Batch: ES52743
Sub Batch: 0
Date of Issue: 04/03/2005
Client: FORBES RIGBY PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		200	201	202							
		Date Sampled		15/12/2004	15/12/2004	15/12/2004							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	LCS	MS							
				CHECKS AND SPIKES									
EA-025	Suspended Solids (SS)	mg/L	1	<1	104%	----							
EK-055A	Ammonia as N	mg/L	0.01	<0.01	100%	101%							
EK-059A	Nitrite and Nitrate as N	mg/L	0.01	<0.01	102%	83.0%							
EK-061A	Total Kjeldahl Nitrogen as N	mg/L	0.1	<0.1	99.0%	100%							
EK-067A	Total Phosphorus as P	mg/L	0.01	<0.01	105%	98.0%							
EK-071A	Reactive Phosphorus as P - Total	mg/L	0.01	<0.01	97.0%	92.0%							
EP-020	Oil & Grease	mg/L	5	<5	101%	----							

ALS Environmental

CERTIFICATE OF ANALYSIS

CONTACT:	MR MITCHELL WATTS	**BATCH:**	ES52743
CLIENT:	FORBES RIGBY PTY LTD	**SUB BATCH:**	0
ADDRESS:	278 KEIRA STREET WOLLONGONG NSW 2500	**LABORATORY:**	SYDNEY
		DATE RECEIVED:	15/12/2004
		DATE COMPLETED:	24/12/2004
ORDER No.:	104016-3	**SAMPLE TYPE:**	SURFACE WATER
PROJECT:		**No. of SAMPLES:**	5

COMMENTS

Oil and Grease determined as per APHA 20th edition method 5520 A and B.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
All pages of this report have been checked and approved for release.

ISSUING LABORATORY: SYDNEY

Address
277-289 Woodpark Road
SMITHFIELD NSW 2164

Phone: 61-2-8784 8555
Fax: 61-2-8784 8500
Email: greg.vogel@alsenviro.com

Signatory

Greg Vogel pp

Nanthini Coilparampil Senior Inorganic Chemist
Marc Centner Technical Manager
Peter Dickenson Senior Inorganic Chemist
Daniel Um Senior Organic Chemist

Reports signed by signatories as required

Batch: ES52743
Sub Batch: 0
Date of Issue: 29/12/2004
Client: FORBES RIGBY PTY LTD
Client Reference:

CERTIFICATE OF ANALYSIS

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		1	2	3	4	5					
		Date Sampled		14/12/2004	14/12/2004	14/12/2004	14/12/2004	14/12/2004					
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	SW1	SW2	SW3	SW4	SW5					
EA-025	Suspended Solids (SS)	mg/L	1	7	6	19	2	8					
EK-055A	Ammonia as N	mg/L	0.01	0.06	0.05	0.05	0.04	0.05					
EK-059A	Nitrite and Nitrate as N	mg/L	0.01	<0.01	<0.01	0.06	<0.01	0.02					
EK-061A	Total Kjeldahl Nitrogen as N	mg/L	0.1	0.9	0.7	1.1	0.5	1.3					
EK-067A	Total Phosphorus as P	mg/L	0.01	0.03	0.01	0.04	0.02	0.02					
EK-071A	Reactive Phosphorus as P - Total	mg/L	0.01	0.02	0.01	0.02	<0.01	<0.01					
EP-020	Oil & Grease	mg/L	5	6	10	<5	12	<5					

Batch: ES52743
Sub Batch: 0
Date of Issue: 29/12/2004
Client: FORBES RIGBY PTY LTD
Client Reference:

QUALITY CONTROL REPORT

				SAMPLE IDENTIFICATION									
		Laboratory I.D.		200	201	202							
		Date Sampled		15/12/2004	15/12/2004	15/12/2004							
METHOD	ANALYSIS DESCRIPTION	UNIT	LOR	METHOD BLANK	LCS	MS							
				CHECKS AND SPIKES									
EA-025	Suspended Solids (SS)	mg/L	1	<1	104%	----							
EK-055A	Ammonia as N	mg/L	0.01	<0.01	100%	101%							
EK-059A	Nitrite and Nitrate as N	mg/L	0.01	<0.01	102%	83.0%							
EK-061A	Total Kjeldahl Nitrogen as N	mg/L	0.1	<0.1	99.0%	100%							
EK-067A	Total Phosphorus as P	mg/L	0.01	<0.01	105%	98.0%							
EK-071A	Reactive Phosphorus as P - Total	mg/L	0.01	<0.01	97.0%	92.0%							
EP-020	Oil & Grease	mg/L	5	<5	101%	----							

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	:	**FORBES RIGBY PTY LTD**	**Laboratory**	:	ALS Environmental Sydney	**Page**	: **1 of 3**
Contact	:	MS MITCHELL WATTS	**Contact**	:	Greg Vogel		
Address	:	278 KEIRA STREET WOLLONGONG NSW AUSTRALIA 2500	**Address**	:	277-289 Woodpark Road Smithfield NSW Australia 2164	**Work order**	: **ES0500396**
Project	:	104016-3	**Quote number**	:	---	**Date received**	: 21 Jan 2005
Order number	:	- Not provided -				**Date issued**	: 3 Feb 2005
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	mitchell.watts@forbesrigby.com.au	**E-mail**	:	Greg.Vogel@alsenviro.com	**No. of samples**	
Telephone	:	- Not provided -	**Telephone**	:	61-2-87848555	**Received**	: 5
Facsimile	:	- Not provided -	**Facsimile**	:	61-2-87848500	**Analysed**	: 5

This final report for the ALSE work order reference ES0500396 supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Analytical results for samples submitted
- Surrogate control limits

ALSE - QUALITY, SERVICE and TECHNOLOGY provided GLOBALLY

NATA Accredited Laboratory - 825

The Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its scope of accreditation. This document shall not be reproduced except in full.

This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Greg Vogel	Inorganics - NATA 10911 (Sydney)
Nanthini Coilparampil	Inorganics - NATA 10911 (Sydney)

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insufficient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits).
Abbreviations: ***CAS number*** = *Chemical Abstract Services number*, ***LOR*** = *Limit of Reporting*, ***# indicates a raised LOR***, **** indicates failed Surrogate Recoveries.***
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes.

Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID: SW1	SW2	SW3	SW4	SW5
				Sample Matrix Type / Description: WATER / SURFACE WATER	WATER / SURFACE WATER	WATER / SURFACE WATER	WATER / SURFACE WATER	WATER / SURFACE WATER
				Sample Date / Time: 21 Jan 2005 15:00	21 Jan 2005 15:00	21 Jan 2005 15:00	21 Jan 2005 15:00	21 Jan 2005 15:00
				Laboratory Sample ID: ES0500396-001	ES0500396-002	ES0500396-003	ES0500396-004	ES0500396-005
EA025: Suspended Solids								
Suspended Solids (SS)		1	mg/L	6	22	16	31	250
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N		0.010	mg/L	<0.010	<0.010	0.010	<0.010	<0.010
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.010	mg/L	0.014	<0.010	<0.010	0.020	0.010
EK059G: NOx as N by Discrete Analyser								
Nitrite + Nitrate as N		0.010	mg/L	0.014	<0.010	0.011	0.020	0.010
EK061: Total Kjeldahl Nitrogen (TKN)								
Total Kjeldahl Nitrogen as N		0.1	mg/L	1.3	1.6	1.4	1.2	0.7
EK067: Total Phosphorus as P								
Total Phosphorus as P		0.01	mg/L	0.06	0.04	0.10	0.03	0.04
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P		0.010	mg/L	<0.010	<0.010	0.039	<0.010	<0.010
EP020: Oil and Grease (O&G)								
Oil & Grease		5	mg/L	10	14	14	13	15

Surrogate Control Limits

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

- **No surrogates present on this report.**

ALS Environmental

INTERPRETIVE QUALITY CONTROL REPORT

Client	:	**FORBES RIGBY PTY LTD**	**Laboratory**	:	ALS Environmental Sydney	**Page**	: 1 of 6
Contact	:	MS MITCHELL WATTS	**Contact**	:	Greg Vogel		
Address	:	278 KEIRA STREET WOLLONGONG NSW AUSTRALIA 2500	**Address**	:	277-289 Woodpark Road Smithfield NSW Australia 2164	**Work order**	: **ES0500396**
						Amendment No.:	
Project	:	104016-3	**Quote number**	:	----	**Date received**	: 21 Jan 2005
Order number	:	- Not provided -				**Date Issued**	: 3 Feb 2005
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	mitchell.watts@forbesrigby.com.au	**E-mail**	:	Greg.Vogel@alsenviro.com	**No. of samples**	
Telephone	:	- Not provided -	**Telephone**	:	61-2-87848555	**Received**	: 5
Facsimile	:	- Not provided -	**Facsimile**	:	61-2-87848500	**Analysed**	: 5

This Interpretive Quality Control Report was issued on 3 Feb 2005 for the ALS work order reference ES0500396 and supersedes any previous reports with this reference.
This report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Type Frequency Compliance
- Summary of all Quality Control Outliers
- Brief Method Summaries

ALS Environmental

Interpretive Quality Control Report - Analysis Holding Time

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the sample aliquot was taken. Elapsed time to analysis represents time from sampling where no extraction / digestion is involved or time from extraction / digestion where this is present. For composite samples, sampling date/time is taken as that of the oldest sample contributing to that composite. Sample date/time for laboratory produced leaches are taken from the completion date/time of the leaching process. Outliers for holding time are based on USEPA SW846, APHA, AS and NEPM (1999). Failed outliers, refer to the 'Summary of Outliers'.

Matrix Type: WATER

Analysis Holding Time and Preservation

Method / Container / Client Sample ID(s)	Date Sampled	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EA025: Suspended Solids							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	28 Jan 2005	Pass
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days
EK059G: Nitrite and Nitrate as N, NOx by Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days
EK061: Total Kjeldahl Nitrogen as N							
Clear Plastic Bottle - Sulphuric Acid							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	26 Jan 2005	18 Feb 2005	Pass	26 Jan 2005	18 Feb 2005	Pass
EK067G: Total Phosphorus as P							
Clear Plastic Bottle - Sulphuric Acid							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	26 Jan 2005	18 Feb 2005	Pass	26 Jan 2005	18 Feb 2005	Pass
EK071G: Reactive Phosphorus as P By Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days
EP020: Oil and Grease							
Clear Plastic Bottle - Sulphuric Acid							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	28 Jan 2005	18 Feb 2005	Pass

Interpretive Quality Control Report - Frequency of Quality Control Samples

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which this work order was processed. Actual rate should be greater than or equal to the expected rate.

Matrix Type: WATER

Frequency of Quality Control Samples

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
EA025: Suspended Solids	2	12	16.7	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK057G: Nitrite as N by Discrete Analyser	2	18	11.1	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser	3	24	12.5	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK061: Total Kjeldahl Nitrogen as N	2	11	18.2	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK067: Total Phosphorus as P	2	8	25.0	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK071G: Reactive Phosphorus as P-By Discrete Analyser	1	5	20.0	10.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Laboratory Control Samples (LCS)					
EA025: Suspended Solids	1	12	8.3	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK057G: Nitrite as N by Discrete Analyser	1	18	5.6	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser	2	24	8.3	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK061: Total Kjeldahl Nitrogen as N	1	11	9.1	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK067: Total Phosphorus as P	1	8	12.5	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK071G: Reactive Phosphorus as P-By Discrete Analyser	1	5	20.0	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EP020: Oil and Grease	1	20	5.0	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Method Blanks (MB)					
EA025: Suspended Solids	1	12	8.3	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK057G: Nitrite as N by Discrete Analyser	1	18	5.6	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser	2	24	8.3	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK061: Total Kjeldahl Nitrogen as N	1	11	9.1	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK067: Total Phosphorus as P	1	8	12.5	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK071G: Reactive Phosphorus as P-By Discrete Analyser	1	5	20.0	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EP020: Oil and Grease	1	20	5.0	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
Matrix Spikes (MS)					
EK057G: Nitrite as N by Discrete Analyser	1	18	5.6	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser	2	24	8.3	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK061: Total Kjeldahl Nitrogen as N	1	11	9.1	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK067: Total Phosphorus as P	1	8	12.5	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement
EK071G: Reactive Phosphorus as P-By Discrete Analyser	1	5	20.0	5.0	NEPM 1999 Schedule B(3) and ALSE QCS3 requirement

Interpretive Quality Control Report - Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged on the 'Quality Control Report'. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EW38 (in the absence of specific USEPA limits). - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot.

Non-surrogates

- For all matrices, no RPD recovery outliers occur for the duplicate analysis.
- For all matrices, no method blank result outliers occur.
- For all matrices, no laboratory spike recoveries breaches occur.
- For all matrices, no matrix spike recoveries breaches occur.

Surrogates

- For all matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time

The following report highlights outliers within this 'Interpretive Quality Control Report - Analysis Holding Time'.

Matrix Type: WATER

Summary of Outliers - Analysis Holding times and Preservation

Method / Container / Client Sample ID(s)	Date Sampled	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Pass?	Date analysed	Due for analysis	Pass?
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005	---	---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days
EK071G: Reactive Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Natural							
SW1, SW2, SW3, SW4, SW5	21 Jan 2005		---	---	25 Jan 2005	23 Jan 2005	Fail by 2 days

Outliers : Frequency of Quality Control Samples

The following report highlights outliers within this 'Interpretive Quality Control Report - Frequency of Quality Control Samples'.

- No frequency outliers occur.

Method Reference Summary

The analytical procecures used by ALS Environmenta are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Matrix Type: SURFACE WATER

Preparation Methods

EK061/EK067 : TKN/TP Digestion - APHA 20th ed., 4500 Norg - D; APHA 20th ed., 4500 P - H. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

Analytical Methods

EA025 : Suspended Solids - APHA 20th ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK057G : Nitrite as N by Discrete Analyser - APHA 20th ed., 4500 NO3- I. SEAL Method 2-018-1-L February 2003. Nitrite is determined by direct colourimetry by SEAL. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK058G : Nitrate as N by Discrete Analyser - APHA 20th ed., 4500 NO3--I. SEAL Method 2-018-1-L February 2003. Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by SEAL. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK059G : Nitrite and Nitrate as N (NOx) by Discrete Analyser - APHA 20th ed.. 4500 NO3- I. SEAL Method 2-018-1-L February 2003. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by SEAL. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK061 : Total Kjeldahl Nitrogen as N - APHA 20th ed., 4500-Norg-D 100mL water samples are digested using a traditional Kjeldahl digestion followed by determination by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK067 : Total Phosphorus as P - APHA 20th ed., 4500 P-H This procedure involves sulphuric acid digestion of a 100mL sample to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

EK071G : Reactive Phosphorus as P-By Discrete Analyser - APHA 20th ed., 4500 P-E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by SEAL. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2

EP020 : Oil and Grease - APHA 20th ed., 5520 B Oil & grease is a gravimetric procedure to determine the amount of oil & grease residue in an aqueous sample. The sample is serially extracted three times using 30mL n-hexane/MTBE for each extract. The resultant extracts are combined, dehydrated and concentrated prior to gravimetric determination. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

ALS Environmental

QUALITY CONTROL REPORT

Client	:	FORBES RIGBY PTY LTD	**Laboratory**	:	ALS Environmental Sydney	**Page**	: 1 of 4
Contact	:	MS MITCHELL WATTS	**Contact**	:	Greg Vogel		
Address	:	278 KEIRA STREET WOLLONGONG NSW AUSTRALIA 2500	**Address**	:	277-289 Woodpark Road Smithfield NSW Australia 2164	**Work order**	: **ES0500396**
Project	:	104016-2	**Quote number**	:	--	**Date received**	: 21 Jan 2005
Order number	:	- Not provided -				**Date issued**	: 3 Feb 2005
C-O-C number	:	- Not provided -					
Site	:	- Not provided -					
E-mail	:	mitchell.watts@forbesrigby.com.au	**E-mail**	:	Greg.Vogel@alsenviro.com	**No. of samples**	
Telephone	:	- Not provided -	**Telephone**	:	61-2-87848555	**Received**	: 5
Facsimile	:	- Not provided -	**Facsimile**	:	61-2-87848500	**Analysed**	: 5

This final report for the ALSE work order reference ES0500396 supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

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NATA Accredited Laboratory - 825

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This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Greg Vogel	Inorganics - NATA 10911 (Sydney)
Nanthini Coilparampil	Inorganics - NATA 10911 (Sydney)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations: LOR = Limit of Reporting, RPD = Relative Percent Difference.* * Indicates failed QC. The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting:- Result < 10 times LOR, no limit - Result between 10 and 20 times LOR, 0% - 50% Result > 20 times LOR, 0% - 20%

Matrix Type: WATER

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	*Client Sample ID*	*Analyte name*	*LOR*	*Original Result*	*Duplicate Result*	*RPD*
EA025: Suspended Solids						
EA025: Suspended Solids - (QC Lot: 34840)				mg/L	mg/L	%
ES0500347-001	- Anonymous -	Suspended Solids (SS)	1 mg/L	15700	15700	0.3
ES0500432-001	- Anonymous -	Suspended Solids (SS)	1 mg/L	222	204	8.4
EK057G: Nitrite as N by Discrete Analyser						
EK057G: Nitrite as N by Discrete Analyser - (QC Lot: 35041)				mg/L	mg/L	%
ES0500347-001	- Anonymous -	Nitrite as N	0.010 mg/L	<0.010	<0.010	0.0
ES0500394-013	- Anonymous -	Nitrite as N	0.010 mg/L	<0.010	<0.010	0.0
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser						
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35040)				mg/L	mg/L	%
ES0500347-001	- Anonymous	Nitrite + Nitrate as N	0.010 mg/L	<0.010	<0.010	0.0
ES0500394-007	- Anonymous -	Nitrite + Nitrate as N	0.010 mg/L	0.145	0.146	0.7
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35042)				mg/L	mg/L	%
ES0500396-005	SW5	Nitrite + Nitrate as N	0.010 mg/L	0.010	<0.010	0.0
EK061: Total Kjeldahl Nitrogen as N						
EK061: Total Kjeldahl Nitrogen (TKN) - (QC Lot: 34867)				mg/L	mg/L	%
ES0500373-001	- Anonymous -	Total Kjeldahl Nitrogen as N	0.1 mg/L	3.0	2.9	6.1
ES0500396-004	SW4	Total Kjeldahl Nitrogen as N	0.1 mg/L	1.2	1.2	0.0
EK067: Total Phosphorus as P						
EK067: Total Phosphorus as P - (QC Lot: 34866)				mg/L	mg/L	%
ES0500373-001	- Anonymous -	Total Phosphorus as P	0.01 mg/L	0.04	0.05	34.8
ES0500396-004	SW4	Total Phosphorus as P	0.01 mg/L	0.03	0.03	0.0
EK071G: Reactive Phosphorus as P By Discrete Analyser						
EK071G: Reactive Phosphorous as P by discrete analyser - (QC Lot: 34713)				mg/L	mg/L	%
ES0500396-001	SW1	Reactive Phosphorus as P	0.010 mg/L	<0.010	0.025	85.7

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

The quality control term **Method / Laboratory Blank** refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC type is to monitor potential laboratory contamination. The quality control term **Laboratory Control Sample (LCS)** refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Abbreviations: LOR = Limit of reporting.
* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: WATER

Method Blank (MB) and Laboratory Control Samples (LCS) Report

Analyte name	LOR	Method blank result	Actual Results: Spike concentration	Actual Results: Spike Recovery LCS	Recovery Limits: Dynamic Recovery Limits Low	Recovery Limits: Dynamic Recovery Limits High
EA025: Suspended Solids						
EA025: Suspended Solids - (QC Lot: 34840)						
Suspended Solics (SS)	1 mg/L	mg/L	mg/L	%	%	%
		<1	---	---	---	---
		---	150	104	70	130
EK057G: Nitrite as N by Discrete Analyser						
EK057G: Nitrite as N by Discrete Analyser - (QC Lot: 35041)						
Nitrite as N	0.010 mg/L	mg/L	mg/L	%	%	%
		<0.010	---	---	---	---
		---	1.00	103	70	130
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser						
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35040)						
Nitrite + Nitrate as N	0.010 mg/L	mg/L	mg/L	%	%	%
		<0.010	---	---	---	---
		---	1.0	113	70	130
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35042)						
Nitrite + Nitrate as N	0.010 mg/L	mg/L	mg/L	%	%	%
		<0.010	---	---	---	---
		---	1.00	106	70	130
EK061: Total Kjeldahl Nitrogen as N						
EK061: Total Kjeldahl Nitrogen (TKN) - (QC Lot: 34867)						
Total Kjeldahl Nitrogen as N	0.1 mg/L	mg/L	mg/L	%	%	%
		<0.1	---	---	---	---
		---	10.0	11*	70	130
EK067: Total Phosphorus as P						
EK067: Total Phosphorus as P - (QC Lot: 34888)						
Total Phosphorus as P	0.01 mg/L	mg/L	mg/L	%	%	%
		<0.01	---	---	---	---
		---	4.42	88.4	70	130
EK071G: Reactive Phosphorus as P By Discrete Analyser						
EK071G: Reactive Phosphorous as P by discrete analyser - (QC Lot: 34713)						
Reactive Phosphorus as P	0.010 mg/L	mg/L	mg/L	%	%	%
		<0.010	---	---	---	---
		---	0.50	116	70	130
EP020: Oil and Grease						
EP020: Oil and Grease (O&G) - (QC Lot: 35765)						
Oil & Grease	5 mg/l	mg/L	mg/L	%	%	%
		<5	---	---	---	---
		---	5000	96.8	70	130

Quality Control Report - Matrix Spikes (MS)

The quality control term **Matrix Spike (MS)** refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations: **LOR** = Limit of Reporting, **RPD** = Relative Percent Difference.*
* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: WATER

Matrix Spike (MS) Repor

Analyte name	Laboratory Sample ID	Client Sample ID	LOR	Spike Concentration	Actual Results: Sample Result	Actual Results: Spike Recovery MS	Recovery Limits: Static Limits Low	Recovery Limits: Static Limits High
EK057G: Nitrite as N by Discrete Analyser								
EK057G: Nitrite as N by Discrete Analyser - (QC Lot: 35041)				mg/L	mg/L	%	%	%
Nitrite as N	ES0500347-001	- Anonymous -	0.01 mg/L	0.40	<0.010	107	70	130
EK059G: Nitrite and Nitrate as N (NOx) by Discrete Analyser								
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35040)				mg/L	mg/L	%	%	%
Nitrite + Nitrate as N	ES0500347-001	- Anonymous	0.01 mg/L	0.40	<0.010	108	70	130
EK059G: NOX as N by Discrete Analyser - (QC Lot: 35042)				mg/L	mg/L	%	%	%
Nitrite + Nitrate as N	ES0500396-005	SW5	0.01 mg/L	0.40	0.010	115	70	130
EK061: Total Kjeldahl Nitrogen as N								
EK061: Total Kjeldahl Nitrogen (TKN) - (QC Lot: 34867)				mg/L	mg/L	%	%	%
Total Kjeldahl Nitrogen as N	ES0500373-001	- Anonymous -	0.1 mg/L	5.0	3.0	110	70	130
EK067: Total Phosphorus as P								
EK067: Total Phosphorus as P - (QC Lot: 34866)				mg/L	mg/L	%	%	%
Total Phosphorus as P	ES0500373-001	- Anonymous -	0.01 mg/L	1.00	0.04	100	70	130
EK071G: Reactive Phosphorus as P By Discrete Analyser								
EK071G: Reactive Phosphorous as P by discrete analyser - (QC Lot: 34713)				mg/L	mg/L	%	%	%
Reactive Phosphorus as P	ES0500396-001	SW1	0.01 mg/L	0.50	<0.010	112	70	130

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CERTIFICATE OF ANALYSIS

Client	: **FORBES RIGBY PTY LTD**	*Laboratory*	: **ALS Environmental Sydney**	*Page*	: **1 of 5**
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Project	: **104016-3**	*Quote number*	: **----**	*Date received*	: **29 Nov 2005**
Order number	: **- Not provided -**			*Date issued*	: **7 Dec 2005**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **8**
Site	: **- Not provided -**				*Analysed* : **8**

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Signatory	*Position*	*Department*
Greg Vogel	**Laboratory Manager**	**Inorganics - NATA 10911 (Sydney)**

ALS Environmental

Comments

This report for the ALSE reference ES0510140 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

ALS Environmental

Analytical Results

	Client Sample ID :	SW1	SW2	SW3	SW4	SW5
	Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
	Laboratory Sample ID :	ES0510140-001	ES0510140-002	ES0510140-003	ES0510140-004	ES0510140-005
Analyte / CAS number / LOR / Units						
EK071G: Reactive Phosphorous as P by discrete analyser						
Reactive Phosphorus as P	0.010 mg/L	<0.010	<0.010	<0.010	<0.010	0.010

ALS Environmental

Analytical Results

	Client Sample ID :	MCW1	MCW2	MCW3		
	Sample Matrix Type / Description :	WATER	WATER	WATER		
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00		
	Laboratory Sample ID :	ES0510140-006	ES0510140-007	ES0510140-008		
Analyte	*CAS number* / *LOR* / *Units*					
EK071G: Reactive Phosphorous as P by discrete analyser						
Reactive Phosphorus as P	0.010 mg/L	<0.010	<0.010	<0.010		

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: **FORBES RIGBY PTY LTD**	*Laboratory*	: **ALS Environmental Sydney**	*Page*	: **1 of 5**
Contact	: **MR CHRIS MCEVOY**	*Contact*	: **Greg Vogel**	*Work Order*	: **ES0510141**
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Project	: **104016-3**	*Quote number*	: **----**	*Date received*	: **29 Nov 2005**
Order number	: **- Not provided -**			*Date issued*	: **7 Dec 2005**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **8**
Site	: **- Not provided -**				*Analysed* : **8**

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Signatory	*Position*	*Department*
Greg Vogel	**Laboratory Manager**	**Inorganics - NATA 10911 (Sydney)**

ALS Environmental

Comments

This report for the ALSE reference ES0510141 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

ALS Environmental

Analytical Results

				Client Sample ID :	SW1	SW2	SW3	SW4	SW5
				Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
				Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
				Laboratory Sample ID :					
Analyte	*CAS number*	*LOR*	*Units*		ES0510141-001	ES0510141-002	ES0510141-003	ES0510141-004	ES0510141-005
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	0.017
EK059G: NOX as N by Discrete Analyser									
Nitrite + Nitrate as N		0.010	mg/L		<0.010	<0.010	0.020	<0.010	0.010
EK061: Total Kjeldahl Nitrogen (TKN)									
Total Kjeldahl Nitrogen as N		0.1	mg/L		1.1	1.1	0.9	0.9	1.8
EK067G: Total Phosphorous-As P by Discrete Analyser									
Total Phosphorus as P		0.01	mg/L		0.02	0.06	0.04	0.02	0.14

ALS Environmental

Analytical Results

				Client Sample ID :	MCW1	MCW2	MCW3	
				Sample Matrix Type / Description :	WATER	WATER	WATER	
				Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	
				Laboratory Sample ID :	ES0510141-006	ES0510141-007	ES0510141-008	
Analyte	*CAS number*	*LOR*	*Units*					
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.010	mg/L		<0.010	<0.010	<0.010	
EK059G: NOX as N by Discrete Analyser								
Nitrite + Nitrate as N		0.010	mg/L		0.120	0.060	<0.010	
EK061: Total Kjeldahl Nitrogen (TKN)								
Total Kjeldahl Nitrogen as N		0.1	mg/L		0.8	1.1	0.4	
EK067G: Total Phosphorous-As P by Discrete Analyser								
Total Phosphorus as P		0.01	mg/L		0.06	0.62	0.01	

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: **FORBES RIGBY PTY LTD**	*Laboratory*	: **ALS Environmental Sydney**	*Page*	: **1 of 5**
Contact	: **MR CHRIS MCEVOY**	*Contact*	: **Greg Vogel**	*Work Order*	: **ES0510142**
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Project	: **104016-3**	*Quote number*	: **----**	*Date received*	: **29 Nov 2005**
Order number	: **- Not provided -**			*Date issued*	: **7 Dec 2005**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **8**
Site	: **- Not provided -**				*Analysed* : **8**

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Signatory	*Position*	*Department*
Greg Vogel	**Laboratory Manager**	**Inorganics - NATA 10911 (Sydney)**

ALS Environmental

Comments

This report for the ALSE reference ES0510142 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

ALS Environmental

Analytical Results

	Client Sample ID :	SW1	SW2	SW3	SW4	SW5
	Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
	Laboratory Sample ID :	ES0510142-001	ES0510142-002	ES0510142-003	ES0510142-004	ES0510142-005
Analyte	CAS number / LOR / Units					
EP020: Oil and Grease (O&G)						
Oil & Grease	mg/L	10	5	5	7	<5

ALS Environmental

Analytical Results

	Client Sample ID :	MCW1	MCW2	MCW3		
	Sample Matrix Type / Description :	WATER	WATER	WATER		
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00		
	Laboratory Sample ID :	ES0510142-006	ES0510142-007	ES0510142-008		
Analyte	*CAS number* / *LOR* / *Units*					
EP020: Oil and Grease (O&G)						
Oil & Grease	mg/L	<5	<5	<5		

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

ALS Environmental

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Client	: **FORBES RIGBY PTY LTD**	*Laboratory*	: **ALS Environmental Sydney**	*Page*	: **1 of 5**
Contact	: **MR CHRIS MCEVOY**	*Contact*	: **Greg Vogel**	*Work Order*	: **ES0510147**
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Facsimile	: **- Not provided -**	*Facsimile*	: **61-2-87848500**		
Project	: **104016-3**	*Quote number*	: **----**	*Date received*	: **29 Nov 2005**
Order number	: **- Not provided -**			*Date issued*	: **5 Dec 2005**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **10**
Site	: **- Not provided -**				*Analysed* : **10**

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Signatory	*Position*	*Department*
Greg Vogel	**Laboratory Manager**	**Inorganics - NATA 10911 (Sydney)**

ALS Environmental

Comments

This report for the ALSE reference ES0510147 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

ALS Environmental

Analytical Results

Analyte	CAS number	LOR	Units	Client Sample ID: BH13	BH5	BH2 AFTER PURGING	BH4	BH2
Sample Matrix Type / Description				WATER	WATER	WATER	WATER	WATER
Sample Date / Time				28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
Laboratory Sample ID				ES0510147-001	ES0510147-002	ES0510147-003	ES0510147-004	ES0510147-005
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C		1	µS/cm	244	289	213	590	235

ALS Environmental

Analytical Results

	Client Sample ID :	TH17	BH11 A	BH11 B	BHF9 A	BHF9 B
	Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
	Laboratory Sample ID :	ES0510147-006	ES0510147-007	ES0510147-008	ES0510147-009	ES0510147-010
Analyte / CAS number / LOR / Units						
EA010P: Conductivity by PC Titrator						
Electrical Conductivity @ 25°C	1 µS/cm	576	973	925	1020	1500

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: **FORBES RIGBY PTY LTD**	*Laboratory*	: **ALS Environmental Sydney**	*Page*	: **1 of 5**
Contact	: **MR CHRIS MCEVOY**	*Contact*	: **Greg Vogel**	*Work Order*	: **ES0510148**
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Telephone	: **- Not provided -**	*Telephone*	: **61-2-87848555**		
Facsimile	: **- Not provided -**	*Facsimile*	: **61-2-87848500**		
Project	: **104016-3**	*Quote number*	: **----**	*Date received*	: **29 Nov 2005**
Order number	: **- Not provided -**			*Date issued*	: **7 Dec 2005**
C-O-C number	: **- Not provided -**			*No. of samples*	- *Received* : **8**
Site	: **- Not provided -**				*Analysed* : **8**

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Signatory	*Position*	*Department*
Nanthini Coilparampil	**Senior Inorganic Chemist**	**Inorganics - NATA 10911 (Sydney)**

ALS Environmental

Comments

This report for the ALSE reference ES0510148 supersedes any previous reports with this reference. Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

This report contains the following information:

- **Analytical results for samples submitted**

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits). Where LOR of reported result differ from standard LOR, this may be due to high moisture, reduced sample amount or matrix interference. When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for process purposes. Abbreviations: CAS number = Chemical Abstract Services number, LOR = Limit of Reporting. * Indicates failed Surrogate Recoveries.

- **Surrogate control limits**

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

ALS Environmental

Analytical Results

	Client Sample ID :	SW1	SW2	SW3	SW4	SW5
	Sample Matrix Type / Description :	WATER	WATER	WATER	WATER	WATER
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00
	Laboratory Sample ID :	ES0510148-001	ES0510148-002	ES0510148-003	ES0510148-004	ES0510148-005
Analyte	CAS number / LOR / Units					
EA025: Suspended Solids						
Suspended Solids (SS)	1 mg/L	9	11	23	62	28

ALS Environmental

Analytical Results

	Client Sample ID :	MCW1	MCW2	MCW3		
	Sample Matrix Type / Description :	WATER	WATER	WATER		
	Sample Date / Time :	28 Nov 2005 14:00	28 Nov 2005 14:00	28 Nov 2005 14:00		
	Laboratory Sample ID :	ES0510148-006	ES0510148-007	ES0510148-008		
Analyte	*CAS number* / *LOR* / *Units*					
EA025: Suspended Solids						
Suspended Solids (SS)	1 mg/L	2	10	11		

ALS Environmental

Surrogate Control Limits

- **No surrogates present on this report.**

APPENDIX B

WBNM RESULTS

WBNM Output – Vincentia Coastal Village

Pre-Development

```
#####START_QA_SUMMARY_FILE#################################################

U:\2004\104-016-03 - Vincentia District Centre - Combined Water
Study\Design\WBNM\Vincentia_Base_EXI.wbn
Program run at 15: 1 on  19  5 2004  (ddmmyy)

Forbes Rigby Pty Ltd
Engineers Planners Scientists
278 Keira St
Wollongong
New South Wales
Australia
2500
02 42284133
02 42286811
secretary@forbesrigby.com.au
beta_107_user
T:\water_eng\forbesrigby.ifd

out_metafile= T
out_culverts= F
out_scourable= F
sum_catchments= T
sum_volumes= T
sum_outlet_structures= T
sum_local_structures= F
sum_subareas= T
sum_depths= F
sum_Qpeaks= T
sum_Tpeaks= F
sum_multiStorms= T
dbg_run= F
dbg_echo= F
dbg_edit= F
dbg_ifd= F
trig_flowmin=           5

#####START_PREAMBLE_BLOCK##########|###########|###########|###########|
RUNFILE Vincentia.wbn
Existing Hydrology (almost no impervious cover)
refer project number 104016-03

MGA coords


No large storage basins
#####END_PREAMBLE_BLOCK############|###########|###########|###########|


#####START_STATUS_BLOCK############|###########|###########|###########|

last edited   8/ 9/2003
by  beta_107_user of Forbes Rigby Pty Ltd
2003_V101   Unchecked_Edited_Model
#####END_STATUS_BLOCK##############|###########|###########|###########|


#####START_DISPLAY_BLOCK###########|###########|###########|###########|
    283305.0   6119485.0    289345.0   6113790.0
        none
    283305.0   6119485.0    289345.0   6113790.0         0.0         0.0
#####END_DISPLAY_BLOCK#############|###########|###########|###########|
```

```
#####START_TOPOLOGY_BLOCK##########|###########|###########|###########|
          13
SUB01           284673.8   6116728.5    285646.1   6117185.5 SUB04
SUB02           285327.1   6116309.0    285496.5   6116499.0 SUB03
SUB03           285636.7   6116796.0    285646.1   6117185.5 SUB04
SUB04           285675.3   6117403.0    285856.9   6117412.5 SUB05
SUB05           286374.8   6117659.5    286493.0   6118145.0 SINK
SUB06           285775.3   6116165.5    285882.6   6116236.0 SUB07
SUB07           286204.4   6116710.0    286797.6   6116837.0 SUB10
SUB08           286210.1   6115782.0    286197.7   6115892.0 SUB09
SUB09           286694.0   6116084.0    286797.6   6116837.0 SUB10
SUB10           286901.5   6116865.0    287096.1   6117188.5 SWAMP
SUB11           287767.8   6115361.0    287370.0   6116167.0 SUB12
SUB12           287219.0   6116493.5    287096.1   6117188.5 SWAMP
SWAMP           287096.1   6117188.5    287096.1   6117188.5 SINK
#####END_TOPOLOGY_BLOCK############|###########|###########|###########|


#####START_SURFACES_BLOCK##########|###########|###########|###########|
        0.77
      -99.90
SUB01             147.10         0.0        1.29        0.10
SUB02              29.70         0.0        1.29        0.10
SUB03              26.80         0.0        1.29        0.10
SUB04              38.40         0.0        1.29        0.10
SUB05              91.20         0.0        1.29        0.10
SUB06               9.40         2.0        1.29        0.10
SUB07              60.70         0.0        1.29        0.10
SUB08              19.20         0.0        1.29        0.10
SUB09              88.80         5.0        1.29        0.10
SUB10              28.70         0.0        1.29        0.10
SUB11             141.40         0.0        1.29        0.10
SUB12              23.60         0.0        1.29        0.10
SWAMP               0.00         0.0        1.29        0.10
#####END_SURFACES_BLOCK############|###########|###########|###########|


#####START_FLOWPATHS_BLOCK#########|###########|###########|###########|
           8
SUB03
#####ROUTING
        1.00
SUB04
#####ROUTING
        1.00
SUB05
#####ROUTING
        1.00
SUB07
#####ROUTING
        1.00
SUB09
#####ROUTING
        1.00
SUB10
#####ROUTING
        1.00
SUB12
#####ROUTING
        1.00
SWAMP
#####ROUTING
        1.00
#####END_FLOWPATHS_BLOCK###########|###########|###########|###########|


#####START_LOCAL_STRUCTURES_BLOCK##|###########|###########|###########|
           0
#####END_LOCAL_STRUCTURES_BLOCK####|###########|###########|###########|
```

```
#####START_OUTLET_STRUCTURES_BLOCK#|###########|###########|###########|
          0
#####END_OUTLET_STRUCTURES_BLOCK###|###########|###########|###########|


#####START_STORM_BLOCK#############|###########|###########|###########|
          8
#####START_STORM#1
1 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
          1         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
          1
VINCENTIA#1
VINCENTIA#1           1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
          0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
          0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#1

#####START_RESULTS_STORM_1



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =        44.06
Excess rainfall        (mm) =        39.10
Calc. runoff depth     (mm) =        20.80  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        22.274 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                 Easting    Northing     Easting    Northing
SUB01          284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02          285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03          285636.69  6116796.00   285646.09  6117185.50 SUB04
```

SUB04	285675.31	6117403.00	285856.91	6117412.50	SUB05
SUB05	286374.81	6117659.50	286493.00	6118145.00	SINK
SUB06	285775.31	6116165.50	285882.59	6116236.00	SUB07
SUB07	286204.41	6116710.00	286797.59	6116837.00	SUB10
SUB08	286210.09	6115782.00	286197.69	6115892.00	SUB09
SUB09	286694.00	6116084.00	286797.59	6116837.00	SUB10
SUB10	286901.50	6116865.00	287096.09	6117188.50	SWAMP
SUB11	287767.81	6115361.00	287370.00	6116167.00	SUB12
SUB12	287219.00	6116493.50	287096.09	6117188.50	SWAMP
SWAMP	287096.09	6117188.50	287096.09	6117188.50	SINK

SUBAREA	AREA (ha)	CONTRIBUTING AREA(ha)	IMP (%)	CODES(1=exists) Stream	Outlet Struct	Local Struct	QLINEAR (m3/s)
SUB01	147.10	147.10	0.0	0	0	0	-99.90
SUB02	29.70	29.70	0.0	0	0	0	-99.90
SUB03	26.80	56.50	0.0	1	0	0	-99.90
SUB04	38.40	242.00	0.0	1	0	0	-99.90
SUB05	91.20	333.20	0.0	1	0	0	-99.90
SUB06	9.40	9.40	2.0	0	0	0	-99.90
SUB07	60.70	70.10	0.0	1	0	0	-99.90
SUB08	19.20	19.20	0.0	0	0	0	-99.90
SUB09	88.80	108.00	5.0	1	0	0	-99.90
SUB10	28.70	206.80	0.0	1	0	0	-99.90
SUB11	141.40	141.40	0.0	0	0	0	-99.90
SUB12	23.60	165.00	0.0	1	0	0	-99.90
SWAMP	0.00	371.80	0.0	1	0	0	-99.90

#####END_SUBAREA_SUMMARY###

#####START_VOLUME_SUMMARY###

SUBAREA	DIRECTED TO TOP	IMPORTED TO TOP	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM	IMPORTED TO BOTTOM	OUTFLOW	BALANCE
	(Volumes in thousands m3)							
SUB01	0.000	0.000	57.981	0.000	0.000	0.000	57.981	0.000
SUB02	0.000	0.000	11.659	0.000	0.000	0.000	11.659	0.000
SUB03	11.659	0.000	10.518	0.000	0.000	0.000	22.197	-0.020
SUB04	80.178	0.000	15.074	0.000	0.000	0.000	95.391	-0.139
SUB05	95.391	0.000	35.857	0.000	0.000	0.000	131.547	-0.299
SUB06	0.000	0.000	3.605	0.083	0.000	0.000	3.688	0.000
SUB07	3.688	0.000	23.834	0.000	0.000	0.000	27.525	-0.003
SUB08	0.000	0.000	7.524	0.000	0.000	0.000	7.524	0.000
SUB09	7.524	0.000	33.161	1.956	0.000	0.000	42.663	-0.022
SUB10	70.188	0.000	11.266	0.000	0.000	0.000	81.549	-0.095
SUB11	0.000	0.000	55.722	0.000	0.000	0.000	55.722	0.000
SUB12	55.722	0.000	9.257	0.000	0.000	0.000	65.072	-0.093
SWAMP	146.621	0.000	0.000	0.000	0.000	0.000	146.621	0.000

