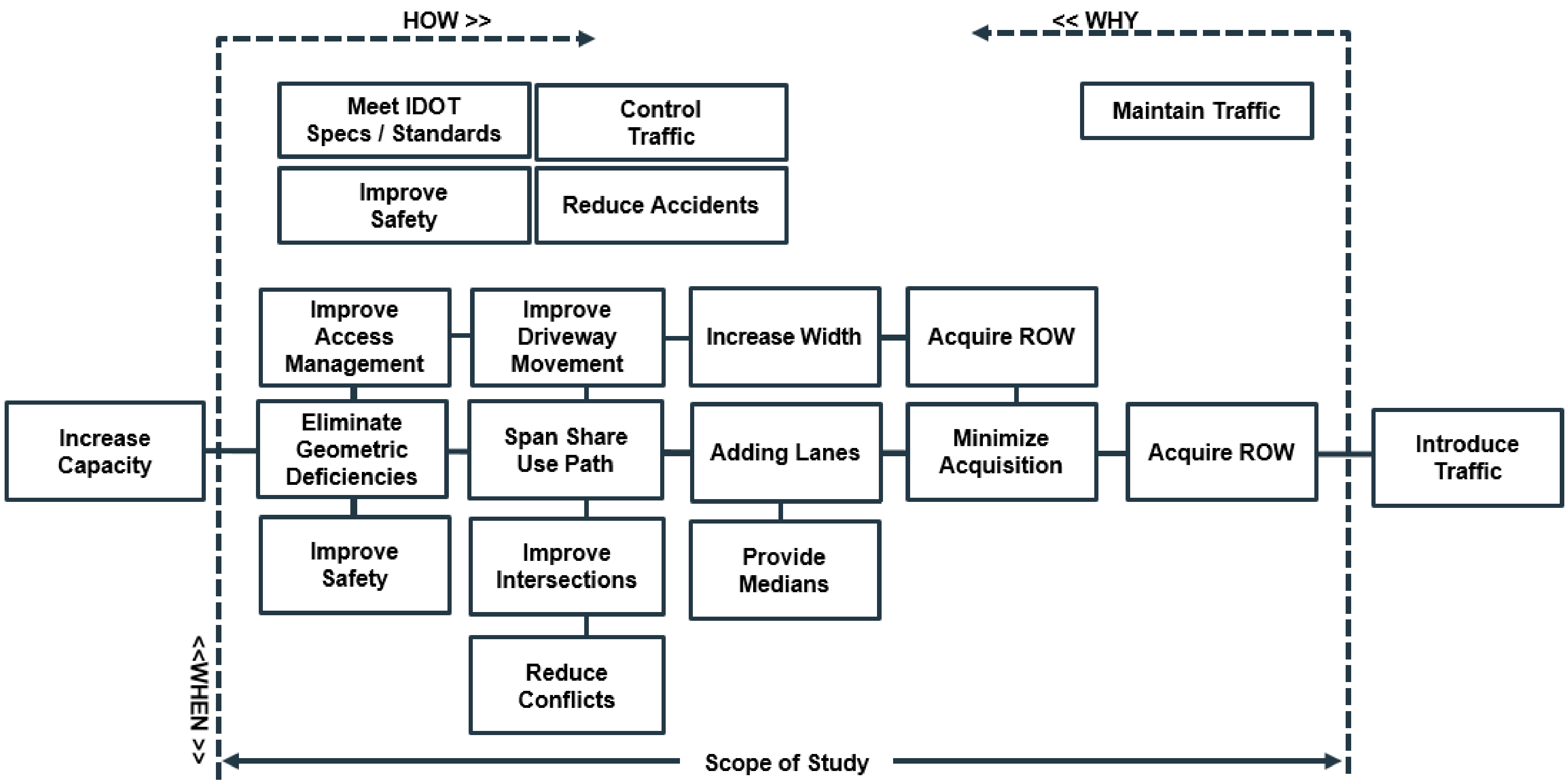
		Illinois Route 47 from US Route 14 to Charles Road		
Item	**Description**	**Cost**	**% of Total**	
A	3. Pavement	**$27,679,022**	**39.65%**	
B	7. Miscellaneous Items (signals, landscape, erosion control, lighting, etc.)	**$15,906,449**	**22.78%**	
C	2. Earthwork	**$13,105,354**	**18.77%**	**81.20%**
D	8. Transportation Management Plan Costs	**$6,631,264**	**9.50%**	
E	1. Clear and Grub (minor removals and demolition)	**$3,723,461**	**5.33%**	
F	6. Structures	**$1,784,229**	**2.56%**	
G	4. Grade Separations (Shared-Use Path Tunnel)	**$983,528**	**1.41%**	
	TOTAL PRELIMNARY COST ESTIMATE:	**$69,813,306.54**	**100.00%**	
	Items below not included			
	10. Contingencies(20% of Line 9)	$13,962,661.31		
	Total:	**$83,775,967.85**		



