APPENDIX A – FIGURES

Location	TSS (mg/L) Mean Concentration (mg/L)	TSS (mg/L) Pollutant Removal (%)	TP (mg/L) Mean Concentration (mg/L)	TP (mg/L) Pollutant Removal (%)	TN (mg/L) Mean Concentration (mg/L)	TN (mg/L) Pollutant Removal (%)
North (Nepean)	1.97	81.4	0.0316	55.4	0.579	79.7
South (Nepean)	2.27	83.1	0.0326	60.9	0.455	53.2
East (Allens)	2.42	82.3	0.0317	41.8	0.443	51.4
Total Site	2.04	82	0.0319	54.2	0.576	73.6

XXX	Complies with Water Quality objectives
XXX	Exceeds Water Quality Objectives
XXX	No Water Quality Objectives specified

Developed Urban Area (lots, roads)

TP = 8mg/L
TN = 40mg/L

Stormwater Runoff 7479ML/yr

TP = 0.25mg/L
TN = 2mg/L

Litter Control

Wastewater 1935ML/yr

Playing Field / verge Irrigation areas

Light Industrial

Wastewater Treatment

Treated Wastewater 1838ML/yr

Pumped connection to irrigation 367ML/yr

Optional Pumped connection to light industrial (to be confirmed)

Excess flows from catchment

Raingarden

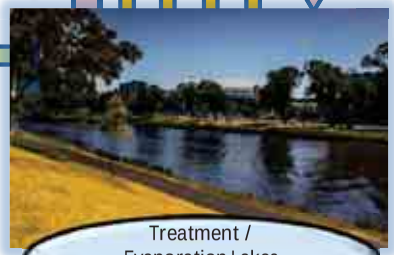
15ML Wastewater Holding Pond (perched)

TP = 0.1mg/L
TN = 6mg/L

Excess Runoff from Lake 967ML/yr (substitute for environmental flows)

Evaporation 137ML/yr

Flow to Lake 1471ML/yr



Treatment / Evaporation Lakes (10.9Ha)

Raingarden

Cascades

Environment

Mean Pollutant Concentrations (combined)
TP = 0.032mg/L (HRC target 0.035)
TN = 0.576mg/L (HRC target 0.7)

J. WYNDHAM PRINCE

Wilton Junction 9708 **FIGURE 1**
Water Cycle Schematic Layout
13/05/2014

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

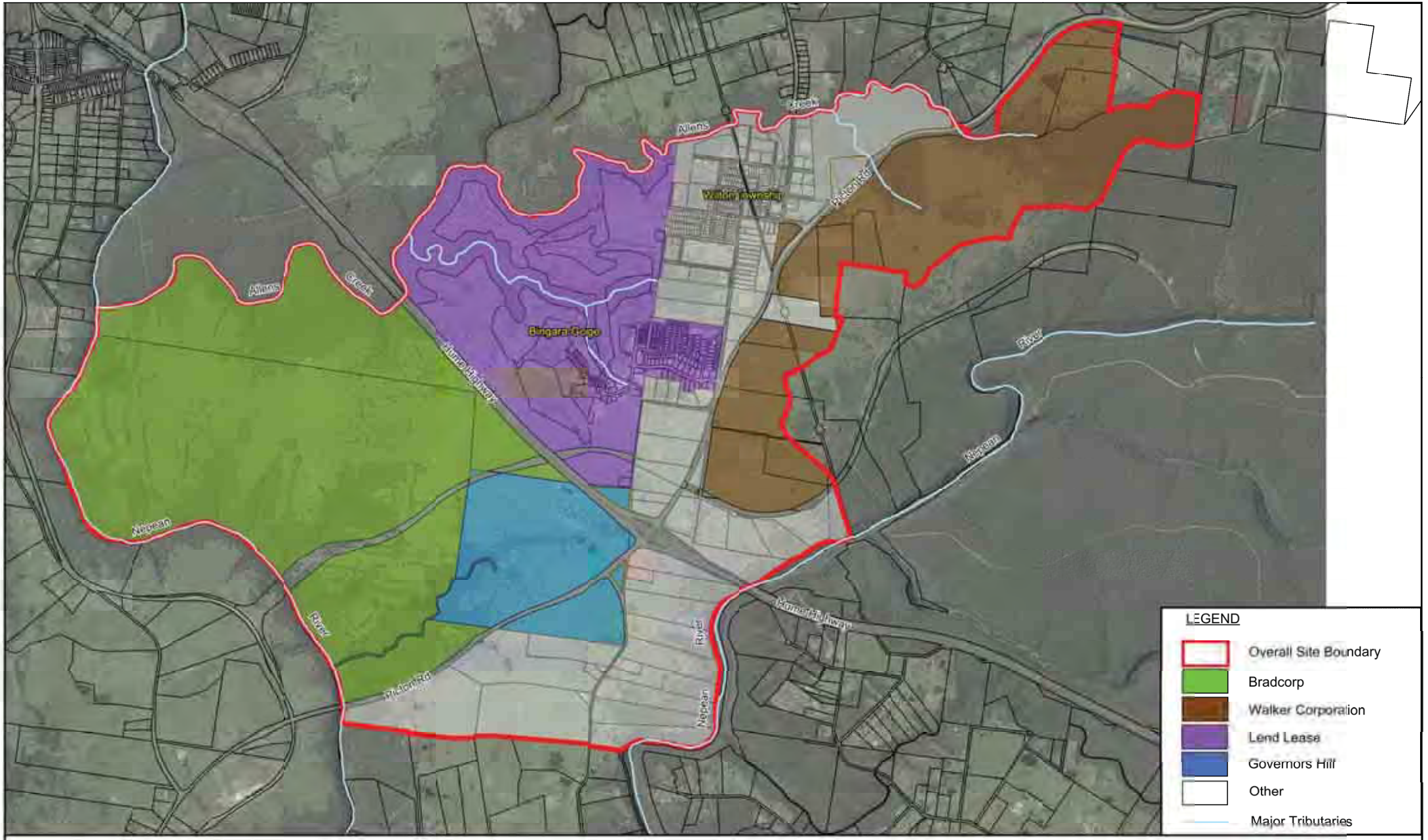
Scale 1: 30,000 @ A3

1000 0 m

FIGURE 2

Wilton Junction
Water Cycle Management Strategy
Major Drainage Elements Plan

Revision: C Dated 30/05/14



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

N W E S

Scale 1: 30,000 @ A3

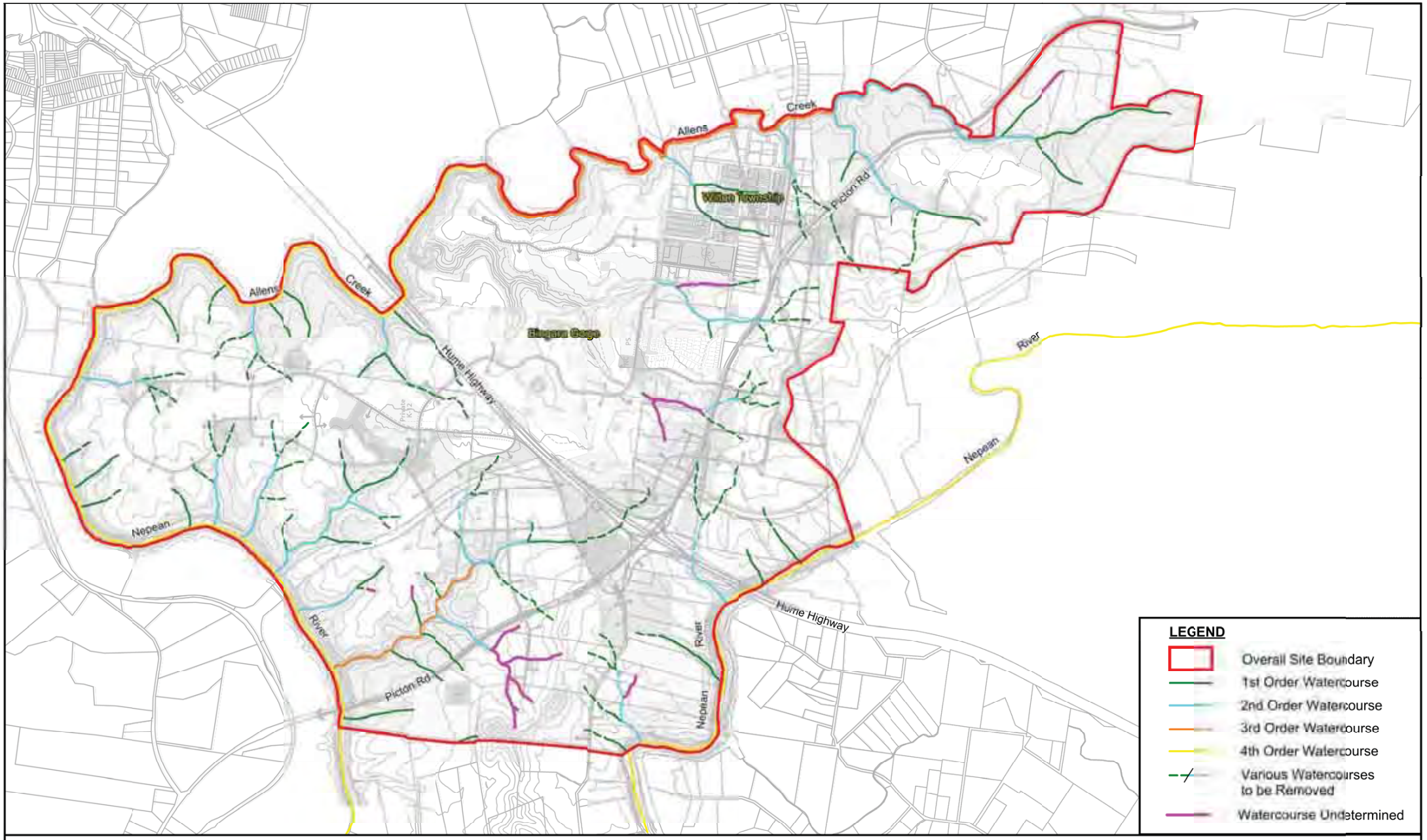
1000 0 m

9708_Figure 3 (Land Ownership Plan)

FIGURE 3

Wilton Junction
Water Cycle Management Strategy
Land Ownership Plan

Revision: D Dated 30/05/14



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

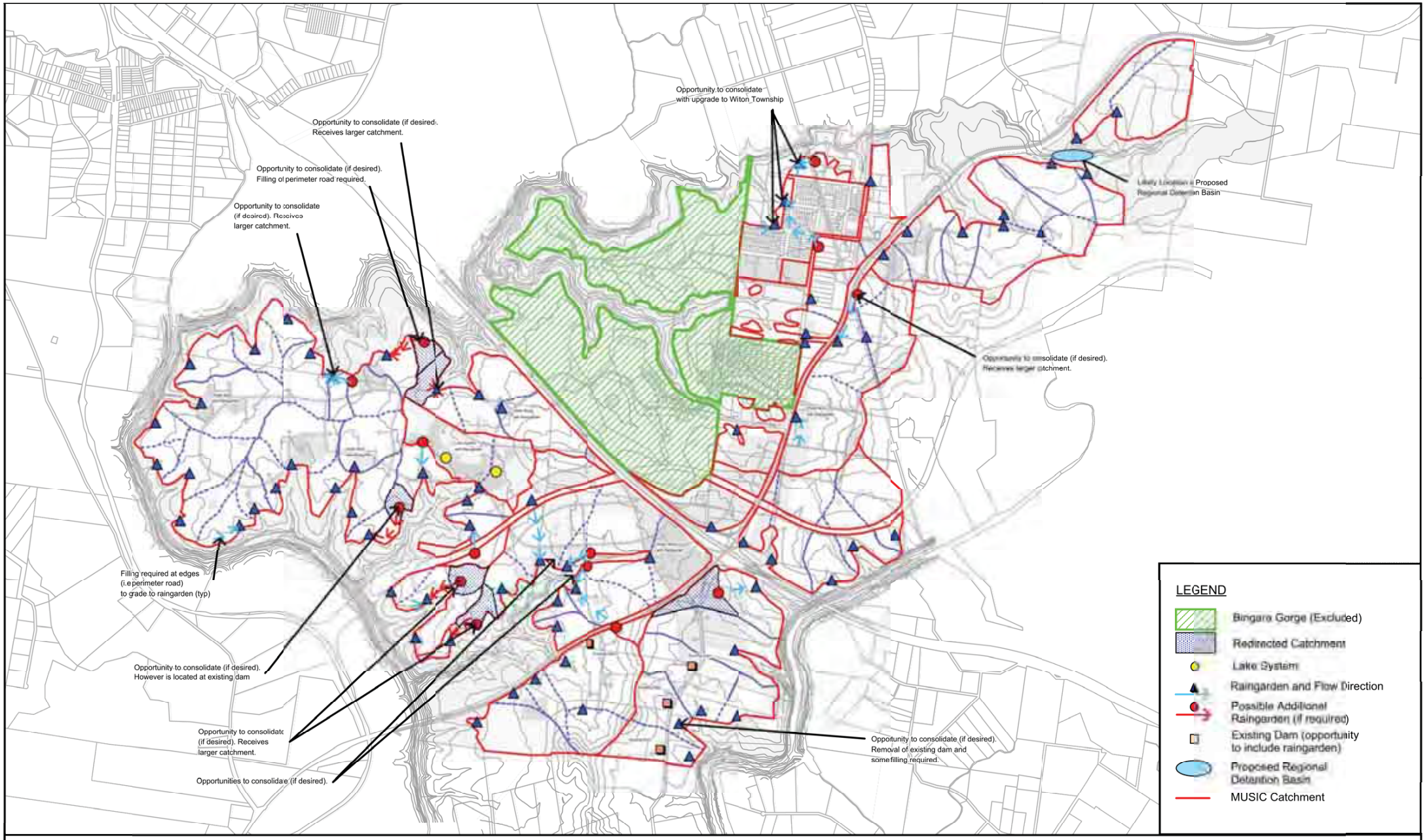
1000 0 m

9708_Figure 4 (Riparian)-C

FIGURE 4

Wilton Junction
Water Cycle Management Strategy
Riparian Plan

Revision: C Dated 30/05/14



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

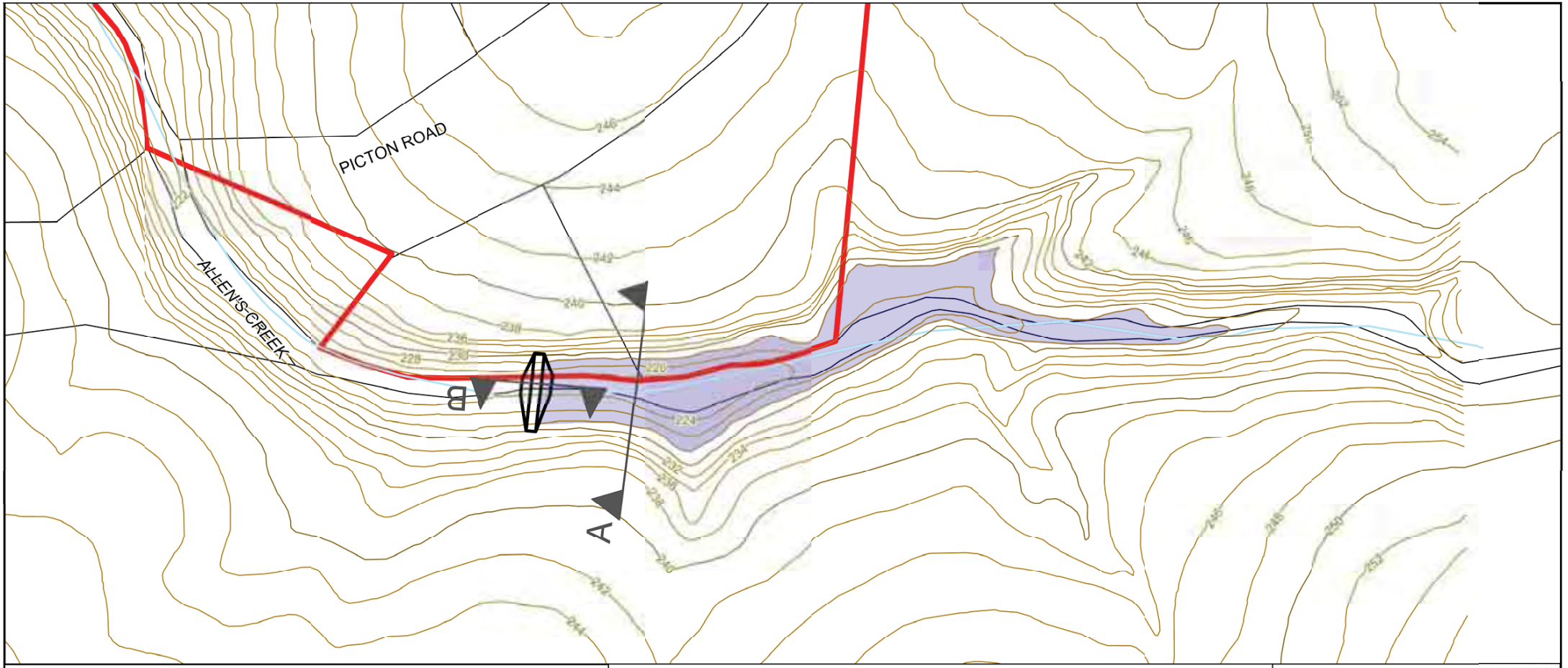
1000 0 m

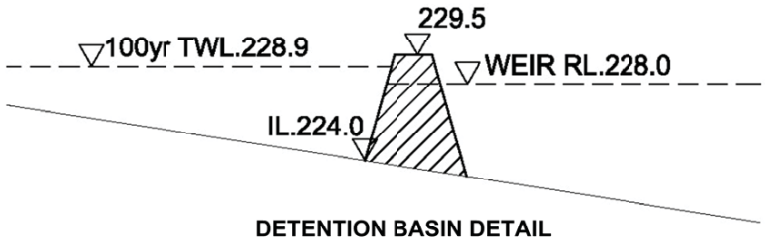
9708_Figure 5 (Stormwater Concept Plan)

FIGURE 5

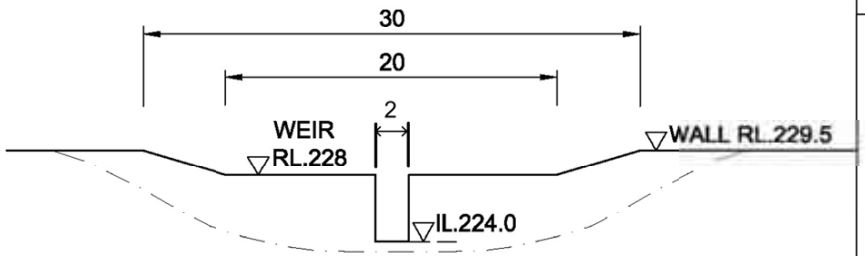
Wilton Junction
Water Cycle Management Strategy
Stormwater Concept Plan

Revision: E Dated 30/05/14





DETENTION BASIN DETAIL
SECTION B-B



DETENTION BASIN DETAIL
SECTION A-A

LEGEND

- Overall Site Boundary
- Contours
- Major Tributaries
- 100yr TWL Extent
- Embankment

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

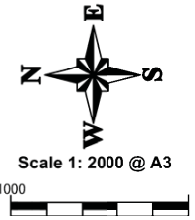
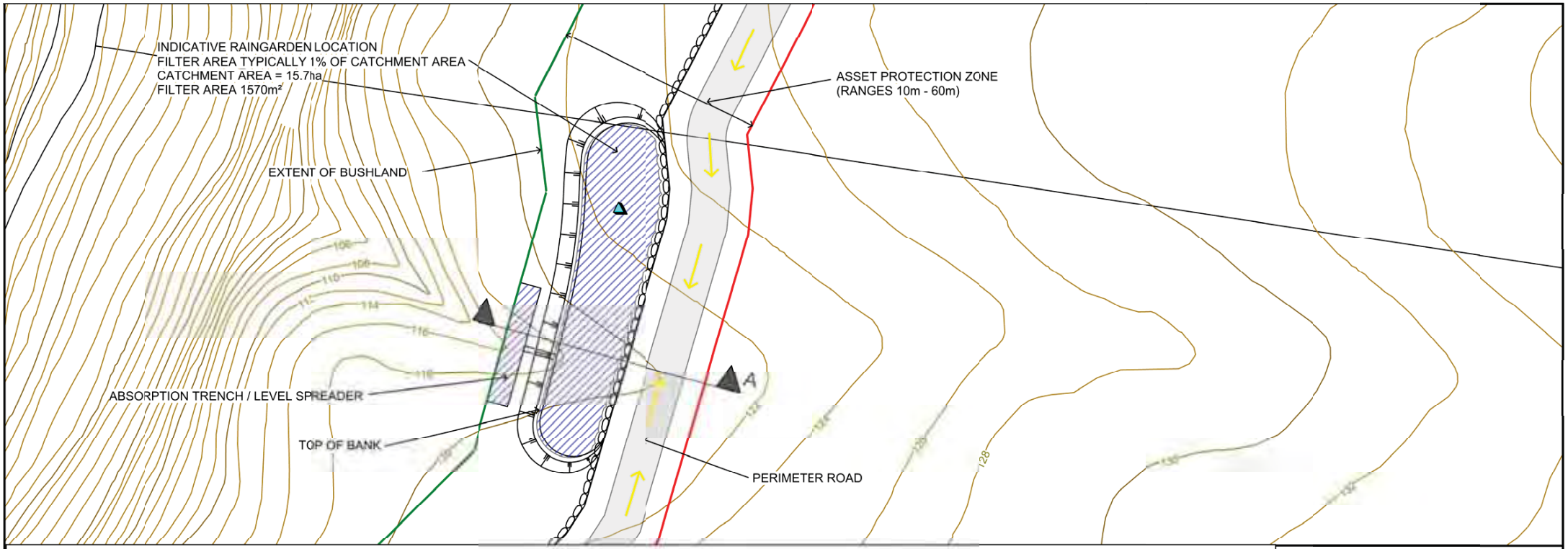
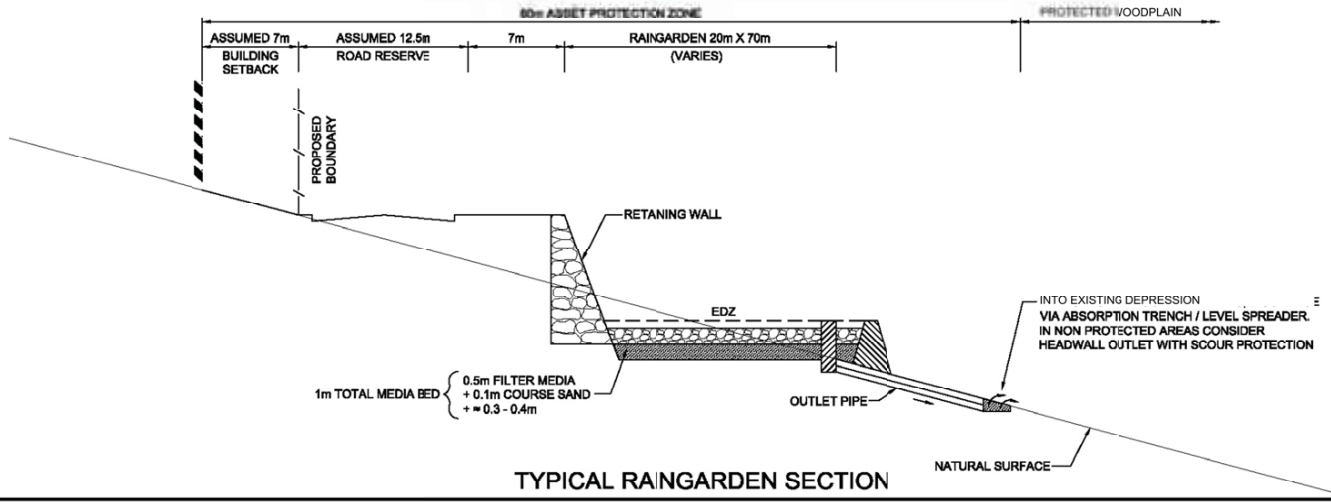


FIGURE 6

Wilton Junction
Water Cycle Management Strategy
Detention Basin Layout & Details

Revision: C Dated 29/10/13





TYPICAL RAINGARDEN SECTION

LEGEND

- Property Boundary
- Flow Direction
- Bushline Extent
- Proposed Raingarden (indicative location only)
- Perimeter Road
- Contours

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 1250 @ A3

1000 0 m

9708_Figure_7_Raingarden_Details

FIGURE 7

Wilton Junction
Asset Protection Zone
and Possible Raingarden Location

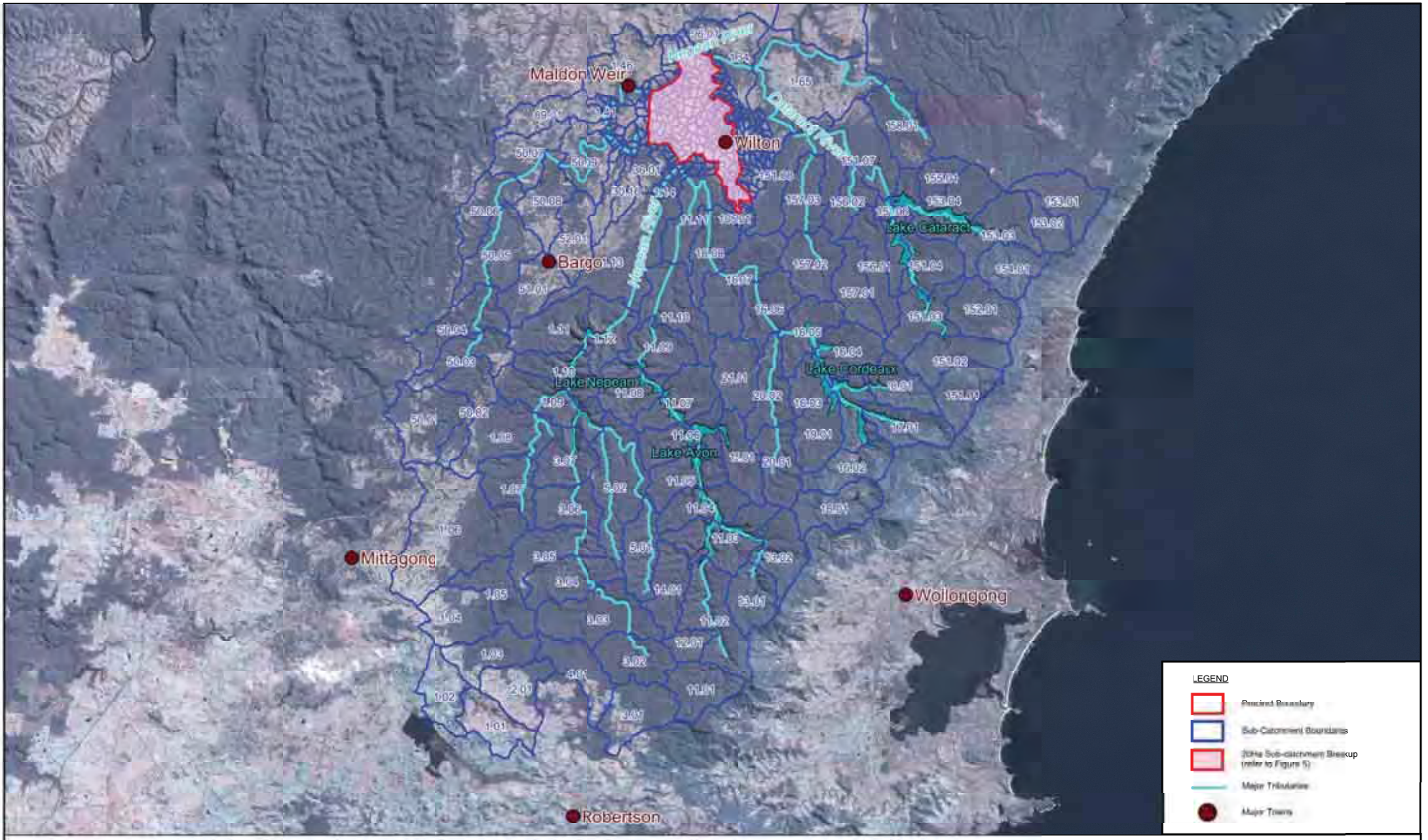
Revision: C Dated 29/10/13

FIGURE 8

Wilton Junction
Water Cycle Management Strategy
XP-RAFTS Catchment Plan

Revision: D Dated 30/05/14

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au



J. WYNDHAM PRINCE

CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS

PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

N W E S

Not to Scale

9708_Figure 9 (XP-RAFTS Catchment Plan)

FIGURE 9

Wilton Junction
Water Cycle Management Strategy
XP-RAFTS Upper Nepean Catchment Plan

Revision: D Dated 30/05/14

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

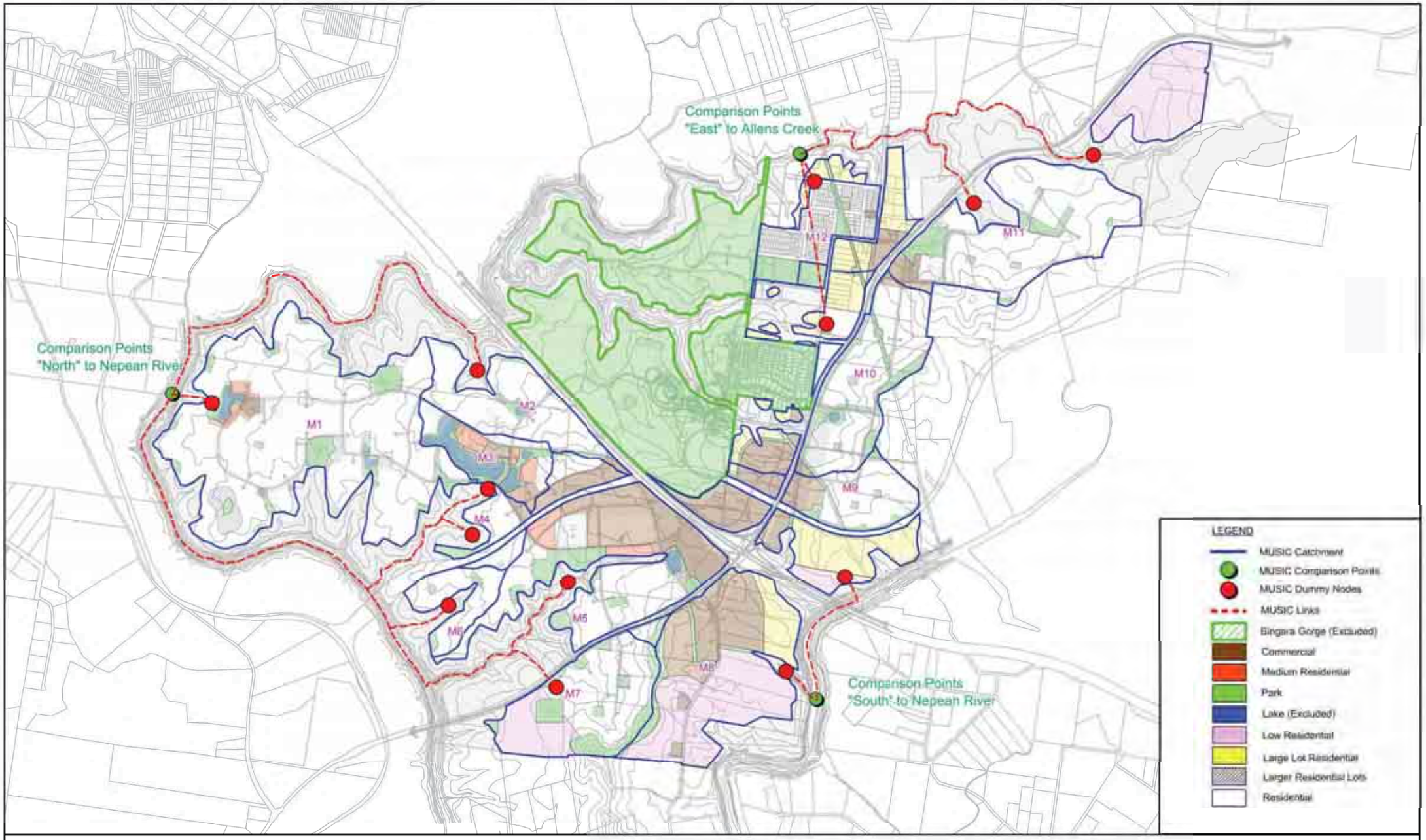
1000 0 m

FIGURE 10

Wilton Junction
Water Cycle Management Strategy
Hydraulics Assessment

Revision: D Dated 30/05/14

9708_Figure 10 (Hydraulics Assessment)