#####END_VOLUME_SUMMARY###

#####START_PEAK_SUMMARY###

SUBAREA	OUT_STR 1=exist	STREAM TOP including imported to TOP	STREAM BOTTOM	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM including imported to BOTTOM	OUTLET_STRUCTURE INFLOW	OUTLET_STRUCTURE OUTFLOW
		(Discharges in m3/s)						
SUB01	0	0.000	0.000	8.912	0.000	0.000	8.912	8.912

```
SUB02        0       0.000     0.000     2.872     0.000     0.000     2.872     2.872
SUB03        0       2.872     2.084     2.664     0.000     0.000     4.204     4.204
SUB04        0      13.112    11.631     3.457     0.000     0.000    14.124    14.124
SUB05        0      14.124    12.014     6.374     0.000     0.000    16.351    16.351
SUB06        0       0.000     0.000     1.177     0.048     0.000     1.212     1.212
SUB07        0       1.212     0.578     4.773     0.000     0.000     5.159     5.159
SUB08        0       0.000     0.000     2.079     0.000     0.000     2.079     2.079
SUB09        0       2.079     1.054     6.029     0.984     0.000     7.276     7.276
SUB10        0      12.352    10.845     2.801     0.000     0.000    12.817    12.817
SUB11        0       0.000     0.000     8.673     0.000     0.000     8.673     8.673
SUB12        0       8.673     7.839     2.425     0.000     0.000     9.457     9.457
SWAMP        0      22.274    22.274     0.000     0.000     0.000    22.274    22.274
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#######################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY#########################################
#####END_RESULTS_STORM_1

#####START_STORM#2
2 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
           2         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#2

#####START_RESULTS_STORM_2
```

```
#####START_CATCHMENT_SUMMARY##################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =        57.54
Excess rainfall        (mm) =        52.58
Calc. runoff depth     (mm) =        27.94  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        30.989 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY####################################################


#####START_SUBAREA_SUMMARY#####################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                  Easting    Northing     Easting    Northing
SUB01          284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02          285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03          285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04          285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05          286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06          285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07          286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08          286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09          286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10          286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11          287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12          287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP          287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01          147.10     147.10     0.0    0      0      0          -99.90
SUB02           29.70      29.70     0.0    0      0      0          -99.90
SUB03           26.80      56.50     0.0    1      0      0          -99.90
SUB04           38.40     242.00     0.0    1      0      0          -99.90
SUB05           91.20     333.20     0.0    1      0      0          -99.90
SUB06            9.40       9.40     2.0    0      0      0          -99.90
SUB07           60.70      70.10     0.0    1      0      0          -99.90
SUB08           19.20      19.20     0.0    0      0      0          -99.90
SUB09           88.80     108.00     5.0    1      0      0          -99.90
SUB10           28.70     206.80     0.0    1      0      0          -99.90
SUB11          141.40     141.40     0.0    0      0      0          -99.90
SUB12           23.60     165.00     0.0    1      0      0          -99.90
SWAMP            0.00     371.80     0.0    1      0      0          -99.90
#####END_SUBAREA_SUMMARY#####################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000      77.899       0.000       0.000       0.000      77.899       0.000
SUB02
       0.000       0.000      15.679       0.000       0.000       0.000      15.679       0.000
SUB03
      15.679       0.000      14.138       0.000       0.000       0.000      29.839      -0.022
SUB04
     107.738       0.000      20.279       0.000       0.000       0.000     128.184      -0.167
SUB05
     128.184       0.000      48.216       0.000       0.000       0.000     176.761      -0.361
SUB06
       0.000       0.000       4.850       0.108       0.000       0.000       4.958       0.000
SUB07
       4.958       0.000      32.061       0.000       0.000       0.000      37.027      -0.008
SUB08
       0.000       0.000      10.121       0.000       0.000       0.000      10.121       0.000
SUB09
      10.121       0.000      44.581       2.555       0.000       0.000      57.288      -0.031
```

```
SUB10
      94.315       0.000      15.147       0.000       0.000       0.000     109.592      -0.130
SUB11
       0.000       0.000      74.868       0.000       0.000       0.000      74.868       0.000
SUB12
      74.868       0.000      12.443       0.000       0.000       0.000      87.420      -0.108
SWAMP
     197.011       0.000       0.000       0.000       0.000       0.000     197.011       0.000
#####END_VOLUME_SUMMARY#################################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                  including                                 including
                imported to                               imported to
                       TOP                                    BOTTOM
                   (Discharges in m3/s)
SUB01        0       0.000     0.000    12.518     0.000     0.000    12.518    12.518
SUB02        0       0.000     0.000     3.994     0.000     0.000     3.994     3.994
SUB03        0       3.994     2.913     3.701     0.000     0.000     5.930     5.930
SUB04        0      18.449    16.324     4.822     0.000     0.000    19.789    19.789
SUB05        0      19.789    16.983     8.908     0.000     0.000    23.158    23.158
SUB06        0       0.000     0.000     1.613     0.063     0.000     1.659     1.659
SUB07        0       1.659     0.810     6.689     0.000     0.000     7.215     7.215
SUB08        0       0.000     0.000     2.876     0.000     0.000     2.876     2.876
SUB09        0       2.876     1.486     8.418     1.285     0.000    10.196    10.196
SUB10        0      17.341    15.128     3.894     0.000     0.000    17.831    17.831
SUB11        0       0.000     0.000    12.177     0.000     0.000    12.177    12.177
SUB12        0      12.177    10.976     3.364     0.000     0.000    13.166    13.166
SWAMP        0      30.989    30.989     0.000     0.000     0.000    30.989    30.989
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY#############################################
#####END_RESULTS_STORM_2

#####START_STORM#3
5 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
           5         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01                0.00        2.50        0.00
SUB02                0.00        2.50        0.00
SUB03                0.00        2.50        0.00
SUB04                0.00        2.50        0.00
SUB05                0.00        2.50        0.00
SUB06                0.00        2.50        0.00
```

```
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
          0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
          0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#3

#####START_RESULTS_STORM_3



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =        76.99
Excess rainfall        (mm) =        72.03
Calc. runoff depth     (mm) =        38.27  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        44.485 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                  Easting    Northing     Easting    Northing
SUB01          284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02          285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03          285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04          285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05          286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06          285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07          286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08          286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09          286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10          286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11          287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12          287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP          287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01          147.10     147.10     0.0    0      0      0          -99.90
SUB02           29.70      29.70     0.0    0      0      0          -99.90
SUB03           26.80      56.50     0.0    1      0      0          -99.90
SUB04           38.40     242.00     0.0    1      0      0          -99.90
SUB05           91.20     333.20     0.0    1      0      0          -99.90
SUB06            9.40       9.40     2.0    0      0      0          -99.90
SUB07           60.70      70.10     0.0    1      0      0          -99.90
SUB08           19.20      19.20     0.0    0      0      0          -99.90
SUB09           88.80     108.00     5.0    1      0      0          -99.90
SUB10           28.70     206.80     0.0    1      0      0          -99.90
SUB11          141.40     141.40     0.0    0      0      0          -99.90
SUB12           23.60     165.00     0.0    1      0      0          -99.90
SWAMP            0.00     371.80     0.0    1      0      0          -99.90
#####END_SUBAREA_SUMMARY###################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
```

```
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     106.702       0.000       0.000       0.000     106.702       0.000
SUB02
       0.000       0.000      21.464       0.000       0.000       0.000      21.464       0.000
SUB03
      21.464       0.000      19.364       0.000       0.000       0.000      40.860      -0.032
SUB04
     147.562       0.000      27.788       0.000       0.000       0.000     175.570      -0.221
SUB05
     175.570       0.000      66.010       0.000       0.000       0.000     242.008      -0.428
SUB06
       0.000       0.000       6.645       0.145       0.000       0.000       6.789       0.000
SUB07
       6.789       0.000      43.924       0.000       0.000       0.000      50.728      -0.015
SUB08
       0.000       0.000      13.867       0.000       0.000       0.000      13.867       0.000
SUB09
      13.867       0.000      61.059       3.418       0.000       0.000      78.380      -0.035
SUB10
     129.108       0.000      20.740       0.000       0.000       0.000     150.034      -0.186
SUB11
       0.000       0.000     102.569       0.000       0.000       0.000     102.569       0.000
SUB12
     102.569       0.000      17.050       0.000       0.000       0.000     119.760      -0.141
SWAMP
     269.794       0.000       0.000       0.000       0.000       0.000     269.794       0.000
#####END_VOLUME_SUMMARY#########################################################################


#####START_PEAK_SUMMARY#########################################################
SUBAREA OUT_STR     STREAM     STREAM      LOCAL      LOCAL     DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP     BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                   including
               imported to                                 imported to
                      TOP                                      BOTTOM
                   (Discharges in m3/s)
SUB01        0       0.000      0.000    18.012      0.000      0.000    18.012    18.012
SUB02        0       0.000      0.000     5.686      0.000      0.000     5.686     5.686
SUB03        0       5.686      4.189     5.261      0.000      0.000     8.571     8.571
SUB04        0      26.583     23.397     6.886      0.000      0.000    28.240    28.240
SUB05        0      28.240     24.531    12.789      0.000      0.000    33.335    33.335
SUB06        0       0.000      0.000     2.261      0.084      0.000     2.322     2.322
SUB07        0       2.322      1.157     9.600      0.000      0.000    10.321    10.321
SUB08        0       0.000      0.000     4.072      0.000      0.000     4.072     4.072
SUB09        0       4.072      2.142    12.113      1.719      0.000    14.660    14.660
SUB10        0      24.962     21.620     5.541      0.000      0.000    25.636    25.636
SUB11        0       0.000      0.000    17.513      0.000      0.000    17.513    17.513
SUB12        0      17.513     15.691     4.775      0.000      0.000    18.858    18.858
SWAMP        0      44.485     44.485     0.000      0.000      0.000    44.485    44.485
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################
#####END_RESULTS_STORM_3

#####START_STORM#4
10 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
       1.00
```

```
       1.00
#####START_DESIGN_RAIN
          10         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#4

#####START_RESULTS_STORM_4


#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =        88.72
Excess rainfall        (mm) =        83.76
Calc. runoff depth     (mm) =        44.49  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        53.099 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                 Easting    Northing     Easting    Northing
SUB01          284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02          285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03          285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04          285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05          286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06          285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07          286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08          286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09          286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10          286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11          287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12          287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP          287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
```

					Struct	Struct	
SUB01	147.10	147.10	0.0	0	0	0	-99.90
SUB02	29.70	29.70	0.0	0	0	0	-99.90
SUB03	26.80	56.50	0.0	1	0	0	-99.90
SUB04	38.40	242.00	0.0	1	0	0	-99.90
SUB05	91.20	333.20	0.0	1	0	0	-99.90
SUB06	9.40	9.40	2.0	0	0	0	-99.90
SUB07	60.70	70.10	0.0	1	0	0	-99.90
SUB08	19.20	19.20	0.0	0	0	0	-99.90
SUB09	88.80	108.00	5.0	1	0	0	-99.90
SUB10	28.70	206.80	0.0	1	0	0	-99.90
SUB11	141.40	141.40	0.0	0	0	0	-99.90
SUB12	23.60	165.00	0.0	1	0	0	-99.90
SWAMP	0.00	371.80	0.0	1	0	0	-99.90

#####END_SUBAREA_SUMMARY##

#####START_VOLUME_SUMMARY###
SUBAREA	DIRECTED TO TOP	IMPORTED TO TOP	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM	IMPORTED TO BOTTOM	OUTFLOW	BALANCE
	(Volumes in thousands m3)							
SUB01	0.000	0.000	124.089	0.000	0.000	0.000	124.089	0.000
SUB02	0.000	0.000	24.959	0.000	0.000	0.000	24.959	0.000
SUB03	24.959	0.000	22.520	0.000	0.000	0.000	47.516	-0.037
SUB04	171.605	0.000	32.309	0.000	0.000	0.000	204.173	-0.259
SUB05	204.173	0.000	76.773	0.000	0.000	0.000	281.412	-0.466
SUB06	0.000	0.000	7.727	0.167	0.000	0.000	7.894	0.000
SUB07	7.894	0.000	51.083	0.000	0.000	0.000	58.997	-0.020
SUB08	0.000	0.000	16.128	0.000	0.000	0.000	16.128	0.000
SUB09	16.128	0.000	71.009	3.939	0.000	0.000	91.118	-0.042
SUB10	150.115	0.000	24.118	0.000	0.000	0.000	174.444	-0.211
SUB11	0.000	0.000	119.238	0.000	0.000	0.000	119.238	0.000
SUB12	119.238	0.000	19.829	0.000	0.000	0.000	139.225	-0.158
SWAMP	313.670	0.000	0.000	0.000	0.000	0.000	313.670	0.000

#####END_VOLUME_SUMMARY###

#####START_PEAK_SUMMARY###
SUBAREA	OUT_STR 1=exist	STREAM TOP including imported to TOP	STREAM BOTTOM	LOCAL PERVIOUS	LOCAL IMPERVIOUS	DIRECTED TO BOTTOM including imported to BOTTOM	OUTLET_STRUCTURE INFLOW	OUTLET_STRUCTURE OUTFLOW
		(Discharges in m3/s)						
SUB01	0	0.000	0.000	21.455	0.000	0.000	21.455	21.455
SUB02	0	0.000	0.000	6.739	0.000	0.000	6.739	6.739
SUB03	0	6.739	4.995	6.232	0.000	0.000	10.225	10.225
SUB04	0	31.681	27.793	8.173	0.000	0.000	33.527	33.527
SUB05	0	33.527	29.261	15.251	0.000	0.000	39.633	39.633
SUB06	0	0.000	0.000	2.660	0.097	0.000	2.730	2.730
SUB07	0	2.730	1.375	11.424	0.000	0.000	12.287	12.287
SUB08	0	0.000	0.000	4.813	0.000	0.000	4.813	4.813
SUB09	0	4.813	2.553	14.440	1.980	0.000	17.467	17.467
SUB10	0	29.754	25.762	6.566	0.000	0.000	30.606	30.606
SUB11	0	0.000	0.000	20.857	0.000	0.000	20.857	20.857
SUB12	0	20.857	18.641	5.651	0.000	0.000	22.502	22.502
SWAMP	0	53.099	53.099	0.000	0.000	0.000	53.099	53.099

#####END_PEAK_SUMMARY###

```
#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################
#####END_RESULTS_STORM_4

#####START_STORM#5
20 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
          20         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01                0.00        2.50        0.00
SUB02                0.00        2.50        0.00
SUB03                0.00        2.50        0.00
SUB04                0.00        2.50        0.00
SUB05                0.00        2.50        0.00
SUB06                0.00        2.50        0.00
SUB07                0.00        2.50        0.00
SUB08                0.00        2.50        0.00
SUB09                0.00        2.50        0.00
SUB10                0.00        2.50        0.00
SUB11                0.00        2.50        0.00
SUB12                0.00        2.50        0.00
SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#5

#####START_RESULTS_STORM_5



#####START_CATCHMENT_SUMMARY#################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =       103.85
Excess rainfall        (mm) =        98.88
Calc. runoff depth     (mm) =        52.51  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        64.572 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY###################################################
```

```
#####START_SUBAREA_SUMMARY#############################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                  Easting    Northing     Easting    Northing
SUB01           284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02           285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03           285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04           285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05           286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06           285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07           286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08           286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09           286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10           286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11           287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12           287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP           287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01          147.10     147.10     0.0    0      0      0          -99.90
SUB02           29.70      29.70     0.0    0      0      0          -99.90
SUB03           26.80      56.50     0.0    1      0      0          -99.90
SUB04           38.40     242.00     0.0    1      0      0          -99.90
SUB05           91.20     333.20     0.0    1      0      0          -99.90
SUB06            9.40       9.40     2.0    0      0      0          -99.90
SUB07           60.70      70.10     0.0    1      0      0          -99.90
SUB08           19.20      19.20     0.0    0      0      0          -99.90
SUB09           88.80     108.00     5.0    1      0      0          -99.90
SUB10           28.70     206.80     0.0    1      0      0          -99.90
SUB11          141.40     141.40     0.0    0      0      0          -99.90
SUB12           23.60     165.00     0.0    1      0      0          -99.90
SWAMP            0.00     371.80     0.0    1      0      0          -99.90
#####END_SUBAREA_SUMMARY###############################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     146.375       0.000       0.000       0.000     146.375       0.000
SUB02
       0.000       0.000      29.467       0.000       0.000       0.000      29.467       0.000
SUB03
      29.467       0.000      26.588       0.000       0.000       0.000      56.104      -0.048
SUB04
     202.478       0.000      38.121       0.000       0.000       0.000     240.908      -0.309
SUB05
     240.908       0.000      90.640       0.000       0.000       0.000     332.049      -0.501
SUB06
       0.000       0.000       9.121       0.195       0.000       0.000       9.317       0.000
SUB07
       9.317       0.000      60.316       0.000       0.000       0.000      69.657      -0.025
SUB08
       0.000       0.000      19.038       0.000       0.000       0.000      19.038       0.000
SUB09
      19.038       0.000      83.824       4.611       0.000       0.000     107.523      -0.051
SUB10
     177.181       0.000      28.474       0.000       0.000       0.000     205.894      -0.239
SUB11
       0.000       0.000     140.678       0.000       0.000       0.000     140.678       0.000
SUB12
     140.678       0.000      23.409       0.000       0.000       0.000     164.278      -0.191
SWAMP
     370.172       0.000       0.000       0.000       0.000       0.000     370.172       0.000
#####END_VOLUME_SUMMARY###########################################################################


#####START_PEAK_SUMMARY#########################################################
SUBAREA OUT_STR     STREAM     STREAM     LOCAL     LOCAL     DIRECTED  OUTLET_STRUCTURE
```

```
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                  including                                including
                 imported to                              imported to
                        TOP                                   BOTTOM
                     (Discharges in m3/s)
SUB01        0       0.000     0.000    26.004     0.000     0.000    26.004    26.004
SUB02        0       0.000     0.000     8.125     0.000     0.000     8.125     8.125
SUB03        0       8.125     6.068     7.508     0.000     0.000    12.415    12.415
SUB04        0      38.418    33.581     9.871     0.000     0.000    40.536    40.536
SUB05        0      40.536    35.490    18.516     0.000     0.000    48.188    48.188
SUB06        0       0.000     0.000     3.181     0.114     0.000     3.263     3.263
SUB07        0       3.263     1.665    13.837     0.000     0.000    14.920    14.920
SUB08        0       0.000     0.000     5.786     0.000     0.000     5.786     5.786
SUB09        0       5.786     3.093    17.518     2.318     0.000    21.185    21.185
SUB10        0      36.104    31.323     7.914     0.000     0.000    37.225    37.225
SUB11        0       0.000     0.000    25.272     0.000     0.000    25.272    25.272
SUB12        0      25.272    22.587     6.803     0.000     0.000    27.352    27.352
SWAMP        0      64.572    64.572     0.000     0.000     0.000    64.572    64.572
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################
#####END_RESULTS_STORM_5

#####START_STORM#6
50 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
          50         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01                0.00        2.50        0.00
SUB02                0.00        2.50        0.00
SUB03                0.00        2.50        0.00
SUB04                0.00        2.50        0.00
SUB05                0.00        2.50        0.00
SUB06                0.00        2.50        0.00
SUB07                0.00        2.50        0.00
SUB08                0.00        2.50        0.00
SUB09                0.00        2.50        0.00
SUB10                0.00        2.50        0.00
SUB11                0.00        2.50        0.00
SUB12                0.00        2.50        0.00
SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
```

```
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#6

#####START_RESULTS_STORM_6



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =       123.97
Excess rainfall        (mm) =       119.00
Calc. runoff depth     (mm) =        63.18  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        76.929 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                  Easting    Northing     Easting    Northing
SUB01           284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02           285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03           285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04           285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05           286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06           285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07           286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08           286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09           286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10           286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11           287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12           287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP           287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01           147.10     147.10     0.0    0      0      0          -99.90
SUB02            29.70      29.70     0.0    0      0      0          -99.90
SUB03            26.80      56.50     0.0    1      0      0          -99.90
SUB04            38.40     242.00     0.0    1      0      0          -99.90
SUB05            91.20     333.20     0.0    1      0      0          -99.90
SUB06             9.40       9.40     2.0    0      0      0          -99.90
SUB07            60.70      70.10     0.0    1      0      0          -99.90
SUB08            19.20      19.20     0.0    0      0      0          -99.90
SUB09            88.80     108.00     5.0    1      0      0          -99.90
SUB10            28.70     206.80     0.0    1      0      0          -99.90
SUB11           141.40     141.40     0.0    0      0      0          -99.90
SUB12            23.60     165.00     0.0    1      0      0          -99.90
SWAMP             0.00     371.80     0.0    1      0      0          -99.90
#####END_SUBAREA_SUMMARY###################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED      OUTFLOW      BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     176.241       0.000       0.000       0.000     176.241       0.000
SUB02
       0.000       0.000      35.459       0.000       0.000       0.000      35.459       0.000
SUB03
      35.459       0.000      31.991       0.000       0.000       0.000      67.508      -0.058
SUB04
     243.750       0.000      45.870       0.000       0.000       0.000     289.980      -0.360
SUB05
     289.980       0.000     109.026       0.000       0.000       0.000     399.596      -0.590
SUB06
       0.000       0.000      10.978       0.233       0.000       0.000      11.211       0.000
```

```
SUB07
      11.211       0.000      72.567       0.000       0.000       0.000      83.811      -0.033
SUB08
       0.000       0.000      22.908       0.000       0.000       0.000      22.908       0.000
SUB09
      22.908       0.000     100.848       5.504       0.000       0.000     129.321      -0.061
SUB10
     213.132       0.000      34.264       0.000       0.000       0.000     247.677      -0.280
SUB11
       0.000       0.000     169.352       0.000       0.000       0.000     169.352       0.000
SUB12
     169.352       0.000      28.165       0.000       0.000       0.000     197.739      -0.222
SWAMP
     445.416       0.000       0.000       0.000       0.000       0.000     445.416       0.000
#####END_VOLUME_SUMMARY#################################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                  including                               including
                imported to                             imported to
                       TOP                                  BOTTOM
                    (Discharges in m3/s)
SUB01        0       0.000     0.000    30.678     0.000     0.000    30.678    30.678
SUB02        0       0.000     0.000     9.514     0.000     0.000     9.514     9.514
SUB03        0       9.514     7.207     8.783     0.000     0.000    14.652    14.652
SUB04        0      45.330    40.123    11.586     0.000     0.000    48.401    48.401
SUB05        0      48.401    42.885    21.885     0.000     0.000    58.350    58.350
SUB06        0       0.000     0.000     3.684     0.126     0.000     3.778     3.778
SUB07        0       3.778     1.985    16.306     0.000     0.000    17.640    17.640
SUB08        0       0.000     0.000     6.747     0.000     0.000     6.747     6.747
SUB09        0       6.747     3.709    20.699     2.582     0.000    25.053    25.053
SUB10        0      42.693    37.329     9.264     0.000     0.000    44.313    44.313
SUB11        0       0.000     0.000    29.805     0.000     0.000    29.805    29.805
SUB12        0      29.805    26.984     7.949     0.000     0.000    32.616    32.616
SWAMP        0      76.929    76.929     0.000     0.000     0.000    76.929    76.929
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY#############################################
#####END_RESULTS_STORM_6

#####START_STORM#7
100 YEAR, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
         100         120        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
```

```
SUB01                0.00        2.50        0.00
SUB02                0.00        2.50        0.00
SUB03                0.00        2.50        0.00
SUB04                0.00        2.50        0.00
SUB05                0.00        2.50        0.00
SUB06                0.00        2.50        0.00
SUB07                0.00        2.50        0.00
SUB08                0.00        2.50        0.00
SUB09                0.00        2.50        0.00
SUB10                0.00        2.50        0.00
SUB11                0.00        2.50        0.00
SUB12                0.00        2.50        0.00
SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#7

#####START_RESULTS_STORM_7



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =       139.50
Excess rainfall        (mm) =       134.54
Calc. runoff depth     (mm) =        71.41  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        88.911 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                   Easting    Northing     Easting    Northing
SUB01           284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02           285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03           285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04           285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05           286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06           285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07           286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08           286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09           286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10           286901.50  6116865.00   287096.09  6117188.50 SWAMP
SUB11           287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12           287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP           287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)           QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01          147.10     147.10     0.0    0      0      0          -99.90
SUB02           29.70      29.70     0.0    0      0      0          -99.90
SUB03           26.80      56.50     0.0    1      0      0          -99.90
SUB04           38.40     242.00     0.0    1      0      0          -99.90
SUB05           91.20     333.20     0.0    1      0      0          -99.90
SUB06            9.40       9.40     2.0    0      0      0          -99.90
SUB07           60.70      70.10     0.0    1      0      0          -99.90
SUB08           19.20      19.20     0.0    0      0      0          -99.90
SUB09           88.80     108.00     5.0    1      0      0          -99.90
SUB10           28.70     206.80     0.0    1      0      0          -99.90
SUB11          141.40     141.40     0.0    0      0      0          -99.90
SUB12           23.60     165.00     0.0    1      0      0          -99.90
SWAMP            0.00     371.80     0.0    1      0      0          -99.90
```

#####END_SUBAREA_SUMMARY###

#####START_VOLUME_SUMMARY###
SUBAREA DIRECTED IMPORTED LOCAL LOCAL DIRECTED IMPORTED OUTFLOW BALANCE
TO TOP TO TOP PERVIOUS IMPERVIOUS TO BOTTOM TO BOTTOM
(Volumes in thousands m3)

SUB01								
	0.000	0.000	199.136	0.000	0.000	0.000	199.136	0.000
SUB02								
	0.000	0.000	40.086	0.000	0.000	0.000	40.086	0.000
SUB03								
	40.086	0.000	36.165	0.000	0.000	0.000	76.317	-0.067
SUB04								
	275.453	0.000	51.854	0.000	0.000	0.000	327.716	-0.410
SUB05								
	327.716	0.000	123.266	0.000	0.000	0.000	451.615	-0.632
SUB06								
	0.000	0.000	12.411	0.262	0.000	0.000	12.673	0.000
SUB07								
	12.673	0.000	82.047	0.000	0.000	0.000	94.754	-0.034
SUB08								
	0.000	0.000	25.900	0.000	0.000	0.000	25.900	0.000
SUB09								
	25.900	0.000	114.022	6.194	0.000	0.000	146.190	-0.074
SUB10								
	240.945	0.000	38.735	0.000	0.000	0.000	280.003	-0.324
SUB11								
	0.000	0.000	191.337	0.000	0.000	0.000	191.337	0.000
SUB12								
	191.337	0.000	31.843	0.000	0.000	0.000	223.439	-0.259
SWAMP								
	503.443	0.000	0.000	0.000	0.000	0.000	503.443	0.000

#####END_VOLUME_SUMMARY###

#####START_PEAK_SUMMARY###
SUBAREA OUT_STR STREAM STREAM LOCAL LOCAL DIRECTED OUTLET_STRUCTURE
1=exist TOP BOTTOM PERVIOUS IMPERVIOUS TO BOTTOM INFLOW OUTFLOW
including including
imported to imported to
TOP BOTTOM
(Discharges in m3/s)

SUB01	0	0.000	0.000	35.395	0.000	0.000	35.395	35.395
SUB02	0	0.000	0.000	10.925	0.000	0.000	10.925	10.925
SUB03	0	10.925	8.319	10.081	0.000	0.000	16.895	16.895
SUB04	0	52.268	46.218	13.321	0.000	0.000	55.812	55.812
SUB05	0	55.812	49.477	25.264	0.000	0.000	67.414	67.414
SUB06	0	0.000	0.000	4.206	0.142	0.000	4.311	4.311
SUB07	0	4.311	2.290	18.790	0.000	0.000	20.365	20.365
SUB08	0	0.000	0.000	7.731	0.000	0.000	7.731	7.731
SUB09	0	7.731	4.271	23.888	2.906	0.000	28.917	28.917
SUB10	0	49.282	43.149	10.637	0.000	0.000	51.225	51.225
SUB11	0	0.000	0.000	34.437	0.000	0.000	34.437	34.437
SUB12	0	34.437	31.158	9.118	0.000	0.000	37.686	37.686
SWAMP	0	88.911	88.911	0.000	0.000	0.000	88.911	88.911

#####END_PEAK_SUMMARY###

#####START_OUTLET_STRUCTURE_SUMMARY###
SUBAREA INITIAL INFLOW OUTFLOW FINAL BALANCE
STORAGE STORAGE
(Volumes in thousands m3)

SUBAREA INFLOW OUTFLOW INFLOW MAX.VOL MAX.WATER
PEAK PEAK VOLUME STORED ELEVATION
(m3/s) (m3/s) (m3 E3) (m3 E3) (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###
#####END_RESULTS_STORM_7

```
#####START_STORM#8
PMF, 120 MINUTE DESIGN STORM, WITH IFD COEFFICIENTS LOCATED IN AN EXTERNAL FILE,
FORBESRIGBYMGA.IFD.
        1.00
        1.00
#####START_DESIGN_RAIN
        9999          60        1.00
IFD_COEFFS_IN_IFD_FILE
T:\Water\Hydrology\IFDF\ARRIFD_Data\ForbesRigbyDesignMGA.ifd
           1
VINCENTIA#1
VINCENTIA#1            1               286324.00  6116427.00        5.00       46.00        8.30
3.10       95.00       20.00        6.00        4.26       15.80        0.00     1200.00
0        0.65 (Design) near JervisBayRd & Vincenti
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#8

#####START_RESULTS_STORM_8



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         0.66
Rainfall depth         (mm) =       314.27
Excess rainfall        (mm) =       311.78
Calc. runoff depth     (mm) =       165.00  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =       292.196 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_SUBAREA_SUMMARY###################################################
SUBAREA          CENTRE OF AREA          OUTLET              DOWNSTREAM
                 Easting    Northing     Easting    Northing
SUB01          284673.81  6116728.50   285646.09  6117185.50 SUB04
SUB02          285327.09  6116309.00   285496.50  6116499.00 SUB03
SUB03          285636.69  6116796.00   285646.09  6117185.50 SUB04
SUB04          285675.31  6117403.00   285856.91  6117412.50 SUB05
SUB05          286374.81  6117659.50   286493.00  6118145.00 SINK
SUB06          285775.31  6116165.50   285882.59  6116236.00 SUB07
SUB07          286204.41  6116710.00   286797.59  6116837.00 SUB10
SUB08          286210.09  6115782.00   286197.69  6115892.00 SUB09
SUB09          286694.00  6116084.00   286797.59  6116837.00 SUB10
SUB10          286901.50  6116865.00   287096.09  6117188.50 SWAMP
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SUB11          287767.81  6115361.00   287370.00  6116167.00 SUB12
SUB12          287219.00  6116493.50   287096.09  6117188.50 SWAMP
SWAMP          287096.09  6117188.50   287096.09  6117188.50 SINK

SUBAREA       AREA   CONTRIBUTING     IMP  CODES(1=exists)          QLINEAR
              (ha)        AREA(ha)    (%)  Stream Outlet  Local       (m3/s)
                                           Struct  Struct
SUB01           147.10     147.10     0.0    0      0      0          -99.90
SUB02            29.70      29.70     0.0    0      0      0          -99.90
SUB03            26.80      56.50     0.0    1      0      0          -99.90
SUB04            38.40     242.00     0.0    1      0      0          -99.90
SUB05            91.20     333.20     0.0    1      0      0          -99.90
SUB06             9.40       9.40     2.0    0      0      0          -99.90
SUB07            60.70      70.10     0.0    1      0      0          -99.90
SUB08            19.20      19.20     0.0    0      0      0          -99.90
SUB09            88.80     108.00     5.0    1      0      0          -99.90
SUB10            28.70     206.80     0.0    1      0      0          -99.90
SUB11           141.40     141.40     0.0    0      0      0          -99.90
SUB12            23.60     165.00     0.0    1      0      0          -99.90
SWAMP             0.00     371.80     0.0    1      0      0          -99.90
#####END_SUBAREA_SUMMARY#############################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED      OUTFLOW      BALANCE
         TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     460.102       0.000       0.000       0.000     460.102       0.000
SUB02
       0.000       0.000      92.754       0.000       0.000       0.000      92.754       0.000
SUB03
      92.754       0.000      83.692       0.000       0.000       0.000     176.551      -0.105
SUB04
     636.652       0.000     119.932       0.000       0.000       0.000     757.162      -0.577
SUB05
     757.162       0.000     285.133       0.000       0.000       0.000    1043.306      -1.011
SUB06
       0.000       0.000      28.743       0.591       0.000       0.000      29.334       0.000
SUB07
      29.334       0.000     189.827       0.000       0.000       0.000     219.224      -0.063
SUB08
       0.000       0.000      59.949       0.000       0.000       0.000      59.949       0.000
SUB09
      59.949       0.000     263.768      13.953       0.000       0.000     337.814      -0.144
SUB10
     557.038       0.000      89.631       0.000       0.000       0.000     647.056      -0.388
SUB11
       0.000       0.000     442.146       0.000       0.000       0.000     442.146       0.000
SUB12
     442.146       0.000      73.701       0.000       0.000       0.000     516.161      -0.314
SWAMP
    1163.221       0.000       0.000       0.000       0.000       0.000    1163.221       0.000
#####END_VOLUME_SUMMARY##########################################################################


#####START_PEAK_SUMMARY#########################################################
SUBAREA OUT_STR     STREAM     STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP     BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                   including
               imported to                                 imported to
                      TOP                                      BOTTOM
                  (Discharges in m3/s)
SUB01         0       0.000      0.000   111.537     0.000      0.000   111.537   111.537
SUB02         0       0.000      0.000    27.953     0.000      0.000    27.953    27.953
SUB03         0      27.953     26.189    25.509     0.000      0.000    50.536    50.536
SUB04         0     162.072    155.425    35.009     0.000      0.000   187.533   187.533
SUB05         0     187.533    169.605    74.440     0.000      0.000   232.110   232.110
SUB06         0       0.000      0.000     9.931     0.251      0.000    10.156    10.156
SUB07         0      10.156      7.636    52.044     0.000      0.000    59.525    59.525
SUB08         0       0.000      0.000    19.075     0.000      0.000    19.075    19.075
```

```
SUB09        0      19.075    14.551    69.579     5.413     0.000    87.263    87.263
SUB10        0     146.787   142.430    27.117     0.000     0.000   167.220   167.220
SUB11        0       0.000     0.000   107.919     0.000     0.000   107.919   107.919
SUB12        0     107.919   104.736    22.776     0.000     0.000   124.975   124.975
SWAMP        0     292.196   292.196     0.000     0.000     0.000   292.196   292.196
#####END_PEAK_SUMMARY#########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#######################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY#########################################
#####END_RESULTS_STORM_8



#####START_MULTIPLE_STORM_SUMMARY#########################################
STORM   ---BURST-----   ---EVENT-----  RAINFALL  EXCESS       PEAK
        ARI  DURATION   ARI  DURATION            RAINFALL     DISCHARGE
      (year) (minutes) (year)(minutes)   (mm)     (mm)         (m3/s)
  1        1      120       0       0     44.06     39.10         22.27
  2        2      120       0       0     57.54     52.58         30.99
  3        5      120       0       0     76.99     72.03         44.48
  4       10      120       0       0     88.72     83.76         53.10
  5       20      120       0       0    103.85     98.88         64.57
  6       50      120       0       0    123.97    119.00         76.93
  7      100      120       0       0    139.50    134.54         88.91
  8     9999       60       0       0    314.27    311.78        292.20
#####END_MULTIPLE_STORM_SUMMARY#########################################

#####END_QA_SUMMARY_FILE#################################################
```

