HYDRAULIC ANALYSIS SUMMARY REPORT
PIGG RIVER POWER DAM REMOVAL
FRANKLIN COUNTY, VA
AUGUST 27, 2015

PREPARED FOR:

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For Review

Mattern & Craig
ENGINEERS • SURVEYORS

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1. EXECUTIVE SUMMARY

The Friends of the Rivers of Virginia, Inc. (FORVA) and the U.S. Fish and Wildlife Service propose to remove the existing power dam situated on the Pigg River just upstream of the Virginia Route 713 (Power Dam Road) Bridge in Franklin County, VA. The project site is located within an area of the Pigg River that is determined to be within the Special Flood Hazard Area (SFHA) and the designated Floodway as delineated on Flood Insurance Rate Map (FIRM) Number 51067C0351C, dated December 16, 2008. As such, the project may require approvals from Division of Federal Insurance Administration – a division of Federal Emergency Management Agency (FEMA) and Franklin County (Floodplain Management Ordinance) for certain impacts to the floodplain and floodway.

Mattern & Craig has been commissioned to perform a hydraulic analysis that may be required during the permitting process for the partial removal of the dam. The hydraulic analysis (flood study) will determine impacts of the removal of the dam on the adopted Flood Insurance Rate Maps (FIRM). The hydraulic analysis may also be used by others to perform a sediment transport analysis to estimate the sediment transport modes and sediment loads downstream of the dam.

The results of the hydraulic analysis indicate that when comparing the results between an Existing Conditions Model and a Proposed Conditions Model, the removal of the Pigg River Dam did not result in an increase in the computed base flood elevation at the dam, the existing bridge locate just downstream of the dam, at cross sections located downstream of the dam and bridge, and at cross sections located immediately upstream of the dam.

The disposition of final permitting will be determined by the Franklin County Floodplain Manager and Zoning Administrator upon review of the finding of this report.

2. PROJECT DESCRIPTION / BACKGROUND

a. The project involves the controlled removal of an existing power dam (constructed in 1915) from the Pigg River with the goal of restoring approximately 2.2 miles of the Pigg River to its natural flow condition and regime. The project is a joint effort undertaken by the Friends of the Rivers of Virginia, Inc. (FORVA) and the U.S. Fish and Wildlife Service. The dam is situated on property currently owned by FORVA and is identified as Tax Parcel No. 0630020500 by the Franklin County tax records. Mattern & Craig has been commissioned to perform a hydraulic analysis that may be required during the permitting process for the partial removal of the dam. The hydraulic analysis (flood study) will determine impacts of the removal of the dam on the adopted Flood Insurance Rate Maps (FIRM). The hydraulic analysis may also be used by others to perform a sediment transport analysis to estimate the sediment transport modes and sediment loads downstream of the dam.

b. The project is located within an area of the Pigg River that is determined to be within the Special Flood Hazard Area (SFHA) and the designated Floodway as delineated on Flood Insurance Rate Map (FIRM) Number 51067C0351C, dated December 16, 2008. The Franklin County Floodplain Management Ordinance requires that "prior to any proposed alteration or relocation of any channel or floodway of any watercourse, stream or the like within the county, approval shall be obtained from the Division of Federal Insurance Administration" – a division of Federal Emergency Management Agency (FEMA). As such, it is understood that the controlled and partial removal of the dam will constitute an "alteration or relocation of any channel or floodway" and that a Conditional Letter of Map Revision (CLOMR) will be required from FEMA prior to approval of the project by Franklin County. It is

noted that most ordinances require the pursuit of a CLOMR when fill is place in the Floodway as this will tent to result in an increase in the base flood elevation.

c. It is also noted in the County's Floodplain Management Ordinance that "a permit shall be obtained from the U. S. Corps of Engineers, the Virginia Department of Environmental Quality, and the Virginia Marine Resources Commission."

3. DESCRIPTION OF PROPOSED ALTERATIONS

a. Dam removal will be conducted as illustrated in **Appendix A** – "Proposed Dam Removal."

4. DEVELOPMENT OF HYDRAULIC MODEL

a. The hydraulic model used in this analysis was obtained from the Federal Emergency Management Agency (FEMA) archives library. The original analysis was performed in 1978 and the model was provided as a scanned / microfiche print out of the input and output data from an original U.S. Army Corps of Engineers HEC-2 Model. It is noted that the effective Flood Insurance Study (FIS) for the areas is dated January 6, 2010. The FIS and the FIRM are both based on hydrologic and hydraulic analysis conducted in 1978.

b. Relevant sections of the HEC-2 Model data are provided in **Appendix B** for reference. Since the HEC-2 Water Surface Profiles program is no longer used by FEMA and other agencies involved in the development, review, and approval of hydraulic analysis, the model was converted to Version 4.1.0 of Hydraulic Engineering Center - River Analysis System (HEC-RAS). This

involved manually extracting relevant data from the print-outs and then entering the data into the HEC-RAS Model.

c. Duplicate Model - Once the data was entered into HEC-RAS the "Duplicate Model" was created. The Duplicate Model is simply a one-to-one replication of the data from the original HEC-2 model imported into HEC-RAS. Since HEC-2 and HEC-RAS model bridges in different manners, the HEC-RAS model was updated in the area of bridges. This mostly affected the area adjacent current Virginia Route 713 Bridge (located immediately downstream of the dam). The area of interest for this analysis was defined as beginning at the downstream terminus of the HEC-2 model at cross section 278800 and extending upstream to cross section 307538, just downstream of the US 220 Bypass Bridge. Model cross sections outside this range were deleted from the model and the model was truncated. All channel geometry, manning's n values, and encroachment stations were also duplicated from the HEC-2 model. Ineffective flow areas in the vicinity of the Route 713 Bridge were placed in accordance with standard HEC-RAS practice at a 1:1 ratio from the bridge opening. The existing power dam is represented as river cross sections 292695, 292700, 292715, 292730 and 292745.

d. Existing Conditions Model - Upon completion of the Duplicate Model, the "Existing Conditions" Model was developed. The Existing Conditions Model is created by updating the Duplicate Model with more accurate information at the vicinity of the dam, the Virginia Route 713 Bridge, and relevant upstream and downstream cross sections. A review of the HEC-2 model in the area of the Route 713 Bridge indicated it was based on a previous bridge and highway alignment. The Existing Conditions Model was updated to include the current Route 713 Bridge. The modeled bridge and highway geometry used in the Existing Conditions model is based on

bridge "as-built plans" (dated September 5, 1989) provided by VDOT, and available aerial survey / photography. Ineffective areas associated with the bridge were placed at a 1:1 ratio from the bridge opening in accordance with standard HEC-RAS modeling procedures. Since the bridge as-built plans were not prepared on the same vertical datum as the HEC-2 model data and neither the HEC-2 data nor the bridge plans were georeferenced, the bridge geometry was interpreted in the context of the available aerial survey topography and photography, and entered as a best-fit representation. This should not pose a concern for purposes of comparison between the Existing Conditions and Proposed Conditions Models as the bridge opening and geometry will be unchanged between the two models.

e. Proposed Conditions Model - The Existing Conditions Model was then modified to create the "Proposed Conditions" Model by incorporating the proposed removal of the power dam. The cross sections affected in the vicinity of the power dam included: cross sections 292695, 292700, 292715, 292730 and 292745.

f. Flow Data - The effective 2010 FIS includes peak discharge data for the area considered by this analysis. The data in the FIS varied slightly from the values used in the HEC-2 model analysis (i.e., 12,825 CFS reported in the FIS versus 12,824 CFS utilized in the HEC-2 model). For consistency with the HEC-2 model, the values from the HEC-2 model were utilized in the HEC-RAS analysis.

5. RESULTS OF ANALYSIS

a. General – the main purpose of this section is to present the results of the analysis, compare the results between the different models (i.e., Duplicate Condition, Existing Condition, Proposed Condition), and provide narrative on the results. The primary objective of this section is to demonstrate that the removal of the dam will not have negative impacts on upstream or downstream properties by increasing the base flood elevation.

b. Comparing Results to Base Flood Elevations in FIS - As anticipated, when comparing the original HEC-2 analysis, with HEC-RAS analysis, with the elevations published in the FIS there are notable differences in calculated water surface elevations (WSEL). These differences are attributable to the differences in vertical datum between the original HEC-2 Model and the FIS, as well as differences in computational methods between HEC-2 and HEC-RAS. When comparing the published WSEL from the published FIS to the HEC-RAS Duplicated Model at key cross sections the WSEL vary as shown in **Table 1** below.

Cross Section	Published WSEL (FIS)	Duplicate Model WSEL	Difference
295500	967.2	967.76	0.56
286850	945.8	946.43	0.63
280620	938.1	938.71	0.61

TABLE 1 – Base Flood Water Surface Elevation (WSEL) from FIS vs. Computed WSEL from Duplicate Model (HEC-RAS)

c. Existing Conditions Model – The results of the Existing Conditions Model are compared to the Duplicate Model in **Table 2** below. As shown, there are no changes in the WSEL when comparing the Duplicate Model with the Existing Conditions Model at key cross section. The Existing Conditions Model will be

used as the comparison model against the Proposed Conditions Model. The results for other intermediate cross sections are provided in **Appendix C**.

Cross Section	Duplicate Model WSEL	Existing Conditions WSEL	Difference
295500	967.76	967.76	0.00
286850	946.43	946.43	0.00
280620	938.71	938.71	0.00

TABLE 2 – Computed Base Flood Water Surface Elevation (WSEL) Duplicate Model vs. Existing Conditions Model

d. Proposed Conditions Model - The results of the Proposed Conditions Model are compared to the Existing Conditions Model in **Table 3** below. As shown, there are significant reductions in the computed water surface elevation at cross sections upstream of the removed dam (295500) and no increase in the computed water surface elevation at key cross sections downstream of the removed dam (280620 and 286850). The results for other intermediate cross sections are provided in **Appendix C**.

Cross Section	Existing Conditions WSEL	Proposed Conditions WSEL	Difference
295500	967.76	959.81	-7.95
286850	946.43	946.43	0.00
280620	938.71	938.71	0.00

TABLE 3 – Computed Base Flood Water Surface Elevation (WSEL) for Existing Conditions Model vs. Proposed Conditions Model

6. CONCLUSIONS

   a. Using standard hydraulic modeling procedures to develop and compare the results between an Existing Conditions Model and a Proposed Conditions Model, it was determined that the removal of the Pigg River Dam did not result in an increase in the computed base flood elevation at the dam, the existing bridge locate just downstream of the dam, at cross sections located downstream of the dam and bridge, and at cross sections located immediately upstream of the dam.

Appendix A

Proposed Dam Removal Exhibit

Appendix A – Proposed Dam Removal

POWER DAM PROPOSED MODIFICATION, Rocky Mount, Virginia. April 2013.
Configuration retains power house in place, maintains functional floodplain behind dam, and matches dimension of natural channel downstream. Staged cuts manage release of sediment behind dam. Modifications during construction may occur.