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

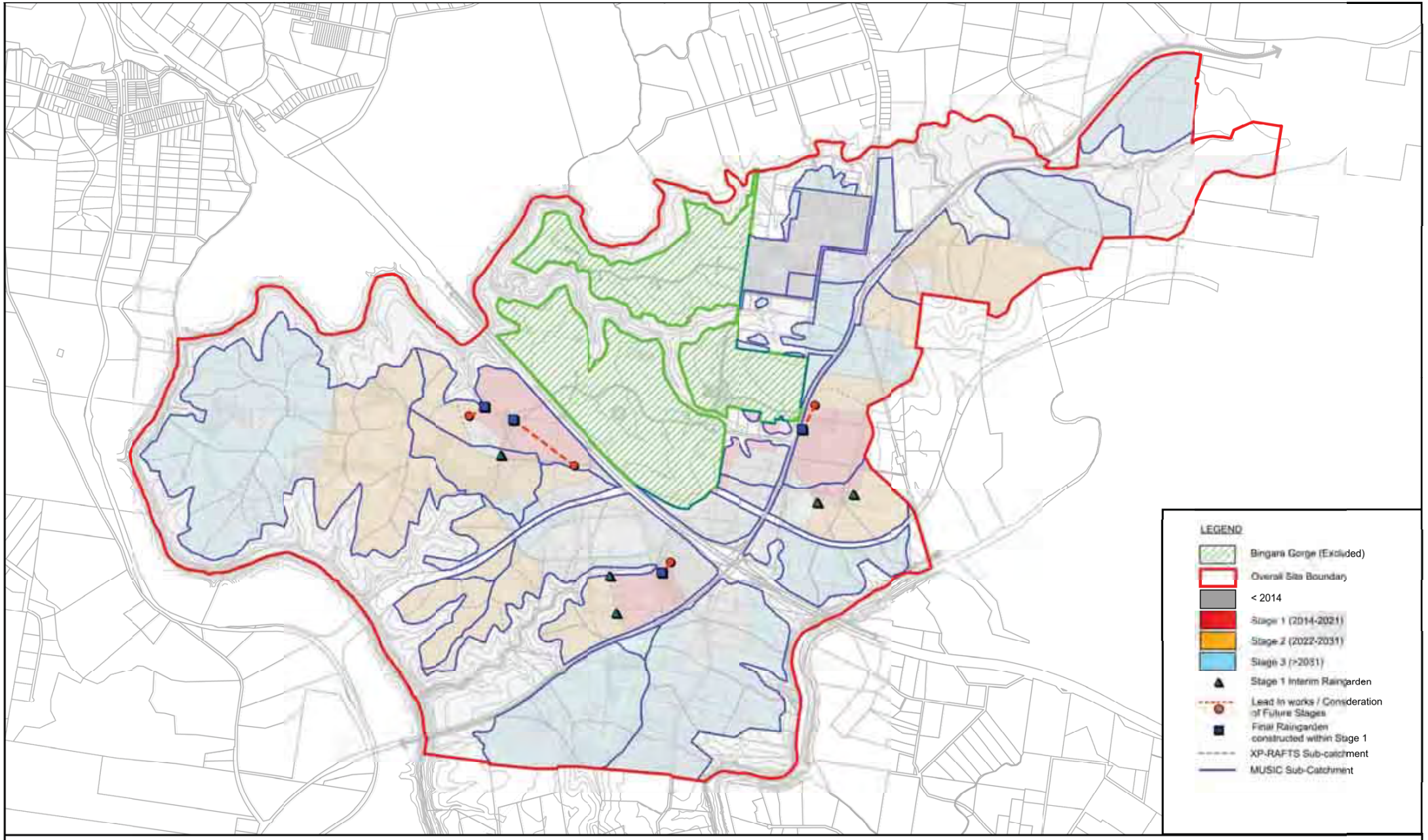
1000 0 m

FIGURE 11

Wilton Junction
Water Cycle Management Strategy
MUSIC Catchment Plan

Revision: E Dated 30/05/14

9708_Figure 11 (MUSIC Catchment Plan)



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

1000 0 m

FIGURE 12

Wilton Junction
Water Cycle Management Strategy
Stage 1 Assessment Plan

Revision: E Dated 30/05/14

9708_Figure 12 (Stage 1 Assessment Plan)

APPENDIX B – HYDROLOGY CATCHMENT DETAILS AND RESULTS

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.01	1000.4	930.4	70.0	7	2.9
1.02	1038.9	966.1	72.7	7	2.4
1.03	1098.7	1043.8	54.9	5	1.5
1.04	1342.4	1275.3	67.1	5	1.9
1.05	1070.1	1048.7	21.4	2	1.4
1.06	3915.7	3524.1	391.6	10	1.8
1.07	1001.7	981.7	20.0	2	4.2
1.08	1655.9	1490.3	165.6	10	4.3
1.09	1334.5	1241.1	93.4	7	2.3
1.10	1000.8	980.8	20.0	2	2.2
1.11	1266.0	1202.7	63.3	5	2.8
1.12	1028.2	1007.6	20.6	2	3.4
1.13	2334.9	2101.4	233.5	10	2.5
1.14	56.1	54.9	1.1	2	10.9
1.15	40.6	39.8	0.8	2	9.0
1.16	32.5	31.8	0.6	2	13.4
1.17	28.2	27.6	0.6	2	7.5
1.18	20.3	19.9	0.4	2	15.8
1.19	20.0	19.6	0.4	2	8.1
1.20	22.2	21.8	0.4	2	15.8
1.21	20.3	19.6	0.6	3	15.5
1.22	27.5	27.0	0.6	2	15.0
1.23	20.4	20.0	0.4	2	7.4
1.24	118.8	116.4	2.4	2	6.5
1.25	27.8	27.0	0.8	3	12.2
1.26	20.9	19.9	1.0	5	4.6
1.27	46.6	44.3	2.3	5	13.0
1.28	21.6	20.9	0.6	3	11.7
1.29	85.6	83.9	1.7	2	3.5
1.30	25.0	24.5	0.5	2	14.4
1.31	20.1	19.5	0.6	3	0.0
1.32	31.0	30.1	0.9	3	10.2
1.33	48.8	47.3	1.5	3	11.0
1.34	20.0	19.4	0.6	3	16.4
1.35	27.0	26.2	0.8	3	15.9
1.36	25.9	25.1	0.8	3	12.9
1.37	27.2	26.4	0.8	3	16.8
1.38	22.1	21.4	0.7	3	14.5
1.39	91.1	88.4	2.7	3	8.3
1.40	21.9	20.8	1.1	5	5.5
1.41	11.3	11.1	0.2	2	32.2
1.42	73.2	71.0	2.2	3	15.1
1.43	23.8	23.1	0.7	3	16.2
1.44	20.4	20.0	0.4	2	4.7
1.45	16.5	16.2	0.3	2	9.6
1.46	1358.6	1154.8	203.8	15	2.0
1.47	68.8	66.8	2.1	3	13.0
1.48	20.1	19.5	0.6	3	15.9
1.49	30.8	29.8	0.9	3	11.7
1.50	42.2	40.9	1.3	3	3.8
1.51	46.1	45.1	0.9	2	3.8
1.52	38.2	37.4	0.8	2	5.2
1.53	11.7	11.4	0.2	2	16.2
1.54	6.2	6.0	0.1	2	16.9

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
1.55	26.7	25.3	1.3	5	14.5
1.56	59.7	57.9	1.8	3	8.0
1.57	155.6	147.8	7.8	5	10.5
1.58	45.5	43.2	2.3	5	7.2
1.59	62.0	58.9	3.1	5	8.5
1.60	32.4	30.8	1.6	5	5.9
1.61	41.3	39.2	2.1	5	6.6
1.62	9.9	9.4	0.5	5	4.8
1.63	0.0	0.0	0.0	0	1.0
1.64	1080.8	864.6	216.2	20	1.8
1.65	3174.0	2856.6	317.4	10	1.0
2.01	1098.3	1043.3	54.9	5	1.2
3.01	1272.1	1208.5	63.6	5	1.3
3.02	1148.2	1125.3	23.0	2	2.8
3.03	1874.0	1836.5	37.5	2	3.1
3.04	1227.0	1202.5	24.5	2	5.9
3.05	1162.4	1139.1	23.2	2	4.7
3.06	1012.1	991.8	20.2	2	3.7
3.07	1010.1	989.8	20.2	2	3.5
4.01	1106.4	1073.2	33.2	3	2.7
5.01	1000.5	980.5	20.0	2	1.6
5.02	1965.8	1926.5	39.3	2	2.4
11.01	1079.7	1058.1	21.6	2	8.1
11.02	1716.2	1681.9	34.3	2	1.4
11.03	1532.4	1501.8	30.6	2	2.3
11.04	1015.2	994.9	20.3	2	3.1
11.05	1006.9	986.7	20.1	2	1.1
11.06	1051.0	1030.0	21.0	2	2.6
11.07	1176.1	1152.6	23.5	2	2.6
11.08	1044.3	1023.4	20.9	2	2.3
11.09	1000.0	980.0	20.0	2	2.0
11.10	1409.0	1380.8	28.2	2	2.4
11.11	1084.7	1063.0	21.7	2	2.1
11.12	67.1	65.7	1.3	2	7.5
11.13	35.9	35.2	0.7	2	12.6
12.01	409.9	401.7	8.2	2	11.0
13.01	1000.7	980.7	20.0	2	4.8
13.02	1078.2	1056.6	21.6	2	2.9
14.01	1000.6	980.6	20.0	2	4.6
15.01	1001.7	981.7	20.0	2	2.1
16.01	1157.6	1134.5	23.2	2	2.0
16.02	1021.8	1001.3	20.4	2	2.7
16.03	1437.8	1409.0	28.8	2	1.5
16.04	1005.5	985.4	20.1	2	1.7
16.05	1000.5	980.5	20.0	2	2.3
16.06	1102.8	1080.8	22.1	2	1.9
16.07	1721.7	1687.2	34.4	2	2.4
16.08	1012.0	991.8	20.2	2	2.8
17.01	1001.7	981.7	20.0	2	0.5
18.01	1009.7	989.5	20.2	2	2.7
19.01	1000.8	980.8	20.0	2	2.4
20.01	1063.6	1042.3	21.3	2	2.7
20.02	1001.7	981.6	20.0	2	1.6
21.01	1143.1	1120.2	22.9	2	1.9

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
22.01	20.4	19.4	1.0	5	3.6
22.02	22.6	22.1	0.5	2	2.8
22.03	23.4	23.0	0.5	2	1.5
22.04	20.0	19.6	0.4	2	3.2
23.01	21.8	21.3	0.4	2	4.4
25.01	20.7	19.6	1.0	5	3.2
25.02	20.8	19.8	1.0	5	3.9
25.03	23.6	22.4	1.2	5	1.7
27.01	20.4	19.3	1.0	5	3.4
27.02	25.2	23.9	1.3	5	4.5
27.03	21.9	20.8	1.1	5	3.4
27.04	19.9	19.5	0.4	2	7.0
28.01	20.1	19.1	1.0	5	3.8
29.01	5.0	4.8	0.3	5	6.1
30.01	450.0	427.5	22.5	5	11.0
34.01	370.0	351.5	18.5	5	12.0
36.01	330.0	323.4	6.6	2	8.3
40.01	25.4	24.2	1.3	5	2.3
40.02	9.8	9.3	0.5	5	2.0
40.03	27.1	25.7	1.4	5	2.1
40.04	26.9	25.5	1.3	5	2.3
40.05	13.9	13.2	0.7	5	3.2
40.06	9.2	8.7	0.5	5	11.9
42.01	16.1	15.3	0.8	5	15.0
43.01	26.0	24.7	1.3	5	8.8
50.01	1628.7	1384.4	244.3	15	3.5
50.02	1000.2	930.2	70.0	7	2.0
50.03	1014.1	912.7	101.4	10	3.3
50.04	1275.4	1249.9	25.5	2	3.3
50.05	1512.4	1361.2	151.2	10	1.6
50.06	1025.8	820.7	205.2	20	2.5
50.07	1017.1	813.7	203.4	20	1.8
50.08	1079.5	917.5	161.9	15	1.5
50.09	1077.7	1002.3	75.4	7	2.8
51.01	1025.8	923.2	102.6	10	1.9
52.01	1036.0	932.4	103.6	10	1.9
54.01	20.2	19.2	1.0	5	2.6
56.01	22.2	21.1	1.1	5	17.3
69.01	913.4	867.7	45.7	5	8.8
70.01	138.6	131.6	6.9	5	3.2
76.01	31.2	29.7	1.6	5	3.5
76.02	22.3	21.1	1.1	5	2.7
79.01	16.0	15.2	0.8	5	3.3
79.02	14.4	12.2	2.2	15	2.6
79.03	9.3	8.9	0.5	5	0.8
80.01	28.4	26.9	1.4	5	1.6
80.02	24.3	23.1	1.2	5	2.1
80.04	19.6	18.6	1.0	5	2.1
80.05	9.4	9.0	0.5	5	2.1
81.01	38.9	37.0	1.9	5	2.4
81.02	24.7	23.5	1.2	5	1.5
82.01	19.1	18.1	1.0	5	2.8
82.02	26.7	25.3	1.3	5	15.3
83.01	18.8	17.9	0.9	5	2.2

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
83.02	20.4	19.4	1.0	5	2.4
83.03	23.0	21.9	1.2	5	3.2
83.04	23.2	22.1	1.2	5	3.8
83.05	21.8	20.7	1.1	5	9.1
83.06	20.1	19.7	0.4	2	7.4
83.08	10.3	9.8	0.5	5	5.1
84.01	21.0	20.0	1.1	5	4.9
84.02	20.0	19.0	1.0	5	3.8
84.03	20.8	19.7	1.0	5	2.6
84.04	19.6	18.6	1.0	5	1.4
85.01	19.8	18.8	1.0	5	2.6
85.02	30.1	28.6	1.5	5	1.3
85.03	19.4	18.4	1.0	5	13.2
86.01	11.1	10.5	0.6	5	1.1
87.01	14.8	14.0	0.7	5	3.1
87.02	7.8	7.4	0.4	5	4.0
88.01	25.2	23.9	1.3	5	3.3
88.02	31.0	29.5	1.6	5	2.3
88.03	31.4	29.8	1.6	5	1.7
88.04	26.7	25.3	1.3	5	11.3
89.01	12.9	12.2	0.6	5	2.3
89.02	17.8	16.9	0.9	5	2.4
89.03	20.4	19.4	1.0	5	13.5
90.01	20.1	19.1	1.0	5	1.9
90.02	5.7	5.4	0.3	5	4.9
91.01	14.6	14.3	0.3	2	6.5
93.01	23.7	22.5	1.2	5	2.0
94.01	20.1	19.5	0.6	3	11.1
95.01	27.0	25.7	1.4	5	2.9
95.02	9.8	9.5	0.3	3	12.0
96.01	302.2	287.1	15.1	5	11.1
103.01	14.5	13.7	0.7	5	1.9
103.02	25.4	24.1	1.3	5	5.0
104.01	40.3	39.5	0.8	2	3.9
104.02	25.5	24.9	0.5	2	2.2
104.03	20.1	19.7	0.4	2	1.2
104.04	30.2	28.7	1.5	5	2.9
104.05	20.2	19.2	1.0	5	2.4
104.06	32.6	31.0	1.6	5	4.0
104.07	32.2	31.3	1.0	3	3.4
104.08	21.2	20.8	0.4	2	4.4
104.09	27.6	26.8	0.8	3	2.1
104.10	57.9	56.7	1.2	2	1.9
104.11	20.1	19.6	0.4	2	3.2
104.12	20.0	16.0	4.0	20	3.3
104.13	12.6	12.3	0.3	2	5.7
104.14	1.8	1.7	0.0	2	4.9
104.15	31.4	30.8	0.6	2	3.8
104.16	20.3	19.8	0.4	2	2.3
104.17	20.0	19.6	0.4	2	0.7
104.18	11.6	11.4	0.2	2	3.4
104.19	6.6	6.4	0.1	2	1.8
104.20	24.4	22.7	1.7	7	3.5
104.21	20.1	18.9	1.2	6	1.0

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
104.22	6.3	5.2	1.1	17	4.3
104.23	8.7	7.0	1.7	20	5.1
104.24	21.9	18.2	3.7	17	4.3
104.25	20.7	18.6	2.1	10	5.9
104.26	20.2	19.0	1.2	6	4.6
104.27	20.8	19.9	0.8	4	7.1
104.28	21.1	20.2	0.8	4	9.9
104.29	20.1	18.1	2.0	10	6.1
104.30	20.2	19.4	0.8	4	6.4
104.31	5.5	5.4	0.1	2	8.0
104.32	21.4	19.3	2.1	10	4.6
104.33	8.5	5.5	3.0	35	10.7
104.34	16.6	16.1	0.5	3	5.8
104.35	20.0	19.6	0.4	2	6.2
104.36	21.4	21.0	0.4	2	9.1
104.37	29.7	29.1	0.6	2	6.3
104.38	13.7	13.4	0.3	2	3.5
104.39	8.7	8.5	0.2	2	4.2
104.40	6.8	6.6	0.1	2	8.5
104.41	29.8	29.2	0.6	2	7.1
104.42	22.2	21.8	0.4	2	4.3
104.43	19.4	19.0	0.4	2	5.1
104.44	18.5	18.1	0.4	2	10.0
105.01	22.2	21.8	0.4	2	2.6
106.01	20.3	19.9	0.4	2	3.8
107.01	20.2	19.8	0.4	2	2.5
107.02	33.3	32.6	0.7	2	3.6
107.03	19.7	19.1	0.6	3	3.0
107.04	17.4	17.1	0.3	2	2.4
107.05	9.2	9.0	0.2	2	2.5
108.01	25.8	24.5	1.3	5	3.2
108.02	24.5	23.3	1.2	5	2.2
108.03	30.2	28.6	1.5	5	3.1
109.01	20.2	19.2	1.0	5	2.8
109.02	20.2	19.2	1.0	5	3.0
110.01	20.8	19.7	1.0	5	3.6
111.01	20.2	19.8	0.4	2	2.6
111.02	11.0	10.7	0.2	2	5.6
112.01	20.4	20.0	0.4	2	2.6
112.02	30.7	29.8	0.9	3	2.0
112.03	45.1	40.6	4.5	10	3.6
112.04	20.7	18.9	1.8	9	2.0
113.01	22.1	20.9	1.1	5	4.1
114.01	13.3	12.6	0.7	5	2.3
115.01	20.1	19.0	1.0	5	4.9
116.01	20.2	19.2	1.0	5	4.0
117.01	20.6	12.4	8.2	40	2.5
117.02	28.9	17.8	11.1	38	1.6
117.03	11.6	10.9	0.8	7	3.4
118.01	24.2	23.0	1.2	5	2.3
119.01	20.1	15.9	4.2	21	3.2
120.01	5.2	3.1	2.1	40	5.6
121.01	20.1	19.1	1.0	5	3.6
121.02	20.1	18.1	2.0	10	4.2

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
121.03	20.8	18.7	2.1	10	4.1
121.04	20.3	19.3	1.0	5	3.2
121.05	21.5	20.5	1.1	5	1.9
121.06	27.9	26.5	1.4	5	1.5
121.07	31.8	30.2	1.6	5	3.0
121.08	31.6	31.0	0.6	2	6.3
121.09	20.8	19.8	1.0	5	4.8
121.10	20.3	19.3	1.0	5	4.8
121.11	28.5	27.0	1.4	5	5.7
121.12	22.8	22.3	0.5	2	5.8
121.13	20.2	19.8	0.4	2	5.1
121.14	20.3	19.9	0.4	2	4.1
122.01	20.5	19.4	1.0	5	3.8
122.02	20.5	19.5	1.0	5	4.2
123.01	20.2	19.2	1.0	5	1.5
124.01	24.4	23.1	1.2	5	2.6
124.02	28.5	27.1	1.4	5	5.6
124.03	21.9	20.8	1.1	5	2.6
124.04	20.1	19.1	1.0	5	3.2
124.05	37.9	36.0	1.9	5	2.3
125.01	20.4	19.3	1.0	5	3.7
126.01	20.3	19.3	1.0	5	3.0
127.01	20.1	19.7	0.4	2	2.2
127.02	31.6	31.0	0.6	2	2.5
127.03	20.4	20.0	0.4	2	2.7
128.01	47.2	44.8	2.4	5	4.3
128.02	8.2	7.8	0.4	5	0.9
128.03	18.3	15.9	2.4	13	0.7
128.04	24.8	22.8	2.0	8	1.7
128.05	20.6	19.5	1.0	5	2.3
128.06	41.5	34.8	6.7	16	2.2
128.07	9.3	7.7	1.6	17	2.3
128.08	11.7	9.9	1.8	15	3.6
128.09	19.2	15.4	3.8	20	2.0
128.10	16.0	13.1	2.9	18	2.9
128.11	14.8	11.1	3.7	25	6.6
128.12	14.1	12.3	1.8	13	6.1
129.01	31.7	29.5	2.2	7	2.1
131.01	21.1	20.1	1.1	5	4.1
131.02	30.0	28.5	1.5	5	4.2
131.03	25.3	23.5	1.8	7	2.8
131.04	23.5	17.8	5.8	25	2.3
131.05	21.1	13.9	7.2	34	2.9
131.06	19.3	12.2	7.1	37	2.3
133.01	21.9	13.6	8.3	38	2.6
133.02	21.0	18.1	2.9	14	2.1
133.03	21.1	15.2	5.9	28	2.4
133.04	18.2	17.1	1.1	6	4.3
134.01	15.3	10.7	4.6	30	0.9
135.01	9.3	8.8	0.5	5	1.7
137.01	10.3	6.6	3.7	36	6.8
139.01	22.3	16.7	5.6	25	2.9
140.01	28.2	26.7	1.4	5	13.1
141.01	20.8	19.7	1.0	5	3.5

XP-RAFTS MODEL - EXISTING CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
141.02	24.7	23.4	1.2	5	6.6
142.01	20.3	19.3	1.0	5	1.3
144.01	21.2	20.8	0.4	2	2.3
144.02	20.1	19.7	0.4	2	2.5
145.01	23.1	22.7	0.5	2	8.5
147.01	24.1	23.6	0.5	2	7.8
147.02	34.5	33.8	0.7	2	7.5
149.01	8.9	8.5	0.4	5	4.2
149.02	4.7	4.6	0.1	2	9.2
151.01	1000.4	980.3	20.0	2	1.5
151.02	1198.9	1174.9	24.0	2	2.3
151.03	1184.6	1160.9	23.7	2	2.5
151.04	1003.0	982.9	20.1	2	1.2
151.05	568.6	557.2	11.4	2	1.3
151.06	221.3	216.8	4.4	2	3.9
151.07	1789.6	1753.8	35.8	2	2.9
151.08	1218.5	1194.1	24.4	2	3.3
152.01	1178.6	1155.0	23.6	2	1.8
153.01	1167.1	1143.7	23.3	2	0.9
153.02	588.8	577.1	11.8	2	1.2
153.03	1321.4	1295.0	26.4	2	2.9
153.04	1650.5	1617.5	33.0	2	0.8
154.01	996.5	976.6	19.9	2	2.7
155.01	507.8	497.6	10.2	2	3.8
156.01	1045.8	1024.8	20.9	2	1.7
156.02	737.2	722.4	14.7	2	2.9
157.01	1009.6	989.4	20.2	2	1.1
157.02	1153.4	1130.3	23.1	2	2.0
157.03	1003.9	983.8	20.1	2	3.1
158.01	1348.9	1321.9	27.0	2	1.9

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.01	1000.4	930.4	70.0	7	2.9
1.02	1038.9	966.1	72.7	7	2.4
1.03	1098.7	1043.8	54.9	5	1.5
1.04	1342.4	1275.3	67.1	5	1.9
1.05	1070.1	1048.7	21.4	2	1.4
1.06	3915.7	3524.1	391.6	10	1.8
1.07	1001.7	981.7	20.0	2	4.2
1.08	1655.9	1490.3	165.6	10	4.3
1.09	1334.5	1241.1	93.4	7	2.3
1.10	1000.8	980.8	20.0	2	2.2
1.11	1266.0	1202.7	63.3	5	2.8
1.12	1028.2	1007.6	20.6	2	3.4
1.13	2334.9	2101.4	233.5	10	2.5
1.14	56.1	54.9	1.1	2	10.9
1.15	40.6	39.8	0.8	2	9.0
1.16	32.5	31.8	0.6	2	13.4
1.17	28.2	27.6	0.6	2	7.5
1.18	20.3	19.9	0.4	2	15.8
1.19	20.0	18.5	1.5	7	8.1
1.20	22.2	20.7	1.5	7	15.8
1.21	20.3	14.5	5.8	29	15.5
1.22	27.5	26.5	1.1	4	15.0
1.23	20.4	17.7	2.7	13	7.4
1.24	118.8	112.1	6.7	6	6.5
1.25	27.8	26.7	1.1	4	12.2
1.26	20.9	19.9	1.0	5	4.6
1.27	46.6	44.3	2.3	5	13.0
1.28	21.6	20.9	0.6	3	11.7
1.29	85.6	83.9	1.7	2	3.5
1.30	25.0	24.5	0.5	2	14.4
1.31	20.1	19.5	0.6	3	0.0
1.32	31.0	30.1	0.9	3	10.2
1.33	48.8	47.3	1.5	3	11.0
1.34	20.0	19.4	0.6	3	16.4
1.35	27.0	26.2	0.8	3	15.9
1.36	25.9	25.1	0.8	3	12.9
1.37	27.2	26.4	0.8	3	16.8
1.38	22.1	21.4	0.7	3	14.5
1.39	91.1	88.4	2.7	3	8.3
1.40	21.9	20.8	1.1	5	5.5
1.41	11.3	11.1	0.2	2	32.2
1.42	73.2	71.0	2.2	3	15.1
1.43	23.8	23.1	0.7	3	16.2
1.44	20.4	20.0	0.4	2	4.7
1.45	16.5	16.2	0.3	2	9.6
1.46	1358.6	1154.8	203.8	15	2.0
1.47	68.8	66.8	2.1	3	13.0
1.48	20.1	19.5	0.6	3	15.9
1.49	30.8	29.8	0.9	3	11.7
1.50	42.2	40.9	1.3	3	3.8
1.51	46.1	45.1	0.9	2	3.8
1.52	38.2	37.4	0.8	2	5.2

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
1.53	11.7	11.4	0.2	2	16.2
1.54	6.2	6.0	0.1	2	16.9
1.55	26.7	22.1	4.6	17	14.5
1.56	59.7	56.2	3.5	6	8.0
1.57	155.6	147.8	7.8	5	10.5
1.58	45.5	43.2	2.3	5	7.2
1.59	62.0	58.9	3.1	5	8.5
1.60	32.4	28.1	4.4	13	5.9
1.61	41.3	35.0	6.3	15	6.6
1.62	9.9	8.7	1.1	12	4.8
1.63	0.0	0.0	0.0	0	1.0
1.64	1080.8	864.6	216.2	20	1.8
1.65	3174.0	2856.6	317.4	10	1.0
2.01	1098.3	1043.3	54.9	5	1.2
3.01	1272.1	1208.5	63.6	5	1.3
3.02	1148.2	1125.3	23.0	2	2.8
3.03	1874.0	1836.5	37.5	2	3.1
3.04	1227.0	1202.5	24.5	2	5.9
3.05	1162.4	1139.1	23.2	2	4.7
3.06	1012.1	991.8	20.2	2	3.7
3.07	1010.1	989.8	20.2	2	3.5
4.01	1106.4	1073.2	33.2	3	2.7
5.01	1000.5	980.5	20.0	2	1.6
5.02	1965.8	1926.5	39.3	2	2.4
11.01	1079.7	1058.1	21.6	2	8.1
11.02	1716.2	1681.9	34.3	2	1.4
11.03	1532.4	1501.8	30.6	2	2.3
11.04	1015.2	994.9	20.3	2	3.1
11.05	1006.9	986.7	20.1	2	1.1
11.06	1051.0	1030.0	21.0	2	2.6
11.07	1176.1	1152.6	23.5	2	2.6
11.08	1044.3	1023.4	20.9	2	2.3
11.09	1000.0	980.0	20.0	2	2.0
11.10	1409.0	1380.8	28.2	2	2.4
11.11	1084.7	1063.0	21.7	2	2.1
11.12	67.1	65.7	1.3	2	7.5
11.13	35.9	35.2	0.7	2	12.6
12.01	409.9	401.7	8.2	2	11.0
13.01	1000.7	980.7	20.0	2	4.8
13.02	1078.2	1056.6	21.6	2	2.9
14.01	1000.6	980.6	20.0	2	4.6
15.01	1001.7	981.7	20.0	2	2.1
16.01	1157.6	1134.5	23.2	2	2.0
16.02	1021.8	1001.3	20.4	2	2.7
16.03	1437.8	1409.0	28.8	2	1.5
16.04	1005.5	985.4	20.1	2	1.7
16.05	1000.5	980.5	20.0	2	2.3
16.06	1102.8	1080.8	22.1	2	1.9
16.07	1721.7	1687.2	34.4	2	2.4
16.08	1012.0	991.8	20.2	2	2.8
17.01	1001.7	981.7	20.0	2	0.5
18.01	1009.7	989.5	20.2	2	2.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
19.01	1000.8	980.8	20.0	2	2.4
20.01	1063.6	1042.3	21.3	2	2.7
20.02	1001.7	981.6	20.0	2	1.6
21.01	1143.1	1120.2	22.9	2	1.9
22.01	20.4	17.1	3.3	16	3.6
22.02	22.6	22.1	0.5	2	2.8
22.03	23.4	23.0	0.5	2	1.5
22.04	20.0	19.6	0.4	2	3.2
23.01	21.8	19.7	2.0	9	4.4
25.01	20.7	19.6	1.0	5	3.2
25.02	20.8	18.7	2.1	10	3.9
25.03	23.6	14.6	9.0	38	1.7
27.01	20.4	11.9	8.5	42	3.4
27.02	25.2	12.1	13.1	52	4.5
27.03	21.9	14.4	7.4	34	3.4
27.04	19.9	16.5	3.4	17	7.0
28.01	20.1	7.3	12.8	64	3.8
29.01	5.0	2.7	2.4	47	6.1
30.01	450.0	427.5	22.5	5	11.0
34.01	370.0	351.5	18.5	5	12.0
36.01	330.0	323.4	6.6	2	8.3
40.01	25.4	3.6	21.9	86	2.3
40.02	9.8	1.6	8.2	84	2.0
40.03	27.1	11.9	15.2	56	2.1
40.04	26.9	18.5	8.4	31	2.3
40.05	13.9	8.6	5.4	38	3.2
40.06	9.2	8.6	0.5	6	11.9
42.01	16.1	13.5	2.6	16	12.0
43.01	26.0	19.4	6.6	25	8.8
50.01	1628.7	1384.4	244.3	15	3.5
50.02	1000.2	930.2	70.0	7	2.0
50.03	1014.1	912.7	101.4	10	3.3
50.04	1275.4	1249.9	25.5	2	3.3
50.05	1512.4	1361.2	151.2	10	1.6
50.06	1025.8	820.7	205.2	20	2.5
50.07	1017.1	813.7	203.4	20	1.8
50.08	1079.5	917.5	161.9	15	1.5
50.09	1077.7	1002.3	75.4	7	2.8
51.01	1025.8	923.2	102.6	10	1.9
52.01	1036.0	932.4	103.6	10	1.9
54.01	20.2	19.2	1.0	5	2.6
56.01	22.2	21.1	1.1	5	17.3
69.01	913.4	867.7	45.7	5	8.8
70.01	138.6	131.6	6.9	5	3.2
76.01	31.2	29.7	1.6	5	3.5
76.02	22.3	21.1	1.1	5	2.7
79.01	16.0	2.1	13.9	87	3.3
79.02	14.4	1.9	12.5	87	2.6
79.03	9.3	1.2	8.1	87	0.8
80.01	28.4	3.7	24.7	87	1.6
80.02	24.3	14.6	9.7	40	2.1
80.04	19.6	3.0	16.6	85	2.1