Post-Development

```
#####START_QA_SUMMARY_FILE#################################################

F:\Projects\FR 2004-016 Vincentia\WBNM\Vincentia_Base_PRO-Jan06.wbn
Program run at 10:21 on   6  1 2006  (ddmmyy)

Your Organisation
Organisations Specialisation
Street Address
City Address
State Address
Country
Zipcode
Phone Number
Fax Number
Your email address
beta_107_user


out_metafile= T
out_culverts= F
out_scourable= F
sum_catchments= T
sum_volumes= T
sum_outlet_structures= T
sum_local_structures= T
sum_subareas= F
sum_depths= F
sum_Qpeaks= T
sum_Tpeaks= F
sum_multiStorms= T
dbg_run= F
dbg_echo= F
dbg_edit= F
dbg_ifd= F
trig_flowmin=           5

#####START_PREAMBLE_BLOCK##########|###########|###########|###########|
Project Number: 104-016-3
RUNFILE: F:\Projects\FR 2004-016 Vincentia\WBNM\Vincentia_Base_PRO-Jan06.wbn
Storms:       1   2   5  10  20  50 100 PMF
Durations:   90  90  90  90  90  90  90  60
Model Purpose:
Structure Blockage Condition:
Comment: Vincentia - PROPOSED
Max 8 lines of text
#####END_PREAMBLE_BLOCK############|###########|###########|###########|


#####START_STATUS_BLOCK############|###########|###########|###########|

last edited on 6/01/2006 10:21:49 AM
by Andrew of Forbes Rigby Pty Ltd
2003_V102
#####END_STATUS_BLOCK##############|###########|###########|###########|


#####START_DISPLAY_BLOCK###########|###########|###########|###########|
    284573.8   6118245.0    287867.8   6115261.0
        none
         0.0         0.0         0.0         0.0         0.0         0.0
#####END_DISPLAY_BLOCK#############|###########|###########|###########|


#####START_TOPOLOGY_BLOCK##########|###########|###########|###########|
          13
SUB01           284673.8   6116728.5    285646.1   6117185.5 SUB04
```

```
SUB02           285327.1   6116309.0    285496.5   6116499.0 SUB03
SUB03           285636.7   6116796.0    285646.1   6117185.5 SUB04
SUB04           285675.3   6117403.0    285856.9   6117412.5 SUB05
SUB05           286374.8   6117659.5    286493.0   6118145.0 SINK
SUB06           285775.3   6116165.5    285882.6   6116236.0 SUB07
SUB07           286204.4   6116710.0    286797.6   6116837.0 SUB10
SUB08           286210.1   6115782.0    286197.7   6115892.0 SUB09
SUB09           286694.0   6116084.0    286797.6   6116837.0 SUB10
SUB10           286901.5   6116865.0    287096.1   6117188.5 SWAMP
SUB11           287767.8   6115361.0    287370.0   6116167.0 SUB12
SUB12           287219.0   6116493.5    287096.1   6117188.5 SWAMP
SWAMP           287096.1   6117188.5    287096.1   6117188.5 SINK
#####END_TOPOLOGY_BLOCK############|###########|###########|###########|


#####START_SURFACES_BLOCKS##########|###########|###########|###########|
        0.77
      -99.90
SUB01             147.10         0.0        1.29        0.10
SUB02              29.70         0.0        1.29        0.10
SUB03              26.80        20.0        1.29        0.10
SUB04              38.40         5.6        1.29        0.10
SUB05              91.20         0.0        1.29        0.10
SUB06               9.40         2.0        1.29        0.10
SUB07              60.70        20.0        1.29        0.10
SUB08              19.20         0.0        1.29        0.10
SUB09              88.80        23.0        1.29        0.10
SUB10              28.70         0.0        1.29        0.10
SUB11             141.40         0.0        1.29        0.10
SUB12              23.60         0.0        1.29        0.10
SWAMP               0.00         0.0        1.29        0.10
#####END_SURFACES_BLOCK############|###########|###########|###########|


#####START_FLOWPATHS_BLOCK#########|###########|###########|###########|
           8
SUB03
#####ROUTING
        1.00
SUB04
#####ROUTING
        1.00
SUB05
#####ROUTING
        1.00
SUB07
#####ROUTING
        1.00
SUB09
#####ROUTING
        1.00
SUB10
#####ROUTING
        1.00
SUB12
#####ROUTING
        1.00
SWAMP
#####ROUTING
        1.00
#####END_FLOWPATHS_BLOCK###########|###########|###########|###########|


#####START_LOCAL_STRUCTURES_BLOCK##|###########|###########|###########|
           0
#####END_LOCAL_STRUCTURES_BLOCK####|###########|###########|###########|


#####START_OUTLET_STRUCTURES_BLOCK#|###########|###########|###########|
           0
#####END_OUTLET_STRUCTURES_BLOCK###|###########|###########|###########|
```

```
#####START_STORM_BLOCK#############|###########|###########|###########|
           8
#####START_STORM#1
 1 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
           1          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#1

#####START_RESULTS_STORM_1



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =        40.36
Excess rainfall        (mm) =        36.82
Calc. runoff depth     (mm) =        19.65  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        24.108 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED      OUTFLOW      BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000      54.427       0.000       0.000       0.000      54.427       0.000
SUB02
       0.000       0.000      10.917       0.000       0.000       0.000      10.917       0.000
SUB03
      10.917       0.000       7.873       2.163       0.000       0.000      20.968      -0.016
SUB04
      75.395       0.000      13.349       0.868       0.000       0.000      89.753      -0.141
SUB05
      89.753       0.000      33.650       0.000       0.000       0.000     123.654      -0.251
```

```
SUB06
       0.000       0.000       3.378       0.076       0.000       0.000       3.454       0.000
SUB07
       3.454       0.000      17.901       4.899       0.000       0.000      26.257      -0.004
SUB08
       0.000       0.000       7.049       0.000       0.000       0.000       7.049       0.000
SUB09
       7.049       0.000      25.226       8.242       0.000       0.000      40.538      -0.020
SUB10
      66.795       0.000      10.547       0.000       0.000       0.000      77.455      -0.113
SUB11
       0.000       0.000      52.298       0.000       0.000       0.000      52.298       0.000
SUB12
      52.298       0.000       8.667       0.000       0.000       0.000      61.053      -0.087
SWAMP
     138.508       0.000       0.000       0.000       0.000       0.000     138.508       0.000
#####END_VOLUME_SUMMARY#################################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                      TOP                                    BOTTOM
                   (Discharges in m3/s)
SUB01        0       0.000     0.000     8.862     0.000     0.000     8.862     8.862
SUB02        0       0.000     0.000     2.977     0.000     0.000     2.977     2.977
SUB03        0       2.977     2.119     2.360     1.310     0.000     4.714     4.714
SUB04        0      13.412    11.734     3.423     0.550     0.000    14.230    14.230
SUB05        0      14.230    11.992     6.381     0.000     0.000    16.306    16.306
SUB06        0       0.000     0.000     1.260     0.052     0.000     1.312     1.312
SUB07        0       1.312     0.582     4.187     2.831     0.000     7.275     7.275
SUB08        0       0.000     0.000     2.179     0.000     0.000     2.179     2.179
SUB09        0       2.179     1.058     5.273     4.609     0.000    10.247    10.247
SUB10        0      17.522    12.408     2.906     0.000     0.000    14.839    14.839
SUB11        0       0.000     0.000     8.617     0.000     0.000     8.617     8.617
SUB12        0       8.617     7.889     2.529     0.000     0.000     9.512     9.512
SWAMP        0      24.108    24.108     0.000     0.000     0.000    24.108    24.108
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###########################################

#####END_RESULTS_STORM_1

#####START_STORM#2
 2 Year,  90 Minute Design Storm
```

```
        1.00
        1.00
#####START_DESIGN_RAIN
           2          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#2

#####START_RESULTS_STORM_2


#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =        52.56
Excess rainfall        (mm) =        49.03
Calc. runoff depth     (mm) =        26.12  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        33.608 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#############################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000      72.495       0.000       0.000       0.000      72.495       0.000
SUB02
       0.000       0.000      14.552       0.000       0.000       0.000      14.552       0.000
SUB03
      14.552       0.000      10.499       2.817       0.000       0.000      27.891      -0.023
SUB04
     100.386       0.000      17.781       1.130       0.000       0.000     119.473      -0.177
SUB05
     119.473       0.000      44.870       0.000       0.000       0.000     164.646      -0.302
SUB06
       0.000       0.000       4.505       0.099       0.000       0.000       4.604       0.000
SUB07
       4.604       0.000      23.856       6.381       0.000       0.000      34.849      -0.009
SUB08
       0.000       0.000       9.400       0.000       0.000       0.000       9.400       0.000
```

```
SUB09
       9.400       0.000      33.626      10.735       0.000       0.000      53.788      -0.027
SUB10
      88.637       0.000      14.061       0.000       0.000       0.000     102.851      -0.153
SUB11
       0.000       0.000      69.663       0.000       0.000       0.000      69.663       0.000
SUB12
      69.663       0.000      11.558       0.000       0.000       0.000      81.329      -0.109
SWAMP
     184.181       0.000       0.000       0.000       0.000       0.000     184.181       0.000
#####END_VOLUME_SUMMARY#########################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                      TOP                                    BOTTOM
                  (Discharges in m3/s)
SUB01        0       0.000     0.000    12.348     0.000     0.000    12.348    12.348
SUB02        0       0.000     0.000     4.136     0.000     0.000     4.136     4.136
SUB03        0       4.136     2.964     3.269     1.707     0.000     6.538     6.538
SUB04        0      18.781    16.384     4.764     0.717     0.000    19.836    19.836
SUB05        0      19.836    16.897     8.951     0.000     0.000    22.983    22.983
SUB06        0       0.000     0.000     1.730     0.068     0.000     1.797     1.797
SUB07        0       1.797     0.812     5.841     3.688     0.000     9.914     9.914
SUB08        0       0.000     0.000     3.014     0.000     0.000     3.014     3.014
SUB09        0       3.014     1.486     7.381     6.003     0.000    13.940    13.940
SUB10        0      23.854    17.252     4.036     0.000     0.000    20.619    20.619
SUB11        0       0.000     0.000    12.002     0.000     0.000    12.002    12.002
SUB12        0      12.002    11.018     3.505     0.000     0.000    13.309    13.309
SWAMP        0      33.608    33.608     0.000     0.000     0.000    33.608    33.608
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#############################################
SUBAREA                INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                       STORAGE                           STORAGE
                       (Volumes in thousands m3)


SUBAREA                 INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                          PEAK       PEAK     VOLUME     STORED  ELEVATION
                        (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###############################################


#####START_LOCAL_STRUCTURE_SUMMARY##############################################
SUBAREA                INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                       STORAGE                           STORAGE
                       (Volumes in thousands m3)


SUBAREA                 INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                          PEAK       PEAK     VOLUME     STORED  ELEVATION
                        (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY################################################

#####END_RESULTS_STORM_2

#####START_STORM#3
 5 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
           5          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
```

```
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
          0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
          0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#3

#####START_RESULTS_STORM_3



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =        69.82
Excess rainfall        (mm) =        66.28
Calc. runoff depth     (mm) =        35.28  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        47.773 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#############################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000      98.035       0.000       0.000       0.000      98.035       0.000
SUB02
       0.000       0.000      19.692       0.000       0.000       0.000      19.692       0.000
SUB03
      19.692       0.000      14.210       3.742       0.000       0.000      37.678      -0.034
SUB04
     135.713       0.000      24.047       1.501       0.000       0.000     161.494      -0.233
SUB05
     161.494       0.000      60.730       0.000       0.000       0.000     222.601      -0.377
SUB06
       0.000       0.000       6.098       0.131       0.000       0.000       6.230       0.000
SUB07
       6.230       0.000      32.277       8.475       0.000       0.000      46.996      -0.014
SUB08
       0.000       0.000      12.722       0.000       0.000       0.000      12.722       0.000
SUB09
      12.722       0.000      45.500      14.259       0.000       0.000      72.517      -0.036
SUB10
     119.513       0.000      19.028       0.000       0.000       0.000     138.749      -0.208
SUB11
       0.000       0.000      94.202       0.000       0.000       0.000      94.202       0.000
```

```
SUB12
      94.202       0.000      15.643       0.000       0.000       0.000     109.987      -0.142
SWAMP
     248.736       0.000       0.000       0.000       0.000       0.000     248.736       0.000
#####END_VOLUME_SUMMARY#########################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                      TOP                                    BOTTOM
                  (Discharges in m3/s)
SUB01        0       0.000     0.000    17.585     0.000     0.000    17.585    17.585
SUB02        0       0.000     0.000     5.856     0.000     0.000     5.856     5.856
SUB03        0       5.856     4.226     4.611     2.267     0.000     9.267     9.267
SUB04        0      26.852    23.299     6.758     0.952     0.000    28.189    28.189
SUB05        0      28.189    24.221    12.810     0.000     0.000    32.984    32.984
SUB06        0       0.000     0.000     2.417     0.090     0.000     2.507     2.507
SUB07        0       2.507     1.155     8.312     4.898     0.000    13.801    13.801
SUB08        0       0.000     0.000     4.247     0.000     0.000     4.247     4.247
SUB09        0       4.247     2.122    10.535     7.974     0.000    19.373    19.373
SUB10        0      33.174    24.473     5.712     0.000     0.000    29.220    29.220
SUB11        0       0.000     0.000    17.136     0.000     0.000    17.136    17.136
SUB12        0      17.136    15.695     4.950     0.000     0.000    19.033    19.033
SWAMP        0      47.773    47.773     0.000     0.000     0.000    47.773    47.773
#####END_PEAK_SUMMARY###########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###############################################


#####START_LOCAL_STRUCTURE_SUMMARY##############################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY################################################

#####END_RESULTS_STORM_3

#####START_STORM#4
 10 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
          10          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
```

```
#####START_LOSS_RATES
SUB01                0.00        2.50        0.00
SUB02                0.00        2.50        0.00
SUB03                0.00        2.50        0.00
SUB04                0.00        2.50        0.00
SUB05                0.00        2.50        0.00
SUB06                0.00        2.50        0.00
SUB07                0.00        2.50        0.00
SUB08                0.00        2.50        0.00
SUB09                0.00        2.50        0.00
SUB10                0.00        2.50        0.00
SUB11                0.00        2.50        0.00
SUB12                0.00        2.50        0.00
SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#4

#####START_RESULTS_STORM_4


#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =        80.15
Excess rainfall        (mm) =        76.61
Calc. runoff depth     (mm) =        40.76  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        56.610 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#############################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     113.305       0.000       0.000       0.000     113.305       0.000
SUB02
       0.000       0.000      22.772       0.000       0.000       0.000      22.772       0.000
SUB03
      22.772       0.000      16.430       4.296       0.000       0.000      43.538      -0.041
SUB04
     156.844       0.000      27.804       1.723       0.000       0.000     186.619      -0.248
SUB05
     186.619       0.000      70.211       0.000       0.000       0.000     257.237      -0.407
SUB06
       0.000       0.000       7.052       0.151       0.000       0.000       7.202       0.000
SUB07
       7.202       0.000      37.300       9.730       0.000       0.000      54.249      -0.017
SUB08
       0.000       0.000      14.712       0.000       0.000       0.000      14.712       0.000
SUB09
      14.712       0.000      52.588      16.369       0.000       0.000      83.712      -0.042
SUB10
     137.961       0.000      22.004       0.000       0.000       0.000     160.199      -0.234
SUB11
       0.000       0.000     108.878       0.000       0.000       0.000     108.878       0.000
SUB12
     108.878       0.000      18.088       0.000       0.000       0.000     127.123      -0.157
SWAMP
     287.323       0.000       0.000       0.000       0.000       0.000     287.323       0.000
#####END_VOLUME_SUMMARY#############################################################################
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#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                  including                                 including
                imported to                               imported to
                       TOP                                     BOTTOM
                   (Discharges in m3/s)
SUB01        0       0.000     0.000    20.937     0.000     0.000    20.937    20.937
SUB02        0       0.000     0.000     6.923     0.000     0.000     6.923     6.923
SUB03        0       6.923     5.011     5.441     2.603     0.000    10.968    10.968
SUB04        0      31.905    27.614     7.998     1.093     0.000    33.498    33.498
SUB05        0      33.498    28.776    15.224     0.000     0.000    39.247    39.247
SUB06        0       0.000     0.000     2.839     0.103     0.000     2.943     2.943
SUB07        0       2.943     1.370     9.851     5.623     0.000    16.199    16.199
SUB08        0       0.000     0.000     5.010     0.000     0.000     5.010     5.010
SUB09        0       5.010     2.515    12.502     9.154     0.000    22.725    22.725
SUB10        0      38.923    28.974     6.752     0.000     0.000    34.551    34.551
SUB11        0       0.000     0.000    20.399     0.000     0.000    20.399    20.399
SUB12        0      20.399    18.642     5.845     0.000     0.000    22.600    22.600
SWAMP        0      56.610    56.610     0.000     0.000     0.000    56.610    56.610
#####END_PEAK_SUMMARY###########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###########################################

#####END_RESULTS_STORM_4

#####START_STORM#5
 20 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
          20          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
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SUB07                0.00        2.50        0.00
SUB08                0.00        2.50        0.00
SUB09                0.00        2.50        0.00
SUB10                0.00        2.50        0.00
SUB11                0.00        2.50        0.00
SUB12                0.00        2.50        0.00
SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
          0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
          0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#5

#####START_RESULTS_STORM_5



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =        93.51
Excess rainfall        (mm) =        89.98
Calc. runoff depth     (mm) =        47.84  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        68.364 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#############################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     133.085       0.000       0.000       0.000     133.085       0.000
SUB02
       0.000       0.000      26.751       0.000       0.000       0.000      26.751       0.000
SUB03
      26.751       0.000      19.305       5.012       0.000       0.000      51.117      -0.048
SUB04
     184.201       0.000      32.661       2.011       0.000       0.000     219.148      -0.275
SUB05
     219.148       0.000      82.478       0.000       0.000       0.000     302.095      -0.469
SUB06
       0.000       0.000       8.286       0.176       0.000       0.000       8.461       0.000
SUB07
       8.461       0.000      43.790      11.352       0.000       0.000      63.623      -0.019
SUB08
       0.000       0.000      17.287       0.000       0.000       0.000      17.287       0.000
SUB09
      17.287       0.000      61.784      19.099       0.000       0.000      98.223      -0.053
SUB10
     161.846       0.000      25.850       0.000       0.000       0.000     187.950      -0.254
SUB11
       0.000       0.000     127.931       0.000       0.000       0.000     127.931       0.000
SUB12
     127.931       0.000      21.252       0.000       0.000       0.000     149.352      -0.170
SWAMP
     337.302       0.000       0.000       0.000       0.000       0.000     337.302       0.000
#####END_VOLUME_SUMMARY#############################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM     STREAM      LOCAL      LOCAL     DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP     BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                   including
                imported to                                 imported to
                       TOP                                      BOTTOM
```

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                (Discharges in m3/s)
SUB01        0       0.000     0.000    25.416     0.000     0.000    25.416    25.416
SUB02        0       0.000     0.000     8.335     0.000     0.000     8.335     8.335
SUB03        0       8.335     6.052     6.541     3.037     0.000    13.233    13.233
SUB04        0      38.650    33.415     9.642     1.275     0.000    40.571    40.571
SUB05        0      40.571    34.850    18.442     0.000     0.000    47.623    47.623
SUB06        0       0.000     0.000     3.395     0.121     0.000     3.516     3.516
SUB07        0       3.516     1.657    11.892     6.561     0.000    19.360    19.360
SUB08        0       0.000     0.000     6.018     0.000     0.000     6.018     6.018
SUB09        0       6.018     3.040    15.124    10.681     0.000    27.156    27.156
SUB10        0      46.517    34.938     8.127     0.000     0.000    41.643    41.643
SUB11        0       0.000     0.000    24.760     0.000     0.000    24.760    24.760
SUB12        0      24.760    22.572     7.029     0.000     0.000    27.353    27.353
SWAMP        0      68.364    68.364     0.000     0.000     0.000    68.364    68.364
#####END_PEAK_SUMMARY#########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY############################################

#####END_RESULTS_STORM_5

#####START_STORM#6
 50 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
          50          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
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SWAMP                0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#6

#####START_RESULTS_STORM_6



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =       111.24
Excess rainfall        (mm) =       107.70
Calc. runoff depth     (mm) =        57.26  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        80.941 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED      OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     159.437       0.000       0.000       0.000     159.437       0.000
SUB02
       0.000       0.000      32.031       0.000       0.000       0.000      32.031       0.000
SUB03
      32.031       0.000      23.112       5.962       0.000       0.000      61.162      -0.057
SUB04
     220.599       0.000      39.109       2.392       0.000       0.000     262.416      -0.315
SUB05
     262.416       0.000      98.711       0.000       0.000       0.000     361.668      -0.541
SUB06
       0.000       0.000       9.919       0.209       0.000       0.000      10.129       0.000
SUB07
      10.129       0.000      52.439      13.504       0.000       0.000      76.096      -0.025
SUB08
       0.000       0.000      20.694       0.000       0.000       0.000      20.694       0.000
SUB09
      20.694       0.000      73.939      22.719       0.000       0.000     117.414      -0.062
SUB10
     193.510       0.000      30.950       0.000       0.000       0.000     224.762      -0.303
SUB11
       0.000       0.000     153.245       0.000       0.000       0.000     153.245       0.000
SUB12
     153.245       0.000      25.442       0.000       0.000       0.000     178.897      -0.211
SWAMP
     403.659       0.000       0.000       0.000       0.000       0.000     403.659       0.000
#####END_VOLUME_SUMMARY#########################################################################


#####START_PEAK_SUMMARY#########################################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                     TOP                                     BOTTOM
                  (Discharges in m3/s)
SUB01        0       0.000     0.000    29.837     0.000     0.000    29.837    29.837
SUB02        0       0.000     0.000     9.669     0.000     0.000     9.669     9.669
SUB03        0       9.669     7.177     7.564     3.372     0.000    15.420    15.420
SUB04        0      45.257    39.945    11.201     1.414     0.000    48.406    48.406
SUB05        0      48.406    42.268    21.574     0.000     0.000    57.828    57.828
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SUB06        0       0.000     0.000     3.895     0.133     0.000     4.029     4.029
SUB07        0       4.029     1.979    13.852     7.300     0.000    22.269    22.269
SUB08        0       0.000     0.000     6.951     0.000     0.000     6.951     6.951
SUB09        0       6.951     3.657    17.664    11.900     0.000    31.244    31.244
SUB10        0      53.513    41.242     9.425     0.000     0.000    49.081    49.081
SUB11        0       0.000     0.000    29.059     0.000     0.000    29.059    29.059
SUB12        0      29.059    26.933     8.136     0.000     0.000    32.548    32.548
SWAMP        0      80.941    80.941     0.000     0.000     0.000    80.941    80.941
#####END_PEAK_SUMMARY#########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                           STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###########################################

#####END_RESULTS_STORM_6

#####START_STORM#7
 100 Year,  90 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
         100          90        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
```

```
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#7

#####START_RESULTS_STORM_7



#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =       124.89
Excess rainfall        (mm) =       121.35
Calc. runoff depth     (mm) =        64.49  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =        93.073 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################


#####START_VOLUME_SUMMARY#####################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED     OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     179.671       0.000       0.000       0.000     179.671       0.000
SUB02
       0.000       0.000      36.092       0.000       0.000       0.000      36.092       0.000
SUB03
      36.092       0.000      26.044       6.694       0.000       0.000      68.892      -0.062
SUB04
     248.563       0.000      44.070       2.685       0.000       0.000     295.660      -0.341
SUB05
     295.660       0.000     111.240       0.000       0.000       0.000     407.467      -0.567
SUB06
       0.000       0.000      11.179       0.235       0.000       0.000      11.414       0.000
SUB07
      11.414       0.000      59.079      15.161       0.000       0.000      85.682      -0.028
SUB08
       0.000       0.000      23.321       0.000       0.000       0.000      23.321       0.000
SUB09
      23.321       0.000      83.323      25.507       0.000       0.000     132.223      -0.072
SUB10
     217.905       0.000      34.876       0.000       0.000       0.000     253.113      -0.332
SUB11
       0.000       0.000     172.634       0.000       0.000       0.000     172.634       0.000
SUB12
     172.634       0.000      28.672       0.000       0.000       0.000     201.548      -0.241
SWAMP
     454.661       0.000       0.000       0.000       0.000       0.000     454.661       0.000
#####END_VOLUME_SUMMARY#####################################################################


#####START_PEAK_SUMMARY#############################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                      TOP                                    BOTTOM
                (Discharges in m3/s)
SUB01        0       0.000     0.000    34.457     0.000     0.000    34.457    34.457
SUB02        0       0.000     0.000    11.095     0.000     0.000    11.095    11.095
SUB03        0      11.095     8.250     8.667     3.786     0.000    17.734    17.734
SUB04        0      52.191    46.004    12.867     1.587     0.000    55.755    55.755
SUB05        0      55.755    48.657    24.873     0.000     0.000    66.659    66.659
SUB06        0       0.000     0.000     4.447     0.150     0.000     4.596     4.596
SUB07        0       4.596     2.278    15.931     8.196     0.000    25.446    25.446
SUB08        0       0.000     0.000     7.962     0.000     0.000     7.962     7.962
SUB09        0       7.962     4.204    20.338    13.360     0.000    35.695    35.695
SUB10        0      61.141    47.408    10.814     0.000     0.000    56.375    56.375
SUB11        0       0.000     0.000    33.555     0.000     0.000    33.555    33.555
```

```
SUB12        0      33.555    31.010     9.327     0.000     0.000    37.455    37.455
SWAMP        0      93.073    93.073     0.000     0.000     0.000    93.073    93.073
#####END_PEAK_SUMMARY##########################################################################


#####START_OUTLET_STRUCTURE_SUMMARY#########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY###########################################


#####START_LOCAL_STRUCTURE_SUMMARY##########################################
SUBAREA               INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                      STORAGE                            STORAGE
                      (Volumes in thousands m3)


SUBAREA                INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                         PEAK       PEAK     VOLUME     STORED  ELEVATION
                       (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY############################################

#####END_RESULTS_STORM_7

#####START_STORM#8
 9999 Year,  60 Minute Design Storm
        1.00
        1.00
#####START_DESIGN_RAIN
        9999          60        1.00
IFD_COEFFS_IN_THIS_FILE
           1
VINCENTIA#1            1UNKNOWN          2863.24    61164.27        0.05       46.01        8.30
3.10       95.01       20.01        6.01        4.26       15.80        0.00       12.00
0        0.65 (Design)
#####END_DESIGN_RAIN
#####START_CALC_RAINGAUGE_WEIGHTS
#####END_CALC_RAINGAUGE_WEIGHTS
#####START_LOSS_RATES
SUB01               0.00        2.50        0.00
SUB02               0.00        2.50        0.00
SUB03               0.00        2.50        0.00
SUB04               0.00        2.50        0.00
SUB05               0.00        2.50        0.00
SUB06               0.00        2.50        0.00
SUB07               0.00        2.50        0.00
SUB08               0.00        2.50        0.00
SUB09               0.00        2.50        0.00
SUB10               0.00        2.50        0.00
SUB11               0.00        2.50        0.00
SUB12               0.00        2.50        0.00
SWAMP               0.00        2.50        0.00
#####END_LOSS_RATES
#####START_RECORDED_HYDROGRAPHS
           0
#####END_RECORDED_HYDROGRAPHS
#####START_IMPORTED_HYDROGRAPHS
           0
#####END_IMPORTED_HYDROGRAPHS
#####END_STORM#8

#####START_RESULTS_STORM_8
```

```
#####START_CATCHMENT_SUMMARY################################################
Catchment area   (hectares) =       705.00
Impervious percent      (%) =         5.71
Rainfall depth         (mm) =       314.27
Excess rainfall        (mm) =       311.91
Calc. runoff depth     (mm) =       165.05  - from bottom subarea
Recd. runoff depth     (mm) =         0.00  - from bottom subarea
Calc. peak discharge (m3/s) =       298.551 - from bottom subarea
Recd. peak discharge (m3/s) =         0.000 - from bottom subarea
#####END_CATCHMENT_SUMMARY##################################################
```

```
#####START_VOLUME_SUMMARY#########################################################################
SUBAREA DIRECTED IMPORTED      LOCAL       LOCAL    DIRECTED    IMPORTED      OUTFLOW     BALANCE
          TO TOP   TO TOP   PERVIOUS  IMPERVIOUS   TO BOTTOM   TO BOTTOM
        (Volumes in thousands m3)
SUB01
       0.000       0.000     460.102       0.000       0.000       0.000     460.102       0.000
SUB02
       0.000       0.000      92.754       0.000       0.000       0.000      92.754       0.000
SUB03
      92.754       0.000      66.946      16.844       0.000       0.000     176.650      -0.105
SUB04
     636.751       0.000     113.211       6.758       0.000       0.000     757.308      -0.588
SUB05
     757.308       0.000     285.133       0.000       0.000       0.000    1043.436      -0.995
SUB06
       0.000       0.000      28.743       0.591       0.000       0.000      29.334       0.000
SUB07
      29.334       0.000     151.753      38.152       0.000       0.000     219.301      -0.063
SUB08
       0.000       0.000      59.949       0.000       0.000       0.000      59.949       0.000
SUB09
      59.949       0.000     213.833      64.185       0.000       0.000     338.112      -0.144
SUB10
     557.413       0.000      89.631       0.000       0.000       0.000     647.468      -0.424
SUB11
       0.000       0.000     442.146       0.000       0.000       0.000     442.146       0.000
SUB12
     442.146       0.000      73.701       0.000       0.000       0.000     516.161      -0.314
SWAMP
    1163.633       0.000       0.000       0.000       0.000       0.000    1163.633       0.000
#####END_VOLUME_SUMMARY###########################################################################
```

```
#####START_PEAK_SUMMARY#############################################################
SUBAREA OUT_STR     STREAM    STREAM     LOCAL     LOCAL    DIRECTED  OUTLET_STRUCTURE
        1=exist        TOP    BOTTOM  PERVIOUS IMPERVIOUS  TO BOTTOM  INFLOW   OUTFLOW
                 including                                 including
               imported to                               imported to
                      TOP                                    BOTTOM
                  (Discharges in m3/s)
SUB01        0       0.000     0.000   111.537     0.000     0.000   111.537   111.537
SUB02        0       0.000     0.000    27.953     0.000     0.000    27.953    27.953
SUB03        0      27.953    26.189    20.979     6.527     0.000    50.585    50.585
SUB04        0     162.117   155.560    33.300     2.627     0.000   187.807   187.807
SUB05        0     187.807   169.842    74.440     0.000     0.000   233.238   233.238
SUB06        0       0.000     0.000     9.931     0.251     0.000    10.156    10.156
SUB07        0      10.156     7.636    42.859    14.667     0.000    61.881    61.881
SUB08        0       0.000     0.000    19.075     0.000     0.000    19.075    19.075
SUB09        0      19.075    14.551    57.869    24.447     0.000    90.066    90.066
SUB10        0     151.353   148.393    27.117     0.000     0.000   174.171   174.171
SUB11        0       0.000     0.000   107.919     0.000     0.000   107.919   107.919
SUB12        0     107.919   104.736    22.776     0.000     0.000   124.975   124.975
SWAMP        0     298.551   298.551     0.000     0.000     0.000   298.551   298.551
#####END_PEAK_SUMMARY###############################################################
```

```
#####START_OUTLET_STRUCTURE_SUMMARY#########################################
```

```
SUBAREA                INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                       STORAGE                           STORAGE
                       (Volumes in thousands m3)


SUBAREA                 INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                          PEAK       PEAK     VOLUME     STORED  ELEVATION
                        (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_OUTLET_STRUCTURE_SUMMARY##########################################


#####START_LOCAL_STRUCTURE_SUMMARY#########################################
SUBAREA                INITIAL     INFLOW    OUTFLOW      FINAL    BALANCE
                       STORAGE                           STORAGE
                       (Volumes in thousands m3)


SUBAREA                 INFLOW    OUTFLOW     INFLOW    MAX.VOL  MAX.WATER
                          PEAK       PEAK     VOLUME     STORED  ELEVATION
                        (m3/s)     (m3/s)    (m3 E3)    (m3 E3)   (metres)

#####END_LOCAL_STRUCTURE_SUMMARY###########################################

#####END_RESULTS_STORM_8

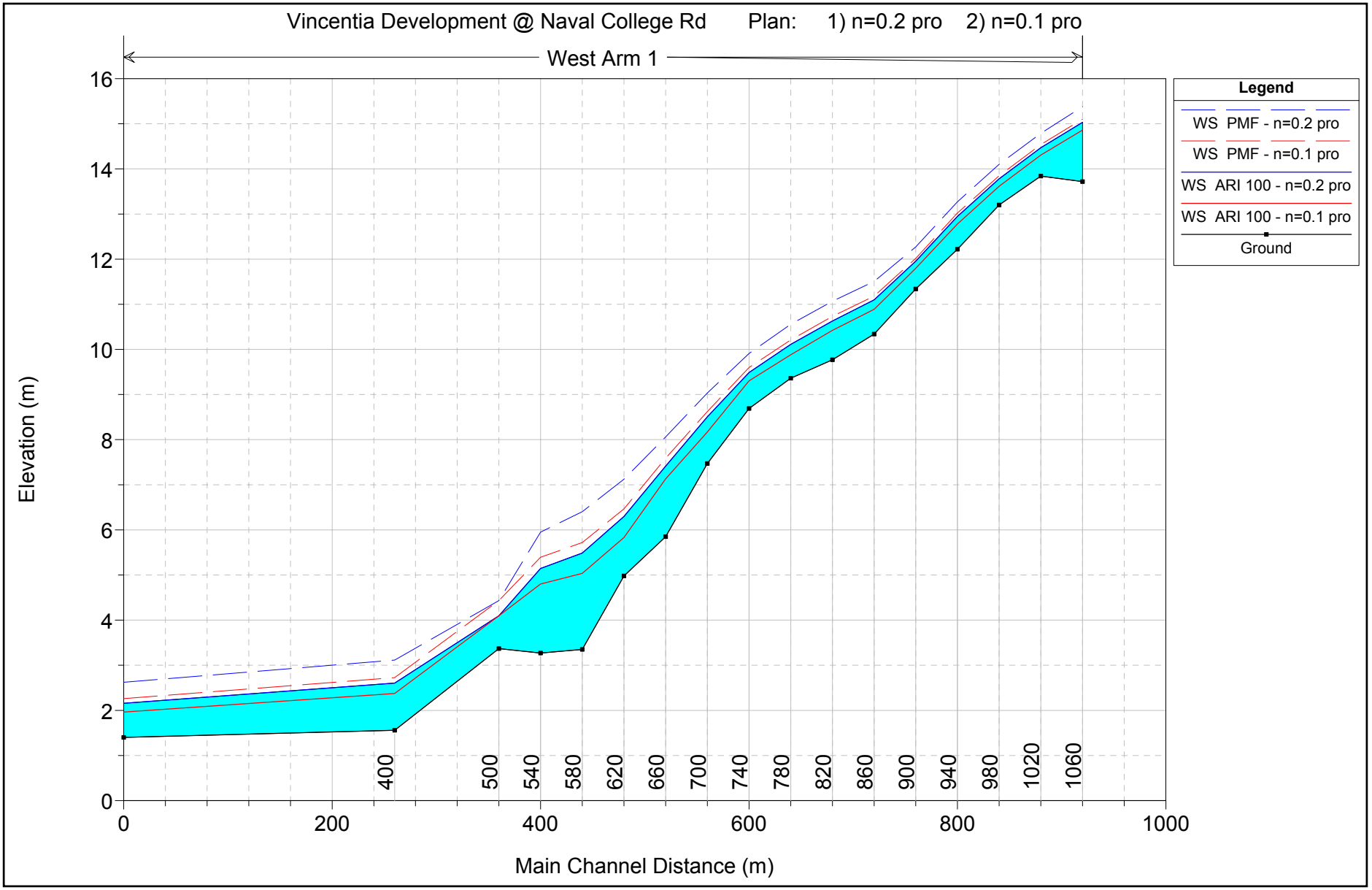


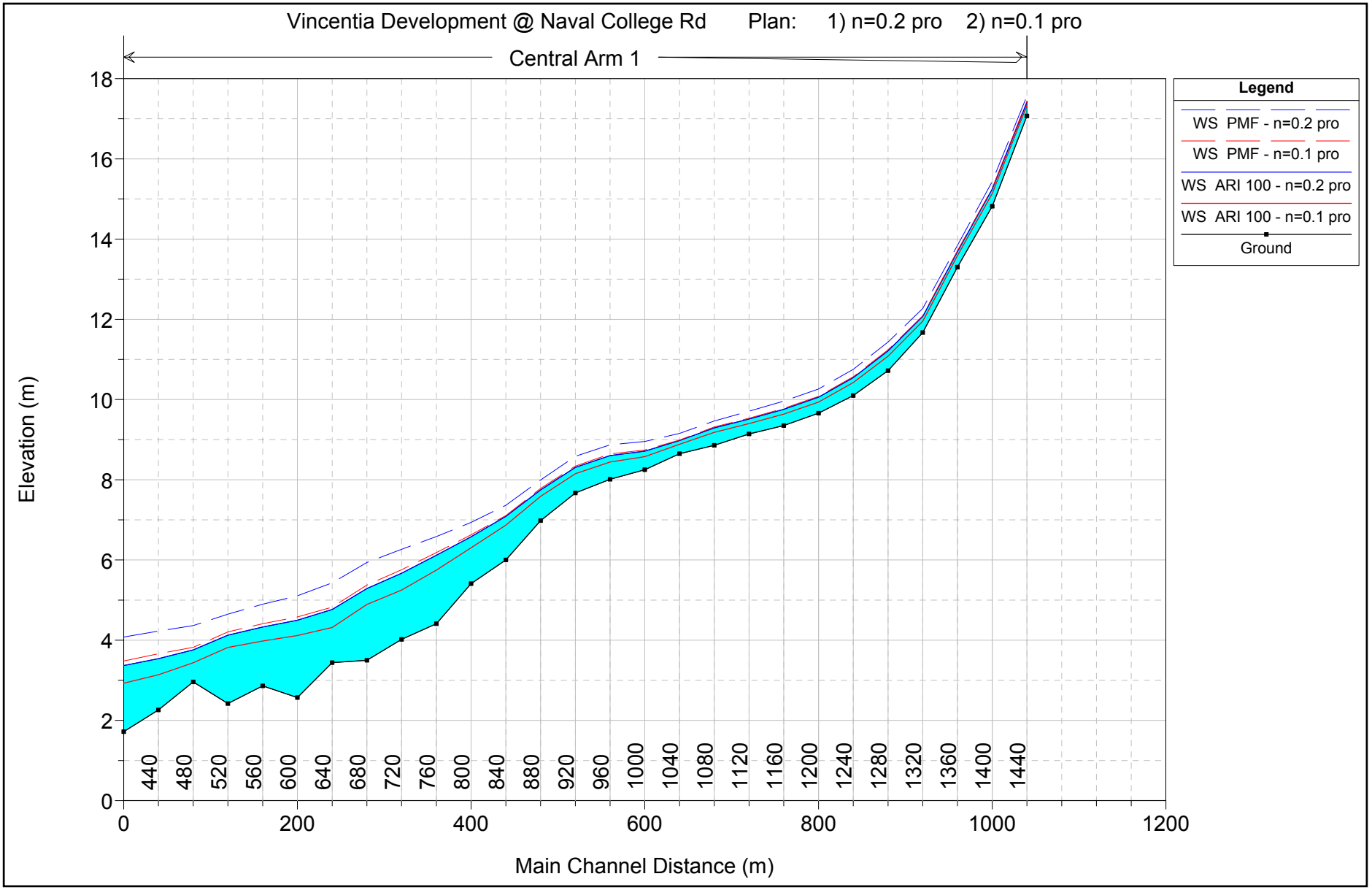
#####START_MULTIPLE_STORM_SUMMARY#########################################
STORM   ---BURST-----   ---EVENT-----  RAINFALL  EXCESS       PEAK
        ARI  DURATION   ARI  DURATION            RAINFALL     DISCHARGE
      (year) (minutes) (year)(minutes)   (mm)     (mm)         (m3/s)
  1        1      90       0       0     40.36     36.82         24.11
  2        2      90       0       0     52.56     49.03         33.61
  3        5      90       0       0     69.82     66.28         47.77
  4       10      90       0       0     80.15     76.61         56.61
  5       20      90       0       0     93.51     89.98         68.36
  6       50      90       0       0    111.24    107.70         80.94
  7      100      90       0       0    124.89    121.35         93.07
  8     9999      60       0       0    314.27    311.91        298.55
#####END_MULTIPLE_STORM_SUMMARY###########################################

