APPENDIX C

Spring Creek Flood Impact Assessment

Wyong Areas Coal Joint Venture

Wallarah 2 Coal Project

Spring Creek Flood Impact Assessment

July 2016 Final Issue

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EXECUTIVE SUMMARY

This Flood Impact Assessment report presents the results of the assessment of potential impacts on flooding in Spring Creek due to the proposed Amendment to the Wallarah 2 Coal Project (the Project). The Amendment involves the construction of a conveyor system, a rail spur and coal loading facilities to enable the transportation of product coal. This infrastructure will replace the previously proposed rail loop and spur. The report is an addendum to the original Flood Impact Assessment prepared in January 2013 as part of the Environmental Impact Statement for the project.

The proposed rail spur will be located on the eastern side of the Main Northern Rail Line between Sydney and Newcastle and north of the Doyalson Link Road (aka Motorway Link Road).

Two new bridges will be constructed to support the proposed rail spur over the two main tributaries of Spring Creek. These bridges will be similar in geometry to the adjacent bridges on the main rail line. Earthworks for the rail spur will encroach on the floodplain of Spring Creek and consequently there may be some afflux caused by reduction in flood storage and constriction of flows.

The northern tributary to Spring Creek flows under the main rail line via a 3.5 metre diameter culvert and twin 1.5m diameter culverts. Both of these crossings will need to be extended eastward under the new rail spur.

The hydrology of Spring Creek catchment upstream of the Doyalson Link Road was modelled using DRAINS software and the hydraulic behaviour was modelled using HEC-RAS software. The models were run for existing conditions and for post development conditions to determine the extent of afflux and any other changes in flow characteristics.

The construction of the rail spur is expected to result in afflux of 0.01m upstream of Bridge 1 over the southern tributary of Spring Creek and 0.03m upstream of Bridge 2 over the main stream of Spring Creek during the 1%AEP (100 year ARI) flood. Mitigation options are available to eliminate this negligible degree of afflux if necessary. There will be no change in flood hazard as a result of the localised, insignificant changes to flow depths and velocities.

The rail line and rail spur would be completely inundated during the PMF with no difference between pre development and post development conditions.

A conveyor is proposed to transport the coal from the stockpile to the loader located about half way along the rail spur. Because much of this conveyor will be constructed along the ridge line beside Tooheys Road and within the rail spur easement, there will be effectively no impacts on flooding caused by the conveyor. Management of water runoff and coal materials, including spillage, within the conveyor and rail spur corridors will be required to avoid potential impacts on water quality. Basic water management methods have also been proposed in this report to address water quality management.

1 INTRODUCTION

1.1 **PROJECT OVERVIEW**

The Wyong Areas Coal Joint Venture (WACJV) is seeking development consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) for the Wallarah 2 Coal Project (the Project). The key features of the Project include:

- A deep underground longwall mine extracting up to 5 million tonnes per annum (Mtpa) of export quality thermal coal;
- The Tooheys Road Site between the M1 Motorway and the Motorway Link Road, which includes a portal, coal handling facilities and stockpiles, water and gas management facilities, small office buildings, workshop, rail spur, train load out bin and connections to the municipal water and sewerage systems;
- The Buttonderry Site near the intersection of Hue Hue Road and Sparks Road, which includes administration offices, bathhouse, personnel access to the mine, ventilation shafts and water management structures;
- The Western Shaft Site in the Wyong State Forest, which includes a downcast ventilation shaft and water management structures;
- An inclined tunnel (or "drift") from the surface at the Tooheys Road Site to the coal seam beneath the Buttonderry Site;
- Transportation of product coal to the Port of Newcastle by rail; and
- An operational workforce of approximately 300 full time employees.

The Project has been subject to the assessment process under Division 4.1 of Part 4 of the EP&A Act, including a review by the Planning Assessment Commission (PAC). In June 2014, the PAC concluded that *'if the recommendations concerning improved strategies to avoid, mitigate or manage the predicted impacts of the project are adopted, then there is merit in allowing the project to proceed'.*

Following the review by the PAC, the Tooheys Road Site was re-designed to avoid land use conflicts with third parties. The changes to the Project include:

- Removal of the previously proposed rail loop;
- Re-location of the previously proposed rail spur to the eastern side of the Main Northern Rail Line;
- Re-location of the train load out facility to the eastern side of the Main Northern Rail Line;
- A conveyor system to deliver product coal from the stockpile to the new train load out facility; and
- Realignment of the sewer connection.

These proposed changes are referred to as the 'Amendment'. All other aspects of the Project remain identical to the original proposal.

To give effect to the proposed changes to the Project, WACJV is seeking an amendment to the Development Application (DA) under clause 55 of the *Environmental Planning and Assessment Regulation 2000*. This report forms part of the "*Amendment to Development Application SSD-4974*" (Amendment Document) being prepared by Hansen Bailey to support the application to amend the DA.

This report assesses the environmental impacts of the Amendment and where necessary, recommends additional management and mitigation measures to ameliorate these impacts. Aspects of the Project that are unchanged have not been reconsidered. The impacts associated with these aspects of the Project will remain as assessed in the *Wallarah 2 Coal Project Environmental Impact Statement* (Hansen Bailey, 2013).

Key items that may have potential impacts on flooding and water quality include:

- The construction of a new rail spur to the east of the Main Northern Rail Line with earthworks encroaching on the floodplain of Spring Creek;
- The construction of two new bridges over Spring Creek and a major tributary;
- The construction and operation of a conveyor from the coal stockpile to the train load out facility. This conveyor will run alongside Tooheys Road and Doyalson Link Road for much of its length.

The general arrangement of the proposed Tooheys Road site, conveyor, rail spur and train load out facility is shown on *Figure 1.1*. All other aspects of the Project are unchanged from the original proposal.



Figure 1.1 Tooheys Road Site, Conveyor, Rail Spur and Train Load Out Facility General Arrangement

1.2 STUDY OVERVIEW

This Flood Impact Assessment forms part of the Amendment Document and looks primarily at the potential changes to flood impacts associated with construction of a rail spur to facilitate loading of coal onto trains for transport to port.

The previous Flood Impact Assessment concentrated on major catchments surrounding the mine subsidence area in the Yarramalong and Dooralong Valleys and the catchment between Buttonderry Creek and Jilliby Jilliby Creek, designated as Hue Hue Creek.

The current study focuses only on Spring Creek and potential impacts on flooding caused by the rail spur and associated infrastructure. The software model DRAINS was used to model the hydrologic behaviour of the Spring Creek catchment and HEC-RAS was used to model the hydraulic behaviour based on flows calculated from the DRAINS model. Flows were determined for the 1% Annual Exceedance Probability (AEP) storm as well as the Probable Maximum Flood (PMF) and hydraulically modelled for Spring Creek and its tributaries upstream of the Doyalson Link Road. The hydraulic model was run for pre and post development conditions to determine afflux (increase in flood water levels).

Note that the terms Annual Exceedance Probability (AEP) and Average Recurrence Interval (ARI) may be used interchangeably. Both terms refer to the likelihood of a particular storm or flood event occurring or being exceeded in any year. The ARI is equivalent to the reciprocal of the AEP i.e. 1% AEP = 100 year ARI, 2% AEP = 50 year ARI etc. The terms "right bank" and "left bank" used throughout this report refer to the right side and left side of a river, stream or channel when facing downstream.

1.3 STUDY OBJECTIVES

The primary purpose of this study is to determine what, if any, impacts may occur to flood flows and to flood levels in the Spring Creek catchment as a result of the proposed coal conveyor and rail spur.

The objectives of this study are to:

- identify all streams and waterways that may be affected;
- determine the extent and quantum of flood impacts resulting from the proposed works; and
- present options to mitigate the flood impacts and to manage the quality of runoff from the works area.

1.4 THE FLOODPLAIN RISK MANAGEMENT PROCESS

In New South Wales, the process to assess the impacts of flooding on a community is set out in the New South Wales Government's Floodplain Development Manual (2005) which supersedes the Floodplain Development Manual (2001). The process is based on the New South Wales Government's Flood Prone Land Policy.

The floodplain risk management study forms part of the floodplain risk management process. A process diagram showing the floodplain management process is shown in *Figure 1.2*.



Figure 1.2 The Floodplain Risk Management Process (NSW Govt, 2005)

This study does not include a floodplain risk management study for existing flood impacts. This study does, however, investigate the risks resulting from the change in flood impacts due to the proposed works. The study has been undertaken to assess the changes in flood behaviour as a result of embankments and structures being constructed within existing flood prone areas and the extent of impacts as a result of these changes.

1.5 REPORT STRUCTURE

The report is structured in the following format:

- *Section* **1** provides an introduction to the study and defines the study objectives;
- *Sections* **2** and **3** provide a description of the study area and summarise available data;
- *Sections* **4** and **5** detail the hydrologic and hydraulic modelling that has been undertaken;
- *Section 6* presents model results and summarises potential impacts;
- *Section* 7 discusses mitigation options; and
- *Section 8* provides a conclusion to this report.

The revised infrastructure proposal involves no coal extraction and no subsidence related impacts in the study area. Accordingly, the following aspects of subsidence-related environmental hydrology that are beyond the scope of this report include:

- fluvial geomorphology;
- low flow hydrology and river hydraulics;
- sediment transport and deposition; and
- riparian ponding, riffle systems and associated ecological habitat.

2 STUDY AREA

2.1 OVERVIEW

The study area catchment and proposed conveyor and rail spur are located near Wyong on the Central Coast of New South Wales (see *Figure 2.1*).

The study area for this assessment incorporates the Spring Creek catchment upstream of the Doyalson Link Road. Spring Creek flows a further 2.5 km into Wallarah Creek, which flows into Budgewoi Lake; another 1.7 km downstream of the confluence with Spring Creek.

Because all of the proposed rail spur is located to the north of the Doyalson Link Road and the bridge and embankments of this road create a hydraulic control point for Spring Creek there will be no impacts on Spring Creek downstream of this bridge.

The conveyor will be located almost entirely within the Spring Creek catchment with only a short length within the Wallarah Creek catchment. Because the conveyor will have no impacts on runoff quantity, only the Spring Creek catchment will be included in the study area.

The **Study Area** for the flood impact assessment has consequently been defined as the floodplains of Spring Creek upstream of the Doyalson Link Road.

The Study Area is shown in *Figure 2.2*.

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Figure 2.1 Catchment Locality Plan



2.2 SPRING CREEK CATCHMENT CHARACTERISTICS

Spring Creek, upstream of the Doyalson Link Road, has a total catchment area of 11.49 km². Spring Creek has three main tributaries, designated in this report as the Northern, Southern and Eastern tributaries.

Some of the upper catchment has been cleared for agriculture but most of the catchment is thickly vegetated. Average slopes exceed 1 in 20 (5%) for sub-catchments and between 1 in 500 (0.2%) to 1 in 50 (2%) for waterways.

Most of the waterways in the lower sub-catchments are rough and heavily vegetated.

2.3 WALLARAH CREEK

Potential impacts on Wallarah Creek relative to the previously proposed rail loop have been eliminated. However, whilst not affected by hydrological or hydraulic changes due to the proposed conveyor and rail spur, Wallarah Creek is adjacent to the proposed surface facilities and will receive some runoff from a short section of the proposed conveyor. Consequently, it will be necessary to ensure that water quality from these areas meets Environmental Protection Authority (EPA) standards as outlined in the previous EIS.

The extent of the 1% AEP flood in Wallarah Creek is shown in *Figure 2.3*. The culvert under the Doyalson Link Road acts as a hydraulic control and all potential afflux is fully contained within the Tooheys Road Site boundary.



3 DATA REVIEW

3.1 TOPOGRAPHIC DATA

3.1.1 Digital Terrain Models

WACJV supplied a Digital Terrain Model (DTM) of most of the Spring Creek catchment. This DTM was derived from a 2006 Aerial Laser Survey (ALS), which produced topographic information with an accuracy of +/- 0.1 m laterally and +/- 0.2 m vertically. This data was used to generate contours for the catchment.

The eastern tributary sub-catchment was not covered by this DTM and contours taken from available orthophoto maps were used to complete the terrain model.

3.1.2 Detailed Survey

A detailed survey was undertaken along the proposed conveyor and rail spur alignments. Contours derived from this survey were found to match the ALS data closely and were used to fill in minor details. Bridges were measured by hand.

3.1.3 *Post-Development Topography*

No significant changes are proposed to topography along the conveyor easement. The embankments proposed for the rail spur will be entirely within the 20m easement and no changes to topography outside these areas is proposed.

3.2 SIGNIFICANT FLOODS OF RECORD

No flood records were available for the Spring Creek study area. This study is therefore limited to a comparative assessment based on calculated water levels before and after development. Absolute values of flood levels should not be taken as definitive until the sufficient actual flood data is obtained to calibrate the hydraulic model.

3.3 RAINFALL DATA

All flood studies require rainfall data for two purposes. The first is to provide information on actual rainfall in the catchment during moderate recorded floods to be entered into a hydrologic model for calibration purposes. This data is referred to as "event" data. The second is to provide information on rare or extreme storms, (usually annual maxima) to compare against design floods. Design storm data requires stations with many years of continuous records. Since no extreme storms have been recorded in the relatively short period of records available, it is not possible to determine estimates of flood probability using statistical methods. Consequently, the only practical method available for developing flood frequency estimates is to use the procedures outlined in *Australian Rainfall and Runoff* (1987, Revised 2007) (AR&R).

There are a number of rainfall gauges within the Wyong and surrounding Local Government Areas. These gauges are summarised in *Table 3.1* and their locations are shown in *Figure 3.3*.

Due to the lack of streamflow records in Spring Creek, it was not possible to correlate data from the available rain gauge data. However, the temporal patterns were reviewed and found to have good correlation to the temporal patterns used by AR&R.

Gauge Type	Location	Data Source	Recording Frequency
Pluviograph	Mardi Dam	MHL	2 minutes
Pluviograph	Toukley	MHL	5 minutes
Pluviograph	Wyong	MHL	10 minutes
Pluviograph	Yarramalong	MHL	2 minutes
Rainfall	Wyee Post Office	BOM	Daily
Rainfall	Gosford (Narara Research Station) AWS	ВОМ	Daily
Rainfall	Ourimbah (Dog Trap Road)	BOM	Daily
Rainfall	Laguna (Kolongba)	BOM	Daily
Rainfall	Kulnura North (Jeavons)	BOM	Daily
Rainfall	Watagan Central	BOM	Daily
Rainfall	Yarramalong (Lewinsbrook)	ВОМ	Daily
Rainfall	Norah Head Lighthouse	BOM	Daily
	eviates Bureau of Meteorology. eviates Manly Hydraulics Laboratory	, ,	

Table 3.1Summary of Rain Gauges

2. MHL abbreviates Manly Hydraulics Laboratory.

3. AWS abbreviates Automated Weather Station.



Figure 3.1 Rainfall and Streamflow Gauging Stations

3.3.1 Design Rainfall

Design storm data published in AR&R was used in this study. Because the catchment is relatively small, there was no need to allow for spatial variations of rainfall intensity parameters. However, design rainfall was applied to sub-catchments to model a range of intensities for design storms of particular probabilities and to account for routing effects along each stream. A conservative approach was taken in this study by adopting, for the whole of the sub-catchments, the maximum value for each of the rainfall parameters from the relevant AR&R Maps from any point within the catchment.

3.3.2 Downstream Conditions

Hydraulic models require the definition of the boundary conditions at the downstream end of the model. The boundary conditions can be entered as:

- a constant water surface level;
- a time varying relationship of water surface levels; or
- a rating curve providing water surface levels for various flow rates.

Due to the lack of recorded flood data it was not possible to use either of the first two approaches. The creek was modelled for a distance of 215m downstream of the Doyalson Link Road to provide a theoretical uniform flow depth rating curve. However, the link road bridge is sufficiently narrow to create a critical flow control point for larger flood flows and flood levels upstream of the bridge are not influenced by conditions downstream.

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4 HYDROLOGICAL MODEL

4.1 OVERVIEW

The software package DRAINS was used to model the hydrology of the Spring Creek catchment for the 1% AEP storm and the PMF. As part of the modelling process, each of the 4 sub-catchments were divided into smaller sub-catchments with channel connections between nodes to allow for the effects of channel routing and timing of individual sub-catchment flood peaks.

A number of runs were undertaken to determine the critical storm duration at the two main points of interest (Rail Bridges 1 and 2). The PMF has also been input into the DRAINS model as a peak intensity with similar temporal patterns as the critical 1% AEP storm.

4.2 DESCRIPTION OF DRAINS MODEL

The arrangement of sub-catchments used in the model is shown in *Figure 4.1*. Values of surface slope, channel slope and channel cross-sections were obtained from the detailed ALS information. Values of surface and channel roughness and other parameters were obtained from site inspections and from aerial photographs. The configuration of the DRAINS model is shown in *Figure 4.2*. Model input data is summarised in *Annex A*.

4.3 RAINFALL PARAMETERS

Design storm rainfall was determined for the 1% AEP and for durations between 30 minutes and 3 hours in accordance with the standard procedures described in Chapter 2 of AR&R. Parameters for each rainfall zone were calculated using the maps provided in Volume 2 of AR&R. Hyetographs for each design storm were also developed in accordance with the procedures outlined in AR&R. Parameters used in development of the hydrologic input to the DRAINS model are detailed in *Annex A*.

4.4 PROBABLE MAXIMUM PRECIPITATION (PMP) CALCULATIONS

Probable Maximum Precipitation (PMP) was calculated using the Generalised Short Duration Method (GSDM) as described in the Bureau of Meteorology's Bulletin 53 (1994). This method is considered suitable only for catchments up to 1000 km² in area and for storms up to 6 hours in duration. Bulletin 53 was revised in June 2003, with the moisture adjustment factor (MAF) being changed to reflect updated moisture data that has been used by the Hydrometeorology Section of the Bureau of Meteorology since 2001.

The PMP was applied directly into the DRAINS model for the maximum intensity zone with no special distribution to determine the PMF.

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Figure 4.1 Spring Creek Sub-catchments and Hydraulic Model Section Locations



Figure 4.2 DRAINS Model Layout

5 HYDRAULIC MODELLING

5.1 METHODOLOGY

Estimating flood levels, flows and velocities before and after development is essential to ensure public safety is maintained. It is also necessary so that mitigation measures can be put in place for every structure and property as well as public infrastructure adversely affected as a result of changes to flood behaviour resulting from the development. The HEC-RAS model was used to determine flood levels for this study.

5.2 MODEL DESCRIPTION

HEC-RAS is a software package developed by the U.S. Army Corps of Engineers to perform one-dimensional steady and unsteady river hydraulic calculations for a full network of natural and constructed channels. The flow data determined using the DRAINS model provides input to the HEC-RAS model to calculate water surface levels, velocities and water profiles for the critical 1% AEP storm and for the PMF.

The HEC-RAS model topographic input was derived from the ALS data as well as limited site survey. Parameters used in the model were determined from site inspections and from aerial photos. Only the main channel of Spring Creek and its southern tributary needed to be modelled to assess flood levels at the two bridges. The locations of sections used in the HEC-RAS model are shown in Figure 4.1 and a diagrammatic representation of the model indicating the section chainages is given in *Figure 5.1*.

HEC-RAS model input data is given in *Annex B*.

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Figure 5.1 HEC-RAS Model Structure

5.4 MODEL PARAMETERS

Roughness Values

Surface roughness is one of the main parameters affecting flood behaviour. In general, for a given flow, water depth is proportional to a function of surface roughness. In the HEC-RAS model, roughness, expressed as Manning's n values, are entered as a tabulated set of material properties for a range of vegetation coverage and surface types across each cross-section.

Roughness values were estimated by comparing the vegetation and topography of the creeks and floodplains with published data (Chow, 1986). These values were varied as part of a sensitivity assessment of the model.

The riparian zones along the main channels are typically heavily vegetated with large trees and dense undergrowth. The majority of the floodplains and surrounding hills are also heavily vegetated with only small areas cleared for agriculture.

Downstream Boundary Conditions

While the hydraulic model extends approximately 250 metres downstream of the Doyalson Link Road bridge, the focus of this study is the creek system upstream of the bridge. No significant variations in flood levels were found to result from changes to downstream boundary conditions. This is due primarily to the bridge acting as a choke for high flows. Uniform flow depth was therefore adopted for the downstream boundary conditions for all floods.

Flow Values

As noted previously, steady state flow values were taken from the DRAINS model. These values were varied along each reach to properly represent the contributions of each sub-catchment and tributary.

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6.1 DRAINS RESULTS

6

The results of the DRAINS model are summarised in the following *Table 6.1*.

Location	1% AEP Flow (m ³ /s)	PMF Flow (m ³ /s)
Bridge 1	59.1	310
Bridge 2	61.1	278
Culvert 1	25.8	93.1*
Culvert 2	8.71	30.4*
Link Rd Bridge	204	1228

 Table 6.1 - DRAINS Model Summary

* Includes flow over rail embankment

The results are also summarised in *Figures 6.1* and *6.2* and fully tabulated in *Annex A*. The critical storm duration was found to be 2 hours for all relevant locations within the catchment.

There is no measurable change in hydrology and resultant flows as a consequence of the proposed development.

The model also showed that both culvert crossings have sufficient capacity to carry the 1% AEP with no overtopping of the embankment but would not be capable of conveying the PMF flows.

The 1% AEP model was also run for 10m extensions to the culverts to represent potential extensions required for construction of the rail spur. There were no significant increases in upstream flood levels (afflux) as a result of these extensions.



W2CP RAIL SIDING SPRING CREEK DRAINS MODEL 100 YEAR ARI FLOWS

Figure 6.1 1% AEP Flows



Figure 6.2 PMF Flows

6.2 HEC-RAS RESULTS

6.2.1 1% AEP Flood

The increase in flood levels – or afflux – caused by development within the floodplain can be caused by an impediment to the flow, which caused a change in energy gradient or by filling of flood volume causing a corresponding increase in levels. For the proposed rail spur, the effects on flood storage volumes are so small as to be undetectable.

Afflux caused by construction of the rail spur and bridges has been determined by comparison of pre and post development HEC-RAS models. These are summarised in the following tables.