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
80.05	9.4	4.2	5.2	55	2.1
81.01	38.9	13.2	25.7	66	2.4
81.02	24.7	12.3	12.4	50	1.5
82.01	19.1	13.6	5.5	29	2.8
82.02	26.7	23.1	3.6	13	15.3
83.01	18.8	11.3	7.5	40	2.2
83.02	20.4	17.7	2.7	13	2.4
83.03	23.0	21.7	1.3	6	3.2
83.04	23.2	21.5	1.8	8	3.8
83.05	21.8	20.5	1.3	6	9.1
83.06	20.1	19.0	1.2	6	7.4
83.08	10.3	7.7	2.6	26	5.1
84.01	21.0	13.6	7.5	36	4.9
84.02	20.0	12.0	8.0	40	3.8
84.03	20.8	12.5	8.3	40	2.6
84.04	19.6	14.2	5.5	28	1.4
85.01	19.8	18.8	1.0	5	2.6
85.02	30.1	21.7	8.4	28	1.3
85.03	19.4	16.1	3.3	17	13.2
86.01	11.1	7.3	3.8	34	1.1
87.01	14.8	7.8	7.0	47	3.1
87.02	7.8	5.9	1.9	25	4.0
88.01	25.2	10.7	14.5	57	3.3
88.02	31.0	11.8	19.2	62	2.3
88.03	31.4	26.3	5.2	16	1.7
88.04	26.7	23.8	2.9	11	11.3
89.01	12.9	7.5	5.4	42	2.3
89.02	17.8	12.1	5.8	32	2.4
89.03	20.4	18.8	1.6	8	13.5
90.01	20.1	12.5	7.7	38	1.9
90.02	5.7	4.1	1.6	29	4.9
91.01	14.6	11.0	3.6	25	6.5
93.01	23.7	14.9	8.8	37	2.0
94.01	20.1	13.6	6.5	32	11.1
95.01	27.0	16.7	10.3	38	2.9
95.02	9.8	9.1	0.8	8	12.0
96.01	302.2	287.1	15.1	5	11.1
103.01	14.5	8.7	5.8	40	1.9
103.02	25.4	15.7	9.7	38	5.0
104.01	40.3	39.5	0.8	2	3.9
104.02	25.5	24.9	0.5	2	2.2
104.03	20.1	19.7	0.4	2	1.2
104.04	30.2	28.7	1.5	5	2.9
104.05	20.2	19.2	1.0	5	2.4
104.06	32.6	31.0	1.6	5	4.0
104.07	32.2	31.3	1.0	3	3.4
104.08	21.2	20.8	0.4	2	4.4
104.09	27.6	26.8	0.8	3	2.1
104.10	57.9	56.7	1.2	2	1.9
104.11	20.1	19.6	0.4	2	3.2
104.12	20.0	16.0	4.0	20	3.3
104.13	12.6	12.3	0.3	2	5.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
104.14	1.8	1.7	0.0	2	4.9
104.15	31.4	29.0	2.4	8	3.8
104.16	20.3	19.8	0.4	2	2.3
104.17	20.0	16.6	3.4	17	0.7
104.18	11.6	11.4	0.2	2	3.4
104.19	6.6	6.4	0.1	2	1.8
104.20	24.4	21.1	3.3	14	3.5
104.21	20.1	18.0	2.2	11	1.0
104.22	6.3	5.3	1.0	17	4.3
104.23	8.7	6.3	2.4	28	5.1
104.24	21.9	15.9	6.1	28	4.3
104.25	20.7	16.5	4.2	20	5.9
104.26	20.2	18.0	2.2	11	4.6
104.27	20.8	19.8	1.0	5	7.1
104.28	21.1	20.0	1.0	5	9.9
104.29	20.1	16.8	3.3	16	6.1
104.30	20.2	19.2	1.0	5	6.4
104.31	5.5	5.4	0.1	2	8.0
104.32	21.4	18.5	2.9	14	4.6
104.33	8.5	3.9	4.6	54	10.7
104.34	16.6	15.0	1.6	10	5.8
104.35	20.0	18.9	1.2	6	6.2
104.36	21.4	21.0	0.4	2	9.1
104.37	29.7	29.1	0.6	2	6.3
104.38	13.7	13.4	0.3	2	3.5
104.39	8.7	8.5	0.2	2	4.2
104.40	6.8	6.1	0.7	10	8.5
104.41	29.8	27.0	2.9	10	7.1
104.42	22.2	21.3	0.9	4	4.3
104.43	19.4	17.9	1.5	8	5.1
104.44	18.5	16.4	2.1	12	10.0
105.01	22.2	21.8	0.4	2	2.6
106.01	20.3	19.9	0.4	2	3.8
107.01	20.2	19.8	0.4	2	2.5
107.02	33.3	22.2	11.1	33	3.6
107.03	19.7	14.1	5.6	29	3.0
107.04	17.4	15.4	2.0	11	2.4
107.05	9.2	6.9	2.3	25	2.5
108.01	25.8	24.5	1.3	5	3.2
108.02	24.5	23.3	1.2	5	2.2
108.03	30.2	28.6	1.5	5	3.1
109.01	20.2	19.2	1.0	5	2.8
109.02	20.2	19.2	1.0	5	3.0
110.01	20.8	19.7	1.0	5	3.6
111.01	20.2	19.8	0.4	2	2.6
111.02	11.0	10.7	0.2	2	5.6
112.01	20.4	16.9	3.5	17	2.6
112.02	30.7	22.0	8.7	28	2.0
112.03	45.1	28.7	16.4	36	3.6
112.04	20.7	13.9	6.8	33	2.0
113.01	22.1	13.6	8.4	38	4.1
114.01	13.3	8.8	4.5	34	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area (ha)	Pervious Area (ha)	Impervious Area (ha)	Percentage of Impervious (%)	Slope (%)
115.01	20.1	17.7	2.3	12	4.9
116.01	20.2	19.2	1.0	5	4.0
117.01	20.6	12.4	8.2	40	2.5
117.02	28.9	17.8	11.1	38	1.6
117.03	11.6	10.9	0.8	7	3.4
118.01	24.2	23.0	1.2	5	2.3
119.01	20.1	11.2	8.9	44	3.2
120.01	5.2	2.1	3.1	60	5.6
121.01	20.1	19.1	1.0	5	3.6
121.02	20.1	18.1	2.0	10	4.2
121.03	20.8	18.7	2.1	10	4.1
121.04	20.3	19.3	1.0	5	3.2
121.05	21.5	20.5	1.1	5	1.9
121.06	27.9	26.5	1.4	5	1.5
121.07	31.8	30.2	1.6	5	3.0
121.08	31.6	31.0	0.6	2	6.3
121.09	20.8	19.8	1.0	5	4.8
121.10	20.3	19.3	1.0	5	4.8
121.11	28.5	27.0	1.4	5	5.7
121.12	22.8	22.3	0.5	2	5.8
121.13	20.2	19.8	0.4	2	5.1
121.14	20.3	19.9	0.4	2	4.1
122.01	20.5	19.4	1.0	5	3.8
122.02	20.5	19.5	1.0	5	4.2
123.01	20.2	19.2	1.0	5	1.5
124.01	24.4	23.1	1.2	5	2.6
124.02	28.5	27.1	1.4	5	5.6
124.03	21.9	20.8	1.1	5	2.6
124.04	20.1	19.1	1.0	5	3.2
124.05	37.9	36.0	1.9	5	2.3
125.01	20.4	19.3	1.0	5	3.7
126.01	20.3	19.3	1.0	5	3.0
127.01	20.1	19.7	0.4	2	2.2
127.02	31.6	31.0	0.6	2	2.5
127.03	20.4	20.0	0.4	2	2.7
128.01	47.2	27.6	19.6	42	4.3
128.02	8.2	5.2	3.0	36	0.9
128.03	18.3	11.7	6.6	36	0.7
128.04	24.8	21.8	3.0	12	1.7
128.05	20.6	17.8	2.8	14	2.3
128.06	41.5	29.3	12.2	29	2.2
128.07	9.3	6.9	2.5	26	2.3
128.08	11.7	9.4	2.4	20	3.6
128.09	19.2	15.8	3.4	18	2.0
128.10	16.0	12.1	3.8	24	2.9
128.11	14.8	9.4	5.5	37	6.6
128.12	14.1	10.6	3.6	25	6.1
129.01	31.7	17.4	14.3	45	2.1
131.01	21.1	11.7	9.4	44	4.1
131.02	30.0	18.2	11.9	40	4.2
131.03	25.3	12.0	13.3	52	2.8
131.04	23.5	17.8	5.8	25	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
131.05	21.1	13.9	7.2	34	2.9
131.06	19.3	12.2	7.1	37	2.3
133.01	21.9	6.6	15.3	70	2.6
133.02	21.0	15.1	5.9	28	2.1
133.03	21.1	13.7	7.4	35	2.4
133.04	18.2	14.4	3.8	21	4.3
134.01	15.3	7.0	8.3	54	0.9
135.01	9.3	3.7	5.6	60	1.7
137.01	10.3	5.0	5.3	51	6.8
139.01	22.3	10.2	12.1	54	2.9
140.01	28.2	13.5	14.6	52	7.0
141.01	20.8	12.5	8.3	40	3.5
141.02	24.7	18.6	6.1	25	6.6
142.01	20.3	13.0	7.4	36	1.3
144.01	21.2	20.8	0.4	2	2.3
144.02	20.1	19.7	0.4	2	2.5
145.01	23.1	19.6	3.5	15	8.5
147.01	24.1	14.4	9.6	40	7.8
147.02	34.5	27.0	7.5	22	7.5
149.01	8.9	5.7	3.2	36	4.2
149.02	4.7	3.7	1.0	21	9.2
151.01	1000.4	980.3	20.0	2	1.5
151.02	1198.9	1174.9	24.0	2	2.3
151.03	1184.6	1160.9	23.7	2	2.5
151.04	1003.0	982.9	20.1	2	1.2
151.05	568.6	557.2	11.4	2	1.3
151.06	221.3	216.8	4.4	2	3.9
151.07	1789.6	1753.8	35.8	2	2.9
151.08	1218.5	1194.1	24.4	2	3.3
152.01	1178.6	1155.0	23.6	2	1.8
153.01	1167.1	1143.7	23.3	2	0.9
153.02	588.8	577.1	11.8	2	1.2
153.03	1321.4	1295.0	26.4	2	2.9
153.04	1650.5	1617.5	33.0	2	0.8
154.01	996.5	976.6	19.9	2	2.7
155.01	507.8	497.6	10.2	2	3.8
156.01	1045.8	1024.8	20.9	2	1.7
156.02	737.2	722.4	14.7	2	2.9
157.01	1009.6	989.4	20.2	2	1.1
157.02	1153.4	1130.3	23.1	2	2.0
157.03	1003.9	983.8	20.1	2	3.1
158.01	1348.9	1321.9	27.0	2	1.9

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.01	1000.4	930.4	70.0	7	2.9
1.02	1038.9	966.1	72.7	7	2.4
1.03	1098.7	1043.8	54.9	5	1.5
1.04	1342.4	1275.3	67.1	5	1.9
1.05	1070.1	1048.7	21.4	2	1.4
1.06	3915.7	3524.1	391.6	10	1.8
1.07	1001.7	981.7	20.0	2	4.2
1.08	1655.9	1490.3	165.6	10	4.3
1.09	1334.5	1241.1	93.4	7	2.3
1.10	1000.8	980.8	20.0	2	2.2
1.11	1266.0	1202.7	63.3	5	2.8
1.12	1028.2	1007.6	20.6	2	3.4
1.13	2334.9	2101.4	233.5	10	2.5
1.14	56.1	54.9	1.1	2	10.9
1.15	40.6	39.8	0.8	2	9.0
1.16	32.5	31.8	0.6	2	13.4
1.17	28.2	27.6	0.6	2	7.5
1.18	20.3	19.9	0.4	2	15.8
1.19	20.0	19.6	0.4	2	8.1
1.20	22.2	21.8	0.4	2	15.8
1.21	20.3	19.8	0.4	2	15.5
1.22	27.5	27.0	0.6	2	15.0
1.23	20.4	20.0	0.4	2	7.4
1.24	118.8	116.4	2.4	2	6.5
1.25	27.8	27.2	0.6	2	12.2
1.26	20.9	19.9	1.0	5	4.6
1.27	46.6	44.3	2.3	5	13.0
1.28	21.6	20.9	0.6	3	11.7
1.29	85.6	83.9	1.7	2	3.5
1.30	25.0	24.5	0.5	2	14.4
1.31	20.1	19.5	0.6	3	0.0
1.32	31.0	30.1	0.9	3	10.2
1.33	48.8	47.3	1.5	3	11.0
1.34	20.0	19.4	0.6	3	16.4
1.35	27.0	26.2	0.8	3	15.9
1.36	25.9	25.1	0.8	3	12.9
1.37	27.2	26.4	0.8	3	16.8
1.38	22.1	21.4	0.7	3	14.5
1.39	91.1	88.4	2.7	3	8.3
1.40	21.9	20.8	1.1	5	5.5
1.41	11.3	11.1	0.2	2	32.2
1.42	73.2	71.0	2.2	3	15.1
1.43	23.8	23.1	0.7	3	16.2
1.44	20.4	20.0	0.4	2	4.7
1.45	16.5	16.2	0.3	2	9.6
1.46	1358.6	1154.8	203.8	15	2.0
1.47	68.8	66.8	2.1	3	13.0
1.48	20.1	19.5	0.6	3	15.9
1.49	30.8	29.8	0.9	3	11.7
1.50	42.2	40.9	1.3	3	3.8
1.51	46.1	45.1	0.9	2	3.8
1.52	38.2	37.4	0.8	2	5.2

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.53	11.7	11.4	0.2	2	16.2
1.54	6.2	6.0	0.1	2	16.9
1.55	26.7	26.1	0.5	2	14.5
1.56	59.7	58.5	1.2	2	8.0
1.57	155.6	147.8	7.8	5	10.5
1.58	45.5	43.2	2.3	5	7.2
1.59	62.0	58.9	3.1	5	8.5
1.60	32.4	30.8	1.6	5	5.9
1.61	41.3	39.2	2.1	5	6.6
1.62	9.9	9.4	0.5	5	4.8
1.63	0.0	0.0	0.0	5	1.0
1.64	1080.8	864.6	216.2	20	1.8
1.65	3174.0	2856.6	317.4	10	1.0
2.01	1098.3	1043.3	54.9	5	1.2
3.01	1272.1	1208.5	63.6	5	1.3
3.02	1148.2	1125.3	23.0	2	2.8
3.03	1874.0	1836.5	37.5	2	3.1
3.04	1227.0	1202.5	24.5	2	5.9
3.05	1162.4	1139.1	23.2	2	4.7
3.06	1012.1	991.8	20.2	2	3.7
3.07	1010.1	989.8	20.2	2	3.5
4.01	1106.4	1073.2	33.2	3	2.7
5.01	1000.5	980.5	20.0	2	1.6
5.02	1965.8	1926.5	39.3	2	2.4
11.01	1079.7	1058.1	21.6	2	8.1
11.02	1716.2	1681.9	34.3	2	1.4
11.03	1532.4	1501.8	30.6	2	2.3
11.04	1015.2	994.9	20.3	2	3.1
11.05	1006.9	986.7	20.1	2	1.1
11.06	1051.0	1030.0	21.0	2	2.6
11.07	1176.1	1152.6	23.5	2	2.6
11.08	1044.3	1023.4	20.9	2	2.3
11.09	1000.0	980.0	20.0	2	2.0
11.10	1409.0	1380.8	28.2	2	2.4
11.11	1084.7	1063.0	21.7	2	2.1
11.12	67.1	65.7	1.3	2	7.5
11.13	35.9	35.2	0.7	2	12.6
12.01	409.9	401.7	8.2	2	11.0
13.01	1000.7	980.7	20.0	2	4.8
13.02	1078.2	1056.6	21.6	2	2.9
14.01	1000.6	980.6	20.0	2	4.6
15.01	1001.7	981.7	20.0	2	2.1
16.01	1157.6	1134.5	23.2	2	2.0
16.02	1021.8	1001.3	20.4	2	2.7
16.03	1437.8	1409.0	28.8	2	1.5
16.04	1005.5	985.4	20.1	2	1.7
16.05	1000.5	980.5	20.0	2	2.3
16.06	1102.8	1080.8	22.1	2	1.9
16.07	1721.7	1687.2	34.4	2	2.4
16.08	1012.0	991.8	20.2	2	2.8
17.01	1001.7	981.7	20.0	2	0.5
18.01	1009.7	989.5	20.2	2	2.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
19.01	1000.8	980.8	20.0	2	2.4
20.01	1063.6	1042.3	21.3	2	2.7
20.02	1001.7	981.6	20.0	2	1.6
21.01	1143.1	1120.2	22.9	2	1.9
22.01	20.4	20.0	0.4	2	3.6
22.02	22.6	22.1	0.5	2	2.8
22.03	23.4	23.0	0.5	2	1.5
22.04	20.0	19.6	0.4	2	3.2
23.01	21.8	21.3	0.4	2	4.4
25.01	20.7	19.6	1.0	5	3.2
25.02	20.8	19.4	1.4	7	3.9
25.03	23.6	19.9	3.7	15	1.7
27.01	20.4	16.5	3.9	19	3.4
27.02	25.2	23.5	1.7	7	4.5
27.03	21.9	20.8	1.1	5	3.4
27.04	19.9	18.9	1.0	5	7.0
28.01	20.1	19.1	1.0	5	3.8
29.01	5.0	4.8	0.3	5	6.1
30.01	450.0	427.5	22.5	5	11.0
34.01	370.0	351.5	18.5	5	12.0
36.01	330.0	323.4	6.6	2	8.3
40.01	25.4	23.1	2.4	9	2.3
40.02	9.8	9.3	0.5	5	2.0
40.03	27.1	25.7	1.4	5	2.1
40.04	26.9	25.5	1.3	5	2.3
40.05	13.9	13.2	0.7	5	3.2
40.06	9.2	8.7	0.5	5	11.9
42.01	16.1	15.3	0.8	5	12.0
43.01	26.0	24.7	1.3	5	8.8
50.01	1628.7	1384.4	244.3	15	3.5
50.02	1000.2	930.2	70.0	7	2.0
50.03	1014.1	912.7	101.4	10	3.3
50.04	1275.4	1249.9	25.5	2	3.3
50.05	1512.4	1361.2	151.2	10	1.6
50.06	1025.8	820.7	205.2	20	2.5
50.07	1017.1	813.7	203.4	20	1.8
50.08	1079.5	917.5	161.9	15	1.5
50.09	1077.7	1002.3	75.4	7	2.8
51.01	1025.8	923.2	102.6	10	1.9
52.01	1036.0	932.4	103.6	10	1.9
54.01	20.2	19.2	1.0	5	2.6
56.01	22.2	21.1	1.1	5	17.3
69.01	913.4	867.7	45.7	5	8.8
70.01	138.6	131.6	6.9	5	3.2
76.01	31.2	29.7	1.6	5	3.5
76.02	22.3	21.1	1.1	5	2.7
79.01	16.0	15.2	0.8	5	3.3
79.02	14.4	12.3	2.1	15	2.6
79.03	9.3	6.4	3.0	32	0.8
80.01	28.4	7.3	21.1	74	1.6
80.02	24.3	15.5	8.8	36	2.1
80.04	19.6	18.6	1.0	5	2.1

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
80.05	9.4	9.0	0.5	5	2.1
81.01	38.9	35.6	3.3	9	2.4
81.02	24.7	23.5	1.2	5	1.5
82.01	19.1	18.1	1.0	5	2.8
82.02	26.7	25.3	1.3	5	15.3
83.01	18.8	14.6	4.2	23	2.2
83.02	20.4	19.4	1.0	5	2.4
83.03	23.0	21.9	1.2	5	3.2
83.04	23.2	22.1	1.2	5	3.8
83.05	21.8	20.7	1.1	5	9.1
83.06	20.1	19.1	1.0	5	7.4
83.08	10.3	9.8	0.5	5	5.1
84.01	21.0	20.0	1.1	5	4.9
84.02	20.0	19.0	1.0	5	3.8
84.03	20.8	19.7	1.0	5	2.6
84.04	19.6	18.6	1.0	5	1.4
85.01	19.8	18.8	1.0	5	2.6
85.02	30.1	28.6	1.5	5	1.3
85.03	19.4	18.4	1.0	5	13.2
86.01	11.1	10.5	0.6	5	1.1
87.01	14.8	14.0	0.7	5	3.1
87.02	7.8	7.4	0.4	5	4.0
88.01	25.2	20.9	4.3	17	3.3
88.02	31.0	28.9	2.1	7	2.3
88.03	31.4	29.8	1.6	5	1.7
88.04	26.7	25.3	1.3	5	11.3
89.01	12.9	11.8	1.1	9	2.3
89.02	17.8	16.9	0.9	5	2.4
89.03	20.4	19.4	1.0	5	13.5
90.01	20.1	19.1	1.0	5	1.9
90.02	5.7	5.4	0.3	5	4.9
91.01	14.6	13.8	0.7	5	6.5
93.01	23.7	22.5	1.2	5	2.0
94.01	20.1	19.1	1.0	5	11.1
95.01	27.0	25.7	1.4	5	2.9
95.02	9.8	9.3	0.5	5	12.0
96.01	302.2	287.1	15.1	5	11.1
103.01	14.5	14.2	0.3	2	1.9
103.02	25.4	24.9	0.5	2	5.0
104.01	40.3	39.5	0.8	2	3.9
104.02	25.5	24.9	0.5	2	2.2
104.03	20.1	19.7	0.4	2	1.2
104.04	30.2	28.7	1.5	5	2.9
104.05	20.2	19.2	1.0	5	2.4
104.06	32.6	31.0	1.6	5	4.0
104.07	32.2	31.3	1.0	3	3.4
104.08	21.2	20.8	0.4	2	4.4
104.09	27.6	26.8	0.8	3	2.1
104.10	57.9	56.7	1.2	2	1.9
104.11	20.1	19.6	0.4	2	3.2
104.12	20.0	16.0	4.0	20	3.3
104.13	12.6	12.3	0.3	2	5.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
104.14	1.8	1.7	0.0	2	4.9
104.15	31.4	29.0	2.4	8	3.8
104.16	20.3	19.8	0.4	2	2.3
104.17	20.0	16.6	3.4	17	0.7
104.18	11.6	11.4	0.2	2	3.4
104.19	6.6	6.4	0.1	2	1.8
104.20	24.4	21.1	3.3	14	3.5
104.21	20.1	18.0	2.2	11	1.0
104.22	6.3	5.3	1.0	17	4.3
104.23	8.7	6.3	2.4	28	5.1
104.24	21.9	15.9	6.1	28	4.3
104.25	20.7	18.9	1.8	9	5.9
104.26	20.2	19.8	0.4	2	4.6
104.27	20.8	20.4	0.4	2	7.1
104.28	21.1	20.6	0.4	2	9.9
104.29	20.1	19.7	0.4	2	6.1
104.30	20.2	19.8	0.4	2	6.4
104.31	5.5	5.4	0.1	2	8.0
104.32	21.4	21.0	0.4	2	4.6
104.33	8.5	3.9	4.6	54	10.7
104.34	16.6	15.0	1.6	10	5.8
104.35	20.0	18.9	1.2	6	6.2
104.36	21.4	21.0	0.4	2	9.1
104.37	29.7	29.1	0.6	2	6.3
104.38	13.7	13.4	0.3	2	3.5
104.39	8.7	8.5	0.2	2	4.2
104.40	6.8	6.6	0.1	2	8.5
104.41	29.8	29.2	0.6	2	7.1
104.42	22.2	21.8	0.4	2	4.3
104.43	19.4	19.0	0.4	2	5.1
104.44	18.5	18.1	0.4	2	10.0
105.01	22.2	21.8	0.4	2	2.6
106.01	20.3	19.9	0.4	2	3.8
107.01	20.2	19.8	0.4	2	2.5
107.02	33.3	33.3	0.0	0	3.6
107.03	19.7	19.7	0.0	0	3.0
107.04	17.4	17.4	0.0	0	2.4
107.05	9.2	9.2	0.0	0	2.5
108.01	25.8	24.5	1.3	5	3.2
108.02	24.5	23.3	1.2	5	2.2
108.03	30.2	28.6	1.5	5	3.1
109.01	20.2	19.2	1.0	5	2.8
109.02	20.2	19.2	1.0	5	3.0
110.01	20.8	19.7	1.0	5	3.6
111.01	20.2	19.8	0.4	2	2.6
111.02	11.0	10.7	0.2	2	5.6
112.01	20.4	19.4	1.0	5	2.6
112.02	30.7	29.2	1.5	5	2.0
112.03	45.1	42.3	2.8	6	3.6
112.04	20.7	13.9	6.8	33	2.0
113.01	22.1	20.9	1.1	5	4.1
114.01	13.3	12.6	0.7	5	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
115.01	20.1	19.0	1.0	5	4.9
116.01	20.2	19.2	1.0	5	4.0
117.01	20.6	12.4	8.2	40	2.5
117.02	28.9	17.8	11.1	38	1.6
117.03	11.6	10.9	0.8	7	3.4
118.01	24.2	23.0	1.2	5	2.3
119.01	20.1	11.2	8.9	44	3.2
120.01	5.2	2.1	3.1	60	5.6
121.01	20.1	19.1	1.0	5	3.6
121.02	20.1	18.1	2.0	10	4.2
121.03	20.8	18.7	2.1	10	4.1
121.04	20.3	19.3	1.0	5	3.2
121.05	21.5	20.5	1.1	5	1.9
121.06	27.9	26.5	1.4	5	1.5
121.07	31.8	30.2	1.6	5	3.0
121.08	31.6	31.0	0.6	2	6.3
121.09	20.8	19.8	1.0	5	4.8
121.10	20.3	19.3	1.0	5	4.8
121.11	28.5	27.0	1.4	5	5.7
121.12	22.8	22.3	0.5	2	5.8
121.13	20.2	19.8	0.4	2	5.1
121.14	20.3	19.9	0.4	2	4.1
122.01	20.5	19.4	1.0	5	3.8
122.02	20.5	19.5	1.0	5	4.2
123.01	20.2	19.2	1.0	5	1.5
124.01	24.4	23.1	1.2	5	2.6
124.02	28.5	27.1	1.4	5	5.6
124.03	21.9	20.8	1.1	5	2.6
124.04	20.1	19.1	1.0	5	3.2
124.05	37.9	36.0	1.9	5	2.3
125.01	20.4	19.3	1.0	5	3.7
126.01	20.3	19.3	1.0	5	3.0
127.01	20.1	19.7	0.4	2	2.2
127.02	31.6	31.0	0.6	2	2.5
127.03	20.4	20.0	0.4	2	2.7
128.01	47.2	44.8	2.4	5	4.3
128.02	8.2	7.8	0.4	5	0.9
128.03	18.3	14.4	3.8	21	0.7
128.04	24.8	21.8	3.0	12	1.7
128.05	20.6	17.8	2.8	14	2.3
128.06	41.5	29.3	12.2	29	2.2
128.07	9.3	6.9	2.5	26	2.3
128.08	11.7	9.4	2.4	20	3.6
128.09	19.2	15.8	3.4	18	2.0
128.10	16.0	14.9	1.0	7	2.9
128.11	14.8	14.5	0.3	2	6.6
128.12	14.1	13.8	0.3	2	6.1
129.01	31.7	25.8	5.9	19	2.1
131.01	21.1	11.7	9.4	44	4.1
131.02	30.0	28.5	1.5	5	4.2
131.03	25.3	23.2	2.2	8	2.8
131.04	23.5	19.4	4.1	17	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 1					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
131.05	21.1	13.9	7.2	34	2.9
131.06	19.3	12.2	7.1	37	2.3
133.01	21.9	12.4	9.5	44	2.6
133.02	21.0	15.1	5.9	28	2.1
133.03	21.1	13.7	7.4	35	2.4
133.04	18.2	14.4	3.8	21	4.3
134.01	15.3	8.4	6.9	45	0.9
135.01	9.3	3.7	5.6	60	1.7
137.01	10.3	8.9	1.4	14	6.8
139.01	22.3	10.9	11.4	51	2.9
140.01	28.2	13.5	14.6	52	7.0
141.01	20.8	14.8	5.9	29	3.5
141.02	24.7	18.6	6.1	25	6.6
142.01	20.3	15.3	5.0	25	1.3
144.01	21.2	20.8	0.4	2	2.3
144.02	20.1	19.7	0.4	2	2.5
145.01	23.1	20.5	2.7	12	8.5
147.01	24.1	22.2	1.9	8	7.8
147.02	34.5	33.8	0.7	2	7.5
149.01	8.9	8.7	0.2	2	4.2
149.02	4.7	4.6	0.1	2	9.2
151.01	1000.4	980.3	20.0	2	1.5
151.02	1198.9	1174.9	24.0	2	2.3
151.03	1184.6	1160.9	23.7	2	2.5
151.04	1003.0	982.9	20.1	2	1.2
151.05	568.6	557.2	11.4	2	1.3
151.06	221.3	216.8	4.4	2	3.9
151.07	1789.6	1753.8	35.8	2	2.9
151.08	1218.5	1194.1	24.4	2	3.3
152.01	1178.6	1155.0	23.6	2	1.8
153.01	1167.1	1143.7	23.3	2	0.9
153.02	588.8	577.1	11.8	2	1.2
153.03	1321.4	1295.0	26.4	2	2.9
153.04	1650.5	1617.5	33.0	2	0.8
154.01	996.5	976.6	19.9	2	2.7
155.01	507.8	497.6	10.2	2	3.8
156.01	1045.8	1024.8	20.9	2	1.7
156.02	737.2	722.4	14.7	2	2.9
157.01	1009.6	989.4	20.2	2	1.1
157.02	1153.4	1130.3	23.1	2	2.0
157.03	1003.9	983.8	20.1	2	3.1
158.01	1348.9	1321.9	27.0	2	1.9