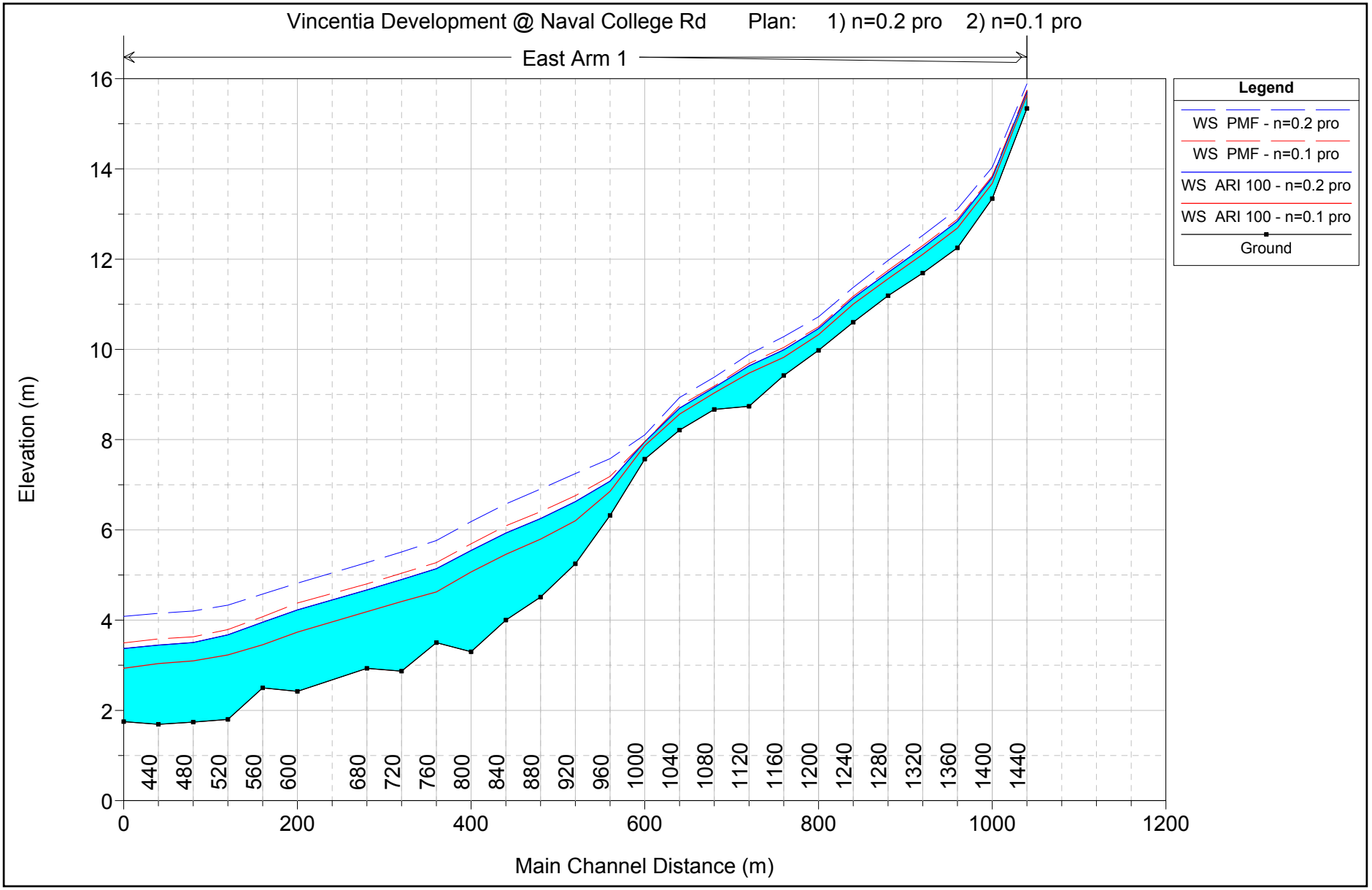
#####END_QA_SUMMARY_FILE###################################################
```

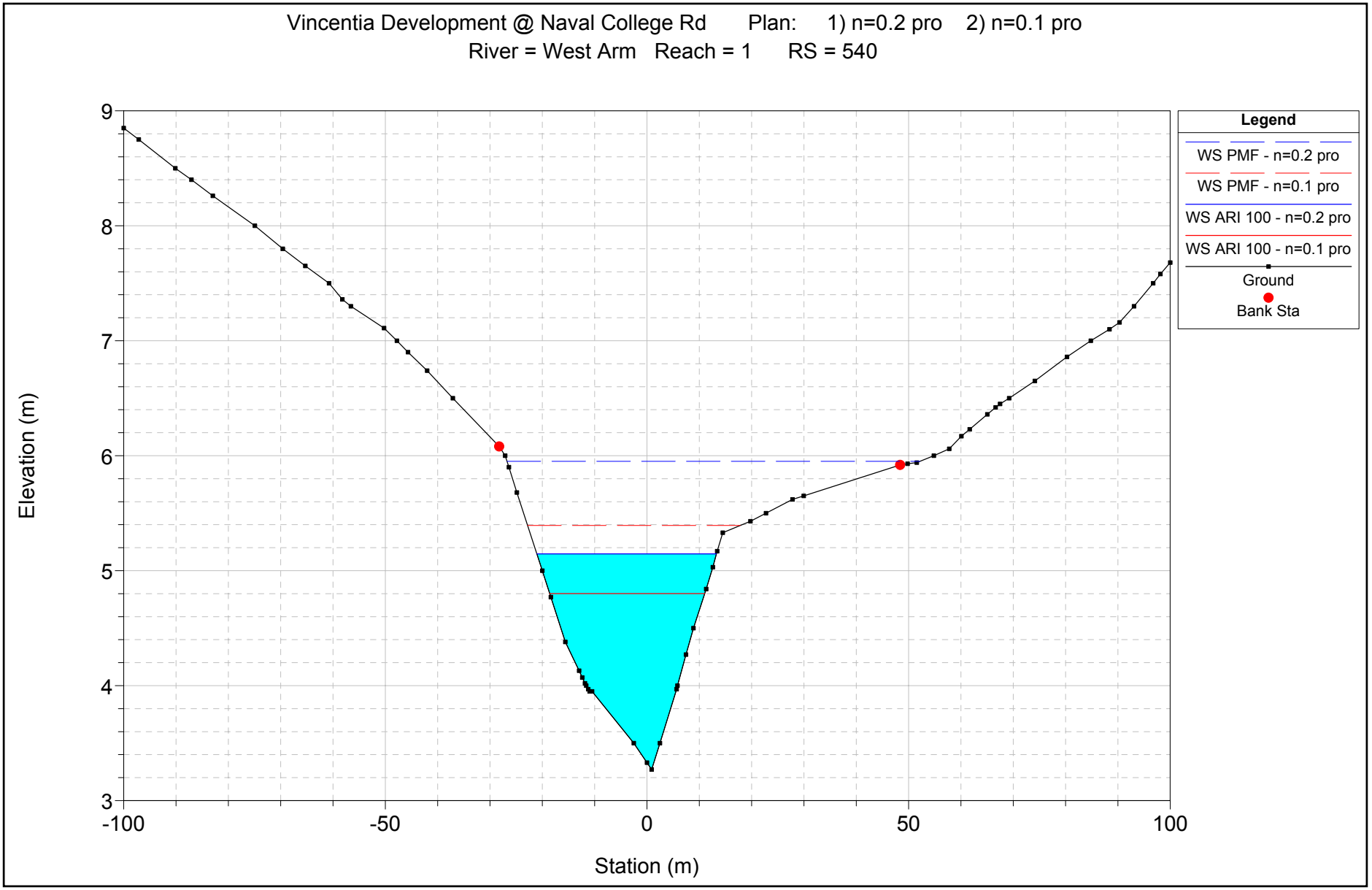
APPENDIX C

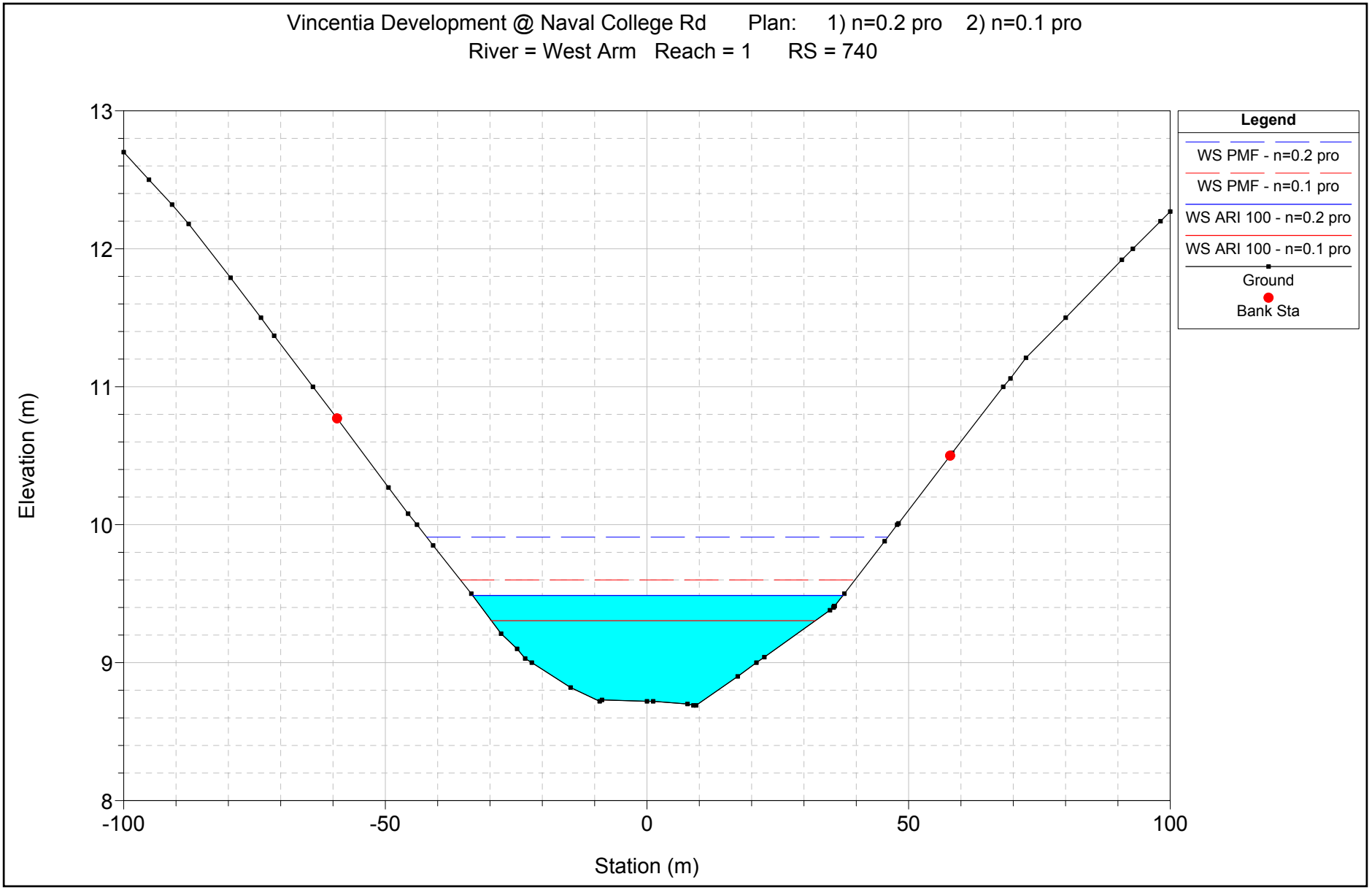
HECRAS MODELLING OUTPUT

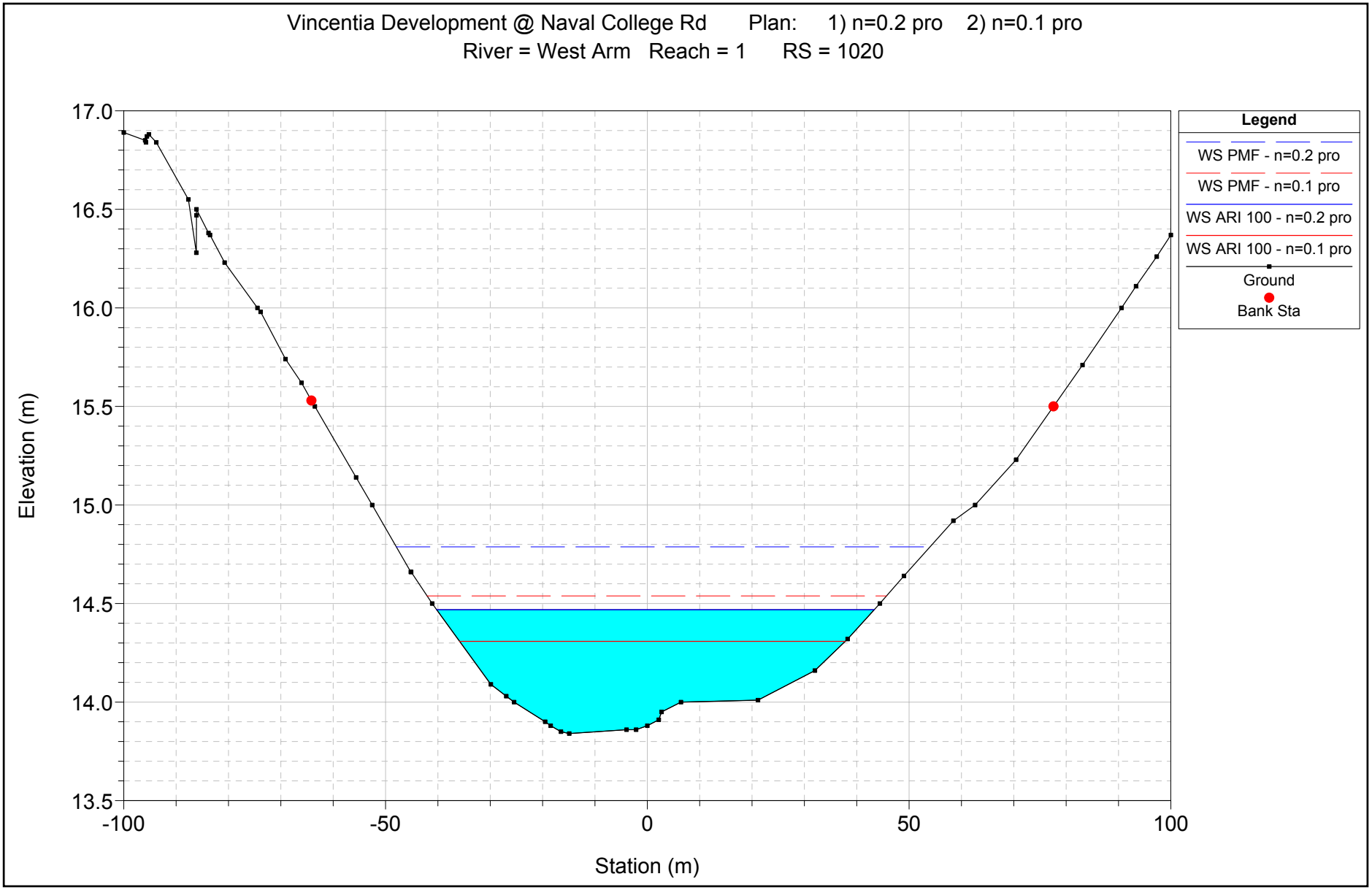

Vincentia Development @ Naval College Rd
Plan: 1) n=0.2 pro 2) n=0.1 pro
West Arm 1
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Elevation (m)
Main Channel Distance (m)
0
2
4
6
8
10
12
14
16
0
200
400
600
800
1000
400
500
540
580
620
660
700
740
780
820
860
900
940
980
1020
1060

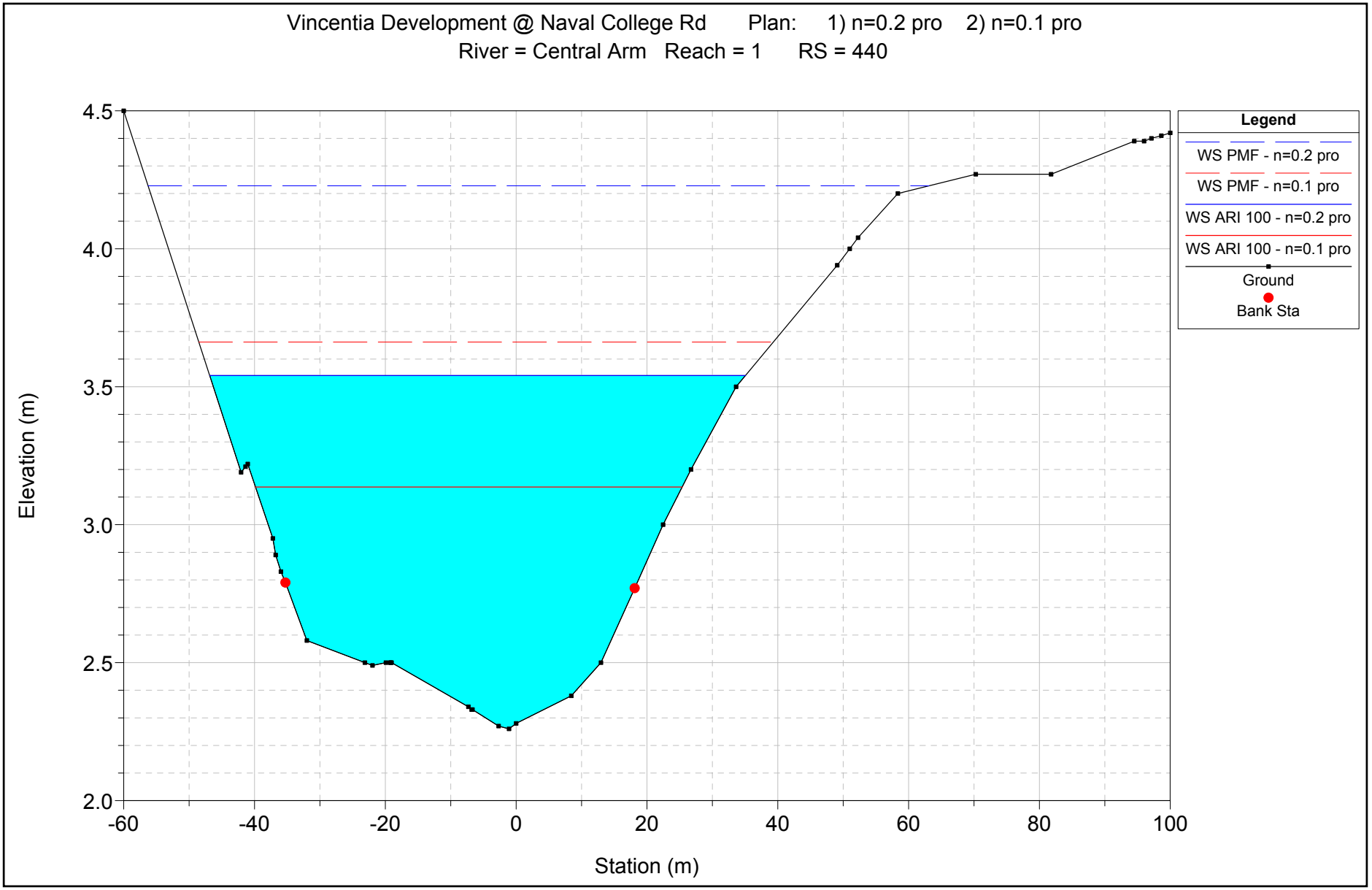

Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
Central Arm 1
Elevation (m)
Main Channel Distance (m)
0
2
4
6
8
10
12
14
16
18
0
200
400
600
800
1000
1200
440
480
520
560
600
640
680
720
760
800
840
880
920
960
1000
1040
1080
1120
1160
1200
1240
1280
1320
1360
1400
1440
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground

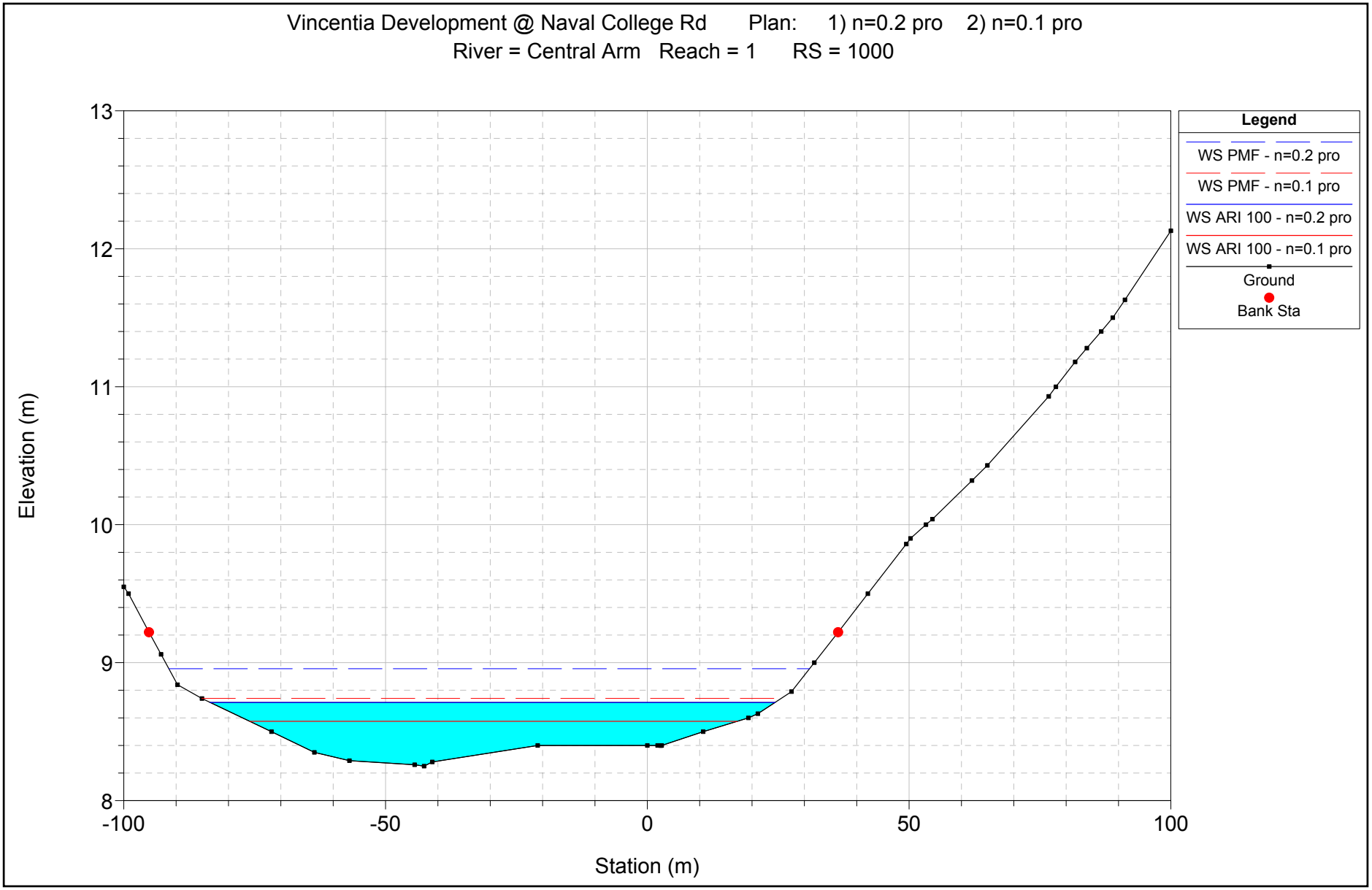

Vincentia Development @ Naval College Rd
Plan: 1) n=0.2 pro 2) n=0.1 pro
East Arm 1
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Elevation (m)
Main Channel Distance (m)
0
2
4
6
8
10
12
14
16
0
200
400
600
800
1000
1200
440
480
520
560
600
680
720
760
800
840
880
920
960
1000
1040
1080
1120
1160
1200
1240
1280
1320
1360
1400
1440

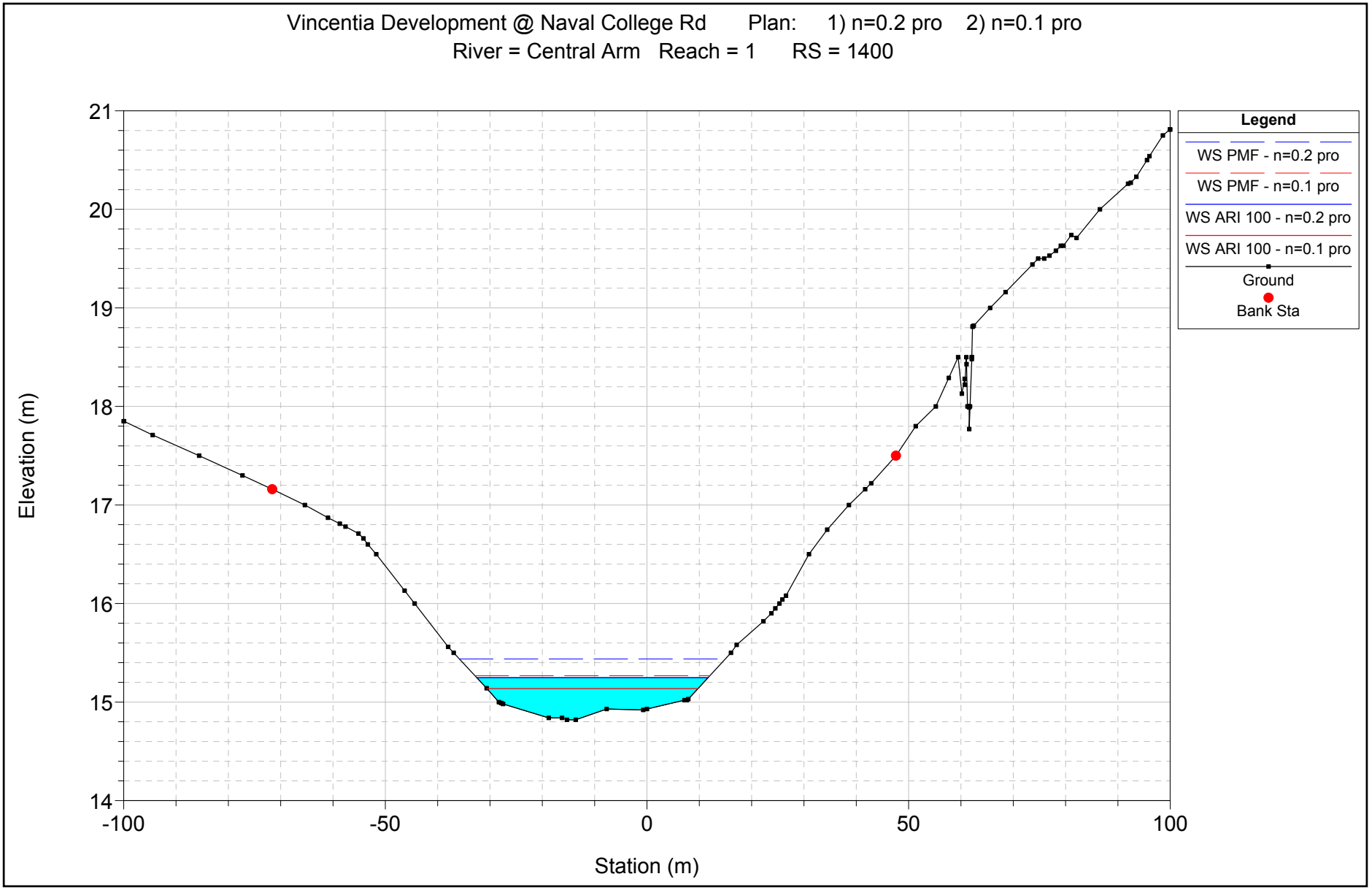

Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = West Arm Reach = 1 RS = 540
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
Station (m)
9
8
7
6
5
4
3
-100
-50
0
50
100

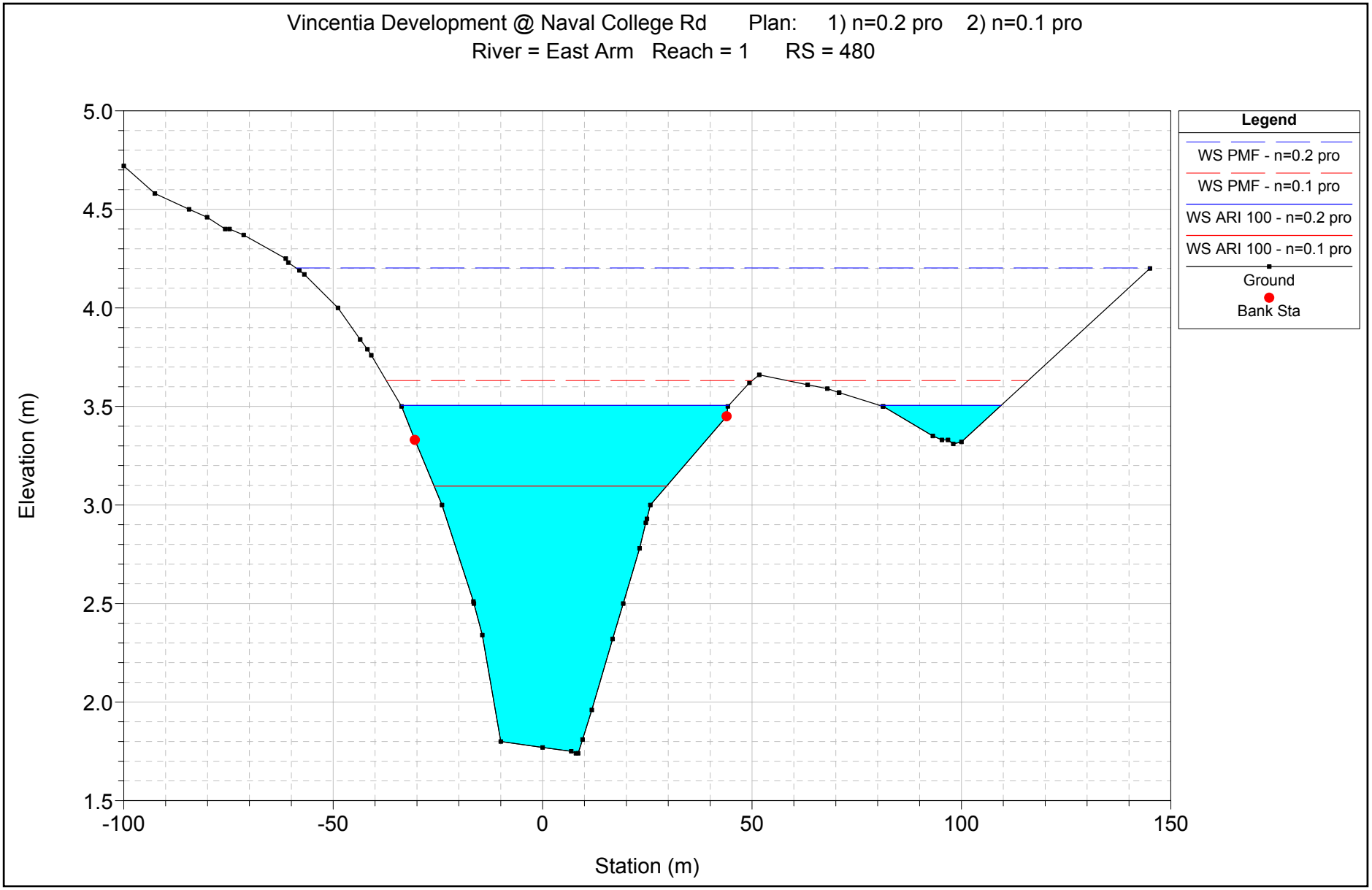

Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = West Arm Reach = 1 RS = 740
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
Station (m)
13
12
11
10
9
8
-100
-50
0
50
100

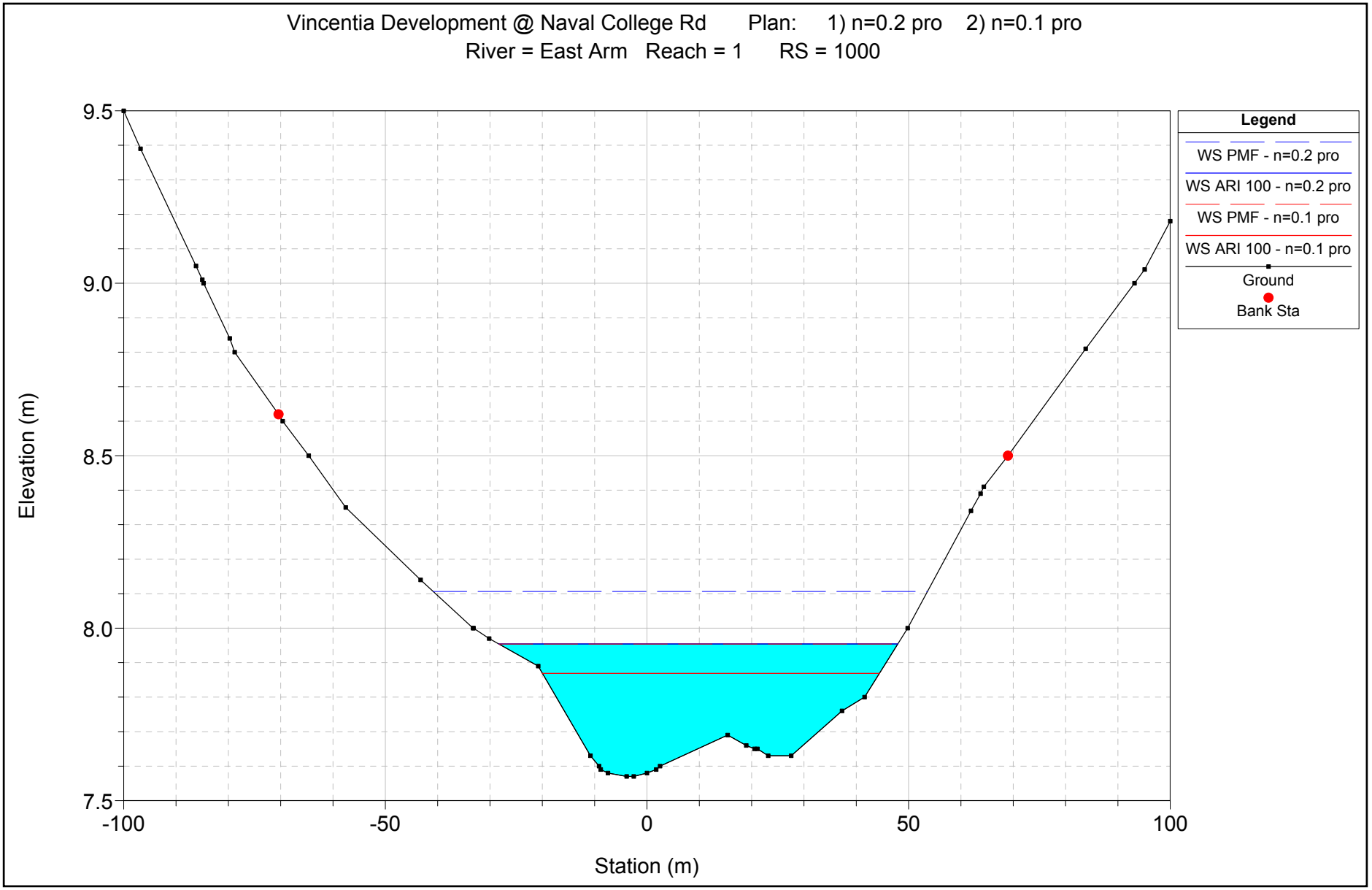

Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = West Arm Reach = 1 RS = 1020
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
-100
-50
0
50
100
Station (m)

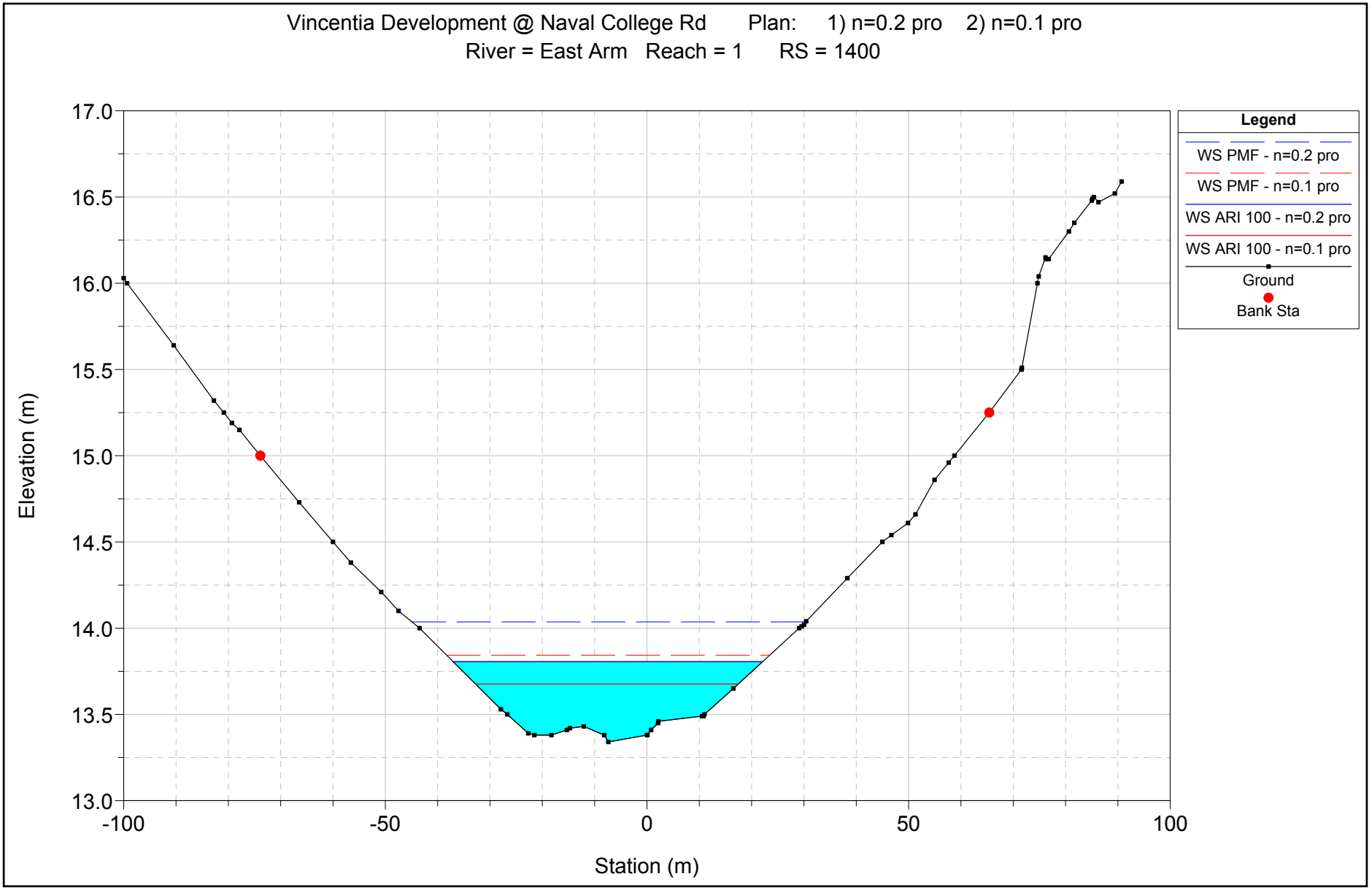

Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = Central Arm Reach = 1 RS = 440
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
Station (m)
4.5
4.0
3.5
3.0
2.5
2.0
-60
-40
-20
0
20
40
60
80
100


Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = Central Arm Reach = 1 RS = 1000
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
13
12
11
10
9
8
-100
-50
0
50
100
Station (m)


Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = Central Arm Reach = 1 RS = 1400
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
Station (m)
21
20
19
18
17
16
15
14
-100
-50
0
50
100


Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = East Arm Reach = 1 RS = 480
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
Station (m)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
-100
-50
0
50
100
150


Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = East Arm Reach = 1 RS = 1000
Legend
WS PMF - n=0.2 pro
WS ARI 100 - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
9.5
9.0
8.5
8.0
7.5
-100
-50
0
50
100
Station (m)


Vincentia Development @ Naval College Rd Plan: 1) n=0.2 pro 2) n=0.1 pro
River = East Arm Reach = 1 RS = 1400
Legend
WS PMF - n=0.2 pro
WS PMF - n=0.1 pro
WS ARI 100 - n=0.2 pro
WS ARI 100 - n=0.1 pro
Ground
Bank Sta
Elevation (m)
17.0
16.5
16.0
15.5
15.0
14.5
14.0
13.5
13.0
-100
-50
0
50
100
Station (m)

HEC-RAS Plan: n=0.2 pro

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
West Arm	1	1060	ARI 1	3.00	13.72	14.74		14.74	0.014966	0.24	12.61	50.59	0.15
West Arm	1	1060	ARI 2	4.10	13.72	14.79		14.80	0.015271	0.27	15.43	53.26	0.16
West Arm	1	1060	ARI 5	5.90	13.72	14.87		14.88	0.016157	0.29	20.27	63.99	0.17
West Arm	1	1060	ARI 10	6.90	13.72	14.91		14.91	0.015807	0.31	22.61	65.40	0.17
West Arm	1	1060	ARI 20	8.30	13.72	14.95		14.96	0.015599	0.32	25.63	67.17	0.17
West Arm	1	1060	ARI 50	9.70	13.72	14.99		15.00	0.016089	0.35	28.11	68.61	0.17
West Arm	1	1060	ARI 100	11.10	13.72	15.03		15.04	0.015892	0.36	30.98	70.87	0.17
West Arm	1	1060	PMF	28.00	13.72	15.38		15.39	0.016190	0.48	58.54	88.35	0.19
West Arm	1	1020	ARI 1	3.00	13.84	14.20	14.00	14.20	0.011923	0.20	14.90	66.53	0.14
West Arm	1	1020	ARI 2	4.10	13.84	14.25	14.02	14.25	0.012154	0.23	18.21	69.76	0.14
West Arm	1	1020	ARI 5	5.90	13.84	14.32		14.32	0.012277	0.25	23.17	74.32	0.15
West Arm	1	1020	ARI 10	6.90	13.84	14.35		14.35	0.012770	0.27	25.40	76.15	0.15
West Arm	1	1020	ARI 20	8.30	13.84	14.39		14.40	0.012789	0.29	28.75	78.82	0.15
West Arm	1	1020	ARI 50	9.70	13.84	14.43		14.44	0.012659	0.30	32.08	81.38	0.15
West Arm	1	1020	ARI 100	11.10	13.84	14.47		14.47	0.012781	0.32	35.06	83.60	0.16
West Arm	1	1020	PMF	28.00	13.84	14.79		14.80	0.013764	0.43	64.67	101.95	0.17
West Arm	1	980	ARI 1	3.00	13.20	13.52	13.35	13.52	0.025938	0.28	10.85	53.89	0.20
West Arm	1	980	ARI 2	4.10	13.20	13.56	13.37	13.57	0.025774	0.31	13.42	57.17	0.20
West Arm	1	980	ARI 5	5.90	13.20	13.63	13.41	13.63	0.025666	0.34	17.24	61.72	0.21
West Arm	1	980	ARI 10	6.90	13.20	13.66	13.42	13.67	0.024664	0.35	19.47	64.23	0.21
West Arm	1	980	ARI 20	8.30	13.20	13.70		13.71	0.024701	0.38	22.13	67.09	0.21
West Arm	1	980	ARI 50	9.70	13.20	13.74		13.75	0.024407	0.39	24.80	69.99	0.21
West Arm	1	980	ARI 100	11.10	13.20	13.78		13.79	0.023666	0.40	27.60	72.97	0.21
West Arm	1	980	PMF	28.00	13.20	14.10		14.12	0.021953	0.51	54.75	95.44	0.22
West Arm	1	940	ARI 1	3.00	12.22	12.66		12.66	0.018255	0.26	11.70	50.08	0.17
West Arm	1	940	ARI 2	4.10	12.22	12.71		12.72	0.017692	0.28	14.65	53.68	0.17
West Arm	1	940	ARI 5	5.90	12.22	12.79		12.79	0.017766	0.31	18.86	58.66	0.18
West Arm	1	940	ARI 10	6.90	12.22	12.82		12.83	0.017976	0.33	20.97	61.00	0.18
West Arm	1	940	ARI 20	8.30	12.22	12.87		12.88	0.018145	0.35	23.82	64.03	0.18
West Arm	1	940	ARI 50	9.70	12.22	12.91		12.92	0.018227	0.37	26.58	66.82	0.18
West Arm	1	940	ARI 100	11.10	12.22	12.95		12.96	0.018718	0.38	28.98	69.17	0.19
West Arm	1	940	PMF	28.00	12.22	13.27		13.28	0.020082	0.51	54.77	89.32	0.21
West Arm	1	900	ARI 1	3.00	11.34	11.70	11.53	11.71	0.032793	0.32	9.46	45.58	0.22
West Arm	1	900	ARI 2	4.10	11.34	11.75	11.56	11.75	0.034652	0.35	11.59	49.50	0.23
West Arm	1	900	ARI 5	5.90	11.34	11.81		11.81	0.036510	0.40	14.65	53.52	0.25
West Arm	1	900	ARI 10	6.90	11.34	11.84		11.85	0.036381	0.42	16.35	55.53	0.25
West Arm	1	900	ARI 20	8.30	11.34	11.88		11.89	0.035949	0.44	18.68	58.17	0.25
West Arm	1	900	ARI 50	9.70	11.34	11.92		11.93	0.035637	0.46	20.90	60.59	0.25
West Arm	1	900	ARI 100	11.10	11.34	11.95		11.97	0.034415	0.48	23.27	63.07	0.25
West Arm	1	900	PMF	28.00	11.34	12.27		12.29	0.031565	0.60	46.54	83.48	0.26
West Arm	1	860	ARI 1	3.00	10.34	10.76		10.76	0.017776	0.26	11.51	47.06	0.17
West Arm	1	860	ARI 2	4.10	10.34	10.82		10.83	0.016576	0.28	14.57	50.43	0.17
West Arm	1	860	ARI 5	5.90	10.34	10.91		10.91	0.015444	0.31	19.19	55.15	0.17
West Arm	1	860	ARI 10	6.90	10.34	10.95		10.96	0.015067	0.32	21.59	57.45	0.17
West Arm	1	860	ARI 20	8.30	10.34	11.01		11.01	0.014761	0.34	24.76	60.39	0.17
West Arm	1	860	ARI 50	9.70	10.34	11.06		11.06	0.014442	0.35	27.91	63.42	0.17
West Arm	1	860	ARI 100	11.10	10.34	11.10		11.10	0.014699	0.36	30.56	65.87	0.17
West Arm	1	860	PMF	28.00	10.34	11.51		11.52	0.012995	0.45	62.65	90.18	0.17
West Arm	1	820	ARI 1	3.00	9.77	10.28		10.28	0.008981	0.21	14.23	47.90	0.12
West Arm	1	820	ARI 2	4.10	9.77	10.34		10.34	0.009363	0.24	17.39	51.11	0.13
West Arm	1	820	ARI 5	5.90	9.77	10.43		10.43	0.009700	0.27	22.13	55.50	0.13
West Arm	1	820	ARI 10	6.90	9.77	10.47		10.48	0.009847	0.28	24.56	57.63	0.14
West Arm	1	820	ARI 20	8.30	9.77	10.53		10.53	0.009881	0.30	27.92	60.33	0.14
West Arm	1	820	ARI 50	9.70	9.77	10.58		10.59	0.009943	0.31	31.07	62.66	0.14
West Arm	1	820	ARI 100	11.10	9.77	10.63		10.63	0.009903	0.32	34.19	64.83	0.14
West Arm	1	820	PMF	28.00	9.77	11.07		11.08	0.009535	0.42	66.91	84.29	0.15
West Arm	1	780	ARI 1	4.15	9.36	9.75	9.55	9.76	0.018492	0.28	14.57	53.69	0.17
West Arm	1	780	ARI 2	5.70	9.36	9.82		9.83	0.017295	0.31	18.37	56.67	0.17
West Arm	1	780	ARI 5	8.05	9.36	9.91		9.91	0.016707	0.34	23.42	60.39	0.18
West Arm	1	780	ARI 10	9.45	9.36	9.96		9.96	0.015893	0.36	26.56	62.58	0.17
West Arm	1	780	ARI 20	11.35	9.36	10.01		10.02	0.015857	0.38	30.13	65.10	0.18
West Arm	1	780	ARI 50	13.20	9.36	10.06		10.07	0.015838	0.39	33.43	67.20	0.18
West Arm	1	780	ARI 100	15.10	9.36	10.11		10.12	0.015750	0.41	36.74	69.30	0.18
West Arm	1	780	PMF	39.35	9.36	10.56		10.57	0.015872	0.55	72.04	89.16	0.19
West Arm	1	740	ARI 1	4.15	8.69	9.15		9.16	0.012398	0.25	16.32	52.89	0.15
West Arm	1	740	ARI 2	5.70	8.69	9.22		9.22	0.013231	0.29	19.97	57.10	0.15
West Arm	1	740	ARI 5	8.05	8.69	9.30		9.31	0.014020	0.32	24.92	61.80	0.16
West Arm	1	740	ARI 10	9.45	8.69	9.35		9.35	0.014286	0.34	27.72	64.31	0.17
West Arm	1	740	ARI 20	11.35	8.69	9.40		9.41	0.014719	0.36	31.21	67.21	0.17
West Arm	1	740	ARI 50	13.20	8.69	9.45		9.45	0.015019	0.38	34.34	69.10	0.17
West Arm	1	740	ARI 100	15.10	8.69	9.49		9.50	0.015501	0.41	37.23	70.77	0.18
West Arm	1	740	PMF	39.35	8.69	9.91		9.93	0.016542	0.56	70.81	88.11	0.20

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
West Arm	1	700	ARI 1	4.15	7.47	7.98	7.83	8.01	0.124825	0.74	5.57	20.34	0.45
West Arm	1	700	ARI 2	5.70	7.47	8.09	7.89	8.12	0.087432	0.69	8.24	25.68	0.39
West Arm	1	700	ARI 5	8.05	7.47	8.23	7.95	8.25	0.065574	0.66	12.20	32.95	0.35
West Arm	1	700	ARI 10	9.45	7.47	8.29	7.98	8.32	0.059584	0.66	14.40	36.48	0.33
West Arm	1	700	ARI 20	11.35	7.47	8.37	8.03	8.39	0.052082	0.65	17.50	40.80	0.32
West Arm	1	700	ARI 50	13.20	7.47	8.44	8.06	8.46	0.047324	0.65	20.39	44.34	0.30
West Arm	1	700	ARI 100	15.10	7.47	8.51		8.53	0.043557	0.65	23.32	47.69	0.30
West Arm	1	700	PMF	39.35	7.47	9.03		9.06	0.029376	0.71	55.67	74.24	0.26
West Arm	1	660	ARI 1	4.15	5.85	6.88		6.89	0.011915	0.36	11.60	21.75	0.16
West Arm	1	660	ARI 2	5.70	5.85	6.98		6.99	0.013541	0.41	14.00	23.80	0.17
West Arm	1	660	ARI 5	8.05	5.85	7.12		7.13	0.015367	0.46	17.45	27.03	0.18
West Arm	1	660	ARI 10	9.45	5.85	7.19		7.20	0.016121	0.49	19.40	28.74	0.19
West Arm	1	660	ARI 20	11.35	5.85	7.27		7.28	0.017310	0.52	21.76	30.68	0.20
West Arm	1	660	ARI 50	13.20	5.85	7.34		7.36	0.018146	0.55	24.13	32.82	0.20
West Arm	1	660	ARI 100	15.10	5.85	7.41		7.43	0.018867	0.57	26.48	34.86	0.21
West Arm	1	660	PMF	39.35	5.85	8.06		8.09	0.020478	0.70	56.04	57.44	0.23
West Arm	1	620	ARI 1	4.15	4.98	5.56	5.45	5.62	0.221631	1.07	3.86	12.47	0.62
West Arm	1	620	ARI 2	5.70	4.98	5.72	5.52	5.77	0.123632	0.93	6.11	15.76	0.48
West Arm	1	620	ARI 5	8.05	4.98	5.91		5.94	0.079404	0.86	9.37	19.59	0.40
West Arm	1	620	ARI 10	9.45	4.98	6.00		6.04	0.066316	0.84	11.31	21.55	0.37
West Arm	1	620	ARI 20	11.35	4.98	6.11		6.15	0.055473	0.82	13.89	23.90	0.34
West Arm	1	620	ARI 50	13.20	4.98	6.21		6.24	0.048847	0.81	16.21	25.50	0.33
West Arm	1	620	ARI 100	15.10	4.98	6.30		6.33	0.043935	0.81	18.57	27.02	0.31
West Arm	1	620	PMF	39.35	4.98	7.12		7.16	0.026669	0.81	48.48	48.70	0.26
West Arm	1	580	ARI 1	4.15	3.35	4.72		4.73	0.007671	0.36	11.56	15.31	0.13
West Arm	1	580	ARI 2	5.70	3.35	4.88		4.88	0.008586	0.40	14.11	17.03	0.14
West Arm	1	580	ARI 5	8.05	3.35	5.07		5.08	0.009713	0.46	17.61	19.38	0.15
West Arm	1	580	ARI 10	9.45	3.35	5.17		5.18	0.010305	0.48	19.59	20.79	0.16
West Arm	1	580	ARI 20	11.35	3.35	5.29		5.30	0.010936	0.51	22.17	22.52	0.16
West Arm	1	580	ARI 50	13.20	3.35	5.39		5.41	0.011431	0.54	24.58	24.02	0.17
West Arm	1	580	ARI 100	15.10	3.35	5.49		5.50	0.011906	0.56	26.95	25.50	0.17
West Arm	1	580	PMF	39.35	3.35	6.40		6.43	0.013243	0.68	57.79	44.37	0.19
West Arm	1	540	ARI 1	4.15	3.27	4.50		4.50	0.004168	0.25	16.90	25.33	0.10
West Arm	1	540	ARI 2	5.70	3.27	4.63		4.64	0.004640	0.28	20.38	27.21	0.10
West Arm	1	540	ARI 5	8.05	3.27	4.79		4.80	0.005232	0.32	24.98	29.52	0.11
West Arm	1	540	ARI 10	9.45	3.27	4.88		4.88	0.005540	0.34	27.45	30.67	0.12
West Arm	1	540	ARI 20	11.35	3.27	4.98		4.98	0.005888	0.37	30.63	32.06	0.12
West Arm	1	540	ARI 50	13.20	3.27	5.07		5.07	0.006200	0.39	33.51	33.25	0.13
West Arm	1	540	ARI 100	15.10	3.27	5.15		5.16	0.006515	0.42	36.24	34.31	0.13
West Arm	1	540	PMF	39.35	3.27	5.95		5.96	0.010084	0.51	77.25	78.91	0.16
West Arm	1	500	ARI 1	4.15	3.37	3.80	3.80	3.91	0.654917	1.46	2.84	13.04	1.00
West Arm	1	500	ARI 2	5.70	3.37	3.86	3.86	3.99	0.640825	1.57	3.63	14.74	1.01
West Arm	1	500	ARI 5	8.05	3.37	3.93	3.93	4.08	0.618540	1.69	4.77	16.88	1.01
West Arm	1	500	ARI 10	9.45	3.37	3.97	3.97	4.13	0.600410	1.74	5.43	18.02	1.01
West Arm	1	500	ARI 20	11.35	3.37	4.02	4.02	4.18	0.573567	1.79	6.34	19.47	1.00
West Arm	1	500	ARI 50	13.20	3.37	4.06	4.06	4.23	0.579361	1.87	7.08	20.56	1.02
West Arm	1	500	ARI 100	15.10	3.37	4.10	4.10	4.28	0.567205	1.91	7.90	21.81	1.01
West Arm	1	500	PMF	39.35	3.37	4.43	4.43	4.70	0.508015	2.29	17.15	33.12	1.02
West Arm	1	400	ARI 1	4.15	1.56	2.22		2.22	0.000478	0.06	73.39	207.74	0.03
West Arm	1	400	ARI 2	5.70	1.56	2.30		2.30	0.000484	0.07	89.47	212.79	0.03
West Arm	1	400	ARI 5	8.05	1.56	2.39		2.39	0.000529	0.08	108.34	218.56	0.03
West Arm	1	400	ARI 10	9.45	1.56	2.44		2.44	0.000536	0.08	119.52	221.91	0.03
West Arm	1	400	ARI 20	11.35	1.56	2.50		2.50	0.000550	0.09	133.39	226.00	0.04
West Arm	1	400	ARI 50	13.20	1.56	2.55		2.55	0.000567	0.10	145.56	229.53	0.04
West Arm	1	400	ARI 100	15.10	1.56	2.61		2.61	0.000581	0.10	157.52	232.94	0.04
West Arm	1	400	PMF	39.35	1.56	3.12		3.12	0.000647	0.15	285.32	269.55	0.04
West Arm	1	100	ARI 1	5.30	1.40	1.83	1.58	1.84	0.009009	0.20	26.50	96.86	0.12
West Arm	1	100	ARI 2	7.30	1.40	1.90	1.61	1.90	0.009004	0.22	33.05	104.03	0.13
West Arm	1	100	ARI 5	10.20	1.40	1.98	1.63	1.98	0.009016	0.24	41.71	112.81	0.13
West Arm	1	100	ARI 10	12.00	1.40	2.02	1.66	2.02	0.009004	0.26	46.51	115.95	0.13
West Arm	1	100	ARI 20	14.40	1.40	2.07	1.67	2.07	0.009017	0.28	52.23	117.99	0.13
West Arm	1	100	ARI 50	16.70	1.40	2.11	1.68	2.12	0.009010	0.29	57.45	119.82	0.13
West Arm	1	100	ARI 100	19.10	1.40	2.16	1.70	2.16	0.009002	0.30	62.66	121.62	0.14
West Arm	1	100	PMF	50.70	1.40	2.62	1.87	2.63	0.009010	0.40	126.79	163.91	0.15
East Arm	1	1440	ARI 1	2.20	15.34	15.58	15.48	15.58	0.057170	0.28	7.74	66.66	0.27
East Arm	1	1440	ARI 2	3.00	15.34	15.60	15.51	15.61	0.059868	0.32	9.35	69.67	0.28
East Arm	1	1440	ARI 5	4.20	15.34	15.63	15.52	15.64	0.059652	0.36	11.73	73.86	0.29
East Arm	1	1440	ARI 10	5.00	15.34	15.65	15.54	15.66	0.060467	0.38	13.12	76.07	0.29
East Arm	1	1440	ARI 20	6.00	15.34	15.67	15.55	15.68	0.060523	0.41	14.76	77.71	0.30
East Arm	1	1440	ARI 50	7.00	15.34	15.69	15.56	15.70	0.060733	0.43	16.30	79.21	0.30
East Arm	1	1440	ARI 100	8.00	15.34	15.71	15.58	15.72	0.060680	0.45	17.79	80.62	0.31

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	1440	PMF	19.10	15.34	15.88	15.67	15.90	0.056477	0.58	33.21	98.59	0.32
East Arm	1	1400	ARI 1	2.20	13.34	13.60	13.49	13.60	0.043051	0.31	7.17	44.63	0.24
East Arm	1	1400	ARI 2	3.00	13.34	13.64	13.50	13.64	0.040912	0.33	8.99	47.38	0.24
East Arm	1	1400	ARI 5	4.20	13.34	13.68	13.52	13.69	0.040507	0.37	11.33	50.69	0.25
East Arm	1	1400	ARI 10	5.00	13.34	13.71	13.54	13.72	0.039684	0.39	12.86	52.73	0.25
East Arm	1	1400	ARI 20	6.00	13.34	13.75	13.55	13.75	0.039038	0.41	14.67	55.04	0.25
East Arm	1	1400	ARI 50	7.00	13.34	13.78	13.57	13.79	0.038537	0.43	16.40	57.17	0.25
East Arm	1	1400	ARI 100	8.00	13.34	13.81		13.82	0.038214	0.44	18.05	59.13	0.26
East Arm	1	1400	PMF	19.10	13.34	14.04		14.05	0.038266	0.57	33.50	75.24	0.27
East Arm	1	1360	ARI 1	2.20	12.25	12.59		12.60	0.016688	0.22	9.97	49.95	0.16
East Arm	1	1360	ARI 2	3.00	12.25	12.64		12.64	0.016844	0.24	12.35	53.87	0.16
East Arm	1	1360	ARI 5	4.20	12.25	12.70		12.70	0.016700	0.27	15.72	59.13	0.17
East Arm	1	1360	ARI 10	5.00	12.25	12.73		12.74	0.016834	0.28	17.76	62.08	0.17
East Arm	1	1360	ARI 20	6.00	12.25	12.77		12.78	0.016810	0.30	20.25	65.52	0.17
East Arm	1	1360	ARI 50	7.00	12.25	12.81		12.81	0.017030	0.31	22.54	68.67	0.17
East Arm	1	1360	ARI 100	8.00	12.25	12.84		12.85	0.016839	0.32	24.96	71.87	0.17
East Arm	1	1360	PMF	19.10	12.25	13.11		13.12	0.015831	0.40	47.19	91.42	0.18
East Arm	1	1320	ARI 1	2.20	11.69	12.02		12.02	0.012538	0.19	11.52	57.81	0.14
East Arm	1	1320	ARI 2	3.00	11.69	12.06		12.06	0.012570	0.21	14.09	60.18	0.14
East Arm	1	1320	ARI 5	4.20	11.69	12.11		12.12	0.012899	0.24	17.44	63.14	0.15
East Arm	1	1320	ARI 10	5.00	11.69	12.15		12.15	0.013071	0.26	19.50	64.89	0.15
East Arm	1	1320	ARI 20	6.00	11.69	12.18		12.19	0.013060	0.27	22.04	67.01	0.15
East Arm	1	1320	ARI 50	7.00	11.69	12.22		12.22	0.013091	0.29	24.46	69.11	0.15
East Arm	1	1320	ARI 100	8.00	11.69	12.25		12.26	0.013160	0.30	26.75	71.06	0.16
East Arm	1	1320	PMF	19.10	11.69	12.53		12.54	0.013592	0.39	48.48	87.24	0.17
East Arm	1	1280	ARI 1	2.20	11.19	11.48	11.30	11.48	0.014439	0.20	11.17	59.51	0.15
East Arm	1	1280	ARI 2	3.00	11.19	11.52		11.52	0.014528	0.22	13.70	62.55	0.15
East Arm	1	1280	ARI 5	4.20	11.19	11.57		11.58	0.014615	0.24	17.15	66.48	0.15
East Arm	1	1280	ARI 10	5.00	11.19	11.61		11.61	0.014069	0.26	19.55	69.05	0.15
East Arm	1	1280	ARI 20	6.00	11.19	11.64		11.65	0.014256	0.27	22.04	71.61	0.16
East Arm	1	1280	ARI 50	7.00	11.19	11.68		11.68	0.014266	0.29	24.50	74.04	0.16
East Arm	1	1280	ARI 100	8.00	11.19	11.71		11.71	0.014701	0.30	26.61	76.16	0.16
East Arm	1	1280	PMF	19.10	11.19	11.97		11.98	0.014534	0.39	49.45	96.41	0.17
East Arm	1	1240	ARI 1	2.20	10.60	10.91		10.92	0.014086	0.19	11.47	62.39	0.14
East Arm	1	1240	ARI 2	3.00	10.60	10.96		10.96	0.013493	0.21	14.33	66.25	0.14
East Arm	1	1240	ARI 5	4.20	10.60	11.01		11.01	0.013644	0.23	17.93	70.62	0.15
East Arm	1	1240	ARI 10	5.00	10.60	11.04		11.04	0.013896	0.25	20.03	72.68	0.15
East Arm	1	1240	ARI 20	6.00	10.60	11.07		11.08	0.014136	0.27	22.52	75.05	0.16
East Arm	1	1240	ARI 50	7.00	10.60	11.10		11.11	0.014332	0.28	24.88	77.23	0.16
East Arm	1	1240	ARI 100	8.00	10.60	11.14		11.14	0.014171	0.29	27.36	79.45	0.16
East Arm	1	1240	PMF	19.10	10.60	11.37		11.38	0.015768	0.40	48.20	96.12	0.18
East Arm	1	1200	ARI 1	2.20	9.98	10.26		10.26	0.019070	0.21	10.41	61.42	0.16
East Arm	1	1200	ARI 2	3.00	9.98	10.29		10.29	0.021457	0.24	12.34	64.53	0.18
East Arm	1	1200	ARI 5	4.20	9.98	10.34		10.34	0.021755	0.27	15.40	68.43	0.18
East Arm	1	1200	ARI 10	5.00	9.98	10.36		10.37	0.021253	0.29	17.47	70.96	0.18
East Arm	1	1200	ARI 20	6.00	9.98	10.40		10.40	0.020697	0.30	19.96	73.89	0.18
East Arm	1	1200	ARI 50	7.00	9.98	10.43		10.44	0.020011	0.31	22.45	76.71	0.18
East Arm	1	1200	ARI 100	8.00	9.98	10.46		10.47	0.019723	0.32	24.75	79.22	0.18
East Arm	1	1200	PMF	19.10	9.98	10.72		10.73	0.017205	0.39	48.69	105.22	0.18
East Arm	1	1160	ARI 1	2.20	9.42	9.71		9.71	0.010512	0.17	12.58	63.17	0.13
East Arm	1	1160	ARI 2	3.00	9.42	9.77		9.77	0.008892	0.18	16.45	68.41	0.12
East Arm	1	1160	ARI 5	4.20	9.42	9.83		9.84	0.008282	0.20	21.24	74.15	0.12
East Arm	1	1160	ARI 10	5.00	9.42	9.87		9.88	0.008140	0.21	24.15	77.70	0.12
East Arm	1	1160	ARI 20	6.00	9.42	9.92		9.92	0.007992	0.22	27.65	81.76	0.12
East Arm	1	1160	ARI 50	7.00	9.42	9.95		9.96	0.008034	0.23	30.74	84.87	0.12
East Arm	1	1160	ARI 100	8.00	9.42	9.99		9.99	0.007914	0.24	33.85	87.41	0.12
East Arm	1	1160	PMF	19.10	9.42	10.28		10.29	0.007842	0.31	62.22	107.77	0.13
East Arm	1	1120	ARI 1	2.20	8.74	9.36		9.36	0.007522	0.18	12.44	47.76	0.11
East Arm	1	1120	ARI 2	3.00	8.74	9.42		9.42	0.008214	0.20	15.35	54.14	0.12
East Arm	1	1120	ARI 5	4.20	8.74	9.48		9.48	0.009205	0.22	19.17	62.11	0.13
East Arm	1	1120	ARI 10	5.00	8.74	9.52		9.53	0.009366	0.23	21.76	66.50	0.13
East Arm	1	1120	ARI 20	6.00	8.74	9.57		9.57	0.009694	0.24	24.71	71.27	0.13
East Arm	1	1120	ARI 50	7.00	8.74	9.60		9.60	0.010196	0.26	27.33	75.59	0.14
East Arm	1	1120	ARI 100	8.00	8.74	9.63		9.64	0.010560	0.27	29.91	79.61	0.14
East Arm	1	1120	PMF	19.10	8.74	9.89		9.90	0.012434	0.35	54.16	107.65	0.16
East Arm	1	1080	ARI 1	2.20	8.67	8.97	8.80	8.97	0.013902	0.17	12.97	84.02	0.14
East Arm	1	1080	ARI 2	3.00	8.67	9.00	8.82	9.00	0.013850	0.19	15.86	87.00	0.14
East Arm	1	1080	ARI 5	4.20	8.67	9.05		9.05	0.013720	0.21	19.78	90.56	0.15
East Arm	1	1080	ARI 10	5.00	8.67	9.07		9.07	0.014361	0.23	21.85	92.62	0.15
East Arm	1	1080	ARI 20	6.00	8.67	9.10		9.10	0.014320	0.24	24.70	95.44	0.15
East Arm	1	1080	ARI 50	7.00	8.67	9.13		9.13	0.013853	0.25	27.69	98.33	0.15

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	1080	ARI 100	8.00	8.67	9.16		9.16	0.013902	0.26	30.27	100.81	0.15
East Arm	1	1080	PMF	19.10	8.67	9.38		9.39	0.013232	0.34	55.69	120.93	0.16
East Arm	1	1040	ARI 1	2.20	8.21	8.48	8.32	8.48	0.010816	0.16	14.02	84.58	0.12
East Arm	1	1040	ARI 2	3.00	8.21	8.52	8.34	8.52	0.010786	0.17	17.19	88.22	0.13
East Arm	1	1040	ARI 5	4.20	8.21	8.57	8.36	8.57	0.010435	0.19	21.66	92.57	0.13
East Arm	1	1040	ARI 10	5.00	8.21	8.60	8.37	8.60	0.010126	0.20	24.54	95.21	0.13
East Arm	1	1040	ARI 20	6.00	8.21	8.63	8.38	8.64	0.009832	0.21	27.96	98.21	0.13
East Arm	1	1040	ARI 50	7.00	8.21	8.67	8.39	8.67	0.009627	0.22	31.21	100.97	0.13
East Arm	1	1040	ARI 100	8.00	8.21	8.70		8.70	0.009425	0.23	34.41	103.81	0.13
East Arm	1	1040	PMF	19.10	8.21	8.93		8.94	0.009969	0.31	61.37	124.69	0.14
East Arm	1	1000	ARI 1	2.20	7.57	7.81	7.69	7.82	0.028821	0.24	9.10	59.88	0.20
East Arm	1	1000	ARI 2	3.00	7.57	7.84	7.70	7.85	0.031021	0.28	10.89	62.21	0.21