**Illinois Department of Transportation District 1 P-91-007-09*

FAST Diagram

Project: **IL47 From US Route 14 to Charles Road**	**Date**: September 17 – September 21, 2018
Location: McHenry County, Illinois IDOT District 1 Headquarters, Schaumburg, Illinois	



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Information Phase – Function Analysis

PROJECT: IL47 From US Route 14 to Charles Road	**FUNCTION:** Improve safety, reduce accidents, accommodate traffic, improve mobility

Item #	Description	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth / Save
A	**Pavement**	Establish Support Allow Shed	Grade Loads Construction Water	$27,679,022	39.65%	✓
B	**Miscellaneous Items (Signals, Landscape, erosion control, Lighting, etc.)**	Improve Display Provide Control Facilitate Prevent	Safety Information Direction Traffic Traffic Accidents	$15,906,449	22.78%	✓
C	**Earthwork**	Raise Accommodate Support Establish	Loads Typical Section Load Grade	$13,105,354	18.77%	X
D	**Transportation Management Plan Cost**	Allow Stage Protect Prevent Control	Construction Construction Public/Workers Accidents Traffic	$6,631,264	9.5%	✓
F	**Structures**	Convey Prevent Reduce Protect	Fluid Flooding Erosion Roadway/Residence	$38,680,000	7.15%	✓

Item #	Description	FUNCTION		INITIAL DOLLARS		
		Verb	Noun	Cost	% of Total	Worth / Save
F	**Structures (Continue)**	Support	Load			
G	**Share-Use Path Tunnel**	Span Support Move Provide Improve	Share Use Path Load Pedestrian Traffic Access Safety	$983,528	1.41%	✓

Creative / Judgement Phase

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
A. PAVEMENT				
1	Flexible Pavement Vs. Concrete Pavement	•	•	X
2	Permeable Pavers Vs. Flexible Pavement	•	•	X
3	Evaluate to reduce the bond breakers design	•	•	X
4	Different thickness for concrete pavement	• Reduce pavement materials. • Reduce concrete placement time. • Reduce pavement cost.	• Increase workers confusion. • Decrease earthwork and aggregate subgrade efficiency by increasing the complexity of the subbase cross slope • Increase production time.	X
5	Use Pavers on roundabout	•	•	X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
A. PAVEMENT continued				
6	Provide flexible pavement instead of concrete pavement for cross streets.	• The cost of the cross street pavement could be reduced since HMA is typically cheaper. • Reduce construction time. • Asphalt resurfacing can be cost-effective and extend the lifespan of the pavement where concrete needs to be replaced at the end of its life span.	• Higher life cycle cost • Potential rutting at intersection	✓
7	Reduce pavement thickness for left turn lanes at several locations	• Reduce pavement cost. • Reduce pavement materials. • Maximized the pavement design.	• Increase forming placement time.	X
8	Concrete Pavement for roundabout only	•	•	X
9	Reduce median openings by introducing raised grass median.	• Improve access management plan. • Reduce cost by replacement left turn pavement with raised grass median.	• Increase user time. • Decreases access for residents and businesses along Il 47	DS
10	Increase mountable median usage in-lieu of left turn lane in business areas.	• Do not detriment access management plan. • Reduce cost by replacement left turn pavement with mountable median.	• Median pavement will deteriorate quicker due to reduced thickness as compared to pavement.	X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
B. MISCELLANEOUS ITEMS (SIGNALS, LANDSCAPE, EROSION CONTROL, LIGHTING, etc.)				
1	Grass Vs. native plants	•	•	X
2	Use artificial turf within the median	•	•	X
3	Use recycle asphalt pavement (RAP) for median	•	•	X
4	Use permeable pavers for median	•	•	X
5	Use porous concrete for median	•	•	X
6	Add lighting	•	•	X
7	Minimize areas disturbed	•	•	X
8	Recommend utility relocations be identify early to reduce future conflicts	•	•	X
9	Evaluate lift station construction and schedule	•	•	X
10	Evaluate a contract for aerial poles relocation	•	•	X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
C. EARTHWORK				
1	@ Station 325+00 evaluate detention storage needs	•	•	X
2	Evaluate cut/fill along the corridor	•	•	X
3	Recycle the existing pavement for embankment and subgrade	• Eliminate the cost to dispose of the material offsite. • Eliminate the cost to purchase new subgrade material. • Sustainable	• Land needs to be available to stock pile the existing pavement and the crushed material after it has been recycled. This may require temporary construction easements.	X