Appendix B

Relevant HEC-2 Data

DHT 8-2-78

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*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED  AUG  77
  ERROR CORR -  01,02
  MODIFICATION -  50,51,52,53
*************************************************
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PIGG R FLOODWAY
ROCKY MOUNT & FRANKLIN CO VA

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C       FRANKLIN CO  VA  FIS
T1      FRANKLIN CO  VA  FIS
T2      100 YR NATURAL
T3      PIGG RIVER NEAR ROCKY MT

J1  ICHECK    ING       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

      0.       4.        0.        0.  0.000000      0.00      0.0       0.   937.500     0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     1.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000    15.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    38.000     1.000     3.000    41.000    42.000     5.000    43.000     0.000    38.000     1.000

    53.000    21.000    22.000    54.000     4.000     0.000   200.000     0.000     0.000     0.000

NC      0.120     0.100     0.050     0.200     0.400     0.000     0.000     0.000     0.000     0.000
QT      6.000  5450.000 10400.000 13000.000 20100.000 13000.000 13000.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

                XXX  TOPO SEC FPG-1A

X1 278800.000    10.000   339.000   421.000     0.000     0.000     0.000     0.000     0.000     0.000
GR    940.000     0.000   929.600   339.000   914.200   357.000   912.900   367.000   912.100   377.000
GR    911.700   387.000   911.600   397.000   914.100   406.000   924.300   421.000   940.000   570.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

X1 278801.000     0.000     0.000     0.000     1.000     1.000     1.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

X1 278802.000     0.000     0.000     0.000     1.000     1.000     1.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

X1 278807.000     0.000     0.000     0.000     5.000     5.000     5.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

X1 278817.000     0.000     0.000     0.000    10.000    10.000    10.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   313.000   464.000     0.000     0.000

X1 278830.000     0.000     0.000     0.000    13.000    13.000    13.000     0.000     0.000     0.000
ET      0.000     0.000     0.000     0.000     0.000     7.100   990.000  1140.000     0.000     0.000
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XXX SURVEY SEC FPG-1 LOWER STUDY LIMIT

X1	280260.000	18.000	1000.000	1082.000	1430.000	1430.000	1430.000	0.000	0.000	0.000
GR	1020.000	830.000	1000.000	860.000	980.000	910.000	960.000	940.000	940.000	960.000
GR	931.400	1000.000	916.000	1018.000	914.700	1028.000	913.900	1038.000	913.500	1048.000
GR	913.400	1058.000	915.900	1067.000	926.100	1082.000	928.400	1097.000	926.700	1110.000
GR	933.900	1197.000	940.000	1210.000	960.000	1570.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	50.000	216.000	0.000	0.000

XXX SURVEY SEC FPG-2

X1	282890.000	11.000	144.000	210.000	2630.000	2630.000	2630.000	0.000	0.000	0.000
GR	945.600	0.000	937.500	38.000	930.300	144.000	919.700	154.000	918.200	164.000
GR	917.200	174.000	916.600	184.000	918.000	194.000	919.700	202.000	929.700	210.000
GR	947.100	224.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1034.000	1196.000	0.000	0.000

XXX SURVEY SEC FPG-3

X1	286850.000	15.000	1099.000	1194.000	3960.000	3960.000	3960.000	0.000	0.000	0.000
GR	950.000	780.000	943.300	1000.000	935.200	1087.000	936.500	1099.000	933.800	1111.000
GR	924.000	1117.000	923.100	1127.000	923.000	1137.000	922.200	1147.000	922.700	1157.000
GR	922.400	1167.000	924.000	1173.000	924.000	1186.000	944.700	1194.000	1000.000	1260.000
NC	0.110	0.070	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1082.000	1272.000	0.000	0.000

XXX SURVEY SEC FPG-4

X1	290620.000	16.000	1087.000	1156.000	3770.000	3770.000	3770.000	0.000	0.000	0.000
GR	960.000	820.000	949.500	1000.000	939.700	1077.000	935.400	1082.000	933.800	1087.000
GR	929.500	1092.000	927.600	1102.000	927.000	1112.000	928.300	1122.000	928.800	1132.000
GR	929.600	1136.000	933.100	1148.000	940.900	1156.000	943.200	1167.000	947.000	1341.000
GR	952.900	1368.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.070	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	100.000	308.000	0.000	0.000

XXX TOPO SEC FPG-4A

X1	292223.000	13.000	116.000	185.000	1603.000	1603.000	1603.000	0.000	0.000	0.000
GR	960.000	0.000	940.000	100.000	938.400	116.000	934.100	121.000	932.100	131.000
GR	931.600	141.000	932.900	151.000	933.400	161.000	934.200	165.000	937.700	177.000
GR	938.100	185.000	940.000	220.000	960.000	740.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	101.000	301.000	0.000	0.000

XXX VA 713 SURVEY SEC FPG-5

X1	292273.000	16.000	101.200	198.800	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	952.800	945.500	0.000
GR	960.000	0.000	955.600	20.000	951.900	26.000	953.400	28.000	953.200	34.000
GR	945.200	75.000	942.800	101.200	941.300	121.200	931.700	136.200	931.700	181.200
GR	938.300	186.200	939.000	198.800	940.000	220.000	947.200	408.000	948.800	508.000
GR	956.900	597.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.110	101.000	301.000	0.000	0.000
SB	0.000	1.180	2.500	0.000	59.000	0.000	1556.000	0.970	931.700	931.700

X1	292287.000	0.000	0.000	0.000	14.000	14.000	14.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	951.700	945.500	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	954.200	945.500	0.000
BT	15.000	0.000	960.000	0.000	20.000	955.600	0.000	26.000	951.900	0.000

Pigeon River

BT	954.200	0.000	101.200	954.200	951.400	198.800	954.500	951.700	198.800	954.500
BT	0.000	213.000	954.400	0.000	284.000	948.200	0.000	297.000	945.500	0.000
BT	508.000	948.800	0.000	597.000	956.900	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	72.000	277.000	0.000	0.000

X1	292337.000	18.000	151.000	241.000	50.000	50.000	50.000	0.000	-0.800	0.000
GR	958.600	0.000	949.200	34.000	943.300	123.000	941.100	129.000	943.800	141.000
GR	942.400	151.000	933.000	164.000	931.800	174.000	930.800	184.000	930.600	194.000
GR	933.100	210.000	934.900	237.000	943.100	241.000	947.300	259.000	946.700	305.000
GR	949.500	312.000	949.700	349.000	955.800	380.000	0.000	0.000	0.000	0.000
NC	0.100	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	67.000	285.000	0.000	0.000

XXX SURVEY SEC FPG-6

X1	292490.000	0.000	0.000	0.000	153.000	153.000	153.000	0.000	0.800	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	230.000	480.000	0.000	0.000

X1	292675.000	27.000	235.000	475.000	185.000	185.000	185.000	0.000	0.000	0.000
GR	976.100	0.000	960.600	27.000	961.800	31.000	963.100	58.000	960.600	106.000
GR	965.400	196.000	965.400	196.000	965.400	196.000	965.400	196.000	965.400	196.000
GR	961.700	218.000	954.900	235.000	944.800	300.000	943.400	310.000	934.000	323.000
GR	932.800	333.000	931.800	343.000	931.600	353.000	934.100	369.000	935.900	396.000
GR	944.100	400.000	948.300	418.000	957.100	475.000	958.300	511.000	972.400	544.000
GR	973.100	588.000	977.200	596.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	228.000	484.000	0.000	0.000

XXX DAM SURVEY SEC FPG-7

X1	292695.000	12.000	273.000	459.000	20.000	20.000	20.000	0.000	0.000	0.000
GR	976.100	0.000	960.600	27.000	961.800	31.000	963.100	58.000	960.600	106.000
GR	965.400	196.000	960.900	218.000	954.600	273.000	954.500	459.000	972.400	544.000
GR	973.100	588.000	977.200	596.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	228.000	484.000	0.000	0.000

X1	292700.000	0.000	0.000	0.000	5.000	5.000	5.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	225.000	485.000	0.000	0.000

X1	292715.000	0.000	0.000	0.000	15.000	15.000	15.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	225.000	485.000	0.000	0.000

X1	292730.000	0.000	0.000	0.000	15.000	15.000	15.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	225.000	485.000	0.000	0.000

X1	292745.000	0.000	0.000	0.000	15.000	15.000	15.000	0.000	0.000	0.000
NC	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	13.000	238.000	0.000	0.000

XXX SURVEY SEC FPG-8

X1	295500.000	16.000	23.000	137.000	3200.000	2680.000	2744.000	0.000	0.000	0.000
GR	971.000	0.000	957.000	23.000	954.600	51.000	952.600	53.000	948.700	61.000
GR	948.000	71.000	947.700	81.000	948.300	91.000	948.600	101.000	949.200	111.000
GR	952.100	121.000	954.600	135.000	958.000	137.000	956.400	195.000	957.800	273.000

GR	[illegible]	[illegible]	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GT	6.000	5375.000	10174.000	12824.000	19848.000	12824.000	12824.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	56.000	241.000	0.000	0.000

XXX SURVEY SEC FPG-9

X1	300110.000	16.000	158.000	238.000	4610.000	4610.000	4610.000	0.000	0.000	0.000
GR	974.900	0.000	957.200	94.000	961.500	141.000	959.000	158.000	954.600	159.000
GR	952.700	160.000	951.800	169.000	951.300	179.000	950.300	189.000	949.500	199.000
GR	950.500	209.000	950.500	219.000	954.600	229.000	960.500	238.000	959.600	255.000
GR	976.900	270.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1025.000	1230.000	0.000	0.000

XXX SURVEY SEC FPG-10

X1	304870.000	22.000	1031.000	1086.000	4760.000	4760.000	4760.000	0.000	0.000	0.000
GR	1000.000	950.000	980.000	980.000	980.000	980.000	980.000	980.000	980.000	980.000
GR	974.900	1000.000	962.900	1017.000	962.300	1031.000	955.300	1040.000	952.300	1043.000
GR	952.400	1050.000	952.900	1060.000	953.500	1070.000	952.700	1077.000	953.300	1080.000
GR	955.300	1086.000	962.100	1092.000	960.200	1190.000	967.600	1250.000	972.900	1337.000
GR	980.000	1400.000	985.000	1525.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.100	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1168.000	1368.000	0.000	0.000

X1	307538.000	18.000	1188.000	1243.000	2668.000	2668.000	2668.000	0.000	1.500	0.000
GR	1000.000	1050.000	980.000	1100.000	980.000	1100.000	980.000	1100.000	980.000	1100.000
GR	967.400	1145.000	964.800	1188.000	955.800	1193.000	955.100	1203.000	955.500	1213.000
GR	954.700	1223.000	953.800	1231.000	955.500	1233.000	955.700	1234.000	964.800	1243.000
GR	964.600	1378.000	978.900	1434.000	998.500	1520.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	105.000	233.000	0.000	0.000

XXX US 220 BYPASS SURVEY SEC FPG-11

X1	307588.000	11.000	58.000	262.000	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1001.000	995.000	0.000
GR	1020.000	0.000	1008.000	30.000	1001.000	47.000	998.300	58.000	997.800	68.000
GR	956.500	142.000	955.000	176.000	982.300	247.000	985.500	262.000	1000.000	510.000
GR	1004.700	538.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.110	105.000	233.000	0.000	0.000
SB	1.250	1.270	2.500	0.000	31.000	6.000	4627.000	2.110	955.700	955.700

X1	307792.000	0.000	0.000	0.000	204.000	204.000	204.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	999.600	997.700	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1004.000	997.800	0.000
BT	9.000	0.000	1020.000	0.000	30.000	1008.000	0.000	58.000	1004.000	0.000
BT	58.000	1004.000	999.600	194.000	1000.000	994.500	262.000	998.000	993.700	262.000
BT	998.000	0.000	302.000	999.700	0.000	538.000	1004.700	0.000	0.000	0.000
NC	0.090	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1069.000	1266.000	0.000	0.000

XXX SURVEY SEC FPG-12

X1	307830.000	18.000	1088.000	1143.000	38.000	38.000	38.000	0.000	0.000	0.000
GR	990.000	900.000	980.000	980.000	980.000	980.000	980.000	980.000	980.000	980.000
GR	967.400	1045.000	964.800	1088.000	955.800	1093.000	955.100	1103.000	955.500	1111.000
GR	954.700	1123.000	953.800	1131.000	955.500	1133.000	955.700	1134.000	964.800	1143.000
GR	964.600	1278.000	978.900	1334.000	1000.000	1380.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1067.000	1282.000	0.000	0.000

XXX SURVEY SEC FPG-13

X1	309640.000	21.000	1089.000	1178.000	2230.000	1660.000	1810.000	0.000	0.000	0.000
GR	1000.000	960.000	1000.000	960.000	1000.000	960.000	1000.000	960.000	1000.000	960.000
GR	978.400	1000.000	977.600	1009.000	971.400	1029.000	966.200	1089.000	960.400	1108.000
GR	958.600	1109.000	955.100	1119.000	955.500	1129.000	956.700	1139.000	958.600	1150.000
GR	960.300	1159.000	967.600	1178.000	965.800	1265.000	969.300	1306.000	980.800	1344.000
GR	1000.000	1350.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.100	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1010.000	1240.000	0.000	0.000

XXX SURVEY SEC FPG-14

X1	311920.000	18.000	1014.000	1150.000	1400.000	2600.000	2280.000	0.000	0.000	0.000
GR	1000.000	950.000	1000.000	950.000	1000.000	950.000	1000.000	950.000	1000.000	950.000
GR	981.600	1000.000	968.800	1014.000	960.900	1029.000	957.700	1032.000	957.900	1039.000
GR	958.000	1049.000	958.700	1059.000	960.900	1068.000	964.700	1076.000	971.600	1150.000
GR	970.300	1203.000	985.500	1548.000	1000.000	1570.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1010.000	1235.000	0.000	0.000