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.01	1000.4	930.4	70.0	7	2.9
1.02	1038.9	966.1	72.7	7	2.4
1.03	1098.7	1043.8	54.9	5	1.5
1.04	1342.4	1275.3	67.1	5	1.9
1.05	1070.1	1048.7	21.4	2	1.4
1.06	3915.7	3524.1	391.6	10	1.8
1.07	1001.7	981.7	20.0	2	4.2
1.08	1655.9	1490.3	165.6	10	4.3
1.09	1334.5	1241.1	93.4	7	2.3
1.10	1000.8	980.8	20.0	2	2.2
1.11	1266.0	1202.7	63.3	5	2.8
1.12	1028.2	1007.6	20.6	2	3.4
1.13	2334.9	2101.4	233.5	10	2.5
1.14	56.1	54.9	1.1	2	10.9
1.15	40.6	39.8	0.8	2	9.0
1.16	32.5	31.8	0.6	2	13.4
1.17	28.2	27.6	0.6	2	7.5
1.18	20.3	19.9	0.4	2	15.8
1.19	20.0	19.6	0.4	2	8.1
1.20	22.2	21.8	0.4	2	15.8
1.21	20.3	17.5	2.7	13	15.5
1.22	27.5	27.0	0.6	2	15.0
1.23	20.4	20.0	0.4	2	7.4
1.24	118.8	116.4	2.4	2	6.5
1.25	27.8	26.7	1.1	4	12.2
1.26	20.9	19.9	1.0	5	4.6
1.27	46.6	44.3	2.3	5	13.0
1.28	21.6	20.9	0.6	3	11.7
1.29	85.6	83.9	1.7	2	3.5
1.30	25.0	24.5	0.5	2	14.4
1.31	20.1	19.5	0.6	3	0.0
1.32	31.0	30.1	0.9	3	10.2
1.33	48.8	47.3	1.5	3	11.0
1.34	20.0	19.4	0.6	3	16.4
1.35	27.0	26.2	0.8	3	15.9
1.36	25.9	25.1	0.8	3	12.9
1.37	27.2	26.4	0.8	3	16.8
1.38	22.1	21.4	0.7	3	14.5
1.39	91.1	88.4	2.7	3	8.3
1.40	21.9	20.8	1.1	5	5.5
1.41	11.3	11.1	0.2	2	32.2
1.42	73.2	71.0	2.2	3	15.1
1.43	23.8	23.1	0.7	3	16.2
1.44	20.4	20.0	0.4	2	4.7
1.45	16.5	16.2	0.3	2	9.6
1.46	1358.6	1154.8	203.8	15	2.0
1.47	68.8	66.8	2.1	3	13.0
1.48	20.1	19.5	0.6	3	15.9
1.49	30.8	29.8	0.9	3	11.7
1.50	42.2	40.9	1.3	3	3.8
1.51	46.1	45.1	0.9	2	3.8
1.52	38.2	37.4	0.8	2	5.2

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
1.53	11.7	11.4	0.2	2	16.2
1.54	6.2	6.0	0.1	2	16.9
1.55	26.7	26.1	0.5	2	14.5
1.56	59.7	58.5	1.2	2	8.0
1.57	155.6	147.8	7.8	5	10.5
1.58	45.5	43.2	2.3	5	7.2
1.59	62.0	58.9	3.1	5	8.5
1.60	32.4	31.8	0.6	2	5.9
1.61	41.3	40.5	0.8	2	6.6
1.62	9.9	9.7	0.2	2	4.8
1.63	0.0	0.0	0.0	0	1.0
1.64	1080.8	864.6	216.2	20	1.8
1.65	3174.0	2856.6	317.4	10	1.0
2.01	1098.3	1043.3	54.9	5	1.2
3.01	1272.1	1208.5	63.6	5	1.3
3.02	1148.2	1125.3	23.0	2	2.8
3.03	1874.0	1836.5	37.5	2	3.1
3.04	1227.0	1202.5	24.5	2	5.9
3.05	1162.4	1139.1	23.2	2	4.7
3.06	1012.1	991.8	20.2	2	3.7
3.07	1010.1	989.8	20.2	2	3.5
4.01	1106.4	1073.2	33.2	3	2.7
5.01	1000.5	980.5	20.0	2	1.6
5.02	1965.8	1926.5	39.3	2	2.4
11.01	1079.7	1058.1	21.6	2	8.1
11.02	1716.2	1681.9	34.3	2	1.4
11.03	1532.4	1501.8	30.6	2	2.3
11.04	1015.2	994.9	20.3	2	3.1
11.05	1006.9	986.7	20.1	2	1.1
11.06	1051.0	1030.0	21.0	2	2.6
11.07	1176.1	1152.6	23.5	2	2.6
11.08	1044.3	1023.4	20.9	2	2.3
11.09	1000.0	980.0	20.0	2	2.0
11.10	1409.0	1380.8	28.2	2	2.4
11.11	1084.7	1063.0	21.7	2	2.1
11.12	67.1	65.7	1.3	2	7.5
11.13	35.9	35.2	0.7	2	12.6
12.01	409.9	401.7	8.2	2	11.0
13.01	1000.7	980.7	20.0	2	4.8
13.02	1078.2	1056.6	21.6	2	2.9
14.01	1000.6	980.6	20.0	2	4.6
15.01	1001.7	981.7	20.0	2	2.1
16.01	1157.6	1134.5	23.2	2	2.0
16.02	1021.8	1001.3	20.4	2	2.7
16.03	1437.8	1409.0	28.8	2	1.5
16.04	1005.5	985.4	20.1	2	1.7
16.05	1000.5	980.5	20.0	2	2.3
16.06	1102.8	1080.8	22.1	2	1.9
16.07	1721.7	1687.2	34.4	2	2.4
16.08	1012.0	991.8	20.2	2	2.8
17.01	1001.7	981.7	20.0	2	0.5
18.01	1009.7	989.5	20.2	2	2.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
19.01	1000.8	980.8	20.0	2	2.4
20.01	1063.6	1042.3	21.3	2	2.7
20.02	1001.7	981.6	20.0	2	1.6
21.01	1143.1	1120.2	22.9	2	1.9
22.01	20.4	19.4	1.0	5	3.6
22.02	22.6	22.1	0.5	2	2.8
22.03	23.4	23.0	0.5	2	1.5
22.04	20.0	19.6	0.4	2	3.2
23.01	21.8	20.7	1.1	5	4.4
25.01	20.7	19.6	1.0	5	3.2
25.02	20.8	18.7	2.1	10	3.9
25.03	23.6	16.2	7.4	31	1.7
27.01	20.4	11.9	8.5	42	3.4
27.02	25.2	19.7	5.5	22	4.5
27.03	21.9	20.8	1.1	5	3.4
27.04	19.9	18.9	1.0	5	7.0
28.01	20.1	19.1	1.0	5	3.8
29.01	5.0	4.8	0.3	5	6.1
30.01	450.0	427.5	22.5	5	11.0
34.01	370.0	351.5	18.5	5	12.0
36.01	330.0	323.4	6.6	2	8.3
40.01	25.4	24.2	1.3	5	2.3
40.02	9.8	9.3	0.5	5	2.0
40.03	27.1	25.7	1.4	5	2.1
40.04	26.9	25.5	1.3	5	2.3
40.05	13.9	13.6	0.3	2	3.2
40.06	9.2	8.7	0.5	5	11.9
42.01	16.1	15.3	0.8	5	12.0
43.01	26.0	26.0	0.0	0	8.8
50.01	1628.7	1384.4	244.3	15	3.5
50.02	1000.2	930.2	70.0	7	2.0
50.03	1014.1	912.7	101.4	10	3.3
50.04	1275.4	1249.9	25.5	2	3.3
50.05	1512.4	1361.2	151.2	10	1.6
50.06	1025.8	820.7	205.2	20	2.5
50.07	1017.1	813.7	203.4	20	1.8
50.08	1079.5	917.5	161.9	15	1.5
50.09	1077.7	1002.3	75.4	7	2.8
51.01	1025.8	923.2	102.6	10	1.9
52.01	1036.0	932.4	103.6	10	1.9
54.01	20.2	19.2	1.0	5	2.6
56.01	22.2	21.1	1.1	5	17.3
69.01	913.4	867.7	45.7	5	8.8
70.01	138.6	131.6	6.9	5	3.2
76.01	31.2	29.7	1.6	5	3.5
76.02	22.3	21.1	1.1	5	2.7
79.01	16.0	15.2	0.8	5	3.3
79.02	14.4	10.7	3.7	25	2.6
79.03	9.3	1.2	8.1	87	0.8
80.01	28.4	7.3	21.1	74	1.6
80.02	24.3	14.6	9.7	40	2.1
80.04	19.6	3.0	16.6	85	2.1

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
80.05	9.4	5.9	3.5	37	2.1
81.01	38.9	21.2	17.8	46	2.4
81.02	24.7	18.1	6.7	27	1.5
82.01	19.1	13.6	5.5	29	2.8
82.02	26.7	23.1	3.6	13	15.3
83.01	18.8	11.3	7.5	40	2.2
83.02	20.4	17.7	2.7	13	2.4
83.03	23.0	21.7	1.3	6	3.2
83.04	23.2	21.5	1.8	8	3.8
83.05	21.8	20.5	1.3	6	9.1
83.06	20.1	19.0	1.2	6	7.4
83.08	10.3	7.7	2.6	26	5.1
84.01	21.0	20.0	1.1	5	4.9
84.02	20.0	19.0	1.0	5	3.8
84.03	20.8	19.7	1.0	5	2.6
84.04	19.6	14.9	4.7	24	1.4
85.01	19.8	18.8	1.0	5	2.6
85.02	30.1	28.6	1.5	5	1.3
85.03	19.4	18.4	1.0	5	13.2
86.01	11.1	7.3	3.8	34	1.1
87.01	14.8	7.8	7.0	47	3.1
87.02	7.8	5.9	1.9	25	4.0
88.01	25.2	10.7	14.5	57	3.3
88.02	31.0	11.8	19.2	62	2.3
88.03	31.4	26.3	5.2	16	1.7
88.04	26.7	23.8	2.9	11	11.3
89.01	12.9	7.5	5.4	42	2.3
89.02	17.8	12.1	5.8	32	2.4
89.03	20.4	18.8	1.6	8	13.5
90.01	20.1	12.5	7.7	38	1.9
90.02	5.7	4.1	1.6	29	4.9
91.01	14.6	11.0	3.6	25	6.5
93.01	23.7	22.3	1.4	6	2.0
94.01	20.1	19.1	1.0	5	11.1
95.01	27.0	25.7	1.4	5	2.9
95.02	9.8	9.3	0.5	5	12.0
96.01	302.2	287.1	15.1	5	11.1
103.01	14.5	13.7	0.7	5	1.9
103.02	25.4	24.1	1.3	5	5.0
104.01	40.3	39.5	0.8	2	3.9
104.02	25.5	24.9	0.5	2	2.2
104.03	20.1	19.7	0.4	2	1.2
104.04	30.2	28.7	1.5	5	2.9
104.05	20.2	19.2	1.0	5	2.4
104.06	32.6	31.0	1.6	5	4.0
104.07	32.2	31.3	1.0	3	3.4
104.08	21.2	20.8	0.4	2	4.4
104.09	27.6	26.8	0.8	3	2.1
104.10	57.9	56.7	1.2	2	1.9
104.11	20.1	19.6	0.4	2	3.2
104.12	20.0	16.0	4.0	20	3.3
104.13	12.6	12.3	0.3	2	5.7

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
104.14	1.8	1.7	0.0	2	4.9
104.15	31.4	29.0	2.4	8	3.8
104.16	20.3	19.8	0.4	2	2.3
104.17	20.0	16.6	3.4	17	0.7
104.18	11.6	11.4	0.2	2	3.4
104.19	6.6	6.4	0.1	2	1.8
104.20	24.4	21.1	3.3	14	3.5
104.21	20.1	18.0	2.2	11	1.0
104.22	6.3	5.3	1.0	17	4.3
104.23	8.7	6.3	2.4	28	5.1
104.24	21.9	15.9	6.1	28	4.3
104.25	20.7	16.5	4.2	20	5.9
104.26	20.2	18.0	2.2	11	4.6
104.27	20.8	19.8	1.0	5	7.1
104.28	21.1	20.0	1.0	5	9.9
104.29	20.1	16.8	3.3	16	6.1
104.30	20.2	19.2	1.0	5	6.4
104.31	5.5	5.4	0.1	2	8.0
104.32	21.4	18.5	2.9	14	4.6
104.33	8.5	3.9	4.6	54	10.7
104.34	16.6	15.0	1.6	10	5.8
104.35	20.0	18.9	1.2	6	6.2
104.36	21.4	21.0	0.4	2	9.1
104.37	29.7	29.1	0.6	2	6.3
104.38	13.7	13.4	0.3	2	3.5
104.39	8.7	8.5	0.2	2	4.2
104.40	6.8	6.6	0.1	2	8.5
104.41	29.8	29.2	0.6	2	7.1
104.42	22.2	21.8	0.4	2	4.3
104.43	19.4	19.0	0.4	2	5.1
104.44	18.5	18.1	0.4	2	10.0
105.01	22.2	21.8	0.4	2	2.6
106.01	20.3	19.9	0.4	2	3.8
107.01	20.2	19.8	0.4	2	2.5
107.02	33.3	31.6	1.7	5	3.6
107.03	19.7	18.7	1.0	5	3.0
107.04	17.4	17.1	0.3	2	2.4
107.05	9.2	9.0	0.2	2	2.5
108.01	25.8	24.5	1.3	5	3.2
108.02	24.5	23.3	1.2	5	2.2
108.03	30.2	28.6	1.5	5	3.1
109.01	20.2	19.2	1.0	5	2.8
109.02	20.2	19.2	1.0	5	3.0
110.01	20.8	19.7	1.0	5	3.6
111.01	20.2	19.8	0.4	2	2.6
111.02	11.0	10.7	0.2	2	5.6
112.01	20.4	20.0	0.4	2	2.6
112.02	30.7	25.5	5.2	17	2.0
112.03	45.1	28.7	16.4	36	3.6
112.04	20.7	13.9	6.8	33	2.0
113.01	22.1	17.1	5.0	22	4.1
114.01	13.3	13.0	0.3	2	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
115.01	20.1	18.3	1.8	9	4.9
116.01	20.2	19.2	1.0	5	4.0
117.01	20.6	12.4	8.2	40	2.5
117.02	28.9	17.8	11.1	38	1.6
117.03	11.6	10.9	0.8	7	3.4
118.01	24.2	23.0	1.2	5	2.3
119.01	20.1	11.2	8.9	44	3.2
120.01	5.2	2.1	3.1	60	5.6
121.01	20.1	19.1	1.0	5	3.6
121.02	20.1	18.1	2.0	10	4.2
121.03	20.8	18.7	2.1	10	4.1
121.04	20.3	19.3	1.0	5	3.2
121.05	21.5	20.5	1.1	5	1.9
121.06	27.9	26.5	1.4	5	1.5
121.07	31.8	30.2	1.6	5	3.0
121.08	31.6	31.0	0.6	2	6.3
121.09	20.8	19.8	1.0	5	4.8
121.10	20.3	19.3	1.0	5	4.8
121.11	28.5	27.0	1.4	5	5.7
121.12	22.8	22.3	0.5	2	5.8
121.13	20.2	19.8	0.4	2	5.1
121.14	20.3	19.9	0.4	2	4.1
122.01	20.5	19.4	1.0	5	3.8
122.02	20.5	19.5	1.0	5	4.2
123.01	20.2	19.2	1.0	5	1.5
124.01	24.4	23.1	1.2	5	2.6
124.02	28.5	27.1	1.4	5	5.6
124.03	21.9	20.8	1.1	5	2.6
124.04	20.1	19.1	1.0	5	3.2
124.05	37.9	36.0	1.9	5	2.3
125.01	20.4	19.3	1.0	5	3.7
126.01	20.3	19.3	1.0	5	3.0
127.01	20.1	19.7	0.4	2	2.2
127.02	31.6	31.0	0.6	2	2.5
127.03	20.4	20.0	0.4	2	2.7
128.01	47.2	40.2	7.0	15	4.3
128.02	8.2	8.0	0.2	2	0.9
128.03	18.3	15.1	3.1	17	0.7
128.04	24.8	21.8	3.0	12	1.7
128.05	20.6	17.8	2.8	14	2.3
128.06	41.5	29.3	12.2	29	2.2
128.07	9.3	6.9	2.5	26	2.3
128.08	11.7	9.4	2.4	20	3.6
128.09	19.2	15.8	3.4	18	2.0
128.10	16.0	12.1	3.8	24	2.9
128.11	14.8	9.4	5.5	37	6.6
128.12	14.1	10.6	3.6	25	6.1
129.01	31.7	17.4	14.3	45	2.1
131.01	21.1	11.7	9.4	44	4.1
131.02	30.0	18.2	11.9	40	4.2
131.03	25.3	23.2	2.2	8	2.8
131.04	23.5	19.4	4.1	17	2.3

XP-RAFTS MODEL - DEVELOPED CONDITIONS - STAGE 2					
Node	Total Area	Pervious Area	Impervious Area	Percentage of Impervious	Slope
	(ha)	(ha)	(ha)	(%)	(%)
131.05	21.1	13.9	7.2	34	2.9
131.06	19.3	12.2	7.1	37	2.3
133.01	21.9	6.6	15.3	70	2.6
133.02	21.0	15.1	5.9	28	2.1
133.03	21.1	13.7	7.4	35	2.4
133.04	18.2	14.4	3.8	21	4.3
134.01	15.3	7.0	8.3	54	0.9
135.01	9.3	3.7	5.6	60	1.7
137.01	10.3	5.0	5.3	51	6.8
139.01	22.3	10.2	12.1	54	2.9
140.01	28.2	13.5	14.6	52	7.0
141.01	20.8	12.5	8.3	40	3.5
141.02	24.7	18.6	6.1	25	6.6
142.01	20.3	13.0	7.4	36	1.3
144.01	21.2	20.8	0.4	2	2.3
144.02	20.1	19.7	0.4	2	2.5
145.01	23.1	19.6	3.5	15	8.5
147.01	24.1	15.8	8.3	34	7.8
147.02	34.5	31.6	2.9	8	7.5
149.01	8.9	8.7	0.2	2	4.2
149.02	4.7	4.6	0.1	2	9.2
151.01	1000.4	980.3	20.0	2	1.5
151.02	1198.9	1174.9	24.0	2	2.3
151.03	1184.6	1160.9	23.7	2	2.5
151.04	1003.0	982.9	20.1	2	1.2
151.05	568.6	557.2	11.4	2	1.3
151.06	221.3	216.8	4.4	2	3.9
151.07	1789.6	1753.8	35.8	2	2.9
151.08	1218.5	1194.1	24.4	2	3.3
152.01	1178.6	1155.0	23.6	2	1.8
153.01	1167.1	1143.7	23.3	2	0.9
153.02	588.8	577.1	11.8	2	1.2
153.03	1321.4	1295.0	26.4	2	2.9
153.04	1650.5	1617.5	33.0	2	0.8
154.01	996.5	976.6	19.9	2	2.7
155.01	507.8	497.6	10.2	2	3.8
156.01	1045.8	1024.8	20.9	2	1.7
156.02	737.2	722.4	14.7	2	2.9
157.01	1009.6	989.4	20.2	2	1.1
157.02	1153.4	1130.3	23.1	2	2.0
157.03	1003.9	983.8	20.1	2	3.1
158.01	1348.9	1321.9	27.0	2	1.9

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	5.5	13.8	20.2	24.4	30.3	33.1	42.2	36.1	28.2	37.1	33.2	36.2
1.02	10.5	26.3	38.1	46.4	59.3	64.7	82.6	69.3	56.3	74.3	66.2	70.6
1.03	16.6	42.0	61.0	75.2	100.8	110.4	142.3	120.1	108.0	134.0	123.4	131.6
1.04	21.1	53.3	77.4	96.0	131.4	143.8	185.4	157.5	141.5	173.1	162.3	170.8
1.05	23.7	59.9	87.0	107.9	151.3	165.7	213.0	185.2	165.9	198.8	190.8	198.2
1.06	35.6	89.1	129.2	160.0	231.7	255.2	324.5	287.7	261.0	299.7	300.7	300.6
1.07	40.3	97.8	138.8	170.3	246.9	272.8	345.3	306.9	284.8	319.3	326.0	321.4
1.08	47.3	107.5	149.0	181.5	264.8	296.8	368.4	343.9	321.6	344.3	364.8	350.1
1.09	101.5	233.6	321.9	391.9	555.3	621.5	768.0	711.2	664.0	721.4	757.0	735.0
1.10	104.6	240.4	331.5	402.9	570.9	639.2	788.1	732.8	685.4	741.3	782.2	757.4
1.11	108.4	247.5	340.4	412.7	585.3	655.4	806.6	756.2	710.2	760.2	810.4	780.2
1.12	111.6	252.9	347.4	421.1	597.0	668.9	821.2	776.3	729.7	775.2	833.0	797.4
1.13	117.2	262.0	358.9	434.8	616.8	691.0	844.1	814.2	766.0	803.9	879.3	827.8
1.14	117.3	262.0	358.9	434.8	616.9	691.1	844.2	814.5	766.5	804.4	880.2	828.1
1.15	117.3	262.0	358.9	434.8	616.9	691.2	844.2	814.6	766.8	804.8	880.9	828.3
1.16	117.3	262.0	358.9	434.8	616.9	691.2	844.3	814.7	767.0	805.0	881.4	828.4
1.17	117.3	262.0	358.9	434.9	616.9	691.2	844.3	814.8	767.2	805.3	881.8	828.6
1.18	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1658	1782	1708
1.19	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1658	1783	1708
1.20	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1547	1659	1783	1708
1.21	228.7	531.8	739.8	901.9	1289	1442	1740	1647	1547	1659	1785	1709
1.22	228.7	531.8	739.8	901.9	1289	1442	1740	1648	1548	1660	1785	1709
1.23	228.7	531.9	739.9	902.0	1290	1443	1741	1648	1549	1661	1787	1710
1.24	228.7	531.9	739.9	902.1	1290	1443	1741	1649	1551	1662	1790	1711
1.25	228.9	532.1	740.2	902.4	1291	1444	1742	1651	1555	1665	1796	1713
1.26	228.9	532.2	740.3	902.4	1291	1444	1742	1651	1556	1666	1798	1714
1.27	228.9	532.2	740.3	902.4	1291	1445	1742	1651	1556	1667	1799	1714
1.28	228.9	532.2	740.3	902.4	1291	1445	1742	1651	1557	1667	1799	1714
1.29	229.0	532.3	740.3	902.5	1291	1445	1743	1652	1557	1668	1800	1714
1.30	229.0	532.3	740.3	902.5	1291	1445	1743	1652	1558	1668	1800	1715
1.31	229.0	532.3	740.3	902.5	1291	1445	1743	1652	1558	1668	1800	1715
1.32	229.1	532.5	740.6	902.9	1292	1446	1744	1654	1565	1677	1811	1718
1.33	229.1	532.5	740.6	902.9	1292	1446	1744	1654	1565	1677	1811	1719
1.34	229.1	532.5	740.6	902.9	1292	1446	1744	1654	1565	1678	1812	1719
1.35	229.1	532.5	740.6	902.9	1292	1446	1744	1654	1565	1678	1812	1719
1.36	259.1	584.6	807.1	980.9	1416	1604	1900	1897	1808	1853	2084	1915
1.37	259.1	584.6	807.1	980.9	1416	1604	1900	1897	1808	1853	2085	1915
1.38	259.1	584.6	807.1	980.9	1416	1604	1900	1897	1809	1853	2085	1915
1.39	259.1	584.6	807.1	980.9	1416	1604	1900	1897	1809	1855	2086	1915
1.40	259.1	584.6	807.2	980.9	1416	1604	1900	1897	1810	1855	2087	1915
1.41	259.4	585.0	807.7	981.5	1418	1607	1902	1902	1819	1866	2098	1920
1.42	259.4	585.0	807.7	981.5	1418	1607	1902	1902	1819	1867	2099	1920
1.43	259.4	585.0	807.7	981.5	1418	1607	1902	1902	1819	1867	2099	1921
1.44	259.4	585.0	807.7	981.5	1418	1607	1902	1902	1820	1868	2099	1921
1.45	259.4	585.0	807.7	981.5	1418	1607	1902	1902	1820	1868	2100	1921
1.46	260.9	587.0	810.0	984.1	1422	1613	1907	1913	1837	1885	2119	1931
1.47	260.9	587.1	810.0	984.2	1422	1613	1907	1913	1837	1886	2119	1931
1.48	260.9	587.1	810.0	984.2	1422	1613	1907	1913	1838	1887	2120	1931
1.49	260.9	587.1	810.0	984.2	1422	1613	1907	1913	1838	1888	2120	1931
1.50	260.9	587.1	810.1	984.2	1422	1613	1907	1913	1839	1890	2121	1932
1.51	261.1	587.3	810.3	984.5	1423	1614	1908	1915	1843	1896	2126	1934
1.52	261.1	587.3	810.3	984.5	1423	1614	1908	1915	1844	1900	2128	1935
1.53	261.1	587.3	810.3	984.5	1423	1614	1908	1915	1844	1900	2128	1935
1.54	261.1	587.3	810.4	984.5	1423	1614	1908	1915	1844	1901	2129	1935
1.55	261.1	587.3	810.4	984.5	1423	1614	1908	1915	1845	1901	2129	1935
1.56	261.1	587.3	810.4	984.6	1423	1614	1908	1915	1845	1902	2129	1935
1.57	261.1	587.4	810.4	984.6	1423	1614	1908	1916	1845	1904	2129	1936
1.58	261.1	587.4	810.4	984.6	1423	1614	1908	1916	1846	1906	2130	1936
1.59	261.2	587.4	810.4	984.6	1423	1614	1909	1916	1847	1911	2132	1937
1.60	261.2	587.4	810.4	984.6	1423	1614	1909	1916	1847	1911	2132	1938
1.61	261.2	587.4	810.4	984.6	1423	1614	1909	1916	1848	1912	2132	1938
1.62	261.2	587.4	810.4	984.6	1423	1614	1909	1916	1848	1912	2132	1938
1.63	262.3	588.7	811.9	986.4	1428	1621	1914	1934	1880	1945	2172	1955
1.64	262.8	589.2	812.6	987.1	1429	1623	1915	1937	1886	1959	2179	1960
1.65	309.4	670.5	910.9	1104.5	1609	1831	2131	2284	2295	2302	2617	2257

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
2.01	2.9	7.3	10.7	13.6	21.6	23.8	30.3	29.9	26.6	29.6	30.2	30.6
3.01	3.3	8.5	12.5	15.9	25.1	27.7	35.4	34.9	30.9	34.6	35.0	35.7
3.02	7.7	19.6	28.8	36.4	51.8	56.7	73.1	67.8	59.0	70.2	67.8	71.0
3.03	18.8	47.6	69.3	87.2	122.9	134.7	173.0	153.0	136.0	164.1	155.2	163.5
3.04	26.5	64.4	90.9	111.0	149.7	162.7	212.6	185.4	166.2	197.1	189.5	196.5
3.05	32.9	79.0	109.9	133.3	176.3	191.4	250.3	215.7	194.2	229.8	222.9	228.6
3.06	37.6	90.2	125.2	151.1	199.0	217.5	282.4	239.8	218.5	259.0	252.1	255.6
3.07	42.0	100.4	138.4	167.2	220.6	242.6	310.4	260.7	242.8	285.1	280.4	282.0
4.01	4.4	11.1	16.4	21.0	28.2	30.9	39.6	33.3	30.2	37.8	33.5	36.8
5.01	2.7	7.0	10.1	12.9	20.3	22.2	28.5	27.6	24.3	27.8	27.7	28.4
5.02	8.5	21.3	31.2	39.3	61.0	66.9	85.5	82.3	72.1	82.1	82.6	83.8
11.01	9.1	22.8	30.9	35.7	40.2	46.1	55.2	50.5	37.9	44.2	40.1	41.4
11.02	18.4	44.8	58.5	68.0	77.6	88.5	114.1	100.1	76.6	98.4	93.0	99.6
11.03	39.0	96.0	132.0	159.9	198.9	222.6	278.9	228.2	191.3	250.1	233.9	244.0
11.04	43.3	106.1	146.2	176.6	223.9	250.6	309.9	254.1	215.9	279.3	263.8	271.6
11.05	45.4	111.3	153.8	186.2	240.2	268.3	332.8	275.1	238.6	301.2	289.1	295.3
11.06	52.3	128.0	177.1	214.1	284.2	318.4	388.4	332.6	288.6	353.6	347.5	346.8
11.07	56.4	137.5	190.2	229.8	308.5	346.8	419.0	367.3	317.2	382.1	380.6	375.9
11.08	59.7	145.1	200.6	242.4	327.7	370.7	444.2	397.2	342.0	405.6	408.5	400.8
11.09	62.7	151.8	209.8	253.5	344.6	391.9	466.8	425.0	365.2	426.9	434.7	423.6
11.10	66.8	160.8	221.4	267.4	367.0	418.7	494.3	461.8	396.0	454.1	470.0	453.0
11.11	116.5	281.3	393.9	483.6	686.6	774.7	935.6	865.1	788.9	871.4	916.5	888.6
11.12	116.7	281.5	394.1	483.8	687.3	775.9	936.5	868.0	791.8	872.8	919.8	890.4
11.13	116.7	281.5	394.1	483.8	687.4	776.0	936.5	868.2	792.3	873.1	920.4	890.6
12.01	5.8	14.1	17.1	19.5	19.9	23.9	24.8	24.7	19.0	19.4	15.9	16.1
13.01	5.9	14.8	21.4	25.6	31.5	34.5	43.6	38.0	28.2	37.6	34.0	36.7
13.02	10.2	25.5	37.1	45.3	58.9	64.3	82.0	68.4	56.2	74.0	66.5	69.5
14.01	5.7	14.4	20.9	25.1	31.0	33.9	43.0	37.2	28.2	37.4	33.7	36.4
15.01	3.2	8.3	12.1	15.4	22.6	24.8	31.6	28.9	25.6	30.9	28.8	30.7
16.01	3.3	8.7	12.8	16.2	24.8	26.9	34.6	32.7	28.4	34.0	32.6	34.2
16.02	7.2	18.7	27.5	34.5	48.9	53.6	68.9	62.4	55.1	65.8	62.4	65.6
16.03	18.9	48.8	71.8	90.5	131.9	144.7	186.0	174.1	152.5	179.7	176.9	185.2
16.04	21.7	55.9	82.0	103.4	150.8	167.1	213.4	200.2	175.5	204.9	204.1	211.8
16.05	31.8	81.6	118.7	149.8	216.8	240.5	305.5	283.1	251.4	291.3	290.1	299.7
16.06	38.3	98.1	142.2	178.6	260.3	289.3	365.3	339.6	306.0	344.4	351.3	356.3
16.07	43.4	110.4	159.3	199.1	289.8	322.4	406.1	376.5	347.9	380.4	395.8	395.3
16.08	47.2	118.3	169.1	209.4	304.5	338.8	426.2	394.8	370.4	398.7	420.4	415.1
17.01	1.3	3.2	4.6	6.0	10.3	12.4	15.1	18.1	17.8	15.9	21.2	19.3
18.01	3.8	9.8	14.5	18.5	25.3	27.8	35.3	30.1	27.3	34.0	30.3	33.1
19.01	3.4	9.0	13.3	16.8	23.7	26.3	33.3	29.5	26.4	32.4	29.4	31.8
20.01	4.0	10.3	15.3	19.5	26.5	29.2	37.2	31.8	28.7	35.8	31.9	34.8
20.02	6.7	17.0	25.0	31.9	46.2	50.9	64.8	59.0	52.1	62.2	59.1	62.2
21.01	3.2	8.4	12.3	15.7	24.1	26.2	33.8	32.1	27.9	33.1	32.1	33.4
22.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
22.02	1.1	2.7	3.1	3.5	3.6	4.0	4.1	4.1	3.1	3.2	2.5	2.5
22.03	1.3	3.2	3.8	4.2	4.4	5.0	5.3	5.3	4.0	4.1	3.4	3.4
22.04	1.6	3.9	4.7	5.2	5.4	6.1	6.5	6.3	4.8	5.0	4.2	4.2
23.01	0.4	1.0	1.1	1.2	1.3	1.4	1.4	1.5	1.1	1.1	0.9	0.9
25.01	0.4	0.9	1.1	1.2	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
25.02	0.8	1.8	2.2	2.4	2.5	2.6	2.7	2.7	2.1	2.1	1.6	1.6
25.03	1.1	2.5	3.0	3.3	3.5	3.9	4.0	4.0	3.1	3.1	2.5	2.6
27.01	0.4	0.9	1.1	1.2	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
27.02	1.6	3.4	3.8	4.2	4.6	4.6	4.6	4.8	3.6	3.5	2.7	2.8
27.03	2.0	4.3	4.9	5.4	5.9	6.0	6.0	6.1	4.6	4.6	3.6	3.6
27.04	2.4	5.2	5.8	6.4	7.1	7.2	7.3	7.3	5.6	5.5	4.4	4.4
28.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.0	1.0	0.8	0.8
29.01	0.2	0.4	0.4	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2
30.01	7.5	17.6	21.1	23.1	24.3	27.5	27.9	28.5	21.9	21.8	17.5	17.7
34.01	7.0	15.8	18.8	20.8	21.9	23.3	23.5	24.5	18.6	18.3	14.4	14.5
36.01	4.0	10.0	12.8	14.6	14.5	18.2	19.5	19.1	14.4	15.1	12.7	12.9
40.01	0.3	0.8	1.1	1.2	1.2	1.5	1.5	1.5	1.2	1.2	1.0	1.0
40.02	0.5	1.2	1.5	1.7	1.7	2.0	2.1	2.1	1.6	1.7	1.4	1.4
40.03	0.3	0.8	1.1	1.2	1.2	1.5	1.6	1.6	1.2	1.3	1.0	1.1
40.04	0.7	1.7	2.2	2.5	2.5	3.0	3.2	3.1	2.4	2.5	2.1	2.1
40.05	0.3	0.7	0.7	0.8	0.9	0.9	0.9	1.0	0.7	0.7	0.5	0.6