River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
3277	PF 1	12.3	27.5	28.59	28.29	28.65	0.003045	1.14	10.8	19.06	0.48
2465	PF 1	28.7	19.5	19.95	19.95	20.06	0.026643	1.51	19.04	84.82	1.02
1713	PF 1	39	11.5	13.31		13.39	0.002598	1.29	32.43	47.1	0.41
856	PF 1	55.6	6	7.5	7.5	7.87	0.017861	2.67	20.83	29.17	1.01
665	PF 1	57	4.5	6.19		6.26	0.001787	1.2	51.5	55.9	0.35
411	PF 1	58	4	5.38		5.53	0.005277	1.69	35.59	46.81	0.57
301	PF 1	59	3.4	5.39		5.4	0.000297	0.49	119.54	97.45	0.14
276	PF 1	59	3	5.36	4.05	5.39	0.000346	0.71	87.48	51.8	0.17
266		Bridge									
256	PF 1	59	2.8	5.35		5.37	0.000258	0.65	93.44	50.33	0.14
234	PF 1	59	1.2	5.35		5.37	0.000179	0.64	120.72	86.4	0.12
122	PF 1	59	1.4	5.34		5.35	0.000126	0.56	171.26	205.83	0.11
0	PF 1	59	1	5.34		5.34	0.000006	0.14	535.32	305.55	0.02

Table 6.2 Southern Tributary - 1% AEP Existing Conditions

Table 6.3 Southern Tributary - 1% AEP Post Development Conditions

River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
3277	PF 1	12.3	27.5	28.59	28.29	28.65	0.003045	1.14	10.8	19.06	0.48
2465	PF 1	28.7	19.5	19.95	19.95	20.06	0.026643	1.51	19.04	84.82	1.02
1713	PF 1	39	11.5	13.31		13.39	0.002598	1.29	32.43	47.11	0.41
856	PF 1	55.6	6	7.5	7.5	7.87	0.017865	2.67	20.83	29.17	1.01
665	PF 1	57	4.5	6.19		6.26	0.00179	1.2	51.47	55.88	0.35
411	PF 1	58	4	5.39		5.53	0.005211	1.68	35.75	46.88	0.57
301	PF 1	59	3.4	5.39		5.4	0.000295	0.49	119.86	97.55	0.14
276	PF 1	59	3	5.37	4.05	5.39	0.000344	0.71	87.65	51.83	0.16
266		Bridge									
256	PF 1	59	2.8	5.36		5.38	0.000257	0.65	93.61	50.36	0.14
244	PF 1	59	1.3	5.35	3.4	5.37	0.000207	0.67	112.68	81.28	0.13
234		Bridge									
224	PF 1	59	1.1	5.35		5.37	0.000154	0.61	129.54	91.68	0.11
122	PF 1	59	1.4	5.34		5.35	0.000126	0.56	171.29	205.84	0.11
0	PF 1	59	1	5.34		5.34	0.000006	0.14	535.32	305.55	0.02

Froude # Ch	Top Width	Flow Area	Vel Chnl	E.G. Slope	E.G. Elev	Crit W.S.	W.S. Elev	Min Ch El	Q Total	Profile	River Sta
	(m)	(m2)	(m/s)	(m/m)	(m)	(m)	(m)	(m)	(m3/s)		
0.	28.65	5.63	1.24	0.014767	33.48	33.38	33.4	33	7	PF 1	3340
1.0	35.96	8.96	1.59	0.01731	23.63	23.51	23.51	23	14.2	PF 1	2740
0.4	42.52	20.16	0.95	0.003742	15.1	14.78	15.05	14	19.1	PF 1	2086
1.0	42.58	23.9	2.39	0.019353	12.35	12.06	12.06	10.5	57	PF 1	1841
0.5	55.28	37.91	1.55	0.004696	10.16		10.04	8.5	58	PF 1	1595
0.5	73.67	45.56	1.3	0.005019	8.2		8.11	6	59	PF 1	1193
0.4	61.3	47.01	1.34	0.003551	7.55		7.46	5.5	61.1	PF 1	1038
0.3	49.24	55.76	1.23	0.001455	7.32		7.24	5.1	61.1	PF 1	933
0.9	31.96	22.58	2.77	0.016512	7.16	6.77	6.77	5	61.1	PF 1	896.5
0.4	27.86	37.37	1.72	0.002652	7.03	6.23	6.88	4.9	61.1	PF 1	886.5
									Bridge		876.5
0.4	29.28	38.9	1.62	0.002464	6.79		6.66	4.8	61.1	PF 1	866.5
0.2	55.19	66.02	0.93	0.001094	6.7	5.69	6.66	4.1	61.1	PF 1	837.5
1.0	46.44	46.75	3.17	0.015961	5.85	5.34	5.34	3.8	148	PF 1	669
0.1	183.14	249.31	0.7	0.000193	5.39		5.37	1.5	148	PF 1	437
0.0	304.78	531.97	0.49	0.000073	5.34		5.33	1	205	PF 1	0

Table 6.4 Spring Creek - 1% AEP Existing Conditions

Table 6.5 Spring Creek - 1% AEP Post Development Conditions

River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
3340	PF 1	7	33	33.4	33.38	33.48	0.014767	1.24	5.63	28.65	0.9
2740	PF 1	14.2	23	23.51	23.51	23.63	0.01731	1.59	8.96	35.96	1.01
2086	PF 1	19.1	14	15.05	14.78	15.1	0.003742	0.95	20.16	42.52	0.43
1841	PF 1	57	10.5	12.06	12.06	12.35	0.019353	2.39	23.9	42.58	1.01
1595	PF 1	58	8.5	10.04		10.16	0.004704	1.55	37.88	55.27	0.53
1193	PF 1	59	6	8.11		8.2	0.005006	1.3	45.6	73.68	0.52
1038	PF 1	61.1	5.5	7.46		7.55	0.003576	1.34	46.88	61.21	0.46
933	PF 1	61.1	5.1	7.24		7.31	0.001471	1.24	55.55	49.19	0.33
896.5	PF 1	61.1	5	6.79	6.77	7.16	0.014989	2.69	23.32	32.36	0.94
886.5	PF 1	61.1	4.9	6.89	6.23	7.04	0.002553	1.7	37.86	27.95	0.43
876.5		Bridge									
866.5	PF 1	61.1	4.8	6.69		6.82	0.002296	1.58	39.82	29.45	0.41
847.5	PF 1	61.1	4.2	6.7	5.79	6.75	0.001245	0.97	62.78	53.64	0.29
837.5		Bridge									
827.5	PF 1	61.1	4	6.59	5.59	6.63	0.001032	0.9	67.53	55.89	0.26
669	PF 1	148	3.8	5.34	5.34	5.85	0.015961	3.17	46.75	46.44	1.01
437	PF 1	148	1.5	5.37		5.39	0.000193	0.7	249.31	183.14	0.13
0	PF 1	205	1	5.33		5.34	0.000073	0.49	531.97	304.78	0.08

A comparison of these tables indicates an afflux of 0.01m at Bridge 1 over the Southern Tributary and 0.03m at Bridge 2 over Spring Creek (main channel). The maximum increase in velocity at any point near the bridges is 0.04 m/s and the maximum decrease in velocity is 0.07 m/s.

Longitudinal profiles for the 1% AEP flood in the Southern Tributary and Spring Creek are shown in *Figures 6.3* and *6.4* respectively.

Note that in all figures E G indicates the energy grade line; W S represents the water surface level and Crit represents the critical flow level.

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Figure 6.3 1%*AEP Flood Profile – Southern Tributary through Bridge* 1



Figure 6.4 1%AEP Flood Profile – Spring Creek through Bridge 2

Figures 6.5 and *6.6* show the flood sections through Bridge 1 and Bridge 2 respectively.



Figure 6.5 Bridge 1 Section – 1% AEP Flood



Figure 6.6 Bridge 2 Section – 1% AEP Flood

6.2.2 PMF

The PMF flows derived from the DRAINS model were input into the HEC-RAS model for existing conditions. The Doyalson Link Road was not overtopped and the road bridge continued to act as a hydraulic control for the Spring Creek catchment upstream of this point.

However, the rail line would be significantly inundated at all crossing points and, indeed, over most of its length during the PMF. The Doyalson Link Road rail bridge would also form an additional discharge route for the Spring Creek catchment.

PMF flood profiles are shown in *Figures 6.7* and *6.8*. There is not purpose in comparing pre and post development conditions for the PMF as backwater effects would ensure no afflux would be possible.


Figure 6.7 PMP Flood Profile – Southern Tributary through Bridge 1



Figure 6.8 PMF Flood Profile – Spring Creek through Bridge 2

6.3 FLOOD HAZARD ASSESSMENT

According to the NSW Floodplain Development Manual (2005), floodplain areas can be divided into specific categories that are used to determine appropriate land uses. Categories include:

- Hydraulic categories that represent the impact of development on flood behaviour floodway, flood storage and flood fringe; and
- Hazard categories (low hazard and high hazard) that show the impact of flooding on structures and people.

Diagrammatic definitions of these categories are provided in *Figures 6.9* and *6.10*.

The food hazard category near the bridges would be classed as high on the basis that velocities are generally greater than 1.4 m/s and depths are generally greater than 1.2 m. Comparison of pre and post development depths and velocities (refer to *Tables 6.2 to 6.5*) indicates that there will be no change to flood hazard categories at any location in the Study Area. This is a consequence of the insignificant changes to both flow depths and flow velocities.



Figure 6.9 Hydraulic Categories



Figure 6.10 Flood Hazard Categories

6.4 FLOOD EXTENTS

There will be no significant change to the 1% AEP flood extent other than the reduction in extent corresponding to the rail spur embankment itself.

An indicative flood map is given in *Figure 6.11*. For the calculated maximum afflux of 30mm there will be no discernible change in flood extent that could be represented on this figure.

It should be noted that without calibration of the model, absolute values of flood levels and associated flood extents cannot be confirmed. As stated in Section 3.2 of this report, no flood data is available for Spring Creek, hence calibration of the model is not possible at this time. For this model the primary aim was to make a comparison between existing and post developed conditions (i.e. afflux) and the model is suitable and sufficiently accurate for that purpose. In addition, conservative values of model parameters were used to give an upper bound estimate of flood levels.



7 MITIGATION MEASURES

The model demonstrates that there will be negligible afflux caused by the proposed rail spur development. Accordingly, it is expected that mitigation measures to address afflux will not be required and none are proposed. Freeboard to existing rail infrastructure will continue to be adequate.

However, if it is deemed necessary to completely eliminate afflux, this can be achieved by minor improvements to channel geometry and conveyance characteristics as part of detailed design. This may include regrading and lining of the channel under and between bridges and for a nominal distance upstream and downstream.

Management of water quality both during construction and as part of ongoing operational requirements can be achieved easily by bunding the conveyor route and the rail spur with swales to direct all runoff to sediment basins and pollution control devices. This will be a requirement of detailed design with a performance requirement that no uncontrolled flows will occur from any construction or operational area without treatment to ensure runoff water quality meets or exceeds EPA water quality parameters.

CONCLUSION

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Flood impacts as a result of the proposed rail spur and conveyor are considered to be negligible. There will be no significant change in flood hazards and no discernible change in flow velocities, flood levels or extents as a consequence of the Amendment. Mitigation measures are available to completely eliminate all impacts as part of detailed design of bridges and adjacent infrastructure.

It is recommended that EPA guidelines are followed to ensure no adverse impacts occur to water quality during the construction and operation of the proposed works in and adjacent to all tributaries of Spring Creek and all other waterways.

REFERENCES

9

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Annex A – DRAINS Model Input and Output

PIT / NOD Name	DE DETAIL Type		Version 1 Size		Pressure	Surface	Max Pond	Base	Blocking	x	y	Bolt-dow	id	Part Full	Inflow						
tunic	type	, ann y					Depth (m)		Factor	~		lid			Hydrograp	bh					
				(cu.m)	Coeff. Ku			(cu.m/s)													
	Headwa	all			0.2			0		903.044			55								
	Node Headwa	411			0.5	21.72		0		890.77 876.83			53 139								
	Node				0.5	12.3		0		890.784			142								
	Node					4		0		895.417			144								
Jnct 2-4						1.5		0		869.965			148								
Jnct 2-3						1		0		862.932			150								
Link Rd Bı Wallarah						0.5		0		870.132 888.465			215 154								
	Node					18		0		864.357			316								
	Node					26.5		0		536.071			586								
N2b	Node					16.5		0		622.475	-266.144		592								
	Node					8.5		0		733.996			597								
Ral Brg 2						5		0		838.149			602								
	Node Node					14		0		553.009 716.079			629 640								
	Node					29.5		0		415.278			659								
	Node					19.5		0		523.495			661								
N3d	Node					6.5		0		700			662								
Rail Brg 1						3		0		822.106			664								
N3e	Node					10.5		0)	698.843	-422.801		663								
DETENTIC	NI BASIN		ç																		
				Outlet Typ	К	Dia(mm)	Centre RL	Pit Famil	Pit Type	x	y	HED	Crest RL	Crest Len	eid						
SUB-CATC																					
			Paved			Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Paved	Grass	Supp	Lag Time		Gutter	Gutter
	Node	Area (ha)	Area %	Area %	Area %	Time (min)	Time (min)	Time (min)	Length (m)	Length (m)	Length (m)	Slope(%) %	Slope %	Slope %	Rough	Rough	Rough	or Factor	Length (m)	Slope %	FlowFacto
Cat1a	HW1a	(na) 25.519	[%]												0.017	0.035	0.05	0		/0	
	N4a	428.26	1													0.035					
Cat4b	Jnct 2-3	88.424	1	99	0	5	5	0										0			
	N117	59.692	1													0.035					
	N2a	26.08	1										8.4			0.035					
	N2b N2c	49.162 60.772	1										6.8 9.8			0.035					
	Ral Brg	38.822	1													0.035					
	N2d	56.578	1							1 1050						0.032					
Cat2e	N2e	27.337	1	99	0	5	2	0	10	0 680	1	1	5.4	1	0.015	0.035	0.015	3			
	N3a	47.135	1										6.5			0.035					
Cat3b 3c		74.169	1										8			0.035					
	N3d Roil Brg	84.425	1										5.5			0.035					
	Rail Brg N3e	41.64 40.897	1																		
																		-			
PIPE DETA	AILS																				
Name	From	То		U/S IL	D/S IL		Туре	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From	At Chg	-	RI	Chg	RL	etc		
D : 4					(m)	(%)	<u> </u>	(mm)	(mm)						(m)	(m)	(m)	(m)	(m)		
		N1a N1b	40				Concrete, Concrete,	1500 2700			Existing Existing		HW1a HW1b	0							
10010	110010	1410		15	12.5	0.75	concrete,	2700	2700	0.5	Existing		110010		,						
DETAILS c	of SERVIC	ES CROS	SING PIPE	s																	
Pipe	Chg	Bottom	Height of	Chg	Bottom	Height of	Chg	Bottom	Height of	Setc											
	(m)	Elev (m	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc											
CUANNEL	DETAIL																				
CHANNEL			Tupo	Longth	11/5 11	D/S II	Slope	Paco Wic		P.P. Slope	Manning	Donth	Roofed								
•ame		.0		Length (m)							n	(m)	nooreu								
Crk1a	N1a	HW1b	Irregular	429																	
			Irregular	879																	
			Irregular	425																	
			Irregular Irregular	437 266																	
			Irregular	540																	
			Irregular	100																	
	N2a	N2b	Irregular	756																	
Crk2b	N2b	N2c	Irregular	854	16.5	8.5															
			Irregular	719																	
			Irregular	439																	
			Irregular Irregular	480 10																	
			Irregular	1020																	
Crk3a	N3bc	N3d	Irregular	1609																	
		Rail Brg	Irregular	590																	
Crk3c Crk3d			Irregular	266																	
Crk3c Crk3d Crk3f	Rail Brg					6.5															
Crk3c Crk3d Crk3f	Rail Brg		Irregular	60	10.5	0.5															
Crk3c Crk3d Crk3f Crk3e	Rail Brg N3e	N3d		60	10.5	0.5															
Crk3c Crk3d Crk3f Crk3e OVERFLO	Rail Brg N3e W ROUT	N3d E DETAIL	S				Cross	Safe Den	SafeDenth	h Safe	Bed	D/S Area		id							
Crk3c Crk3d Crk3f Crk3e OVERFLO	Rail Brg N3e	N3d E DETAIL To	S Travel	Spill	Crest	Weir Coeff. C			SafeDepth Minor Sto		Bed Slope	D/S Area Contribut	ing	id							
Crk3c Crk3d Crk3f Crk3e OVERFLO Name	Rail Brg N3e W ROUT From	N3d E DETAIL To	S Travel Time	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Section	Major Sto (m)	Minor Sto (m)	r DxV (sq.m/sec)	Slope (%)	Contribut %									
Crk3c Crk3d Crk3f Crk3e OVERFLO Name OF1a	Rail Brg N3e W ROUT	N3d E DETAIL To N1a	S Travel Time	Spill Level (m) 26	Crest Length (m) 40	Weir Coeff. C 1.5		Major Sto (m) 0.05	(m)	r DxV	Slope (%) 1	Contribut % 0		id 56 218							

PIT / NOD	DE DETAILS			Version 8			
Name	Max HGL	Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint
		HGL	Flow Arriving	Volume	Freeboard	(cu.m/s)	
			(cu.m/s)	(cu.m)	(m)		
HW1a	23.9		8.693		2.1	0	None
N1a	22.58		0				
HW1b	17.43		29.115		2.12	0	None
N1b	13.62		0				
N4a	6.06		100.342				
Jnct 2-4	4.42		158.743				
Jnct 2-3	4.07		211.835				
Link Rd Br	3.76		206.104				
Wallarah	2.64		204.974				
N117	19.03		20.746				
N2a	27.4		9.121				
N2b	17.78		24.382				
N2c	10.31		56.813				
Ral Brg 2	6.72		62.622				
N2d	15.08		14.301				
N2e	10.33		19.525				
N3a	30.54		12.524				
N3bc	17.96		31.941				
N3d	7.77		59.699				
Rail Brg 1	4.74		60.261				
N3e	11.21		10.577				
	CHMENT DET						
Name	Max	Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
		Max Q	Max Q	Тс	Тс	Тс	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Cat1a	8.693	0.119					AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat4a	91.242	2.333			41.86		AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat4b	49.086	0.533					AR&R 100 year, 1.5 hours storm, average 62 mm/h, Zone 1
Cat1b	20.746	0.325					AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat2a	9.121	0.142			15.86		AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat2b	15.506	0.268					AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat2c	17.536	0.301					AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1
Cat2f	13.179	0.211					AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat2d	14.301	0.304					AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1
Cat2e	7.971	0.135					AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1
Cat3a	12.524	0.233					AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1
Cat3b 3c	23.249	0.404					AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat3d	23.362	0.418					AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1
Cat3f	12.783	0.227	1				AR&R 100 year, 2 hours storm, average 53 mm/h, Zone 1
Cat3e	10.577	0.202	10.52	6.56	26.72	0.39	AR&R 100 year, 1 hour storm, average 77 mm/h, Zone 1