XXX TOPO SEC FPG-14A

X1	313000.000	15.000	1170.000	1229.000	1260.000	800.000	1080.000	0.000	0.000	0.000
GR	990.000	745.000	990.000	745.000	990.000	745.000	990.000	745.000	990.000	745.000
GR	980.000	1000.000	969.600	1170.000	961.200	1175.000	960.000	1185.000	959.000	1195.000
GR	959.500	1205.000	963.200	1221.000	974.100	1229.000	980.000	1250.000	1000.000	1340.000
NC	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1016.000	1175.000	0.000	0.000

XXX SURVEY SEC FPG-15

X1	314090.000	21.000	1038.000	1097.000	1000.000	1090.000	1090.000	0.000	0.000	0.000
GR	1000.000	990.000	1000.000	990.000	1000.000	990.000	1000.000	990.000	1000.000	990.000
GR	985.200	1000.000	975.500	1009.000	973.400	1022.000	971.900	1026.000	970.900	1038.000
GR	964.500	1043.000	961.300	1053.000	960.300	1063.000	960.800	1073.000	964.500	1089.000
GR	975.400	1097.000	974.000	1112.000	976.300	1124.000	984.800	1240.000	1000.000	1310.000
GR	1000.000	1390.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1021.000	1131.000	0.000	0.000

XXX SURVEY SEC FPG-16

X1	316660.000	22.000	1044.000	1128.000	2570.000	2570.000	2570.000	0.000	0.000	0.000
GR	1000.000	700.000	1000.000	700.000	1000.000	700.000	1000.000	700.000	1000.000	700.000
GR	988.200	1000.000	977.400	1018.000	977.700	1044.000	966.700	1058.000	964.200	1061.000
GR	964.600	1068.000	965.300	1078.000	966.300	1088.000	967.100	1098.000	966.400	1108.000
GR	966.700	1118.000	966.700	1124.000	974.600	1128.000	978.400	1136.000	982.400	1148.000
GR	988.400	1154.000	1000.000	1170.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1022.000	1190.000	0.000	0.000

XXX SURVEY SEC FPG-17

X1	318170.000	22.000	1106.000	1169.000	1440.000	1540.000	1510.000	0.000	0.000	0.000
GR	1000.000	900.000	1000.000	900.000	1000.000	900.000	1000.000	900.000	1000.000	900.000
GR	984.300	1000.000	981.600	1014.000	980.100	1085.000	978.100	1090.000	977.000	1106.000
GR	969.100	1116.000	968.500	1121.000	968.100	1131.000	967.300	1141.000	966.800	1148.000
GR	967.100	1151.000	968.500	1161.000	969.000	1163.000	975.900	1169.000	979.100	1190.000
GR	988.200	1230.000	1000.000	1280.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.035	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1021.000	1190.000	0.000	0.000

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X1 318226.000      0.000      0.000      0.000     75.000     25.000     56.000      0.000     -0.900      0.000
ET       0.000      0.000      0.000      0.000      0.000      7.100    389.000    554.000      0.000      0.000

                  XXX  US 220 BUS  SURVEY SEC FPG-18

X1 318276.000     30.000    389.000    559.000     50.000     50.000     50.000      0.000      0.000      0.000
X3      10.000      0.000      0.000      0.000      0.000      0.000      0.000    991.000    997.600      0.000
GR    1000.000    254.000   1000.000    254.000   1000.000    254.000   1000.000    254.000   1000.000    254.000
GR     991.000    300.000    981.700    348.000    980.900    389.000    979.400    404.000    976.300    414.000
GR     973.000    420.000    969.500    428.000    969.100    435.000    968.800    449.000    968.300    459.000
GR     966.700    469.000    966.500    475.000    966.300    483.000    965.300    489.000    966.200    499.000
GR     968.500    509.000    971.800    514.000    972.800    519.000    975.000    529.000    975.800    534.000
GR     983.800    539.000    984.000    544.000    987.500    559.000   1000.700    635.000   1021.900    699.000
ET       0.000      0.000      0.000      0.000      0.000      7.110    389.000    554.000      0.000      0.000

X1 318278.000     27.000    389.000    559.000      2.000      2.000      2.000      0.000      0.000      0.000
BT      29.000    254.000   1000.000      0.000    300.000    991.000      0.000    389.000    992.400      0.000
BT     389.000    992.400    988.000    404.000    992.700    989.900    414.000    993.000    988.600    420.000
BT     993.100    987.400    420.000    993.100    973.000    428.000    993.300    969.500    435.000    993.400
BT     976.000    449.000    993.700    983.600    459.000    994.000    987.000    469.000    994.200    989.100
BT     475.000    994.300    989.700    483.000    994.600    989.000    489.000    994.900    987.700    499.000
BT     995.300    984.000    509.000    995.700    979.000    514.000    995.900    975.500    519.000    996.000
BT     972.800    529.000    996.400    975.000    529.000    996.400    990.400    534.000    996.600    991.800
BT     539.000    996.800    993.200    544.000    997.000    994.000    559.000    997.600    993.300    559.000
BT     997.600      0.000    635.000   1000.700      0.000    699.000   1021.900      0.000      0.000      0.000
GR    1000.000    254.000    991.000    300.000    992.400    389.000    985.800    389.000    979.400    404.000
GR     976.300    414.000    973.000    420.000    969.500    428.000    969.100    435.000    968.800    449.000
GR     968.300    459.000    966.700    469.000    966.500    475.000    966.300    483.000    965.300    489.000
GR     966.200    499.000    968.500    509.000    971.800    514.000    972.800    519.000    975.000    529.000
GR     975.800    534.000    983.800    539.000    984.000    544.000    992.300    559.000    997.600    559.000
GR    1000.700    635.000   1021.900    699.000      0.000      0.000      0.000      0.000      0.000      0.000
ET       0.000      0.000      0.000      0.000      0.000      7.110    389.000    559.000      0.000      0.000

X1 318302.000      0.000      0.000      0.000     24.000     24.000     24.000      0.000      0.000      0.000
BT      29.000    254.000   1000.000      0.000    300.000    991.000      0.000    389.000    992.400      0.000
BT     389.000    992.400    988.000    404.000    992.700    989.900    414.000    993.000    988.600    420.000
BT     993.100    987.400    420.000    993.100    973.000    428.000    993.300    969.500    435.000    993.400
BT     976.000    449.000    993.700    983.600    459.000    994.000    987.000    469.000    994.200    989.100
BT     475.000    994.300    989.700    483.000    994.600    989.000    489.000    994.900    987.700    499.000
BT     995.300    984.000    509.000    995.700    979.000    514.000    995.900    975.500    519.000    996.000
BT     972.800    529.000    996.400    975.000    529.000    996.400    990.400    534.000    996.600    991.800
BT     539.000    996.800    993.200    544.000    997.000    994.000    559.000    997.600    993.300    559.000
BT     997.600      0.000    635.000   1000.700      0.000    699.000   1021.900      0.000      0.000      0.000
ET       0.000      0.000      0.000      0.000      0.000      7.100    389.000    559.000      0.000      0.000

X1 318304.000     26.000    389.000    559.000      2.000      2.000      2.000      0.000      0.100      0.000
X3      10.000      0.000      0.000      0.000      0.000      0.000      0.000    991.000    997.600      0.000
GR    1000.000    254.000    991.000    300.000    981.700    348.000    980.900    389.000    979.400    404.000
GR     976.300    414.000    973.000    420.000    969.500    428.000    969.100    435.000    968.800    449.000
GR     968.300    459.000    966.700    469.000    966.500    475.000    966.300    483.000    965.300    489.000
GR     966.200    499.000    968.500    509.000    971.800    514.000    972.800    519.000    975.000    529.000
GR     975.800    534.000    983.800    539.000    984.000    544.000    987.500    559.000   1000.700    635.000
GR    1021.900    699.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
NC       0.000      0.000      0.050      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET       0.000      0.000      0.000      0.000      0.000      7.100    389.000    559.000      0.000      0.000

X1 318354.000      0.000      0.000      0.000     50.000     50.000     50.000      0.000      0.300      0.000
QT       6.000   5050.000   9750.000  12200.000  19000.000  12200.000  12200.000      0.000      0.000      0.000
ET       0.000      0.000      0.000      0.000      0.000      7.100     30.000    196.000      0.000      0.000
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X1	318520.000	15.000	68.000	150.000	50.000	160.000	216.000	0.000	-1.400	0.000
GR	994.900	0.000	982.900	16.000	984.200	23.000	983.200	51.000	982.600	68.000
GR	970.700	84.000	968.100	94.000	967.800	104.000	969.500	114.000	971.600	124.000
GR	972.600	136.000	979.700	150.000	987.900	211.000	995.600	284.000	997.500	296.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	90.000	250.000	0.000	0.000

XXX TREATMENT PLANT DAM SURV SEC 184

X1	318570.000	14.000	173.000	234.000	50.000	50.000	50.000	0.000	0.000	0.000
GR	996.400	0.000	986.400	16.000	986.600	23.000	987.000	65.000	986.500	92.000
GR	987.000	96.000	981.700	142.000	977.500	157.000	977.200	172.000	973.300	173.000
GR	973.300	234.000	979.800	246.000	979.800	258.000	994.100	275.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	90.000	250.000	0.000	0.000

X1	318575.000	0.000	0.000	0.000	5.000	5.000	5.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	28.000	185.000	0.000	0.000

X1	318625.000	15.000	68.000	150.000	50.000	50.000	50.000	0.000	-1.000	0.000
GR	994.900	0.000	982.900	16.000	984.200	23.000	983.200	51.000	982.600	68.000
GR	970.700	84.000	968.100	94.000	967.800	104.000	969.500	114.000	971.600	124.000
GR	972.600	136.000	979.700	150.000	987.900	211.000	995.600	284.000	997.500	296.000
NC	0.080	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	23.000	196.000	0.000	0.000

XXX SURVEY SEC FPG-19

X1	318850.000	15.000	68.000	150.000	250.000	130.000	225.000	0.000	0.000	0.000
GR	994.900	0.000	982.900	16.000	984.200	23.000	983.200	51.000	982.600	68.000
GR	970.700	84.000	968.100	94.000	967.800	104.000	969.500	114.000	971.600	124.000
GR	972.600	136.000	979.700	150.000	987.900	211.000	995.600	284.000	997.500	296.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	27.000	225.000	0.000	0.000

XXX SURVEY SEC FPG-20

X1	321850.000	15.000	112.000	186.000	3100.000	3000.000	3000.000	0.000	0.000	0.000
GR	996.100	0.000	986.000	70.000	984.500	112.000	979.700	126.000	974.800	133.000
GR	974.200	143.000	973.700	153.000	973.800	163.000	973.100	173.000	975.200	182.000
GR	982.800	186.000	985.400	199.000	988.300	204.000	989.800	236.000	996.000	260.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	498.000	860.000	0.000	0.000

XXX TOPO SEC FPG-20A

X1	323000.000	16.000	771.000	850.000	1170.000	1180.000	1150.000	0.000	0.000	0.000
GR	1040.000	0.000	1020.000	80.000	1000.000	180.000	980.000	740.000	981.100	771.000
GR	976.200	784.000	975.600	794.000	975.100	804.000	975.200	814.000	974.500	824.000
GR	976.600	833.000	980.000	850.000	1000.000	870.000	1020.000	920.000	1040.000	990.000
GR	1060.000	1230.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	192.000	1000.000	0.000	0.000

XXX TOPO SEC FPG-20B

X1	324400.000	16.000	209.000	262.000	1100.000	520.000	1400.000	0.000	0.000	0.000
GR	1060.000	0.000	1040.000	40.000	1020.000	80.000	1000.000	110.000	980.000	190.000
GR	978.200	209.000	976.900	219.000	976.700	229.000	976.900	239.000	976.300	249.000
GR	977.600	259.000	979.000	262.000	980.000	310.000	1000.000	1290.000	1020.000	1380.000
GR	1040.000	1870.000	0.000	[illegible]	[illegible]	[illegible]	0.000	0.000	0.000	0.000
NC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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ET      0.000      0.000      0.000      0.000      0.000      7.100    470.000    681.000      0.000      0.000