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
40.06	2.2	4.3	4.6	5.1	5.9	5.9	6.2	6.7	4.9	4.9	4.0	4.0
42.01	0.9	1.4	1.6	1.8	1.6	1.4	1.3	1.3	0.9	0.8	0.6	0.6
43.01	0.9	1.7	1.9	2.0	2.3	2.1	1.9	2.0	1.4	1.3	1.0	1.0
50.01	13.3	33.0	45.9	53.1	59.6	68.1	82.3	75.1	55.5	66.0	59.9	62.3
50.02	17.6	43.8	61.9	73.1	85.3	95.2	119.2	105.1	76.7	99.6	90.6	95.0
50.03	24.8	60.9	84.4	99.9	116.4	130.7	162.0	140.9	106.1	137.9	124.0	128.1
50.04	30.2	74.2	103.4	123.9	149.4	166.5	207.2	174.9	133.3	181.3	162.8	168.8
50.05	41.0	100.7	140.9	171.2	214.5	239.1	294.3	241.6	197.0	264.8	239.7	247.5
50.06	47.0	108.1	149.2	181.0	233.6	259.6	315.9	263.6	222.8	286.2	266.9	271.3
50.07	52.3	116.1	158.8	190.9	251.8	280.6	337.3	291.5	249.0	306.6	294.2	293.7
50.08	57.1	125.3	170.3	204.0	272.6	305.3	362.2	323.1	277.0	330.7	324.1	318.5
50.09	66.1	143.6	192.4	231.4	316.2	354.1	413.9	384.6	331.9	380.9	382.7	371.3
51.01	5.0	12.5	18.4	22.8	28.9	31.5	40.5	33.6	28.7	37.1	32.7	36.0
52.01	4.9	12.3	18.1	22.5	28.8	31.4	40.3	33.2	29.0	37.2	32.8	36.1
54.01	0.3	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.0	1.0	0.8	0.8
56.01	1.2	2.0	2.1	2.4	2.2	2.0	1.8	1.8	1.2	1.1	0.9	0.9
69.01	10.3	25.3	32.8	37.6	37.2	46.8	52.0	49.7	38.1	40.8	35.0	35.6
70.01	1.4	3.4	4.6	5.3	5.5	6.7	7.7	7.2	5.5	6.0	5.3	5.4
76.01	0.6	1.3	1.5	1.6	1.7	1.9	2.0	2.0	1.5	1.5	1.2	1.2
76.02	0.9	2.1	2.5	2.8	2.9	3.3	3.3	3.4	2.6	2.6	2.1	2.1
79.01	0.3	0.7	0.9	1.0	1.0	1.0	1.0	1.1	0.8	0.8	0.6	0.6
79.02	0.8	1.7	1.9	2.1	2.4	2.3	2.4	2.6	1.9	1.9	1.5	1.6
79.03	0.1	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.3	0.4	0.4	0.4
80.01	1.1	2.4	2.8	3.1	3.4	3.6	4.0	4.0	3.0	3.1	2.6	2.7
80.02	1.4	3.2	3.7	4.1	4.5	5.0	5.4	5.3	4.0	4.2	3.5	3.6
80.04	1.6	3.8	4.5	5.0	5.4	6.0	6.5	6.3	4.8	5.1	4.3	4.4
80.05	2.6	6.0	7.2	8.1	8.4	9.9	10.7	10.3	7.9	8.4	7.1	7.2
81.01	0.5	1.2	1.5	1.7	1.7	2.1	2.3	2.3	1.7	1.8	1.5	1.5
81.02	0.8	1.9	2.4	2.7	2.7	3.4	3.7	3.5	2.7	2.9	2.4	2.5
82.01	0.3	0.8	0.9	1.0	1.1	1.2	1.2	1.2	0.9	0.9	0.7	0.8
82.02	1.6	2.7	2.9	3.2	3.4	3.1	3.1	3.3	2.4	2.3	1.8	1.8
83.01	0.3	0.7	0.8	0.9	1.0	1.1	1.2	1.2	0.9	0.9	0.7	0.7
83.02	3.1	7.3	8.8	9.8	10.2	11.9	12.9	12.3	9.5	10.1	8.6	8.7
83.03	5.0	11.5	13.8	15.3	16.0	18.4	19.8	18.8	14.5	15.5	13.0	13.2
83.04	5.3	12.2	14.6	16.3	16.9	19.5	21.0	19.9	15.3	16.5	13.8	14.1
83.05	5.5	12.5	15.1	16.8	17.6	20.3	21.9	20.4	15.9	17.3	14.6	14.9
83.06	5.7	12.8	15.6	17.4	18.2	21.0	22.7	21.0	16.4	18.0	15.3	15.6
83.08	0.3	0.7	0.7	0.7	0.9	0.8	0.7	0.8	0.6	0.5	0.4	0.4
84.01	0.6	1.1	1.2	1.4	1.6	1.4	1.4	1.5	1.1	1.1	0.8	0.8
84.02	0.9	2.1	2.3	2.5	2.8	2.8	2.7	2.8	2.1	2.1	1.6	1.6
84.03	1.3	2.8	3.3	3.6	3.9	4.0	4.0	4.1	3.1	3.1	2.4	2.4
84.04	1.5	3.4	4.0	4.3	4.7	5.0	5.1	5.0	3.9	3.9	3.2	3.2
85.01	0.3	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.0	1.0	0.8	0.8
85.02	0.3	0.7	0.9	1.0	1.1	1.3	1.6	1.4	1.1	1.3	1.1	1.2
85.03	1.2	2.0	2.1	2.4	2.5	2.3	2.7	2.9	2.1	2.2	1.9	1.9
86.01	0.1	0.3	0.4	0.4	0.4	0.6	0.6	0.6	0.5	0.5	0.4	0.4
87.01	0.3	0.7	0.8	0.9	0.9	1.0	1.0	1.0	0.8	0.7	0.6	0.6
87.02	0.2	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.4	0.4	0.3	0.3
88.01	0.5	1.1	1.2	1.4	1.4	1.6	1.6	1.7	1.3	1.2	1.0	1.0
88.02	0.4	1.0	1.3	1.4	1.4	1.8	1.9	1.8	1.4	1.4	1.2	1.2
88.03	1.6	3.9	4.6	5.1	5.3	6.2	6.6	6.7	5.0	5.2	4.3	4.3
88.04	2.5	5.0	5.7	6.3	6.9	7.6	8.1	8.2	6.1	6.4	5.3	5.4
89.01	0.2	0.5	0.6	0.7	0.7	0.8	0.8	0.8	0.6	0.6	0.5	0.5
89.02	0.7	1.8	2.2	2.4	2.5	3.0	3.1	3.1	2.3	2.4	2.0	2.0
89.03	1.7	3.2	3.4	3.6	4.2	4.4	4.6	4.9	3.6	3.7	3.0	3.0
90.01	0.2	0.6	0.8	0.9	0.9	1.1	1.2	1.2	0.9	0.9	0.8	0.8
90.02	0.2	0.4	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2
91.01	0.4	0.8	0.9	1.0	1.2	1.1	1.0	1.1	0.8	0.7	0.6	0.6
93.01	0.3	0.7	0.9	1.1	1.1	1.3	1.4	1.4	1.1	1.1	0.9	0.9
94.01	0.8	1.4	1.5	1.7	1.9	1.7	1.5	1.6	1.1	1.0	0.8	0.8
95.01	0.4	1.0	1.2	1.4	1.4	1.6	1.7	1.7	1.3	1.3	1.1	1.1
95.02	0.8	1.5	1.6	1.8	2.0	2.2	2.2	2.4	1.8	1.8	1.4	1.4
96.01	5.7	13.1	15.2	16.9	18.0	19.1	19.2	20.2	15.2	14.9	11.7	11.9
103.01	0.2	0.5	0.6	0.7	0.7	0.9	0.9	0.9	0.7	0.7	0.6	0.6
103.02	0.8	1.8	2.0	2.2	2.5	2.5	2.5	2.7	2.0	2.0	1.6	1.6

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.01	0.6	1.4	1.7	1.9	2.0	2.4	2.5	2.5	1.9	1.9	1.6	1.6
104.02	0.9	2.1	2.6	3.0	3.0	3.7	3.9	3.8	2.9	3.1	2.5	2.6
104.03	1.3	3.2	4.0	4.6	4.6	5.7	6.2	6.0	4.6	4.9	4.1	4.2
104.04	2.1	5.0	6.2	7.0	7.2	8.6	9.2	8.9	6.9	7.2	6.1	6.2
104.05	2.4	5.7	7.0	7.9	8.1	9.7	10.4	10.1	7.7	8.2	6.8	7.0
104.06	3.0	6.9	8.4	9.4	9.7	11.3	12.3	11.8	9.1	9.6	8.1	8.2
104.07	3.5	8.0	9.7	10.8	11.2	13.0	14.1	13.3	10.3	11.1	9.3	9.5
104.08	3.8	8.7	10.5	11.7	12.2	14.1	15.3	14.4	11.2	12.0	10.1	10.3
104.09	5.5	12.8	15.6	17.4	18.0	21.1	22.8	21.5	16.6	17.8	15.0	15.3
104.10	8.1	18.9	23.0	25.7	26.5	31.3	34.0	31.9	24.6	26.6	22.6	23.0
104.11	8.3	19.5	23.7	26.5	27.3	32.3	35.1	32.8	25.4	27.5	23.3	23.7
104.12	8.5	19.8	24.2	27.1	27.9	33.0	36.0	33.4	25.9	28.2	24.0	24.5
104.13	9.1	20.9	25.6	28.6	29.5	35.0	38.2	35.2	27.4	30.0	25.6	26.1
104.14	9.1	20.9	25.6	28.6	29.6	35.0	38.2	35.2	27.5	30.1	25.6	26.2
104.15	12.3	27.9	34.3	38.2	39.3	46.5	50.9	47.1	36.7	40.1	34.2	34.9
104.16	12.5	28.4	35.0	38.9	40.1	47.5	51.9	48.0	37.4	41.0	34.9	35.6
104.17	12.6	28.7	35.3	39.4	40.6	48.1	52.7	48.6	37.9	41.7	35.6	36.3
104.18	12.8	28.9	35.6	39.8	41.1	48.5	53.1	49.0	38.2	42.1	35.9	36.7
104.19	13.6	30.5	38.2	42.7	44.7	52.1	57.0	52.0	40.9	45.8	39.2	40.2
104.20	14.1	31.2	39.1	43.8	46.3	53.7	58.7	53.2	42.0	47.5	40.7	41.8
104.21	14.2	31.5	39.6	44.5	47.0	54.5	59.6	53.9	42.6	48.3	41.5	42.6
104.22	14.3	31.5	39.6	44.6	47.2	54.6	59.8	54.0	42.6	48.5	41.6	42.7
104.23	14.3	31.6	39.7	44.7	47.7	54.9	60.1	54.0	42.8	48.9	42.0	43.0
104.24	14.3	31.6	39.9	45.0	48.4	55.4	60.6	54.2	43.1	49.6	42.6	43.5
104.25	14.4	31.7	40.0	45.3	49.0	55.9	61.0	54.4	43.4	50.3	43.2	44.1
104.26	14.4	31.8	40.2	45.6	49.6	56.3	61.5	54.6	43.7	51.0	43.8	44.7
104.27	23.1	50.8	63.9	72.4	78.1	88.1	96.0	84.7	68.1	79.1	68.0	69.5
104.28	23.1	50.8	64.0	72.6	78.7	88.6	96.5	84.8	68.4	79.8	68.5	70.1
104.29	23.1	50.9	64.1	72.8	79.3	89.0	96.9	84.9	68.6	80.4	69.0	70.5
104.30	23.2	50.9	64.2	73.0	79.8	89.4	97.3	85.1	68.9	81.0	69.6	71.0
104.31	27.8	59.7	76.3	88.1	99.0	109.1	120.0	101.0	83.3	101.8	88.8	91.3
104.32	27.9	59.7	76.5	88.3	99.5	109.6	120.5	101.1	83.6	102.4	89.4	91.8
104.33	27.9	59.8	76.7	88.7	100.9	110.8	121.6	101.5	84.4	104.1	90.9	93.2
104.34	28.3	60.4	77.5	89.9	103.1	112.8	123.8	102.7	85.8	106.7	93.4	95.9
104.35	28.4	60.4	77.7	90.1	103.6	113.3	124.2	102.9	86.2	107.2	94.0	96.4
104.36	28.7	60.9	78.3	90.9	105.2	114.8	125.9	103.8	87.5	109.1	95.9	98.3
104.37	28.8	61.0	78.5	91.2	105.9	115.4	126.5	104.1	88.2	109.8	96.7	99.0
104.38	28.8	61.1	78.7	91.5	106.7	116.2	127.2	104.5	89.0	110.7	97.7	99.9
104.39	28.9	61.1	78.7	91.5	106.9	116.4	127.4	104.6	89.2	110.9	97.9	100.2
104.40	29.0	61.3	79.0	92.0	108.3	117.7	128.6	105.2	90.8	112.3	99.7	101.7
104.41	29.0	61.3	79.1	92.2	108.9	118.3	129.0	105.6	91.5	112.9	100.4	102.4
104.42	29.1	61.4	79.2	92.3	109.4	118.7	129.4	105.8	92.1	113.3	101.0	102.9
104.43	29.1	61.4	79.3	92.4	109.8	119.1	129.7	106.1	92.7	113.6	101.5	103.3
104.44	29.1	61.5	79.4	92.5	110.3	119.7	130.1	106.8	93.7	114.0	102.3	103.8
105.01	0.3	0.7	0.9	1.0	1.0	1.3	1.3	1.3	1.0	1.0	0.9	0.9
106.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
107.01	0.3	0.7	0.8	0.9	0.9	1.1	1.2	1.2	0.9	0.9	0.8	0.8
107.02	0.8	1.8	2.2	2.5	2.6	3.1	3.2	3.2	2.4	2.5	2.1	2.1
107.03	1.1	2.5	3.1	3.4	3.5	4.2	4.4	4.4	3.3	3.4	2.8	2.9
107.04	1.3	3.1	3.8	4.2	4.3	5.2	5.5	5.3	4.1	4.2	3.5	3.6
107.05	1.4	3.4	4.2	4.6	4.8	5.7	6.0	5.8	4.5	4.7	3.9	3.9
108.01	0.4	1.1	1.2	1.4	1.4	1.6	1.6	1.7	1.3	1.3	1.0	1.0
108.02	0.7	1.8	2.2	2.5	2.6	3.0	3.1	3.1	2.3	2.4	2.0	2.0
108.03	1.3	3.0	3.6	4.0	4.1	4.7	4.9	4.8	3.7	3.8	3.1	3.2
109.01	0.3	0.8	1.0	1.1	1.1	1.3	1.3	1.3	1.0	1.0	0.8	0.8
109.02	0.7	1.6	2.0	2.2	2.3	2.5	2.5	2.6	2.0	2.0	1.6	1.6
110.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
111.01	0.3	0.7	0.8	0.9	1.0	1.2	1.2	1.2	0.9	1.0	0.8	0.8
111.02	0.6	1.2	1.4	1.5	1.7	1.8	1.9	2.0	1.5	1.5	1.2	1.2
112.01	0.3	0.7	0.8	0.9	1.0	1.2	1.2	1.2	0.9	1.0	0.8	0.8
112.02	1.3	3.1	3.6	4.0	4.2	4.9	5.2	5.2	3.9	4.1	3.3	3.4
112.03	2.7	6.0	6.9	7.6	8.3	8.8	9.2	9.2	7.0	7.2	5.9	5.9
112.04	3.0	6.6	7.7	8.5	9.1	9.9	10.5	10.2	7.8	8.1	6.7	6.8
113.01	0.5	1.1	1.2	1.3	1.5	1.5	1.4	1.5	1.1	1.1	0.9	0.9
114.01	0.2	0.5	0.6	0.7	0.7	0.8	0.8	0.9	0.7	0.7	0.5	0.5

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
115.01	0.5	1.1	1.2	1.3	1.5	1.4	1.4	1.5	1.1	1.0	0.8	0.8
116.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
117.01	2.3	2.3	2.6	2.4	1.8	1.6	1.6	1.6	1.2	1.1	0.9	0.9
117.02	4.7	4.1	4.6	4.9	3.6	3.3	3.5	3.7	2.7	2.6	2.1	2.1
117.03	4.8	4.4	4.9	5.3	4.3	4.0	4.2	4.4	3.3	3.2	2.5	2.5
118.01	0.3	0.8	1.0	1.1	1.2	1.4	1.5	1.5	1.1	1.1	0.9	1.0
119.01	1.2	1.2	1.5	1.3	1.4	1.3	1.3	1.5	1.1	1.0	0.8	0.8
120.01	0.4	0.7	1.0	1.0	0.7	0.5	0.4	0.4	0.3	0.3	0.2	0.2
121.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.0	1.0	0.8	0.8
121.02	1.8	3.9	4.4	4.8	5.3	5.3	5.3	5.5	4.1	4.1	3.2	3.2
121.03	2.4	5.0	5.5	6.0	6.7	6.6	6.7	6.8	5.1	5.1	4.0	4.0
121.04	2.7	5.8	6.5	7.1	7.9	7.9	8.0	8.0	6.1	6.0	4.8	4.8
121.05	3.2	7.0	8.0	8.8	9.6	10.1	10.3	10.1	7.8	7.9	6.3	6.4
121.06	6.4	14.5	17.0	18.8	20.1	21.8	22.6	21.8	16.9	17.3	14.1	14.3
121.07	6.8	15.4	18.2	20.2	21.5	23.4	24.3	23.3	18.1	18.7	15.3	15.5
121.08	8.1	18.3	22.0	24.4	25.8	28.7	30.1	28.1	22.1	23.2	19.2	19.6
121.09	8.3	18.7	22.6	25.1	26.5	29.5	31.1	28.8	22.7	24.1	20.0	20.3
121.10	8.6	19.0	23.1	25.7	27.2	30.3	32.0	29.4	23.2	24.8	20.7	21.1
121.11	8.8	19.4	23.7	26.4	28.1	31.3	33.1	30.2	23.9	25.9	21.7	22.1
121.12	9.1	19.7	24.2	27.0	28.9	32.1	34.0	30.7	24.4	26.7	22.5	22.9
121.13	9.2	19.9	24.5	27.5	29.5	32.8	34.8	31.1	24.9	27.5	23.2	23.7
121.14	9.4	20.2	24.9	28.0	30.2	33.5	35.5	31.5	25.3	28.2	23.9	24.4
122.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
122.02	0.9	2.0	2.2	2.5	2.7	2.7	2.7	2.8	2.1	2.1	1.6	1.6
123.01	0.2	0.6	0.7	0.8	0.8	1.0	1.2	1.1	0.8	0.9	0.8	0.8
124.01	0.4	0.9	1.1	1.2	1.3	1.5	1.5	1.5	1.2	1.2	0.9	1.0
124.02	1.4	3.2	3.7	4.1	4.5	4.5	4.6	4.8	3.6	3.6	2.8	2.9
124.03	1.8	4.0	4.7	5.2	5.6	5.9	6.0	6.1	4.6	4.6	3.7	3.7
124.04	2.1	4.8	5.7	6.2	6.8	7.1	7.2	7.3	5.5	5.6	4.5	4.5
124.05	2.9	6.8	8.1	9.0	9.5	10.4	10.7	10.4	8.1	8.2	6.7	6.8
125.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
126.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
127.01	0.2	0.6	0.8	0.9	0.9	1.1	1.2	1.1	0.9	0.9	0.8	0.8
127.02	0.6	1.5	1.9	2.2	2.2	2.7	3.0	2.9	2.2	2.3	2.0	2.0
127.03	0.8	2.2	2.7	3.1	3.1	3.9	4.2	4.0	3.1	3.3	2.8	2.8
128.01	0.8	1.9	2.3	2.5	2.7	2.9	3.0	3.0	2.3	2.3	1.8	1.9
128.02	0.9	2.1	2.6	2.8	2.9	3.3	3.4	3.5	2.7	2.7	2.1	2.2
128.03	1.5	3.7	4.5	4.9	5.1	6.0	6.4	6.2	4.8	4.9	4.1	4.1
128.04	1.8	4.4	5.5	6.0	6.2	7.4	7.8	7.6	5.8	6.0	5.0	5.1
128.05	2.1	5.1	6.3	7.0	7.1	8.4	9.0	8.6	6.6	7.0	5.8	5.9
128.06	4.8	11.4	14.2	15.9	16.2	18.9	20.0	18.4	14.5	15.4	13.0	13.2
128.07	5.0	11.6	14.4	16.2	16.6	19.3	20.6	18.8	14.9	15.8	13.4	13.5
128.08	5.1	11.9	14.7	16.6	16.9	19.7	21.1	19.2	15.3	16.3	13.8	14.0
128.09	5.4	12.2	15.2	17.2	17.5	20.6	22.0	20.1	15.9	17.1	14.5	14.7
128.10	8.9	16.1	19.7	21.9	22.2	27.0	29.0	27.4	21.4	22.8	19.3	19.6
128.11	9.1	16.2	20.0	22.2	22.6	27.5	29.5	27.7	21.7	23.3	19.8	20.1
128.12	9.5	16.4	20.5	22.8	23.4	28.2	30.3	28.2	22.2	24.1	20.7	21.1
129.01	0.4	1.1	1.3	1.5	1.5	1.8	1.9	1.9	1.4	1.5	1.2	1.2
131.01	0.5	1.0	1.2	1.3	1.4	1.4	1.4	1.5	1.1	1.1	0.8	0.8
131.02	1.1	2.4	2.7	3.0	3.3	3.3	3.3	3.5	2.6	2.6	2.0	2.0
131.03	1.5	3.4	3.9	4.4	4.7	4.9	4.9	5.0	3.8	3.8	3.0	3.0
131.04	1.9	4.2	5.0	5.5	5.9	6.4	6.4	6.2	4.9	4.9	3.9	4.0
131.05	2.3	4.9	5.8	6.6	6.8	7.7	7.7	7.4	5.9	5.9	4.8	4.8
131.06	3.0	5.4	6.5	7.4	7.6	8.8	8.9	8.4	6.7	6.8	5.6	5.6
133.01	2.4	2.3	2.7	2.4	1.8	1.6	1.6	1.7	1.2	1.2	0.9	0.9
133.02	2.7	3.1	3.7	3.6	4.0	3.7	3.9	4.1	3.1	3.0	2.3	2.4
133.03	3.5	4.6	5.6	5.6	5.8	5.6	5.9	6.1	4.5	4.5	3.5	3.6
133.04	3.9	5.4	6.6	6.7	7.1	6.9	7.1	7.3	5.4	5.3	4.2	4.3
134.01	0.4	0.9	0.9	1.0	1.2	1.1	1.1	1.1	0.8	0.8	0.6	0.6
135.01	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.4	0.4	0.4	0.4
137.01	0.8	1.3	1.8	1.9	1.3	0.9	0.8	0.8	0.6	0.5	0.4	0.4
139.01	1.0	1.7	1.8	2.0	2.1	1.9	1.7	1.8	1.2	1.1	0.9	0.9
140.01	1.3	2.2	2.3	2.5	2.7	2.4	2.2	2.2	1.5	1.5	1.1	1.1
141.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
141.02	1.3	2.7	3.1	3.4	3.7	3.7	4.0	4.2	3.1	3.1	2.5	2.6

Existing Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
142.01	0.2	0.5	0.7	0.8	0.8	1.0	1.1	1.1	0.8	0.9	0.8	0.8
144.01	0.3	0.7	0.8	0.9	0.9	1.2	1.3	1.2	0.9	1.0	0.8	0.8
144.02	0.5	1.3	1.6	1.8	1.8	2.3	2.4	2.4	1.8	1.9	1.6	1.6
145.01	0.7	1.4	1.5	1.6	1.9	1.7	1.6	1.7	1.2	1.2	0.9	0.9
147.01	0.7	1.4	1.5	1.6	1.9	1.7	1.7	1.8	1.3	1.2	0.9	1.0
147.02	1.5	3.1	3.5	3.8	4.4	4.1	4.0	4.2	3.1	3.0	2.3	2.3
149.01	0.3	0.5	0.6	0.6	0.7	0.7	0.6	0.7	0.5	0.5	0.4	0.4
149.02	0.5	0.9	0.9	1.0	1.1	1.0	1.0	1.0	0.7	0.7	0.5	0.5
151.01	2.6	6.6	9.6	12.1	19.6	21.6	27.4	27.2	24.2	26.7	27.4	27.7
151.02	6.5	16.6	24.4	30.9	46.0	50.6	64.7	61.0	53.3	62.2	61.3	63.1
151.03	13.8	35.2	51.7	65.3	96.4	105.7	135.5	127.2	111.0	130.5	127.7	131.9
151.04	16.0	40.7	59.8	75.4	113.2	125.0	159.4	152.7	133.7	153.4	153.9	156.8
151.05	17.7	44.7	65.6	82.6	123.3	136.9	174.0	166.3	146.6	166.9	168.7	171.2
151.06	37.1	91.8	132.5	164.5	238.5	263.9	338.8	323.0	286.8	323.0	331.6	339.4
151.07	49.4	121.5	173.7	213.9	305.7	339.7	435.1	407.9	371.0	408.9	426.2	429.3
151.08	63.9	156.3	221.0	270.6	387.0	429.7	547.5	511.3	472.0	512.4	541.1	538.8
152.01	3.2	8.3	12.1	15.4	24.0	26.2	33.7	32.7	28.7	33.0	32.7	33.7
153.01	2.1	5.2	7.6	9.5	16.3	19.3	23.4	26.6	25.2	22.5	27.9	26.5
153.02	3.7	9.1	13.3	16.9	27.4	31.3	39.0	41.7	38.6	38.0	43.5	42.7
153.03	12.6	31.5	45.9	57.8	81.6	89.6	116.0	106.1	93.8	110.9	108.3	114.7
153.04	18.1	45.0	64.8	79.8	113.0	123.9	161.4	152.8	137.2	153.3	158.0	164.1
154.01	3.8	9.7	14.5	18.4	25.1	27.5	35.0	29.7	27.0	33.6	30.0	32.7
155.01	3.1	8.1	11.6	13.7	16.6	18.4	23.0	20.4	14.5	19.4	17.7	18.9
156.01	2.9	7.4	10.8	13.7	21.4	23.4	30.1	29.0	25.5	29.4	29.1	29.9
156.02	6.2	16.0	23.1	28.5	39.2	43.2	55.9	50.0	44.2	53.3	50.4	53.5
157.01	2.1	5.2	7.7	9.6	16.1	18.8	23.0	25.0	23.2	22.3	25.8	24.9
157.02	5.5	14.0	20.5	25.9	40.0	44.3	56.6	56.2	50.8	54.6	57.5	57.8
157.03	9.8	24.9	36.0	44.9	63.1	69.0	89.8	83.8	74.3	85.6	85.1	88.6
158.01	3.6	9.3	13.8	17.6	27.2	29.8	38.6	37.6	32.8	37.8	37.4	38.7