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
D. TRANSPORTATION MANAGEMENT PLAN COST				
1	Provide middle turn lanes within the business areas only.	•	•	X
2	Stagger construction	•	•	X
3	Limit construction for 2-miles sections only	•	•	X
4	Identify roundabout MOT	•	•	X
5	Close side streets for roundabout construction	•	•	X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	CREATIVE IDEA	COMMENTS		IDEA RATING
		Advantages	Disadvantages	
E. RETAINING WALLS				
1	Use cast-in-place	•		X
2	Use MSE walls	•		X
3	Use block wall	•		X
4	Get temporary easement in lieu of walls	•		X
5	Use gabion basket wall	•		X
6	Use H-pile	•		X

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	CREATIVE IDEA	COMMENTS		IDEA RATING
		Advantages	Disadvantages	
F. STRUCTURES				
1	Culvert extension only	•		X
2	Use pre-cast elements	•		X
3	Evaluate size of culvert and optimize design	•		X
4	Build BMP catch basins	•		X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
G. GRADE SEPARATIONS (SHARE-USE PATH TUNNEL)				
1	Share-use path in the median	•	•	X
2	Eliminate the shared-use-path tunnel crossing the UPRR and maintain 5′ wide sidewalk at street level with fence separating traffic.	• Eliminate cost of boring underneath the railroad tracks and permitting. • Eliminate liability of boring underneath the railroad tracks. • Eliminate railroad flaggers. • Eliminate obtaining a permanent easement from the railroad which could reduce the time needed for ROW acquisition.	• The width of the multi-use path will be less than 10-feet.	✓
3	Relocate share-use path to Mc Connell Rd.	•		X
4	Maintain 5′shoulder at street level (under Bridge)	•		X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

CREATIVE PHASE Creative Idea Listing		JUDGMENT PHASE Idea Evaluation		
No.	**CREATIVE IDEA**	**COMMENTS**		**IDEA RATING**
		Advantages	**Disadvantages**	
G. GRADE SEPARATIONS (SHARE-USE PATH TUNNEL) continued				
5	Decrease the width of the shared path at the railroad tunnel	• Per the current concept, the temporary easement on the south side of the railroad is not large enough to accommodate the push pit. Therefore, the push pit needs to be relocated on the north side. • Increases constructability and material handling- The current concept of a 17' out to out diameter. • There is a reduction in cost reducing the pipe size from 17' to 14'.	• Decreases the width of the shared use path. Creates a non-uniform path.	✓
6	Use alternate material for the pedestrian tunnel (Steel, Concrete Box Culvert, etc.…)	• Smaller components can increase constructability for delivery, reduced size of equipment to move material and easier installation. • Expedite construction, simplify the installation	• Smaller components can increase time to install	DS
7	Build bridge over RR at Mc Connell	•	•	X
8	Build pedestrian bridge at Mc Connell	•	•	X
9	Build new bridge to accommodate full design	•	•	X

✓ = Recommendation being developed	X = Recommendation not being developed	DS = Design Suggestion

Response to Recommendations

The Value Engineering Study findings and recommendations have been reviewed by IDOT Phase I and the Prime consultant. We offer the following disposition for the recommendations and design suggestions:

Recommendation Number	Description	Potential Cost Savings	Potential Added Value
A-6	Provide flexible pavement instead of concrete pavement for cross streets	$240,000	

Disposition: This is an acceptable approach on some of the side streets. However, several side streets require concrete because of construction staging efficiencies. Southview Drive, South Street, St. John's Road, Greenwood Avenue, Russel Court, and Cooney Drive can all be constructed with hot mix asphalt (HMA), if desired. HMA is not recommended for Country Club Road as pavement rutting is anticipated due to the heavy truck traffic at this signalized intersection. HMA is not recommended at the roundabout intersections. However, beyond the limits of the approach median, HMA can be considered at the west leg of Lake Street, the west leg of Ware Road, and the east and west legs of Charles Road. This should be decided in Phase II for final design.