                XXX  TOPO SEC FPG-20C

X1 325800.000     15.000    575.000    628.000   1950.000    500.000   1400.000      0.000      0.000      0.000
GR   1040.000      0.000   1020.000    120.000   1000.000    430.000    980.000    550.000    980.200    575.000
GR    978.100    585.000    978.200    595.000    978.600    605.000    978.300    615.000    978.500    626.000
GR    979.000    628.000    980.000    660.000   1000.000    730.000   1020.000    800.000   1040.000    840.000
NC      0.000      0.120      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100     35.000    180.000      0.000      0.000

                XXX  SURV SEC FPG-21

X1 326940.000     13.000    106.000    171.000   1070.000   1220.000   1140.000      0.000      0.000      0.000
GR   1003.100      0.000    994.800     41.000    989.500    106.000    981.600    113.000    979.500    123.000
GR    979.600    133.000    980.000    143.000    979.700    153.000    979.900    164.000    990.900    171.000
GR    994.100    184.000    993.700    193.000   1004.400    236.000      0.000      0.000      0.000      0.000
DT      6.000   4960.000   9592.000  12019.000  18729.000  12019.000  12019.000      0.000      0.000      0.000
NC      0.100      0.100      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100     19.000    189.000      0.000      0.000

                XXX  SURV SEC FPG-22

X1 330560.000     12.000     23.000     96.000   3470.000   3650.000   3620.000      0.000      0.000      0.000
GR   1011.200      0.000    999.100     14.000    998.000     23.000    986.700     47.000    985.500     57.000
GR    985.200     67.000    985.100     77.000    983.800     87.000    986.900     87.000    997.400     96.000
GR   1001.900    280.000   1010.300    314.000      0.000      0.000      0.000      0.000      0.000      0.000
NC      0.070      0.120      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100     20.000    168.000      0.000      0.000

                XXX  SURV SEC FPG-23

X1 334660.000     12.000    107.000    163.000   4100.000   4100.000   4100.000      0.000      0.000      0.000
GR   1015.400      0.000   1002.000     79.000   1003.800     88.000   1000.000    107.000    991.400    114.000
GR    990.300    124.000    989.400    134.000    988.700    141.000    989.400    144.000    991.400    154.000
GR   1000.000    163.000   1015.900    181.000      0.000      0.000      0.000      0.000      0.000      0.000
NC      0.100      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100     27.000    189.000      0.000      0.000

                XXX  SURV SEC FPG-24

X1 338230.000     14.000     28.000     87.000   3430.000   3140.000   3570.000      0.000      0.000      0.000
GR   1021.700      0.000   1006.900     23.000   1003.200     28.000    997.000     29.000    996.700     39.000
GR    996.700     49.000    996.300     59.000    995.800     69.000    995.200     79.000    997.600     79.000
GR   1004.600     87.000   1010.600    109.000   1013.000    213.000   1022.600    280.000      0.000      0.000
NC      0.080      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100    160.000    336.000      0.000      0.000

                XXX  TOPO SEC FPG-24A

X1 340900.000     16.000    270.000    329.000   2625.000   2550.000   2670.000      0.000      0.000      0.000
GR   1040.000      0.000   1020.000    150.000   1007.700    270.000   1001.500    271.000   1001.200    281.000
GR   1001.200    291.000   1000.800    301.000   1000.300    311.000    999.700    321.000   1002.100    321.000
GR   1004.600    329.000   1020.000    350.000   1040.000    370.000   1060.000    380.000   1080.000    400.000
GR   1100.000    430.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
NC      0.000      0.080      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      0.000      0.000      0.000      7.100     90.000    394.000      0.000      0.000
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XXX SURV SEC FPG-25

X1	344080.000	16.000	130.000	237.000	3025.000	3300.000	3180.000	0.000	0.000	0.000
GR	1027.300	0.000	1016.900	12.000	1014.600	45.000	1017.200	130.000	1007.600	154.000
GR	1005.900	164.000	1006.200	174.000	1006.300	184.000	1005.800	194.000	1005.400	197.000
GR	1005.400	204.000	1006.600	206.000	1008.500	208.000	1015.500	237.000	1015.000	448.000
GR	1027.100	516.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	9.100	9.100	9.100	0.000	7.100	84.000	284.000	84.000	284.000

X1	344338.000	0.000	0.000	0.000	258.000	258.000	258.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	429.000	549.000	0.000	0.000

XXX VA 754 SURV SEC FPG-25A

X1	344388.000	17.000	429.000	549.200	50.000	50.000	50.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1025.100	1025.300	0.000
GR	1027.500	175.000	1025.900	219.000	1026.000	305.000	1016.900	311.000	1014.600	344.000
GR	1017.200	429.000	1010.800	429.100	1013.200	444.000	1008.500	454.000	1005.300	514.000
GR	1012.200	529.000	1011.200	544.000	1010.700	549.000	1015.700	549.200	1015.000	747.000
GR	1031.900	848.000	1032.200	859.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.110	429.000	549.000	0.000	0.000
SB	1.050	1.330	2.500	0.000	67.000	7.200	1817.000	1.290	1005.400	1005.400

X1	344412.000	0.000	0.000	0.000	24.000	24.000	24.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	1024.400	1026.000	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1026.000	1026.100	0.000
BT	12.000	0.000	1034.000	0.000	219.000	1025.900	0.000	429.000	1026.000	0.000
BT	429.000	1026.000	1024.300	463.000	1026.000	1024.400	463.000	1026.000	1024.000	515.000
BT	1026.100	1023.900	515.000	1026.100	1024.400	549.200	1026.100	1024.400	549.200	1026.100
BT	0.000	687.000	1026.700	0.000	859.000	1032.200	0.000	0.000	0.000	0.000
ET	0.000	9.100	9.100	9.100	7.100	0.000	195.000	915.000	455.000	655.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	455.000	655.000	0.000	0.000

X1	344462.000	13.000	526.000	584.000	50.000	50.000	50.000	0.000	0.100	0.000
GR	1031.100	0.000	1026.500	83.000	1017.200	239.000	1017.900	512.000	1014.900	526.000
GR	1007.800	542.000	1005.700	552.000	1005.600	562.000	1005.400	572.000	1006.500	582.000
GR	1014.500	584.000	1016.600	1000.000	1029.900	1100.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	9.100	9.100	9.100	7.100	0.000	160.000	950.000	355.000	755.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	434.000	706.000	0.000	0.000

XXX SURV SEC FPG-25B

X1	344520.000	0.000	0.000	0.000	58.000	58.000	58.000	0.000	-0.100	0.000
ET	0.000	9.100	9.100	9.100	9.100	7.100	422.000	758.000	350.000	800.000

XXX BELOW CONFLUENCE STORY CREEK

X1	345324.000	0.000	0.000	0.000	804.000	804.000	804.000	0.000	1.600	0.000
QT	6.000	4050.000	8000.000	10000.000	16000.000	10000.000	10000.000	0.000	0.000	0.000
NC	0.000	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	9.100	9.100	9.100	9.100	7.100	422.000	758.000	350.000	800.000

XXX ABOVE CONFLUENCE STORY CREEK

X1	345325.000	0.000	0.000	0.000	1.000	1.000	1.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	64.000	211.000	0.000	0.000

2.

XXX TRANSFERRED SEC FPG-26A

X1	345950.000	17.000	133.000	196.000	625.000	625.000	625.000	0.000	-1.300	0.000
GR	1033.800	0.000	1029.700	33.000	1021.300	114.000	1022.200	128.000	1019.200	133.000
GR	1010.600	135.000	1009.800	140.000	1010.400	150.000	1010.300	160.000	1010.500	170.000
GR	1009.600	180.000	1011.800	180.000	1016.000	184.000	1020.600	196.000	1022.100	215.000
GR	1032.700	234.000	1040.000	290.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	72.000	204.000	0.000	0.000

XXX SURV SEC FPG-26

X1	346590.000	17.000	133.000	196.000	640.000	640.000	640.000	0.000	0.000	0.000
GR	1033.800	0.000	1029.700	33.000	1021.300	114.000	1022.200	128.000	1019.200	133.000
GR	1010.600	135.000	1009.800	140.000	1010.400	150.000	1010.300	160.000	1010.500	170.000
GR	1009.600	180.000	1011.800	180.000	1016.000	184.000	1020.600	196.000	1022.100	215.000
GR	1032.700	234.000	1040.000	290.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.100	0.100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	1010.000	1129.000	0.000	0.000

XXX SURV SEC FPG-27

X1	349180.000	16.000	1013.000	1057.000	2590.000	2640.000	2590.000	0.000	0.000	0.000
GR	1060.000	950.000	1040.000	970.000	1040.000	970.000	1040.000	970.000	1040.000	970.000
GR	1034.400	1000.000	1024.100	1013.000	1016.200	1023.000	1011.500	1033.000	1014.200	1043.000
GR	1016.200	1046.000	1024.600	1057.000	1027.700	1079.000	1029.300	1125.000	1036.400	1174.000
GR	1060.000	1230.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QT	6.000	4022.000	7944.000	9944.000	15775.000	9944.000	9944.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	190.000	325.000	0.000	0.000

XXX TOPO SEC FPG-27A

X1	350830.000	12.000	228.000	272.000	1650.000	1650.000	1650.000	0.000	0.000	0.000
GR	1080.000	0.000	1060.000	70.000	1040.000	140.000	1030.100	228.000	1021.700	238.000
GR	1017.000	248.000	1019.700	258.000	1021.700	261.000	1030.100	272.000	1040.000	370.000
GR	1060.000	420.000	1080.000	450.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.120	0.120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	148.000	254.000	0.000	0.000

XXX TOPO SEC FPG-27B

X1	352330.000	16.000	162.000	218.000	1560.000	1300.000	1500.000	0.000	0.000	0.000
GR	1100.000	0.000	1080.000	50.000	1060.000	90.000	1040.000	120.000	1031.500	162.000
GR	1024.200	167.000	1023.400	177.000	1022.600	187.000	1023.400	197.000	1021.900	207.000
GR	1023.700	215.000	1029.400	218.000	1040.000	270.000	1060.000	880.000	1080.000	1000.000
GR	1100.000	1100.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.080	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	29.000	134.000	0.000	0.000

XXX SURV SEC FPG-28

X1	353350.000	11.000	63.000	119.000	1020.000	870.000	1020.000	0.000	0.000	0.000
GR	1051.000	0.000	1035.000	50.000	1034.900	63.000	1027.600	68.000	1026.800	78.000
GR	1026.000	88.000	1026.800	98.000	1025.300	108.000	1027.100	116.000	1032.800	119.000
GR	1052.900	154.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	7.100	182.000	296.000	0.000	0.000

XXX SURV SEC FPG-29

X1	354980.000	15.000	190.000	248.000	1560.000	1800.000	1630.000	0.000	0.000	0.000
GR	1054.500	0.000	1050.100	113.000	1041.300	[illegible]	1036.500	[illegible]	1035.000	180.000

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GR   1032
GR   1037.600   244.000   1040.500   248.000   1043.900   360.000   1048.600   386.000   1052.200   492.000
NC      0.000     0.100      0.040     0.000      0.000     0.000      0.000     0.000      0.000     0.000
ET      0.000     0.000      0.000     0.000      0.000     7.100    180.000   314.000      0.000     0.000

X1 355027.000     0.000      0.000     0.000     47.000    47.000     47.000     0.000      0.200     0.000
ET      0.000     0.000      0.000     0.000      0.000     7.100   1227.000  1351.000      0.000     0.000

                XXX  VA 40  SURV SEC FPG-30

X1 355077.000    11.000   1227.000  1351.000     50.000    50.000     50.000     0.000      0.000     0.000
X3     10.000     0.000      0.000     0.000      0.000     0.000      0.000  1050.000   1050.000     0.000
GR   1054.700  1070.000   1050.300  1187.000   1049.000  1222.000   1046.600  1227.000   1031.500  1267.000
GR   1032.200  1302.000   1039.200  1312.000   1037.200  1327.000   1046.000  1351.000   1048.800  1456.000
GR   1052.400  1562.000      0.000     0.000      0.000     0.000      0.000     0.000      0.000     0.000
ET      0.000     0.000      0.000     0.000      0.000     7.110   1227.000  1351.000      0.000     0.000
SB      1.250     1.740      2.500     0.000     39.000     5.200   1314.000     2.490   1031.500  1031.500