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	43.7	77.0	94.6	103.9	103.7	114.6	116.9	108.9	86.8	96.7	89.7	93.6
1.02	83.3	144.7	179.9	200.5	204.7	223.9	228.0	208.2	167.8	194.1	177.5	186.8
1.03	132.6	233.6	294.4	331.2	359.3	382.5	426.4	377.5	302.5	373.8	344.0	365.0
1.04	168.4	295.3	373.7	426.1	469.3	498.9	550.8	479.4	391.1	488.1	449.6	472.1
1.05	189.4	331.4	421.4	483.1	544.1	577.8	639.3	546.5	456.2	568.8	529.0	549.6
1.06	280.0	481.8	608.8	705.9	829.7	888.6	966.4	799.2	719.8	872.9	823.9	836.6
1.07	299.2	504.1	634.0	732.9	882.9	945.8	1023.1	868.6	785.0	926.9	891.9	895.1
1.08	315.3	521.5	654.6	757.5	952.8	1027.6	1088.1	989.9	896.9	996.7	999.6	975.5
1.09	648.0	1050.5	1325	1543	1948	2061	2237	1967	1844	2058	2047	2031
1.10	663.5	1072.0	1352	1574	1997	2117	2290	2035	1907	2112	2113	2089
1.11	675.3	1087.0	1370	1596	2042	2171	2338	2111	1984	2164	2188	2148
1.12	684.4	1098.3	1383	1612	2075	2214	2378	2171	2048	2205	2248	2196
1.13	697.9	1114.8	1403	1634	2125	2282	2442	2280	2185	2284	2371	2282
1.14	697.9	1114.8	1403	1634	2125	2283	2443	2281	2188	2285	2374	2283
1.15	697.9	1114.8	1403	1634	2125	2283	2443	2282	2189	2287	2376	2284
1.16	697.9	1114.8	1403	1634	2125	2283	2443	2283	2191	2288	2377	2285
1.17	697.9	1114.8	1403	1634	2125	2283	2444	2284	2192	2288	2378	2285
1.18	1478	2398	3014	3478	4371	4673	5067	4618	4369	4701	4822	4694
1.19	1478	2398	3014	3478	4371	4674	5067	4618	4369	4702	4823	4695
1.20	1478	2398	3014	3478	4371	4674	5067	4619	4370	4703	4824	4695
1.21	1478	2398	3014	3478	4372	4675	5068	4621	4374	4705	4828	4697
1.22	1478	2398	3014	3478	4372	4676	5069	4622	4375	4706	4829	4698
1.23	1478	2398	3014	3478	4373	4678	5070	4625	4381	4710	4836	4701
1.24	1478	2398	3014	3478	4374	4680	5072	4630	4388	4714	4843	4705
1.25	1478	2399	3014	3479	4376	4684	5077	4641	4403	4724	4860	4714
1.26	1478	2399	3014	3479	4377	4686	5078	4644	4408	4728	4865	4716
1.27	1478	2399	3014	3479	4377	4686	5078	4645	4410	4730	4868	4717
1.28	1478	2399	3015	3479	4377	4686	5078	4646	4411	4730	4869	4718
1.29	1478	2399	3015	3479	4378	4687	5080	4648	4414	4733	4873	4720
1.30	1478	2399	3015	3479	4378	4687	5080	4649	4415	4734	4874	4720
1.31	1478	2399	3015	3479	4378	4687	5080	4649	4415	4734	4874	4720
1.32	1479	2399	3015	3480	4380	4693	5087	4667	4445	4759	4914	4737
1.33	1479	2399	3015	3480	4380	4694	5087	4668	4446	4760	4916	4738
1.34	1479	2399	3015	3480	4380	4694	5087	4668	4447	4761	4917	4738
1.35	1479	2399	3015	3480	4380	4694	5087	4668	4448	4762	4918	4739
1.36	1574	2534	3179	3675	4797	5192	5549	5392	5191	5256	5650	5280
1.37	1574	2534	3179	3675	4797	5192	5549	5393	5193	5257	5652	5281
1.38	1574	2534	3179	3675	4797	5192	5549	5394	5193	5258	5653	5281
1.39	1574	2534	3179	3675	4797	5192	5550	5395	5197	5261	5657	5283
1.40	1574	2534	3179	3675	4797	5193	5550	5396	5198	5263	5659	5283
1.41	1574	2534	3180	3676	4801	5201	5559	5416	5236	5293	5700	5303
1.42	1574	2534	3180	3676	4801	5201	5560	5417	5238	5296	5702	5304
1.43	1574	2534	3180	3676	4801	5201	5560	5417	5239	5297	5703	5304
1.44	1574	2534	3180	3676	4801	5201	5560	5417	5239	5298	5704	5305
1.45	1574	2534	3180	3676	4801	5201	5560	5417	5240	5299	5704	5305
1.46	1577	2537	3184	3681	4812	5220	5578	5453	5303	5350	5765	5339
1.47	1577	2537	3184	3681	4812	5220	5578	5454	5305	5354	5767	5340
1.48	1577	2537	3184	3681	4812	5220	5578	5455	5307	5357	5769	5341
1.49	1577	2537	3184	3681	4812	5220	5578	5455	5308	5359	5770	5342
1.50	1577	2538	3184	3681	4812	5221	5579	5456	5311	5363	5773	5344
1.51	1577	2538	3184	3681	4813	5223	5582	5463	5329	5382	5791	5353
1.52	1578	2538	3184	3681	4814	5224	5584	5466	5336	5393	5798	5358
1.53	1578	2538	3184	3681	4814	5224	5584	5466	5337	5393	5798	5358
1.54	1578	2538	3184	3681	4814	5224	5584	5466	5338	5395	5799	5359
1.55	1578	2538	3184	3681	4814	5224	5584	5466	5339	5397	5800	5359
1.56	1578	2538	3184	3681	4814	5224	5584	5466	5340	5399	5801	5360
1.57	1578	2538	3184	3681	4814	5225	5584	5467	5344	5406	5804	5363
1.58	1578	2538	3184	3681	4814	5225	5584	5467	5347	5411	5806	5365
1.59	1578	2538	3184	3681	4814	5225	5585	5469	5357	5427	5813	5372
1.60	1578	2538	3184	3681	4814	5225	5585	5469	5358	5429	5814	5372
1.61	1578	2538	3184	3681	4814	5225	5586	5469	5360	5432	5815	5374
1.62	1578	2538	3184	3681	4814	5225	5586	5469	5360	5433	5815	5374
1.63	1579	2540	3187	3684	4828	5259	5618	5546	5494	5532	5938	5440
1.64	1580	2541	3188	3685	4830	5263	5622	5555	5523	5576	5965	5462
1.65	1732	2742	3423	3951	5296	5871	6218	6570	6777	6532	7166	6334
2.01	23.1	41.8	54.9	66.2	81.2	84.8	97.2	82.3	77.6	91.1	83.0	90.0

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
3.01	26.8	48.1	64.1	76.9	94.4	98.7	112.9	96.2	89.9	105.7	96.2	104.5
3.02	61.9	110.0	141.4	164.7	187.3	196.2	227.2	198.0	168.7	205.6	188.2	201.4
3.03	149.8	262.8	340.0	391.5	440.7	464.0	518.1	446.9	375.7	467.6	428.5	452.8
3.04	196.5	327.4	404.8	460.9	526.5	556.2	627.4	536.3	455.6	561.8	521.4	543.8
3.05	234.3	383.3	469.8	533.9	605.2	644.7	725.0	610.2	530.1	653.0	609.1	627.6
3.06	264.4	427.8	525.2	599.5	673.6	719.9	805.9	671.6	593.1	732.6	683.6	704.3
3.07	290.4	466.5	570.6	654.0	738.5	791.9	880.9	731.5	659.6	800.0	755.2	772.2
4.01	35.3	62.7	82.1	92.4	101.3	107.0	115.4	104.3	83.2	100.6	92.9	99.9
5.01	22.1	39.9	52.3	62.5	75.4	78.9	90.0	77.0	71.0	84.1	76.3	83.0
5.02	67.3	120.4	158.3	186.7	225.8	235.8	269.4	230.6	208.6	248.6	227.2	243.5
11.01	70.8	120.6	134.3	144.7	140.1	151.8	144.0	140.0	110.4	115.2	100.9	103.0
11.02	142.1	223.7	256.2	276.5	272.0	300.2	331.4	305.9	239.8	280.2	257.5	270.5
11.03	300.4	491.0	595.7	664.9	703.0	747.6	786.1	667.5	564.3	694.0	634.9	653.2
11.04	328.2	534.7	650.5	729.4	787.2	831.8	872.2	729.3	633.6	771.7	713.2	728.9
11.05	344.5	563.4	688.4	775.9	850.9	900.3	948.4	793.1	697.1	841.5	785.6	799.2
11.06	390.5	633.0	779.1	884.4	1003.9	1056.7	1100.5	933.2	842.1	984.0	938.5	943.2
11.07	415.0	669.5	825.2	939.7	1087.6	1141.7	1180.9	1019.6	925.6	1064.0	1024.2	1022.5
11.08	433.4	697.2	858.9	981.0	1155.4	1211.5	1242.8	1094.2	996.9	1127.1	1098.5	1086.7
11.09	449.3	721.7	888.4	1016.6	1215.1	1276.0	1298.4	1164.5	1063.1	1184.2	1168.2	1148.1
11.10	468.9	749.5	921.9	1058.1	1287.2	1358.9	1366.5	1259.3	1152.5	1255.7	1260.2	1228.4
11.11	814.1	1333.9	1692.8	1952.8	2432	2584	2683	2431.2	2225.8	2468.5	2495.0	2437.9
11.12	814.3	1334.1	1693.1	1953.2	2435	2590	2687	2443	2235	2473	2505	2444
11.13	814.3	1334.1	1693.1	1953.3	2436	2591	2688	2445	2238	2474	2506	2445
12.01	45.7	67.1	69.3	73.3	75	66	60	63	49	48	39	39
13.01	46.6	82	100	109	106	119	120	112	89	98	91	94
13.02	80.7	141	175	198	204	223	228	206	167	196	179	187
14.01	45.2	80	97	107	105	117	119	111	88	98	90	94
15.01	25.9	46.7	61.6	72.2	82.7	86.2	96.7	84.7	71.8	87.8	79.5	86.8
16.01	27.2	49.0	65.2	77.3	90.9	94.9	107.5	93.3	82.7	99.5	89.9	98.4
16.02	58.6	104.9	134.5	156.0	176.5	184.9	210.6	184.1	153.3	189.2	172.8	184.5
16.03	153.5	275.0	358.0	416.3	483.7	506.3	583.8	499.7	444.4	534.7	497.1	532.9
16.04	176.1	312.8	407.3	470.5	556.1	583.0	667.3	564.8	509.5	606.3	573.0	604.4
16.05	256.4	449.6	580.9	668.9	792.6	832.1	944.3	797.9	716.2	851.2	810.4	843.6
16.06	307.0	535.2	682.5	784.0	947.1	998.3	1125.8	943.4	858.3	1008.3	976.9	995.5
16.07	341.7	591.9	745.5	853.6	1050.3	1113.6	1244.4	1066.6	966.3	1117.5	1101.0	1101.0
16.08	359.9	617.2	771.7	881.9	1099.0	1171.5	1298.6	1138.1	1028.7	1171.3	1169.7	1153.6
17.01	10.1	18.3	24.3	29.5	46.7	51.8	60.2	62.6	60.6	58.2	65.2	62.9
18.01	30.9	55.5	72.9	81.9	90.9	95.9	104	93.5	74.7	91.3	83.9	90.5
19.01	28.2	50.8	67.1	76.8	86.7	90	100	89	71.8	89	81	88
20.01	32.5	58.1	76.4	86.2	96	101	110	99	78	96	88	95
20.02	54.0	96.3	126.4	146.3	169.1	176.9	198.2	173.6	145.2	179.1	163.7	173.8
21.01	26.4	47.4	63.0	75.1	88.8	92.7	105.3	90.9	81.5	97.7	88.3	96.5
22.01	3.1	4.2	4.3	4.5	4.2	3.6	3.2	3.4	2.5	2.4	1.9	2.0
22.02	8.7	12.0	12.3	12.9	12.6	11.0	9.8	10.1	7.8	7.6	6.1	6.2
22.03	10.4	14.7	15.2	15.9	15.8	14.1	12.9	13.1	10.2	10.2	8.3	8.5
22.04	12.5	17.9	18.6	19.5	19.1	17.3	15.8	15.8	12.4	12.4	10.2	10.4
23.01	3.2	4.3	4.4	4.6	4.5	3.8	3.4	3.6	2.7	2.6	2.1	2.1
25.01	3.0	4.0	4.1	4.3	4.2	3.6	3.2	3.4	2.5	2.5	2.0	2.0
25.02	6.0	8.2	8.4	8.8	8.4	7.3	6.4	6.7	5.1	4.9	3.9	4.0
25.03	8.2	11.5	11.8	12.4	12.2	10.8	9.7	9.9	7.7	7.6	6.1	6.2
27.01	3.0	4.0	4.1	4.3	4.2	3.6	3.2	3.3	2.5	2.4	1.9	2.0
27.02	11.0	14.6	15.0	16.1	14.6	12.7	11.2	11.5	8.7	8.4	6.7	6.8
27.03	13.9	18.8	19.2	20.5	18.7	16.3	14.5	14.7	11.2	11.0	8.7	8.9
27.04	16.4	22.3	22.9	24.4	22.3	19.6	17.5	17.5	13.6	13.3	10.6	10.8
28.01	3.2	4.2	4.3	4.6	4.2	3.6	3.2	3.4	2.5	2.4	1.9	1.9
29.01	1.2	1.5	1.7	1.8	1.2	1.0	0.9	0.9	0.6	0.6	0.5	0.5
30.01	57.5	81.1	82.6	86.1	87.7	75.7	67.5	71.3	54.3	53.1	42.4	43.1
34.01	53.0	71.7	73.3	76.5	75.2	64.7	56.9	60.2	45.2	44.1	34.8	35.5
36.01	32.2	49.5	52.4	55.9	56.1	51.2	47.2	48.7	38.2	38.0	31.1	31.6
40.01	2.7	4.1	4.2	4.5	4.6	4.0	3.7	3.8	3.0	3.0	2.4	2.4
40.02	4.0	5.8	5.9	6.2	6.4	5.7	5.1	5.3	4.1	4.1	3.3	3.4
40.03	2.7	4.1	4.4	4.6	4.7	4.2	3.9	4.0	3.1	3.1	2.6	2.6
40.04	5.5	8.3	8.7	9.2	9.3	8.4	7.8	7.9	6.2	6.2	5.1	5.2
40.05	2.3	2.9	3.0	3.1	2.9	2.5	2.2	2.3	1.7	1.7	1.3	1.3
40.06	14.2	18.0	18.7	20.2	19.0	16.9	15.1	16.2	12.1	12.0	9.7	9.9
42.01	4.3	5.5	6.2	6.3	4.1	3.2	2.9	2.9	2.0	1.9	1.5	1.6

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
43.01	5.7	7.1	7.4	8.2	6.0	5.1	4.5	4.7	3.2	3.1	2.5	2.5
50.01	104.4	178.0	199.3	215.6	207.9	226.4	215.5	209.0	164.9	172.8	151.8	155.3
50.02	138.7	238.4	277.4	301.7	288.6	325.9	321.1	302.8	241.3	263.5	236.1	245.3
50.03	191.8	310.2	367.3	401.3	397.9	432.7	425.1	393.2	319.2	361.9	322.1	334.9
50.04	233.4	378.5	456.1	508.2	516.0	554.5	550.0	489.2	406.3	478.2	426.0	442.4
50.05	314.7	511.9	624.1	709.3	750.0	792.5	791.3	677.6	577.9	701.8	633.6	658.8
50.06	328.5	528.3	645.1	736.4	815.0	856.1	849.5	718.3	645.6	758.6	704.6	714.5
50.07	342.4	545.1	667.4	761.9	876.4	916.7	906.7	782.0	717.1	811.7	774.6	775.3
50.08	360.5	568.5	697.8	793.0	945.1	982.8	968.5	857.8	791.7	877.9	850.1	841.0
50.09	395.6	614.8	757.9	868.0	1079.7	1114.1	1093.9	1006.5	936.3	1017.3	999.8	994.5
51.01	40.0	70.4	88.2	97.7	101.6	109.6	114.7	105.6	84.3	96.6	89.9	94.8
52.01	39.3	69.4	87.4	97.1	101.7	109.2	114.7	105.4	84.1	97.1	90.3	95.5
54.01	2.6	3.6	3.7	3.8	3.9	3.4	3.0	3.2	2.4	2.4	1.9	1.9
56.01	6.0	7.6	8.6	8.8	5.7	4.4	4.0	4.0	2.8	2.7	2.1	2.1
69.01	79.9	126.5	136.5	146.2	144.6	137.5	128.5	130.4	102.5	103.2	85.9	87.5
70.01	11.2	18.2	19.9	21.2	20.9	20.5	19.3	19.4	15.2	15.4	13.0	13.3
76.01	4.1	5.8	5.9	6.2	6.2	5.4	4.7	5.0	3.8	3.7	2.9	3.0
76.02	6.8	9.7	9.9	10.4	10.3	9.0	8.0	8.3	6.4	6.3	5.0	5.1
79.01	2.5	3.3	3.4	3.5	3.3	2.9	2.5	2.7	2.0	1.9	1.5	1.5
79.02	5.7	7.4	7.6	8.1	7.5	6.6	6.0	6.3	4.7	4.6	3.7	3.8
79.03	0.7	1.1	1.3	1.3	1.3	1.4	1.3	1.3	1.0	1.0	0.9	0.9
80.01	8.1	10.8	11.1	11.8	11.7	10.6	9.7	10.0	7.7	7.8	6.4	6.5
80.02	10.5	14.5	15.1	15.9	15.6	14.4	13.2	13.3	10.4	10.5	8.7	8.8
80.04	12.4	17.6	18.3	19.4	18.8	17.5	16.0	15.9	12.5	12.7	10.5	10.7
80.05	19.1	28.0	29.4	31.2	30.5	28.6	26.4	26.1	20.6	20.9	17.4	17.7
81.01	3.8	5.9	6.2	6.6	6.7	6.1	5.6	5.8	4.5	4.5	3.7	3.7
81.02	5.9	9.2	9.8	10.4	10.4	9.7	9.0	9.1	7.1	7.2	6.0	6.1
82.01	2.6	3.5	3.6	3.8	3.8	3.3	2.9	3.1	2.3	2.3	1.8	1.8
82.02	8.4	10.6	11.5	12.3	9.4	8.3	7.4	7.8	5.6	5.5	4.3	4.4
83.01	2.3	3.2	3.3	3.5	3.5	3.1	2.8	2.9	2.3	2.2	1.8	1.8
83.02	22.6	33.5	35.3	37.4	36.5	34.6	31.9	31.1	24.7	25.2	21.0	21.5
83.03	35.8	52.0	54.7	57.7	55.8	52.6	48.6	47.3	37.6	38.2	31.9	32.5
83.04	37.3	54.5	57.6	60.8	58.6	55.9	51.6	49.6	39.7	40.6	34.0	34.7
83.05	37.8	55.5	59.5	62.9	60.1	58.4	53.9	50.8	41.1	42.5	36.0	36.8
83.06	38.3	56.6	61.2	64.8	61.6	60.7	56.1	52.1	42.4	44.4	37.8	38.6
83.08	2.2	2.7	2.8	3.0	2.3	2.0	1.8	1.8	1.3	1.2	1.0	1.0
84.01	3.7	4.8	4.9	5.4	4.5	3.9	3.4	3.6	2.6	2.5	2.0	2.0
84.02	6.7	9.0	9.2	9.8	8.7	7.5	6.6	6.8	5.1	4.9	3.9	3.9
84.03	9.2	12.7	12.9	13.7	12.5	10.9	9.7	9.8	7.5	7.3	5.8	5.9
84.04	10.8	15.3	15.7	16.7	15.5	13.8	12.4	12.4	9.7	9.5	7.7	7.8
85.01	2.6	3.6	3.6	3.8	3.8	3.3	3.0	3.1	2.4	2.3	1.9	1.9
85.02	2.1	3.4	3.8	4.1	4.0	4.3	4.1	3.9	3.1	3.2	2.8	2.9
85.03	6.2	7.8	8.5	9.1	7.5	6.9	6.6	7.2	5.4	5.5	4.6	4.7
86.01	1.0	1.5	1.6	1.8	1.8	1.7	1.6	1.6	1.2	1.3	1.0	1.1
87.01	2.3	3.0	3.1	3.2	3.1	2.6	2.3	2.5	1.8	1.8	1.4	1.4
87.02	1.6	2.0	2.0	2.3	1.7	1.5	1.3	1.4	1.0	0.9	0.7	0.8
88.01	3.5	4.8	4.9	5.1	5.1	4.4	3.8	4.1	3.1	3.0	2.4	2.4
88.02	3.2	4.8	5.1	5.4	5.5	4.9	4.5	4.7	3.6	3.6	2.9	3.0
88.03	12.9	18.0	18.4	19.1	19.9	17.5	15.9	16.7	12.8	12.7	10.4	10.6
88.04	15.8	21.6	22.2	23.5	23.8	21.7	19.6	20.1	15.7	15.7	12.9	13.1
89.01	1.7	2.4	2.5	2.6	2.6	2.2	2.0	2.1	1.6	1.5	1.2	1.2
89.02	6.0	8.5	8.7	9.2	9.2	8.2	7.5	7.7	6.0	5.9	4.8	4.9
89.03	10.0	12.7	13.5	14.3	13.9	12.5	11.3	11.9	9.1	9.0	7.2	7.4
90.01	2.1	3.1	3.2	3.5	3.5	3.2	2.9	3.0	2.4	2.3	1.9	1.9
90.02	1.3	1.6	1.7	1.9	1.3	1.1	1.0	1.0	0.7	0.7	0.5	0.6
91.01	2.8	3.6	3.7	4.0	3.2	2.8	2.5	2.6	1.8	1.8	1.4	1.4
93.01	2.4	3.6	3.8	4.1	4.1	3.7	3.4	3.5	2.7	2.7	2.2	2.3
94.01	4.7	5.8	6.2	6.8	4.7	4.0	3.5	3.6	2.5	2.4	1.9	1.9
95.01	3.3	4.8	4.9	5.1	5.2	4.5	4.0	4.3	3.2	3.2	2.5	2.6
95.02	4.8	6.3	6.6	7.2	7.0	6.2	5.5	5.8	4.4	4.3	3.5	3.5
96.01	43.9	58.9	60.4	63.1	61.6	52.9	46.7	49.3	37.0	36.0	28.5	29.0
103.01	1.6	2.4	2.5	2.6	2.7	2.4	2.1	2.2	1.7	1.7	1.4	1.4
103.02	5.9	7.8	8.0	8.5	8.0	7.0	6.2	6.5	4.8	4.7	3.8	3.8
104.01	4.5	6.7	6.9	7.3	7.5	6.5	5.9	6.2	4.8	4.7	3.8	3.9
104.02	6.8	10.2	10.7	11.4	11.5	10.3	9.5	9.7	7.6	7.6	6.2	6.3
104.03	10.4	15.8	16.7	17.8	17.8	16.4	15.3	15.5	12.2	12.3	10.2	10.4

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.04	16.2	23.9	24.9	26.4	26.5	24.4	22.6	22.7	17.9	18.0	14.9	15.2
104.05	18.4	27.0	28.2	29.8	29.9	27.6	25.5	25.4	20.1	20.3	16.8	17.1
104.06	21.7	31.6	33.1	34.9	34.7	32.6	30.1	29.5	23.5	23.8	19.9	20.2
104.07	24.7	36.1	37.9	40.2	39.3	37.5	34.6	33.5	26.8	27.4	22.9	23.3
104.08	26.4	39.0	41.0	43.4	42.3	41	37.6	36	29.0	29.6	24.9	25.4
104.09	39.2	58.4	61.4	65.1	63.4	60	55.8	54	43.3	44.1	36.8	37.6
104.10	57.1	85.8	91.0	96.6	93.4	90	83.6	80	64.5	66.0	55.5	56.6
104.11	58.6	88.2	93.9	99.5	96.1	93.0	86.3	82.6	66.4	68.1	57.3	58.5
104.12	59.1	89.3	95.7	101.5	97.7	95.4	88.5	84.0	67.8	70.0	59.2	60.4
104.13	61.7	93.6	101.0	107.1	102.8	101.3	94.0	88.5	71.8	74.4	63.2	64.5
104.14	61.8	93.7	101.1	107.3	102.9	101.5	94.2	88.6	71.9	74.6	63.4	64.7
104.15	80.8	122.6	132.3	140.3	135.3	134.0	124.6	117.8	95.3	99.1	84.3	86.1
104.16	82.1	124.5	134.6	142.9	137.8	136.7	127.1	119.9	97.0	101.2	86.1	88.0
104.17	82.9	126.0	136.5	144.9	139.7	139.0	129.4	121.8	98.7	103.1	87.9	89.8
104.18	83.3	126.6	137.4	146.0	140.7	140.2	130.5	122.7	99.5	104.2	88.9	90.8
104.19	86.5	131.5	145.4	154.8	148.8	150.0	139.9	129.7	106.1	112.8	97.4	99.7
104.20	87.5	133.3	148.6	158.3	152.6	154.5	144.0	132.5	108.9	116.8	101.3	103.7
104.21	88.4	134.7	150.4	160.5	154.8	156.9	146.1	134.1	110.4	118.7	103.1	105.5
104.22	88.5	134.7	150.6	160.8	155.4	157.3	146.5	134.2	110.7	119.2	103.5	105.9
104.23	88.5	134.8	150.9	161.5	156.7	158.2	147.4	134.4	111.2	120.3	104.5	106.9
104.24	88.6	135.0	151.4	162.6	158.5	159.7	148.8	134.8	112.0	122.1	106.1	108.5
104.25	88.6	135.1	151.9	163.5	160.3	161.1	150.0	135.1	112.8	123.8	107.5	110.1
104.26	88.8	135.4	152.4	164.5	162.0	162.5	151.3	135.5	113.6	125.4	109.0	111.7
104.27	142.9	213.3	239.1	256.3	252.0	253.1	235.8	210.2	176.0	194.2	169.1	173.5
104.28	143.0	213.4	239.5	257.2	253.7	254.4	237.0	210.5	176.8	195.9	170.7	175.0
104.29	143.0	213.6	239.9	258.1	255.3	255.7	238.1	210.8	177.5	197.6	172.1	176.3
104.30	143.1	213.7	240.2	258.9	256.9	256.9	239.3	211.0	178.2	199.2	173.5	177.6
104.31	161.9	243.7	283.5	309.0	308.3	313.3	293.5	252.6	217.3	249.1	222.2	228.2
104.32	162.0	243.9	283.9	309.8	309.9	314.6	294.7	253.0	218.1	250.8	223.7	229.8
104.33	162.1	244.1	284.5	311.8	314.2	318.1	297.9	253.7	220.2	255.6	227.7	233.8
104.34	162.9	245.4	286.9	315.6	320.6	323.7	303.2	256.3	223.8	262.3	234.0	240.5
104.35	162.9	245.6	287.1	316.2	322.0	324.9	304.3	256.6	224.6	263.6	235.4	241.9
104.36	163.6	246.6	288.9	318.9	326.6	329.2	308.3	258.5	227.5	268.4	240.1	246.9
104.37	163.7	246.8	289.2	319.7	328.5	330.9	309.9	259.1	228.9	270.2	242.2	248.9
104.38	163.8	247.0	289.7	320.6	330.9	333.0	311.9	259.9	230.6	272.5	244.7	251.2
104.39	163.8	247.0	289.8	320.8	331.4	333.5	312.3	260.1	231.0	273.0	245.3	251.7
104.40	164.0	247.3	290.4	322.1	335.5	337.3	315.6	261.4	234.3	277.0	249.7	255.7
104.41	164.1	247.5	290.6	322.6	337.3	339.0	316.9	262.2	236.2	278.5	251.6	257.3
104.42	164.1	247.6	290.9	323.0	338.6	340.2	317.9	262.8	237.6	279.7	253.1	258.6
104.43	164.2	247.7	291.0	323.3	339.8	341.3	318.7	263.4	239.0	280.5	254.4	259.5
104.44	164.2	247.7	291.1	323.6	341.5	343.1	320.0	264.6	241.5	281.6	256.5	260.8
105.01	2.3	3.4	3.6	3.9	3.9	3.5	3.2	3.3	2.6	2.6	2.1	2.1
106.01	2.8	3.8	3.9	4.0	4.0	3.5	3.1	3.3	2.5	2.4	1.9	2.0
107.01	2.2	3.2	3.3	3.5	3.6	3.2	2.9	3.0	2.4	2.3	1.9	1.9
107.02	5.8	8.6	8.9	9.4	9.4	8.5	7.8	8.0	6.3	6.2	5.0	5.1
107.03	8.2	11.9	12.3	13.0	13.0	11.7	10.7	10.9	8.5	8.5	6.9	7.0
107.04	9.9	14.6	15.1	16.0	15.9	14.5	13.2	13.3	10.5	10.4	8.5	8.7
107.05	10.9	16.1	16.6	17.6	17.5	16.0	14.5	14.6	11.5	11.5	9.4	9.6
108.01	3.4	4.8	4.9	5.1	5.1	4.4	3.9	4.1	3.1	3.1	2.4	2.5
108.02	6.0	8.7	8.9	9.3	9.3	8.2	7.4	7.6	5.9	5.9	4.7	4.8
108.03	9.4	13.7	14.1	14.8	14.7	13.2	11.9	11.9	9.4	9.3	7.6	7.7
109.01	2.7	3.7	3.8	3.9	4.0	3.4	3.1	3.2	2.5	2.4	1.9	1.9
109.02	5.4	7.5	7.6	7.9	7.9	6.9	6.1	6.3	4.9	4.8	3.8	3.9
110.01	3.2	4.2	4.3	4.5	4.3	3.7	3.2	3.4	2.6	2.5	2.0	2.0
111.01	2.2	3.2	3.3	3.6	3.6	3.2	2.9	3.0	2.4	2.4	1.9	1.9
111.02	4.2	5.3	5.5	5.9	5.8	5.1	4.6	4.9	3.7	3.6	2.9	3.0
112.01	2.2	3.2	3.4	3.6	3.6	3.2	3.0	3.1	2.4	2.4	1.9	2.0
112.02	10.1	14.1	14.5	15.2	15.5	13.8	12.5	13.0	10.0	10.0	8.1	8.3
112.03	19.0	26.2	26.7	28.4	27.4	24.7	22.3	22.7	17.7	17.5	14.3	14.5
112.04	20.8	29.2	30.1	31.9	30.6	27.9	25.3	25.3	19.8	19.8	16.2	16.5
113.01	3.5	4.7	4.8	5.1	4.6	4.0	3.5	3.7	2.7	2.6	2.1	2.1
114.01	1.8	2.5	2.5	2.6	2.6	2.3	2.0	2.1	1.6	1.6	1.3	1.3
115.01	3.6	4.7	4.7	5.2	4.3	3.8	3.3	3.4	2.5	2.4	1.9	1.9
116.01	3.3	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.4	1.9	1.9
117.01	5.6	6.3	7.4	6.6	4.8	4.1	3.6	3.7	2.6	2.5	2.0	2.0
117.02	10.8	11.4	12.4	13.9	10.2	9.3	8.2	8.6	6.2	6.1	4.8	4.9