	Volumes for	• Total Catchi	ment (11.5 impe	ervious + 11	37 nervious =	11/9 total h	2)		
Storm			Impervious Ru		-	1145 (0(a) 11	a)		
	cu.m		cu.m (Runoff %						
		•	6319.02 (98.2%	•	,				
AR&R 100	775516.63	471109.25 (6	7640.28 (98.5%	463468.97 (60.4%)				
AR&R 100	884663.44	553222.18 (6	8731.74 (98.7%	544490.44 (62.2%)				
AR&R 100	1068489.5	691856.70 (6	10570.07 (98.99	681286.63 (64.4%)				
			12063.59 (99.19						
AR&R 100	1440736.4	958263.01 (6	14292.64 (99.29	943970.38 (66.2%)				
PIPE DETA	\								
	Max Q	Max V	Max U/S	Max D/S	Due to Storm	۱ ۱			
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)	Due to storm				
Pipe1a	8.705	4.44	. ,		AR&R 100 ye	ar, 2 hours s	orm, average 5	3 mm/h, Zone 1	
Pipe1b	25.862	11.84	15.663					i3 mm/h, Zone 1	
CHANNEL	DETAILS								
	Max Q	Max V			Due to Storm	ı			
	(cu.m/s)	(m/s)							
Crk1a	8.609	1.96						3 mm/h, Zone 1	
Crk1c Crk4a	25.778 100.315							3 mm/h, Zone 1 3 mm/h, Zone 1	
Crk4a Crk2g	100.315							3 mm/h, Zone 1 3 mm/h, Zone 1	
Crk2h	206.104							3 mm/h, Zone 1	
Crk2i	204.974					-		i3 mm/h, Zone 1	
Crk1b	20.711	3.23						3 mm/h, Zone 1	
Crk2a	8.998	1.89			AR&R 100 ye	ar, 2 hours s	orm, average 5	3 mm/h, Zone 1	
Crk2b	23.403							3 mm/h, Zone 1	
Crk2c	57.041	2.64						3 mm/h, Zone 1	
Crk2f	61.141	2.83						3 mm/h, Zone 1	
Crk2d	14.155	1.98						mm/h, Zone 1	
Crk2e	19.063							3 mm/h, Zone 1	
Crk3a Crk3c	12.289 28.652	2.73						7 mm/h, Zone 1 3 mm/h, Zone 1	
Crk3d	55.599							i3 mm/h, Zone 1	
Crk3f	59.255	2.12						3 mm/h, Zone 1	
Crk3e	10.578							mm/h, Zone 1	
OVERFLO	W ROUTE DI	TAILS							
	Max Q U/S	Max Q D/S		Max D	Max DxV	Max Width	Max V		
OF1a	0	Max Q D/S 0	0	0	0	0			(
		Max Q D/S 0	0	0	0	0			(
OF1a	0	Max Q D/S 0	0	0	0	0			
OF1a OF16	0	Max Q D/S 0 0	0	0	0	0			
OF1a OF16 DETENTIO	0 0 DN BASIN DE	Max Q D/S 0 0 TAILS	0	0	0	0			
OF1a OF16	0	Max Q D/S 0 0	0	0 0 Max Q	0	0			
OF1a OF16 DETENTIO	0 0 DN BASIN DE	Max Q D/S 0 0 TAILS	0 0 Max Q	0 0 Max Q	0 0 Max Q	0			
OF1a OF16 DETENTIO Name CONTINU	0 0 DN BASIN DE Max WL	Max Q D/S 0 TAILS MaxVol or AR&R 100	0 0 Max Q Total year, 2 hours st	0 0 Max Q Low Level corm, averag	0 0 Max Q High Level				
OF1a OF16 DETENTIO Name CONTINU Node	0 0 DN BASIN DE Max WL ITY CHECK for Inflow	Max Q D/S 0 0 TAILS MaxVol 0 AR&R 100 Outflow	0 0 Max Q Total year, 2 hours st Storage Chang	0 0 Max Q Low Level orm, averaţ Difference	0 0 Max Q High Level				
OF1a OF16 DETENTIO Name CONTINU Node	ON BASIN DE Max WL ITY CHECK fi Inflow (cu.m)	Max Q D/S 0 0 TAILS MaxVol 0 AR&R 100 Outflow (cu.m)	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m)	0 0 Max Q Low Level corm, averag Difference %	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a	0 0N BASIN DE Max WL ITY CHECK fi Inflow (cu.m) 17897.17	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0	0 0 Max Q Low Level corm, avera _į Difference % 0	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0	0 0 Max Q Low Level corm, averag Difference % 0 -0.6	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0	0 0 Max Q Low Level Difference % 0 -0.6 -0.8	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0	0 0 Max Q Low Level Difference % 0 -0.6 -0.8 -1.3	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b N4a	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4 Jnct 2-3	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd Br	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 Total Vear, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1a HW1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd Br Wallarah	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 7 0 7 0 1 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1a HW1b N1b N1a Jnct 2-4 Jnct 2-3 Link Rd Br Wallarah N117 N2a	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 7 0 7 0 1 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1a HW1b N1b N1a Jnct 2-4 Jnct 2-3 Link Rd Br Wallarah N117 N2a N2b	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 7 0 7 0 1 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1b N1a HW1b N1a Juct 2-4 Juct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c	0 0N BASIN DE Max WL ITY CHECK f Inflow (cu.m) 17897.17 17903.18 59960.63 60418.14 358300.41 549542.94 838630 838573.63 844411.88 41899.14 18311.38 52932.36 155475.88	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 7 Otal 9 ear, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, 2				
OF1a OF16 DETENTIO Name CONTINU Node HW1a N1b N1a Junct 2-4 Junct 2-3 Link Rd Br Wallarah N117 N2a N2b N2c Ral Brg 2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, 2				
OF1a OF16 OF16 Name CONTINU Node HW1a N1b N1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd Br Wallarah N117 N2a N2b N2c Ral Brg 2 N2d	0 0N BASIN DE Max WL ITY CHECK f Inflow (cu.m) 17897.17 17903.18 59960.63 60418.14 358300.41 549542.94 830630 838573.63 844411.88 41899.14 18311.38 52932.36 155475.88 185640.69 39433.22	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, 2				
OF1a OF16 OF16 Name CONTINU Node HW1a N1b N1b N1b N1b N1b N1b N1b N1b N1b N1b	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, 2				
OF1a OF16 OF16 Name CONTINU Node HW1a N1b N1b N1b N1b N1b N1b N1b N1b N1b N1b	0 0N BASIN DE Max WL ITY CHECK fr Inflow (cu.m) 17897.17 17903.18 59960.63 60418.14 358300.41 549542.94 830630 838573.63 844411.88 41899.14 18311.38 52932.36 155475.88 185640.69 39433.22 58872.59 32895.34	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, 2				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N10 HW1b N10 N14 Jnct 2-4 Jnct 2-4 Jn	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N10 HW1b N10 N14 Jnct 2-4 Jnct 2-4 Jn	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N10 HW1b N1b N14 Jnct 2-4 Jnct 2-4 Jn	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N10 HW1b N1b N10 Unt 2-4 Jnct 2-4 Jnc	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1a HW1b N1b N1a Jnct 2-4 Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c N2c N2c N2c N2c N2c N2c N2c N2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 Max Q Total year, 2 hours st Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z				
OF1a OF16 OF16 DETENTIO Name CONTINU Node HW1a N1a HW1b N1b N1b N1b N1b N1b N1b N1c Link Rd Bi Wallarah N117 N2a N2la N2b N2c Ral Brg 2 N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c Ral Brg 2 N2c N2c N2c Ral Brg 2 N2c N2c N2c Ral Brg 2 N2c N2c N2c N2c N2c N2c N2c N2c N2c N2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Max Q D/S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 7 0 1 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 Max Q High Level ge 53 mm/h, Z	20ne 1		e cross section.	

DRAINS re	esults prepa	ared 28 Marcl	h, 2016 from Ve	ersion 2011.	18		
	E DETAILS			Version 8			
		Max Pond	Max Surface	Max Pond	Min	Overflow	Constraint
Name		HGL	Flow Arriving		Freeboard	(cu.m/s)	Constraint
		IIGL	(cu.m/s)	(cu.m)	(m)	(cu.iii/s)	
HW1a	26.36		30.408		-0.36	12 727	Headwall height/system capacity
N1a	20.30		12.727		-0.30	12.727	neadwan neight/system capacity
HW1b	19.94		95.698		-0.39	26 792	Headwall height/system capacity
N1b	19.94		36.283		-0.59	50.265	Headwall height/system capacity
N4a	7.79		588.474				
Jnct 2-4	7.19		848.51				
Jnct 2-4	6.8		1228.93				
Link Rd Br							
Wallarah	6.29 4.55		1227.85				
N117			1227.954				
	19.96		71.225				
N2a	27.82		31.117 89.47				
N2b	18.37						
N2C	11.21 7.75		247.762				
Ral Brg 2			291.743				
N2d	15.71 11.22		66.061				
N2e			96.178				
N3a	31.13		55.123				
N3bc	18.72		138.476				
N3d	8.92		277.001				
Rail Brg 1	6.88		314.671				
N3e	11.68		47.748				
SUB-CATC	HMENT DET	rails					
		Paved	Grassed	Paved	Grassed	Supp.	Due to Storm
		Max Q	Max Q	Тс	Тс	Тс	
	(cu.m/s)	(cu.m/s)	(cu.m/s)	(min)	(min)	(min)	
Cat1a	30.408						PMF
Cat4a	495.914						PMF
Cat4b	105.771	1.105					PMF
Cat1b	71.225						PMF
Cat2a	31.117	0.326					PMF
Cat2b	58.561						PMF
Cat2c	71.765						PMF
Cat2f	46.287						PMF
Cat2d	66.061						PMF
Cat2e	32.324						PMF
Cat3a	55.123						PMF
Cat3b 3c	88.323						PMF
Cat3d	99.36						PMF
Cat3f	49.538	0.521	49.047	5.91	12.13	0.23	PMF

Storm			ment (11.5 imp			1149 (0(a) 11	
			Impervious Ru				
	cu.m		cu.m (Runoff %	•			
PMF	6824546	6410329.10	68131.60 (99.89	6342197.50	(93.9%)		
PIPE DETA							
Name	Max Q	Max V	Max U/S	Max D/S	Due to Storm		
	(cu.m/s)	(m/s)	HGL (m)	HGL (m)			
Pipe1a	17.688	5.26	23.441	23.244	PMF		
Pipe1b	56.773	14.79	15.997	14.193	PMF		
CHANNEL	LDETAILS						
Name	Max Q	Max V			Due to Storm		
	(cu.m/s)	(m/s)					
Crk1a	30.48	,			PMF		
Crk1c	93.045	3.32			PMF		
Crk4a	571.34				PMF		
Crk2g	834.652	2.77			PMF		
Crk2h	1227.85				PMF		
Crk2i	1227.954				PMF		
Crk1b	66.326				PMF		
Crk2a	31.085	2.73			PMF		
Crk2b	88.665	3.28			PMF		
Crk2c	248.751	3.43			PMF		
Crk2f	278.148	3.63			PMF		
Crk2d	65.915				PMF		
Crk2e	96.179				PMF		
Crk3a	54.946				PMF		
Crk3c	136.513				PMF		
Crk3d	270.59				PMF		
Crk3f	310.107	1.9			PMF		
Crk3e	47.788				PMF		
Сткзе	47.788	5.47			PIVIF		
	W ROUTE D						
Name		Max Q D/S		Max D	Max DxV	Max Width	
OF1a	12.727	12.727	0.288	0.286	0.67	29.13	2.34
OF16	36.283	36.283	0.288	0.3	1.85	30	6.18
DETENTIC	ON BASIN DE	TAILS					
Name	Max WL	MaxVol	Max Q	Max Q	Max Q		
			T-+-1	Low Level	High Loval		
			Total		Ingli Level		
			Iotai		light Level		
CONTINU	JITY CHECK f	or PMF	lotal		light Level		
	JITY CHECK f						
CONTINU Node	Inflow	Outflow	Storage Chang	Difference			
Node	Inflow (cu.m)	Outflow (cu.m)	Storage Chang (cu.m)	Difference %			
Node HW1a	Inflow (cu.m) 142433.63	Outflow (cu.m) 142441.88	Storage Chang (cu.m) 0	Difference % 0			
Node HW1a N1a	Inflow (cu.m) 142433.63 142441.53	Outflow (cu.m) 142441.88 142834.25	Storage Chang (cu.m) 0 0	Difference % 0 -0.3			
Node HW1a N1a HW1b	Inflow (cu.m) 142433.63 142441.53 476738.72	Outflow (cu.m) 142441.88 142834.25 480044.88	Storage Chang (cu.m) 0 0 0	Difference % -0.3 -0.7			
Node HW1a N1a HW1b N1b	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03	Storage Chang (cu.m) 0 0 0 0 0	Difference % -0.3 -0.7 -0.3			
Node HW1a N1a HW1b N1b N1b N4a	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057	Storage Chang (cu.m) 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2			
Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2			
Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4 Jnct 2-3	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.2 -0.1			
Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6456707	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.2 -0.1			
Node HW1a N1a HW1b N1b N1b N4a Jnct 2-4 Jnct 2-3	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6456707	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.2 -0.1 -0.1			
Node HW1a N1a HW1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd B	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6456707	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0			
Node HW1a N1a HW1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6466707 6472684.5 333244.41	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 0 -0.2			
Node HW1a N1a HW1b N1b N4a Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6466707 6472684.5	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 0 -0.2 -0.4			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 -0.2 -0.4 -0.4 -0.5			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 633910.03 146145.34 422705.53 1236306.13	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 -0.2 -0.4 -0.5 -0.4			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 633910.03 146145.34 422705.53 1236306.13 1457532.38	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 -0.2 -0.4 -0.5 -0.4 -0.3			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2e	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 0 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c Ral Brg 2 N2d N2e N3a	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 633910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N2d N2c N3a N3bc	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N3a N3bc N3d	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31 1382377.9	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38 1388122.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 0 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N3a N2c N3a N3bc N3d Rail Brg 1	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31 1382377.9 1620531.3	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38 1388122.5 1623344.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N3a N3bc N3d	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31 1382377.9	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38 1388122.5 1623344.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N3a N2c N3a N3bc N3d Rail Brg 1	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31 1382377.9 1620531.3	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38 1388122.5 1623344.5	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.2 -0.4 -0.7 -0.4 -0.7 -0.4 -0.7			
Node HW1a N1a HW1b N1b Jnct 2-4 Jnct 2-3 Link Rd Bi Wallarah N117 N2a N2b N2c Ral Brg 2 N2d N2c N2d N2c N3a N3bc N3bc N3d Rail Brg 1 N3e	Inflow (cu.m) 142433.63 142441.53 476738.72 480045.28 2869466 4331589.5 6458325.5 6458325.5 6458325.5 6456707 6472684.5 333244.41 145599.61 420547 1231361.6 1453024.8 315631.56 468781.72 262962.22 678089.31 1382377.9 1620531.3 228148.38	Outflow (cu.m) 142441.88 142834.25 480044.88 481275.03 2874057 4341072 6466707 6472684.5 6472684.5 333910.03 146145.34 422705.53 1236306.13 1457532.38 316224.94 469517.91 264114.69 683100.38 1388122.5 1623344.5 228176	Storage Chang (cu.m) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Difference % 0 -0.3 -0.7 -0.3 -0.2 -0.2 -0.1 -0.1 -0.1 -0.1 -0.2 -0.4 -0.5 -0.4 -0.3 -0.2 -0.2 -0.4 -0.2 -0.2 -0.2 -0.4 -0.7 -0.2 -0.2 -0.4 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2 -0.2			

Annex B - HEC-RAS Model Input and Output

PREDEVELOPMENT CONDITIONS

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

Х	Х	XXXXXX	XX	XX		XX	XX	Х	X	XXXX
Х	Х	Х	Х	Х		Х	Х	Х	Х	Х
Х	Х	Х	Х			Х	Х	Х	Х	Х
XXXX	XXX	XXXX	Х		XXX	XX	XX	XXX	XXX	XXXX
Х	Х	Х	Х			Х	Х	Х	Х	Х
Х	Х	Х	Х	Х		Х	Х	Х	Х	Х
Х	Х	XXXXXX	XX	XX		Х	Х	Х	Х	XXXXX

PROJECT DATA Project Title: W2CP Rail Siding Pre Dev Project File : W2CPRailSidingPr.prj Run Date and Time: 28/03/2016 3:44:52 PM

Project in SI units

Project Description: Flood Impacts Assessment

PLAN DATA

Plan Title: Plan 02 Plan File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPr.p02 Geometry Title: Spring Creek Geometry File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPr.g01 Flow Title : 100 year ARI Flow File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPr.f01 Plan Summary Information: Number of: Cross Sections = 34 Multiple Openings = 0 Culverts = 0 Inline Structures = 0 Bridges = 2 Lateral Structures = 0 Computational Information Water surface calculation tolerance = 0.003 Critical depth calculation tolerance = 0.003 Maximum number of iterations = 20 = 0.1 Maximum difference tolerance Flow tolerance factor = 0.001 Computation Options Critical depth computed only where necessary Conveyance Calculation Method: At breaks in n values only Friction Slope Method: Average Conveyance Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 100 year ARI Flow File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPr.f01

Flow Data (m3/s)

D. J.	Dl.		DC	DD 1
River	Reach		RS	PF 1
South Tributary			3277	12.3
South Tributary			2465	28.7
South Tributary			1713	39
South Tributary			856	55.6
South Tributary			665	57
South Tributary			411	58
South Tributary			301	59
South Tributary			276	59
South Tributary			256	59
South Tributary			234	59
South Tributary	•		122	59
South Tributary			0	59
Spring Creek	US of	Jn	3340	7
Spring Creek	US of	Jn	2740	14.2
Spring Creek	US of	Jn	2086	19.1
Spring Creek	US of	Jn	1841	57
Spring Creek	US of	Jn	1595	58
Spring Creek	US of	Jn	1193	59
Spring Creek	US of	Jn	1038	61.1
Spring Creek	US of	Jn	933	61.1
Spring Creek	US of	Jn	896.5	61.1
Spring Creek	US of	Jn	886.5	61.1
Spring Creek	US of	Jn	866.5	61.1
Spring Creek	US of	Jn	837.5	61.1
Spring Creek	US of	Jn	669	148
Spring Creek	US of	Jn	437	148
Spring Creek	US of	Jn	0	205
Spring Creek	US of	Wallarah	C530	205
Spring Creek	US of	Wallarah	C352	205
Spring Creek	US of	Wallarah	C323	205
Spring Creek	US of	Wallarah	C273	205
Spring Creek	US of	Wallarah	C258	205
Spring Creek	US of	Wallarah	C215	203
Spring Creek	US of	Wallarah	C0	203

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Spring Creek	US of Wallarah	n CPF 1		Normal S = 0.001

GEOMETRY DATA

Geometry Title: Spring Creek Geometry File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPr.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
South Tributary	•		Jnl
Spring Creek	US of Jn		Jnl
Spring Creek	US of Wallarah C	Jnl	

JUNCTION INFORMATION

Name: Jnl Description: Energy computation Method

Length across Junct River Rea Spring Creek US of Ju South Tributary .	ach n t	o Spring	ibutary River g Creek g Creek	R US of US of	Wallara	Leng h C h C	gth Angle 0 0 0 0
CROSS SECTION							
RIVER: South Tributary REACH: .	RS: 3277						
INPUT	7						
Description: Top DS of 1 Station Elevation Data	num=	13					
Sta Elev Sta		Sta	Elev	Sta	Elev	Sta	
-119 33 $-81-6$ 28) 31) 27.5	-57 4	30 28	-17 6	29 28.5	-11 12	28.5 29
31 30 3		59	33	Ũ	20.5	10	20
Manning's n Values	num=	3					
Sta n Val Sta		Sta	n Val				
-119 .035 -1	7.033	12	.035				
Bank Sta: Left Right -17 12	Lengths:	Left C 812	hannel 812	Right 812	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: South Tributary REACH: .	RS: 2465						
INPUT							
Description: Jn Trib 3c		10					
Station Elevation Data Sta Elev Sta	num= a Elev	13 Sta	Elev	Sta	Elev	Sta	Elev
-192 25 -102		-85	22	-68	21	-56	20.5
-48 20 89 22 11) 19.5 1 23	46.5 147	20 25	59	20.5	70	21
09 22 11.	1 23	147	25				
5	num=	3					
Sta n Val Sta -192 .05 -50		Sta 59	n Val .05				
Daula Chart Taffa Dialah	T	T - E + O		D i sht	G F F	Garata	
Bank Sta: Left Right -56 59	Lengths:	752	nannei 752	752 Right	COEII	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: South Tributary REACH: .	RS: 1713						
INPUT Description: Intermedia							
Station Elevation Data Sta Elev Sta	num= a Elev	13 Sta	Elev	Sta	Elev	Sta	Elev
-119 17 -8		-57	14	-17	13	-11	12.5
) 11.5	4	12	б	12.5	12	13
31 14 3	5 15	59	17				
-	num=	3	_				
Sta n Val Sta -119 .05 -1		Sta 12	n Val .05				
··· ··· ··· ··· ··· ··· ··· ··· ··· ··	01	12	.05				
Bank Sta: Left Right -17 12	Lengths:	Left C1 857	hannel 857	Right 857	Coeff	Contr. .1	Expan. .3
CROSS SECTION							

RIVER:	South	Tributary		
REACH:	•		RS:	856

INPUT Descriptio				10					
Station El Sta	Elev	Dala Sta	num= Elev	13 Sta	Elev	C+ 2	Elev	Sta	Elev
-119		-80	9.5	-57	8.5	-17			7
-6	6.5	0	6	4	6.5	_, 6	7	12	7.5
31	8.5	36	9.5		11.5				
Manning's	n Value	S	num=	3					
Sta	n Val	Sta	n Val	Sta	n Val				
-119	.05	-17	.04	12	.05				
Bank Sta:	I.⊖ft 1	Piaht	Lengths:	Left Cl	hannel	Right	Coeff	Contr	Expan.
ballk Sta.	-17		Lengens.	191	191		COEII	.1	.3
						171		•=	
CROSS SECT	LION								
RIVER: Sou	uth Trib	utary							
REACH: .			RS: 665						
INPUT									
Descriptio	on: Inte	rmediate							
Station El	levation	Data	num=	15					
Sta	Elev	Sta		Sta				Sta	Elev
-76	8.5	-57.6	7.5	-47.1	7		6.5	-26	6
-16.8	5.5	-7.3	5	0	4.5	12.7	5		5.5
23.6	6	28.2	6.5	36.6	7	54.4	7.5	103.5	8.5
Manning's	n Value	S	num=	3					
Sta		- Sta		Sta	n Val				
-76	.05		.04	20.9	.05				
Bank Sta:		Right 20.9	Lengths:	Left Cl 254	nannel 254	Right 254	Coeff	Contr. .1	Expan. .3
CROSS SECT	LION								
RIVER: Sou REACH: .	uth Trib	utary	RS: 411						
INPUT									
Descriptio	on: Inte	rmediate							
Station El	levation	Data	num=	15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-76	8	-57.6	7	-47.1	6.5	-37.6	6	-26	5.5
-16.8	5	-7.3	4.5	0	4	12.7	4.5	20.9	5
23.6	5.5	28.2	6	36.6	б.5	54.4	7	103.5	8
Manning's	n Value	S	num=	3					
Sta	n Val	- Sta		Sta	_				
-76	0.5			bla	n Val				
	.05	-16.8	.04	20.9	n Val .05				
Bank Sta:		Right	.04	20.9	.05	Right 110	Coeff	Contr. .1	Expan.
	Left 1 -16.8	Right	.04	20.9 Left Cl	.05 nannel		Coeff		-
-	Left 1 -16.8	Right	.04	20.9 Left Cl	.05 nannel		Coeff		-
CROSS SECT	Left 1 -16.8 FION	Right 20.9	.04	20.9 Left Cl	.05 nannel		Coeff		-
-	Left 1 -16.8 FION	Right 20.9	.04	20.9 Left Cl	.05 nannel		Coeff		-
CROSS SECT RIVER: Sou	Left 1 -16.8 FION	Right 20.9	.04 Lengths:	20.9 Left Cl	.05 nannel		Coeff		-
CROSS SECT RIVER: Sou REACH: .	Left 1 -16.8 TION ath Trib	Right 20.9 utary	.04 Lengths: RS: 301	20.9 Left Cl	.05 nannel		Coeff		-
CROSS SECT RIVER: Sou REACH: . INPUT	Left 1 -16.8 TION ath Tribo	Right 20.9 utary f Bridge	.04 Lengths: RS: 301 1	20.9 Left Cl	.05 nannel		Coeff		-
CROSS SECT RIVER: Sou REACH: . INPUT Descriptio	Left 1 -16.8 TION ath Tribo	Right 20.9 utary f Bridge	.04 Lengths: RS: 301 1	20.9 Left Cl 110	.05 hannel 110 Elev	110	Elev		-
CROSS SECT RIVER: Sou REACH: . INPUT Descriptic Station El Sta -177	Left 1 -16.8 TION ath Tribu on: US of levation Elev 9	Right 20.9 utary f Bridge Data Sta -155	.04 Lengths: RS: 301 1 num= Elev 8	20.9 Left Cl 110 21 Sta -127	.05 hannel 110 Elev 7	110 Sta -98.7	Elev 6.5	.1 Sta -60.4	.3 Elev 6
CROSS SECT RIVER: Sou REACH: . INPUT Descriptic Station El Sta -177 -42.5	Left 1 -16.8 TION ath Tribu on: US of levation Elev 9 5.5	Right 20.9 utary f Bridge Data Sta -155 -31.7	.04 Lengths: RS: 301 1 num= Elev 8 5	20.9 Left Cl 110 21 Sta -127 -25.9	.05 hannel 110 Elev 7 4.5	110 Sta -98.7 -19.6	Elev 6.5 4	.1 Sta -60.4 -3.07	.3 Elev 6 3.5
CROSS SECT RIVER: Sou REACH: . INPUT Descriptic Station El Sta -177 -42.5 0	Left 1 -16.8 TION ath Tribu on: US of Levation Elev 9 5.5 3.4	Right 20.9 utary f Bridge Data Sta -155 -31.7 4.37	.04 Lengths: RS: 301 1 num= Elev 8 5 3.5	20.9 Left Cl 110 21 Sta -127 -25.9 27.7	.05 hannel 110 Elev 7 4.5 4	Sta -98.7 -19.6 47.6	Elev 6.5 4 4.5	.1 Sta -60.4 -3.07 53.6	.3 Elev 6 3.5 5
CROSS SECT RIVER: Sou REACH: . INPUT Descriptic Station El Sta -177 -42.5	Left 1 -16.8 TION ath Tribu on: US of levation Elev 9 5.5	Right 20.9 utary f Bridge Data Sta -155 -31.7	.04 Lengths: RS: 301 1 num= Elev 8 5	20.9 Left Cl 110 21 Sta -127 -25.9	.05 hannel 110 Elev 7 4.5	110 Sta -98.7 -19.6	Elev 6.5 4	.1 Sta -60.4 -3.07	.3 Elev 6 3.5