X1 355103.000    15.000   1227.000  1351.000     26.000    26.000     26.000     0.000      0.000     0.000
X2      0.000     0.000      1.000  1048.000   1052.100     0.000      0.000     0.000      0.000     0.000
X3     10.000     0.000      0.000     0.000      0.000     0.000      0.000  1052.100   1052.600     0.000
BT      8.000   980.000   1063.000     0.000   1000.000  1062.100      0.000  1227.000   1052.100     0.000
BT   1227.000  1052.100   1047.500  1351.000   1052.600  1048.000   1351.000  1052.600      0.000  1469.000
BT   1054.700     0.000   1498.000  1061.200      0.000     0.000      0.000     0.000      0.000     0.000
GR   1063.000   980.000   1057.500  1050.000   1047.000  1184.000   1049.900  1194.000   1050.000  1213.000
GR   1049.000  1222.000   1046.600  1227.000   1031.500  1267.000   1032.200  1302.000   1039.200  1312.000
GR   1037.200  1327.000   1046.000  1351.000   1048.700  1443.000   1054.700  1469.000   1061.200  1498.000
NC      0.000     0.070      0.050     0.000      0.000     0.000      0.000     0.000      0.000     0.000
ET      0.000     0.000      0.000     0.000      0.000     7.100    123.000   370.000      0.000     0.000

X1 355153.000    16.000    212.000   266.000     50.000    50.000     50.000     0.000      0.300     0.000
GR   1056.700     0.000   1046.200   134.000   1049.100   144.000   1049.200   163.000   1046.200   191.000
GR   1041.900   199.000   1040.200   212.000   1032.600   218.000   1030.800   228.000   1031.000   238.000
GR   1030.700   248.000   1031.200   258.000   1032.800   262.000   1039.300   266.000   1048.000   393.000
GR   1060.400   448.000      0.000     0.000      0.000     0.000      0.000     0.000      0.000     0.000
ET      0.000     0.000      0.000     0.000      0.000     7.100    137.000   370.000      0.000     0.000

                XXX  SURV SEC FPG-31

X1 355190.000     0.000      0.000     0.000     37.000    37.000     37.000     0.000     -0.300     0.000
EJ      0.000     0.000      0.000     0.000      0.000     0.000      0.000     0.000      0.000     0.000
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  HEC2 RELEASE DATED NOV 76 UPDATED  AUG  77
  ERROR CORR -  01,02
  MODIFICATION -  50,51,52,53
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T1      FRANKLIN CO., VA  FIS
T2      100 YR FLOODWAY
T3      PIGG RIVER NEAR ROCKY MT

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ

       0.        6.        0.        0.  0.000000      0.00       0.0        0.   938.300     0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

     15.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000    15.000
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Appendix C

HEC-RAS Input and Output Data

For Review

Appendix C-1

HEC-RAS Summary Output Table for Existing & Proposed Conditions Model

For Review

HEC-RAS Locations: User Defined Profile: PF 3

River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Pigg River	Reach 1	295500	PF 3	ExistingCond	13000.00	947.70	967.76		968.14	0.000847	5.47	3627.86	309.89	0.24
Pigg River	Reach 1	295500	PF 3	Proposed	13000.00	947.70	959.81	959.07	962.06	0.010585	12.46	1349.81	263.15	0.75
Pigg River	Reach 1	292745	PF 3	ExistingCond	13000.00	954.50	961.64		962.85	0.006951	9.15	1678.64	323.32	0.61
Pigg River	Reach 1	292745	PF 3	Proposed	13000.00	932.60	953.54		953.99	0.001197	5.39	2413.31	183.97	0.26
Pigg River	Reach 1	292730	PF 3	ExistingCond	13000.00	954.50	961.42		962.73	0.007762	9.46	1609.35	311.83	0.64
Pigg River	Reach 1	292730	PF 3	Proposed	13000.00	932.60	953.52		953.97	0.001203	5.39	2409.72	183.93	0.26
Pigg River	Reach 1	292715	PF 3	ExistingCond	13000.00	954.50	961.14		962.57	0.008981	9.90	1524.20	297.10	0.68
Pigg River	Reach 1	292715	PF 3	Proposed	13000.00	932.60	953.50		953.95	0.001208	5.40	2406.12	183.89	0.26
Pigg River	Reach 1	292700	PF 3	ExistingCond	13000.00	954.50	960.71	959.72	962.37	0.011368	10.65	1400.95	273.65	0.76
Pigg River	Reach 1	292700	PF 3	Proposed	13000.00	932.60	953.48		953.94	0.001214	5.41	2402.50	183.85	0.26
Pigg River	Reach 1	292695	PF 3	ExistingCond	13000.00	954.50	959.74	959.74	962.15	0.020547	12.77	1145.70	255.75	0.99
Pigg River	Reach 1	292695	PF 3	Proposed	13000.00	932.60	953.47		953.93	0.001216	5.41	2401.26	183.84	0.26
Pigg River	Reach 1	292675	PF 3	ExistingCond	13000.00	931.60	953.36		953.89	0.001699	5.82	2235.23	205.89	0.31
Pigg River	Reach 1	292675	PF 3	Proposed	13000.00	931.60	953.36		953.89	0.001699	5.82	2235.23	205.89	0.31
Pigg River	Reach 1	292601	PF 3	ExistingCond	13000.00	931.50	953.50	939.10	953.69	0.000347	3.57	3639.21	212.28	0.15
Pigg River	Reach 1	292601	PF 3	Proposed	13000.00	931.50	953.50	939.10	953.69	0.000347	3.57	3639.21	212.28	0.15
Pigg River	Reach 1	292580.5			Bridge									
Pigg River	Reach 1	292490	PF 3	ExistingCond	13000.00	931.40	952.49	942.98	953.12	0.001248	6.83	2828.21	334.11	0.28
Pigg River	Reach 1	292490	PF 3	Proposed	13000.00	931.40	952.49	942.98	953.12	0.001248	6.83	2828.21	334.11	0.28
Pigg River	Reach 1	292337	PF 3	ExistingCond	13000.00	930.60	952.36		952.91	0.001062	6.45	3054.14	339.94	0.26
Pigg River	Reach 1	292337	PF 3	Proposed	13000.00	930.60	952.36		952.91	0.001062	6.45	3054.14	339.94	0.26
Pigg River	Reach 1	292287	PF 3	ExistingCond	13000.00	931.70	952.47		952.76	0.000777	5.23	4464.38	512.23	0.22
Pigg River	Reach 1	292287	PF 3	Proposed	13000.00	931.70	952.47		952.76	0.000777	5.23	4464.38	512.23	0.22
Pigg River	Reach 1	292273	PF 3	ExistingCond	13000.00	931.70	952.46		952.75	0.000780	5.23	4458.32	512.00	0.22
Pigg River	Reach 1	292273	PF 3	Proposed	13000.00	931.70	952.46		952.75	0.000780	5.23	4458.32	512.00	0.22
Pigg River	Reach 1	292223	PF 3	ExistingCond	13000.00	931.60	952.34		952.70	0.000906	6.05	4293.23	502.58	0.25
Pigg River	Reach 1	292223	PF 3	Proposed	13000.00	931.60	952.34		952.70	0.000906	6.05	4293.23	502.58	0.25
Pigg River	Reach 1	290620	PF 3	ExistingCond	13000.00	927.00	950.38		951.01	0.001153	7.15	3039.66	371.55	0.28
Pigg River	Reach 1	290620	PF 3	Proposed	13000.00	927.00	950.38		951.01	0.001153	7.15	3039.66	371.55	0.28
Pigg River	Reach 1	286850	PF 3	ExistingCond	13000.00	922.20	946.43		946.96	0.000983	6.13	2860.79	298.71	0.24
Pigg River	Reach 1	286850	PF 3	Proposed	13000.00	922.20	946.43		946.96	0.000983	6.13	2860.79	298.71	0.24

HEC-RAS Locations: User Defined Profile: PF 3 (Continued)

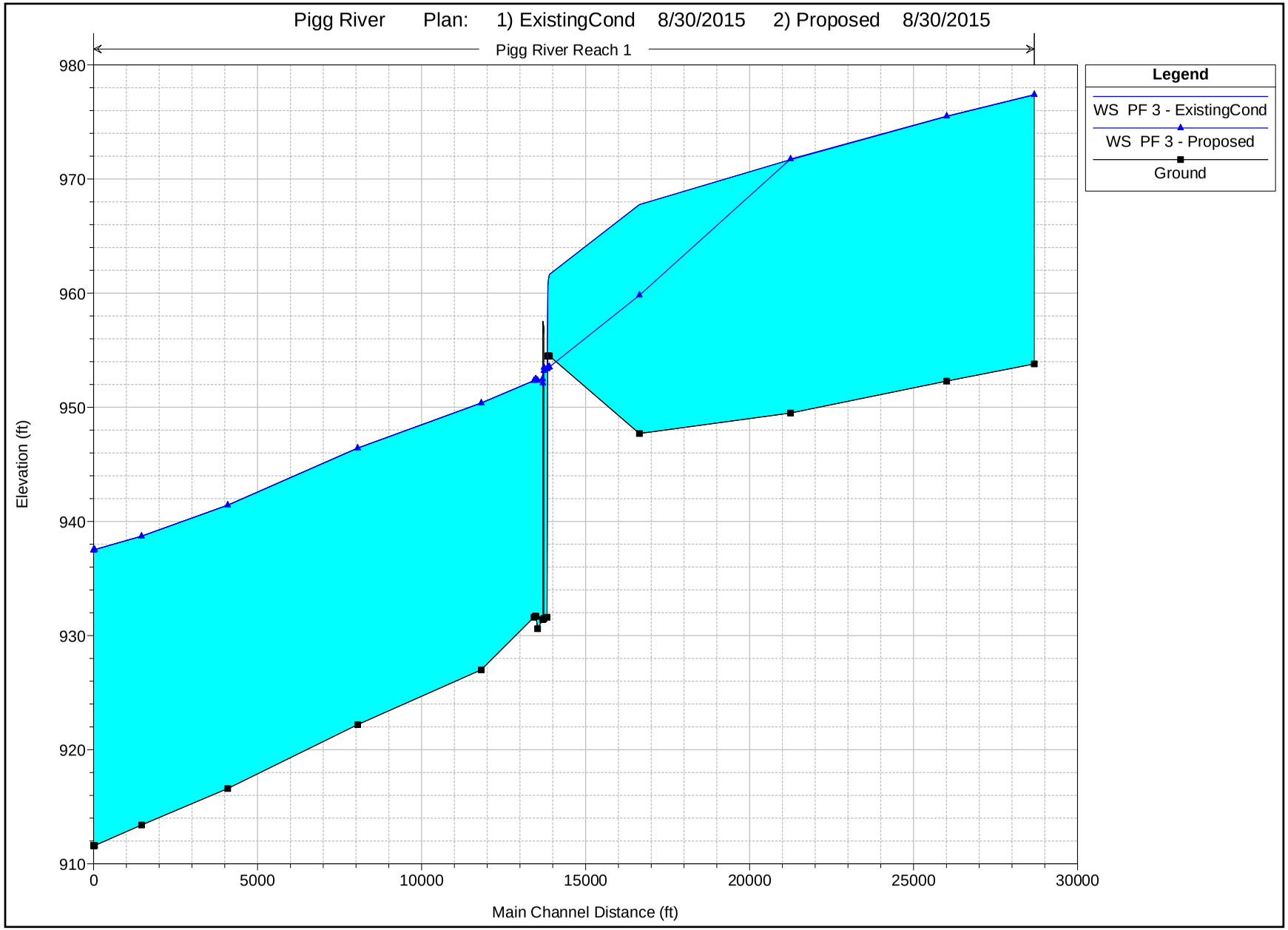
River	Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
					(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Pigg River	Reach 1	282890	PF 3	ExistingCond	13000.00	916.60	941.42		942.27	0.001414	7.91	2313.90	199.52	0.30
Pigg River	Reach 1	282890	PF 3	Proposed	13000.00	916.60	941.42		942.27	0.001414	7.91	2313.90	199.52	0.30
Pigg River	Reach 1	280260	PF 3	ExistingCond	13000.00	913.40	938.71		939.23	0.000888	6.30	2929.98	241.24	0.24
Pigg River	Reach 1	280260	PF 3	Proposed	13000.00	913.40	938.71		939.23	0.000888	6.30	2929.98	241.24	0.24
Pigg River	Reach 1	278830	PF 3	ExistingCond	13000.00	911.60	937.53		938.01	0.000801	6.10	3637.51	465.90	0.23
Pigg River	Reach 1	278830	PF 3	Proposed	13000.00	911.60	937.53		938.01	0.000801	6.10	3637.51	465.90	0.23
Pigg River	Reach 1	278817	PF 3	ExistingCond	13000.00	911.60	937.52		938.00	0.000803	6.10	3632.14	465.42	0.23
Pigg River	Reach 1	278817	PF 3	Proposed	13000.00	911.60	937.52		938.00	0.000803	6.10	3632.14	465.42	0.23
Pigg River	Reach 1	278807	PF 3	ExistingCond	13000.00	911.60	937.51		938.00	0.000804	6.11	3627.99	465.04	0.23
Pigg River	Reach 1	278807	PF 3	Proposed	13000.00	911.60	937.51		938.00	0.000804	6.11	3627.99	465.04	0.23
Pigg River	Reach 1	278802	PF 3	ExistingCond	13000.00	911.60	937.50		937.99	0.000805	6.11	3625.92	464.86	0.23
Pigg River	Reach 1	278802	PF 3	Proposed	13000.00	911.60	937.50		937.99	0.000805	6.11	3625.92	464.86	0.23
Pigg River	Reach 1	278801	PF 3	ExistingCond	13000.00	911.60	937.50		937.99	0.000805	6.11	3625.52	464.82	0.23
Pigg River	Reach 1	278801	PF 3	Proposed	13000.00	911.60	937.50		937.99	0.000805	6.11	3625.52	464.82	0.23
Pigg River	Reach 1	278800	PF 3	ExistingCond	13000.00	911.60	937.50	924.57	937.99	0.000805	6.11	3625.13	464.78	0.23
Pigg River	Reach 1	278800	PF 3	Proposed	13000.00	911.60	937.50	924.57	937.99	0.000805	6.11	3625.13	464.78	0.23