East Arm	1	1000	ARI 5	4.20	7.57	7.88	7.72	7.88	0.034506	0.32	13.14	65.02	0.23
East Arm	1	1000	ARI 10	5.00	7.57	7.90	7.73	7.90	0.036439	0.34	14.55	67.38	0.24
East Arm	1	1000	ARI 20	6.00	7.57	7.92	7.75	7.93	0.039755	0.37	16.16	71.05	0.25
East Arm	1	1000	ARI 50	7.00	7.57	7.94	7.77	7.95	0.043901	0.40	17.48	73.94	0.26
East Arm	1	1000	ARI 100	8.00	7.57	7.95	7.78	7.96	0.048772	0.43	18.58	76.26	0.28
East Arm	1	1000	PMF	19.10	7.57	8.11		8.13	0.062446	0.60	31.68	94.48	0.33
East Arm	1	960	ARI 1	2.20	6.32	6.72	6.52	6.72	0.025905	0.29	7.69	36.23	0.20
East Arm	1	960	ARI 2	3.00	6.32	6.79		6.79	0.022244	0.29	10.44	43.66	0.19
East Arm	1	960	ARI 5	4.20	6.32	6.86		6.87	0.019163	0.30	13.97	48.78	0.18
East Arm	1	960	ARI 10	5.00	6.32	6.91		6.91	0.017788	0.31	16.22	51.61	0.18
East Arm	1	960	ARI 20	6.00	6.32	6.97		6.97	0.015958	0.31	19.20	55.12	0.17
East Arm	1	960	ARI 50	7.00	6.32	7.02		7.03	0.014338	0.31	22.30	58.72	0.16
East Arm	1	960	ARI 100	8.00	6.32	7.08		7.08	0.012541	0.31	25.85	62.88	0.15
East Arm	1	960	PMF	19.10	6.32	7.58		7.58	0.005699	0.28	68.22	106.74	0.11
East Arm	1	920	ARI 1	6.65	5.25	5.98		5.98	0.016774	0.38	17.66	39.79	0.18
East Arm	1	920	ARI 2	9.00	5.25	6.10		6.11	0.015658	0.39	22.95	46.22	0.18
East Arm	1	920	ARI 5	12.45	5.25	6.25		6.25	0.014276	0.41	30.14	52.35	0.17
East Arm	1	920	ARI 10	14.65	5.25	6.33		6.34	0.013377	0.42	34.85	56.17	0.17
East Arm	1	920	ARI 20	17.45	5.25	6.44		6.45	0.012314	0.43	40.94	60.75	0.17
East Arm	1	920	ARI 50	20.05	5.25	6.53		6.54	0.011485	0.43	46.85	65.58	0.16
East Arm	1	920	ARI 100	22.90	5.25	6.63		6.64	0.010934	0.43	53.45	72.01	0.16
East Arm	1	920	PMF	55.25	5.25	7.25		7.26	0.009061	0.50	111.51	115.51	0.15
East Arm	1	880	ARI 1	6.65	4.51	5.49		5.50	0.009180	0.33	20.22	35.42	0.14
East Arm	1	880	ARI 2	9.00	4.51	5.65		5.66	0.008383	0.34	26.26	40.41	0.14
East Arm	1	880	ARI 5	12.45	4.51	5.84		5.84	0.007916	0.36	34.22	46.15	0.13
East Arm	1	880	ARI 10	14.65	4.51	5.94		5.95	0.007716	0.38	39.03	49.27	0.13
East Arm	1	880	ARI 20	17.45	4.51	6.05		6.06	0.007782	0.39	44.91	54.17	0.14
East Arm	1	880	ARI 50	20.05	4.51	6.15		6.16	0.007963	0.40	50.60	60.30	0.14
East Arm	1	880	ARI 100	22.90	4.51	6.25		6.26	0.008022	0.40	56.88	66.57	0.14
East Arm	1	880	PMF	55.25	4.51	6.91		6.92	0.008054	0.48	114.95	112.66	0.15
East Arm	1	840	ARI 1	6.65	4.00	5.13		5.14	0.008944	0.35	19.00	29.60	0.14
East Arm	1	840	ARI 2	9.00	4.00	5.31		5.32	0.008823	0.36	24.87	36.53	0.14
East Arm	1	840	ARI 5	12.45	4.00	5.51		5.51	0.008681	0.38	32.77	44.25	0.14
East Arm	1	840	ARI 10	14.65	4.00	5.61		5.62	0.008680	0.39	37.69	49.18	0.14
East Arm	1	840	ARI 20	17.45	4.00	5.73		5.74	0.008590	0.40	43.79	54.65	0.14
East Arm	1	840	ARI 50	20.05	4.00	5.83		5.83	0.008480	0.41	49.31	59.16	0.14
East Arm	1	840	ARI 100	22.90	4.00	5.93		5.94	0.008150	0.41	55.78	64.04	0.14
East Arm	1	840	PMF	55.25	4.00	6.57		6.59	0.008530	0.50	110.36	106.78	0.15
East Arm	1	800	ARI 1	6.65	3.30	4.77		4.78	0.009008	0.38	17.69	24.81	0.14
East Arm	1	800	ARI 2	9.00	3.30	4.93		4.94	0.010004	0.41	22.08	29.72	0.15
East Arm	1	800	ARI 5	12.45	3.30	5.12		5.13	0.010829	0.44	28.03	35.24	0.16
East Arm	1	800	ARI 10	14.65	3.30	5.22		5.23	0.011055	0.46	31.73	38.25	0.16
East Arm	1	800	ARI 20	17.45	3.30	5.34		5.35	0.011090	0.48	36.47	41.79	0.16
East Arm	1	800	ARI 50	20.05	3.30	5.44		5.45	0.011039	0.49	40.79	44.74	0.16
East Arm	1	800	ARI 100	22.90	3.30	5.54		5.56	0.011262	0.50	45.80	49.73	0.17
East Arm	1	800	PMF	55.25	3.30	6.18		6.20	0.010544	0.65	92.75	103.27	0.17
East Arm	1	760	ARI 1	6.65	3.50	4.33		4.34	0.014262	0.40	16.68	30.44	0.17
East Arm	1	760	ARI 2	9.00	3.50	4.49		4.50	0.012573	0.41	21.95	34.98	0.17
East Arm	1	760	ARI 5	12.45	3.50	4.68		4.69	0.010992	0.43	29.18	39.61	0.16
East Arm	1	760	ARI 10	14.65	3.50	4.79		4.80	0.010296	0.43	33.70	42.35	0.16
East Arm	1	760	ARI 20	17.45	3.50	4.93		4.94	0.009623	0.44	39.54	46.18	0.15
East Arm	1	760	ARI 50	20.05	3.50	5.03		5.04	0.009384	0.45	44.62	49.76	0.15
East Arm	1	760	ARI 100	22.90	3.50	5.14		5.15	0.009210	0.46	50.29	54.22	0.15
East Arm	1	760	PMF	55.25	3.50	5.76		5.78	0.010556	0.60	94.25	90.24	0.17
East Arm	1	720	ARI 1	6.65	2.87	4.11		4.11	0.002875	0.23	28.95	36.39	0.08
East Arm	1	720	ARI 2	9.00	2.87	4.27		4.27	0.003174	0.26	34.84	39.54	0.09
East Arm	1	720	ARI 5	12.45	2.87	4.46		4.46	0.003483	0.29	42.74	43.42	0.09
East Arm	1	720	ARI 10	14.65	2.87	4.57		4.57	0.003683	0.31	47.56	46.33	0.10
East Arm	1	720	ARI 20	17.45	2.87	4.69		4.70	0.003957	0.32	53.79	51.18	0.10

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	720	ARI 50	20.05	2.87	4.79		4.80	0.004198	0.34	59.11	54.99	0.10
East Arm	1	720	ARI 100	22.90	2.87	4.90		4.90	0.004356	0.35	65.12	59.00	0.11
East Arm	1	720	PMF	55.25	2.87	5.51		5.52	0.004421	0.46	143.08	159.69	0.12
East Arm	1	680	ARI 1	6.65	2.93	3.92		3.92	0.009358	0.34	19.51	32.90	0.14
East Arm	1	680	ARI 2	9.00	2.93	4.06		4.07	0.009310	0.37	24.45	36.59	0.14
East Arm	1	680	ARI 5	12.45	2.93	4.24		4.25	0.009227	0.40	31.48	42.03	0.15
East Arm	1	680	ARI 10	14.65	2.93	4.34		4.35	0.008945	0.41	36.00	44.97	0.15
East Arm	1	680	ARI 20	17.45	2.93	4.46		4.47	0.008702	0.42	41.48	48.28	0.14
East Arm	1	680	ARI 50	20.05	2.93	4.56		4.57	0.008437	0.43	46.65	60.20	0.14
East Arm	1	680	ARI 100	22.90	2.93	4.67		4.68	0.007459	0.44	53.85	68.26	0.14
East Arm	1	680	PMF	55.25	2.93	5.27		5.29	0.007442	0.60	107.44	110.96	0.15
East Arm	1	600	ARI 1	6.65	2.42	3.46		3.46	0.003975	0.24	28.17	43.31	0.09
East Arm	1	600	ARI 2	9.00	2.42	3.60		3.60	0.003997	0.26	34.45	45.68	0.10
East Arm	1	600	ARI 5	12.45	2.42	3.78		3.78	0.003975	0.29	43.05	48.79	0.10
East Arm	1	600	ARI 10	14.65	2.42	3.89		3.89	0.003889	0.30	48.52	50.73	0.10
East Arm	1	600	ARI 20	17.45	2.42	4.01		4.02	0.003932	0.32	54.82	53.37	0.10
East Arm	1	600	ARI 50	20.05	2.42	4.11		4.12	0.003957	0.33	60.51	56.09	0.10
East Arm	1	600	ARI 100	22.90	2.42	4.23		4.23	0.004308	0.34	67.41	66.52	0.11
East Arm	1	600	PMF	55.25	2.42	4.82		4.83	0.004558	0.46	139.58	142.29	0.12
East Arm	1	560	ARI 1	6.65	2.50	3.17		3.18	0.015299	0.41	16.24	30.04	0.18
East Arm	1	560	ARI 2	9.00	2.50	3.33		3.34	0.012913	0.43	21.04	32.10	0.17
East Arm	1	560	ARI 5	12.45	2.50	3.52		3.53	0.011721	0.45	27.48	35.75	0.16
East Arm	1	560	ARI 10	14.65	2.50	3.63		3.64	0.011689	0.46	31.53	39.43	0.17
East Arm	1	560	ARI 20	17.45	2.50	3.75		3.76	0.011815	0.47	36.82	45.05	0.17
East Arm	1	560	ARI 50	20.05	2.50	3.85		3.87	0.011757	0.48	41.64	49.59	0.17
East Arm	1	560	ARI 100	22.90	2.50	3.95		3.97	0.011655	0.49	46.79	54.02	0.17
East Arm	1	560	PMF	55.25	2.50	4.58		4.59	0.008223	0.54	119.03	145.17	0.15
East Arm	1	520	ARI 1	6.65	1.80	2.96		2.96	0.002724	0.23	29.09	35.31	0.08
East Arm	1	520	ARI 2	9.00	1.80	3.10		3.10	0.003234	0.26	34.25	38.39	0.09
East Arm	1	520	ARI 5	12.45	1.80	3.28		3.28	0.003700	0.30	41.57	42.36	0.10
East Arm	1	520	ARI 10	14.65	1.80	3.38		3.38	0.003936	0.32	45.91	44.55	0.10
East Arm	1	520	ARI 20	17.45	1.80	3.49		3.50	0.004188	0.34	51.11	46.94	0.10
East Arm	1	520	ARI 50	20.05	1.80	3.59		3.59	0.004457	0.36	55.53	49.15	0.11
East Arm	1	520	ARI 100	22.90	1.80	3.67		3.68	0.004749	0.38	60.02	51.59	0.11
East Arm	1	520	PMF	55.25	1.80	4.33		4.34	0.004752	0.51	132.28	151.61	0.12
East Arm	1	480	ARI 1	6.65	1.74	2.86		2.86	0.002219	0.19	34.33	45.93	0.07
East Arm	1	480	ARI 2	9.00	1.74	2.98		2.98	0.002644	0.22	40.17	49.28	0.08
East Arm	1	480	ARI 5	12.45	1.74	3.14		3.14	0.003346	0.26	48.59	58.16	0.09
East Arm	1	480	ARI 10	14.65	1.74	3.23		3.23	0.003665	0.27	53.99	63.50	0.09
East Arm	1	480	ARI 20	17.45	1.74	3.33		3.34	0.003947	0.29	60.90	75.14	0.10
East Arm	1	480	ARI 50	20.05	1.74	3.42		3.42	0.004018	0.30	68.09	91.92	0.10
East Arm	1	480	ARI 100	22.90	1.74	3.50		3.51	0.003888	0.31	76.78	107.12	0.10
East Arm	1	480	PMF	55.25	1.74	4.20		4.21	0.002462	0.35	193.72	203.90	0.09
East Arm	1	440	ARI 1	6.65	1.69	2.79		2.79	0.001337	0.12	58.20	135.15	0.05
East Arm	1	440	ARI 2	9.00	1.69	2.92		2.92	0.001120	0.13	75.48	139.10	0.05
East Arm	1	440	ARI 5	12.45	1.69	3.08		3.08	0.000970	0.14	97.85	145.08	0.05
East Arm	1	440	ARI 10	14.65	1.69	3.17		3.17	0.000914	0.14	111.00	148.88	0.05
East Arm	1	440	ARI 20	17.45	1.69	3.27		3.27	0.000867	0.15	126.71	153.30	0.05
East Arm	1	440	ARI 50	20.05	1.69	3.36		3.36	0.000843	0.16	140.17	156.99	0.05
East Arm	1	440	ARI 100	22.90	1.69	3.45		3.45	0.000822	0.16	154.32	160.16	0.05
East Arm	1	440	PMF	55.25	1.69	4.15		4.15	0.000833	0.22	278.86	193.35	0.05
East Arm	1	400	ARI 1	11.10	1.75	2.68		2.68	0.005274	0.25	44.74	79.17	0.11
East Arm	1	400	ARI 2	15.00	1.75	2.81		2.82	0.005090	0.27	56.59	91.25	0.11
East Arm	1	400	ARI 5	20.70	1.75	2.98		2.99	0.004364	0.29	73.14	102.43	0.10
East Arm	1	400	ARI 10	24.30	1.75	3.08		3.08	0.004101	0.30	84.74	139.42	0.10
East Arm	1	400	ARI 20	28.90	1.75	3.19		3.19	0.003786	0.31	100.77	153.68	0.10
East Arm	1	400	ARI 50	33.10	1.75	3.28		3.28	0.003557	0.32	115.02	161.73	0.10
East Arm	1	400	ARI 100	37.80	1.75	3.37		3.38	0.003371	0.33	130.26	170.89	0.10
East Arm	1	400	PMF	91.40	1.75	4.08		4.09	0.002677	0.40	282.63	244.97	0.09
Central Arm	1	1440	ARI 1	1.30	17.07	17.28	17.22	17.29	0.199991	0.53	2.44	20.88	0.50
Central Arm	1	1440	ARI 2	1.80	17.07	17.31	17.25	17.33	0.201720	0.58	3.08	23.20	0.51
Central Arm	1	1440	ARI 5	2.50	17.07	17.34	17.28	17.36	0.210065	0.66	3.81	24.76	0.53
Central Arm	1	1440	ARI 10	2.90	17.07	17.36	17.30	17.38	0.189881	0.66	4.37	25.84	0.52
Central Arm	1	1440	ARI 20	3.50	17.07	17.38	17.30	17.41	0.185241	0.70	4.97	26.48	0.52
Central Arm	1	1440	ARI 50	4.00	17.07	17.40	17.32	17.43	0.182576	0.73	5.46	27.00	0.52
Central Arm	1	1440	ARI 100	4.60	17.07	17.42	17.34	17.45	0.188912	0.78	5.93	27.55	0.53
Central Arm	1	1440	PMF	10.20	17.07	17.57	17.45	17.62	0.170865	0.98	10.39	31.19	0.54
Central Arm	1	1400	ARI 1	1.30	14.82	15.07	14.95	15.07	0.025505	0.23	5.75	38.09	0.19
Central Arm	1	1400	ARI 2	1.80	14.82	15.10	14.96	15.11	0.025508	0.25	7.07	39.26	0.19
Central Arm	1	1400	ARI 5	2.50	14.82	15.15	14.98	15.15	0.024834	0.28	8.81	40.75	0.19
Central Arm	1	1400	ARI 10	2.90	14.82	15.17	15.01	15.17	0.025790	0.30	9.58	41.40	0.20

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	1400	ARI 20	3.50	14.82	15.20	15.00	15.20	0.025990	0.32	10.81	42.42	0.20
Central Arm	1	1400	ARI 50	4.00	14.82	15.22	15.03	15.22	0.026071	0.34	11.79	43.22	0.21
Central Arm	1	1400	ARI 100	4.60	14.82	15.25	15.03	15.25	0.025603	0.35	13.00	44.19	0.21
Central Arm	1	1400	PMF	10.20	14.82	15.44		15.45	0.026086	0.46	22.05	50.82	0.22
Central Arm	1	1360	ARI 1	1.30	13.30	13.53		13.53	0.064540	0.33	3.90	28.99	0.29
Central Arm	1	1360	ARI 2	1.80	13.30	13.56		13.57	0.065565	0.37	4.84	30.86	0.30
Central Arm	1	1360	ARI 5	2.50	13.30	13.59		13.60	0.068455	0.42	5.97	32.95	0.31
Central Arm	1	1360	ARI 10	2.90	13.30	13.62		13.63	0.063702	0.43	6.78	34.37	0.31
Central Arm	1	1360	ARI 20	3.50	13.30	13.65		13.66	0.063295	0.45	7.75	35.98	0.31
Central Arm	1	1360	ARI 50	4.00	13.30	13.67		13.68	0.063045	0.47	8.52	37.22	0.31
Central Arm	1	1360	ARI 100	4.60	13.30	13.69		13.70	0.065584	0.50	9.27	38.42	0.32
Central Arm	1	1360	PMF	10.20	13.30	13.84		13.86	0.067557	0.64	15.95	46.21	0.35
Central Arm	1	1320	ARI 1	1.30	11.67	11.88	11.76	11.89	0.028620	0.24	5.33	34.46	0.20
Central Arm	1	1320	ARI 2	1.80	11.67	11.92	11.79	11.93	0.028279	0.27	6.65	36.39	0.20
Central Arm	1	1320	ARI 5	2.50	11.67	11.97	11.81	11.97	0.026886	0.30	8.44	38.87	0.20
Central Arm	1	1320	ARI 10	2.90	11.67	11.99	11.81	11.99	0.028184	0.32	9.19	39.87	0.21
Central Arm	1	1320	ARI 20	3.50	11.67	12.02	11.84	12.02	0.028557	0.34	10.40	41.36	0.21
Central Arm	1	1320	ARI 50	4.00	11.67	12.04		12.05	0.028411	0.35	11.42	42.59	0.22
Central Arm	1	1320	ARI 100	4.60	11.67	12.07		12.08	0.027722	0.36	12.68	44.07	0.22
Central Arm	1	1320	PMF	10.20	11.67	12.27		12.28	0.025824	0.46	22.36	52.26	0.22
Central Arm	1	1280	ARI 1	1.30	10.72	10.99		11.00	0.018000	0.22	5.98	32.37	0.16
Central Arm	1	1280	ARI 2	1.80	10.72	11.04		11.05	0.017378	0.23	7.66	35.98	0.16
Central Arm	1	1280	ARI 5	2.50	10.72	11.09		11.10	0.018169	0.26	9.54	39.32	0.17
Central Arm	1	1280	ARI 10	2.90	10.72	11.12		11.12	0.017494	0.27	10.62	40.03	0.17
Central Arm	1	1280	ARI 20	3.50	10.72	11.16		11.16	0.016828	0.29	12.18	41.26	0.17
Central Arm	1	1280	ARI 50	4.00	10.72	11.18		11.19	0.016990	0.30	13.26	42.10	0.17
Central Arm	1	1280	ARI 100	4.60	10.72	11.21		11.22	0.017077	0.32	14.53	43.05	0.17
Central Arm	1	1280	PMF	10.20	10.72	11.43		11.44	0.017362	0.41	24.77	50.11	0.19
Central Arm	1	1240	ARI 1	1.30	10.10	10.35		10.35	0.014725	0.19	6.75	37.71	0.15
Central Arm	1	1240	ARI 2	1.80	10.10	10.39		10.39	0.015061	0.22	8.35	40.14	0.15
Central Arm	1	1240	ARI 5	2.50	10.10	10.44		10.44	0.015325	0.24	10.39	42.83	0.16
Central Arm	1	1240	ARI 10	2.90	10.10	10.46		10.46	0.015675	0.25	11.41	44.13	0.16
Central Arm	1	1240	ARI 20	3.50	10.10	10.49		10.50	0.015995	0.27	12.91	45.95	0.16
Central Arm	1	1240	ARI 50	4.00	10.10	10.52		10.52	0.016034	0.28	14.10	47.00	0.17
Central Arm	1	1240	ARI 100	4.60	10.10	10.55		10.55	0.016129	0.30	15.44	47.99	0.17
Central Arm	1	1240	PMF	10.20	10.10	10.75		10.76	0.016631	0.39	26.10	55.31	0.18
Central Arm	1	1200	ARI 1	1.30	9.66	9.87		9.87	0.009688	0.14	8.98	56.28	0.12
Central Arm	1	1200	ARI 2	1.80	9.66	9.91		9.91	0.009628	0.16	11.05	57.81	0.12
Central Arm	1	1200	ARI 5	2.50	9.66	9.95		9.95	0.009629	0.18	13.63	59.64	0.12
Central Arm	1	1200	ARI 10	2.90	9.66	9.97		9.98	0.009597	0.19	15.01	60.59	0.12
Central Arm	1	1200	ARI 20	3.50	9.66	10.01		10.01	0.009570	0.21	16.98	62.03	0.13
Central Arm	1	1200	ARI 50	4.00	9.66	10.03		10.03	0.009578	0.22	18.51	63.03	0.13
Central Arm	1	1200	ARI 100	4.60	9.66	10.06		10.06	0.009561	0.23	20.29	64.22	0.13
Central Arm	1	1200	PMF	10.20	9.66	10.26		10.27	0.009562	0.30	34.43	72.97	0.14
Central Arm	1	1160	ARI 1	1.30	9.35	9.56		9.57	0.006225	0.12	11.03	67.55	0.09
Central Arm	1	1160	ARI 2	1.80	9.35	9.60		9.60	0.006218	0.13	13.58	69.71	0.10
Central Arm	1	1160	ARI 5	2.50	9.35	9.65		9.65	0.006139	0.15	16.86	72.37	0.10
Central Arm	1	1160	ARI 10	2.90	9.35	9.67		9.67	0.006136	0.16	18.57	73.73	0.10
Central Arm	1	1160	ARI 20	3.50	9.35	9.70		9.70	0.006131	0.17	21.00	75.56	0.10
Central Arm	1	1160	ARI 50	4.00	9.35	9.73		9.73	0.006098	0.17	22.92	76.70	0.10
Central Arm	1	1160	ARI 100	4.60	9.35	9.76		9.76	0.006113	0.18	25.07	77.96	0.10
Central Arm	1	1160	PMF	10.20	9.35	9.96		9.96	0.006421	0.24	41.85	88.16	0.11
Central Arm	1	1120	ARI 1	1.30	9.14	9.33		9.33	0.005681	0.11	11.66	72.51	0.09
Central Arm	1	1120	ARI 2	1.80	9.14	9.37		9.37	0.005749	0.13	14.35	75.43	0.09
Central Arm	1	1120	ARI 5	2.50	9.14	9.41		9.41	0.005774	0.14	17.78	78.98	0.09
Central Arm	1	1120	ARI 10	2.90	9.14	9.43		9.43	0.005811	0.15	19.58	80.78	0.10
Central Arm	1	1120	ARI 20	3.50	9.14	9.47		9.47	0.005771	0.16	22.24	83.37	0.10
Central Arm	1	1120	ARI 50	4.00	9.14	9.49		9.49	0.006095	0.17	23.88	84.94	0.10
Central Arm	1	1120	ARI 100	4.60	9.14	9.51		9.52	0.006062	0.18	26.28	87.16	0.10
Central Arm	1	1120	PMF	10.20	9.14	9.71		9.71	0.006171	0.23	44.62	100.50	0.11
Central Arm	1	1080	ARI 1	1.30	8.86	9.11		9.11	0.005515	0.10	12.40	82.63	0.09
Central Arm	1	1080	ARI 2	1.80	8.86	9.15		9.15	0.005225	0.12	15.62	86.76	0.09
Central Arm	1	1080	ARI 5	2.50	8.86	9.19		9.19	0.005280	0.13	19.26	90.22	0.09
Central Arm	1	1080	ARI 10	2.90	8.86	9.22		9.22	0.005209	0.14	21.32	92.12	0.09
Central Arm	1	1080	ARI 20	3.50	8.86	9.24		9.24	0.005379	0.15	23.87	94.42	0.09
Central Arm	1	1080	ARI 50	4.00	8.86	9.27		9.27	0.005285	0.15	26.23	96.49	0.09
Central Arm	1	1080	ARI 100	4.60	8.86	9.29		9.29	0.005337	0.16	28.68	98.61	0.09
Central Arm	1	1080	PMF	10.20	8.86	9.47		9.47	0.006051	0.22	47.06	113.09	0.11
Central Arm	1	1040	ARI 1	1.30	8.65	8.84		8.84	0.009346	0.13	10.11	73.76	0.11
Central Arm	1	1040	ARI 2	1.80	8.65	8.86		8.87	0.010239	0.15	12.18	77.11	0.12
Central Arm	1	1040	ARI 5	2.50	8.65	8.89		8.89	0.011856	0.17	14.45	80.64	0.13

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	1040	ARI 10	2.90	8.65	8.91		8.91	0.012177	0.18	15.86	83.16	0.13
Central Arm	1	1040	ARI 20	3.50	8.65	8.94		8.94	0.011913	0.19	18.20	87.02	0.13
Central Arm	1	1040	ARI 50	4.00	8.65	8.96		8.96	0.012194	0.20	19.79	89.37	0.14
Central Arm	1	1040	ARI 100	4.60	8.65	8.98		8.98	0.012131	0.21	21.84	92.36	0.14
Central Arm	1	1040	PMF	10.20	8.65	9.15		9.16	0.010157	0.26	39.65	108.66	0.14
Central Arm	1	1000	ARI 1	1.30	8.25	8.49		8.49	0.008321	0.12	10.91	81.63	0.10
Central Arm	1	1000	ARI 2	1.80	8.25	8.53		8.53	0.007135	0.13	14.26	87.21	0.10
Central Arm	1	1000	ARI 5	2.50	8.25	8.59		8.59	0.005508	0.13	19.44	95.26	0.09
Central Arm	1	1000	ARI 10	2.90	8.25	8.62		8.62	0.005064	0.13	22.10	98.67	0.09
Central Arm	1	1000	ARI 20	3.50	8.25	8.65		8.65	0.004938	0.14	25.25	101.91	0.09
Central Arm	1	1000	ARI 50	4.00	8.25	8.68		8.68	0.004469	0.14	28.52	104.92	0.09
Central Arm	1	1000	ARI 100	4.60	8.25	8.71		8.71	0.004255	0.14	31.83	107.89	0.08
Central Arm	1	1000	PMF	10.20	8.25	8.96		8.96	0.002938	0.17	60.32	122.36	0.08
Central Arm	1	960	ARI 1	1.30	8.01	8.33		8.33	0.002385	0.09	15.22	73.56	0.06
Central Arm	1	960	ARI 2	1.80	8.01	8.39		8.39	0.002334	0.09	19.71	84.75	0.06
Central Arm	1	960	ARI 5	2.50	8.01	8.46		8.46	0.002225	0.10	26.07	100.57	0.06
Central Arm	1	960	ARI 10	2.90	8.01	8.49		8.49	0.002087	0.10	29.58	105.20	0.06
Central Arm	1	960	ARI 20	3.50	8.01	8.53		8.53	0.002025	0.10	33.91	109.09	0.06
Central Arm	1	960	ARI 50	4.00	8.01	8.57		8.57	0.001918	0.11	37.76	112.21	0.06
Central Arm	1	960	ARI 100	4.60	8.01	8.60		8.60	0.001863	0.11	41.75	114.45	0.06
Central Arm	1	960	PMF	10.20	8.01	8.87		8.87	0.001583	0.14	74.73	131.50	0.06
Central Arm	1	920	ARI 1	5.05	7.67	8.06		8.06	0.010189	0.21	24.51	93.99	0.13
Central Arm	1	920	ARI 2	6.80	7.67	8.11		8.11	0.010799	0.23	29.26	97.84	0.14
Central Arm	1	920	ARI 5	9.35	7.67	8.17		8.17	0.011514	0.26	35.42	102.60	0.14
Central Arm	1	920	ARI 10	10.90	7.67	8.20		8.21	0.012083	0.28	38.63	105.00	0.15
Central Arm	1	920	ARI 20	12.95	7.67	8.24		8.25	0.012542	0.30	42.85	108.08	0.15
Central Arm	1	920	ARI 50	14.80	7.67	8.27		8.28	0.013259	0.32	46.20	111.27	0.16
Central Arm	1	920	ARI 100	16.85	7.67	8.31		8.31	0.013392	0.33	50.49	115.24	0.16
Central Arm	1	920	PMF	37.70	7.67	8.58		8.59	0.014061	0.44	86.05	139.72	0.18
Central Arm	1	880	ARI 1	5.05	6.98	7.48	7.29	7.48	0.022882	0.26	19.42	96.33	0.18
Central Arm	1	880	ARI 2	6.80	6.98	7.54	7.32	7.54	0.020549	0.27	25.19	108.95	0.18
Central Arm	1	880	ARI 5	9.35	6.98	7.61	7.35	7.61	0.017310	0.28	33.24	118.91	0.17
Central Arm	1	880	ARI 10	10.90	6.98	7.64	7.37	7.65	0.016305	0.29	37.41	121.30	0.17
Central Arm	1	880	ARI 20	12.95	6.98	7.68		7.69	0.015654	0.31	42.38	124.14	0.17
Central Arm	1	880	ARI 50	14.80	6.98	7.71		7.72	0.015093	0.32	46.58	126.16	0.17
Central Arm	1	880	ARI 100	16.85	6.98	7.74		7.75	0.015276	0.33	50.35	127.94	0.17
Central Arm	1	880	PMF	37.70	6.98	7.99		8.00	0.015640	0.45	83.95	142.85	0.18
Central Arm	1	840	ARI 1	5.05	6.00	6.73		6.73	0.015906	0.32	15.60	42.37	0.17
Central Arm	1	840	ARI 2	6.80	6.00	6.81		6.82	0.016333	0.35	19.45	48.03	0.18
Central Arm	1	840	ARI 5	9.35	6.00	6.91		6.91	0.017403	0.39	24.26	54.27	0.18
Central Arm	1	840	ARI 10	10.90	6.00	6.96		6.96	0.017712	0.40	27.45	75.34	0.19
Central Arm	1	840	ARI 20	12.95	6.00	7.02		7.02	0.017510	0.42	32.97	112.96	0.19
Central Arm	1	840	ARI 50	14.80	6.00	7.05		7.06	0.017550	0.43	37.53	124.87	0.19
Central Arm	1	840	ARI 100	16.85	6.00	7.09		7.10	0.017542	0.45	41.89	127.96	0.19
Central Arm	1	840	PMF	37.70	6.00	7.37		7.38	0.015579	0.56	81.84	157.34	0.19
Central Arm	1	800	ARI 1	5.05	5.41	6.09		6.09	0.015667	0.34	14.66	35.84	0.17
Central Arm	1	800	ARI 2	6.80	5.41	6.20		6.20	0.014552	0.36	19.18	56.79	0.17
Central Arm	1	800	ARI 5	9.35	5.41	6.34		6.35	0.011778	0.35	28.75	77.45	0.16
Central Arm	1	800	ARI 10	10.90	5.41	6.40		6.41	0.011212	0.36	33.70	84.69	0.15
Central Arm	1	800	ARI 20	12.95	5.41	6.47		6.47	0.010857	0.36	39.61	92.97	0.15
Central Arm	1	800	ARI 50	14.80	5.41	6.53		6.54	0.010115	0.37	45.98	112.83	0.15
Central Arm	1	800	ARI 100	16.85	5.41	6.58		6.58	0.009705	0.38	51.33	116.06	0.15
Central Arm	1	800	PMF	37.70	5.41	6.94		6.95	0.008046	0.46	97.66	140.72	0.14
Central Arm	1	760	ARI 1	5.05	4.41	5.49		5.49	0.014139	0.39	12.97	24.34	0.17
Central Arm	1	760	ARI 2	6.80	4.41	5.62		5.62	0.014374	0.41	16.39	28.31	0.17
Central Arm	1	760	ARI 5	9.35	4.41	5.79		5.80	0.015960	0.42	22.32	41.18	0.18
Central Arm	1	760	ARI 10	10.90	4.41	5.88		5.88	0.015385	0.42	26.02	46.72	0.18
Central Arm	1	760	ARI 20	12.95	4.41	5.97		5.98	0.014911	0.42	30.69	53.27	0.18
Central Arm	1	760	ARI 50	14.80	4.41	6.04		6.05	0.014480	0.42	34.92	58.93	0.18
Central Arm	1	760	ARI 100	16.85	4.41	6.12		6.13	0.014008	0.43	39.54	66.99	0.17
Central Arm	1	760	PMF	37.70	4.41	6.58		6.59	0.009390	0.44	97.49	170.16	0.15
Central Arm	1	720	ARI 1	5.05	4.02	4.99		5.00	0.011010	0.34	14.81	28.16	0.15
Central Arm	1	720	ARI 2	6.80	4.02	5.13		5.14	0.010393	0.36	19.01	32.25	0.15
Central Arm	1	720	ARI 5	9.35	4.02	5.30		5.31	0.009913	0.37	25.04	38.46	0.15
Central Arm	1	720	ARI 10	10.90	4.02	5.39		5.40	0.009770	0.38	28.60	42.13	0.15
Central Arm	1	720	ARI 20	12.95	4.02	5.50		5.51	0.009556	0.39	33.28	46.73	0.15
Central Arm	1	720	ARI 50	14.80	4.02	5.58		5.59	0.009419	0.40	37.42	50.75	0.15
Central Arm	1	720	ARI 100	16.85	4.02	5.67		5.68	0.009260	0.40	41.93	54.80	0.15
Central Arm	1	720	PMF	37.70	4.02	6.27		6.27	0.006898	0.42	101.76	164.09	0.13