Manning's n Values Sta n Val Sta -177 .05 -42.5	num= 3 n Val St .04 58.				
Bank Sta: Left Right -42.5 58.4	Lengths: Left 25		Right 25	Coeff Contr. .3	Expan. .5
CROSS SECTION					
RIVER: South Tributary REACH: .	RS: 276				
INPUT Description: West edge B Station Elevation Data					
Sta Elev Sta -148.6 8 -29.7	Elev St 7 -21.			Elev Sta 4 -18.8	
-140.0 0 -29.7	7 -21. 3 2.4				3.5 4
27.3 5 35.1	7 112.		5.0	5.5 25.7	-
Manning's n Values Sta n Val Sta	num= 3 n Val St	a nVal			
-148.6 .06 -18.8		7 .06			
Bank Sta: Left Right -18.8 23.7	Lengths: Left 20		Right 20	Coeff Contr. .3	Expan. .5
BRIDGE					
RIVER: South Tributary REACH: .	RS: 266				
INPUT Description: Existing Br: Distance from Upstream X Deck/Roadway Width Weir Coefficient	5 = 5 = 10				
Weir Coefficient Upstream Deck/Roadway Co	= 1.7 pordinates				
Upstream Deck/Roadway Co num= 6	oordinates			Caral I.a. Caral	
Upstream Deck/Roadway Co num= 6 Sta Hi Cord Lo Cord	oordinates Sta Hi Cor			. Cord Lo Cord	
Upstream Deck/Roadway Co num= 6	oordinates	7 0	Sta Hi -20 500	. Cord Lo Cord 8.7 7.7 8.4 0	
Upstream Deck/Roadway Co num= 6 Sta Hi Cord Lo Cord -500 9 0	oordinates Sta Hi Cor -20 8. 21 8.	7 0	-20	8.7 7.7	
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data	Sta Hi Cor -20 8. 21 8. ction Data num= 13	7 0 6 0	-20 500	8.7 7.7 8.4 0	
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St	7 0 6 0 a Elev	-20 500 Sta	8.7 7.7 8.4 0 Elev Sta	
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21.	7 0 6 0 a Elev 6 5	-20 500 Sta -20	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta	Sta Hi Cor -20 8. 21 8. ction Data 13 Elev St 7 -21. 3 2.4	7 0 6 0 a Elev 6 5 9 3.1	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta	3.5
Upstream Deck/Roadway Co num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112.	7 0 6 0 a Elev 6 5 9 3.1	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3	7 0 6 0 8 Elev 6 5 9 3.1 7 8	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Co num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St	7 0 6 0 4 Elev 6 5 9 3.1 7 8 a n Val	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23.	7 0 6 0 8 Elev 6 5 9 3.1 7 8 a n Val 7 .06	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3	7 0 6 0 8 Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan.	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7	Sta Hi Cor -20 8. 21 8. ction Data 13 num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates .3	7 0 6 0 8 Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan. .5	-20 500 Sta -20 3.8	8.7 7.7 8.4 0 Elev Sta 4 -18.8	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0	Dordinates Sta Hi Cor -20 8. 21 7. 21. 3 2.4 7 112. 23. Coeff Contr. .3 Coordinates Sta Hi Cor -20 8. 20 8. 21 8.	7 0 6 0 a Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan. .5 d Lo Cord 7 0	-20 500 Sta -20 3.8 Sta Hi -20	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor .20 8. .21 8.	7 0 6 0 a Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan. .5 d Lo Cord 7 0	-20 500 Sta -20 3.8 Sta Hi -20	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor .20 8. .21 8.	7 0 6 0 a Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan. .5 d Lo Cord 7 0	-20 500 Sta -20 3.8 Sta Hi -20	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7	3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Downstream Bridge Cross S Station Elevation Data Sta Elev Sta	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor .20 8. Section Data num= num= 13 Elev St	7 0 6 0 a Elev 6 5 9 3.1 7 8 a n Val 7 .06 Expan. .5 d Lo Cord 7 0 6 0 a Elev	-20 500 Sta -20 3.8 Sta Hi -20 500 Sta	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7 Cord Lo Cord 8.7 7.7 8.4 0 Elev Sta	3.5 4 Elev
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Downstream Bridge Cross S Station Elevation Data Sta Elev Sta -153 8 -31.2	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor .20 8. Section Data num= num= 13 Elev St 7 -20.	7 0 6 0 1 2 9 3.1 7 8 1 1 7 8 1 1 7 .06 Expan. .5 1 Lo Cord 7 0 6 0 1 2 2 3 5	-20 500 Sta -20 3.8 Sta Hi -20 500 Sta -17.6	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7 . Cord Lo Cord 8.7 7.7 8.4 0 Elev Sta 4 -14.1	3.5 4 Elev 3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Downstream Bridge Cross S Station Elevation Data Sta Elev Sta -153 8 -31.2 -7.72 3 0	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor -20 8. Section Data num= num= 13 Elev St 7 -20. 2.8 1.5	7 0 6 0 1 0 1 10 1 1	-20 500 Sta -20 3.8 Sta Hi -20 500 Sta -17.6	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7 . Cord Lo Cord 8.7 7.7 8.4 0 Elev Sta 4 -14.1	3.5 4 Elev
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Downstream Bridge Cross S Station Elevation Data Sta Elev Sta -153 8 -31.2 -7.72 3 0	Sta Hi Cor -20 8. 21 8. ction Data num= 13 Elev St 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor -20 8. Section Data num= num= 13 Elev St 7 -20. 2.8 1.5	7 0 6 0 1 0 1 10 1 1	-20 500 Sta -20 3.8 Sta Hi -20 500 Sta -17.6	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7 . Cord Lo Cord 8.7 7.7 8.4 0 Elev Sta 4 -14.1	3.5 4 Elev 3.5
Upstream Deck/Roadway Conum= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Upstream Bridge Cross Sec Station Elevation Data Sta Elev Sta -148.6 8 -29.7 -4.37 3.1 0 27.3 5 35.1 Manning's n Values Sta n Val Sta -148.6 .06 -18.8 Bank Sta: Left Right -18.8 23.7 Downstream Deck/Roadway num= 6 Sta Hi Cord Lo Cord -500 9 0 21 8.6 7.6 Downstream Bridge Cross S Station Elevation Data Sta Elev Sta -153 8 -31.2 -7.72 3 0	Dordinates Sta Hi Cor -20 8. 21 8. 21 8. 21 8. 21 8. 21 8. 21 7 -21. 3 2.4 7 -21. 3 2.4 7 112. num= 3 n Val St .04 23. Coeff Contr. .3 Coordinates Sta Hi Cor -20 8. 21 8. Section Data num= 13 Elev St 7 -20. 2.8 1.5 7 107. num= 3	7 0 6 0 9 3.1 7 8 a n Val 7 .06 Expan. .5 d Lo Cord 7 0 6 0 6 0 8 4 3 9 8	-20 500 Sta -20 3.8 Sta Hi -20 500 Sta -17.6 20.5	8.7 7.7 8.4 0 Elev Sta 4 -18.8 3.5 23.7 . Cord Lo Cord 8.7 7.7 8.4 0 Elev Sta 4 -14.1	3.5 4 Elev 3.5

-153 .06 -17.6 .04 25 .06 Bank Sta: Left Right Coeff Contr. Expan. -17.6 25 .3 .5 Upstream Embankment side slope = Downstream Embankment side slope = 0 horiz. to 1.0 vertical 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 = 2 Pier Data Pier Station Upstream= -10.1 Downstream= -10.1 Upstream num= 2 Width Elev Width Elev .75 0 .75 9 Downstream num= 2 Width Elev Width Elev .75 0 .75 9 Pier Data Pier Station Upstream= 5.1 Downstream= 5.1 Upstream num= 2 Width Elev Width Elev .75 0 .75 nstream num= 2 9 Downstream Width Elev Width Elev .75 0 .75 9 .75 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: South Tributary REACH: . RS: 256 INPUT Description: East edge Bridge 1 13 Station Elevation Data num= Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev -153 8 -31.2 7 -20.3 5 -17.6 4 -14.1 3.5 -7.72 3 0 5 32.8 3 20.5 8 2.8 1.54 7 107.9 3.5 25 4 27.1 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -153 .06 -17.6 .04 25 .06 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -17.6 25 22 22 22 .3.5

CROSS SECTION

REACH: .	RS: 234					
INPUT						
Description: CL New Bridg		05				
Station Elevation Data Sta Elev Sta	num= Elev	25 Sta E	lev Sta	Elev	Sta	Elev
-107 8 -89.4	7		6 -29.3	5.5	-19.7	5
-16.2 4.5 -13.3	4		3.5 -7.77		-4.88	2.5
-3.31 2.4 -2.88 4.68 2.5 10.7	1.3 3		1.2 2.09 3.5 24.3	1.4 4	2.83 34.4	2.3 4.5
4.68 2.5 10.7 48 5 65.1	5.5	10.0 72.4	6 82.5	4	34.4 95	4.5
10 0 0011	515	, 2	0 02.0		20	Ū
Manning's n Values		3	_			
Sta n Val Sta -107 .05 -11.3	n Val .04	Sta n 16.6	Val 05			
10, .05 11.5	.01	10.0				
Bank Sta: Left Right	Lengths:	Left Chann		Coeff C		Expan.
-11.3 16.6		112 1	12 112		.1	.3
CROSS SECTION						
RIVER: South Tributary						
REACH: .	RS: 122					
INPUT						
Description: Intermediate Station Elevation Data	num=	22				
Sta Elev Sta	Elev		lev Sta	Elev	Sta	Elev
-154 5 -42.2	4.95	-30.9	4.5 -25.1	4	-17.5	3.5
-11.7 3 -8.82	2.5	-5.04	2 -1.21	1.5	0	1.4
1.25 1.5 $3.0815.4$ 4 20.5	2 4.5	5.56 34.1	2.5 8.53 5 60.4	3 5.5	11.8 82.3	3.5 6
93 7 99.1	8	51.1	5 00.1	5.5	02.5	Ū
Manning's n Values Sta n Val Sta	num= n Val	3 Sta n'	Val			
-154 .05 -17.5	.04		.05			
Bank Sta: Left Right -17.5 11.8	Lengths:	Left Chann 112 1	el Right 12 112	Coeff C	lontr. .1	Expan. .3
17.5 11.0		112 1	12 112		• -	• 5
CROSS SECTION						
RIVER: South Tributary						
REACH: .	RS: 0					
INPUT						
Description: Jn Spring Cr	eek					
Station Elevation Data	num=	30				
Sta Elev Sta	Elev		lev Sta	Elev	Sta	Elev
-218 7 -214 -94.1 4 -90.4	6 3.5	-199 -87.9	5 -175 3 -84.3	4.5 2.5	-111 -75.3	4.5 2
-58.4 2 -50		-46.2	1 -38.8		-27.8	2
-13 1.5 0	1	5.26	1.5 7.23	2	9.36	2.5
11.5 3 15.5		30.8	4 57.8		82.5	5
110 5.5 133	6	138	6.5 141	7	145	8
Manning's n Values	num=	3				
Sta n Val Sta			Val			
-218 .05 -90.4	.04	15.5	.05			
Bank Sta: Left Right	Lengths:	Left Chann	el Right	Coeff C	Contr.	Expan.
-90.4 15.5		0	0 0		.1	.3
CROSS SECTION						
CUOD DECITON						
RIVER: Spring Creek REACH: US of Jn	RS: 3340					
NEACH. OR OF OH	⊼ә∙ 3340					
INPUT						
Description: top						

Description: top

Station Elevation Data	num=	9	D] ees			Ch a	
Sta Elev Sta -57 36 -32.9	Elev 34.5	Sta -15	Elev 33.5	-3.5	Elev 33.1	Sta 0	Elev 33
2.8 33.1 20.7	33.5	41.8	34.5	66	36		
Manning's n Values Sta n Val Sta	num= n Val	3 Sta	n Val				
-57 .035 -15	.033	20.7	.035				
Bank Sta: Left Right -15 20.7	Lengths:	Left Ch 600	nannel 600	Right 600	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 2740						
INPUT Description: Intermediate							
Station Elevation Data	num=	9					
Sta Elev Sta -57 26 -32.9	Elev 24.5	Sta -15	Elev 23.5	Sta -3.5	Elev 23.1	Sta 0	Elev 23
2.8 23.1 20.7	23.5	41.8	24.5	66	26	0	20
Manning's n Values	num=	3					
Sta n Val Sta -57 .035 -15	n Val .033	Sta 20.7	n Val .035				
Bank Sta: Left Right -15 20.7	Lengths:	Left Ch 652	nannel 652	Right 652	Coeff	Contr. .1	Expan. .3
		052	052	0.52		• ±	• 3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 2086						
INPUT							
INPUT Description: Jn Trib 2e Station Elevation Data	num=	9					
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta	Elev	Sta	Elev		Elev	Sta	Elev
Description: Jn Trib 2e Station Elevation Data			Elev 15 16	Sta -7.6 79.9	Elev 14.5 18	Sta O	Elev 14
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3	Elev 16 15	Sta -27.8	15	-7.6	14.5		
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta	Elev 16 15 num= n Val	Sta -27.8 30.7 3 Sta	15 16 n Val	-7.6	14.5		
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8	Elev 16 15 num= n Val .04	Sta -27.8 30.7 3 Sta 13.3	15 16 n Val .05	-7.6 79.9	14.5 18	0	14
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta	Elev 16 15 num= n Val .04	Sta -27.8 30.7 3 Sta 13.3	15 16 n Val .05	-7.6 79.9 Right	14.5 18	0	14
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right	Elev 16 15 num= n Val .04	Sta -27.8 30.7 3 Sta 13.3 Left Ch	15 16 n Val .05 nannel	-7.6 79.9 Right	14.5 18	0 Contr.	14 Expan.
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek	Elev 16 15 num= n Val .04	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245	15 16 n Val .05 nannel	-7.6 79.9 Right	14.5 18	0 Contr.	14 Expan.
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek	Elev 16 15 num= n Val .04 Lengths: RS: 1841	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245	15 16 n Val .05 nannel	-7.6 79.9 Right	14.5 18	0 Contr.	14 Expan.
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num=	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245	15 16 n Val .05 mannel 245	-7.6 79.9 Right 245	14.5 18 Coeff	0 Contr. .1	14 Expan. .3
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num=	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245	15 16 n Val .05 hannel 245 Elev 14	-7.6 79.9 Right 245 Sta -22.2	14.5 18 Coeff	0 Contr. .1 Sta	14 Expan. .3 Elev
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data Sta Elev Sta	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num= Elev	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245 14 Sta -61.1 0	15 16 n Val .05 nannel 245 Elev 14	-7.6 79.9 Right 245 Sta -22.2 3.79	14.5 18 Coeff Elev 13.5 11	0 Contr. .1 Sta -12.3	14 Expan. .3 Elev 13
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -124 16 -89.9 -7.99 12 -3.84 33.5 12 46.7	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num= Elev 15 11 13	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245 14 Sta -61.1 0 60.6	15 16 n Val .05 nannel 245 Elev 14 10.5	-7.6 79.9 Right 245 Sta -22.2 3.79	14.5 18 Coeff Elev 13.5 11	0 Contr. .1 Sta -12.3	14 Expan. .3 Elev 13
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -124 16 -89.9 -7.99 12 -3.84	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num= Elev 15 11 13 num=	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245 14 Sta -61.1 0	15 16 n Val .05 hannel 245 Elev 14 10.5 14	-7.6 79.9 Right 245 Sta -22.2 3.79	14.5 18 Coeff Elev 13.5 11	0 Contr. .1 Sta -12.3	14 Expan. .3 Elev 13
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -124 16 -89.9 -7.99 12 -3.84 33.5 12 46.7 Manning's n Values Sta n Val Sta	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num= Elev 15 11 13 num=	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245 14 Sta -61.1 0 60.6 3 Sta	15 16 n Val .05 hannel 245 Elev 14 10.5 14	-7.6 79.9 Right 245 Sta -22.2 3.79	14.5 18 Coeff Elev 13.5 11	0 Contr. .1 Sta -12.3	14 Expan. .3 Elev 13
Description: Jn Trib 2e Station Elevation Data Sta Elev Sta -70.6 18 -38.3 7.9 14.5 13.3 Manning's n Values Sta n Val Sta -70.6 .05 -27.8 Bank Sta: Left Right -27.8 13.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -124 16 -89.9 -7.99 12 -3.84 33.5 12 46.7 Manning's n Values Sta n Val Sta	Elev 16 15 num= n Val .04 Lengths: RS: 1841 num= Elev 15 11 13 num= n Val .04	Sta -27.8 30.7 3 Sta 13.3 Left Ch 245 14 Sta -61.1 0 60.6 3 Sta 33.5	15 16 n Val .05 hannel 245 Elev 14 10.5 14 n Val .05	-7.6 79.9 Right 245 Sta -22.2 3.79 95.4 Right	14.5 18 Coeff Elev 13.5 11 16	0 Contr. .1 Sta -12.3 8.26	14 Expan. .3 Elev 13 11.5

CROSS SECTION

RIVER: Spring Creek REACH: US of Jn	RS: 1595		
INPUT Description: Jn Nth Trib Station Elevation Data	num= 16		
Sta Elev Sta -96.7 14 -81.6	Elev Sta Ele 13 -59.1 1		ev Sta Elev .5 -34.9 11
-21.5 10 -10.7			9 0 8.5
9.41 9 28 91.9 14	9.5 32.9 1	0 43.6	11 55.1 12
Manning's n Values Sta n Val Sta		1	
-96.7 .05 -10.7	.04 32.9 .0		
Bank Sta: Left Right -10.7 32.9	-	Right Co 402	eff Contr. Expan. .1 .3
CROSS SECTION			
RIVER: Spring Creek REACH: US of Jn	RS: 1193		
INPUT			
Description: Intermediate			
Station Elevation Data Sta Elev Sta	num= 21 Elev Sta Ele	v Sta Ele	ev Sta Elev
-38.6 13 -20.5	11 -17.6 1	0 -14.2	9 -12.4 8.5
-9.77 8 -6.44 2.4 6.5 3.86	7.5 - 4.18 7 10.4 7.		.5 0 6 .5 42.8 8
58.2 7.5 62.4			10 104 11
142 13			
Manning's n Values	num= 3		
Sta n Val Sta -38.6 .05 -9.77	n Val Sta n Va .04 62.4 .0		
Bank Sta: Left Right -9.77 62.4	Lengths: Left Channel 155 155		eff Contr. Expan. .1 .3
CROSS SECTION			
RIVER: Spring Creek REACH: US of Jn	RS: 1038		
INPUT			
Description: Intermediate Station Elevation Data	e num= 21		
Sta Elev Sta	Elev Sta Ele		ev Sta Elev
-75.8 11 -60.4 -38.1 7 -31		9 -46.3 7 -14.3	8 -43.2 7.5 7 -7.27 6.5
-5.55 6 0	5.5 8.31	6 11.2 6	.5 15.8 7
20 7.5 25 89 11	8 33 8.	5 51	9 72 10
Manning's n Values			
	n Val Sta n Va .04 15.8 .0		
Bank Sta: Left Right -38.1 15.8		Right Co 105	eff Contr. Expan. .1 .3
CROSS SECTION			
RIVER: Spring Creek REACH: US of Jn	RS: 933		

INPUT

Description: Intermediate Description: IntermediateStation Elevation Datanum=17StaElevStaElevStaElevSta-30.210-19.68-16.47-14.56.5-12.7-7.835.8-3.556-1.65.505.13.67.68614.55.817.9620.86.530.337.5877.610 Sta Elev 3.6 6 5.5 6 20.8 6.5 30.3 7 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -30.2 .05 -12.7 .04 17.9 .05 Bank Sta: LeftRightLengths: LeftChannelRightCoeffContr.Expan.-12.717.936.536.536.5.1.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn RS: 896.5 INPUT

 Attion Elevation Data
 num=
 17

 Sta
 Elev
 Sta
 <th Description: US of Bridge 2 Station Elevation Data num= Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -26.6 .05 -14.2 .04 13 .05 Bank Sta: LeftRightLengths: LeftChannelRightCoeffContr.Expan.-14.213101010.1.3 CROSS SECTION RIVER: Spring Creek REACH: US of Jn RS: 886.5 INPUT Description: West side of Bridge 2 Station Elevation Data num= 16 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 -117
 11
 -37.3
 10
 -23.5
 9
 -14.8
 7
 -13.2
 6.5

 -10.1
 6
 -6.19
 5.5
 -.729
 5
 0
 4.9
 2.48
 5

 11.3
 5.5
 12
 6
 12.7
 6.5
 13.7
 7
 18.6
 9

 5 149.1 9 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -117 .06 -10.1 .04 12 .06 Bank Sta: LeftRightLengths: LeftChannelRightCoeffContr.Expan.-10.112202020.3.5 BRIDGE RIVER: Spring Creek REACH: US of Jn RS: 876.5 INPUT Description: Existing Bridge 2 Distance from Upstream XS = Deck/Roadway Width = 10 Weir Coefficient = 1.7 10 Weir Coefficient Upstream Deck/Roadway Coordinates num= 6
 Sta Hi Cord Lo Cord
 Sta Hi Cord Lo Cord
 Sta Hi Cord Lo Cord
 Sta Hi Cord Lo Cord