Appendix C-2

HEC-RAS Profile Output for

Existing & Proposed Conditions Model

For Review


Pigg River Plan: 1) ExistingCond 8/30/2015 2) Proposed 8/30/2015
Pigg River Reach 1
Legend
WS PF 3 - ExistingCond
WS PF 3 - Proposed
Ground
Elevation (ft)
980
970
960
950
940
930
920
910
0
5000
10000
15000
20000
25000
30000
Main Channel Distance (ft)

Appendix C-3

HEC-RAS Input Data

For

Existing & Proposed Conditions Model

For Review

```
                    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: Pigg River
Project File : PiggRiver.prj
Run Date and Time: 8/30/2015 7:18:41 PM

Project in English units

Project Description:

PLAN DATA

Plan Title: Existing Conditions
Plan File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.p02

Geometry Title: Existing Conditions
Geometry File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.g02

Flow Title : Pigg Rvr HEC-2 Flows
Flow File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.f01

Plan Summary Information:

Number of:	Cross Sections	= 26	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	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

Encroachment Data
   Equal Conveyance = True
   Left Offset      =        0
   Right Offset     =        0

River = Pigg River       Reach = Reach 1
RS      Profile           Method  Value1  Value2
307538  PF 2                   0
304870  PF 2                   0
300110  PF 2                   0
295500  PF 2                   0
292745  PF 2                   0
292730  PF 2                   0
292715  PF 2                   0
292700  PF 2                   0
292695  PF 2                   0
292675  PF 2                   0
292490  PF 2                   0
292337  PF 2                   0
292287  PF 2                   0
292273  PF 2                   0
292223  PF 2                   0
290620  PF 2                   0
286850  PF 2                   0
282890  PF 2                   0
280260  PF 2                   0
278830  PF 2                   0
278817  PF 2                   0
278807  PF 2                   0
278802  PF 2                   0
278801  PF 2                   0

River = Pigg River       Reach = Reach 1
RS      Profile           Method  Value1  Value2
307538  PF 3                   0
```

304870	PF 3	0
300110	PF 3	0
295500	PF 3	0
292745	PF 3	0
292730	PF 3	0
292715	PF 3	0
292700	PF 3	0
292695	PF 3	0
292675	PF 3	0
292490	PF 3	0
292337	PF 3	0
292287	PF 3	0
292273	PF 3	0
292223	PF 3	0
290620	PF 3	0
286850	PF 3	0
282890	PF 3	0
280260	PF 3	0
278830	PF 3	0
278817	PF 3	0
278807	PF 3	0
278802	PF 3	0
278801	PF 3	0

River = Pigg River Reach = Reach 1

RS	Profile	Method	Value1	Value2
307538	PF 4	0	0	0
304870	PF 4	0	0	0
300110	PF 4	0	0	0
295500	PF 4	0	0	0
292745	PF 4	0	0	0
292730	PF 4	0	0	0
292715	PF 4	0	0	0
292700	PF 4	0	0	0
292695	PF 4	0	0	0
292675	PF 4	0	0	0
292490	PF 4	0	0	0
292337	PF 4	0	0	0
292287	PF 4	0	0	0
292273	PF 4	0	0	0
292223	PF 4	0	0	0
290620	PF 4	0	0	0
286850	PF 4	0	0	0
282890	PF 4	0	0	0
280260	PF 4	0	0	0
278830	PF 4	0	0	0
278817	PF 4	0	0	0
278807	PF 4	0	0	0

278802	PF 4	0	0	0
278801	PF 4	0	0	0

River = Pigg River Reach = Reach 1

RS	Profile	Method	Value1	Value2
307538	PF 5	1	1168	1368
304870	PF 5	1	1025	1230
300110	PF 5	1	56	241
295500	PF 5	1	13	238
292745	PF 5	1	225	485
292730	PF 5	1	225	485
292715	PF 5	1	225	485
292700	PF 5	1	228	484
292695	PF 5	1	228	484
292675	PF 5	1	230	480
292490	PF 5	1	67	285
292337	PF 5	1	72	277
292287	PF 5	1	101	301
292273	PF 5	1	101	301
292223	PF 5	1	100	308
290620	PF 5	1	1082	1272
286850	PF 5	1	1034	1196
282890	PF 5	1	50	216
280260	PF 5	1	990	1140
278830	PF 5	1	313	464
278817	PF 5	1	313	464
278807	PF 5	1	313	464
278802	PF 5	1	313	464
278801	PF 5	1	313	464

FLOW DATA

Flow Title: Pigg Rvr HEC-2 Flows
Flow File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2	PF 3	PF 4	PF 5
Pigg River	Reach 1	307538	5375	10174	12824	19848	12824
Pigg River	Reach 1	295500	5450	10400	13000	20100	13000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Pigg River	Reach 1	PF 1		Known WS = 928.32
Pigg River	Reach 1	PF 2		Known WS = 935.93
Pigg River	Reach 1	PF 3		Known WS = 937.5
Pigg River	Reach 1	PF 4		Known WS = 940.39

GEOMETRY DATA

Geometry Title: Existing Conditions
Geometry File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.g02

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 307538

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1050	1000	1100	980	1145	967.4	1188	964.8	1193	955.8
1203	955.1	1213	955.5	1223	954.7	1231	953.8	1233	955.5
1234	955.7	1243	964.8	1378	964.6	1434	978.9	1520	998.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1050	.1	1188	.05	1243	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1188	1243	2668	2668	2668	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 304870

INPUT
Description: Survey Sec FPG-10

```
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     950    1000     980     980    1000   974.9    1017   962.9    1031   962.3
    1040   955.3    1043   952.3    1050   952.4    1060   952.9    1070   953.5
    1077   952.7    1080   953.3    1086   955.3    1092   962.1    1190   960.2
    1250   967.6    1337   972.9    1400     980    1525     985

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     950      .1    1031     .05    1086     .08

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1031    1086             4760    4760    4760             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 300110

INPUT
Description: Survey Sec FPG-9
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   974.9      94   957.2     141   961.5     158     959     159   954.6
     160   952.7     169   951.8     179   951.3     189   950.3     199   949.5
     209   950.5     219   950.5     229   954.6     238   960.5     255   959.6
     270   976.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     158     .05     238     .08

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           158     238             4610    4610    4610             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 295500

INPUT
Description: Survey Sec FPG-8
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     971      23     957      51     954      53   952.6      61   948.7
      71     948      81   947.7      91   948.3     101   948.6     111   949.2
```

```
     121   952.1     135   954.6     137     958     195   956.4     273   957.8
     334   972.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      23     .05     137     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            23     137             3200    2744    2680             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292745

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6     459   954.5     544   972.4
     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292730

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6     459   954.5     544   972.4
     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292715

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6     459   954.5     544   972.4
     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292700

INPUT
Description:
Station Elevation Data    num=      12
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6     459   954.5     544   972.4
     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459                5       5       5             .2       .4

CROSS SECTION
```

RIVER: Pigg River
REACH: Reach 1 RS: 292695

INPUT
Description: Dam Survey Sec FPG-7
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.1	27	960.6	31	961.8	58	963.1	106	960.6
196	965.4	218	960.9	273	954.6	459	954.5	544	972.4
588	973.1	596	977.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	273	.05	459	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
273	459	20	20	20	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292675

INPUT
Description:
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	976.1	27	960.6	31	961.8	58	963.1	106	960.6
196	965.4	218	961.7	235	954.9	300	944.8	310	943.4
323	934	333	932.8	343	931.8	353	931.6	369	934.1
396	935.9	400	944.1	418	948.3	475	957.1	511	958.3
544	972.4	588	973.1	596	977.2				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	235	.05	475	.12

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
235	475	94	94	94	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292601

```
INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     959      60     957      75     948     100     936     125     932
     150   931.5     175     932     200     932     225     934     250     936
     275     952     300     964     312     970     325     971     350     972
     375     973     400     980

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      60     .05     300     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            60     300             41.83   41.83   41.83              .2       .4
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    55.5  957.12       F
   316.5     400     970       F

BRIDGE


RIVER: Pigg River
REACH: Reach 1            RS: 292580.5

INPUT
Description:
Distance from Upstream XS =       5
Deck/Roadway Width        =   31.83
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      60     961  947.98     312  969.94  957.54

Upstream Bridge Cross Section Data
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     959      60     957      75     948     100     936     125     932
     150   931.5     175     932     200     932     225     934     250     936
     275     952     300     964     312     970     325     971     350     972
     375     973     400     980

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      60     .05     300     .12
```

```
Bank Sta: Left   Right    Coeff Contr.   Expan.
            60     300             .2       .4
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    55.5  957.12       F
   316.5     400     970       F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      17   954.7              41   958.1  947.98      41     961  947.98
     293  969.94  957.54     293   967.1             380   956.6

Downstream Bridge Cross Section Data
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   959.4      34     950     123   944.1     129   941.9     141   944.6
     151   943.2     164   933.8     174   932.6     184   931.6     194   931.4
     210   933.9     237   935.7     241   943.9     259   948.1     305   947.5
     312   950.3     349   950.5     380   956.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     151     .05     241      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
           151     241             .2       .4
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   367.6     380     970       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 Piers =  4

Pier Data
Pier Station     Upstream=     110    Downstream=      91
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
```

```
      12     940      12     955

Pier Data
Pier Station     Upstream=     160    Downstream=     141
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955

Pier Data
Pier Station     Upstream=     210    Downstream=     191
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955

Pier Data
Pier Station     Upstream=     260    Downstream=     241
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     960
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     960

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
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: Pigg River
REACH: Reach 1 RS: 292490

INPUT
Description: Survey Sec FPG-6
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	959.4	34	950	123	944.1	129	941.9	141	944.6
151	943.2	164	933.8	174	932.6	184	931.6	194	931.4
210	933.9	237	935.7	241	943.9	259	948.1	305	947.5
312	950.3	349	950.5	380	956.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	151	.05	241	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
151	241	153	153	153	.2	.4

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
367.6	380	970	F

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292337

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.6	34	949.2	123	943.3	129	941.1	141	943.8
151	942.4	164	933	174	931.8	184	930.8	194	930.6
210	933.1	237	934.9	241	943.1	259	947.3	305	946.7
312	949.5	349	949.7	380	955.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	151	.05	241	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
151	241	50	50	50	.2	.4

CROSS SECTION

RIVER: Pigg River