Value Engineering Comments: Implement where applicable; During phase II, a life cycle cost analysis shall be performed for each of the recommended intersections and/or roadways to determine feasibility of implementing flexible pavement. In addition, local coordination and concurrence will also be required for those qualifying intersections or roadways that are proposed to be switched to flexible pavement. The designer consultant needs to report a revised cost savings estimate for final implementation of this item.

Recommendation Number	Description	Potential Cost Savings	Potential Added Value
G-2	Eliminate shared-use path tunnel crossing the UPRR and maintain 5-foot-wide sidewalk at street level with fence separating traffic	$972,000	

Disposition: This would not be recommended. This would change RAB geometry and right-of-way acquisition at Lake Avenue and McConnell Road. The proposed alternative may cause possible problems with oversized loads traveling under the bridge. It may also require the acquisition of the Yamaha business in the southwest corner of the Illinois Route 47 and McConnell Avenue intersection or increased impacts on the business in the northeast corner of the intersection. The railroad bridge is already a perceived constriction by stakeholders. This alternative also does not provide 1.5 feet clear from face of curb and no room for guardrail, if desired.

Additionally, there were several roundabout geometric alternatives considered at the Lake Avenue intersection. Only the layout in the preferred alternative is able to accommodate traffic sufficiently and retain the Three Brother's Restaurant and the gas station at Lake Street. If the walk were to be located under the tunnel on the west side (instead of the east side as the VE study recommends) of Illinois Route 47, we would not be able to shift the IL 47 mainline back to the east.

Value Engineering Comments: Do not implement.

Recommendation Number	Description	Potential Cost Savings	Potential Added Value
G-5	Decrease width of shared-use path at railroad tunnel	$414,000 *	

Disposition: This is acceptable. Details shall be determined in Phase II during final design. Additionally, the Geometric Studies Unit recommended a 9-foot vertical clearance in the tunnel. A box culvert, if feasible, may readily accommodate these new dimensions.

Value Engineering Comments: Implement.

DESIGN SUGGESTIONS

In addition to the recommendations, there were five Design Suggestions that were considered.

A)-Pavement

A-9 Reduce the number of median openings.

Disposition: The VE Report recommended eliminating two of the four median openings north of Ware. The median openings were placed to meet median spacing criteria. If two median openings are removed, existing residents and business users will travel an additional 1,800 feet or more north or south to the next possible U-turn location. The median break locations were discussed in-depth with City officials, property/business owners, and presented at the Public Hearing. We believe the locations as currently shown should remain.

Value Engineering Comments: Do not implement.

B)-Miscellaneous Items (signals, landscape, erosion control, lighting, etc.)

B-1/4 Eliminate the use of grass (sod) in the median; use salt tolerant native plants and permeable pavers.

Disposition: The VE Report recommended native plantings and permeable pavers be used in the medians. This will add capital cost and reduce maintenance costs. This should be discussed with the City of Woodstock during Phase II design. The City previously mentioned adding landscaping to the median in the future.

Value Engineering Comments: Possible Implementation; During phase II, local coordination and concurrence will be required to determine if this implementation proposal is feasible. The designer consultant needs to report a revised cost savings estimate for final implementation of this item.

D)-Transportation Management Plan

D-5 Close side streets for roundabout construction.

Disposition: The TMP will include staging for roundabout construction. During Phase II potential detours could be evaluated and coordinated with the City.

Value Engineering Comments: Possible Implementation; During phase II, local coordination and concurrence will be required to determine if this implementation proposal is feasible.

F)-Structures

F-1 Use precast elements as much as possible.

Disposition: We concur with this and will include a statement with this recommendation in the Combined Design Report.

Value Engineering Comments: Implement.

G)-Share-Use Path Tunnel

G-6 Use alternative materials (box culvert).

Disposition: A detailed cost comparison can be done in Phase II to determine the most cost-effective and constructible size and approach.

Value Engineering Comments: Possible Implementation; During phase II, determine if this implementation proposal is feasible and coordinate approval with necessary entities. Designer consultant to report any cost saving estimates.

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