 -500
 10.7
 0
 -10.2
 10.5
 0
 -10.2
 10.5
 9.5

10.7 10.4 9.4 10.7 10.4 0 500 10.2 0 Upstream Bridge Cross Section Data Station Elevation Data num= 16 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

 11
 -37.3
 10
 -23.5
 9
 -14.8
 7
 -13.2
 6.5

 6
 -6.19
 5.5
 -.729
 5
 0
 4.9
 2.48
 5

 -117 -10.1 6 -6.19 5.5 -.729 11.3 5.5 12 6 12.7 149.1 9 -10.1 4.9 2.48 7 18.6 7 6.5 13.7 9 149.1 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -117 .06 -10.1 .04 12 .06 Bank Sta: Left Right Coeff Contr. Expan. -10.1 12 .3 .5 Downstream Deck/Roadway Coordinates num= 6 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 -500
 10.7
 0
 -10.2
 10.5
 0
 -10.2
 10.5
 9.5

 10.7
 10.4
 9.4
 10.7
 10.4
 0
 500
 10.2
 0
 Downstream Bridge Cross Section Data Station Elevation Data num= 16
 Sta
 Elev
 St Elev 6.5 4.8 10.8 5 13.7 5.5 106.3 9 5.5 15 6 16 6.5 17.2 7 44.7 8 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -133 .06 -9.84 .04 15 .06 Bank Sta: Left Right Coeff Contr. Expan. -9.84 15 .3 .5 .3 0 horiz. to 1.0 vertical 0 horiz. to 1.0 vertical .98 Upstream Embankment side slope = Downstream Embankment side slope = Maximum allowable submergence for weir flow = 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 = 2Pier Data Pier Station Upstream= -3.5 Downstream= -3.5 Upstream num= 2 WidthElevWidthElev10110Downstreamnum=2 Width Elev Width Elev 1 0 1 10 Pier Data Pier Station Upstream= 3.8 Downstream= 3.8 Upstream num= 2 WidthElevWidthElev10110Downstreamnum=2 Width Elev Width Elev 1 0 1 10 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: Spring Creek REACH: US of Jn RS: 866.5 INPUT Description: East side of Bridge 2 Station Elevation Data num= 16 Elev Sta Elev Sta Sta Elev Sta Elev Sta Elev 11 9 -13.9 5 0 -76 10 -30.1 -133 7 -12.4 6.5 6 -7.39 5.5 -1.06 5 -9.84 0 4.8 10.8 13.7 5.5 15 б 16 6.5 17.2 7 44.7 8 106.3 9 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -133 .06 -9.84 .04 15 .06 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -9.84 15 29 29 29 .3 .5 CROSS SECTION RIVER: Spring Creek REACH: US of Jn RS: 837.5 INPUT Description: CL new Bridge 2 25 Station Elevation Data num= sta Elev -121 Sta Elev Sta Sta Elev Sta Elev Sta Elev 9 7.7 -55.7 -154 -102 7.8 -80.6 7.5 -35.3 7 -26.5 6.5 -19.3 6 -12 5.5 -4.61 5 4.9 -.985 5 17.5 7.5 56.1 4.2 0 5.5 20.8 4.1 2.81 4.2 3.22 -2 4.6 11.9 6 24.5 6.5 28.7 7 8 69.6 7.7 83.5 9 37 8 99.7 3 Manning's n Values num= Sta n Val Sta n Val -154 .05 -35.3 .04 Sta n Val 28.7 .05 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. 168.5 168.5 168.5 -35.3 28.7 .3 .1 CROSS SECTION RIVER: Spring Creek RS: 669 REACH: US of Jn INPUT Description: Intermediate Station Elevation Data num= 18 Sta Elev Sta Elev Elev Sta Elev Sta Sta Elev 8 -160 7 -68.8 -225 6.5 -46.7 6 -23 5.5 -17.3 5 -12.8 4.5 -10 4 0 3.8 11.6 4 22.7 26.5 5 7 5.5 16.3 4.5 30.2 6 34.9 6.5 118 6.5 135 148 8 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val .05 .04 .05 -225 -23 26.5 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. 232 232 232 -23 26.5 .1 .3

CROSS SECTION

RIVER: Spring Creek REACH: US of Jn	RS: 437						
KERCHT OD OF OH	10. 157						
INPUT Descuintion: In Rock twik							
Description: Jn East trib Station Elevation Data	num=	23					
Sta Elev Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-105 7 -91.3	б	-72	5	-58.4	4	-50.9	3.5
-43.4 3 -35		-22.4	2	-16.4	1.6	-11.7	2
$ \begin{array}{cccc} -4.77 & 2 & 0 \\ 9 & 3.5 & 10.3 \end{array} $	1.5 4	5.46 19.5	2 4.5	6.62 45	2.5 5	7.74 125	3 5.5
208 6 220	6.5	223	7	15	5	125	5.5
Manning's n Values	num=	3					
Sta n Val Sta	n Val		n Val				
-105 .05 -58.4	.04	10.3	.05				
Bank Sta: Left Right -58.4 10.3	Lengths:	Left Cha 437	nnel 437	Right 437	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 0						
INPUT							
Description: Jn Sth Tribu	-						
Station Elevation Data	num=	30		Ch -		Q h a	
Sta Elev Sta -218 7 -214	Elev 6	Sta -199	Elev 5	Sta -175	Elev 4.5	Sta -111	Elev 4.5
-94.1 4 -90.4		-87.9	3	-84.3	2.5	-75.3	2
-58.4 2 -50	1.5	-46.2	1	-38.8	1.5	-27.8	2
-13 1.5 0	1	5.26	1.5	7.23	2	9.36	2.5
11.5 3 15.5 110 5.5 133	3.5 6	30.8 138	4 6.5	57.8 141	4.5 7	82.5 145	5 8
110 5.5 133	0	130	0.5	141	/	145	0
Manning's n Values	num=	3					
Sta nVal Sta	n Val		n Val				
-218 .05 -90.4	.04	15.5	.05				
Bank Sta: Left Right -90.4 15.5	Lengths:	Left Cha: 0	nnel 0	Right 0	Coeff	Contr. .1	Expan. .3
50.1 15.5		0	0	0		• ±	• 5
CROSS SECTION							
RIVER: Spring Creek REACH: US of Wallarah C	RS: 530						
INPUT							
Description: Jn Spring Ck Station Elevation Data	num=	30					
Sta Elev Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-218 7 -214	6	-199	5	-175	4.5	-111	4.5
-94.1 4 -90.4		-87.9	3	-84.3	2.5	-75.3	2
$ \begin{array}{ccccc} -58.4 & 2 & -50 \\ -13 & 1.5 & 0 \end{array} $	1.5 1	-46.2 5.26	1 1.5	-38.8 7.23	1.5 2	-27.8 9.36	2 2.5
-13 1.5 0 11.5 3 15.5	3.5	30.8	1.5 4	57.8	4.5	9.30 82.5	2.5 5
110 5.5 133	6	138	6.5	141	7	145	8
Manning's n Values	num=	3					
Sta n Val Sta	n Val		n Val				
-218 .05 -90.4	.04	15.5	.05				
Bank Sta: Left Right	Lengths:	Left Cha	nnel	Right	Coeff	Contr.	Expan.
-90.4 15.5		178	178	178	COCLT	.1	.3

CROSS SECTION

RIVER: Spring Creek REACH: US of Wallarah C RS: 352 INPUT Description: Intermediate 24 Station Elevation Data num=
 lev
 Sta
 Elev
 Sta
 Elev
 Sta
 Elev

 7
 -241
 6
 -234
 5
 -227
 4.5

 5
 -87.3
 4.5
 -70.2
 4
 -61.3
 3

 Sta
 Elev
 Sta
 Elev

 -248
 7
 -241
 6
 Elev Sta 4.5 -149 Elev 4.5 2.5 3 -57.3 -117 .95 -34.5 1 0 2 24 3 34.3 4 7 88.9 8 5.57 41 Manning's n Values 3 num= Sta n Val Sta n Val -248 .05 -57.3 .04 Sta n Val 13.8 .05 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. 29 -57.3 13.8 29 29 .1 .3 CROSS SECTION RIVER: Spring Creek REACH: US of Wallarah C RS: 323 TNPUT Description: US of Hwy Link 20 Station Elevation Data num= sta Elev -146 Sta Sta Elev Sta Sta Elev Elev Sta Elev 5 -83.5 7 7 -146 6 -131 3 -38.9 2.5 -33.2 4.5 -66.7 -162 4 -55.7 2 -28.9 1.5 -17.7 1 1 0 3 34.8 .9 7.58 4 46.1 1 11.4 1.5 13.8 5 59.9 6 71.1 -7.04 2 6 28.8 7 3 Manning's n Values num= Sta n Val Sta n Val Sta n Val -162 .05 -38.9 .04 13.8 .05 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -38.9 13.8 50 50 50 .3 .5 CROSS SECTION RIVER: Spring Creek REACH: US of Wallarah C RS: 273 INPUT Description: Nth edge of Hwy Link Station Elevation Data num= 21
 Sta
 Elev
 Sta
 Elev

 24.9
 10
 -20.4
 8
 Sta Elev Sta Sta Elev Elev
 10
 -20.4
 8
 -17.1
 6
 -15.3

 3
 -9.96
 2.5
 -8.2
 2
 -6.25
 5 -13.2 -24.9 4 1 -11.2 1.5 -1.2 0 .85 1.2 1 3 13.2 4 5.81.57.4229.0315.6517.2620.2 2.5 10.7 8 10 23.7 Manning's n Values num= 3
 Sta
 n Val
 Sta
 n Val

 -24.9
 .06
 -8.2
 .04
 Sta n Val .06 7.42 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -8.2 7.42 15 15 15 .3.5 CROSS SECTION RIVER: Spring Creek REACH: US of Wallarah C RS: 258

INPUT Description: Sth edge of Hwy Link

Station Elevation Data Sta Elev State -24.9 10 -20.2 -11.2 3 -9.9 0 .83 10.7 3 13.2 23.7 10 Manning's n Values	4 8 5 2.5 2 1 2 4		6 2	Sta -15.3 -6.25 7.42 17.2		-13.2 -2 9.03	Elev 4 1 2.5 8
Sta n Val St. -24.9 .06 -8.		Sta 7.42					
Bank Sta: Left Right -8.2 7.42	Lengths:		nannel 43		Coeff	Contr. .3	Expan. .5
CROSS SECTION							
RIVER: Spring Creek REACH: US of Wallarah C	RS: 215						
INPUT Description: Sth edge o	-						
Station Elevation Data							
Sta Elev Sta			Elev	Sta	Elev	Sta	Elev
-194 6 -18 -154 4.5 -8		-180	4	-178 -39.1	3.5	-175	4
-154 4.5 -8 -22.7 2.5 -9.1		-44.4	4 1 5	-39.1 0	3.5	-35.1 5.58	3 1.5
9.98 2 15.			1.5 4	U	. 0 5	53.6	1.5 6
J. JO Z 13.	5 5	21.9	Т	50.7	5	55.0	0
Manning's n Values Sta n Val Sta	num= a n Val	3 Sta 9.98	n Val				
-194 .05 -22.	7.04	9.98	.05				
Bank Sta: Left Right -22.7 9.98	Lengths:	Left Ch 215			Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Wallarah C	RS: 0						
INPUT							
Description: Sth edge of	E Hwy Link						
Station Elevation Data	num=	30					
Sta Elev Sta	a Elev	Sta	Elev	Sta		Sta	Elev
-288 6 -28	L 5	-274	4	-244	4.5	-201	4.5
-172 4 -15	7 3.5	-154	3	-148	2	-139	1.5
-117 1.5 -8		-69	3	-61.4	3.5	-55.6	3.5
-41.2 3 -36.		-26	2	-14.7	1.5	-7.9	1
0 .5 4.1		5.68	1.5		2	7.25	2.5
8.9 3.5 12.	9 4	42.6	4.5	60.9	5	85.8	б
Monningla n Maluar		2					
Manning's n Values Sta n Val Sta	num= a n Val	3 Sta	n Val				
-288 .05 -2			.05				
200 .00 -2	.04	5.4/	.05				
Bank Sta: Left Right -26 6.47	Lengths:	Left Ch 215		Right 215	Coeff	Contr. .1	Expan. .3

SUMMARY OF MANNING'S N VALUES

River:South Tributary

Reach	River Sta.	nl	n2	n3
	3277	.035	.033	.035
	2465	.05	.04	.05
	1713	.05	.04	.05
	856	.05	.04	.05
	665	.05	.04	.05

	411	.05	.04	.05
	301	.05	.04	.05
•	276	.06	.04	.06
•	266	Bridge		
	256	.06	.04	.06
•	234	.05	.04	.05
	122	.05	.04	.05
•	0	.05	.04	.05

River:Spring Creek

Reach	River Sta.	nl	n2	n3
US of Jn	3340	.035	.033	.035
US of Jn	2740	.035	.033	.035
US of Jn	2086	.05	.04	.05
US of Jn	1841	.05	.04	.05
US of Jn	1595	.05	.04	.05
US of Jn	1193	.05	.04	.05
US of Jn	1038	.05	.04	.05
US of Jn	933	.05	.04	.05
US of Jn	896.5	.05	.04	.05
US of Jn	886.5	.06	.04	.06
US of Jn	876.5	Bridge		
US of Jn	866.5	.06	.04	.06
US of Jn	837.5	.05	.04	.05
US of Jn	669	.05	.04	.05
US of Jn	437	.05	.04	.05
US of Jn	0	.05	.04	.05
US of Wallarah C	530	.05	.04	.05
US of Wallarah C	352	.05	.04	.05
US of Wallarah C	323	.05	.04	.05
US of Wallarah C	273	.06	.04	.06
US of Wallarah C	258	.06	.04	.06
US of Wallarah C	215	.05	.04	.05
US of Wallarah C	0	.05	.04	.05

SUMMARY OF REACH LENGTHS

River: South Tributary

Reach	River Sta.	Left	Channel	Right
	3277	812	812	812
•	2465	752	752	752
•	1713	857	857	857
	856	191	191	191
•	665	254	254	254
•	411	110	110	110
•	301	25	25	25
•	276	20	20	20
	266	Bridge		
•	256	22	22	22
	234	112	112	112
	122	112	112	112
	0	0	0	0

River: Spring Creek

Reach	River Sta.	Left	Channel	Right
US of Jn	3340	600	600	600
US of Jn	2740	652	652	652
US of Jn	2086	245	245	245
US of Jn	1841	246	246	246
US of Jn	1595	402	402	402
US of Jn	1193	155	155	155
US of Jn	1038	105	105	105
US of Jn	933	36.5	36.5	36.5

US of	Jn	896.5	10	10	10
US of	Jn	886.5	20	20	20
US of	Jn	876.5	Bridge		
US of	Jn	866.5	29	29	29
US of	Jn	837.5	168.5	168.5	168.5
US of	Jn	669	232	232	232
US of	Jn	437	437	437	437
US of	Jn	0	0	0	0
US of	Wallarah C	530	178	178	178
US of	Wallarah C	352	29	29	29
US of	Wallarah C	323	50	50	50
US of	Wallarah C	273	15	15	15
US of	Wallarah C	258	43	43	43
US of	Wallarah C	215	215	215	215
US of	Wallarah C	0	215	215	215

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS River: South Tributary

R	each	River	Sta.	Co	ntr.	Exp	pan.
		3277			.1		. 3
		2465			.1		. 3
		1713			.1		. 3
		856			.1		. 3
		665			.1		. 3
		411			.1		. 3
		301			.3		. 5
		276			.3		. 5
		266	B	ridge			
		256			.3		. 5
		234			.1		. 3
		122			.1		. 3
•		0			.1		. 3

River: Spring Creek

Reach	River Sta	. Contr.	Expan.
US of Jn	3340	.1	.3
US of Jn	2740	.1	.3
US of Jn	2086	.1	.3
US of Jn	1841	.1	.3
US of Jn	1595	.1	.3
US of Jn	1193	.1	.3
US of Jn	1038	.1	.3
US of Jn	933	.1	.3
US of Jn	896.5	.1	.3
US of Jn	886.5	.3	.5
US of Jn	876.5	Bridge	
US of Jn	866.5	.3	.5
US of Jn	837.5	.1	.3
US of Jn	669	.1	.3
US of Jn	437	.1	.3
US of Jn	0	.1	.3
US of Wallarah C	530	.1	.3
US of Wallarah C	352	.1	.3
US of Wallarah C	323	.3	.5
US of Wallarah C	273	.3	.5
US of Wallarah C	258	.3	.5
US of Wallarah C	215	.1	.3
US of Wallarah C	0	.1	.3

POSTDEVELOPMENT CONDITIONS

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

Х	Х	XXXXXX	XX	XX		XX	XX	Х	X	XXXX
Х	Х	Х	Х	Х		Х	Х	Х	Х	Х
Х	Х	Х	Х			Х	Х	Х	Х	Х
XXXX	XXX	XXXX	Х		XXX	XX	XX	XXX	XXX	XXXX
Х	Х	Х	Х			Х	Х	Х	Х	Х
Х	Х	Х	Х	Х		Х	Х	Х	Х	Х
Х	Х	XXXXXX	XX	XX		Х	Х	Х	Х	XXXXX

PROJECT DATA Project Title: W2CP Rail Siding Post Dev Project File : W2CPRailSidingPo.prj Run Date and Time: 28/03/2016 4:22:58 PM

Project in SI units

Project Description: Flood Impacts Assessment

PLAN DATA

```
Plan Title: Plan 02
Plan File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS
Model\W2CPRailSidingPo.p02
```

Geometry Title: Spring Creek Geometry File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPo.g01

Flow Title : 100 year ARI Flow File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPo.f01

Plan Summary Information: Number of: Cross Sections = 36 Multiple Openings = 0 Culverts=0Inline Structures=Bridges=4Lateral Structures= 0 0 Computational Information Water surface calculation tolerance = 0.003 Critical depth calculation tolerance = 0.003 Maximum number of iterations = 20 = 0.1 = 0.001 Maximum difference tolerance Flow tolerance factor Computation Options Critical depth computed only where necessary Conveyance Calculation Method: At breaks in n values only Friction Slope Method: Average Conveyance Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: 100 year ARI

Flow File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPo.f01

Flow Data (m3/s)

River	Read	h	RS	PF 1
South Tributary			3277	12.3
South Tributary			2465	28.7
South Tributary			1713	39
South Tributary			856	55.6
South Tributary			665	57
South Tributary			411	58
South Tributary			301	59
South Tributary			276	59
South Tributary			256	59
South Tributary			234	59
South Tributary			122	59
South Tributary			0	59
Spring Creek	US o	f Jn	3340	7
Spring Creek	US o	f Jn	2740	14.2
Spring Creek	US o	f Jn	2086	19.1
Spring Creek	US o	f Jn	1841	57
Spring Creek	US o	f Jn	1595	58
Spring Creek	US o	f Jn	1193	59
Spring Creek	US o	f Jn	1038	61.1
Spring Creek	US o	f Jn	933	61.1
Spring Creek	US o	f Jn	896.5	61.1
Spring Creek	US o	f Jn	886.5	61.1
Spring Creek	US o	f Jn	866.5	61.1
Spring Creek	US o	f Jn	837.5	61.1
Spring Creek	US o	f Jn	669	148
Spring Creek	US o	f Jn	437	148
Spring Creek	US o	f Jn	0	205
Spring Creek	US o	f Wallarah	C530	205
Spring Creek	US o	f Wallarah	C352	205
Spring Creek	US o	f Wallarah	C323	205
Spring Creek	US o	f Wallarah	C273	205
Spring Creek	US o	f Wallarah	C258	205
Spring Creek	US o	f Wallarah	C215	203
Spring Creek	US o	f Wallarah	C0	203

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Spring Creek	US of Wallarah	n CPF 1		Normal S = 0.001

GEOMETRY DATA

Geometry Title: Spring Creek Geometry File : e:\G Herman & Associates\Jobs\16049 - Wallarah 2 Coal Project Rail\HEC RAS Model\W2CPRailSidingPo.g01

Reach Connection Table

River	Reach	Upstream Boundary	Downstream Boundary
South Tributary			Jnl
Spring Creek	US of Jn		Jnl
Spring Creek	US of Wallarah C	Jnl	

JUNCTION INFORMATION

Name: Jnl Description: Energy computation Method

> Length across Junction Tributary River Reach River Reach Length Angle

Spring Creek US of Jn South Tributary .	to Spring Crea to Spring Crea		0 0 0 0
CROSS SECTION			
RIVER: South Tributary REACH: .	RS: 3277		
INPUT			
Description: Top DS of Fw Station Elevation Data	-		
Station Elevation Data Sta Elev Sta	num= 13 Elev Sta Ele	ev Sta Elev Sta	Elev
-119 33 -80		80 -17 29 -11	28.5
-6 28 0		28628.512	29
31 30 36	31 59 3	33	
Manning's n Values	num= 3		
Sta n Val Sta	n Val Sta n Va	al	
-119 .035 -17	.033 12 .03	35	
Bank Sta: Left Right -17 12	Lengths: Left Channe. 812 81:	-	Expan. .3
CROSS SECTION			
RIVER: South Tributary REACH: .	RS: 2465		
INPUT			
Description: Jn Trib 3c			
Station Elevation Data	num= 13		
Sta Elev Sta	Elev Sta Ele		Elev
-192 25 $-102-48$ 20 0		22 -68 21 -56 20 59 20.5 70	20.5 21
89 22 111		25	21
	_		
Manning's n Values Sta n Val Sta	num= 3 n Val Sta n Va	51	
-192 .05 -56)5	
			_
Bank Sta: Left Right -56 59	Lengths: Left Channel 752 752		Expan. .3
CROSS SECTION			
RIVER: South Tributary REACH: .	RS: 1713		
INPUT			
Description: Intermediate Station Elevation Data	num= 13		
Sta Elev Sta		ev Sta Elev Sta	Elev
-119 17 -80		.4 -17 13 -11	12.5
-6 12 0	11.5 4	2 6 12.5 12	13
31 14 36	15 59 3	.7	
Manning's n Values	num= 3		
Sta n Val Sta	n Val Sta n Va	al	
-119 .05 -17	.04 12 .0)5	
Bank Sta: Left Right	Lengths: Left Channe	Right Coeff Contr.	Expan.
-17 12	857 85'		.3
CROSS SECTION			
RIVER: South Tributary			
REACH: .	RS: 856		
INPUT			
Description: Jn Trib 3e			