```
REACH: Reach 1            RS: 292287

INPUT
Description: Copied XS 292273
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     960      20   955.6      26   951.9      28   953.4      34   953.2
      75   945.2   101.2   942.8   121.2   941.3   136.2   931.7   181.2   931.7
   186.2   938.3   198.8     939     220     940     408   947.2     508   948.8
     597   956.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   101.2     .05   198.8      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         101.2   198.8               14      14      14              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292273

INPUT
Description: VA 713 Survey Sec FPG-5
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     960      20   955.6      26   951.9      28   953.4      34   953.2
      75   945.2   101.2   942.8   121.2   941.3   136.2   931.7   181.2   931.7
   186.2   938.3   198.8     939     220     940     408   947.2     508   948.8
     597   956.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   101.2     .05   198.8      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         101.2   198.8               50      50      50              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292223

INPUT
Description: Topo Sec FPG-4A
```

```
Station Elevation Data    num=      13
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     960     100     940     116   938.4     121   934.1     131   932.1
     141   931.6     151   932.9     161   933.4     165   934.2     177   937.7
     185   938.1     220     940     740     960

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07     116     .05     185      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           116     185             1603    1603    1603             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 290620

INPUT
Description: Survey Sec FPG-4
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     820     960    1000   949.5    1077   939.7    1082   935.4    1087   933.8
    1092   929.5    1102   927.6    1112     927    1122   928.3    1132   928.8
    1136   929.6    1148   933.1    1156   940.9    1167   943.2    1341     947
    1368   952.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     820     .07    1087     .05    1156      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1087    1156             3770    3770    3770             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 286850

INPUT
Description: Survey Sec FPG-3
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     780     950    1000   943.3    1087   935.2    1099   936.5    1111   933.8
    1117     924    1127   923.1    1137     923    1147   922.2    1157   922.7
    1167   922.4    1173     924    1186     924    1194   944.7    1260    1000
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     780     .11    1099     .05    1194     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1099    1194             3960    3960    3960             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 282890

INPUT
Description: Survey Sec FPG-2
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   945.6      38   937.5     144   930.3     154   919.7     164   918.2
     174   917.2     184   916.6     194     918     202   919.7     210   929.7
     224   947.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     144     .05     210      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           144     210             2630    2630    2630             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 280260

INPUT
Description: Survey Sec FPG-1 Lower Study Limit
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     830    1020     860    1000     910     980     940     960     960     940
    1000   931.4    1018     916    1028   914.7    1038   913.9    1048   913.5
    1058   913.4    1067   915.9    1082   926.1    1097   928.4    1110   926.7
    1197   933.9    1210     940    1570     960

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     830     .12    1000     .05    1082      .1
```

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1000    1082             1430    1430    1430             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278830

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421               13      13      13             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278817

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421               10      10      10             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278807
```

```
INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 5       5       5              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278802

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 1       1       1              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278801

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 1       1       1              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278800

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 0       0       0              .2       .4



SUMMARY OF MANNING'S N VALUES

River:Pigg River

      Reach          River Sta.       n1        n2        n3

 Reach 1              307538              .1       .05       .08
 Reach 1              304870              .1       .05       .08
 Reach 1              300110              .1       .05       .08
 Reach 1              295500              .1       .05       .12
 Reach 1              292745              .1       .05       .12
 Reach 1              292730              .1       .05       .12
 Reach 1              292715              .1       .05       .12
 Reach 1              292700              .1       .05       .12
 Reach 1              292695              .1       .05       .12
 Reach 1              292675              .1       .05       .12
 Reach 1              292601              .1       .05       .12
 Reach 1              292580.5     Bridge
 Reach 1              292490              .1       .05        .1
```

Reach 1	292337	.1	.05	.1
Reach 1	292287	.07	.05	.1
Reach 1	292273	.07	.05	.1
Reach 1	292223	.07	.05	.1
Reach 1	290620	.07	.05	.1
Reach 1	286850	.11	.05	.07
Reach 1	282890	.1	.05	.1
Reach 1	280260	.12	.05	.1
Reach 1	278830	.12	.05	.1
Reach 1	278817	.12	.05	.1
Reach 1	278807	.12	.05	.1
Reach 1	278802	.12	.05	.1
Reach 1	278801	.12	.05	.1
Reach 1	278800	.12	.05	.1

SUMMARY OF REACH LENGTHS

River: Pigg River

Reach	River Sta.	Left	Channel	Right
Reach 1	307538	2668	2668	2668
Reach 1	304870	4760	4760	4760
Reach 1	300110	4610	4610	4610
Reach 1	295500	3200	2744	2680
Reach 1	292745	15	15	15
Reach 1	292730	15	15	15
Reach 1	292715	15	15	15
Reach 1	292700	5	5	5
Reach 1	292695	20	20	20
Reach 1	292675	94	94	94
Reach 1	292601	41.83	41.83	41.83
Reach 1	292580.5	Bridge		
Reach 1	292490	153	153	153
Reach 1	292337	50	50	50
Reach 1	292287	14	14	14
Reach 1	292273	50	50	50
Reach 1	292223	1603	1603	1603
Reach 1	290620	3770	3770	3770
Reach 1	286850	3960	3960	3960
Reach 1	282890	2630	2630	2630
Reach 1	280260	1430	1430	1430
Reach 1	278830	13	13	13
Reach 1	278817	10	10	10
Reach 1	278807	5	5	5

Reach 1	278802	1	1	1
Reach 1	278801	1	1	1
Reach 1	278800	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Pigg River

Reach	River Sta.	Contr.	Expan.
Reach 1	307538	.2	.4
Reach 1	304870	.2	.4
Reach 1	300110	.2	.4
Reach 1	295500	.2	.4
Reach 1	292745	.2	.4
Reach 1	292730	.2	.4
Reach 1	292715	.2	.4
Reach 1	292700	.2	.4
Reach 1	292695	.2	.4
Reach 1	292675	.2	.4
Reach 1	292601	.2	.4
Reach 1	292580.5 Bridge		
Reach 1	292490	.2	.4
Reach 1	292337	.2	.4
Reach 1	292287	.2	.4
Reach 1	292273	.2	.4
Reach 1	292223	.2	.4
Reach 1	290620	.2	.4
Reach 1	286850	.2	.4
Reach 1	282890	.2	.4
Reach 1	280260	.2	.4
Reach 1	278830	.2	.4
Reach 1	278817	.2	.4
Reach 1	278807	.2	.4
Reach 1	278802	.2	.4
Reach 1	278801	.2	.4
Reach 1	278800	.2	.4

```
                    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: Pigg River
Project File : PiggRiver.prj
Run Date and Time: 8/30/2015 7:18:40 PM

Project in English units

Project Description:

PLAN DATA

Plan Title: Proposed Condition
Plan File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.p03

Geometry Title: Proposed Condition
Geometry File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.g03

Flow Title : Pigg Rvr HEC-2 Flows
Flow File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.f01

Plan Summary Information:

Number of:	Cross Sections	= 26	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 1	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

Encroachment Data
   Equal Conveyance = True
   Left Offset      =        0
   Right Offset     =        0

River = Pigg River       Reach = Reach 1
RS      Profile           Method  Value1  Value2
307538  PF 2                   0
304870  PF 2                   0
300110  PF 2                   0
295500  PF 2                   0
292745  PF 2                   0
292730  PF 2                   0
292715  PF 2                   0
292700  PF 2                   0
292695  PF 2                   0
292675  PF 2                   0
292490  PF 2                   0
292337  PF 2                   0
292287  PF 2                   0
292273  PF 2                   0
292223  PF 2                   0
290620  PF 2                   0
286850  PF 2                   0
282890  PF 2                   0
280260  PF 2                   0
278830  PF 2                   0
278817  PF 2                   0
278807  PF 2                   0
278802  PF 2                   0
278801  PF 2                   0

River = Pigg River       Reach = Reach 1
RS      Profile           Method  Value1  Value2
307538  PF 3                   0
```

304870	PF 3	0
300110	PF 3	0
295500	PF 3	0
292745	PF 3	0
292730	PF 3	0
292715	PF 3	0
292700	PF 3	0
292695	PF 3	0
292675	PF 3	0
292490	PF 3	0
292337	PF 3	0
292287	PF 3	0
292273	PF 3	0
292223	PF 3	0
290620	PF 3	0
286850	PF 3	0
282890	PF 3	0
280260	PF 3	0
278830	PF 3	0
278817	PF 3	0
278807	PF 3	0
278802	PF 3	0
278801	PF 3	0

River = Pigg River Reach = Reach 1

RS	Profile	Method	Value1	Value2
307538	PF 4	0	0	0
304870	PF 4	0	0	0
300110	PF 4	0	0	0
295500	PF 4	0	0	0
292745	PF 4	0	0	0
292730	PF 4	0	0	0
292715	PF 4	0	0	0
292700	PF 4	0	0	0
292695	PF 4	0	0	0
292675	PF 4	0	0	0
292490	PF 4	0	0	0
292337	PF 4	0	0	0
292287	PF 4	0	0	0
292273	PF 4	0	0	0
292223	PF 4	0	0	0
290620	PF 4	0	0	0
286850	PF 4	0	0	0
282890	PF 4	0	0	0
280260	PF 4	0	0	0
278830	PF 4	0	0	0
278817	PF 4	0	0	0
278807	PF 4	0	0	0

278802	PF 4	0	0	0
278801	PF 4	0	0	0

River = Pigg River Reach = Reach 1

RS	Profile	Method	Value1	Value2
307538	PF 5	1	1168	1368
304870	PF 5	1	1025	1230
300110	PF 5	1	56	241
295500	PF 5	1	13	238
292745	PF 5	1	225	485
292730	PF 5	1	225	485
292715	PF 5	1	225	485
292700	PF 5	1	228	484
292695	PF 5	1	228	484
292675	PF 5	1	230	480
292490	PF 5	1	67	285
292337	PF 5	1	72	277
292287	PF 5	1	101	301
292273	PF 5	1	101	301
292223	PF 5	1	100	308
290620	PF 5	1	1082	1272
286850	PF 5	1	1034	1196
282890	PF 5	1	50	216
280260	PF 5	1	990	1140
278830	PF 5	1	313	464
278817	PF 5	1	313	464
278807	PF 5	1	313	464
278802	PF 5	1	313	464
278801	PF 5	1	313	464

FLOW DATA

Flow Title: Pigg Rvr HEC-2 Flows
Flow File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.f01

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2	PF 3	PF 4	PF 5
Pigg River	Reach 1	307538	5375	10174	12824	19848	12824
Pigg River	Reach 1	295500	5450	10400	13000	20100	13000

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Pigg River	Reach 1	PF 1		Known WS = 928.32
Pigg River	Reach 1	PF 2		Known WS = 935.93
Pigg River	Reach 1	PF 3		Known WS = 937.5
Pigg River	Reach 1	PF 4		Known WS = 940.39

GEOMETRY DATA

Geometry Title: Proposed Condition
Geometry File : C:\Users\wta\Desktop\3505\HEC-RAS Model\Pigg River\PiggRiver.g03

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 307538

INPUT
Description:
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
1050	1000	1100	980	1145	967.4	1188	964.8	1193	955.8
1203	955.1	1213	955.5	1223	954.7	1231	953.8	1233	955.5
1234	955.7	1243	964.8	1378	964.6	1434	978.9	1520	998.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
1050	.1	1188	.05	1243	.08

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1188	1243	2668	2668	2668	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 304870