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
117.03	11.9	13.5	14.4	16.2	12.4	11.3	10.0	10.3	7.6	7.4	5.9	6.0
118.01	2.7	3.9	4.1	4.3	4.4	3.9	3.5	3.7	2.9	2.8	2.3	2.3
119.01	3.4	4.0	4.9	4.6	4.1	3.7	3.2	3.4	2.5	2.4	1.9	2.0
120.01	2.5	2.5	2.7	2.5	1.4	1.0	0.9	0.9	0.6	0.6	0.5	0.5
121.01	3.1	4.1	4.2	4.4	4.2	3.6	3.2	3.3	2.5	2.4	1.9	1.9
121.02	12.7	16.8	17.2	18.4	16.7	14.5	12.8	13.2	10.0	9.7	7.6	7.8
121.03	15.5	20.6	21.3	22.7	20.6	18.0	16.0	16.2	12.4	12.1	9.6	9.8
121.04	18.1	24.4	25.1	26.7	24.4	21.4	19.1	19.1	14.8	14.5	11.5	11.7
121.05	21.8	30.3	31.3	33.4	31.0	27.7	25.0	24.7	19.4	19.2	15.4	15.7
121.06	45.5	64.5	66.8	71.2	66.7	60.5	54.8	53.5	42.4	42.3	34.4	35.0
121.07	48.1	68.4	71.4	75.9	70.9	65.2	59.3	57.1	45.5	45.6	37.3	38.0
121.08	55.7	81.1	86.1	91.5	85.4	80.5	73.5	69.2	56.0	56.8	47.1	48.0
121.09	56.4	82.5	88.2	93.8	87.3	83.1	75.9	70.7	57.6	58.8	49.0	49.9
121.10	57.0	83.5	90.0	95.8	88.9	85.4	78.1	72.0	59.0	60.7	50.9	51.9
121.11	57.6	84.7	92.3	98.4	91.1	88.3	80.9	73.5	60.7	63.2	53.5	54.5
121.12	58.0	85.5	93.9	100.1	92.9	90.5	83.0	74.7	62.1	65.2	55.5	56.7
121.13	58.4	86.2	95.2	101.7	94.5	92.4	84.8	75.7	63.2	67.0	57.3	58.6
121.14	58.8	86.9	96.5	103.3	96.2	94.2	86.5	76.7	64.5	68.8	59.2	60.4
122.01	3.2	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.5	1.9	2.0
122.02	6.3	8.5	8.7	9.3	8.5	7.3	6.5	6.7	5.0	4.9	3.9	3.9
123.01	1.8	2.8	3.0	3.2	3.1	3.0	2.8	2.9	2.3	2.3	1.9	1.9
124.01	2.9	4.2	4.3	4.5	4.6	4.0	3.6	3.8	2.9	2.9	2.3	2.3
124.02	10.6	14.1	14.5	15.4	14.5	12.7	11.2	11.7	8.9	8.7	6.9	7.0
124.03	13.2	17.9	18.4	19.5	18.5	16.3	14.5	14.9	11.4	11.2	9.0	9.1
124.04	15.7	21.5	22.1	23.4	22.0	19.6	17.5	17.6	13.7	13.5	10.9	11.1
124.05	21.6	30.7	31.7	33.7	31.8	28.8	26.0	25.5	20.2	20.1	16.3	16.6
125.01	3.2	4.2	4.3	4.6	4.3	3.7	3.2	3.4	2.5	2.4	1.9	2.0
126.01	2.8	3.8	3.9	4.0	4.1	3.5	3.1	3.3	2.5	2.4	1.9	1.9
127.01	2.0	3.0	3.1	3.4	3.3	3.1	2.9	2.9	2.3	2.3	1.9	1.9
127.02	4.8	7.4	8.0	8.5	8.4	7.9	7.3	7.4	5.8	5.9	4.9	5.0
127.03	7.0	10.5	11.2	11.8	11.8	11.1	10.3	10.3	8.1	8.2	6.8	6.9
128.01	6.5	8.9	9.1	9.5	9.4	8.2	7.2	7.6	5.7	5.6	4.4	4.5
128.02	7.2	9.9	10.1	10.6	10.7	9.3	8.3	8.8	6.6	6.5	5.2	5.3
128.03	12.0	17.4	17.9	18.8	19.0	17.0	15.4	15.8	12.3	12.2	9.9	10.1
128.04	14.4	21.1	21.9	23.1	23.0	20.8	18.9	19.1	14.9	15.0	12.2	12.5
128.05	16.4	24.2	25.2	26.5	26.2	24.1	21.9	21.8	17.1	17.2	14.2	14.4
128.06	34.8	52.7	56.2	59.9	56.2	53.4	48.8	45.9	37.5	37.9	31.5	32.0
128.07	35.1	53.5	57.1	60.9	57.2	54.6	50.1	46.9	38.3	38.9	32.3	32.9
128.08	35.4	54.2	58.2	62.2	58.3	56.2	51.5	47.9	39.3	40.1	33.4	34.0
128.09	35.9	55.4	60.0	64.2	59.9	58.6	53.7	49.7	41.0	41.9	35.2	35.9
128.10	43.6	68.7	75.9	80.8	76.5	75.9	70.2	66.7	54.2	55.6	46.8	47.7
128.11	43.7	69.0	76.9	82.1	77.4	77.3	71.5	67.4	54.9	56.9	48.2	49.1
128.12	44.5	69.5	78.6	84.2	78.8	79.6	73.6	68.6	56.1	58.9	50.4	51.4
129.01	3.3	5.0	5.2	5.5	5.7	5.0	4.6	4.8	3.7	3.7	3.0	3.0
131.01	3.4	4.5	4.6	5.0	4.5	3.9	3.4	3.5	2.6	2.5	2.0	2.0
131.02	7.7	10.6	10.8	11.5	10.6	9.1	8.1	8.4	6.3	6.1	4.8	4.9
131.03	11.0	15.3	15.6	16.5	15.4	13.4	11.9	12.1	9.3	9.1	7.2	7.3
131.04	13.2	18.9	19.6	20.9	19.1	17.1	15.4	15.1	12.1	11.8	9.5	9.6
131.05	14.5	21.6	22.8	24.4	22.3	20.3	18.4	18.0	14.5	14.3	11.5	11.7
131.06	15.6	23.9	25.4	27.5	24.9	23.1	21.1	20.4	16.7	16.5	13.4	13.6
133.01	5.7	6.3	7.4	6.6	4.9	4.3	3.8	3.9	2.8	2.7	2.1	2.2
133.02	9.4	11.9	13.6	13.7	12.0	10.6	9.4	9.8	7.2	7.0	5.6	5.7
133.03	14.9	18.6	20.4	20.8	17.7	15.8	14.0	14.5	10.9	10.6	8.4	8.6
133.04	18.1	22.8	24.5	25.2	21.6	18.9	16.9	17.3	13.0	12.7	10.1	10.3
134.01	2.9	3.7	3.8	4.1	3.4	2.9	2.6	2.7	1.9	1.8	1.4	1.5
135.01	1.1	1.6	1.7	1.7	1.8	1.5	1.4	1.5	1.1	1.1	0.9	0.9
137.01	4.6	4.8	5.1	4.8	2.8	2.1	1.9	1.9	1.3	1.2	1.0	1.0
139.01	5.4	6.7	7.4	7.9	5.4	4.4	4.0	4.0	2.8	2.7	2.1	2.1
140.01	6.9	8.6	9.4	10.1	6.8	5.6	5.0	5.1	3.5	3.4	2.7	2.7
141.01	3.1	4.2	4.3	4.5	4.3	3.7	3.2	3.4	2.5	2.5	2.0	2.0
141.02	8.9	11.7	12.0	12.8	12.1	10.7	9.7	10.2	7.7	7.6	6.2	6.3
142.01	1.6	2.7	2.9	3.1	3.0	3.0	2.8	2.8	2.2	2.3	1.9	2.0
144.01	2.1	3.2	3.4	3.6	3.6	3.3	3.0	3.1	2.5	2.4	2.0	2.0
144.02	4.3	6.2	6.6	7.1	7.0	6.4	5.9	6.0	4.8	4.7	3.9	4.0
145.01	4.6	5.9	6.0	6.6	5.1	4.5	3.9	4.1	2.9	2.8	2.2	2.2
147.01	4.6	5.9	6.0	6.5	5.3	4.6	4.0	4.2	3.0	2.9	2.3	2.3

Existing Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
147.02	10.6	13.6	13.9	15.1	12.6	11.0	9.7	10.0	7.2	7.0	5.5	5.6
149.01	1.8	2.3	2.3	2.5	2.0	1.7	1.5	1.6	1.1	1.1	0.8	0.9
149.02	2.7	3.4	3.7	3.9	3.1	2.6	2.3	2.4	1.7	1.6	1.3	1.3
151.01	21.0	37.3	49.4	59.3	73.2	76.7	88.0	74.4	70.5	82.5	75.3	81.6
151.02	52.6	93.7	122.1	143.0	168.1	175.6	202.1	174.6	153.9	185.0	169.2	181.1
151.03	111.3	197.7	257.5	299.2	351.3	367.7	421.8	360.6	318.9	382.7	352.6	375.7
151.04	128.6	228.3	299.0	348.2	417.2	438.1	502.8	423.4	384.9	456.6	425.2	448.3
151.05	141.5	249.4	324.9	376.7	455.2	478.0	547.2	459.6	420.8	494.0	467.4	486.0
151.06	287.4	494.5	633.9	736.1	877.7	921.5	1074.5	901.7	835.6	977.2	933.3	970.2
151.07	374.6	632.7	797.0	914.4	1113.8	1173.2	1351.8	1133.1	1060.8	1223.9	1194.7	1211.8
151.08	470.5	787.1	982.8	1133.6	1390.3	1472.4	1680.8	1416.8	1339.0	1533.4	1511.0	1515.2
152.01	25.9	46.7	62.0	74.3	89.3	93.3	106.5	91.2	83.7	99.4	90.0	98.3
153.01	16.2	28.8	39.5	47.4	68.4	72.4	85.3	81.1	74.0	81.6	81.7	82.7
153.02	28.9	51.5	69.1	81.8	106.7	113.1	134.6	122.8	113.2	127.3	123.7	129.0
153.03	99.9	174.7	225.5	260.7	294.5	309.0	358.6	307.7	271.3	328.6	305.5	323.8
153.04	142.3	242.9	308.2	354.6	411.9	433.7	516.1	435.3	402.8	474.1	451.4	473.5
154.01	30.7	55.2	72.4	81.3	90.0	95.0	103.2	92.5	74.0	90.2	83.0	89.4
155.01	25.3	45.1	53.2	58.1	55.2	63.2	62.3	58.7	46.8	50.7	46.4	48.0
156.01	23.3	42.2	55.3	66.3	79.5	83.1	94.6	81.1	74.3	88.2	80.0	87.1
156.02	50.1	89.4	111.5	126.3	140.5	147.8	172.1	150.8	124.3	153.0	140.5	149.9
157.01	16.4	29.1	39.9	47.7	64.8	68.1	79.4	72.3	67.0	75.9	72.5	75.9
157.02	43.8	78.4	104.1	122.4	148.8	156.2	183.6	155.6	146.2	171.4	159.2	169.2
157.03	78.1	135.3	172.5	199.6	225.7	236.4	280.1	237.8	213.2	255.9	237.8	251.0
158.01	29.2	52.6	70.7	84.2	101.8	106.3	121.3	104.1	95.8	113.2	102.8	111.8

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	5.5	13.8	20.2	24.4	30.3	33.1	42.2	36.1	28.2	37.1	33.2	36.2
1.02	10.5	26.3	38.1	46.4	59.3	64.7	82.6	69.3	56.3	74.3	66.2	70.6
1.03	16.6	42.0	61.0	75.2	100.8	110.4	142.3	120.1	108.0	134.0	123.4	131.6
1.04	21.1	53.3	77.4	96.0	131.4	143.8	185.4	157.5	141.5	173.1	162.3	170.8
1.05	23.7	59.9	87.0	107.9	151.3	165.7	213.0	185.2	165.9	198.8	190.8	198.2
1.06	35.6	89.1	129.2	160.0	231.7	255.2	324.5	287.7	261.0	299.7	300.7	300.6
1.07	40.3	97.8	138.8	170.3	246.9	272.8	345.3	306.9	284.8	319.3	326.0	321.4
1.08	47.3	107.5	149.0	181.5	264.8	296.8	368.4	343.9	321.6	344.3	364.8	350.1
1.09	101.5	233.6	321.9	391.9	555.3	621.5	768.0	711.2	664.0	721.4	757.0	735.0
1.10	104.6	240.4	331.5	402.9	570.9	639.2	788.1	732.8	685.4	741.3	782.2	757.4
1.11	108.4	247.5	340.4	412.7	585.3	655.4	806.6	756.2	710.2	760.2	810.4	780.2
1.12	111.6	252.9	347.4	421.1	597.0	668.9	821.2	776.3	729.7	775.2	833.0	797.4
1.13	117.2	262.0	358.9	434.8	616.8	691.0	844.1	814.2	766.0	803.9	879.3	827.8
1.14	117.3	262.0	358.9	434.8	616.9	691.1	844.2	814.5	766.5	804.4	880.2	828.1
1.15	117.3	262.0	358.9	434.8	616.9	691.2	844.2	814.6	766.8	804.8	880.9	828.3
1.16	117.3	262.0	358.9	434.8	616.9	691.2	844.3	814.7	767.0	805.0	881.4	828.4
1.17	117.3	262.0	358.9	434.9	616.9	691.2	844.3	814.8	767.2	805.3	881.8	828.6
1.18	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1658	1782	1708
1.19	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1659	1783	1708
1.20	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1547	1659	1783	1708
1.21	228.6	531.8	739.8	901.8	1289	1442	1741	1647	1547	1660	1785	1709
1.22	228.6	531.8	739.8	901.9	1289	1442	1741	1647	1548	1660	1785	1709
1.23	228.6	531.8	739.8	901.9	1289	1442	1741	1648	1549	1661	1788	1710
1.24	228.7	531.9	739.8	901.9	1290	1443	1741	1648	1551	1663	1790	1711
1.25	228.8	532.1	740.1	902.2	1290	1444	1742	1650	1555	1666	1796	1713
1.26	228.8	532.1	740.1	902.3	1290	1444	1743	1651	1556	1667	1799	1714
1.27	228.8	532.1	740.1	902.3	1290	1444	1743	1651	1557	1668	1800	1714
1.28	228.8	532.1	740.1	902.3	1291	1444	1743	1651	1557	1668	1800	1714
1.29	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.30	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.31	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.32	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1678	1812	1719
1.33	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1678	1812	1719
1.34	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1679	1813	1719
1.35	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1679	1813	1719
1.36	259.0	584.4	807.0	980.7	1416	1603	1901	1897	1808	1854	2085	1915
1.37	259.0	584.4	807.0	980.7	1416	1603	1901	1897	1808	1854	2086	1915
1.38	259.0	584.5	807.0	980.7	1416	1603	1901	1897	1809	1855	2086	1915
1.39	259.0	584.5	807.0	980.7	1416	1604	1901	1897	1809	1856	2087	1915
1.40	259.0	584.5	807.0	980.7	1416	1604	1901	1897	1810	1856	2088	1916
1.41	259.3	584.9	807.5	981.3	1417	1606	1903	1902	1819	1867	2099	1920
1.42	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1819	1868	2100	1921
1.43	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1819	1868	2100	1921
1.44	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1820	1869	2100	1921
1.45	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1820	1869	2100	1921
1.46	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1837	1886	2120	1931
1.47	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1837	1888	2120	1931
1.48	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1838	1889	2121	1931
1.49	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1838	1889	2121	1931
1.50	260.8	587.0	809.9	984.0	1422	1612	1908	1913	1839	1891	2122	1932
1.51	260.9	587.0	810.0	984.1	1422	1612	1908	1914	1843	1900	2126	1935
1.52	260.9	587.1	810.0	984.1	1422	1613	1908	1914	1845	1904	2128	1936
1.53	260.9	587.1	810.0	984.1	1422	1613	1908	1914	1845	1904	2128	1936
1.54	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1905	2128	1936
1.55	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1905	2128	1937
1.56	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1906	2129	1937
1.57	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1846	1908	2129	1937
1.58	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1846	1910	2130	1938
1.59	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1915	2131	1939
1.60	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1916	2132	1939
1.61	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1917	2132	1940
1.62	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1917	2132	1940
1.63	261.8	588.2	811.4	985.8	1426	1619	1914	1932	1882	1953	2173	1959
1.64	262.4	588.8	812.0	986.5	1428	1621	1915	1936	1888	1967	2180	1964
1.65	309.0	669.9	910.3	1103.7	1607	1829	2130	2281	2297	2310	2619	2261

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
2.01	2.9	7.3	10.7	13.6	21.6	23.8	30.3	29.9	26.6	29.6	30.2	30.6
3.01	3.3	8.5	12.5	15.9	25.1	27.7	35.4	34.9	30.9	34.6	35.0	35.7
3.02	7.7	19.6	28.8	36.4	51.8	56.7	73.1	67.8	59.0	70.2	67.8	71.0
3.03	18.8	47.6	69.3	87.2	122.9	134.7	173.0	153.0	136.0	164.1	155.2	163.5
3.04	26.5	64.4	90.9	111.0	149.7	162.7	212.6	185.4	166.2	197.1	189.5	196.5
3.05	32.9	79.0	109.9	133.3	176.3	191.4	250.3	215.7	194.2	229.8	222.9	228.6
3.06	37.6	90.2	125.2	151.1	199.0	217.5	282.4	239.8	218.5	259.0	252.1	255.6
3.07	42.0	100.4	138.4	167.2	220.6	242.6	310.4	260.7	242.8	285.1	280.4	282.0
4.01	4.4	11.1	16.4	21.0	28.2	30.9	39.6	33.3	30.2	37.8	33.5	36.8
5.01	2.7	7.0	10.1	12.9	20.3	22.2	28.5	27.6	24.3	27.8	27.7	28.4
5.02	8.5	21.3	31.2	39.3	61.0	66.9	85.5	82.3	72.1	82.1	82.6	83.8
11.01	9.1	22.8	30.9	35.7	40.2	46.1	55.2	50.5	37.9	44.2	40.1	41.4
11.02	18.4	44.8	58.5	68.0	77.6	88.5	114.1	100.1	76.6	98.4	93.0	99.6
11.03	39.0	96.0	132.0	159.9	198.9	222.6	278.9	228.2	191.3	250.1	233.9	244.0
11.04	43.3	106.1	146.2	176.6	223.9	250.6	309.9	254.1	215.9	279.3	263.8	271.6
11.05	45.4	111.3	153.8	186.2	240.2	268.3	332.8	275.1	238.6	301.2	289.1	295.3
11.06	52.3	128.0	177.1	214.1	284.2	318.4	388.4	332.6	288.6	353.6	347.5	346.8
11.07	56.4	137.5	190.2	229.8	308.5	346.8	419.0	367.3	317.2	382.1	380.6	375.9
11.08	59.7	145.1	200.6	242.4	327.7	370.7	444.2	397.2	342.0	405.6	408.5	400.8
11.09	62.7	151.8	209.8	253.5	344.6	391.9	466.8	425.0	365.2	426.9	434.7	423.6
11.10	66.8	160.8	221.4	267.4	367.0	418.7	494.3	461.8	396.0	454.1	470.0	453.0
11.11	116.5	281.3	393.9	483.6	686.6	774.7	935.6	865.1	788.9	871.4	916.5	888.6
11.12	116.7	281.5	394.1	483.8	687.3	775.9	936.5	867.9	791.8	872.8	919.8	890.4
11.13	116.7	281.5	394.1	483.8	687.4	776.0	936.5	868.2	792.2	873.1	920.4	890.6
12.01	5.8	14.1	17.1	19.5	19.9	23.9	24.8	24.7	19.0	19.4	15.9	16.1
13.01	5.9	14.8	21.4	25.6	31.5	34.5	43.6	38.0	28.2	37.6	34.0	36.7
13.02	10.2	25.5	37.1	45.3	58.9	64.3	82.0	68.4	56.2	74.0	66.5	69.5
14.01	5.7	14.4	20.9	25.1	31.0	33.9	43.0	37.2	28.2	37.4	33.7	36.4
15.01	3.2	8.3	12.1	15.4	22.6	24.8	31.6	28.9	25.6	30.9	28.8	30.7
16.01	3.3	8.7	12.8	16.2	24.8	26.9	34.6	32.7	28.4	34.0	32.6	34.2
16.02	7.2	18.7	27.5	34.5	48.9	53.6	68.9	62.4	55.1	65.8	62.4	65.6
16.03	18.9	48.8	71.8	90.5	131.9	144.7	186.0	174.1	152.5	179.7	176.9	185.2
16.04	21.7	55.9	82.0	103.4	150.8	167.1	213.4	200.2	175.5	204.9	204.1	211.8
16.05	31.8	81.6	118.7	149.8	216.8	240.5	305.5	283.1	251.4	291.3	290.1	299.7
16.06	38.3	98.1	142.2	178.6	260.3	289.3	365.3	339.6	306.0	344.4	351.3	356.3
16.07	43.4	110.4	159.3	199.1	289.8	322.4	406.1	376.5	347.9	380.4	395.8	395.3
16.08	47.2	118.3	169.1	209.4	304.5	338.8	426.2	394.8	370.4	398.7	420.4	415.1
17.01	1.3	3.2	4.6	6.0	10.3	12.4	15.1	18.1	17.8	15.9	21.2	19.3
18.01	3.8	9.8	14.5	18.5	25.3	27.8	35.3	30.1	27.3	34.0	30.3	33.1
19.01	3.4	9.0	13.3	16.8	23.7	26.3	33.3	29.5	26.4	32.4	29.4	31.8
20.01	4.0	10.3	15.3	19.5	26.5	29.2	37.2	31.8	28.7	35.8	31.9	34.8
20.02	6.7	17.0	25.0	31.9	46.2	50.9	64.8	59.0	52.1	62.2	59.1	62.2
21.01	3.2	8.4	12.3	15.7	24.1	26.2	33.8	32.1	27.9	33.1	32.1	33.4
22.01	0.9	1.0	1.3	1.3	1.4	1.3	1.4	1.5	1.1	1.1	0.8	0.8
22.02	1.7	2.6	3.2	3.6	3.8	4.0	4.1	4.3	3.2	3.2	2.6	2.6
22.03	1.8	3.1	3.8	4.3	4.6	5.0	5.3	5.4	4.1	4.2	3.4	3.5
22.04	2.1	3.9	4.7	5.3	5.6	6.2	6.5	6.5	4.9	5.1	4.2	4.3
23.01	0.6	1.0	1.2	1.3	1.4	1.4	1.4	1.5	1.1	1.1	0.9	0.9
25.01	0.4	0.9	1.1	1.2	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
25.02	0.7	1.7	2.1	2.3	2.4	2.6	2.6	2.7	2.1	2.1	1.6	1.7
25.03	2.9	2.7	3.1	3.5	3.6	4.1	4.1	4.3	3.3	3.3	2.6	2.6
27.01	2.3	2.4	2.8	2.5	1.9	1.8	1.6	1.7	1.2	1.1	0.9	0.9
27.02	8.5	8.5	9.2	10.0	6.6	6.1	5.7	5.8	4.0	3.9	3.0	3.0
27.03	9.1	9.9	10.5	11.4	8.3	7.7	7.2	7.4	5.3	5.1	3.9	3.9
27.04	9.8	11.1	11.8	12.7	10.1	9.1	8.5	8.8	6.3	6.1	4.7	4.7
28.01	3.5	3.5	3.8	3.7	2.1	1.9	1.7	1.7	1.2	1.1	0.9	0.9
29.01	0.7	0.7	0.9	0.8	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
30.01	7.5	17.6	21.1	23.1	24.3	27.5	27.9	28.5	21.9	21.8	17.5	17.7
34.01	7.0	15.8	18.8	20.8	21.9	23.3	23.5	24.5	18.6	18.3	14.4	14.5
36.01	4.0	10.0	12.8	14.6	14.5	18.2	19.5	19.1	14.4	15.1	12.7	12.9
40.01	5.9	5.8	6.3	6.1	3.1	2.4	2.2	2.2	1.5	1.5	1.1	1.2
40.02	7.3	6.9	7.3	7.7	4.2	3.3	3.0	3.1	2.1	2.0	1.6	1.6
40.03	4.1	4.1	4.5	4.2	2.4	2.2	2.1	2.2	1.5	1.5	1.2	1.2
40.04	5.5	5.3	5.6	6.3	4.0	3.8	3.9	4.1	3.0	2.9	2.3	2.3
40.05	1.5	1.5	1.8	1.6	1.3	1.2	1.1	1.1	0.8	0.8	0.6	0.6

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
40.06	8.9	8.4	9.8	10.7	8.4	7.9	7.7	8.0	5.7	5.5	4.3	4.3
42.01	0.8	1.3	1.5	1.6	1.6	1.5	1.3	1.3	0.9	0.9	0.6	0.7
43.01	1.9	2.1	2.7	2.4	2.4	2.3	2.1	2.1	1.4	1.4	1.1	1.1
50.01	13.3	33.0	45.9	53.1	59.6	68.1	82.3	75.1	55.5	66.0	59.9	62.3
50.02	17.6	43.8	61.9	73.1	85.3	95.2	119.2	105.1	76.7	99.6	90.6	95.0
50.03	24.8	60.9	84.4	99.9	116.4	130.7	162.0	140.9	106.1	137.9	124.0	128.1
50.04	30.2	74.2	103.4	123.9	149.4	166.5	207.2	174.9	133.3	181.3	162.8	168.8
50.05	41.0	100.7	140.9	171.2	214.5	239.1	294.3	241.6	197.0	264.8	239.7	247.5
50.06	47.0	108.1	149.2	181.0	233.6	259.6	315.9	263.6	222.8	286.2	266.9	271.3
50.07	52.3	116.1	158.8	190.9	251.8	280.6	337.3	291.5	249.0	306.6	294.2	293.7
50.08	57.1	125.3	170.3	204.0	272.6	305.3	362.2	323.1	277.0	330.7	324.1	318.5
50.09	66.1	143.6	192.4	231.4	316.2	354.1	413.9	384.6	331.9	380.9	382.7	371.3
51.01	5.0	12.5	18.4	22.8	28.9	31.5	40.5	33.6	28.7	37.1	32.7	36.0
52.01	4.9	12.3	18.1	22.5	28.8	31.4	40.3	33.2	29.0	37.2	32.8	36.1
54.01	0.3	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.0	1.0	0.8	0.8
56.01	1.2	2.0	2.1	2.4	2.2	2.0	1.8	1.8	1.2	1.1	0.9	0.9
69.01	10.3	25.3	32.8	37.6	37.2	46.8	52.0	49.7	38.1	40.8	35.0	35.6
70.01	1.4	3.4	4.6	5.3	5.5	6.7	7.7	7.2	5.5	6.0	5.3	5.4
76.01	0.6	1.3	1.5	1.6	1.7	1.9	2.0	2.0	1.5	1.5	1.2	1.2
76.02	0.9	2.1	2.5	2.8	2.9	3.3	3.3	3.4	2.6	2.6	2.1	2.1
79.01	3.8	3.7	4.1	4.0	2.0	1.5	1.4	1.4	1.0	0.9	0.7	0.7
79.02	7.0	7.3	7.3	8.5	4.9	3.8	3.4	3.5	2.4	2.3	1.8	1.8
79.03	2.2	2.1	2.3	2.2	1.1	0.9	0.8	0.8	0.6	0.5	0.4	0.4
80.01	10.4	10.8	10.5	11.0	8.1	6.4	5.8	5.9	4.1	3.9	3.1	3.1
80.02	11.3	12.1	11.6	12.2	9.6	8.0	7.4	7.7	5.4	5.2	4.1	4.1
80.04	12.8	13.9	12.9	13.5	11.4	9.5	8.9	9.3	6.5	6.3	4.9	5.0
80.05	20.6	22.9	22.1	23.7	17.4	15.1	14.4	14.9	10.6	10.3	8.1	8.2
81.01	7.0	6.8	7.5	7.2	3.9	3.3	3.1	3.2	2.3	2.2	1.7	1.7
81.02	8.7	8.4	8.8	9.7	5.6	5.0	4.8	5.1	3.6	3.5	2.7	2.8
82.01	1.5	1.6	1.8	1.6	1.4	1.3	1.3	1.4	1.0	1.0	0.8	0.8
82.02	2.4	3.0	3.6	3.8	3.8	3.5	3.4	3.6	2.5	2.4	1.8	1.9
83.01	2.1	2.1	2.4	2.2	1.6	1.4	1.4	1.5	1.1	1.0	0.8	0.8
83.02	21.8	24.6	23.9	25.5	19.9	17.3	16.8	17.4	12.5	12.2	9.7	9.8
83.03	26.7	31.3	30.9	33.1	27.6	24.8	24.5	25.3	18.5	18.1	14.4	14.5
83.04	27.0	32.1	32.0	34.2	28.8	26.2	25.9	26.5	19.4	19.2	15.3	15.5
83.05	27.5	33.3	33.2	35.7	30.0	27.6	27.3	27.4	20.2	20.1	16.1	16.3
83.06	27.9	34.2	34.3	36.9	31.0	28.8	28.5	28.2	20.9	21.0	16.9	17.1
83.08	0.8	0.8	1.0	0.9	0.9	0.9	0.8	0.8	0.6	0.6	0.4	0.4
84.01	2.1	2.2	2.7	2.3	2.0	1.9	1.7	1.7	1.2	1.1	0.9	0.9
84.02	3.7	3.5	3.9	4.4	3.7	3.5	3.2	3.3	2.3	2.2	1.7	1.7
84.03	4.8	4.9	5.2	5.8	5.3	4.9	4.6	4.9	3.5	3.3	2.6	2.6
84.04	5.3	5.6	5.8	6.4	6.1	5.8	5.7	6.0	4.4	4.3	3.4	3.4
85.01	0.3	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.0	1.0	0.8	0.8
85.02	2.3	2.3	2.6	2.4	1.6	1.7	1.8	2.0	1.5	1.5	1.2	1.2
85.03	2.9	3.4	4.0	4.1	3.4	3.1	3.3	3.5	2.5	2.5	2.0	2.0
86.01	1.0	1.0	1.2	1.1	0.7	0.7	0.7	0.8	0.6	0.6	0.5	0.5
87.01	1.9	1.9	2.2	2.0	1.3	1.3	1.2	1.2	0.8	0.8	0.6	0.6
87.02	0.6	0.6	0.8	0.7	0.7	0.7	0.6	0.6	0.4	0.4	0.3	0.3
88.01	4.0	3.9	4.4	4.2	2.5	2.3	2.1	2.1	1.5	1.4	1.1	1.1
88.02	5.2	5.1	5.7	5.4	3.0	2.6	2.5	2.6	1.8	1.7	1.3	1.4
88.03	12.5	12.4	13.7	13.3	8.2	7.8	7.8	8.2	5.8	5.8	4.6	4.6
88.04	13.2	13.7	15.4	15.0	10.3	9.7	9.6	10.0	7.2	7.1	5.6	5.7
89.01	1.5	1.5	1.7	1.6	1.1	1.1	1.0	1.0	0.7	0.7	0.5	0.5
89.02	4.3	4.5	4.9	5.2	3.8	3.6	3.6	3.9	2.8	2.7	2.1	2.1
89.03	5.1	6.2	6.8	7.3	6.0	5.6	5.5	5.8	4.2	4.1	3.1	3.2
90.01	2.1	2.1	2.4	2.2	1.5	1.4	1.4	1.6	1.1	1.1	0.8	0.8
90.02	0.5	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.3	0.3	0.2	0.2
91.01	1.0	1.1	1.5	1.3	1.4	1.3	1.2	1.2	0.8	0.8	0.6	0.6
93.01	2.4	2.4	2.7	2.5	1.8	1.6	1.7	1.8	1.3	1.3	1.0	1.0
94.01	1.9	2.1	2.8	2.5	2.1	1.9	1.7	1.7	1.1	1.1	0.8	0.8
95.01	2.8	2.9	3.4	3.0	2.3	2.1	2.0	2.1	1.5	1.5	1.1	1.1
95.02	3.1	3.4	4.1	3.8	3.0	2.9	2.8	2.9	2.0	2.0	1.5	1.5
96.01	5.7	13.1	15.2	16.9	18.0	19.1	19.2	20.2	15.2	14.9	11.7	11.9
103.01	1.6	1.6	1.8	1.7	1.2	1.1	1.1	1.1	0.8	0.8	0.6	0.6
103.02	4.2	4.2	5.0	4.4	3.5	3.3	3.1	3.2	2.2	2.2	1.7	1.7