Central Arm	1	680	ARI 1	5.05	3.50	4.64		4.64	0.007586	0.32	15.76	24.85	0.13
Central Arm	1	680	ARI 2	6.80	3.50	4.77		4.77	0.008206	0.35	19.21	27.66	0.14

HEC-RAS Plan: n=0.2 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	680	ARI 5	9.35	3.50	4.94		4.94	0.008639	0.39	24.17	31.66	0.14
Central Arm	1	680	ARI 10	10.90	3.50	5.02		5.03	0.008951	0.41	26.88	33.72	0.14
Central Arm	1	680	ARI 20	12.95	3.50	5.12		5.13	0.009258	0.42	30.48	36.55	0.15
Central Arm	1	680	ARI 50	14.80	3.50	5.20		5.21	0.009475	0.44	33.60	38.85	0.15
Central Arm	1	680	ARI 100	16.85	3.50	5.29		5.30	0.009650	0.46	36.99	41.23	0.15
Central Arm	1	680	PMF	37.70	3.50	5.94		5.95	0.009629	0.52	77.65	114.59	0.16
Central Arm	1	640	ARI 1	5.05	3.44	4.08		4.09	0.033071	0.53	9.45	20.86	0.25
Central Arm	1	640	ARI 2	6.80	3.44	4.22		4.24	0.026284	0.54	12.66	23.37	0.23
Central Arm	1	640	ARI 5	9.35	3.44	4.40		4.41	0.021921	0.55	17.09	26.79	0.22
Central Arm	1	640	ARI 10	10.90	3.44	4.49		4.50	0.020610	0.56	19.58	28.52	0.21
Central Arm	1	640	ARI 20	12.95	3.44	4.59		4.61	0.019467	0.57	22.68	30.49	0.21
Central Arm	1	640	ARI 50	14.80	3.44	4.68		4.70	0.018616	0.58	25.35	31.86	0.21
Central Arm	1	640	ARI 100	16.85	3.44	4.77		4.78	0.017908	0.60	28.21	33.27	0.21
Central Arm	1	640	PMF	37.70	3.44	5.43		5.45	0.016617	0.69	54.78	49.42	0.21
Central Arm	1	600	ARI 1	5.05	2.57	3.87		3.87	0.002161	0.19	26.28	34.85	0.07
Central Arm	1	600	ARI 2	6.80	2.57	4.00		4.00	0.002458	0.22	31.08	37.37	0.08
Central Arm	1	600	ARI 5	9.35	2.57	4.16		4.17	0.002772	0.25	37.55	40.69	0.08
Central Arm	1	600	ARI 10	10.90	2.57	4.24		4.25	0.002989	0.27	40.88	42.30	0.09
Central Arm	1	600	ARI 20	12.95	2.57	4.34		4.34	0.003246	0.29	44.93	44.00	0.09
Central Arm	1	600	ARI 50	14.80	2.57	4.42		4.42	0.003446	0.31	48.42	45.40	0.09
Central Arm	1	600	ARI 100	16.85	2.57	4.50		4.50	0.003638	0.32	52.15	46.86	0.10
Central Arm	1	600	PMF	37.70	2.57	5.11		5.12	0.004958	0.45	84.17	58.41	0.12
Central Arm	1	560	ARI 1	5.05	2.86	3.75		3.75	0.004256	0.22	22.49	39.29	0.09
Central Arm	1	560	ARI 2	6.80	2.86	3.87		3.87	0.004495	0.25	27.49	43.31	0.10
Central Arm	1	560	ARI 5	9.35	2.86	4.02		4.02	0.004964	0.27	34.78	52.07	0.11
Central Arm	1	560	ARI 10	10.90	2.86	4.09		4.10	0.004899	0.28	38.73	53.61	0.11
Central Arm	1	560	ARI 20	12.95	2.86	4.18		4.19	0.004921	0.30	43.45	55.38	0.11
Central Arm	1	560	ARI 50	14.80	2.86	4.25		4.26	0.004947	0.31	47.53	56.93	0.11
Central Arm	1	560	ARI 100	16.85	2.86	4.33		4.33	0.004970	0.32	51.91	58.63	0.11
Central Arm	1	560	PMF	37.70	2.86	4.90		4.91	0.005656	0.42	89.94	76.28	0.12
Central Arm	1	520	ARI 1	5.05	2.42	3.62		3.62	0.002607	0.20	25.82	38.44	0.08
Central Arm	1	520	ARI 2	6.80	2.42	3.72		3.72	0.003147	0.23	29.99	41.16	0.08
Central Arm	1	520	ARI 5	9.35	2.42	3.85		3.85	0.003792	0.26	35.37	44.36	0.09
Central Arm	1	520	ARI 10	10.90	2.42	3.91		3.92	0.004099	0.28	38.48	46.11	0.10
Central Arm	1	520	ARI 20	12.95	2.42	3.99		4.00	0.004497	0.31	42.12	47.83	0.10
Central Arm	1	520	ARI 50	14.80	2.42	4.06		4.06	0.004814	0.33	45.29	49.42	0.11
Central Arm	1	520	ARI 100	16.85	2.42	4.13		4.13	0.005141	0.35	48.74	51.35	0.11
Central Arm	1	520	PMF	37.70	2.42	4.65		4.66	0.006703	0.47	81.07	73.18	0.13
Central Arm	1	480	ARI 1	5.05	2.96	3.34		3.35	0.045972	0.44	11.53	44.12	0.27
Central Arm	1	480	ARI 2	6.80	2.96	3.39		3.41	0.045747	0.49	13.98	45.53	0.28
Central Arm	1	480	ARI 5	9.35	2.96	3.49		3.50	0.035603	0.51	18.45	46.79	0.26
Central Arm	1	480	ARI 10	10.90	2.96	3.55		3.56	0.032872	0.51	21.18	49.64	0.25
Central Arm	1	480	ARI 20	12.95	2.96	3.62		3.64	0.027347	0.52	25.05	56.46	0.23
Central Arm	1	480	ARI 50	14.80	2.96	3.69		3.70	0.023494	0.52	28.86	60.64	0.22
Central Arm	1	480	ARI 100	16.85	2.96	3.76		3.77	0.020201	0.53	33.31	65.79	0.21
Central Arm	1	480	PMF	37.70	2.96	4.36		4.37	0.007709	0.51	89.17	120.13	0.15
Central Arm	1	440	ARI 1	5.05	2.26	2.91		2.92	0.004705	0.20	24.91	57.75	0.10
Central Arm	1	440	ARI 2	6.80	2.26	3.03		3.03	0.003958	0.22	31.84	61.42	0.09
Central Arm	1	440	ARI 5	9.35	2.26	3.18		3.18	0.003339	0.23	41.52	66.80	0.09
Central Arm	1	440	ARI 10	10.90	2.26	3.27		3.27	0.003071	0.24	47.45	71.34	0.09
Central Arm	1	440	ARI 20	12.95	2.26	3.37		3.37	0.002839	0.25	54.88	75.07	0.08
Central Arm	1	440	ARI 50	14.80	2.26	3.45		3.46	0.002681	0.26	61.40	78.19	0.08
Central Arm	1	440	ARI 100	16.85	2.26	3.54		3.54	0.002556	0.27	68.39	81.89	0.08
Central Arm	1	440	PMF	37.70	2.26	4.23		4.23	0.001976	0.33	136.28	119.40	0.08
Central Arm	1	400	ARI 1	8.80	1.72	2.67	2.17	2.68	0.006860	0.34	29.29	51.62	0.13
Central Arm	1	400	ARI 2	11.80	1.72	2.81	2.21	2.82	0.006415	0.37	36.69	55.49	0.13
Central Arm	1	400	ARI 5	16.20	1.72	2.98	2.26	2.99	0.006105	0.41	46.57	60.40	0.13
Central Arm	1	400	ARI 10	18.90	1.72	3.08	2.30	3.08	0.005972	0.42	52.43	63.91	0.13
Central Arm	1	400	ARI 20	22.40	1.72	3.19	2.33	3.19	0.005887	0.45	59.62	71.42	0.13
Central Arm	1	400	ARI 50	25.60	1.72	3.28	2.36	3.28	0.005848	0.47	65.89	77.42	0.13
Central Arm	1	400	ARI 100	29.10	1.72	3.37	2.40	3.38	0.005805	0.49	72.61	83.23	0.13
Central Arm	1	400	PMF	65.20	1.72	4.08	2.67	4.09	0.005361	0.61	135.41	153.40	0.13

HEC-RAS Plan: n=0.1 pro

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
West Arm	1	1060	ARI 1	3.00	13.72	14.64	14.46	14.65	0.013610	0.37	8.03	43.10	0.28
West Arm	1	1060	ARI 2	4.10	13.72	14.68	14.50	14.69	0.014741	0.42	9.83	47.56	0.29
West Arm	1	1060	ARI 5	5.90	13.72	14.73		14.75	0.014961	0.47	12.46	50.40	0.30
West Arm	1	1060	ARI 10	6.90	13.72	14.76		14.77	0.015208	0.50	13.78	51.88	0.31
West Arm	1	1060	ARI 20	8.30	13.72	14.79		14.81	0.015474	0.54	15.48	53.29	0.32
West Arm	1	1060	ARI 50	9.70	13.72	14.83		14.85	0.016397	0.55	17.77	62.46	0.33
West Arm	1	1060	ARI 100	11.10	13.72	14.86		14.88	0.016248	0.57	19.45	63.49	0.33
West Arm	1	1060	PMF	28.00	13.72	15.10		15.13	0.016025	0.77	36.26	74.65	0.35
West Arm	1	1020	ARI 1	3.00	13.84	14.11	14.00	14.12	0.012595	0.33	9.21	58.89	0.26
West Arm	1	1020	ARI 2	4.10	13.84	14.15	14.02	14.16	0.011985	0.35	11.57	62.76	0.26
West Arm	1	1020	ARI 5	5.90	13.84	14.20	14.05	14.21	0.012041	0.40	14.69	66.32	0.27
West Arm	1	1020	ARI 10	6.90	13.84	14.22	14.06	14.23	0.011897	0.42	16.35	67.97	0.27
West Arm	1	1020	ARI 20	8.30	13.84	14.25	14.08	14.26	0.012009	0.45	18.43	69.97	0.28
West Arm	1	1020	ARI 50	9.70	13.84	14.28	14.11	14.29	0.011846	0.47	20.55	71.95	0.28
West Arm	1	1020	ARI 100	11.10	13.84	14.31	14.11	14.32	0.012032	0.50	22.38	73.62	0.29
West Arm	1	1020	PMF	28.00	13.84	14.54		14.56	0.012815	0.68	41.05	87.77	0.32
West Arm	1	980	ARI 1	3.00	13.20	13.44	13.35	13.45	0.023691	0.43	6.99	47.43	0.36
West Arm	1	980	ARI 2	4.10	13.20	13.47	13.37	13.48	0.024309	0.48	8.57	50.39	0.37
West Arm	1	980	ARI 5	5.90	13.20	13.52	13.40	13.53	0.025186	0.54	10.83	53.87	0.39
West Arm	1	980	ARI 10	6.90	13.20	13.53	13.42	13.55	0.026409	0.58	11.85	55.19	0.40
West Arm	1	980	ARI 20	8.30	13.20	13.56	13.44	13.58	0.025689	0.61	13.55	57.33	0.40
West Arm	1	980	ARI 50	9.70	13.20	13.59	13.46	13.61	0.025771	0.64	15.05	59.15	0.41
West Arm	1	980	ARI 100	11.10	13.20	13.61	13.47	13.64	0.025766	0.67	16.51	60.87	0.41
West Arm	1	980	PMF	28.00	13.20	13.85		13.89	0.023181	0.86	32.75	77.80	0.42
West Arm	1	940	ARI 1	3.00	12.22	12.55	12.44	12.56	0.021166	0.44	6.83	41.10	0.34
West Arm	1	940	ARI 2	4.10	12.22	12.60	12.46	12.61	0.020063	0.47	8.72	45.59	0.34
West Arm	1	940	ARI 5	5.90	12.22	12.65		12.67	0.018909	0.52	11.44	49.75	0.34
West Arm	1	940	ARI 10	6.90	12.22	12.68		12.70	0.017870	0.53	12.96	51.58	0.34
West Arm	1	940	ARI 20	8.30	12.22	12.72		12.73	0.017654	0.56	14.79	53.84	0.34
West Arm	1	940	ARI 50	9.70	12.22	12.75		12.77	0.017701	0.59	16.47	55.88	0.35
West Arm	1	940	ARI 100	11.10	12.22	12.78		12.80	0.017497	0.61	18.17	57.86	0.35
West Arm	1	940	PMF	28.00	12.22	13.02		13.06	0.018536	0.81	34.38	74.30	0.38
West Arm	1	900	ARI 1	3.00	11.34	11.63		11.64	0.024972	0.47	6.38	39.27	0.37
West Arm	1	900	ARI 2	4.10	11.34	11.66	11.56	11.68	0.027078	0.53	7.72	42.15	0.40
West Arm	1	900	ARI 5	5.90	11.34	11.70	11.61	11.72	0.030617	0.62	9.57	45.81	0.43
West Arm	1	900	ARI 10	6.90	11.34	11.72	11.61	11.75	0.032467	0.66	10.49	47.51	0.45
West Arm	1	900	ARI 20	8.30	11.34	11.75	11.63	11.78	0.034325	0.71	11.74	49.75	0.46
West Arm	1	900	ARI 50	9.70	11.34	11.77	11.65	11.80	0.035152	0.75	12.97	51.48	0.48
West Arm	1	900	ARI 100	11.10	11.34	11.80	11.67	11.83	0.035453	0.78	14.19	52.96	0.48
West Arm	1	900	PMF	28.00	11.34	12.02		12.07	0.034946	1.03	27.31	67.20	0.51
West Arm	1	860	ARI 1	3.00	10.34	10.64	10.54	10.65	0.024204	0.46	6.47	39.78	0.37
West Arm	1	860	ARI 2	4.10	10.34	10.69	10.57	10.70	0.022020	0.49	8.30	43.21	0.36
West Arm	1	860	ARI 5	5.90	10.34	10.75		10.77	0.018905	0.53	11.15	46.65	0.35
West Arm	1	860	ARI 10	6.90	10.34	10.78		10.80	0.018034	0.55	12.59	48.27	0.34
West Arm	1	860	ARI 20	8.30	10.34	10.82		10.84	0.017178	0.57	14.52	50.37	0.34
West Arm	1	860	ARI 50	9.70	10.34	10.86		10.87	0.016522	0.59	16.37	52.32	0.34
West Arm	1	860	ARI 100	11.10	10.34	10.89		10.91	0.016174	0.61	18.11	54.08	0.34
West Arm	1	860	PMF	28.00	10.34	11.18		11.21	0.014473	0.77	36.35	70.93	0.34
West Arm	1	820	ARI 1	3.00	9.77	10.17		10.17	0.007349	0.32	9.36	40.92	0.21
West Arm	1	820	ARI 2	4.10	9.77	10.22		10.22	0.007642	0.36	11.49	44.05	0.22
West Arm	1	820	ARI 5	5.90	9.77	10.28		10.29	0.008419	0.41	14.38	48.11	0.24
West Arm	1	820	ARI 10	6.90	9.77	10.31		10.32	0.008676	0.44	15.85	49.60	0.25
West Arm	1	820	ARI 20	8.30	9.77	10.35		10.36	0.008830	0.46	17.90	51.60	0.25
West Arm	1	820	ARI 50	9.70	9.77	10.39		10.40	0.009030	0.49	19.79	53.38	0.26
West Arm	1	820	ARI 100	11.10	9.77	10.42		10.44	0.009033	0.51	21.73	55.15	0.26
West Arm	1	820	PMF	28.00	9.77	10.73		10.76	0.009325	0.68	41.12	69.40	0.28
West Arm	1	780	ARI 1	4.15	9.36	9.64	9.55	9.65	0.022228	0.48	8.70	48.13	0.36
West Arm	1	780	ARI 2	5.70	9.36	9.68	9.55	9.69	0.022040	0.53	10.77	50.55	0.37
West Arm	1	780	ARI 5	8.05	9.36	9.74	9.59	9.76	0.020296	0.58	13.85	53.11	0.36
West Arm	1	780	ARI 10	9.45	9.36	9.77	9.61	9.79	0.019816	0.61	15.51	54.45	0.36
West Arm	1	780	ARI 20	11.35	9.36	9.81	9.63	9.83	0.019328	0.64	17.65	56.12	0.37
West Arm	1	780	ARI 50	13.20	9.36	9.84		9.87	0.018757	0.67	19.72	57.68	0.37
West Arm	1	780	ARI 100	15.10	9.36	9.88		9.91	0.018032	0.69	21.86	59.26	0.36
West Arm	1	780	PMF	39.35	9.36	10.21		10.25	0.016238	0.90	43.76	73.80	0.37
West Arm	1	740	ARI 1	4.15	8.69	9.04		9.04	0.010932	0.39	10.55	45.66	0.26
West Arm	1	740	ARI 2	5.70	8.69	9.09		9.10	0.010784	0.43	13.17	48.93	0.27
West Arm	1	740	ARI 5	8.05	8.69	9.16		9.17	0.010903	0.48	16.72	53.36	0.27
West Arm	1	740	ARI 10	9.45	8.69	9.20		9.21	0.010983	0.51	18.68	55.69	0.28
West Arm	1	740	ARI 20	11.35	8.69	9.24		9.25	0.011209	0.54	21.09	58.20	0.29
West Arm	1	740	ARI 50	13.20	8.69	9.27		9.29	0.011519	0.57	23.22	60.23	0.29
West Arm	1	740	ARI 100	15.10	8.69	9.30		9.32	0.012199	0.60	25.01	61.89	0.30
West Arm	1	740	PMF	39.35	8.69	9.60		9.64	0.014691	0.87	45.49	75.41	0.36

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
West Arm	1	700	ARI 1	4.15	7.47	7.83	7.83	7.93	0.167627	1.38	3.00	15.24	1.00
West Arm	1	700	ARI 2	5.70	7.47	7.89	7.89	8.00	0.160464	1.48	3.85	17.09	1.00
West Arm	1	700	ARI 5	8.05	7.47	7.95	7.95	8.08	0.153011	1.59	5.05	19.42	1.00
West Arm	1	700	ARI 10	9.45	7.47	7.99	7.98	8.12	0.144722	1.63	5.81	20.74	0.98
West Arm	1	700	ARI 20	11.35	7.47	8.05	8.03	8.18	0.123060	1.59	7.14	23.41	0.92
West Arm	1	700	ARI 50	13.20	7.47	8.11	8.06	8.23	0.106328	1.54	8.57	26.38	0.86
West Arm	1	700	ARI 100	15.10	7.47	8.17	8.10	8.28	0.088571	1.47	10.29	29.67	0.80
West Arm	1	700	PMF	39.35	7.47	8.62	8.40	8.72	0.040275	1.34	29.36	53.73	0.58
West Arm	1	660	ARI 1	4.15	5.85	6.65	6.33	6.67	0.010620	0.57	7.23	17.30	0.28
West Arm	1	660	ARI 2	5.70	5.85	6.75	6.39	6.77	0.011066	0.63	9.02	19.26	0.29
West Arm	1	660	ARI 5	8.05	5.85	6.87	6.48	6.90	0.011425	0.70	11.52	21.67	0.31
West Arm	1	660	ARI 10	9.45	5.85	6.94	6.52	6.96	0.011598	0.73	12.90	22.88	0.31
West Arm	1	660	ARI 20	11.35	5.85	7.01	6.57	7.04	0.011785	0.77	14.71	24.44	0.32
West Arm	1	660	ARI 50	13.20	5.85	7.08		7.11	0.012030	0.80	16.44	26.10	0.32
West Arm	1	660	ARI 100	15.10	5.85	7.13		7.17	0.012915	0.85	17.76	27.31	0.34
West Arm	1	660	PMF	39.35	5.85	7.59		7.66	0.018613	1.19	33.08	40.45	0.42
West Arm	1	620	ARI 1	4.15	4.98	5.45	5.45	5.58	0.159066	1.60	2.59	10.09	1.01
West Arm	1	620	ARI 2	5.70	4.98	5.52	5.52	5.67	0.148114	1.68	3.39	11.65	1.00
West Arm	1	620	ARI 5	8.05	4.98	5.60	5.60	5.77	0.146444	1.82	4.41	13.34	1.01
West Arm	1	620	ARI 10	9.45	4.98	5.65	5.65	5.83	0.141980	1.88	5.04	14.27	1.01
West Arm	1	620	ARI 20	11.35	4.98	5.70	5.70	5.90	0.138434	1.94	5.84	15.39	1.01
West Arm	1	620	ARI 50	13.20	4.98	5.75	5.75	5.96	0.135287	2.00	6.60	16.39	1.01
West Arm	1	620	ARI 100	15.10	4.98	5.83	5.80	6.01	0.106884	1.89	7.98	18.05	0.91
West Arm	1	620	PMF	39.35	4.98	6.46		6.61	0.039732	1.69	23.35	29.87	0.61
West Arm	1	580	ARI 1	4.15	3.35	4.44		4.45	0.005873	0.54	7.64	12.60	0.22
West Arm	1	580	ARI 2	5.70	3.35	4.56		4.58	0.006560	0.62	9.26	13.73	0.24
West Arm	1	580	ARI 5	8.05	3.35	4.71		4.73	0.007491	0.71	11.40	15.20	0.26
West Arm	1	580	ARI 10	9.45	3.35	4.79		4.81	0.007914	0.75	12.61	16.05	0.27
West Arm	1	580	ARI 20	11.35	3.35	4.88		4.91	0.008450	0.80	14.15	17.06	0.28
West Arm	1	580	ARI 50	13.20	3.35	4.96		5.00	0.008879	0.85	15.57	17.94	0.29
West Arm	1	580	ARI 100	15.10	3.35	5.04		5.08	0.009341	0.89	16.98	18.90	0.30
West Arm	1	580	PMF	39.35	3.35	5.72		5.79	0.011950	1.18	33.31	29.20	0.35
West Arm	1	540	ARI 1	4.15	3.27	4.28		4.29	0.002951	0.35	11.70	22.08	0.16
West Arm	1	540	ARI 2	5.70	3.27	4.39		4.40	0.003283	0.40	14.14	23.83	0.17
West Arm	1	540	ARI 5	8.05	3.27	4.51		4.53	0.003683	0.47	17.28	25.54	0.18
West Arm	1	540	ARI 10	9.45	3.27	4.58		4.60	0.003829	0.49	19.09	26.53	0.19
West Arm	1	540	ARI 20	11.35	3.27	4.66		4.68	0.004087	0.53	21.25	27.67	0.19
West Arm	1	540	ARI 50	13.20	3.27	4.73		4.75	0.004293	0.57	23.26	28.68	0.20
West Arm	1	540	ARI 100	15.10	3.27	4.80		4.82	0.004503	0.60	25.18	29.62	0.21
West Arm	1	540	PMF	39.35	3.27	5.39		5.43	0.006627	0.87	45.21	40.62	0.26
West Arm	1	500	ARI 1	4.15	3.37	3.80	3.80	3.91	0.163729	1.46	2.84	13.04	1.00
West Arm	1	500	ARI 2	5.70	3.37	3.86	3.86	3.99	0.160206	1.57	3.63	14.74	1.01
West Arm	1	500	ARI 5	8.05	3.37	3.93	3.93	4.08	0.154635	1.69	4.77	16.88	1.01
West Arm	1	500	ARI 10	9.45	3.37	3.97	3.97	4.13	0.150103	1.74	5.43	18.02	1.01
West Arm	1	500	ARI 20	11.35	3.37	4.02	4.02	4.18	0.143392	1.79	6.34	19.47	1.00
West Arm	1	500	ARI 50	13.20	3.37	4.06	4.06	4.23	0.144840	1.87	7.08	20.56	1.02
West Arm	1	500	ARI 100	15.10	3.37	4.10	4.10	4.28	0.141801	1.91	7.90	21.81	1.01
West Arm	1	500	PMF	39.35	3.37	4.43	4.43	4.70	0.127006	2.29	17.15	33.12	1.02
West Arm	1	400	ARI 1	4.15	1.56	2.10		2.10	0.000450	0.09	48.09	199.54	0.05
West Arm	1	400	ARI 2	5.70	1.56	2.15		2.15	0.000469	0.10	58.13	202.84	0.06
West Arm	1	400	ARI 5	8.05	1.56	2.22		2.22	0.000482	0.12	71.81	207.24	0.06
West Arm	1	400	ARI 10	9.45	1.56	2.25		2.25	0.000488	0.12	79.18	209.57	0.06
West Arm	1	400	ARI 20	11.35	1.56	2.30		2.30	0.000494	0.13	88.63	212.53	0.06
West Arm	1	400	ARI 50	13.20	1.56	2.34		2.34	0.000502	0.14	97.09	215.14	0.06
West Arm	1	400	ARI 100	15.10	1.56	2.37		2.37	0.000508	0.15	105.34	217.66	0.07
West Arm	1	400	PMF	39.35	1.56	2.73		2.73	0.000587	0.23	186.44	240.99	0.08
West Arm	1	100	ARI 1	5.30	1.40	1.73	1.58	1.73	0.009008	0.32	16.58	84.86	0.23
West Arm	1	100	ARI 2	7.30	1.40	1.77	1.61	1.78	0.009009	0.36	20.56	89.86	0.24
West Arm	1	100	ARI 5	10.20	1.40	1.83	1.63	1.84	0.009009	0.40	25.81	96.07	0.24
West Arm	1	100	ARI 10	12.00	1.40	1.86	1.66	1.87	0.009007	0.42	28.86	99.50	0.25
West Arm	1	100	ARI 20	14.40	1.40	1.90	1.67	1.91	0.009010	0.44	32.73	103.69	0.25
West Arm	1	100	ARI 50	16.70	1.40	1.93	1.68	1.94	0.009004	0.46	36.28	107.39	0.25
West Arm	1	100	ARI 100	19.10	1.40	1.96	1.70	1.97	0.009001	0.48	39.85	110.99	0.26
West Arm	1	100	PMF	50.70	1.40	2.26	1.87	2.28	0.009000	0.67	75.29	125.88	0.28
East Arm	1	1440	ARI 1	2.20	15.34	15.54		15.55	0.047153	0.42	5.26	62.11	0.46
East Arm	1	1440	ARI 2	3.00	15.34	15.55	15.51	15.56	0.055598	0.49	6.09	63.64	0.51
East Arm	1	1440	ARI 5	4.20	15.34	15.57	15.52	15.59	0.058995	0.57	7.43	66.07	0.54
East Arm	1	1440	ARI 10	5.00	15.34	15.59	15.54	15.61	0.056921	0.59	8.43	67.97	0.54
East Arm	1	1440	ARI 20	6.00	15.34	15.60	15.55	15.62	0.058853	0.64	9.41	69.77	0.55
East Arm	1	1440	ARI 50	7.00	15.34	15.61	15.56	15.64	0.060720	0.68	10.32	71.40	0.57
East Arm	1	1440	ARI 100	8.00	15.34	15.63	15.58	15.65	0.059463	0.70	11.36	73.23	0.57

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	1440	PMF	19.10	15.34	15.74	15.67	15.79	0.058862	0.94	20.33	84.37	0.61
East Arm	1	1400	ARI 1	2.20	13.34	13.53	13.49	13.54	0.054054	0.52	4.22	39.71	0.51
East Arm	1	1400	ARI 2	3.00	13.34	13.56	13.50	13.57	0.044440	0.54	5.51	41.95	0.48
East Arm	1	1400	ARI 5	4.20	13.34	13.59	13.52	13.61	0.041687	0.60	7.03	44.41	0.48
East Arm	1	1400	ARI 10	5.00	13.34	13.61	13.54	13.63	0.042821	0.64	7.83	45.64	0.49
East Arm	1	1400	ARI 20	6.00	13.34	13.63	13.55	13.66	0.041592	0.67	8.94	47.31	0.49
East Arm	1	1400	ARI 50	7.00	13.34	13.66	13.57	13.68	0.039840	0.70	10.07	48.94	0.49
East Arm	1	1400	ARI 100	8.00	13.34	13.68	13.58	13.70	0.040405	0.73	10.97	50.20	0.50
East Arm	1	1400	PMF	19.10	13.34	13.84	13.70	13.89	0.038882	0.94	20.32	61.72	0.52
East Arm	1	1360	ARI 1	2.20	12.25	12.52		12.52	0.014510	0.34	6.50	43.59	0.28
East Arm	1	1360	ARI 2	3.00	12.25	12.55		12.55	0.016281	0.39	7.72	45.93	0.30
East Arm	1	1360	ARI 5	4.20	12.25	12.59		12.60	0.016792	0.44	9.63	49.37	0.31
East Arm	1	1360	ARI 10	5.00	12.25	12.61		12.62	0.016370	0.46	10.97	51.64	0.32
East Arm	1	1360	ARI 20	6.00	12.25	12.64		12.65	0.016667	0.48	12.39	53.94	0.32
East Arm	1	1360	ARI 50	7.00	12.25	12.66		12.68	0.017154	0.51	13.68	56.00	0.33
East Arm	1	1360	ARI 100	8.00	12.25	12.69		12.70	0.017078	0.53	15.06	58.14	0.33
East Arm	1	1360	PMF	19.10	12.25	12.89		12.91	0.016751	0.67	28.30	75.14	0.35
East Arm	1	1320	ARI 1	2.20	11.69	11.93	11.84	11.94	0.014838	0.32	6.87	51.00	0.28
East Arm	1	1320	ARI 2	3.00	11.69	11.97		11.97	0.013268	0.34	8.78	54.29	0.27
East Arm	1	1320	ARI 5	4.20	11.69	12.01		12.02	0.012490	0.38	11.19	57.50	0.27
East Arm	1	1320	ARI 10	5.00	11.69	12.03		12.04	0.012853	0.40	12.42	58.65	0.28
East Arm	1	1320	ARI 20	6.00	11.69	12.06		12.07	0.012822	0.43	14.00	60.10	0.28
East Arm	1	1320	ARI 50	7.00	11.69	12.08		12.09	0.012680	0.45	15.55	61.49	0.29
East Arm	1	1320	ARI 100	8.00	11.69	12.11		12.12	0.012785	0.47	16.93	62.70	0.29
East Arm	1	1320	PMF	19.10	11.69	12.30		12.32	0.013164	0.63	30.22	73.91	0.32
East Arm	1	1280	ARI 1	2.20	11.19	11.42	11.30	11.42	0.011682	0.29	7.60	54.80	0.25
East Arm	1	1280	ARI 2	3.00	11.19	11.44	11.34	11.45	0.013059	0.33	8.97	56.65	0.27
East Arm	1	1280	ARI 5	4.20	11.19	11.47	11.36	11.48	0.014449	0.39	10.83	59.07	0.29
East Arm	1	1280	ARI 10	5.00	11.19	11.49	11.36	11.50	0.014338	0.41	12.19	60.78	0.29
East Arm	1	1280	ARI 20	6.00	11.19	11.52	11.38	11.53	0.014733	0.44	13.64	62.47	0.30
East Arm	1	1280	ARI 50	7.00	11.19	11.54	11.39	11.55	0.015127	0.47	14.99	64.05	0.31
East Arm	1	1280	ARI 100	8.00	11.19	11.56		11.58	0.014753	0.48	16.54	65.82	0.31
East Arm	1	1280	PMF	19.10	11.19	11.75		11.77	0.014679	0.63	30.13	79.60	0.33
East Arm	1	1240	ARI 1	2.20	10.60	10.82		10.83	0.018827	0.35	6.25	48.11	0.31
East Arm	1	1240	ARI 2	3.00	10.60	10.86		10.87	0.015739	0.35	8.46	56.30	0.29
East Arm	1	1240	ARI 5	4.20	10.60	10.91		10.92	0.014155	0.38	11.10	61.87	0.29
East Arm	1	1240	ARI 10	5.00	10.60	10.93		10.94	0.013790	0.40	12.58	63.91	0.29
East Arm	1	1240	ARI 20	6.00	10.60	10.96		10.97	0.013260	0.42	14.42	66.36	0.28
East Arm	1	1240	ARI 50	7.00	10.60	10.98		10.99	0.013265	0.44	16.01	68.40	0.29
East Arm	1	1240	ARI 100	8.00	10.60	11.00		11.01	0.013476	0.46	17.43	70.12	0.29
East Arm	1	1240	PMF	19.10	10.60	11.18		11.20	0.014241	0.62	30.84	82.46	0.32
East Arm	1	1200	ARI 1	2.20	9.98	10.20		10.21	0.013090	0.30	7.30	54.08	0.26
East Arm	1	1200	ARI 2	3.00	9.98	10.22		10.23	0.016295	0.36	8.42	57.07	0.30
East Arm	1	1200	ARI 5	4.20	9.98	10.25		10.26	0.018851	0.42	10.11	60.78	0.33
East Arm	1	1200	ARI 10	5.00	9.98	10.27		10.28	0.019800	0.45	11.23	63.08	0.34
East Arm	1	1200	ARI 20	6.00	9.98	10.29		10.30	0.021416	0.49	12.35	64.54	0.35
East Arm	1	1200	ARI 50	7.00	9.98	10.31		10.32	0.021794	0.51	13.61	66.17	0.36
East Arm	1	1200	ARI 100	8.00	9.98	10.33		10.34	0.021925	0.54	14.86	67.75	0.37
East Arm	1	1200	PMF	19.10	9.98	10.50		10.52	0.019876	0.68	27.93	82.64	0.38
East Arm	1	1160	ARI 1	2.20	9.42	9.61	9.54	9.62	0.017354	0.33	6.76	55.08	0.30
East Arm	1	1160	ARI 2	3.00	9.42	9.65	9.55	9.66	0.012836	0.33	9.13	58.51	0.27
East Arm	1	1160	ARI 5	4.20	9.42	9.70		9.71	0.010790	0.35	12.09	62.53	0.25
East Arm	1	1160	ARI 10	5.00	9.42	9.73		9.74	0.010114	0.36	13.89	64.84	0.25
East Arm	1	1160	ARI 20	6.00	9.42	9.77		9.77	0.008979	0.37	16.40	68.33	0.24
East Arm	1	1160	ARI 50	7.00	9.42	9.80		9.80	0.008627	0.38	18.49	71.03	0.24
East Arm	1	1160	ARI 100	8.00	9.42	9.82		9.83	0.008385	0.39	20.45	73.23	0.24
East Arm	1	1160	PMF	19.10	9.42	10.04		10.06	0.007643	0.49	38.62	90.75	0.24
East Arm	1	1120	ARI 1	2.20	8.74	9.25		9.26	0.005607	0.27	8.00	35.95	0.19
East Arm	1	1120	ARI 2	3.00	8.74	9.30		9.30	0.006433	0.31	9.74	40.96	0.20
East Arm	1	1120	ARI 5	4.20	8.74	9.35		9.36	0.007333	0.35	12.11	46.99	0.22