INPUT
Description: Survey Sec FPG-10

```
Station Elevation Data    num=      19
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     950    1000     980     980    1000   974.9    1017   962.9    1031   962.3
    1040   955.3    1043   952.3    1050   952.4    1060   952.9    1070   953.5
    1077   952.7    1080   953.3    1086   955.3    1092   962.1    1190   960.2
    1250   967.6    1337   972.9    1400     980    1525     985

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     950      .1    1031     .05    1086     .08

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1031    1086             4760    4760    4760             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 300110

INPUT
Description: Survey Sec FPG-9
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   974.9      94   957.2     141   961.5     158     959     159   954.6
     160   952.7     169   951.8     179   951.3     189   950.3     199   949.5
     209   950.5     219   950.5     229   954.6     238   960.5     255   959.6
     270   976.9

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     158     .05     238     .08

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           158     238             4610    4610    4610             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 295500

INPUT
Description: Survey Sec FPG-8
Station Elevation Data    num=      16
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     971      23     957      51     954      53   952.6      61   948.7
      71     948      81   947.7      91   948.3     101   948.6     111   949.2
```

```
     121   952.1     135   954.6     137     958     195   956.4     273   957.8
     334   972.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      23     .05     137     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            23     137             3200    2744    2680             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292745

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6   281.5   946.1   318.5   946.1
     332   932.6     400   932.6   413.5   946.1   450.5   946.1     459   954.5
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292730

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6   281.5   946.1   318.5   946.1
     332   932.6     400   932.6   413.5   946.1   450.5   946.1     459   954.5
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
```

```
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292715

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6   281.5   946.1   318.5   946.1
     332   932.6     400   932.6   413.5   946.1   450.5   946.1     459   954.5
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459               15      15      15             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292700

INPUT
Description:
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6   281.5   946.1   318.5   946.1
     332   932.6     400   932.6   413.5   946.1   450.5   946.1     459   954.5
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

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

```
           273     459                 5       5       5             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292695

INPUT
Description: Dam Survey Sec FPG-7
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   960.9     273   954.6   281.5   946.1   318.5   946.1
     332   932.6     400   932.6   413.5   946.1   450.5   946.1     459   954.5
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     273     .05     459     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           273     459                20      20      20             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 292675

INPUT
Description:
Station Elevation Data    num=      23
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   976.1      27   960.6      31   961.8      58   963.1     106   960.6
     196   965.4     218   961.7     235   954.9     300   944.8     310   943.4
     323     934     333   932.8     343   931.8     353   931.6     369   934.1
     396   935.9     400   944.1     418   948.3     475   957.1     511   958.3
     544   972.4     588   973.1     596   977.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     235     .05     475     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           235     475                94      94      94             .2       .4

CROSS SECTION
```

```
RIVER: Pigg River
REACH: Reach 1            RS: 292601

INPUT
Description:
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     959      60     957      75     948     100     936     125     932
     150   931.5     175     932     200     932     225     934     250     936
     275     952     300     964     312     970     325     971     350     972
     375     973     400     980

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      60     .05     300     .12

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
             60     300            41.83   41.83   41.83              .2       .4
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    55.5  957.12       F
   316.5     400     970       F

BRIDGE


RIVER: Pigg River
REACH: Reach 1            RS: 292580.5

INPUT
Description:
Distance from Upstream XS =       5
Deck/Roadway Width        =   31.83
Weir Coefficient          =     2.6
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      60     961  947.98     312  969.94  957.54

Upstream Bridge Cross Section Data
Station Elevation Data    num=      17
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     959      60     957      75     948     100     936     125     932
     150   931.5     175     932     200     932     225     934     250     936
     275     952     300     964     312     970     325     971     350     972
     375     973     400     980
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1      60     .05     300     .12

Bank Sta: Left   Right    Coeff Contr.   Expan.
            60     300             .2       .4
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    55.5  957.12       F
   316.5     400     970       F

Downstream  Deck/Roadway Coordinates
    num=       6
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      17   954.7              41   958.1  947.98      41     961  947.98
     293  969.94  957.54     293   967.1             380   956.6

Downstream Bridge Cross Section Data
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   959.4      34     950     123   944.1     129   941.9     141   944.6
     151   943.2     164   933.8     174   932.6     184   931.6     194   931.4
     210   933.9     237   935.7     241   943.9     259   948.1     305   947.5
     312   950.3     349   950.5     380   956.6

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     151     .05     241      .1

Bank Sta: Left   Right    Coeff Contr.   Expan.
           151     241             .2       .4
Ineffective Flow     num=       1
   Sta L   Sta R    Elev  Permanent
   367.6     380     970       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 Piers =  4

Pier Data
Pier Station     Upstream=     110    Downstream=      91
```

```
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955

Pier Data
Pier Station     Upstream=     160    Downstream=     141
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955

Pier Data
Pier Station     Upstream=     210    Downstream=     191
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     955

Pier Data
Pier Station     Upstream=     260    Downstream=     241
Upstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     960
Downstream     num=       2
    Width   Elev    Width   Elev
      12     940      12     960

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
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: Pigg River
REACH: Reach 1 RS: 292490

INPUT
Description: Survey Sec FPG-6
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	959.4	34	950	123	944.1	129	941.9	141	944.6
151	943.2	164	933.8	174	932.6	184	931.6	194	931.4
210	933.9	237	935.7	241	943.9	259	948.1	305	947.5
312	950.3	349	950.5	380	956.6				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	151	.05	241	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
151	241	153	153	153	.2	.4

Ineffective Flow num= 1

Sta L	Sta R	Elev	Permanent
367.6	380	970	F

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292337

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	958.6	34	949.2	123	943.3	129	941.1	141	943.8
151	942.4	164	933	174	931.8	184	930.8	194	930.6
210	933.1	237	934.9	241	943.1	259	947.3	305	946.7
312	949.5	349	949.7	380	955.8				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.1	151	.05	241	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
151	241	50	50	50	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292287

INPUT
Description: Copied XS 292273
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	960	20	955.6	26	951.9	28	953.4	34	953.2
75	945.2	101.2	942.8	121.2	941.3	136.2	931.7	181.2	931.7
186.2	938.3	198.8	939	220	940	408	947.2	508	948.8
597	956.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	101.2	.05	198.8	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
101.2	198.8	14	14	14	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292273

INPUT
Description: VA 713 Survey Sec FPG-5
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	960	20	955.6	26	951.9	28	953.4	34	953.2
75	945.2	101.2	942.8	121.2	941.3	136.2	931.7	181.2	931.7
186.2	938.3	198.8	939	220	940	408	947.2	508	948.8
597	956.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	101.2	.05	198.8	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
101.2	198.8	50	50	50	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 292223

INPUT
Description: Topo Sec FPG-4A
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	960	100	940	116	938.4	121	934.1	131	932.1
141	931.6	151	932.9	161	933.4	165	934.2	177	937.7
185	938.1	220	940	740	960				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	116	.05	185	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
116	185	1603	1603	1603	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 290620

INPUT
Description: Survey Sec FPG-4
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
820	960	1000	949.5	1077	939.7	1082	935.4	1087	933.8
1092	929.5	1102	927.6	1112	927	1122	928.3	1132	928.8
1136	929.6	1148	933.1	1156	940.9	1167	943.2	1341	947
1368	952.9								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
820	.07	1087	.05	1156	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
1087	1156	3770	3770	3770	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 286850

INPUT
Description: Survey Sec FPG-3

```
Station Elevation Data    num=      15
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     780     950    1000   943.3    1087   935.2    1099   936.5    1111   933.8
    1117     924    1127   923.1    1137     923    1147   922.2    1157   922.7
    1167   922.4    1173     924    1186     924    1194   944.7    1260    1000

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     780     .11    1099     .05    1194     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1099    1194             3960    3960    3960             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 282890

INPUT
Description: Survey Sec FPG-2
Station Elevation Data    num=      11
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   945.6      38   937.5     144   930.3     154   919.7     164   918.2
     174   917.2     184   916.6     194     918     202   919.7     210   929.7
     224   947.7

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0      .1     144     .05     210      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           144     210             2630    2630    2630             .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 280260

INPUT
Description: Survey Sec FPG-1 Lower Study Limit
Station Elevation Data    num=      18
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
     830    1020     860    1000     910     980     940     960     960     940
    1000   931.4    1018     916    1028   914.7    1038   913.9    1048   913.5
    1058   913.4    1067   915.9    1082   926.1    1097   928.4    1110   926.7
    1197   933.9    1210     940    1570     960
```

```
Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
     830     .12    1000     .05    1082      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          1000    1082             1430    1430    1430              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278830

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421               13      13      13              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278817

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421               10      10      10              .2       .4
```

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 278807

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	940	339	929.6	357	914.2	367	912.9	377	912.1
387	911.7	397	911.6	406	914.1	421	924.3	570	940

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.12	339	.05	421	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
339	421	5	5	5	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 278802

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	940	339	929.6	357	914.2	367	912.9	377	912.1
387	911.7	397	911.6	406	914.1	421	924.3	570	940

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.12	339	.05	421	.1

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
339	421	1	1	1	.2	.4

CROSS SECTION

RIVER: Pigg River
REACH: Reach 1 RS: 278801

INPUT
Description:

```
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 1       1       1              .2       .4

CROSS SECTION


RIVER: Pigg River
REACH: Reach 1            RS: 278800

INPUT
Description:
Station Elevation Data    num=      10
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0     940     339   929.6     357   914.2     367   912.9     377   912.1
     387   911.7     397   911.6     406   914.1     421   924.3     570     940

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .12     339     .05     421      .1

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
           339     421                 0       0       0              .2       .4


SUMMARY OF MANNING'S N VALUES

River:Pigg River

      Reach          River Sta.       n1        n2        n3

 Reach 1              307538              .1       .05       .08
 Reach 1              304870              .1       .05       .08
 Reach 1              300110              .1       .05       .08
 Reach 1              295500              .1       .05       .12
 Reach 1              292745              .1       .05       .12
 Reach 1              292730              .1       .05       .12
 Reach 1              292715              .1       .05       .12
 Reach 1              292700              .1       .05       .12
```

Reach 1	292695		.1	.05	.12
Reach 1	292675		.1	.05	.12
Reach 1	292601		.1	.05	.12
Reach 1	292580.5	Bridge			
Reach 1	292490		.1	.05	.1
Reach 1	292337		.1	.05	.1
Reach 1	292287		.07	.05	.1
Reach 1	292273		.07	.05	.1
Reach 1	292223		.07	.05	.1
Reach 1	290620		.07	.05	.1
Reach 1	286850		.11	.05	.07
Reach 1	282890		.1	.05	.1
Reach 1	280260		.12	.05	.1
Reach 1	278830		.12	.05	.1
Reach 1	278817		.12	.05	.1
Reach 1	278807		.12	.05	.1
Reach 1	278802		.12	.05	.1
Reach 1	278801		.12	.05	.1
Reach 1	278800		.12	.05	.1

SUMMARY OF REACH LENGTHS

River: Pigg River

Reach	River Sta.		Left	Channel	Right
Reach 1	307538		2668	2668	2668
Reach 1	304870		4760	4760	4760
Reach 1	300110		4610	4610	4610
Reach 1	295500		3200	2744	2680
Reach 1	292745		15	15	15
Reach 1	292730		15	15	15
Reach 1	292715		15	15	15
Reach 1	292700		5	5	5
Reach 1	292695		20	20	20
Reach 1	292675		94	94	94
Reach 1	292601		41.83	41.83	41.83
Reach 1	292580.5	Bridge			
Reach 1	292490		153	153	153
Reach 1	292337		50	50	50
Reach 1	292287		14	14	14
Reach 1	292273		50	50	50
Reach 1	292223		1603	1603	1603
Reach 1	290620		3770	3770	3770
Reach 1	286850		3960	3960	3960

Reach 1	282890	2630	2630	2630
Reach 1	280260	1430	1430	1430
Reach 1	278830	13	13	13
Reach 1	278817	10	10	10
Reach 1	278807	5	5	5
Reach 1	278802	1	1	1
Reach 1	278801	1	1	1
Reach 1	278800	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Pigg River

Reach	River Sta.	Contr.	Expan.
Reach 1	307538	.2	.4
Reach 1	304870	.2	.4
Reach 1	300110	.2	.4
Reach 1	295500	.2	.4
Reach 1	292745	.2	.4
Reach 1	292730	.2	.4
Reach 1	292715	.2	.4
Reach 1	292700	.2	.4
Reach 1	292695	.2	.4
Reach 1	292675	.2	.4
Reach 1	292601	.2	.4
Reach 1	292580.5 Bridge		
Reach 1	292490	.2	.4
Reach 1	292337	.2	.4
Reach 1	292287	.2	.4
Reach 1	292273	.2	.4
Reach 1	292223	.2	.4
Reach 1	290620	.2	.4
Reach 1	286850	.2	.4
Reach 1	282890	.2	.4
Reach 1	280260	.2	.4
Reach 1	278830	.2	.4
Reach 1	278817	.2	.4
Reach 1	278807	.2	.4
Reach 1	278802	.2	.4
Reach 1	278801	.2	.4
Reach 1	278800	.2	.4