Sta Elev Sta -119 11.5 -80 -6 6.5 0 31 8.5 36	num= Elev 9.5 6 9.5	13 Sta -57 4 59	Elev 8.5 6.5 11.5	Sta -17 6	Elev 7.5 7	Sta -11 12	Elev 7 7.5
Manning's n Values Sta n Val Sta -119 .05 -17	num= n Val .04	3 Sta 12	n Val .05				
Bank Sta: Left Right -17 12	Lengths:	Left Ch 191	nannel 191	Right 191	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: South Tributary REACH: .	RS: 665						
INPUT Description: Intermediate Station Elevation Data	num=	15					
Sta Elev Sta	Elev	Sta	Elev		Elev	Sta	Elev
-76 8.5 -57.6	7.5	-47.1	7	-37.6	6.5	-26	6
-16.8 5.5 -7.3	5	0	4.5	12.7	5	20.9	5.5
23.6 6 28.2	6.5	36.6	7	54.4	7.5	103.5	8.5
	n Val	3 Sta	n Val				
-76 .05 -16.8	.04	20.9	.05				
Bank Sta: Left Right -16.8 20.9	Lengths:	Left Ch 254	nannel 254	Right 254	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: South Tributary REACH: .	RS: 411						
	10.111						
	KD: 111						
INPUT							
INPUT Description: Intermediate		15					
INPUT Description: Intermediate Station Elevation Data	num=	15 Sta	Elev	Sta	Elev	Sta	Elev
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta	num= Elev	Sta	Elev 6.5	Sta -37.6	Elev 6	Sta -26	Elev 5.5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6	num= Elev 7	Sta -47.1	6.5	-37.6	б	-26	5.5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3	num= Elev 7 4.5	Sta -47.1 0	6.5 4	-37.6 12.7	6	-26 20.9	
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6	num= Elev 7 4.5 6	Sta -47.1 0	6.5	-37.6 12.7	6 4.5	-26 20.9	5.5 5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values	num= Elev 7 4.5 6	Sta -47.1 0 36.6 3	6.5 4	-37.6 12.7	6 4.5	-26 20.9	5.5 5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta	num= Elev 7 4.5 6 num=	Sta -47.1 36.6 3 Sta	6.5 4 6.5 n Val	-37.6 12.7	6 4.5	-26 20.9	5.5 5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta	num= Elev 7 4.5 6 num= n Val .04	Sta -47.1 0 36.6 3 Sta 20.9	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right	6 4.5 7	-26 20.9 103.5	5.5 5 8
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right	num= Elev 7 4.5 6 num= n Val .04	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right	6 4.5 7	-26 20.9 103.5	5.5 5 8 Expan.
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9	num= Elev 7 4.5 6 num= n Val .04	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right	6 4.5 7	-26 20.9 103.5	5.5 5 8 Expan.
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: .	num= Elev 7 4.5 6 num= n Val .04 Lengths:	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right	6 4.5 7	-26 20.9 103.5	5.5 5 8 Expan.
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right	6 4.5 7	-26 20.9 103.5	5.5 5 8 Expan.
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110	6.5 4 6.5 n Val .05 nannel 110	-37.6 12.7 54.4 Right 110	6 4.5 7 Coeff	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 1 num= Elev	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110	6.5 4 6.5 n Val .05	-37.6 12.7 54.4 Right 110	6 4.5 7 Coeff	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan.
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 1 num= Elev 8	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110	6.5 4 6.5 n Val .05 nannel 110 Elev 7	-37.6 12.7 54.4 Right 110	6 4.5 7 Coeff	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 1 num= Elev 8 5	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110 21 Sta -127 -25.9	6.5 4 6.5 n Val .05 hannel 110 Elev 7	-37.6 12.7 54.4 Right 110 Sta -98.7	6 4.5 7 Coeff Elev 6.5 4	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155 -42.5 5.5 -31.7	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 1 num= Elev 8 5	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110 21 Sta -127 -25.9	6.5 4 6.5 n Val .05 nannel 110 Elev 7 4.5	-37.6 12.7 54.4 Right 110 Sta -98.7 -19.6	6 4.5 7 Coeff Elev 6.5 4	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6 3.5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155 -42.5 5.5 -31.7 0 3.4 4.37	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 1 num= Elev 8 5 3.5	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110 21 Sta -127 -25.9 27.7	6.5 4 6.5 n Val .05 nannel 110 Elev 7 4.5 4	-37.6 12.7 54.4 Right 110 Sta -98.7 -19.6 47.6	6 4.5 7 Coeff Elev 6.5 4 4.5	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6 3.5 5
<pre>INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155 -42.5 5.5 -31.7 0 3.4 4.37 58.4 5.5 74.1 165 9</pre>	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 Lengths: RS: 301 1 num= Elev 8 5 3.5 6	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110 21 Sta -127 -25.9 27.7 91.4	6.5 4 6.5 n Val .05 nannel 110 Elev 7 4.5 4	-37.6 12.7 54.4 Right 110 Sta -98.7 -19.6 47.6	6 4.5 7 Coeff Elev 6.5 4 4.5	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6 3.5 5
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -76 8 -57.6 -16.8 5 -7.3 23.6 5.5 28.2 Manning's n Values Sta n Val Sta -76 .05 -16.8 Bank Sta: Left Right -16.8 20.9 CROSS SECTION RIVER: South Tributary REACH: . INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -177 9 -155 -42.5 5.5 -31.7 0 3.4 4.37 58.4 5.5 74.1 165 9 Manning's n Values	num= Elev 7 4.5 6 num= n Val .04 Lengths: RS: 301 Lengths: RS: 301 1 num= Elev 8 5 3.5 6	Sta -47.1 0 36.6 3 Sta 20.9 Left Ch 110 21 Sta -127 -25.9 27.7 91.4	6.5 4 6.5 n Val .05 nannel 110 Elev 7 4.5 4	-37.6 12.7 54.4 Right 110 Sta -98.7 -19.6 47.6	6 4.5 7 Coeff Elev 6.5 4 4.5	-26 20.9 103.5 Contr. .1	5.5 5 8 Expan. .3 Elev 6 3.5 5
Bank Sta: Left Rig -42.5 5			Right 25	Coeff Contr. .3	Expan. .5		
---	---	---	-------------------	---------------------------------	------------------		
CROSS SECTION							
RIVER: South Tributa REACH: .	ary RS: 276						
INPUT Description: West e Station Elevation D	ata num=	13		Elev Sta			
Sta Elev -148.6 8 -4.37 3.1 27.3 5	Sta Elev -29.7 7 0 3 35.1 7	Sta Elev -21.6 5 2.49 3.1 112.7 8	5 –20 3.8	Elev Sta 4 -18.8 3.5 23.7	Elev 3.5 4		
Manning's n Values Sta n Val -148.6 .06		3 Sta n Val 23.7 .06					
Bank Sta: Left Rig -18.8 2		: Left Channel 20 20	Right 20	Coeff Contr. .3	Expan. .5		
BRIDGE							
RIVER: South Tribut REACH: .	ary RS: 266						
INPUT Description: Existi: Distance from Upstr Deck/Roadway Width Weir Coefficient Upstream Deck/Roadw num= 6	eam XS = = 1 = 1.	5 10 .7 s					
Sta Hi Cord Lo		Hi Cord Lo Cord		Cord Lo Cord			
-500 9 21 8.6	0 -20 7.6 21	8.7 C 8.6 C		8.7 7.7 8.4 0			
Upstream Bridge Cros Station Elevation D		a 13					
Sta Elev -148.6 8	Sta Elev -29.7 7	Sta Elev -21.6 5		Elev Sta 4 -18.8	Elev		
-148.6 8 -4.37 3.1		2.49 3.1	3.8	3.5 23.7			
27.3 5	35.1 7	112.7 8					
Manning's n Values	num=	3					
Sta n Val -148.6 .06	Sta n Val -18.8 .04	Sta n Val 23.7 .06	5				
Bank Sta: Left Rig -18.8 2							
Downstream Deck/Roo num= 6	adway Coordinat	tes					
	Cord Sta H						
-500 9 21 8.6	0 -20 7.6 21	8.7 C 8.6 C) –20) 500	8.77.78.40			
Downstream Bridge C: Station Elevation D							
Sta Elev	Sta Elev	Sta Elev		Elev Sta	Elev		
-153 8 -7.72 3	-31.2 7 0 2.8	-20.3 5	5 -17.6 3 20.5	4 -14.1			
-7.72 3 27.1 5	0 2.8	1.54 3		3.5 25	4		
Manning's n Values	num=	3					
Sta n Val							
-153 .06	Sta n Val						
Bank Sta: Left Rig	-17.6 .04	25 .06					

.3 .5 -17.6 25 0 horiz. to 1.0 vertical Downstream Embankment side slope = 0 horiz. to 1.0 vertical = .98 Maximum allowable submergence for weir flow = 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 = 2 Pier Data Pier Station Upstream= -10.1 Downstream= -10.1 Upstream num= 2 Width Elev Width Elev .75 0 .75 Downstream num= 2 9 Width Elev Width Elev 0.75 9 .75 Pier Data Pier Station Upstream= 5.1 Downstream= 5.1 Upstream num= 2 Width Elev Width Elev .75 0 .75 9 Downstream num= 2 Width Elev Width Elev 9 .75 0 .75 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: South Tributary REACH: . RS: 256 INPUT Description: East edge Bridge 1 Station Elevation Data num= 13 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev 3.5 8 -31.2 3 0 5 32.8 -20.3 1.54 5 -17.6 3 20.5 4 -14.1 3.5 25 -153 7 -7.72 2.8 4 8 7 107.9 27.1 3 Sta n Val Manning's n Values num= Sta n Val Sta n Val -153 .06 -17.6 .04 .04 .06 25 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -17.6 25 12 12 12 .3.5 CROSS SECTION RIVER: South Tributary RS: 244 REACH: .

INPUT

Description		- · ·							
Station Ele			e l num=	25					
Station Eie Sta	Elev	Sta	Elev	25 Sta	Elev	Sta	Elev	Sta	Elev
-107	8.1	-89.4	7.1	-52.8		-29.3	5.6	-19.7	5.1
-16.2	°.⊥ 4.6		7.1 4.1				3.1		2.6
-16.2		-13.3		-11.3		-7.77 2.09		-4.88	2.6
	2.5	-2.88	1.4				1.5	2.83	
4.68	2.6	10.7	3.1	16.6	3.6	24.3	4.1	34.4	4.6
48	5.1	65.1	5.6	72.4	6.1	82.5	7.1	95	8.1
Manning's n	Value	S	num=	3					
	n Val	Sta	n Val	Sta	n Val				
-107	.05	-11.3	.04	16.6					
Bank Sta: L	.eft ·	Right	Lengths:	Left (Thannel	Right	Coeff	Contr.	Expan
	.1.3	16.6	Lengens.	20	20	20	COCII	.1	.3
BRIDGE									
RIVER: Sout	h Trib	utary	DG • 004						
REACH: .			RS: 234						
INPUT									
Description				-					
Distance fr Deck/Roadwa	_			5					
Veir Coeffi	-	h	= 1.	.0					
Jpstream D		adway Co							
num= Sta Hi	6 . Cord I	Lo Cord	Sta H	Ii Cord	Lo Cord	Sta H	i Cord I	Lo Cord	
-500	9	0	-20	8.7		-20	8.7	7.7	
21	8.6	7.6	21	8.6		500	8.4	0	
Jpstream Br	-								
Station Ele			num=	25	_ 2	-			_ 1
Sta	Elev	Sta	Elev	Sta		Sta	Elev	Sta	Elev
-107	8.1	-89.4	7.1	-52.8		-29.3	5.6	-19.7	5.1
-16.2	4.6	-13.3	4.1	-11.3		-7.77	3.1	-4.88	2.6
-3.31	2.5	-2.88	1.4	0		2.09	1.5	2.83	2.4
4.68	2.6	10.7	3.1	16.6		24.3	4.1	34.4	4.6
48	5.1	65.1	5.6	72.4	6.1	82.5	7.1	95	8.1
Manning's n	Value	s	num=	3					
5			n Val		n Val				
-107			.04						
Bank Sta: L		-	Coeff Co		-				
-1	1.3	16.6		.1	.3				
Downstream	Deck/1	Roadway	Coordinat	es					
num=	6	-							
Sta Hi	Cord I	Lo Cord	Sta H	Ii Cord	Lo Cord	Sta H	i Cord i	Lo Cord	
-500	9	0	-20	8.7	0	-20	8.7	7.7	
	~ -	7.6	21	8.6	0	500	8.4	0	
21	8.6			0.0	0	500	0.1		
		Crogg S			0	500	0.1		
ownstream	Bridge		ection Da	ita	0	500	0.1		
Oownstream Station Ele	Bridge vation	Data	ection Da num=	ita 25				Sta	Flor
Oownstream Station Ele Sta	Bridge vation Elev	Data Sta	ection Da num= Elev	ita 25 Sta	Elev	Sta	Elev	Sta -19 7	
Downstream Station Ele Sta -107	Bridge evation Elev 7.9	Data Sta -89.4	ection Da num= Elev 6.9	nta 25 Sta -52.8	Elev 5.9	Sta -29.3	Elev 5.4	-19.7	4.9
Oownstream Station Ele Sta -107 -16.2	Bridge evation Elev 7.9 4.4	Data Sta -89.4 -13.3	ection Da num= Elev 6.9 3.9	ata 25 Sta -52.8 -11.3	Elev 5.9 3.4	Sta -29.3 -7.77	Elev 5.4 2.9	-19.7 -4.88	4.9 2.4
ownstream Station Ele Sta -107 -16.2 -3.31	Bridge evation Elev 7.9 4.4 2.3	Data Sta -89.4 -13.3 -2.88	ection Da num= Elev 6.9 3.9 1.2	uta 25 Sta -52.8 -11.3 0	Elev 5.9 3.4 1.1	Sta -29.3 -7.77 2.09	Elev 5.4 2.9 1.3	-19.7 -4.88 2.83	4.9 2.4 2.2
ownstream tation Ele Sta -107 -16.2 -3.31 4.68	Bridge evation Elev 7.9 4.4 2.3 2.4	Data Sta -89.4 -13.3 -2.88 10.7	ection Da num= Elev 6.9 3.9 1.2 2.9	ata 25 5ta -52.8 -11.3 0 16.6	Elev 5.9 3.4 1.1 3.4	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Oownstream Station Ele Sta -107 -16.2 -3.31	Bridge evation Elev 7.9 4.4 2.3	Data Sta -89.4 -13.3 -2.88 10.7	ection Da num= Elev 6.9 3.9 1.2	ata 25 5ta -52.8 -11.3 0 16.6	Elev 5.9 3.4 1.1 3.4	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9	Data Sta -89.4 -13.3 -2.88 10.7 65.1	ection Da num= Elev 6.9 3.9 1.2 2.9	ata 25 5ta -52.8 -11.3 0 16.6	Elev 5.9 3.4 1.1 3.4	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's m	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9	Data Sta -89.4 -13.3 -2.88 10.7 65.1	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4	ata 25 Sta -52.8 -11.3 0 16.6 72.4	Elev 5.9 3.4 1.1 3.4 5.9	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's m	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 Values	Data Sta -89.4 -13.3 -2.88 10.7 65.1	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num=	ata 25 52.8 -11.3 0 16.6 72.4 3	Elev 5.9 3.4 1.1 3.4 5.9 n Val	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's n Sta -107	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 N Values n Values .05	Data Sta -89.4 -13.3 -2.88 10.7 65.1 s Sta -11.3	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num= n Val .04	ata 25 52.8 -11.3 0 16.6 72.4 3 Sta 16.6	Elev 5.9 3.4 1.1 3.4 5.9 n Val .05	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's n Sta -107 Bank Sta: L	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 N Values n Values .05	Data Sta -89.4 -13.3 -2.88 10.7 65.1 s Sta -11.3 Right	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num= n Val	ata 25 52.8 -11.3 0 16.6 72.4 3 5ta 16.6	Elev 5.9 3.4 1.1 3.4 5.9 n Val .05 Expan.	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's n Sta -107 Bank Sta: L	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 N Values n Values .05	Data Sta -89.4 -13.3 -2.88 10.7 65.1 s Sta -11.3	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num= n Val .04	ata 25 52.8 -11.3 0 16.6 72.4 3 Sta 16.6	Elev 5.9 3.4 1.1 3.4 5.9 n Val .05	Sta -29.3 -7.77 2.09 24.3	Elev 5.4 2.9 1.3 3.9	-19.7 -4.88 2.83 34.4	Elev 4.9 2.4 2.2 4.4 7.9
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's m Sta -107 Bank Sta: L -1	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 N Values n Values .05 eft 1 1.3	Data Sta -89.4 -13.3 -2.88 10.7 65.1 s Sta -11.3 Right 16.6	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num= n Val .04 Coeff Co	ata 25 52.8 -11.3 0 16.6 72.4 3 5ta 16.6	Elev 5.9 3.4 1.1 3.4 5.9 n Val .05 Expan.	Sta -29.3 -7.77 2.09 24.3 82.5	Elev 5.4 2.9 1.3 3.9 6.9	-19.7 -4.88 2.83 34.4	4.9 2.4 2.2 4.4 7.9
Downstream Station Ele Sta -107 -16.2 -3.31 4.68 48 Manning's m Sta -107 Bank Sta: L	Bridge evation Elev 7.9 4.4 2.3 2.4 4.9 N Values n Val .05 .05 .1.3 .05	Data Sta -89.4 -13.3 -2.88 10.7 65.1 s Sta -11.3 Right 16.6 nt side	ection Da num= Elev 6.9 3.9 1.2 2.9 5.4 num= n Val .04 Coeff Co	ata 25 52.8 -11.3 0 16.6 72.4 3 5ta 16.6 ontr. .1	Elev 5.9 3.4 1.1 3.4 5.9 n Val .05 Expan. .3	Sta -29.3 -7.77 2.09 24.3 82.5	Elev 5.4 2.9 1.3 3.9 6.9 z. to 1	-19.7 -4.88 2.83 34.4 95	4.9 2.4 2.2 4.4 7.9

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 = 2 Pier Data Pier Station Upstream= -10.1 Downstream= -10.1 Upstream num= 2 Width Elev Width Elev .75 0 .75 9 Downstream num= 2 Width Elev Width Elev .75 0 .75 9 Pier Data Pier Station Upstream= 5.1 Downstream= 5.1 Upstream num= 2 Width Elev Width Elev 0.75 9 num= 2 .75 0 Downstream Width Elev Width Elev 0.75 .75 9 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: South Tributary REACH: . RS: 224 INPUT Description: CL New Bridge 1 Station Elevation Data num= 25 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev 4.9

 7.9
 -89.4
 6.9
 -52.8
 5.9
 -29.3
 5.4
 -19.7

 4.4
 -13.3
 3.9
 -11.3
 3.4
 -7.77
 2.9
 -4.88

 2.3
 -2.88
 1.2
 0
 1.1
 2.09
 1.3
 2.83

 -107 -16.2 2.4 -3.31 2.2 3.4 24.3 4.68 2.4 10.7 2.9 16.6 3.9 34.4 4.4 5.9 82.5 6.9 95 7.9 48 4.9 65.1 5.4 72.4 Manning's n Values num= Sta n Val Sta n Val 3 Sta n Val -107 .05 -11.3 .04 16.6 .05 Coeff Contr. Bank Sta: Left Right Lengths: Left Channel Right Expan. 16.6 102 102 102 -11.3 .1 .3 CROSS SECTION RIVER: South Tributary REACH: . RS: 122 INPUT Description: Intermediate Station Elevation Data num= 22 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev

-154 -11.7 1.25 15.4 93	3	-42.2 -8.82 3.08 20.5 99.1		-30.9 -5.04 5.56 34.1	4.5 2 2.5 5	-25.1 -1.21 8.53 60.4	4 1.5 3 5.5	-17.5 0 11.8 82.3	3.5 1.4 3.5 6
Manning's n Sta r -154	n Val	Sta	num= n Val .04	3 Sta 11.8	n Val .05				
Bank Sta: Le -17		ight 11.8	Lengths:	Left Ch 122	nannel 122	Right 122	Coeff	Contr. .1	Expan. .3
CROSS SECTIO	N								
RIVER: South REACH: .	n Tribut	tary	RS: 0						
INPUT Description Station Elev Sta		Data		30 Sta	Elev	Sta	Elev	Sta	Elev
-218	EIEV 7	-214	EIEV 6	-199	Elev 5	-175		-111	4.5
-94.1		-90.4		-87.9	3	-84.3		-75.3	2
-58.4	2	-50	1.5	-46.2	1	-38.8		-27.8	2
-13 11.5	1.5 3	0 1 E E	1 3.5	5.26	1.5 4	7.23 57.8	2 4.5		2.5 5
11.5		15.5 133	3.5	30.8 138	4 6.5	57.8	4.5	82.5 145	5
Manning's n	Values			3					
Sta r -218	n Val .05	Sta -90.4	n Val .04	Sta 15.5	n Val .05				
Bank Sta: Le -90		ight 15.5	Lengths:	Left Ch O	nannel O	Right 0	Coeff	Contr. .1	Expan. .3
CROSS SECTIO	NC								
CROSS SECTION RIVER: Sprin REACH: US of	ng Creeł		RS: 3340						
RIVER: Sprin REACH: US of INPUT Description	ng Cree E Jn : top			0					
RIVER: Sprin REACH: US of INPUT Description Station Elev	ng Cree} f Jn : top vation I	Data	num=	9 Sta	Elev	Sta	Elev	Sta	Elev
RIVER: Sprin REACH: US of INPUT Description	ng Cree E Jn : top			9 Sta -15	Elev 33.5	Sta -3.5	Elev 33.1	Sta 0	Elev 33
RIVER: Sprin REACH: US of INPUT Description Station Elev Sta	ng Creeł f Jn : top vation I Elev	Data Sta	num= Elev 34.5	Sta					
RIVER: Sprin REACH: US of INPUT Description Station Elev Sta -57 2.8	ng Creek E Jn : top vation I Elev 36 33.1	Data Sta -32.9 20.7	num= Elev 34.5 33.5	Sta -15 41.8	33.5	-3.5	33.1		
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n	ng Creek E Jn : top vation I Elev 36 33.1	Data Sta -32.9 20.7	num= Elev 34.5	Sta -15	33.5	-3.5	33.1		
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n	ng Creek E Jn : top vation I Elev 36 33.1 Values	Data Sta -32.9 20.7	num= Elev 34.5 33.5 num=	Sta -15 41.8 3	33.5 34.5	-3.5	33.1		
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le	ng Cree f Jn : top vation I Elev 36 33.1 Values n Val .035 eft R:	Data Sta -32.9 20.7 Sta	num= Elev 34.5 33.5 num= n Val	Sta -15 41.8 3 Sta 20.7	33.5 34.5 n Val .035	-3.5	33.1 36		33
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le	ng Cree f Jn : top vation I Elev 36 33.1 Values n Val .035 eft R: -15 2	Data Sta -32.9 20.7 Sta -15 ight	num= Elev 34.5 33.5 num= n Val .033	Sta -15 41.8 3 Sta 20.7 Left Ch	33.5 34.5 n Val .035	-3.5 66 Right	33.1 36	0 Contr.	33 Expan.
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le	ng Cree f Jn : top vation I Elev 36 33.1 Values N Val .035 eft R: -15 20N	Data Sta -32.9 20.7 Sta -15 ight 20.7	num= Elev 34.5 33.5 num= n Val .033	Sta -15 41.8 3 Sta 20.7 Left Ch	33.5 34.5 n Val .035	-3.5 66 Right	33.1 36	0 Contr.	33 Expan.
RIVER: Sprin REACH: US of INPUT Description Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le CROSS SECTIO	ng Creek f Jn : top vation I Elev 36 33.1 Values n Val .035 eft R: -15 2 DN ng Creek f Jn : Interr	Data Sta -32.9 20.7 Sta -15 ight 20.7 k	num= Elev 34.5 33.5 num= n Val .033 Lengths: RS: 2740	Sta -15 41.8 3 Sta 20.7 Left Ch	33.5 34.5 n Val .035	-3.5 66 Right	33.1 36	0 Contr.	33 Expan.
RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le CROSS SECTION RIVER: Sprin REACH: US of INPUT Description	ng Creek f Jn : top vation I Elev 36 33.1 Values n Val .035 eft R: -15 2 DN ng Creek f Jn : Interr	Data Sta -32.9 20.7 Sta -15 ight 20.7 k	num= Elev 34.5 33.5 num= n Val .033 Lengths: RS: 2740	Sta -15 41.8 3 Sta 20.7 Left Ch 600	33.5 34.5 n Val .035	-3.5 66 Right 600	33.1 36	0 Contr.	33 Expan.
RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le CROSS SECTIO RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57	ng Creek E Jn : top vation I Elev 36 33.1 Values N Values N Val .035 eft R: -15 2 DN ng Creek E Jn : Interr vation I Elev 26	Data Sta -32.9 20.7 Sta -15 ight 20.7 k mediate Data Sta -32.9	<pre>num= Elev 34.5 33.5 num= n Val .033 Lengths: RS: 2740 num= Elev 24.5</pre>	Sta -15 41.8 3 Sta 20.7 Left Ch 600 9 Sta -15	33.5 34.5 n Val .035 nannel 600 Elev 23.5	-3.5 66 Right 600 Sta -3.5	33.1 36 Coeff Elev 23.1	0 Contr. .1	33 Expan. .3
RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le CROSS SECTIO RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta	ng Creek f Jn : top vation I Elev 36 33.1 Values N Values N Val .035 eft R: -15 2 DN ng Creek f Jn : Interr vation I Elev	Data Sta -32.9 20.7 Sta -15 ight 20.7 k mediate Data Sta	<pre>num= Elev 34.5 33.5 num= n Val .033 Lengths: RS: 2740 num= Elev</pre>	Sta -15 41.8 3 Sta 20.7 Left Ch 600	33.5 34.5 n Val .035 nannel 600 Elev	-3.5 66 Right 600 Sta	33.1 36 Coeff	0 Contr. .1 Sta	33 Expan. .3 Elev
RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57 2.8 Manning's n Sta r -57 Bank Sta: Le CROSS SECTIO RIVER: Sprin REACH: US of INPUT Description: Station Elex Sta -57 2.8 Manning's n	ng Creek E Jn : top vation I Elev 36 33.1 Values n Val .035 eft R: -15 2 DN ng Creek E Jn : Interr vation I Elev 26 23.1	Data Sta -32.9 20.7 Sta -15 ight 20.7 k mediate Data Sta -32.9 20.7	<pre>num= Elev 34.5 33.5 num= n Val .033 Lengths: RS: 2740 num= Elev 24.5</pre>	Sta -15 41.8 3 Sta 20.7 Left Ch 600 9 Sta -15	33.5 34.5 n Val .035 nannel 600 Elev 23.5	-3.5 66 Right 600 Sta -3.5	33.1 36 Coeff Elev 23.1	0 Contr. .1 Sta	33 Expan. .3 Elev

Bank Sta: Left Right -15 20.7		: Left C 652	hannel 652		Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 2086	5					
INPUT Description: Jn Trib 24 Station Elevation Data Sta Elev S -70.6 18 -38 7.9 14.5 13	num= a Elev 3 16	9 Sta -27.8 30.7	15		14.5	Sta 0	Elev 14
Manning's n Values Sta n Val S -70.6 .05 -27	a nVal		n Val .05				
Bank Sta: Left Right -27.8 13.3	Lengths	: Left C 245	hannel 245		Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 1841	L					
INPUT							
Description: Intermedia Station Elevation Data		14					
Sta Elev S	a Elev	Sta			Elev	Sta	Elev
-124 16 -89				-22.2		-12.3	13
-7.99 12 -3.8 33.5 12 46		0 60.6	10.5 14	3.79 95.4	11 16	8.26	11.5
5515 12 10	1 20	00.0		2011	10		
Manning's n Values		3					
Sta n Val S [.] -124 .05 -12	a nVal 3.04						
Bank Sta: Left Right -12.3 33.5	Lengths	: Left C 246	hannel 246		Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 1595	5					
INPUT Description: Jn Nth Tr Station Elevation Data		16					
	a Elev		Elev	Sta	Elev	Sta	Elev
-96.7 14 -81		-59.1		-43.7		-34.9	11
	.7 10 28 9.5			-5.36 43.6		0 55.1	8.5 12
91.9 14	20 9.5	52.9	10	43.0	ΤŢ	55.I	12
Manning's n Values		3					
-	a n Val		n Val				
-96.7 .05 -10	.04	32.9	.05				
Bank Sta: Left Right -10.7 32.9		: Left C 402	hannel 402		Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 1193	3					
INPUT Description: Intermedia	ate						

Station Elevation Data Sta Elev Sta -38.6 13 -20.5 -9.77 8 -6.44 2.4 6.5 3.86 58.2 7.5 62.4 142 13	num= Elev 11 7.5 7 8	21 Sta -17.6 -4.18 10.4 70.6	Elev 10 7.5 9	Sta -14.2 -2.36 28.6 84.5	Elev Sta 9 -12.4 6.5 0 7.5 42.8 10 104	Elev 8.5 6 8 11
	num= n Val .04	3 Sta 1 62.4				
Bank Sta: Left Right -9.77 62.4	Lengths:	Left Char 155	nnel 155		Coeff Contr. .1	Expan. .3
CROSS SECTION						
RIVER: Spring Creek REACH: US of Jn	RS: 1038					
INPUT Description: Intermediate						
Description: Intermediate Station Elevation Data Sta Elev Sta -75.8 11 -60.4 -38.1 7 -31 -5.55 6 0 20 7.5 25 89 11	num= Elev 10 7.5 5.5 8	21 Sta -52.2 -24.7 8.31 33		Sta -46.3 -14.3 11.2 51	Elev Sta 8 -43.2 7 -7.27 6.5 15.8 9 72	Elev 7.5 6.5 7 10
Manning's n Values		3				
Sta n Val Sta -75.8 .05 -38.1	n val .04	Sta 1 15.8				
Bank Sta: Left Right -38.1 15.8	Lengths:	Left Chai 105	nnel 105		Coeff Contr. .1	Expan. .3
CROSS SECTION						
RIVER: Spring Creek REACH: US of Jn	RS: 933					
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -30.2 10 -19.6	num= Elev 8	17 Sta -16.4	Elev 7	-14.5	Elev Sta 6.5 -12.7	Elev 6
-7.83 5.8 -3.55 7.68 6 14.5	6 5.8	-1.6 17.9	5.5 6	0 20.8	5.1 3.6 6.5 30.3	5.5 7
37.5 8 77.6	10					
Manning's n Values Sta n Val Sta	num= n Val	3 Sta 1	n Val			
-30.2 .05 -12.7	.04	17.9	.05			
Bank Sta: Left Right -12.7 17.9	Lengths:			Right 36.5	Coeff Contr. .1	Expan. .3
CROSS SECTION						
RIVER: Spring Creek REACH: US of Jn	RS: 896.	5				
INPUT Description: US of Bridge Station Elevation Data Sta Elev Sta -26.6 10 -22.8 -14.2 6.5 -7.14 5.09 6 13 44.2 9 68.8	2 num= Elev 9 6.5 10	17 Sta -20.4 -1.09 17.7	Elev 8 5.5 7	Sta -19.2 0 21.4	Elev Sta 7.5 -18.3 5 2.25 7.5 26.9	Elev 7 5.5 8

Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -26.6 .05 -14.2 .04 13 .05 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. 10 10 10 -14.2 13 .1 .3 CROSS SECTION RIVER: Spring Creek RS: 886.5 REACH: US of Jn INPUT Description: West side of Bridge 2

 Station Elevation Data
 num=
 16

 Sta
 Elev
 Sta
 Sta
 Elev 149.1 9 Manning's n Values num= Sta n Val Sta n Val -117 .06 -10.1 .04 3 Sta n Val 12 .06 Bank Sta: LeftRightLengths: LeftChannelRightCoeffContr.Expan.-10.112202020.3.5 .3.5 BRIDGE RIVER: Spring Creek INPUT Description: Existing Bridge 2 Distance from Upstream XS = 5 Deck/Roadway Width = 10 Weir Coefficient = 1.7 Upstream Deck/Roadway Coordinates num= 6 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 -500
 10.7
 0
 -10.2
 10.5
 0
 -10.2
 10.5
 9.5

 10.7
 10.4
 9.4
 10.7
 10.4
 0
 500
 10.2
 0
 Upstream Bridge Cross Section Data Station Elevation Data num= 16 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev -117 -10.1 6 -6.19 5.5 -.729 5 5.5 12 6 12.7 6.5 5 -10._ 11.3 149.1 9 Manning's n Values num= Sta n Val Sta n Val -117 .06 -10.1 .04 3 Sta n Val 12 .06 Bank Sta: Left Right Coeff Contr. Expan. -10.1 12 .3 .5 Downstream Deck/Roadway Coordinates num= 6 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord
 -500
 10.7
 0
 -10.2
 10.5
 0
 -10.2
 10.5
 9.5

 10.7
 10.4
 9.4
 10.7
 10.4
 0
 500
 10.2
 0
 10.7 Downstream Bridge Cross Section Data Station Elevation Data num= 16
 Sta
 Elev
 Sta
 Elev
 Sta

 -133
 11
 -76
 10
 -30.1

 -9.84
 6
 -7.39
 5.5
 -1.06
 Elev Sta Sta Elev Elev 9 -13.9 5 0 7 -12.4 6.5 5 -9.84 4.8 10.8 13.7 5.5 15 6 16 6.5 17.2 7 44.7 8

106.3 Manning's n Values num= 3 Sta n Val Sta n Val Sta n Val -133 .06 -9.84 .04 15 .06 Bank Sta: Left Right Coeff Contr. Expan. .3 -9.84 15 .5 Upstream Embankment side slope 0 horiz. to 1.0 vertical Downstream Embankment side slope = 0 horiz. to 1.0 vertical Maximum allowable submergence for weir flow = .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 = 2 Pier Data Pier Station Upstream= -3.5 Downstream= -3.5 Upstream num= 2 Width Elev Width Elev 1 0 1 10 Downstream num= 2 Width Elev Width Elev 1 0 1 10 1 10 Pier Data Pier Data Pier Station Upstream= 3.8 Downstream= 3.8 Upstream num= 2 Width Elev Width Elev 1 0 1 10 stream num= 2 Downstream Width Elev Width Elev 0 1 10 1 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: Spring Creek REACH: US of Jn RS: 866.5 INPUT Description: East side of Bridge 2 Station Elevation Data num= 16 Sta Elev Sta -133 11 -76 Sta Elev Sta Elev Sta Elev Elev 11
 11
 -76
 10
 -30.1

 6
 -7.39
 5.5
 -1.06
 9 -13.9 5 0 7 -12.4 6.5 5 -9.84 0 4.8 10.8 15 13.7 5.5 6 16 6.5 17.2 7 44.7 8 106.3 9 Manning's n Values num= 3 Sta n Val Sta n Val -133 .06 -9.84 .04 Sta n Val .06 15 Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan. -9.84 15 19 19 19 .3 .5

9

CROSS SECTION

RIVER: Spring Creek REACH: US of Jn	RS: 847.5	
INPUT		
Description: CL new Bri	dge 2	
Station Elevation Data	num= 25	
Sta Elev St		ev Sta Elev Sta Elev
-154 9.1 -12		
-35.3 7.1 -26.		
-2 5 $9811.9 5.1 17.$		2 2.81 4.3 3.22 4.7 1 24.5 6.6 28.7 7.1
37 7.6 56.		
Manning's n Values	num= 3	
Sta n Val St	a nVal Sta nVa	1
-154 .05 -35.	3 .04 28.7 .0	15
Bank Sta: Left Right -35.3 28.7	Lengths: Left Channel 20 20	
DDIDGE		
BRIDGE		
RIVER: Spring Creek REACH: US of Jn	RS: 837.5	
INPUT Description: Existing E	ridao 2	
Distance from Upstream		
Deck/Roadway Width	= 10	
Weir Coefficient	= 1.7	
Upstream Deck/Roadway	Coordinates	
num= 6		
Sta Hi Cord Lo Cor		
-500 10.7 10.7 10.4 9.	0 -10.2 10.5 4 10.7 10.4	0 -10.2 10.5 9.5 0 500 10.2 0
10.7 10.1 9.	1 10.7 10.1	0 500 10.2 0
Upstream Bridge Cross S	ection Data	
Station Elevation Data	num= 25	
Sta Elev St		
-154 9.1 -12		9 -80.6 7.8 -55.7 7.6
-35.3 7.1 -26. -2 598		
11.9 5.1 17.		
		8 83.5 8.1 99.7 9.1
Manning's n Values		
	a nVal Sta nVa	
-154 .05 -35.	3 .04 28.7 .0	15
Bank Sta: Left Right	Coeff Contr. Expan.	
-35.3 28.7		
Downstream Deck/Roadwa	y Coordinates	
num= 6		
		d Sta Hi Cord Lo Cord
-500 10.7 10.7 10.4 9.	0 -10.2 10.5 4 10.7 10.4	0 -10.2 10.5 9.5 0 500 10.2 0
10.7 10.4 9.	4 10.7 10.4	0 500 10.2 0
Downstream Bridge Cross	Section Data	
Station Elevation Data	num= 25	
Sta Elev St		ev Sta Elev Sta Elev
-154 8.9 -12		7 -80.6 7.6 -55.7 7.4
-35.3 6.9 -26.		9 -12 5.4 -4.61 4.9
37 7.4 56.	5 5.4 20.8 5. 1 7.9 69.6 7.	924.56.428.76.9683.57.999.78.9
5 50.	_ ,., ,,,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Manning's n Values	num= 3	
	a nVal Sta nVa	1

-154 .05 -35.3 .04 28.7 .05 Bank Sta: Left Right Coeff Contr. Expan. -35.3 28.7 .1 .3 = = Upstream Embankment side slope 0 horiz. to 1.0 vertical Downstream Embankment side slope 0 horiz. to 1.0 vertical Maximum allowable submergence for weir flow = . 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 = 2 Pier Data Pier Station Upstream= -3.5 Downstream= -3.5 Upstream num= 2 Width Elev Width Elev 1 0 1 10 Downstream num= 2 Width Elev Width Elev 1 0 1 10 1 10 Pier Data Pier Station Upstream= 3.8 Downstream= 3.8 Upstream num= 2 Width Elev Width Elev 1 0 1 10 stream num= 2 Downstream Width Elev Width Elev 0 1 1 10 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: Spring Creek REACH: US of Jn RS: 827.5 INPUT Description: CL new Bridge 2 Station Elevation Data num= 25 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev -154 8.9 -121 7.9 -102 7.7 -80.6 7.6 -55.7 7.4 -35.3

 6.9
 -26.5
 6.4
 -19.3

 4.8
 -.985
 4.1
 0

 4.9
 17.5
 5.4
 20.8

 4.9 5.9 -12 4 2.81 5.4 -4.61 -2 4.1 3.22 4.5 4.⊥ 3.22 6.4 28.7 0 4 2.8120.8 5.9 24.5 11.9 6.9 37 7.4 56.1 7.9 69.6 7.6 83.5 7.9 99.7 8.9 3 Manning's n Values num= Sta n Val Sta n Val Sta n Val -154 .05 -35.3 .04 28.7 .05
 Bank Sta:
 Left
 Right
 Lengths:
 Left
 Channel
 Right
 Coeff
 Contr.
 Expan.

 -35.3
 28.7
 158.5
 158.5
 158.5
 .1
 .3

CROSS SECTION

RIVER: Spring Creek REACH: US of Jn	RS: 669						
INPUT Description: Intermediate Station Elevation Data Sta Elev Sta -225 8 -160 -17.3 5 -12.8 16.3 4.5 22.7 118 6.5 135	num= Elev 7 4.5 5 7	18 Sta -68.8 -10 26.5 148	Elev 6.5 4 5.5 8	Sta -46.7 0 30.2	Elev 6 3.8 6	Sta -23 11.6 34.9	Elev 5.5 4 6.5
Manning's n Values Sta n Val Sta -225 .05 -23	num= n Val .04	3 Sta 26.5	n Val .05				
Bank Sta: Left Right -23 26.5	Lengths:	Left Ch 232	nannel 232	Right 232	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 437						
INPUT Description: Jn East trik Station Elevation Data	outary num=	23					
Sta Elev Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-105 7 -91.3	6	-72	5	-58.4	4	-50.9	3.5
-43.4 3 -35	2.5	-22.4	2	-16.4	1.6		2
-4.77 2 0	1.5	5.46	2	6.62	2.5	7.74	3
9 3.5 10.3	4	19.5	4.5	45	5	125	5.5
208 6 220	6.5	223		10	5	100	515
Manning's n Values	num=	3					
Sta n Val Sta	n Val	Sta	n Val				
-105 .05 -58.4	.04	10.3	.05				
Bank Sta: Left Right -58.4 10.3	Lengths:	Left Cł 437	nannel 437	Right 437	Coeff	Contr. .1	Expan. .3
CROSS SECTION							
RIVER: Spring Creek REACH: US of Jn	RS: 0						
INPUT							
Description: Jn Sth Tribu	tary						
Station Elevation Data							
	num=	30					
Sta Elev Sta	Elev	Sta	Elev		Elev	Sta	Elev
Sta Elev Sta -218 7 -214	Elev 6	Sta -199	5	-175	4.5	-111	4.5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4	Elev 6 3.5	Sta -199 -87.9	5 3	-175 -84.3	4.5 2.5	-111 -75.3	4.5 2
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50	Elev 6 3.5 1.5	Sta -199 -87.9 -46.2	5 3 1	-175 -84.3 -38.8	4.5 2.5 1.5	-111 -75.3 -27.8	4.5 2 2
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0	Elev 6 3.5 1.5 1	Sta -199 -87.9 -46.2 5.26	5 3 1 1.5	-175 -84.3 -38.8 7.23	4.5 2.5 1.5 2	-111 -75.3 -27.8 9.36	4.5 2 2 2.5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5	Elev 6 3.5 1.5 1 3.5	Sta -199 -87.9 -46.2 5.26 30.8	5 3 1.5 4	-175 -84.3 -38.8 7.23 57.8	4.5 2.5 1.5 2 4.5	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0	Elev 6 3.5 1.5 1	Sta -199 -87.9 -46.2 5.26	5 3 1 1.5	-175 -84.3 -38.8 7.23	4.5 2.5 1.5 2	-111 -75.3 -27.8 9.36	4.5 2 2 2.5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5 110 5.5 133	Elev 6 3.5 1.5 1 3.5 6	Sta -199 -87.9 -46.2 5.26 30.8 138	5 3 1.5 4	-175 -84.3 -38.8 7.23 57.8	4.5 2.5 1.5 2 4.5	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5 110 5.5 133	Elev 6 3.5 1.5 1 3.5 6 num=	Sta -199 -87.9 -46.2 5.26 30.8 138 3	5 3 1.5 4 6.5	-175 -84.3 -38.8 7.23 57.8	4.5 2.5 1.5 2 4.5	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5 110 5.5 133 Manning's n Values Sta n Val	Elev 6 3.5 1.5 1 3.5 6 num= n Val	Sta -199 -87.9 -46.2 5.26 30.8 138 3 Sta	5 3 1.5 4 6.5 n Val	-175 -84.3 -38.8 7.23 57.8	4.5 2.5 1.5 2 4.5	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5 110 5.5 133	Elev 6 3.5 1.5 1 3.5 6 num=	Sta -199 -87.9 -46.2 5.26 30.8 138 3	5 3 1.5 4 6.5	-175 -84.3 -38.8 7.23 57.8	4.5 2.5 1.5 2 4.5	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5
Sta Elev Sta -218 7 -214 -94.1 4 -90.4 -58.4 2 -50 -13 1.5 0 11.5 3 15.5 110 5.5 133 Manning's n Values Sta n Val	Elev 6 3.5 1.5 1 3.5 6 num= n Val	Sta -199 -87.9 -46.2 5.26 30.8 138 3 Sta 15.5	5 3 1.5 4 6.5 n Val .05	-175 -84.3 -38.8 7.23 57.8 141	4.5 2.5 1.5 2 4.5 7	-111 -75.3 -27.8 9.36 82.5	4.5 2 2.5 5