East Arm	1	1120	ARI 10	5.00	8.74	9.38		9.39	0.007758	0.37	13.60	50.40	0.23
East Arm	1	1120	ARI 20	6.00	8.74	9.42		9.42	0.008122	0.39	15.41	54.28	0.23
East Arm	1	1120	ARI 50	7.00	8.74	9.45		9.45	0.008577	0.41	17.03	57.61	0.24
East Arm	1	1120	ARI 100	8.00	8.74	9.47		9.48	0.008897	0.43	18.65	60.81	0.25
East Arm	1	1120	PMF	19.10	8.74	9.69		9.70	0.010661	0.56	34.18	85.85	0.28
East Arm	1	1080	ARI 1	2.20	8.67	8.91	8.80	8.91	0.014058	0.27	8.28	77.99	0.26
East Arm	1	1080	ARI 2	3.00	8.67	8.93	8.82	8.94	0.013825	0.29	10.18	81.13	0.27
East Arm	1	1080	ARI 5	4.20	8.67	8.96	8.85	8.97	0.014499	0.34	12.42	83.39	0.28
East Arm	1	1080	ARI 10	5.00	8.67	8.98	8.87	8.99	0.014275	0.36	13.96	85.01	0.28
East Arm	1	1080	ARI 20	6.00	8.67	9.00	8.88	9.01	0.014225	0.38	15.71	86.68	0.29
East Arm	1	1080	ARI 50	7.00	8.67	9.02	8.89	9.03	0.014034	0.40	17.42	88.23	0.29

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	1080	ARI 100	8.00	8.67	9.04	8.90	9.04	0.014370	0.42	18.87	89.66	0.30
East Arm	1	1080	PMF	19.10	8.67	9.19		9.20	0.014496	0.57	33.66	103.99	0.32
East Arm	1	1040	ARI 1	2.20	8.21	8.42	8.32	8.42	0.011231	0.25	8.78	76.41	0.24
East Arm	1	1040	ARI 2	3.00	8.21	8.44	8.34	8.45	0.010844	0.28	10.88	79.77	0.24
East Arm	1	1040	ARI 5	4.20	8.21	8.48	8.36	8.48	0.010592	0.31	13.69	84.08	0.24
East Arm	1	1040	ARI 10	5.00	8.21	8.50	8.37	8.50	0.010501	0.32	15.40	86.34	0.25
East Arm	1	1040	ARI 20	6.00	8.21	8.52	8.38	8.53	0.010368	0.34	17.41	88.44	0.25
East Arm	1	1040	ARI 50	7.00	8.21	8.54	8.39	8.55	0.010177	0.36	19.37	90.37	0.25
East Arm	1	1040	ARI 100	8.00	8.21	8.57	8.41	8.57	0.009831	0.37	21.39	92.32	0.25
East Arm	1	1040	PMF	19.10	8.21	8.75		8.76	0.008616	0.48	40.07	108.89	0.25
East Arm	1	1000	ARI 1	2.20	7.57	7.75	7.69	7.76	0.026551	0.38	5.83	52.42	0.36
East Arm	1	1000	ARI 2	3.00	7.57	7.78	7.71	7.79	0.028944	0.43	7.00	55.39	0.38
East Arm	1	1000	ARI 5	4.20	7.57	7.81	7.73	7.82	0.030385	0.48	8.68	59.31	0.40
East Arm	1	1000	ARI 10	5.00	7.57	7.82	7.73	7.84	0.031033	0.52	9.66	60.61	0.41
East Arm	1	1000	ARI 20	6.00	7.57	7.84	7.75	7.85	0.032341	0.56	10.74	62.02	0.43
East Arm	1	1000	ARI 50	7.00	7.57	7.86	7.77	7.87	0.032972	0.59	11.81	63.38	0.44
East Arm	1	1000	ARI 100	8.00	7.57	7.87	7.78	7.89	0.035306	0.63	12.62	64.39	0.46
East Arm	1	1000	PMF	19.10	7.57	7.95	7.88	8.01	0.069854	1.03	18.54	76.19	0.67
East Arm	1	960	ARI 1	2.20	6.32	6.61	6.52	6.63	0.030545	0.51	4.31	27.25	0.41
East Arm	1	960	ARI 2	3.00	6.32	6.66	6.55	6.68	0.026389	0.52	5.73	31.26	0.39
East Arm	1	960	ARI 5	4.20	6.32	6.72	6.58	6.73	0.024471	0.55	7.58	35.93	0.39
East Arm	1	960	ARI 10	5.00	6.32	6.75	6.60	6.77	0.023008	0.56	8.89	39.41	0.38
East Arm	1	960	ARI 20	6.00	6.32	6.79	6.63	6.81	0.021518	0.57	10.57	43.88	0.37
East Arm	1	960	ARI 50	7.00	6.32	6.82	6.64	6.84	0.020602	0.58	11.98	46.14	0.37
East Arm	1	960	ARI 100	8.00	6.32	6.85		6.87	0.019304	0.59	13.46	48.12	0.36
East Arm	1	960	PMF	19.10	6.32	7.19		7.20	0.009211	0.58	33.02	70.54	0.27
East Arm	1	920	ARI 1	6.65	5.25	5.77		5.79	0.018933	0.65	10.22	31.42	0.36
East Arm	1	920	ARI 2	9.00	5.25	5.85		5.87	0.018586	0.70	12.80	34.52	0.37
East Arm	1	920	ARI 5	12.45	5.25	5.95		5.98	0.017289	0.75	16.64	38.75	0.36
East Arm	1	920	ARI 10	14.65	5.25	6.01		6.04	0.016633	0.77	19.07	41.43	0.36
East Arm	1	920	ARI 20	17.45	5.25	6.08		6.12	0.015984	0.78	22.26	45.53	0.36
East Arm	1	920	ARI 50	20.05	5.25	6.14		6.18	0.015273	0.80	25.07	48.09	0.35
East Arm	1	920	ARI 100	22.90	5.25	6.20		6.24	0.014784	0.82	27.95	50.49	0.35
East Arm	1	920	PMF	55.25	5.25	6.76		6.80	0.010401	0.87	63.62	80.91	0.31
East Arm	1	880	ARI 1	6.65	4.51	5.21		5.23	0.010739	0.58	11.50	27.53	0.29
East Arm	1	880	ARI 2	9.00	4.51	5.31		5.33	0.010475	0.63	14.26	29.35	0.29
East Arm	1	880	ARI 5	12.45	4.51	5.46		5.48	0.009276	0.65	19.11	34.22	0.28
East Arm	1	880	ARI 10	14.65	4.51	5.55		5.57	0.008784	0.66	22.11	37.07	0.27
East Arm	1	880	ARI 20	17.45	4.51	5.64		5.66	0.008351	0.68	25.69	39.97	0.27
East Arm	1	880	ARI 50	20.05	4.51	5.72		5.74	0.008105	0.70	28.83	42.35	0.27
East Arm	1	880	ARI 100	22.90	4.51	5.79		5.82	0.007831	0.71	32.27	44.81	0.27
East Arm	1	880	PMF	55.25	4.51	6.40		6.44	0.007808	0.82	67.73	76.19	0.28
East Arm	1	840	ARI 1	6.65	4.00	4.77		4.79	0.011242	0.66	10.15	20.74	0.30
East Arm	1	840	ARI 2	9.00	4.00	4.92		4.94	0.009402	0.67	13.43	23.16	0.28
East Arm	1	840	ARI 5	12.45	4.00	5.10		5.12	0.008779	0.69	18.04	28.31	0.28
East Arm	1	840	ARI 10	14.65	4.00	5.19		5.22	0.008803	0.70	20.86	31.96	0.28
East Arm	1	840	ARI 20	17.45	4.00	5.30		5.32	0.008702	0.72	24.37	35.99	0.28
East Arm	1	840	ARI 50	20.05	4.00	5.38		5.41	0.008625	0.73	27.48	39.22	0.28
East Arm	1	840	ARI 100	22.90	4.00	5.46		5.49	0.008552	0.74	30.77	42.37	0.28
East Arm	1	840	PMF	55.25	4.00	6.09		6.12	0.007815	0.83	66.58	72.93	0.28
East Arm	1	800	ARI 1	6.65	3.30	4.45		4.47	0.005785	0.59	11.22	16.05	0.23
East Arm	1	800	ARI 2	9.00	3.30	4.59		4.61	0.007323	0.66	13.55	19.57	0.25
East Arm	1	800	ARI 5	12.45	3.30	4.74		4.77	0.008672	0.74	16.93	23.86	0.28
East Arm	1	800	ARI 10	14.65	3.30	4.83		4.86	0.009307	0.77	19.03	26.40	0.29
East Arm	1	800	ARI 20	17.45	3.30	4.92		4.95	0.009891	0.81	21.60	29.23	0.30
East Arm	1	800	ARI 50	20.05	3.30	4.99		5.03	0.010332	0.84	23.88	31.51	0.31
East Arm	1	800	ARI 100	22.90	3.30	5.07		5.11	0.010682	0.87	26.31	33.74	0.31
East Arm	1	800	PMF	55.25	3.30	5.69		5.74	0.011667	1.03	53.75	58.62	0.34
East Arm	1	760	ARI 1	6.65	3.50	4.02		4.05	0.023418	0.79	8.46	22.90	0.41
East Arm	1	760	ARI 2	9.00	3.50	4.14		4.17	0.018115	0.79	11.40	25.28	0.38
East Arm	1	760	ARI 5	12.45	3.50	4.29		4.32	0.015257	0.80	15.47	29.30	0.35
East Arm	1	760	ARI 10	14.65	3.50	4.37		4.40	0.014157	0.81	17.98	31.63	0.34
East Arm	1	760	ARI 20	17.45	3.50	4.47		4.50	0.013100	0.83	21.12	34.30	0.34
East Arm	1	760	ARI 50	20.05	3.50	4.55		4.58	0.012285	0.84	23.95	36.35	0.33
East Arm	1	760	ARI 100	22.90	3.50	4.62		4.66	0.011620	0.85	26.91	38.22	0.32
East Arm	1	760	PMF	55.25	3.50	5.27		5.32	0.009579	0.95	57.94	60.07	0.31
East Arm	1	720	ARI 1	6.65	2.87	3.83		3.84	0.002164	0.34	19.45	30.80	0.14
East Arm	1	720	ARI 2	9.00	2.87	3.94		3.95	0.002459	0.39	23.13	33.16	0.15
East Arm	1	720	ARI 5	12.45	2.87	4.09		4.10	0.002752	0.44	28.03	35.87	0.16
East Arm	1	720	ARI 10	14.65	2.87	4.16		4.18	0.002920	0.47	30.90	37.46	0.17
East Arm	1	720	ARI 20	17.45	2.87	4.26		4.27	0.003085	0.51	34.42	39.32	0.17

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
East Arm	1	720	ARI 50	20.05	2.87	4.33		4.35	0.003209	0.53	37.56	40.92	0.18
East Arm	1	720	ARI 100	22.90	2.87	4.41		4.43	0.003347	0.56	40.78	42.49	0.18
East Arm	1	720	PMF	55.25	2.87	5.04		5.07	0.004404	0.74	78.48	112.83	0.22
East Arm	1	680	ARI 1	6.65	2.93	3.65		3.67	0.010293	0.57	11.59	27.18	0.28
East Arm	1	680	ARI 2	9.00	2.93	3.75		3.77	0.010085	0.62	14.42	29.35	0.28
East Arm	1	680	ARI 5	12.45	2.93	3.89		3.91	0.009607	0.67	18.45	32.19	0.28
East Arm	1	680	ARI 10	14.65	2.93	3.96		3.98	0.009533	0.71	20.77	33.72	0.29
East Arm	1	680	ARI 20	17.45	2.93	4.04		4.07	0.009487	0.74	23.69	35.93	0.29
East Arm	1	680	ARI 50	20.05	2.93	4.11		4.14	0.009485	0.76	26.40	38.21	0.29
East Arm	1	680	ARI 100	22.90	2.93	4.19		4.22	0.009449	0.78	29.30	40.52	0.29
East Arm	1	680	PMF	55.25	2.93	4.80		4.84	0.006993	0.92	63.47	76.41	0.27
East Arm	1	600	ARI 1	6.65	2.42	3.22		3.22	0.003479	0.36	18.40	38.24	0.17
East Arm	1	600	ARI 2	9.00	2.42	3.32		3.32	0.003600	0.40	22.33	40.42	0.17
East Arm	1	600	ARI 5	12.45	2.42	3.44		3.45	0.003830	0.46	27.29	42.96	0.18
East Arm	1	600	ARI 10	14.65	2.42	3.51		3.52	0.003843	0.48	30.38	44.12	0.19
East Arm	1	600	ARI 20	17.45	2.42	3.59		3.60	0.003859	0.51	34.13	45.56	0.19
East Arm	1	600	ARI 50	20.05	2.42	3.66		3.67	0.003919	0.54	37.31	46.74	0.19
East Arm	1	600	ARI 100	22.90	2.42	3.73		3.75	0.003903	0.56	40.90	48.03	0.19
East Arm	1	600	PMF	55.25	2.42	4.38		4.40	0.004274	0.71	80.89	116.09	0.21
East Arm	1	560	ARI 1	6.65	2.50	2.85		2.89	0.041216	0.91	7.31	24.36	0.53
East Arm	1	560	ARI 2	9.00	2.50	2.98		3.01	0.025234	0.84	10.66	27.45	0.43
East Arm	1	560	ARI 5	12.45	2.50	3.13		3.16	0.017229	0.83	14.94	29.46	0.37
East Arm	1	560	ARI 10	14.65	2.50	3.21		3.24	0.015242	0.85	17.34	30.52	0.36
East Arm	1	560	ARI 20	17.45	2.50	3.30		3.34	0.013781	0.87	20.16	31.73	0.35
East Arm	1	560	ARI 50	20.05	2.50	3.38		3.42	0.012897	0.89	22.64	32.75	0.34
East Arm	1	560	ARI 100	22.90	2.50	3.45		3.50	0.012237	0.91	25.22	33.77	0.34
East Arm	1	560	PMF	55.25	2.50	4.08		4.13	0.012091	1.03	54.71	82.40	0.34
East Arm	1	520	ARI 1	6.65	1.80	2.67		2.67	0.001902	0.34	19.79	29.15	0.13
East Arm	1	520	ARI 2	9.00	1.80	2.79		2.79	0.002233	0.39	23.34	31.53	0.14
East Arm	1	520	ARI 5	12.45	1.80	2.93		2.94	0.002647	0.45	27.97	34.60	0.16
East Arm	1	520	ARI 10	14.65	1.80	3.00		3.01	0.002906	0.48	30.54	36.21	0.17
East Arm	1	520	ARI 20	17.45	1.80	3.08		3.10	0.003199	0.52	33.60	38.02	0.18
East Arm	1	520	ARI 50	20.05	1.80	3.15		3.17	0.003420	0.55	36.38	39.59	0.18
East Arm	1	520	ARI 100	22.90	1.80	3.23		3.25	0.003608	0.58	39.41	41.23	0.19
East Arm	1	520	PMF	55.25	1.80	3.79		3.83	0.005043	0.84	66.59	60.80	0.24
East Arm	1	480	ARI 1	6.65	1.74	2.60		2.60	0.001591	0.29	23.32	38.51	0.12
East Arm	1	480	ARI 2	9.00	1.74	2.71		2.71	0.001844	0.33	27.60	41.63	0.13
East Arm	1	480	ARI 5	12.45	1.74	2.83		2.84	0.002154	0.38	33.08	45.19	0.14
East Arm	1	480	ARI 10	14.65	1.74	2.90		2.90	0.002365	0.41	35.99	46.89	0.15
East Arm	1	480	ARI 20	17.45	1.74	2.97		2.98	0.002601	0.44	39.51	48.92	0.16
East Arm	1	480	ARI 50	20.05	1.74	3.03		3.04	0.002867	0.47	42.60	51.60	0.17
East Arm	1	480	ARI 100	22.90	1.74	3.10		3.11	0.003171	0.50	46.09	55.52	0.17
East Arm	1	480	PMF	55.25	1.74	3.63		3.65	0.003644	0.65	92.55	144.86	0.20
East Arm	1	440	ARI 1	6.65	1.69	2.54		2.54	0.001419	0.22	31.71	82.64	0.10
East Arm	1	440	ARI 2	9.00	1.69	2.64		2.65	0.001401	0.23	41.02	96.67	0.11
East Arm	1	440	ARI 5	12.45	1.69	2.77		2.77	0.001328	0.24	54.96	134.14	0.10
East Arm	1	440	ARI 10	14.65	1.69	2.83		2.84	0.001246	0.25	63.57	136.39	0.10
East Arm	1	440	ARI 20	17.45	1.69	2.91		2.91	0.001115	0.26	74.07	138.78	0.10
East Arm	1	440	ARI 50	20.05	1.69	2.97		2.98	0.001043	0.26	82.92	140.86	0.10
East Arm	1	440	ARI 100	22.90	1.69	3.04		3.04	0.000980	0.27	92.31	143.45	0.10
East Arm	1	440	PMF	55.25	1.69	3.58		3.59	0.000797	0.35	176.82	167.64	0.09
East Arm	1	400	ARI 1	11.10	1.75	2.41		2.42	0.005555	0.42	26.52	62.97	0.21
East Arm	1	400	ARI 2	15.00	1.75	2.52		2.53	0.005253	0.45	33.39	68.37	0.21
East Arm	1	400	ARI 5	20.70	1.75	2.65		2.66	0.005146	0.49	42.41	75.55	0.21
East Arm	1	400	ARI 10	24.30	1.75	2.71		2.72	0.005462	0.51	47.53	82.56	0.22
East Arm	1	400	ARI 20	28.90	1.75	2.79		2.81	0.005259	0.53	54.75	89.92	0.21
East Arm	1	400	ARI 50	33.10	1.75	2.86		2.88	0.004840	0.54	61.15	94.46	0.21
East Arm	1	400	ARI 100	37.80	1.75	2.93		2.95	0.004537	0.56	68.01	99.10	0.21
East Arm	1	400	PMF	91.40	1.75	3.50		3.52	0.003290	0.69	152.64	187.12	0.19
Central Arm	1	1440	ARI 1	1.30	17.07	17.23	17.22	17.27	0.171065	0.85	1.53	16.52	0.89
Central Arm	1	1440	ARI 2	1.80	17.07	17.25	17.25	17.30	0.209424	0.99	1.82	18.00	1.00
Central Arm	1	1440	ARI 5	2.50	17.07	17.28	17.28	17.33	0.200616	1.06	2.36	20.56	1.00
Central Arm	1	1440	ARI 10	2.90	17.07	17.30	17.30	17.35	0.151824	0.99	2.92	22.65	0.88
Central Arm	1	1440	ARI 20	3.50	17.07	17.30	17.30	17.37	0.215789	1.19	2.95	22.74	1.05
Central Arm	1	1440	ARI 50	4.00	17.07	17.32	17.32	17.39	0.188987	1.18	3.39	23.91	1.00
Central Arm	1	1440	ARI 100	4.60	17.07	17.34	17.34	17.41	0.185045	1.22	3.76	24.65	1.00
Central Arm	1	1440	PMF	10.20	17.07	17.44	17.44	17.56	0.164494	1.53	6.66	28.37	1.01
Central Arm	1	1400	ARI 1	1.30	14.82	15.01	14.95	15.02	0.027462	0.36	3.59	35.03	0.36
Central Arm	1	1400	ARI 2	1.80	14.82	15.04	14.96	15.05	0.025135	0.39	4.58	37.02	0.36
Central Arm	1	1400	ARI 5	2.50	14.82	15.07	14.98	15.08	0.024798	0.44	5.65	38.01	0.37
Central Arm	1	1400	ARI 10	2.90	14.82	15.08	15.01	15.09	0.024646	0.47	6.23	38.52	0.37

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	1400	ARI 20	3.50	14.82	15.10	15.00	15.12	0.024862	0.50	7.00	39.20	0.38
Central Arm	1	1400	ARI 50	4.00	14.82	15.12	15.01	15.13	0.025043	0.53	7.61	39.72	0.38
Central Arm	1	1400	ARI 100	4.60	14.82	15.14	15.04	15.15	0.024931	0.55	8.34	40.35	0.39
Central Arm	1	1400	PMF	10.20	14.82	15.27	15.12	15.30	0.025512	0.73	13.94	44.92	0.42
Central Arm	1	1360	ARI 1	1.30	13.30	13.48		13.49	0.057300	0.51	2.53	25.44	0.52
Central Arm	1	1360	ARI 2	1.80	13.30	13.50		13.51	0.065077	0.59	3.03	26.92	0.57
Central Arm	1	1360	ARI 5	2.50	13.30	13.52		13.54	0.066942	0.67	3.75	28.65	0.59
Central Arm	1	1360	ARI 10	2.90	13.30	13.53		13.56	0.068175	0.70	4.12	29.47	0.60
Central Arm	1	1360	ARI 20	3.50	13.30	13.55		13.58	0.067335	0.74	4.70	30.60	0.61
Central Arm	1	1360	ARI 50	4.00	13.30	13.57		13.60	0.065423	0.77	5.20	31.55	0.60
Central Arm	1	1360	ARI 100	4.60	13.30	13.59		13.62	0.065945	0.81	5.71	32.48	0.61
Central Arm	1	1360	PMF	10.20	13.30	13.71	13.63	13.76	0.063062	1.01	10.12	39.82	0.64
Central Arm	1	1320	ARI 1	1.30	11.67	11.82	11.76	11.83	0.031353	0.40	3.29	31.22	0.39
Central Arm	1	1320	ARI 2	1.80	11.67	11.85	11.79	11.86	0.028412	0.43	4.20	32.69	0.38
Central Arm	1	1320	ARI 5	2.50	11.67	11.88	11.81	11.89	0.027712	0.48	5.25	34.33	0.39
Central Arm	1	1320	ARI 10	2.90	11.67	11.90	11.81	11.91	0.027465	0.50	5.81	35.17	0.39
Central Arm	1	1320	ARI 20	3.50	11.67	11.92	11.82	11.93	0.027888	0.53	6.56	36.26	0.40
Central Arm	1	1320	ARI 50	4.00	11.67	11.93	11.84	11.95	0.028369	0.56	7.13	37.07	0.41
Central Arm	1	1320	ARI 100	4.60	11.67	11.95	11.85	11.97	0.028210	0.59	7.85	38.07	0.41
Central Arm	1	1320	PMF	10.20	11.67	12.09	11.94	12.12	0.028358	0.76	13.50	44.86	0.44
Central Arm	1	1280	ARI 1	1.30	10.72	10.92		10.92	0.017273	0.35	3.73	27.30	0.30
Central Arm	1	1280	ARI 2	1.80	10.72	10.95		10.96	0.018686	0.40	4.55	29.24	0.32
Central Arm	1	1280	ARI 5	2.50	10.72	10.99		11.00	0.018130	0.43	5.80	31.99	0.32
Central Arm	1	1280	ARI 10	2.90	10.72	11.01		11.02	0.018264	0.45	6.43	33.35	0.33
Central Arm	1	1280	ARI 20	3.50	10.72	11.04		11.05	0.017765	0.47	7.45	35.54	0.33
Central Arm	1	1280	ARI 50	4.00	10.72	11.06		11.07	0.017351	0.48	8.28	37.23	0.33
Central Arm	1	1280	ARI 100	4.60	10.72	11.08		11.09	0.017577	0.51	9.10	38.68	0.33
Central Arm	1	1280	PMF	10.20	10.72	11.24		11.26	0.016952	0.65	15.61	43.85	0.35
Central Arm	1	1240	ARI 1	1.30	10.10	10.27		10.28	0.014963	0.31	4.20	32.93	0.28
Central Arm	1	1240	ARI 2	1.80	10.10	10.30		10.31	0.014296	0.34	5.24	34.05	0.28
Central Arm	1	1240	ARI 5	2.50	10.10	10.34		10.35	0.014632	0.38	6.57	37.26	0.29
Central Arm	1	1240	ARI 10	2.90	10.10	10.36		10.37	0.014940	0.40	7.24	38.59	0.30
Central Arm	1	1240	ARI 20	3.50	10.10	10.38		10.39	0.015136	0.43	8.18	39.91	0.30
Central Arm	1	1240	ARI 50	4.00	10.10	10.40		10.41	0.015277	0.45	8.93	40.92	0.31
Central Arm	1	1240	ARI 100	4.60	10.10	10.42		10.43	0.015225	0.47	9.83	42.12	0.31
Central Arm	1	1240	PMF	10.20	10.10	10.57		10.59	0.016204	0.62	16.51	48.78	0.34
Central Arm	1	1200	ARI 1	1.30	9.66	9.81		9.82	0.009166	0.22	5.92	53.94	0.21
Central Arm	1	1200	ARI 2	1.80	9.66	9.84		9.84	0.009866	0.25	7.09	54.84	0.23
Central Arm	1	1200	ARI 5	2.50	9.66	9.87		9.87	0.009764	0.29	8.74	56.10	0.23
Central Arm	1	1200	ARI 10	2.90	9.66	9.88		9.89	0.009630	0.30	9.64	56.77	0.23
Central Arm	1	1200	ARI 20	3.50	9.66	9.90		9.91	0.009658	0.32	10.85	57.66	0.24
Central Arm	1	1200	ARI 50	4.00	9.66	9.92		9.92	0.009710	0.34	11.79	58.34	0.24
Central Arm	1	1200	ARI 100	4.60	9.66	9.94		9.94	0.009693	0.36	12.90	59.12	0.24
Central Arm	1	1200	PMF	10.20	9.66	10.08		10.09	0.009625	0.47	21.66	65.12	0.26
Central Arm	1	1160	ARI 1	1.30	9.35	9.50		9.50	0.006501	0.19	7.00	63.26	0.18
Central Arm	1	1160	ARI 2	1.80	9.35	9.53		9.53	0.006459	0.21	8.63	65.23	0.18
Central Arm	1	1160	ARI 5	2.50	9.35	9.56		9.56	0.006205	0.23	10.77	67.33	0.19
Central Arm	1	1160	ARI 10	2.90	9.35	9.58		9.58	0.006293	0.25	11.78	68.20	0.19
Central Arm	1	1160	ARI 20	3.50	9.35	9.60		9.60	0.006242	0.26	13.32	69.49	0.19
Central Arm	1	1160	ARI 50	4.00	9.35	9.62		9.62	0.006165	0.27	14.57	70.52	0.19
Central Arm	1	1160	ARI 100	4.60	9.35	9.64		9.64	0.006153	0.29	15.96	71.65	0.19
Central Arm	1	1160	PMF	10.20	9.35	9.78		9.79	0.006139	0.38	26.77	78.94	0.21
Central Arm	1	1120	ARI 1	1.30	9.14	9.27		9.27	0.005304	0.17	7.65	67.81	0.16
Central Arm	1	1120	ARI 2	1.80	9.14	9.30		9.30	0.005564	0.19	9.27	69.81	0.17
Central Arm	1	1120	ARI 5	2.50	9.14	9.33		9.33	0.005649	0.22	11.39	72.21	0.18
Central Arm	1	1120	ARI 10	2.90	9.14	9.34		9.34	0.005810	0.23	12.43	73.35	0.18
Central Arm	1	1120	ARI 20	3.50	9.14	9.36		9.37	0.005759	0.25	14.08	75.14	0.18
Central Arm	1	1120	ARI 50	4.00	9.14	9.38		9.38	0.005730	0.26	15.39	76.52	0.18
Central Arm	1	1120	ARI 100	4.60	9.14	9.40		9.40	0.005775	0.27	16.83	78.01	0.19
Central Arm	1	1120	PMF	10.20	9.14	9.53		9.54	0.006076	0.36	28.16	88.86	0.21
Central Arm	1	1080	ARI 1	1.30	8.86	9.05	8.94	9.06	0.005952	0.17	7.72	75.58	0.17
Central Arm	1	1080	ARI 2	1.80	8.86	9.08		9.08	0.005558	0.19	9.73	78.69	0.17
Central Arm	1	1080	ARI 5	2.50	8.86	9.11		9.11	0.005616	0.21	12.01	82.07	0.17
Central Arm	1	1080	ARI 10	2.90	8.86	9.13		9.13	0.005221	0.21	13.57	84.30	0.17
Central Arm	1	1080	ARI 20	3.50	8.86	9.15		9.15	0.005189	0.23	15.37	86.52	0.17
Central Arm	1	1080	ARI 50	4.00	8.86	9.16		9.17	0.005342	0.24	16.60	87.71	0.18
Central Arm	1	1080	ARI 100	4.60	8.86	9.18		9.18	0.005254	0.25	18.27	89.30	0.18
Central Arm	1	1080	PMF	10.20	8.86	9.32		9.32	0.005187	0.33	31.02	100.58	0.19
Central Arm	1	1040	ARI 1	1.30	8.65	8.79	8.71	8.79	0.007588	0.19	6.88	68.19	0.19
Central Arm	1	1040	ARI 2	1.80	8.65	8.81	8.72	8.82	0.008014	0.22	8.36	70.78	0.20
Central Arm	1	1040	ARI 5	2.50	8.65	8.84		8.84	0.009051	0.25	9.96	73.51	0.22

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	1040	ARI 10	2.90	8.65	8.85		8.85	0.009352	0.27	10.87	75.00	0.22
Central Arm	1	1040	ARI 20	3.50	8.65	8.86		8.87	0.010132	0.29	11.99	76.82	0.24
Central Arm	1	1040	ARI 50	4.00	8.65	8.87		8.88	0.010590	0.31	12.92	78.28	0.24
Central Arm	1	1040	ARI 100	4.60	8.65	8.88		8.89	0.011659	0.33	13.74	79.55	0.26
Central Arm	1	1040	PMF	10.20	8.65	8.99		9.00	0.013015	0.45	22.90	93.91	0.29
Central Arm	1	1000	ARI 1	1.30	8.25	8.43		8.44	0.011129	0.21	6.33	73.73	0.22
Central Arm	1	1000	ARI 2	1.80	8.25	8.46		8.46	0.010305	0.22	8.00	76.71	0.22
Central Arm	1	1000	ARI 5	2.50	8.25	8.49		8.49	0.008511	0.24	10.55	81.04	0.21
Central Arm	1	1000	ARI 10	2.90	8.25	8.51		8.51	0.007752	0.24	12.00	83.46	0.20
Central Arm	1	1000	ARI 20	3.50	8.25	8.53		8.53	0.007324	0.25	13.87	86.57	0.20
Central Arm	1	1000	ARI 50	4.00	8.25	8.55		8.55	0.006481	0.25	15.81	89.69	0.19
Central Arm	1	1000	ARI 100	4.60	8.25	8.57		8.58	0.005843	0.26	18.00	93.09	0.19
Central Arm	1	1000	PMF	10.20	8.25	8.74		8.75	0.003934	0.29	35.02	110.67	0.17
Central Arm	1	960	ARI 1	1.30	8.01	8.23		8.23	0.002817	0.15	8.66	57.61	0.12
Central Arm	1	960	ARI 2	1.80	8.01	8.27		8.27	0.002770	0.16	10.99	63.34	0.13
Central Arm	1	960	ARI 5	2.50	8.01	8.32		8.33	0.002485	0.17	14.55	71.92	0.12
Central Arm	1	960	ARI 10	2.90	8.01	8.35		8.35	0.002393	0.18	16.50	76.59	0.12
Central Arm	1	960	ARI 20	3.50	8.01	8.38		8.39	0.002350	0.18	19.21	83.40	0.12
Central Arm	1	960	ARI 50	4.00	8.01	8.41		8.41	0.002268	0.18	21.69	89.97	0.12
Central Arm	1	960	ARI 100	4.60	8.01	8.44		8.44	0.002242	0.19	24.34	96.52	0.12
Central Arm	1	960	PMF	10.20	8.01	8.64		8.65	0.001646	0.22	46.52	117.07	0.11
Central Arm	1	920	ARI 1	5.05	7.67	7.97	7.81	7.98	0.008010	0.30	16.82	86.53	0.22
Central Arm	1	920	ARI 2	6.80	7.67	8.01	7.83	8.01	0.009014	0.35	19.71	89.94	0.24
Central Arm	1	920	ARI 5	9.35	7.67	8.05	7.86	8.06	0.009932	0.40	23.50	93.15	0.25
Central Arm	1	920	ARI 10	10.90	7.67	8.07	7.88	8.08	0.010043	0.42	25.90	95.13	0.26
Central Arm	1	920	ARI 20	12.95	7.67	8.10		8.11	0.010469	0.45	28.62	97.33	0.27
Central Arm	1	920	ARI 50	14.80	7.67	8.12		8.14	0.010960	0.48	30.80	99.05	0.28
Central Arm	1	920	ARI 100	16.85	7.67	8.15		8.16	0.011164	0.50	33.38	101.05	0.28
Central Arm	1	920	PMF	37.70	7.67	8.34		8.36	0.013830	0.70	54.08	118.46	0.33
Central Arm	1	880	ARI 1	5.05	6.98	7.38	7.26	7.39	0.034185	0.48	10.52	79.47	0.42
Central Arm	1	880	ARI 2	6.80	6.98	7.42	7.33	7.43	0.026978	0.49	13.89	85.39	0.39
Central Arm	1	880	ARI 5	9.35	6.98	7.47	7.35	7.48	0.023052	0.51	18.37	94.63	0.37
Central Arm	1	880	ARI 10	10.90	6.98	7.50	7.37	7.51	0.021363	0.52	20.96	98.73	0.36
Central Arm	1	880	ARI 20	12.95	6.98	7.53	7.39	7.54	0.020510	0.53	24.21	106.05	0.36
Central Arm	1	880	ARI 50	14.80	6.98	7.56	7.40	7.57	0.019111	0.53	27.72	115.47	0.35
Central Arm	1	880	ARI 100	16.85	6.98	7.59	7.41	7.60	0.017552	0.54	30.96	117.57	0.34
Central Arm	1	880	PMF	37.70	6.98	7.78		7.81	0.014233	0.68	55.28	130.24	0.33
Central Arm	1	840	ARI 1	5.05	6.00	6.56		6.58	0.013465	0.52	9.63	31.67	0.30
Central Arm	1	840	ARI 2	6.80	6.00	6.63		6.64	0.014921	0.58	11.72	35.79	0.32
Central Arm	1	840	ARI 5	9.35	6.00	6.70		6.73	0.015815	0.64	14.72	40.97	0.34
Central Arm	1	840	ARI 10	10.90	6.00	6.74		6.77	0.016555	0.67	16.30	43.45	0.35
Central Arm	1	840	ARI 20	12.95	6.00	6.80		6.82	0.016368	0.69	18.71	47.00	0.35
Central Arm	1	840	ARI 50	14.80	6.00	6.84		6.86	0.016509	0.72	20.68	49.69	0.35
Central Arm	1	840	ARI 100	16.85	6.00	6.87		6.90	0.017481	0.75	22.35	51.88	0.37
Central Arm	1	840	PMF	37.70	6.00	7.11		7.15	0.018928	0.96	44.51	129.78	0.40
Central Arm	1	800	ARI 1	5.05	5.41	5.87	5.70	5.89	0.022278	0.64	7.83	27.57	0.39