CROSS SECTION

RIVER: Spring Creek REACH: US of Wallarah C RS: 530

Descriptic Station El Sta -218 -94.1 -58.4 -13 11.5 110	evation Elev 7 4 2 1.5 3 5.5	Data Sta -214 -90.4 -50 0 15.5 133	num= Elev 6 3.5 1.5 1 3.5 6	30 Sta -199 -87.9 -46.2 5.26 30.8 138	Elev 5 1 1.5 4 6.5	Sta -175 -84.3 -38.8 7.23 57.8 141	Elev 4.5 2.5 1.5 2 4.5 7	Sta -111 -75.3 -27.8 9.36 82.5 145	Elev 4.5 2 2.5 5 8
Manning's Sta -218	n Values n Val .05	s Sta -90.4		3 Sta 15.5	n Val .05				
Bank Sta: -	Left H 90.4	Right 15.5	Lengths:	Left C 178	hannel 178	Right 178	Coeff	Contr. .1	Expan. .3
CROSS SECT	TION								
RIVER: Spr REACH: US			RS: 352						
INPUT Descriptic Station El				24					
Station El Sta	Elev	Sta	Elev	24 Sta	Elev	Sta	Elev	Sta	Elev
-248	7	-241	6	-234	5	-227	4.5	-149	4.5
-117	, 5	-87.3	4.5	-70.2	4	-61.3	3	-57.3	2.5
-34.5	2		1.5	-27.3	1	-5.75	1	0	.95
5.57	1		1.5	13.8	2	24	3	34.3	4
41	5		6	71.7	7	88.9	8		_
	_			_					
Manning's			num=	3					
Sta		Sta		Sta 12 0	n Val				
-248	.05	-57.3	.04	13.8	.05				
Bank Sta: -	Left 1 -57.3	Right 13.8	Lengths:	Left Cl 29	hannel 29	Right 29	Coeff	Contr. .1	Expan. .3
	-57.3		Lengths:				Coeff		-
-	-57.3 CION	13.8 ek	Lengths: RS: 323				Coeff		-
CROSS SECT RIVER: Spr	-57.3 CION	13.8 ek					Coeff		-
CROSS SECT RIVER: Spr REACH: US	-57.3 TION ring Cree of Walla on: US of	13.8 ek arah C f Hwy Li	RS: 323				Coeff		-
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic	-57.3 TION ring Cree of Walla on: US of	13.8 ek arah C f Hwy Li Data	RS: 323 nk	29		29	Coeff	.1	-
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El	TION TION TION TION TION TION TION TION	13.8 ek arah C f Hwy Li Data Sta	RS: 323 nk num=	29 20	29	29		.1	.3
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta	TION TION TION TION TION TION TION TION	13.8 ek arah C f Hwy Li Data Sta	RS: 323 nk num= Elev	29 20 Sta	29 Elev	29 Sta	Elev	.1 Sta	.3 Elev
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04	TION TION Cring Cree of Walla on: US of evation Elev 7 3 1	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0	RS: 323 nk num= Elev 6 2.5 .9	29 20 Sta -131 -33.2 7.58	29 Elev 5 2 1	29 Sta -83.5 -28.9 11.4	Elev 4.5 1.5 1.5	.1 Sta -66.7 -17.7 13.8	.3 Elev 4 1 2
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7	TION TION TION TION TION TION TION TION	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0	RS: 323 nk num= Elev 6 2.5	29 20 Sta -131 -33.2	29 Elev 5 2	29 Sta -83.5 -28.9	Elev 4.5 1.5	.1 Sta -66.7 -17.7	.3 Elev 4 1
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8	TION TION TION TION TION TION TION TION	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8	RS: 323 nk num= Elev 6 2.5 .9 4	29 20 Sta -131 -33.2 7.58 46.1	29 Elev 5 2 1	29 Sta -83.5 -28.9 11.4	Elev 4.5 1.5 1.5	.1 Sta -66.7 -17.7 13.8	.3 Elev 4 1 2
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's	ring Cree of Walla on: US of evation Elev 7 3 1 3 n Values	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8	RS: 323 nk num= Elev 6 2.5 .9 4 num=	29 20 Sta -131 -33.2 7.58 46.1 3	29 Elev 5 2 1 5	29 Sta -83.5 -28.9 11.4	Elev 4.5 1.5 1.5	.1 Sta -66.7 -17.7 13.8	.3 Elev 4 1 2
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8	TION TION Cring Cree of Walla on: US of evation Elev 7 3 1 3 n Values n Values	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val	29 20 Sta -131 -33.2 7.58 46.1	29 Elev 5 2 1 5 n Val	29 Sta -83.5 -28.9 11.4	Elev 4.5 1.5 1.5	.1 Sta -66.7 -17.7 13.8	.3 Elev 4 1 2
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta:	TION TION Cring Cree of Walls on: US of evation Elev 7 3 1 3 n Values n Values .05	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8	29 Elev 5 2 1 5 n Val .05	29 Sta -83.5 -28.9 11.4	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta:	ST.3 STON Sting Cree of Walls on: US of evation Elev 7 3 1 3 n Values n Values n Values State of Left F -38.9	13.8 ek arah C f Hwy Li Data -146 -38.9 0 34.8 s s s s s s s s a -38.9	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left C	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta:	57.3 TION TION Cing Creation of Wallation Elev 7 3 1 3 n Values n Values n Values 1 .05 Left F -38.9 TION	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s S Sta -38.9 Right 13.8	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left C	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: -162	-57.3 CION Cing Creation of Walla on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Creation Creatio	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s S Sta -38.9 Right 13.8	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths:	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left C	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: CROSS SECT RIVER: Spr REACH: US INPUT	-57.3 CION Cing Creation of Walla on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Creation of Walla	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta -38.9 Right 13.8 ek arah C	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths: RS: 273	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left C	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: CROSS SECT RIVER: Spr REACH: US INPUT Descriptic	-57.3 CION Cing Cree of Walls on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Cing Cree of Walls on Nth e	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta -38.9 Right 13.8 ek arah C	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths: RS: 273 Hwy Link	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left Cl 50	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El	57.3 CION Cing Creation of Walla on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Cing Creation of Walla on: Nth a evation	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta -38.9 Right 13.8 ek arah C edge of Data	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths: RS: 273 Hwy Link num=	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left C	29 Elev 5 2 1 5 n Val .05 hannel	29 Sta -83.5 -28.9 11.4 59.9 Right	Elev 4.5 1.5 1.5 6	.1 Sta -66.7 -17.7 13.8 71.1 Contr.	.3 Elev 4 1 2 7
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta	57.3 CION Cing Creation of Walla on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Cing Creation cof Walla of Walla on: Nth a Elev	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s S Sta -38.9 Right 13.8 Right 13.8 ek arah C	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths: RS: 273 Hwy Link num= Elev	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left Cl 50 21 Sta	29 Elev 5 2 1 5 n Val .05 hannel 50 Elev	29 Sta -83.5 -28.9 11.4 59.9 Right 50	Elev 4.5 1.5 1.5 6 Coeff	.1 Sta -66.7 -17.7 13.8 71.1 Contr. .3	.3 Elev 4 1 2 7 Expan. .5
CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El Sta -162 -55.7 -7.04 28.8 Manning's Sta -162 Bank Sta: CROSS SECT RIVER: Spr REACH: US INPUT Descriptic Station El	57.3 CION Cing Creation of Walla on: US of evation Elev 7 3 1 3 n Values n Val .05 Left H -38.9 CION Cing Creation of Walla on: Nth a evation	13.8 ek arah C f Hwy Li Data Sta -146 -38.9 0 34.8 s Sta -38.9 Right 13.8 ek arah C edge of Data	RS: 323 nk num= Elev 6 2.5 .9 4 num= n Val .04 Lengths: RS: 273 Hwy Link num= Elev 8	29 20 Sta -131 -33.2 7.58 46.1 3 Sta 13.8 Left Cl 50	Elev 5 2 1 5 n Val .05 hannel 50	29 Sta -83.5 -28.9 11.4 59.9 Right 50	Elev 4.5 1.5 1.5 6 Coeff	.1 Sta -66.7 -17.7 13.8 71.1 Contr. .3	.3 Elev 4 1 2 7 Expan. .5

23.7	.85 3 10			5.8 15.6	1.5 5		2 6	9.03 20.2	2.5 8
Manning's Sta -24.9	n Valu n Val .06	Sta	n Val	3 Sta 7.42	n Val .06				
Bank Sta:		Right 7.42	Lengths:	Left Cl 15	hannel 15			Contr. .3	Expan. .5
CROSS SEC	LION								
RIVER: Spi REACH: US			RS: 258						
INPUT Descriptio	on: Sth	edge of	Hwy Link						
Station E	levatio	n Data	num=	21					
Sta	Elev	Sta		Sta	Elev	Sta	Elev	Sta	Elev
-24.9	10			-17.1		-15.3	5		4
-11.2	3					-6.25		-2	1
0	.83			5.8	1.5	7.42	2	9.03	2.5
10.7	3	13.2	4	15.6	5	17.2	6	20.2	8
23.7	10								
Manning's				3	_				
Sta				Sta					
-24.9	.06	-8.2	.04	7.42	.06				
Bank Sta:		Right 7.42	Lengths:	Left Cl 43	hannel 43		Coeff	Contr. .3	Expan. .5
CROSS SEC	TION								
RIVER: Spi REACH: US			RS: 215						
TNIDIIT									
INPUT	on. Sth	odro of	Uner Link						
Descriptio			-	20					
Descriptio Station E	levatio	n Data	num=	20 Sta	Flev	Sta	Flev	9ta	Flev
Descriptic Station E Sta	levatio Elev	n Data Sta	num= Elev	Sta	Elev	Sta	Elev 35	Sta -175	Elev
Descriptic Station E Sta -194	levatio Elev 6	n Data Sta -186	num= Elev 5	Sta -180	4	-178	3.5	-175	4
Descriptic Station E Sta -194 -154	levation Elev 6 4.5	n Data Sta -186 -88	num= Elev 5 4.5	Sta -180 -44.4	4 4	-178 -39.1	3.5 3.5	-175 -35.1	4 3
Descriptic Station E Sta -194 -154 -22.7	levation Elev 6 4.5 2.5	n Data Sta -186 -88 -9.16	num= Elev 5 4.5 2	Sta -180 -44.4 -4.73	4 4 1.5	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3 1.5
Descriptic Station E Sta -194 -154	levation Elev 6 4.5 2.5	n Data Sta -186 -88	num= Elev 5 4.5 2	Sta -180 -44.4	4 4 1.5	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3
Descriptio Station E: Sta -194 -154 -22.7 9.98	levation Elev 6 4.5 2.5 2	n Data Sta -186 -88 -9.16 15.8	num= Elev 5 4.5 2 3	Sta -180 -44.4 -4.73 27.9	4 4 1.5	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3 1.5
Description Station E: Sta -194 -154 -22.7 9.98 Manning's	levation Elev 6 4.5 2.5 2 n Value	n Data Sta -186 -88 -9.16 15.8 es	num= Elev 5 4.5 2 3 num=	Sta -180 -44.4 -4.73 27.9 3	4 4 1.5 4	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3 1.5
Descriptio Station E Sta -194 -154 -22.7 9.98 Manning's Sta	levation Elev 4.5 2.5 2 n Value n Value	n Data Sta -186 -88 -9.16 15.8 es Sta	num= Elev 5 4.5 2 3 num= n Val	Sta -180 -44.4 -4.73 27.9 3 Sta	4 1.5 4 n Val	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3 1.5
Descriptio Station E Sta -194 -154 -22.7 9.98 Manning's Sta	levation Elev 6 4.5 2.5 2 n Value	n Data Sta -186 -88 -9.16 15.8 es Sta	num= Elev 5 4.5 2 3 num=	Sta -180 -44.4 -4.73 27.9 3 Sta	4 4 1.5 4	-178 -39.1 0	3.5 3.5 .8	-175 -35.1 5.58	4 3 1.5
Descriptio Station E Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta:	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7	num= Elev 5 4.5 2 3 num= n Val .04	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6
Descriptio Station E Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta:	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right	num= Elev 5 4.5 2 3 num= n Val .04	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left C	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan.
Descriptio Station E Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta:	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 FION	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98	num= Elev 5 4.5 2 3 num= n Val .04 Lengths:	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left C	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan.
Descriptio Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 FION	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98	num= Elev 5 4.5 2 3 num= n Val .04 Lengths:	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left C	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan.
Descriptio Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cru of Wal	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left C	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan.
Descriptio Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT Descriptio	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cre of Wal	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215	4 1.5 4 n Val .05	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan.
Descriptic Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT Descriptic Station E:	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cre of Wall	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num=	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215	4 1.5 4 n Val .05 hannel 215	-178 -39.1 0 38.7 Right 215	3.5 3.5 .8 5	-175 -35.1 5.58 53.6	4 3 1.5 6 Expan. .3
Descriptio Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT Descriptio	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cre of Wal	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215	4 1.5 4 n Val .05 hannel 215	-178 -39.1 0 38.7 Right	3.5 3.5 .8 5 Coeff	-175 -35.1 5.58 53.6 Contr. .1	4 3 1.5 6 Expan. .3
Descriptic Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT Descriptic Station E: Sta	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cre of Wall	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215	4 4 1.5 4 n Val .05 hannel 215 Elev 4	-178 -39.1 0 38.7 Right 215	3.5 3.5 .8 5 Coeff	-175 -35.1 5.58 53.6 Contr. .1	4 3 1.5 6 Expan. .3 Elev 4.5
Descriptic Station E Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spi REACH: US INPUT Descriptic Station E Sta -288 -172	levation Elev 6 4.5 2.5 2 n Value n Value n Val .05 Left -22.7 FION ring Cr. of Wal on: Sth levation Elev 6 4	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281 -157	<pre>num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5 3.5</pre>	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215 30 Sta -274	4 4 1.5 4 n Val .05 hannel 215 Elev 4 3	-178 -39.1 0 38.7 Right 215 Sta -244 -148	3.5 3.5 .8 5 Coeff Elev 4.5 2	-175 -35.1 5.58 53.6 Contr. .1	4 3 1.5 6 Expan. .3 Elev 4.5 1.5
Description Station E: Station E: Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spi REACH: US INPUT Description Station E: Sta -288 -172	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 TION ring Cro of Wal on: Sth levation Elev 6 4 1.5	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281 -257 -84	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5 3.5 2	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215 30 Sta -274 -154 -69	4 4 1.5 4 n Val .05 hannel 215 Elev 4 3 3	-178 -39.1 0 38.7 Right 215 Sta -244 -148 -61.4	3.5 3.5 .8 5 Coeff Elev 4.5 2 3.5	-175 -35.1 5.58 53.6 Contr. .1	4 3 1.5 6 Expan. .3 Elev 4.5 1.5 3.5
Description Station E: Station F: Station F: -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spin REACH: US INPUT Description Station E: Sta -288 -172 -117	levation Elev 6 4.5 2.5 2 n Value n Value n Val .05 Left -22.7 FION ring Cre of Wal on: Sth levation Elev 6 4 1.5 3	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281 -157 -84 -36.1	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5 3.5 2 2.5	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215 30 Sta -274 -154 -69 -26	4 4 1.5 4 n Val .05 hannel 215 Elev 4 3 2	-178 -39.1 0 38.7 Right 215 Sta -244 -148 -61.4 -14.7	3.5 3.5 .8 5 Coeff Elev 4.5 2 3.5 1.5	-175 -35.1 5.58 53.6 Contr. .1 Sta -201 -139 -55.6 -7.9	4 3 1.5 6 Expan. .3 Elev 4.5 1.5 3.5 1
Descriptic Station E Sta -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spr REACH: US INPUT Descriptic Station E Sta -288 -172 -117 -41.2 0	levation Elev 6 4.5 2.5 2 n Value n Value n Val .05 Left -22.7 TION ring Cr of Wal on: Sth levation Elev 6 4 1.5 3 .5	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281 -157 -84 -36.1 4.19	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5 3.5 2 2.5 1	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215 30 Sta -274 -154 -69 -26 5.68	4 4 1.5 4 n Val .05 hannel 215 Elev 4 3 2 1.5	-178 -39.1 0 38.7 Right 215 Sta -244 -148 -61.4 -14.7 6.47	3.5 3.5 .8 5 Coeff Elev 4.5 2 3.5 1.5 2	-175 -35.1 5.58 53.6 Contr. .1 Sta -201 -139 -55.6 -7.9 7.25	4 3 1.5 6 Expan. .3 Elev 4.5 1.5 3.5 1.5 3.5 1.2.5
Description Station E: Station F: Station F: -194 -154 -22.7 9.98 Manning's Sta -194 Bank Sta: CROSS SEC RIVER: Spin REACH: US INPUT Description Station E: Sta -288 -172 -117 -41.2	levation Elev 6 4.5 2.5 2 n Value n Value .05 Left -22.7 FION ring Cro of Wal on: Sth levation Elev 6 4 1.5 3 .5 3.5	n Data Sta -186 -88 -9.16 15.8 es Sta -22.7 Right 9.98 eek larah C edge of n Data Sta -281 -157 -84 -36.1 4.19 12.9	num= Elev 5 4.5 2 3 num= n Val .04 Lengths: RS: 0 Hwy Link num= Elev 5 3.5 2 2.5 1 4	Sta -180 -44.4 -4.73 27.9 3 Sta 9.98 Left Cl 215 30 Sta -274 -154 -69 -26	4 4 1.5 4 n Val .05 hannel 215 Elev 4 3 2	-178 -39.1 0 38.7 Right 215 Sta -244 -148 -61.4 -14.7	3.5 3.5 .8 5 Coeff Elev 4.5 2 3.5 1.5	-175 -35.1 5.58 53.6 Contr. .1 Sta -201 -139 -55.6 -7.9	4 3 1.5 6 Expan. .3 Elev 4.5 1.5 3.5 1

Sta	n Va	l Sta	n Val	Sta	. n Val			
-288	.0	5 –26	.04	6.47	.05			
Bank Sta:	Left	Right	Lengths:	Left	Channel	Right	Coeff Contr.	Expan.
	-26	6.47		215	215	215	.1	.3

SUMMARY OF MANNING'S N VALUES

River:South Tributary

Reach	River Sta.	nl	n2	n3
	3277	.035	.033	.035
	2465	.05	.04	.05
	1713	.05	.04	.05
	856	.05	.04	.05
	665	.05	.04	.05
	411	.05	.04	.05
	301	.05	.04	.05
	276	.06	.04	.06
	266	Bridge		
	256	.06	.04	.06
	244	.05	.04	.05
	234	Bridge		
	224	.05	.04	.05
	122	.05	.04	.05
	0	.05	.04	.05

River:Spring Creek

R	each	River Sta.	nl	n2	n3
US of	Jn	3340	.035	.033	.035
US of	Jn	2740	.035	.033	.035
US of	Jn	2086	.05	.04	.05
US of	Jn	1841	.05	.04	.05
US of	Jn	1595	.05	.04	.05
US of	Jn	1193	.05	.04	.05
US of	Jn	1038	.05	.04	.05
US of	Jn	933	.05	.04	.05
US of	Jn	896.5	.05	.04	.05
US of	Jn	886.5	.06	.04	.06
US of	Jn	876.5	Bridge		
US of	Jn	866.5	.06	.04	.06
US of	Jn	847.5	.05	.04	.05
US of	Jn	837.5	Bridge		
US of	Jn	827.5	.05	.04	.05
US of	Jn	669	.05	.04	.05
US of	Jn	437	.05	.04	.05
US of	Jn	0	.05	.04	.05
US of	Wallarah C	530	.05	.04	.05
US of	Wallarah C	352	.05	.04	.05
US of	Wallarah C	323	.05	.04	.05
US of	Wallarah C	273	.06	.04	.06
US of	Wallarah C	258	.06	.04	.06
US of	Wallarah C	215	.05	.04	.05
US of	Wallarah C	0	.05	.04	.05

SUMMARY OF REACH LENGTHS

River: South Tributary

Reach	Reach River Sta.		Channel	Right	
	3277	812	812	812	
	2465	752	752	752	
•	1713	857	857	857	
	856	191	191	191	

	665	254	254	254
	411	110	110	110
•	301	25	25	25
•	276	20	20	20
	266	Bridge		
•	256	12	12	12
•	244	20	20	20
•	234	Bridge		
•	224	102	102	102
	122	122	122	122
•	0	0	0	0

River: Spring Creek

Reach	River Sta.	Left	Channel	Right
US of Jn	3340	600	600	600
US of Jn	2740	652	652	652
US of Jn	2086	245	245	245
US of Jn	1841	246	246	246
US of Jn	1595	402	402	402
US of Jn	1193	155	155	155
US of Jn	1038	105	105	105
US of Jn	933	36.5	36.5	36.5
US of Jn	896.5	10	10	10
US of Jn	886.5	20	20	20
US of Jn	876.5	Bridge		
US of Jn	866.5	19	19	19
US of Jn	847.5	20	20	20
US of Jn	837.5	Bridge		
US of Jn	827.5	158.5	158.5	158.5
US of Jn	669	232	232	232
US of Jn	437	437	437	437
US of Jn	0	0	0	0
US of Wallarah C	530	178	178	178
US of Wallarah C	352	29	29	29
US of Wallarah C	323	50	50	50
US of Wallarah C	273	15	15	15
US of Wallarah C	258	43	43	43
US of Wallarah C	215	215	215	215
US of Wallarah C	0	215	215	215

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS River: South Tributary

Reach	River St	a. Contr.	Expan.
	3277	.1	.3
	2465	.1	.3
	1713	.1	.3
	856	.1	.3
	665	.1	.3
	411	.1	.3
	301	.3	.5
	276	.3	.5
	266	Bridge	
	256	.3	.5
	244	.1	.3
	234	Bridge	
	224	.1	.3
	122	.1	.3
	0	.1	.3

River: Spring Creek

Reach	River Sta.	Contr.	Expan.
US of Jn	3340	.1	.3

US	of	Jn		2740		.1	.3
US	of	Jn		2086		.1	.3
US	of	Jn		1841		.1	.3
US	of	Jn		1595		.1	.3
US	of	Jn		1193		.1	.3
US	of	Jn		1038		.1	.3
US	of	Jn		933		.1	.3
US	of	Jn		896.5		.1	.3
US	of	Jn		886.5		.3	.5
US	of	Jn		876.5	Bridge		
US	of	Jn		866.5		.3	.5
US	of	Jn		847.5		.1	.3
US	of	Jn		837.5	Bridge		
US	of	Jn		827.5		.1	.3
US	of	Jn		669		.1	.3
US	of	Jn		437		.1	.3
US	of	Jn		0		.1	.3
US	of	Wallarah (С	530		.1	.3
US	of	Wallarah (С	352		.1	.3
US	of	Wallarah (С	323		.3	.5
US	of	Wallarah (С	273		.3	.5
US	of	Wallarah (С	258		.3	.5
US	of	Wallarah (С	215		.1	.3
US	of	Wallarah (С	0		.1	.3