Central Arm	1	800	ARI 2	6.80	5.41	5.96	5.75	5.98	0.018324	0.65	10.41	31.04	0.36
Central Arm	1	800	ARI 5	9.35	5.41	6.06		6.09	0.015842	0.68	13.75	34.62	0.34
Central Arm	1	800	ARI 10	10.90	5.41	6.12		6.14	0.015169	0.69	15.73	37.25	0.34
Central Arm	1	800	ARI 20	12.95	5.41	6.18		6.21	0.014503	0.71	18.31	49.02	0.34
Central Arm	1	800	ARI 50	14.80	5.41	6.23		6.26	0.013836	0.72	21.33	61.65	0.33
Central Arm	1	800	ARI 100	16.85	5.41	6.30		6.33	0.011828	0.69	26.06	73.22	0.31
Central Arm	1	800	PMF	37.70	5.41	6.63		6.65	0.008911	0.76	57.42	119.59	0.29
Central Arm	1	760	ARI 1	5.05	4.41	5.23		5.25	0.012228	0.65	7.73	16.92	0.31
Central Arm	1	760	ARI 2	6.80	4.41	5.33		5.36	0.013396	0.71	9.58	19.85	0.33
Central Arm	1	760	ARI 5	9.35	4.41	5.45		5.48	0.014096	0.77	12.19	23.37	0.34
Central Arm	1	760	ARI 10	10.90	4.41	5.52		5.55	0.014325	0.79	13.72	25.26	0.34
Central Arm	1	760	ARI 20	12.95	4.41	5.59		5.63	0.014483	0.82	15.71	27.57	0.35
Central Arm	1	760	ARI 50	14.80	4.41	5.65		5.69	0.014543	0.85	17.45	29.45	0.35
Central Arm	1	760	ARI 100	16.85	4.41	5.75		5.78	0.015729	0.82	20.59	38.94	0.36
Central Arm	1	760	PMF	37.70	4.41	6.18		6.22	0.013567	0.86	44.45	81.31	0.34
Central Arm	1	720	ARI 1	5.05	4.02	4.73		4.75	0.013135	0.61	8.22	20.88	0.31
Central Arm	1	720	ARI 2	6.80	4.02	4.83		4.85	0.012025	0.64	10.63	23.80	0.31
Central Arm	1	720	ARI 5	9.35	4.02	4.96		4.99	0.011123	0.67	13.92	27.29	0.30
Central Arm	1	720	ARI 10	10.90	4.02	5.03		5.06	0.010727	0.69	15.85	29.23	0.30
Central Arm	1	720	ARI 20	12.95	4.02	5.11		5.14	0.010387	0.71	18.32	31.61	0.30
Central Arm	1	720	ARI 50	14.80	4.02	5.18		5.21	0.010129	0.72	20.56	33.88	0.30
Central Arm	1	720	ARI 100	16.85	4.02	5.25		5.28	0.009955	0.73	23.01	36.51	0.29
Central Arm	1	720	PMF	37.70	4.02	5.76		5.79	0.008815	0.80	46.86	58.97	0.29
Central Arm	1	680	ARI 1	5.05	3.50	4.43	3.96	4.44	0.005020	0.46	10.99	20.95	0.20
Central Arm	1	680	ARI 2	6.80	3.50	4.51		4.53	0.005986	0.53	12.82	22.48	0.22

HEC-RAS Plan: n=0.1 pro (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Central Arm	1	680	ARI 5	9.35	3.50	4.62		4.64	0.006872	0.61	15.43	24.56	0.24
Central Arm	1	680	ARI 10	10.90	3.50	4.69		4.71	0.007260	0.64	16.99	25.89	0.25
Central Arm	1	680	ARI 20	12.95	3.50	4.76		4.78	0.007712	0.68	18.95	27.46	0.26
Central Arm	1	680	ARI 50	14.80	3.50	4.82		4.85	0.007949	0.71	20.79	29.01	0.27
Central Arm	1	680	ARI 100	16.85	3.50	4.89		4.92	0.008184	0.74	22.75	30.58	0.27
Central Arm	1	680	PMF	37.70	3.50	5.38		5.42	0.009500	0.93	40.68	43.69	0.31
Central Arm	1	640	ARI 1	5.05	3.44	3.75	3.74	3.86	0.158963	1.46	3.46	15.55	0.99
Central Arm	1	640	ARI 2	6.80	3.44	3.88		3.95	0.067347	1.21	5.63	17.66	0.68
Central Arm	1	640	ARI 5	9.35	3.44	4.02		4.08	0.041865	1.13	8.24	19.90	0.56
Central Arm	1	640	ARI 10	10.90	3.44	4.09		4.15	0.035382	1.12	9.73	21.09	0.53
Central Arm	1	640	ARI 20	12.95	3.44	4.17		4.24	0.030477	1.12	11.58	22.50	0.50
Central Arm	1	640	ARI 50	14.80	3.44	4.25		4.31	0.027403	1.12	13.27	23.88	0.48
Central Arm	1	640	ARI 100	16.85	3.44	4.32		4.38	0.025376	1.12	15.01	25.25	0.46
Central Arm	1	640	PMF	37.70	3.44	4.82		4.90	0.018591	1.25	30.17	34.20	0.42
Central Arm	1	600	ARI 1	5.05	2.57	3.61		3.62	0.001531	0.28	18.12	30.07	0.11
Central Arm	1	600	ARI 2	6.80	2.57	3.72		3.72	0.001760	0.32	21.31	32.04	0.12
Central Arm	1	600	ARI 5	9.35	2.57	3.84		3.84	0.002053	0.37	25.33	34.33	0.14
Central Arm	1	600	ARI 10	10.90	2.57	3.90		3.91	0.002183	0.39	27.66	35.59	0.14
Central Arm	1	600	ARI 20	12.95	2.57	3.98		3.99	0.002350	0.42	30.49	37.07	0.15
Central Arm	1	600	ARI 50	14.80	2.57	4.05		4.06	0.002438	0.45	33.16	38.46	0.15
Central Arm	1	600	ARI 100	16.85	2.57	4.12		4.13	0.002593	0.47	35.65	39.74	0.16
Central Arm	1	600	PMF	37.70	2.57	4.58		4.60	0.003738	0.67	56.02	48.33	0.20
Central Arm	1	560	ARI 1	5.05	2.86	3.52		3.53	0.003528	0.35	14.44	31.92	0.17
Central Arm	1	560	ARI 2	6.80	2.86	3.61		3.62	0.003745	0.39	17.57	34.90	0.17
Central Arm	1	560	ARI 5	9.35	2.86	3.72		3.73	0.004064	0.43	21.60	38.54	0.18
Central Arm	1	560	ARI 10	10.90	2.86	3.78		3.79	0.004172	0.45	23.97	40.53	0.19
Central Arm	1	560	ARI 20	12.95	2.86	3.86		3.87	0.004298	0.48	26.95	42.90	0.19
Central Arm	1	560	ARI 50	14.80	2.86	3.92		3.93	0.004591	0.50	29.84	47.58	0.20
Central Arm	1	560	ARI 100	16.85	2.86	3.98		3.99	0.004753	0.52	32.65	50.34	0.20
Central Arm	1	560	PMF	37.70	2.86	4.41		4.43	0.004808	0.66	56.79	60.50	0.22
Central Arm	1	520	ARI 1	5.05	2.42	3.44		3.44	0.001436	0.26	19.36	33.82	0.11
Central Arm	1	520	ARI 2	6.80	2.42	3.51		3.52	0.001807	0.31	22.10	35.82	0.13
Central Arm	1	520	ARI 5	9.35	2.42	3.60		3.61	0.002336	0.37	25.41	38.15	0.14
Central Arm	1	520	ARI 10	10.90	2.42	3.66		3.66	0.002583	0.40	27.41	39.50	0.15
Central Arm	1	520	ARI 20	12.95	2.42	3.72		3.73	0.002869	0.43	29.93	41.12	0.16
Central Arm	1	520	ARI 50	14.80	2.42	3.77		3.78	0.003064	0.46	32.22	42.52	0.17
Central Arm	1	520	ARI 100	16.85	2.42	3.82		3.83	0.003370	0.49	34.22	43.70	0.18
Central Arm	1	520	PMF	37.70	2.42	4.21		4.23	0.005256	0.71	52.98	54.36	0.23
Central Arm	1	480	ARI 1	5.05	2.96	3.24	3.16	3.27	0.044985	0.68	7.41	40.63	0.51
Central Arm	1	480	ARI 2	6.80	2.96	3.28	3.18	3.31	0.048228	0.77	8.83	42.50	0.54
Central Arm	1	480	ARI 5	9.35	2.96	3.32	3.23	3.36	0.050875	0.88	10.63	43.58	0.57
Central Arm	1	480	ARI 10	10.90	2.96	3.34		3.39	0.052566	0.94	11.60	44.16	0.59
Central Arm	1	480	ARI 20	12.95	2.96	3.37		3.42	0.051897	1.00	13.01	44.98	0.59
Central Arm	1	480	ARI 50	14.80	2.96	3.40		3.46	0.049518	1.03	14.39	45.77	0.59
Central Arm	1	480	ARI 100	16.85	2.96	3.44		3.49	0.046021	1.06	15.97	46.23	0.57
Central Arm	1	480	PMF	37.70	2.96	3.82		3.88	0.017748	1.05	37.79	70.10	0.40
Central Arm	1	440	ARI 1	5.05	2.26	2.73		2.74	0.006127	0.34	14.83	51.67	0.20
Central Arm	1	440	ARI 2	6.80	2.26	2.80		2.81	0.005594	0.37	18.47	54.07	0.20
Central Arm	1	440	ARI 5	9.35	2.26	2.89		2.90	0.004824	0.40	23.54	57.13	0.19
Central Arm	1	440	ARI 10	10.90	2.26	2.94		2.95	0.004469	0.42	26.57	58.50	0.19
Central Arm	1	440	ARI 20	12.95	2.26	3.01		3.02	0.003955	0.43	30.85	60.85	0.18
Central Arm	1	440	ARI 50	14.80	2.26	3.07		3.08	0.003645	0.44	34.56	62.98	0.18
Central Arm	1	440	ARI 100	16.85	2.26	3.14		3.15	0.003381	0.45	38.58	65.22	0.17
Central Arm	1	440	PMF	37.70	2.26	3.66		3.68	0.002161	0.53	78.71	87.82	0.15
Central Arm	1	400	ARI 1	8.80	1.72	2.41		2.43	0.009142	0.59	16.62	44.35	0.27
Central Arm	1	400	ARI 2	11.80	1.72	2.51		2.53	0.007722	0.62	21.44	47.20	0.26
Central Arm	1	400	ARI 5	16.20	1.72	2.64		2.66	0.006802	0.66	27.50	48.99	0.25
Central Arm	1	400	ARI 10	18.90	1.72	2.70		2.73	0.006625	0.69	30.67	49.90	0.25
Central Arm	1	400	ARI 20	22.40	1.72	2.79		2.81	0.006294	0.72	34.86	51.08	0.25
Central Arm	1	400	ARI 50	25.60	1.72	2.86		2.88	0.006118	0.75	38.41	52.06	0.25
Central Arm	1	400	ARI 100	29.10	1.72	2.93		2.95	0.005979	0.77	42.10	53.06	0.25
Central Arm	1	400	PMF	65.20	1.72	3.48		3.52	0.005492	0.99	77.37	77.60	0.25

APPENDIX D

MUSIC MODELLING OUTPUT

MUSIC Modelling – Parameter Details

RUNOFF GENERATION

Soil parameters are required to generate runoff volumes from the various source nodes. In general the default values provided in MUSIC have been. The details of the soil parameters used are given in **Table A1**.

Table A1 – Adopted Soil Parameters

Parameter	Value	Description
Impervious Areas		
Rainfall threshold (mm/day)	1	Represents effect of depression storage
Pervious Areas		
Soil Storage Capacity (mm)	120	Amount of water able to be stored in soil
Initial Storage (% of capacity)	30	Level of storage at start of simulation
Field Capacity (mm)	80	Soil capacity above which water can drain to ground water by gravity
Infiltration Capacity Coefficient-a	200	Infiltration rate for a dry soil condition
Infiltration Capacity Coefficient-b	1	Exponential rate at which infiltration rate decreases as soil moisture increases.
Groundwater Characteristics		
Initial Depth (mm)	10	Initial depth of groundwater
Daily Recharge Rate (%)	25	Water draining to groundwater as a percentage of volume above field capacity
Daily Baseflow Rate (%)	5	Water draining to baseflow
Daily Seepage Rate (%)	0	Water lost to groundwater via seepage

WATER QUALITY PARAMETERS

MUSIC models the performance of stormwater treatment measures in removing Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorous (TP) and Gross Pollutants, under base flow and storm flow conditions. In modelling the proposed Vincentia water quality treatment measures, the default values for Event Mean Concentrations (EMC's) provided by MUSIC have been used. Details of these values for runoff pollutant EMC's are given in **Table A2**.

Table A2 - Event Mean Concentrations For Target Pollutants

Land Use	Flow Condition	TSS (mg/L)	TP (mg/L)	TN (mg/L)
Urban	Storm flow	158.49	0.355	2.63
	Base flow	12.59	0.151	2.09
Agricultural	Storm flow	199.53	0.537	3.89
	Base flow	25.12	0.132	1.19
Forest	Storm flow	79.43	0.079	0.84
	Base flow	7.94	0.032	0.72

POLLUTANT RETENTION

MUSIC utilises the Universal Stormwater Treatment Model (USTM) developed at the CRC for Catchment Hydrology to calculate pollutant removal. This involves the use of a first order kinetic model to predict the removal of pollutants in a wetland (or bioswales). The first order kinetic model assumes that contaminant concentrations in a parcel of water entering a wetland or other vegetation based treatment measure will undergo exponential decay towards an equilibrium value. C* is the equilibrium or background concentration, and k is the exponential rate constant. The default values for k and C* included in MUSIC have generally been used for the modelling of the proposed water quality treatment measures. These default values are derived from the sedimentation equations of Fair and Geyer (1954) and are based upon typical Australian particle size distributions. The validity of this approach was investigated by empirical analysis of observed data for wetland performance, and also by fitting observed water quality data into MUSIC. The results indicate the USTM can be used to predict pollutant capture that is very close to actual recorded performance.

INFILTRATION PARAMETERS

The latest version of MUSIC enables the modeller to incorporate water seepage losses in wetlands and swales due to infiltration of water through the base material. The adopted parameters were revised slightly (from earlier modelling) to match recommended values in MUSIC documentation and are as detailed in **Table A4**.

Table A4 - Infiltration parameters – Water Treatment Measures

WQ Measure	Infiltration	Equivalent Soil Type [a]
	mm/hr	
Bioswales	2.00	Medium Clay
Permanent Wetlands	0.00	Heavy Clay
Commercial Pond and Existing Basin	2.50	Medium Clay
Intermittent Wetlands	15.00	Sandy Clay

[a] as per MUSIC documentation

MODEL RESULTS

Concentrations for the pre and post-development models are reproduced in **Tables A5** and **A6**.

Table A5 - MUSIC Concentrations For Pre Development Model

Pollutant	West	Central	East
Mean Concentration at Discharge Point (mg/L)			
TSS	49.9	37	29.3
TN	1.41	1.25	1.2
TP	0.162	0.114	0.0865

Table A6 - MUSIC Concentrations For Post Development Model including Treatment

Pollutant	West	Central	East
Mean Concentration at Discharge Point (mg/L)			
TSS	11.5	11.0	9.24
TN	0.843	0.914	0.805
TP	0.045	0.052	0.038

MUSIC Results for Post-Development

WEST

Outflow	mean	SD	median	maximum	minimum	10th %ile	90th %ile
Flow (cubic metres/sec)	5.85E-03	3.98E-02	3.66E-04	2.22	0	7.09E-07	8.17E-03
TSS Concentration (mg/L)	11.5	22.3	8.2	593	0	6.71	10.7
Log [TSS] (mg/L)	0.949	0.2	0.914	2.77	9.25E-02	0.828	1.03
TP Concentration (mg/L)	4.53E-02	5.66E-02	3.42E-02	2.01	0	2.74E-02	5.93E-02
Log [TP] (mg/L)	-1.42	0.191	-1.47	0.302	-2.39	-1.56	-1.23
TN Concentration (mg/L)	0.843	0.365	0.783	8.37	0	0.625	1.03
Log [TN] (mg/L)	-9.26E-02	0.114	-0.106	0.922	-0.96	-0.203	1.20E-02
TSS Load (kg/Day)	52	604	0.26	4.52E+04	0	4.93E-04	5.23
TP Load (kg/Day)	0.135	1.61	1.03E-03	161	0	2.01E-06	4.07E-02
TN Load (kg/Day)	1.15	11.6	2.35E-02	662	0	4.59E-05	0.7
Gross Pollutants (kg/Day)	0	0	0	0	0	0	0

CENTRAL

Outflow	mean	SD	median	maximum	minimum	10th %ile	90th %ile
Flow (cubic metres/sec)	6.16E-03	4.01E-02	8.77E-04	2.36	0	2.34E-06	7.37E-03
TSS Concentration (mg/L)	11	9.82	8.42	167	0	5.32	18.1
Log [TSS] (mg/L)	0.956	0.255	0.925	2.22	-1.79	0.726	1.26
TP Concentration (mg/L)	5.19E-02	4.06E-02	3.77E-02	0.605	0	2.43E-02	0.101
Log [TP] (mg/L)	-1.37	0.243	-1.42	-0.218	-2.31	-1.61	-0.994
TN Concentration (mg/L)	0.914	0.368	0.831	4.44	0	0.554	1.38
Log [TN] (mg/L)	-6.81E-02	0.156	-8.02E-02	0.648	-0.665	-0.256	0.14
TSS Load (kg/Day)	21.4	270	0.746	2.05E+04	0	1.58E-03	5.54
TP Load (kg/Day)	6.26E-02	0.691	3.46E-03	51.8	0	6.38E-06	3.43E-02
TN Load (kg/Day)	0.774	6.93	6.76E-02	407	0	1.50E-04	0.61
Gross Pollutants (kg/Day)	0	0	0	0	0	0	0

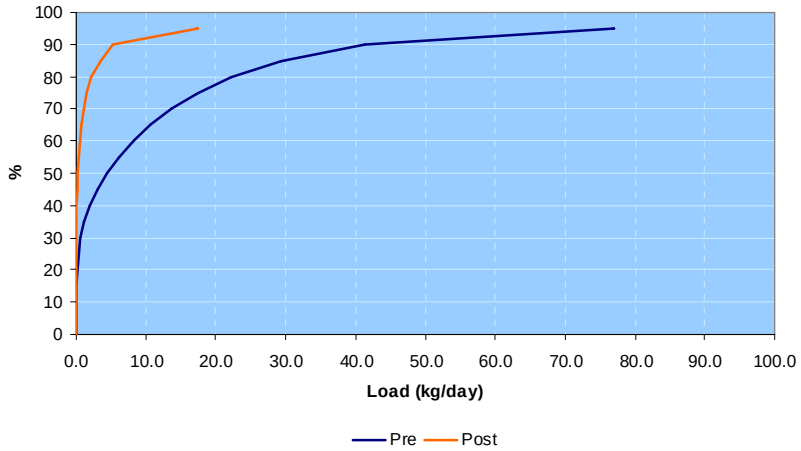
EAST

Outflow	mean	SD	median	maximum	minimum	10th %ile	90th %ile
Flow (cubic metres/sec)	1.30E-02	7.19E-02	1.63E-03	3.82	0	3.07E-06	2.06E-02
TSS Concentration (mg/L)	9.24	7.81	8.13	163	0	6.63	10.1
Log [TSS] (mg/L)	0.926	0.137	0.91	2.21	0.233	0.822	1
TP Concentration (mg/L)	3.79E-02	1.78E-02	3.35E-02	0.571	0	2.73E-02	4.81E-02
Log [TP] (mg/L)	-1.45	0.134	-1.48	-0.244	-2.2	-1.56	-1.32
TN Concentration (mg/L)	0.805	0.201	0.767	6.14	0	0.628	0.999
Log [TN] (mg/L)	-0.104	9.05E-02	-0.115	0.788	-0.71	-0.202	-3.58E-04
TSS Load (kg/Day)	47.7	528	1.14	3.29E+04	0	2.18E-03	14.1
TP Load (kg/Day)	0.106	0.994	4.63E-03	69.1	0	8.69E-06	7.82E-02
TN Load (kg/Day)	1.41	11	0.106	1.04E+03	0	2.00E-04	1.56
Gross Pollutants (kg/Day)	0	0	0	0	0	0	0

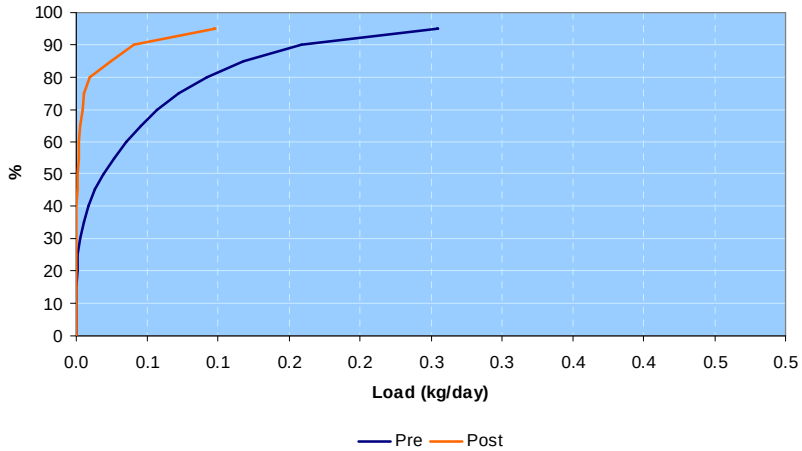
West Catchment

Total Loads – Cumulative Frequency

TSS



TP



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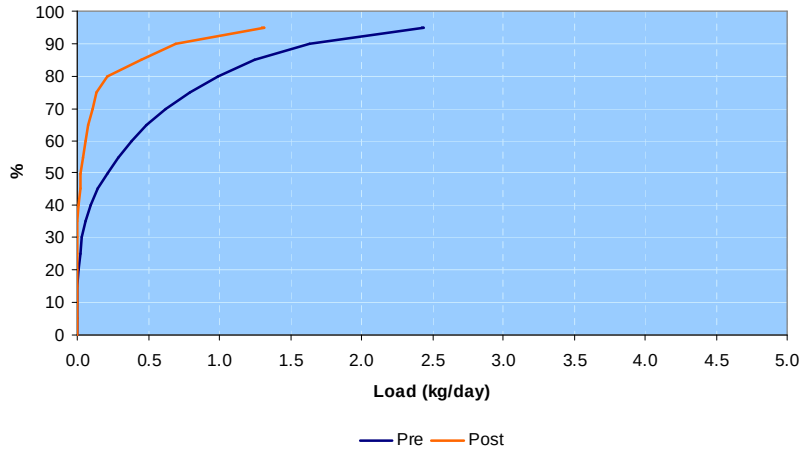
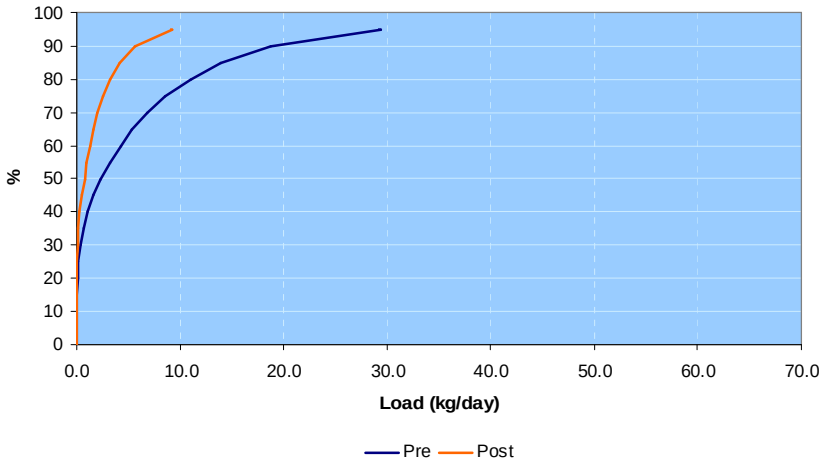


Central Catchment

Total Loads – Cumulative Frequency

TSS



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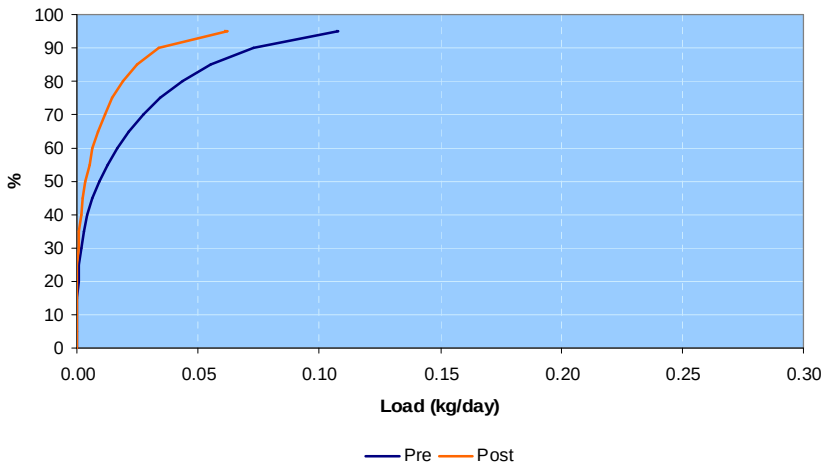

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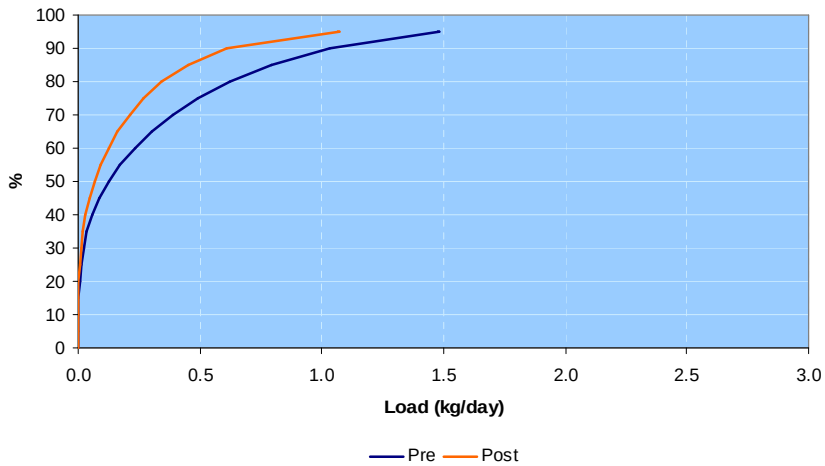
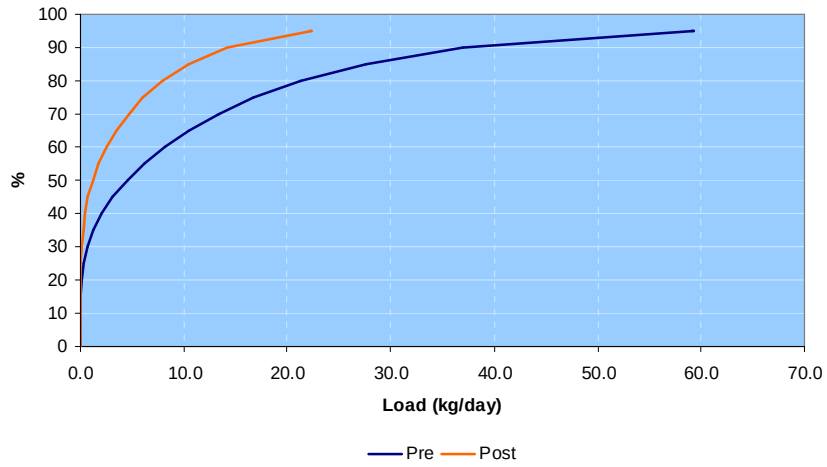


East Catchment

Total Loads – Cumulative Frequency

TSS



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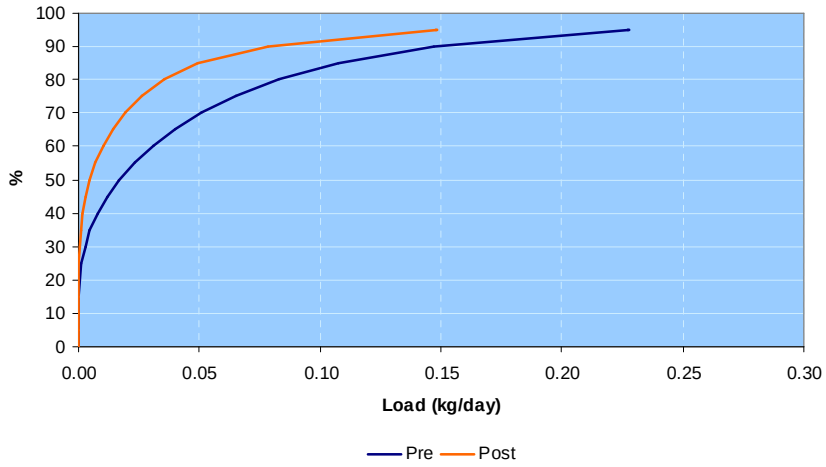

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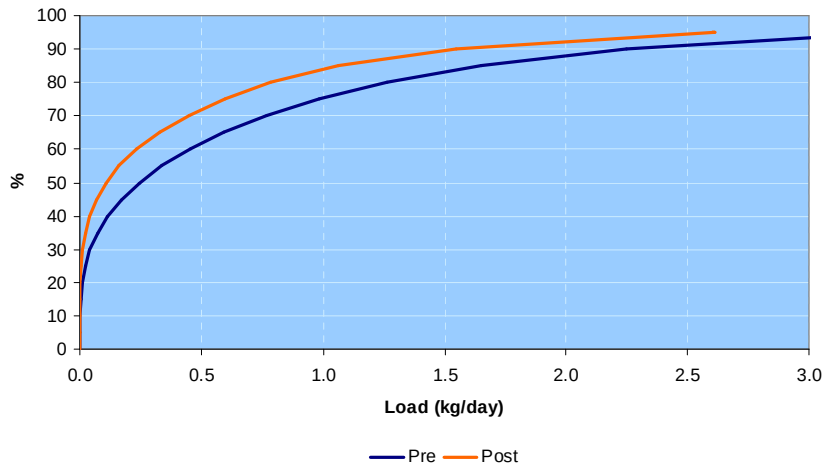


APPENDIX E

DIPNR LETTER
DATED 28 APRIL 2004

Department of
Infrastructure, Planning and Natural Resources

Contact: Chris Page
Phone: (02) 4224 9663
Fax: (02) 4224 9669
Email: cpage@dipnr.nsw.gov.au

File: cp/04erm017

Forbes Rigby Pty Ltd
278 Keira Street
Wollongong NSW 2500

Attention: Mr Paul Nichols

28 April 2004

Dear Sir

Subject: Vincentia District Shopping Centre – Creek Management Options

Reference is made to your letter dated 12 March 2004 providing further information on creek management options in regard to the proposed location for the shopping centre. The Department subsequently undertook a site inspection to assess the merits of the four options presented in your correspondence. While informal advice was provided to David Maxwell from The Riverview Group in regard to the site inspection outcomes, the delay in formally responding to your firm is regretted.

The Department recognises that the subject waterway on the site has considerable inherent environmental values. It is also noted that there is a limited upper catchment above the site, and that the upper catchment has reduced environmental value due to previous activity and current landuse. It is noted, however, that the lower catchment contains more significant values, including a SEPP14 wetland, that warrants a very high degree of protection from landuse change/impacts likely to arise from a new town centre.

While previous advice from the Department was not premised on the new proposed location for the shopping centre, the Department did identify that wetland protection was a priority objective for any future development of the site. This position is maintained. Hence, water quality and quantity management cannot be overemphasised. Water quality maintenance for the site is considered to come from environmental services derived via appropriate riparian management outcomes as well as stormwater/water quality infrastructure.

In regard to Options 1, 2 and 3, the Department acknowledges the disadvantages arising from the creek management approaches and the impacts this would have on the social and practical outcomes for the shopping precinct. Taking into account the broader positive direction of riparian management elsewhere on the site, Option 4 is an outcome that, on balance, is able to be agreed to in principle. Obviously, the finer details in regard to Option 4, as well as the overall riparian management across the site, is important to gain the Department's full support.

Finer details in regard to Option 4 include demarcating the "footprints" of the shopping centre and basin more accurately. The Department can accept the concept design/plan provided by The Riverview Group for the Option 4 outcome. However, additional encroachment down into the riparian area is not supported.

Consideration should also be given to the basin's design in regard to its principle function as a water quality and quantity control structure. Hence, the performance benchmark for water quality should be ascertained from Shoalhaven City Council who, as the responsible authority, should identify the relevant water quality discharge criteria (being mindful of SEPP14 wetlands

downstream). The basin should also ensure that the likely pollutant sources are identified and dealt with to a high degree (eg sediments and oils from carparks, litter from shopping centre, etc).

Appropriate soil and water management (and monitoring/maintenance) during the construction period for the town centre and basin is critical to the protection of the sensitive waterway. Poor soil and water management during the construction period can often result in the most significant adverse impacts even though the construction phase is of a relatively short-term duration.

Additionally, Council is responsible for the determination of flood related issues (including hazard and risk, design of culverts and pipes, overland flow paths, retention/detention solutions, and any requirement for freeboard of floor levels).

The return of flow from the basin to the natural waterway is also an important aspect of the design so that concentration of flows and scouring of the natural drainage system is avoided. The need to undertake soils investigations to determine the nature of soils in this landscape, in particular the potential for dispersive soil characteristics and the implications to water quality basin design and management, were outlined briefly in the Department's previous correspondence dated 9th October 2003.

As a final comment, the responsibility for short-term and long-term tenure and maintenance is an issue that should begin to be teased out at this early stage.

The Department can provide assistance to ensure the adequacy of Council's advice and advice generally on natural resource issues identified above. The protection of the receiving waters including the SEPP14 wetlands is paramount. As such, the design, function and maintenance of the proposed basin of 5000m^3 as a water quality/environmental flow structure is the priority aspect. The primary function of the basin is not to be seen simply as an ornamental water feature for the shopping centre.

Please direct any queries to the undersigned on ph: 4224 9663.

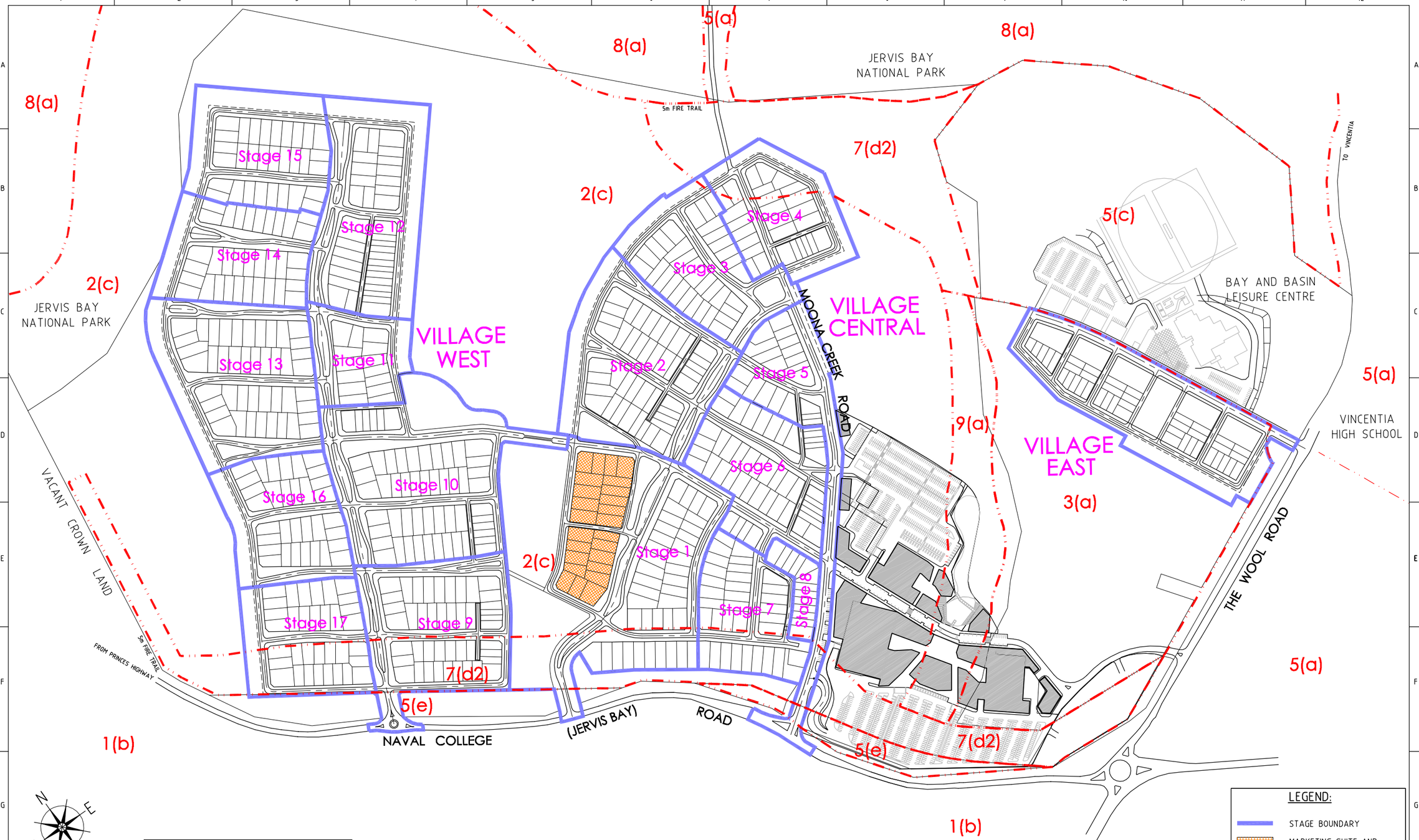
Yours sincerely

Chris Page
Landscape Planning Manager
Strategy and Planning

APPENDIX F

STAGING PLAN

DO NOT SCALE IF IN DOUBT ASK



N E S W

0 125
SCALE 1:2500

STAGING BOUNDARIES MAY CHANGE SUBJECT TO DETAILED DESIGN AND MARKETING DEMAND.

LEGEND:
- STAGE BOUNDARY
- MARKETING SUITE AND DISPLAY VILLAGE
- EXISTING ZONING BOUNDARY

REV	DATE	BY	APP.	DETAILS
1	20/12/04	CJG	MCW	AMENDED COMMERCIAL & VILLAGE EAST FOOTPRINT
2	21/01/05	CJG	MCW	LOT LATOUT UPDATED
3	27/01/06	CJG	MCW	FOOT PRINT, TITLE, LENGEND AND LOT LAYOUT UPDATED
4	01/02/06	CJG	MCW	STAGING BOUNDARYS UPDATED
5	02/02/06	CJG	MCW	FOOT PRINT HATCH ADDED

DRAWING STATUS		
DESIGN BY	BJB	09/06/04
DRAWN BY	ROH	10/06/04
DRAFTING CHECK	PJS	10/12/04
DESIGN CHECK	MCW	10/12/04
FINAL APPROVAL	MCW	10/12/04

FOR APPROVAL

SCALE: (on A1 Original) 1:2500

HEIGHT DATUM AHD

FORBES RIGBY PTY LTD
Engineers Planners & Scientists
Quality Endorsed Company, ISO 9001 LIC QEC 10508, Standards Australia
278 KEIRA STREET, WOLLONGONG, NSW 2500
Ph: (02) 4228 4133 Facsimile: (02) 4228 6811 ACN 003 936 981

PROJECT TITLE
VINCENTIA COASTAL VILLAGE AND DISTRICT CENTRE
for
STOCKLAND DEVELOPMENTS PTY LTD

DRAWING TITLE
PROPOSED STAGING PLAN

Project No.	Com No.	Drawing No.	REV
104016	4	4107	5

A1

File Plotted: U:\2004\104-016-04 - VINCENTIA DISTRICT CENTRE - CIVIL ENG'G & INFRASTRUCTURE\DRAWING\BUILD\4107 - PROPOSED STAGING PLAN.DWG
February 14, 2006 11:43:10 a.m.
Xrefs: x104016-04_base_3.DWG