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.01	0.6	1.4	1.7	1.9	2.0	2.4	2.5	2.5	1.9	1.9	1.6	1.6
104.02	0.9	2.1	2.6	3.0	3.0	3.7	3.9	3.8	2.9	3.1	2.5	2.6
104.03	1.3	3.2	4.0	4.6	4.6	5.7	6.2	6.0	4.6	4.9	4.1	4.2
104.04	2.1	5.0	6.2	7.0	7.2	8.6	9.2	8.9	6.9	7.2	6.1	6.2
104.05	2.4	5.7	7.0	7.9	8.1	9.7	10.4	10.1	7.7	8.2	6.8	7.0
104.06	3.0	6.9	8.4	9.4	9.7	11.3	12.3	11.8	9.1	9.6	8.1	8.2
104.07	3.5	8.0	9.7	10.8	11.2	13.0	14.1	13.3	10.3	11.1	9.3	9.5
104.08	3.8	8.7	10.5	11.7	12.2	14.1	15.3	14.4	11.2	12.0	10.1	10.3
104.09	5.5	13.0	15.5	17.4	18.0	21.2	22.9	21.8	16.9	17.9	15.2	15.4
104.10	8.1	19.3	23.3	25.8	26.7	31.6	34.3	32.5	25.1	26.9	22.7	23.1
104.11	8.4	20.0	24.1	26.7	27.5	32.6	35.4	33.5	25.9	27.8	23.5	23.9
104.12	8.6	20.3	24.6	27.4	28.1	33.4	36.3	34.1	26.5	28.5	24.1	24.6
104.13	9.4	21.4	26.2	29.1	29.7	35.4	38.5	36.1	28.0	30.4	25.8	26.3
104.14	9.5	21.5	26.2	29.1	29.8	35.4	38.6	36.1	28.1	30.4	25.8	26.4
104.15	14.4	28.2	34.9	39.0	39.9	47.0	51.4	47.8	37.4	40.6	34.7	35.4
104.16	14.6	28.8	35.6	39.8	40.7	48.0	52.5	48.7	38.1	41.5	35.5	36.2
104.17	14.7	29.0	36.0	40.3	41.3	48.7	53.3	49.4	38.6	42.3	36.1	36.8
104.18	14.9	29.3	36.4	40.7	41.7	49.1	53.8	49.8	39.0	42.7	36.5	37.2
104.19	16.1	31.1	39.1	43.7	45.4	52.9	57.8	53.1	41.8	46.5	39.9	40.9
104.20	16.6	31.7	40.1	45.1	47.2	54.4	59.5	54.3	43.0	48.2	41.5	42.5
104.21	16.7	32.0	40.6	45.6	47.8	55.2	60.3	55.0	43.6	49.0	42.2	43.2
104.22	16.8	32.1	40.6	45.8	48.0	55.4	60.5	55.0	43.7	49.2	42.4	43.4
104.23	16.8	32.1	40.7	46.0	48.5	55.7	60.9	55.1	43.9	49.7	42.8	43.7
104.24	17.0	32.3	40.9	46.4	49.2	56.3	61.5	55.4	44.3	50.5	43.4	44.2
104.25	17.1	32.5	41.2	46.8	49.8	56.9	62.1	55.7	44.7	51.2	44.0	44.8
104.26	17.3	32.7	41.4	47.1	50.4	57.4	62.6	56.0	45.1	51.9	44.6	45.4
104.27	26.7	52.8	65.5	74.3	79.8	90.1	98.0	87.4	70.1	80.5	68.9	70.5
104.28	26.8	52.9	65.7	74.5	80.4	90.6	98.5	87.6	70.4	81.2	69.5	71.0
104.29	26.9	53.0	65.8	74.7	81.0	91.1	99.0	87.8	70.8	81.8	70.1	71.5
104.30	26.9	53.1	66.0	75.0	81.6	91.5	99.5	88.0	71.1	82.5	70.6	72.1
104.31	34.1	61.0	78.8	89.8	100.9	110.4	122.2	102.5	84.2	103.3	91.0	93.3
104.32	34.4	61.2	79.0	90.2	101.5	110.9	122.8	102.9	84.6	104.0	91.6	93.9
104.33	34.7	61.2	79.2	90.6	102.9	112.3	124.1	103.3	85.9	105.8	93.4	95.2
104.34	35.6	61.6	79.7	91.7	105.1	114.3	126.2	104.3	87.7	108.5	95.9	97.9
104.35	35.9	61.6	79.9	92.0	105.6	114.8	126.6	104.5	88.1	109.1	96.4	98.5
104.36	36.6	62.2	80.6	93.1	107.3	116.4	128.4	105.8	89.4	111.1	98.3	100.6
104.37	36.9	62.4	80.8	93.4	108.0	117.1	129.0	106.1	90.0	111.8	99.1	101.5
104.38	37.2	62.5	81.0	93.8	108.8	117.9	129.8	106.4	90.9	112.7	100.1	102.4
104.39	37.3	62.5	81.1	93.9	109.0	118.0	130.0	106.5	91.1	112.9	100.4	102.6
104.40	37.5	62.6	81.2	94.2	110.4	119.4	131.2	107.1	93.1	114.1	102.1	104.1
104.41	37.7	62.6	81.3	94.4	111.0	120.1	131.7	107.4	94.0	114.9	102.9	104.8
104.42	37.9	62.7	81.5	94.6	111.5	120.5	132.1	107.7	94.6	115.4	103.5	105.3
104.43	38.1	62.8	81.5	94.8	111.9	120.9	132.4	108.0	95.2	115.8	104.0	105.7
104.44	38.1	62.8	81.6	94.9	112.4	121.6	132.8	108.4	96.3	116.3	104.9	106.2
105.01	0.3	0.7	0.9	1.0	1.0	1.3	1.3	1.3	1.0	1.0	0.9	0.9
106.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
107.01	0.3	0.7	0.8	0.9	0.9	1.1	1.2	1.2	0.9	0.9	0.8	0.8
107.02	3.1	3.1	3.7	3.3	3.4	3.2	3.3	3.7	2.7	2.7	2.2	2.2
107.03	4.1	4.1	4.7	4.7	4.6	4.4	4.6	5.1	3.7	3.7	3.0	3.0
107.04	4.4	4.5	5.1	5.2	5.3	5.4	5.6	6.0	4.5	4.5	3.6	3.7
107.05	4.6	4.9	5.5	5.7	5.9	6.0	6.2	6.5	4.9	4.9	4.0	4.1
108.01	0.4	1.1	1.2	1.4	1.4	1.6	1.6	1.7	1.3	1.3	1.0	1.0
108.02	0.7	1.8	2.2	2.5	2.6	3.0	3.1	3.1	2.3	2.4	2.0	2.0
108.03	1.3	3.0	3.6	4.0	4.1	4.7	4.9	4.8	3.7	3.8	3.1	3.2
109.01	0.3	0.8	1.0	1.1	1.1	1.3	1.3	1.3	1.0	1.0	0.8	0.8
109.02	0.7	1.6	2.0	2.2	2.3	2.5	2.5	2.6	2.0	2.0	1.6	1.6
110.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
111.01	0.3	0.7	0.8	0.9	1.0	1.2	1.2	1.2	0.9	1.0	0.8	0.8
111.02	0.6	1.2	1.4	1.5	1.7	1.8	1.9	2.0	1.5	1.5	1.2	1.2
112.01	1.0	1.1	1.3	1.1	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
112.02	5.8	6.0	6.8	7.0	5.9	5.6	5.8	6.3	4.6	4.5	3.5	3.6
112.03	8.0	9.1	9.8	10.4	9.7	9.7	10.0	10.7	8.0	7.8	6.2	6.3
112.04	8.7	10.1	10.7	11.4	10.8	11.0	11.3	11.7	8.9	8.8	7.0	7.1
113.01	2.3	2.4	2.9	2.5	2.0	1.9	1.8	1.8	1.2	1.2	0.9	0.9
114.01	1.3	1.3	1.5	1.3	1.1	1.0	1.0	1.0	0.7	0.7	0.6	0.6

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
115.01	0.7	1.0	1.2	1.3	1.5	1.4	1.4	1.5	1.1	1.0	0.8	0.8
116.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
117.01	2.3	2.3	2.6	2.4	1.8	1.6	1.6	1.6	1.2	1.1	0.9	0.9
117.02	4.7	4.1	4.6	4.9	3.6	3.3	3.5	3.7	2.7	2.6	2.1	2.1
117.03	4.8	4.4	4.9	5.3	4.3	4.0	4.2	4.4	3.3	3.2	2.5	2.5
118.01	0.3	0.8	1.0	1.1	1.2	1.4	1.5	1.5	1.1	1.1	0.9	1.0
119.01	2.4	2.4	2.8	2.6	1.8	1.7	1.6	1.6	1.1	1.1	0.8	0.9
120.01	1.0	0.9	1.1	1.0	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
121.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.0	1.0	0.8	0.8
121.02	1.8	3.9	4.4	4.8	5.3	5.3	5.3	5.5	4.1	4.1	3.2	3.2
121.03	2.4	5.0	5.5	6.0	6.7	6.6	6.7	6.8	5.1	5.1	4.0	4.0
121.04	2.7	5.8	6.5	7.1	7.9	7.9	8.0	8.0	6.1	6.0	4.8	4.8
121.05	3.2	7.0	8.0	8.8	9.6	10.1	10.3	10.1	7.8	7.9	6.3	6.4
121.06	6.4	14.5	17.0	18.8	20.1	21.8	22.6	21.8	16.9	17.3	14.1	14.3
121.07	6.8	15.4	18.2	20.2	21.5	23.4	24.3	23.3	18.1	18.7	15.3	15.5
121.08	8.1	18.3	22.0	24.4	25.8	28.7	30.1	28.1	22.1	23.2	19.2	19.6
121.09	8.3	18.7	22.6	25.1	26.5	29.5	31.1	28.8	22.7	24.1	20.0	20.3
121.10	8.6	19.0	23.1	25.7	27.2	30.3	32.0	29.4	23.2	24.8	20.7	21.1
121.11	8.8	19.4	23.7	26.4	28.1	31.3	33.1	30.2	23.9	25.9	21.7	22.1
121.12	9.1	19.7	24.2	27.0	28.9	32.1	34.0	30.7	24.4	26.7	22.5	22.9
121.13	9.2	19.9	24.5	27.5	29.5	32.8	34.8	31.1	24.9	27.5	23.2	23.7
121.14	9.4	20.2	24.9	28.0	30.2	33.5	35.5	31.5	25.3	28.2	23.9	24.4
122.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
122.02	0.9	2.0	2.2	2.5	2.7	2.7	2.7	2.8	2.1	2.1	1.6	1.6
123.01	0.2	0.6	0.7	0.8	0.8	1.0	1.2	1.1	0.8	0.9	0.8	0.8
124.01	0.4	0.9	1.1	1.2	1.3	1.5	1.5	1.5	1.2	1.2	0.9	1.0
124.02	1.4	3.2	3.7	4.1	4.5	4.5	4.6	4.8	3.6	3.6	2.8	2.9
124.03	1.8	4.0	4.7	5.2	5.6	5.9	6.0	6.1	4.6	4.6	3.7	3.7
124.04	2.1	4.8	5.7	6.2	6.8	7.1	7.2	7.3	5.5	5.6	4.5	4.5
124.05	2.9	6.8	8.1	9.0	9.5	10.4	10.7	10.4	8.1	8.2	6.7	6.8
125.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
126.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
127.01	0.2	0.6	0.8	0.9	0.9	1.1	1.2	1.1	0.9	0.9	0.8	0.8
127.02	0.6	1.5	1.9	2.2	2.2	2.7	3.0	2.9	2.2	2.3	2.0	2.0
127.03	0.8	2.2	2.7	3.1	3.1	3.9	4.2	4.0	3.1	3.3	2.8	2.8
128.01	5.4	5.4	6.4	5.7	4.2	4.0	3.7	3.8	2.7	2.6	2.0	2.0
128.02	6.1	6.0	6.8	6.4	4.6	4.4	4.2	4.4	3.1	3.0	2.3	2.3
128.03	10.2	9.9	10.8	11.1	7.8	7.3	7.4	7.9	5.7	5.6	4.4	4.4
128.04	10.5	10.5	11.4	11.8	8.6	8.2	8.7	9.1	6.7	6.7	5.4	5.4
128.05	11.0	11.1	12.1	12.4	9.6	9.3	9.9	10.1	7.5	7.6	6.2	6.2
128.06	17.6	22.5	23.3	24.0	21.2	21.5	22.2	22.0	16.8	16.9	13.7	13.8
128.07	17.7	22.9	23.8	24.5	21.6	22.1	22.8	22.4	17.2	17.3	14.0	14.2
128.08	18.0	23.5	24.5	25.3	22.2	22.9	23.6	23.0	17.7	17.8	14.5	14.7
128.09	18.2	24.2	25.3	26.2	23.0	24.0	24.8	23.9	18.4	18.7	15.2	15.5
128.10	21.0	30.1	31.6	32.8	30.6	31.6	32.4	31.4	24.2	24.8	20.3	20.6
128.11	21.2	30.5	32.2	33.4	31.1	32.2	33.0	31.9	24.7	25.4	20.9	21.2
128.12	21.5	31.1	33.1	34.4	31.9	33.2	34.2	32.5	25.3	26.3	21.9	22.2
129.01	3.9	3.9	4.3	4.0	2.5	2.4	2.3	2.5	1.8	1.7	1.3	1.3
131.01	2.6	2.7	3.1	2.8	2.0	1.9	1.7	1.8	1.2	1.2	0.9	0.9
131.02	5.4	4.6	5.2	5.8	4.6	4.3	4.0	4.1	2.9	2.8	2.1	2.2
131.03	6.4	6.8	6.7	7.5	6.4	5.9	5.8	6.1	4.3	4.2	3.2	3.2
131.04	7.1	7.8	7.7	8.5	7.8	7.3	7.2	7.5	5.5	5.4	4.2	4.2
131.05	7.8	9.0	8.8	9.7	9.0	8.7	8.6	8.9	6.7	6.5	5.0	5.1
131.06	8.2	10.0	9.8	10.9	10.1	10.0	9.9	10.1	7.6	7.4	5.8	5.9
133.01	4.4	4.1	4.5	4.3	2.4	2.0	1.8	1.9	1.3	1.2	1.0	1.0
133.02	7.1	7.2	7.8	8.0	4.8	4.3	4.3	4.5	3.2	3.1	2.5	2.5
133.03	8.4	9.1	9.4	10.4	6.9	6.4	6.4	6.8	4.9	4.7	3.7	3.8
133.04	9.0	10.1	10.5	11.4	8.4	7.6	7.6	7.9	5.8	5.7	4.5	4.5
134.01	2.3	2.2	2.4	2.3	1.3	1.1	1.1	1.2	0.8	0.8	0.7	0.7
135.01	1.6	1.5	1.7	1.6	0.9	0.8	0.8	0.8	0.5	0.5	0.4	0.4
137.01	1.6	1.5	1.8	1.6	1.2	1.0	0.9	0.9	0.6	0.6	0.4	0.4
139.01	3.3	3.3	3.6	3.4	2.0	1.9	1.8	1.8	1.3	1.2	1.0	1.0
140.01	4.1	4.1	4.9	4.4	3.0	2.6	2.4	2.4	1.6	1.6	1.2	1.2
141.01	2.3	2.3	2.8	2.5	1.9	1.8	1.6	1.7	1.2	1.1	0.9	0.9
141.02	5.0	5.7	6.4	6.6	5.2	4.9	4.7	5.0	3.6	3.5	2.7	2.7

Developed Condition Discharges - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
142.01	2.0	2.0	2.3	2.1	1.3	1.3	1.3	1.5	1.1	1.1	0.8	0.9
144.01	0.3	0.7	0.8	0.9	0.9	1.2	1.3	1.2	0.9	1.0	0.8	0.8
144.02	0.5	1.3	1.6	1.8	1.8	2.3	2.4	2.4	1.8	1.9	1.6	1.6
145.01	1.1	1.5	1.7	1.7	2.1	1.8	1.7	1.8	1.3	1.2	0.9	0.9
147.01	2.8	2.9	3.6	3.1	2.5	2.2	2.0	2.0	1.4	1.3	1.0	1.0
147.02	4.8	5.0	6.2	5.5	5.4	5.0	4.6	4.7	3.3	3.1	2.4	2.4
149.01	0.9	1.0	1.2	1.0	0.8	0.8	0.7	0.7	0.5	0.5	0.4	0.4
149.02	1.1	1.3	1.6	1.5	1.3	1.2	1.1	1.1	0.8	0.7	0.6	0.6
151.01	2.6	6.6	9.6	12.1	19.6	21.6	27.4	27.2	24.2	26.7	27.4	27.7
151.02	6.5	16.6	24.4	30.9	46.0	50.6	64.7	61.0	53.3	62.2	61.3	63.1
151.03	13.8	35.2	51.7	65.3	96.4	105.7	135.5	127.2	111.0	130.5	127.7	131.9
151.04	16.0	40.7	59.8	75.4	113.2	125.0	159.4	152.7	133.7	153.4	153.9	156.8
151.05	17.7	44.7	65.6	82.6	123.3	136.9	174.0	166.3	146.6	166.9	168.7	171.2
151.06	37.1	91.8	132.5	164.5	238.5	263.9	338.8	323.0	286.8	323.0	331.6	339.4
151.07	49.4	121.5	173.7	213.9	305.7	339.7	435.1	407.9	371.0	408.9	426.2	429.3
151.08	63.9	156.3	221.0	270.6	387.0	429.7	547.5	511.3	472.0	512.4	541.1	538.8
152.01	3.2	8.3	12.1	15.4	24.0	26.2	33.7	32.7	28.7	33.0	32.7	33.7
153.01	2.1	5.2	7.6	9.5	16.3	19.3	23.4	26.6	25.2	22.5	27.9	26.5
153.02	3.7	9.1	13.3	16.9	27.4	31.3	39.0	41.7	38.6	38.0	43.5	42.7
153.03	12.6	31.5	45.9	57.8	81.6	89.6	116.0	106.1	93.8	110.9	108.3	114.7
153.04	18.1	45.0	64.8	79.8	113.0	123.9	161.4	152.8	137.2	153.3	158.0	164.1
154.01	3.8	9.7	14.5	18.4	25.1	27.5	35.0	29.7	27.0	33.6	30.0	32.7
155.01	3.1	8.1	11.6	13.7	16.6	18.4	23.0	20.4	14.5	19.4	17.7	18.9
156.01	2.9	7.4	10.8	13.7	21.4	23.4	30.1	29.0	25.5	29.4	29.1	29.9
156.02	6.2	16.0	23.1	28.5	39.2	43.2	55.9	50.0	44.2	53.3	50.4	53.5
157.01	2.1	5.2	7.7	9.6	16.1	18.8	23.0	25.0	23.2	22.3	25.8	24.9
157.02	5.5	14.0	20.5	25.9	40.0	44.3	56.6	56.2	50.8	54.6	57.5	57.8
157.03	9.8	24.9	36.0	44.9	63.1	69.0	89.8	83.8	74.3	85.6	85.1	88.6
158.01	3.6	9.3	13.8	17.6	27.2	29.8	38.6	37.6	32.8	37.8	37.4	38.7

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	43.7	77.0	94.6	103.9	103.7	114.6	116.9	108.9	86.8	96.7	89.7	93.6
1.02	83.3	144.7	179.9	200.5	204.7	223.9	228.0	208.2	167.8	194.1	177.5	186.8
1.03	132.6	233.6	294.4	331.2	359.3	382.5	426.4	377.5	302.5	373.8	344.0	365.0
1.04	168.4	295.3	373.7	426.1	469.3	498.9	550.8	479.4	391.1	488.1	449.6	472.1
1.05	189.4	331.4	421.4	483.1	544.1	577.8	639.3	546.5	456.2	568.8	529.0	549.6
1.06	280.0	481.8	608.8	705.9	829.7	888.6	966.4	799.2	719.8	872.9	823.9	836.6
1.07	299.2	504.1	634.0	732.9	882.9	945.8	1023.1	868.6	785.0	926.9	891.9	895.1
1.08	315.3	521.5	654.6	757.5	952.8	1027.6	1088.1	989.9	896.9	996.7	999.6	975.5
1.09	648.0	1050.5	1325	1543	1948	2061	2237	1967	1844	2058	2047	2031
1.10	663.5	1072.0	1352	1574	1997	2117	2290	2035	1907	2112	2113	2089
1.11	675.3	1087.0	1370	1596	2042	2171	2338	2111	1984	2164	2188	2148
1.12	684.4	1098.3	1383	1612	2075	2214	2378	2171	2048	2205	2248	2196
1.13	697.9	1114.8	1403	1634	2125	2282	2442	2280	2185	2284	2371	2282
1.14	697.9	1114.8	1403	1634	2125	2283	2443	2281	2188	2285	2374	2283
1.15	697.9	1114.8	1403	1634	2125	2283	2443	2282	2189	2287	2376	2284
1.16	697.9	1114.8	1403	1634	2125	2283	2443	2283	2191	2288	2377	2285
1.17	697.9	1114.8	1403	1634	2125	2283	2444	2284	2192	2288	2378	2285
1.18	1478	2398	3014	3478	4371	4673	5067	4618	4369	4701	4822	4694
1.19	1478	2398	3014	3478	4371	4674	5067	4618	4369	4702	4823	4695
1.20	1478	2398	3014	3478	4371	4674	5067	4618	4370	4703	4824	4695
1.21	1478	2398	3014	3478	4372	4675	5068	4621	4374	4705	4828	4697
1.22	1478	2398	3014	3478	4372	4675	5069	4622	4375	4706	4830	4698
1.23	1478	2398	3014	3478	4372	4677	5070	4625	4380	4710	4836	4701
1.24	1478	2398	3014	3478	4373	4678	5072	4629	4387	4715	4843	4705
1.25	1478	2399	3014	3478	4375	4683	5076	4640	4402	4725	4860	4713
1.26	1478	2399	3014	3479	4375	4684	5078	4643	4406	4729	4866	4716
1.27	1478	2399	3014	3479	4376	4684	5078	4644	4408	4731	4869	4717
1.28	1478	2399	3014	3479	4376	4684	5078	4645	4409	4732	4870	4718
1.29	1478	2399	3014	3479	4376	4685	5079	4647	4413	4734	4874	4720
1.30	1478	2399	3014	3479	4376	4685	5080	4648	4413	4735	4875	4720
1.31	1478	2399	3014	3479	4376	4685	5080	4648	4413	4735	4875	4720
1.32	1478	2399	3015	3479	4379	4692	5087	4666	4443	4760	4915	4737
1.33	1478	2399	3015	3479	4379	4692	5087	4667	4444	4762	4917	4738
1.34	1478	2399	3015	3479	4379	4692	5087	4667	4445	4762	4918	4738
1.35	1478	2399	3015	3479	4379	4692	5087	4667	4446	4763	4919	4739
1.36	1574	2533	3179	3675	4796	5190	5548	5389	5191	5257	5651	5279
1.37	1574	2533	3179	3675	4796	5191	5549	5390	5193	5258	5653	5280
1.38	1574	2533	3179	3675	4796	5191	5549	5390	5194	5259	5654	5280
1.39	1574	2533	3179	3675	4796	5191	5550	5392	5197	5262	5658	5282
1.40	1574	2533	3179	3675	4796	5191	5550	5392	5199	5264	5660	5283
1.41	1574	2534	3180	3676	4799	5200	5559	5412	5236	5295	5700	5302
1.42	1574	2534	3180	3676	4800	5200	5559	5413	5239	5297	5703	5303
1.43	1574	2534	3180	3676	4800	5200	5559	5413	5239	5298	5704	5303
1.44	1574	2534	3180	3676	4800	5200	5559	5414	5240	5299	5705	5304
1.45	1574	2534	3180	3676	4800	5200	5559	5414	5240	5300	5705	5304
1.46	1577	2537	3184	3680	4810	5218	5577	5450	5303	5352	5766	5338
1.47	1577	2537	3184	3680	4810	5218	5577	5450	5305	5355	5767	5339
1.48	1577	2537	3184	3680	4810	5219	5578	5451	5307	5358	5770	5341
1.49	1577	2537	3184	3680	4810	5219	5578	5451	5309	5360	5771	5341
1.50	1577	2537	3184	3680	4811	5219	5578	5452	5312	5364	5773	5343
1.51	1577	2537	3184	3681	4811	5220	5580	5457	5329	5387	5791	5353
1.52	1577	2537	3184	3681	4811	5221	5581	5459	5336	5399	5797	5358
1.53	1577	2537	3184	3681	4811	5221	5581	5459	5337	5400	5797	5359
1.54	1577	2537	3184	3681	4811	5221	5581	5459	5338	5402	5798	5359
1.55	1577	2537	3184	3681	4811	5221	5581	5459	5339	5403	5799	5360
1.56	1577	2537	3184	3681	4811	5221	5581	5460	5340	5406	5800	5361
1.57	1577	2537	3184	3681	4811	5221	5582	5460	5344	5413	5803	5364
1.58	1577	2538	3184	3681	4811	5221	5582	5461	5347	5417	5805	5366
1.59	1577	2538	3184	3681	4812	5222	5583	5462	5357	5434	5812	5373
1.60	1577	2538	3184	3681	4812	5222	5583	5462	5358	5435	5812	5373
1.61	1577	2538	3184	3681	4812	5222	5583	5462	5360	5439	5814	5375
1.62	1577	2538	3184	3681	4812	5222	5583	5463	5360	5439	5814	5375
1.63	1579	2539	3186	3683	4823	5253	5614	5537	5494	5542	5938	5443
1.64	1579	2540	3187	3684	4826	5257	5619	5546	5524	5586	5965	5464
1.65	1731	2741	3422	3949	5290	5864	6216	6561	6778	6542	7167	6336
2.01	23.1	41.8	54.9	66.2	81.2	84.8	97.2	82.3	77.6	91.1	83.0	90.0

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
3.01	26.8	48.1	64.1	76.9	94.4	98.7	112.9	96.2	89.9	105.7	96.2	104.5
3.02	61.9	110.0	141.4	164.7	187.3	196.2	227.2	198.0	168.7	205.6	188.2	201.4
3.03	149.8	262.8	340.0	391.5	440.7	464.0	518.1	446.9	375.7	467.6	428.5	452.8
3.04	196.5	327.4	404.8	460.9	526.5	556.2	627.4	536.3	455.6	561.8	521.4	543.8
3.05	234.3	383.3	469.8	533.9	605.2	644.7	725.0	610.2	530.1	653.0	609.1	627.6
3.06	264.4	427.8	525.2	599.5	673.6	719.9	805.9	671.6	593.1	732.6	683.6	704.3
3.07	290.4	466.5	570.6	654.0	738.5	791.9	880.9	731.5	659.6	800.0	755.2	772.2
4.01	35.3	62.7	82.1	92.4	101.3	107.0	115.4	104.3	83.2	100.6	92.9	99.9
5.01	22.1	39.9	52.3	62.5	75.4	78.9	90.0	77.0	71.0	84.1	76.3	83.0
5.02	67.3	120.4	158.3	186.7	225.8	235.8	269.4	230.6	208.6	248.6	227.2	243.5
11.01	70.8	120.6	134.3	144.7	140.1	151.8	144.0	140.0	110.4	115.2	100.9	103.0
11.02	142.1	223.7	256.2	276.5	272.0	300.2	331.4	305.9	239.8	280.2	257.5	270.5
11.03	300.4	491.0	595.7	664.9	703.0	747.6	786.1	667.5	564.3	694.0	634.9	653.2
11.04	328.2	534.7	650.5	729.4	787.2	831.8	872.2	729.3	633.6	771.7	713.2	728.9
11.05	344.5	563.4	688.4	775.9	850.9	900.3	948.4	793.1	697.1	841.5	785.6	799.2
11.06	390.5	633.0	779.1	884.4	1003.9	1056.7	1100.5	933.2	842.1	984.0	938.5	943.2
11.07	415.0	669.5	825.2	939.7	1087.6	1141.7	1180.9	1019.6	925.6	1064.0	1024.2	1022.5
11.08	433.4	697.2	858.9	981.0	1155.4	1211.5	1242.8	1094.2	996.9	1127.1	1098.5	1086.7
11.09	449.3	721.7	888.4	1016.6	1215.1	1276.0	1298.4	1164.5	1063.1	1184.2	1168.2	1148.1
11.10	468.9	749.5	921.9	1058.1	1287.2	1358.9	1367	1259.3	1152.5	1255.7	1260.2	1228.4
11.11	814.1	1333.9	1692.8	1952.8	2432	2584	2683	2431	2226	2468	2495	2438
11.12	814.3	1334.1	1693.1	1953.2	2435	2590	2687	2443	2236	2473	2505	2444
11.13	814.3	1334.1	1693.1	1953.2	2436	2591	2688	2445	2238	2474	2506	2445
12.01	45.7	67.1	69.3	73.3	75	66	60	63	49	48	39	39
13.01	46.6	82	100	109	106	119	120	112	89	98	91	94
13.02	80.7	141	175	198	204	223	228	206	167	196	179	187
14.01	45.2	80	97	107	105	117	119	111	88	98	90	94
15.01	25.9	46.7	61.6	72.2	82.7	86.2	96.7	84.7	71.8	87.8	79.5	86.8
16.01	27.2	49.0	65.2	77.3	90.9	94.9	107.5	93.3	82.7	99.5	89.9	98.4
16.02	58.6	104.9	134.5	156.0	176.5	184.9	210.6	184.1	153.3	189.2	172.8	184.5
16.03	153.5	275.0	358.0	416.3	483.7	506.3	583.8	499.7	444.4	534.7	497.1	532.9
16.04	176.1	312.8	407.3	470.5	556.1	583.0	667.3	564.8	509.5	606.3	573.0	604.4
16.05	256.4	449.6	580.9	668.9	792.6	832.1	944.3	797.9	716.2	851.2	810.4	843.6
16.06	307.0	535.2	682.5	784.0	947.1	998.3	1125.8	943.4	858.3	1008.3	976.9	995.5
16.07	341.7	591.9	745.5	853.6	1050.3	1113.6	1244.4	1066.6	966.3	1117.5	1101.0	1101.0
16.08	359.9	617.2	771.7	881.9	1099.0	1171.5	1298.6	1138.1	1028.7	1171.3	1169.7	1153.6
17.01	10.1	18.3	24.3	29.5	46.7	51.8	60.2	62.6	60.6	58.2	65.2	62.9
18.01	30.9	55.5	72.9	81.9	90.9	95.9	104	93.5	74.7	91.3	83.9	90.5
19.01	28.2	50.8	67.1	76.8	86.7	90	100	89	72	89	81	88
20.01	32.5	58.1	76.4	86.2	96	101	110	99	78	96	88	95
20.02	54.0	96.3	126.4	146.3	169.1	176.9	198.2	173.6	145.2	179.1	163.7	173.8
21.01	26.4	47.4	63.0	75.1	88.8	92.7	105.3	90.9	81.5	97.7	88.3	96.5
22.01	3.2	4.1	4.7	4.6	4.3	3.8	3.3	3.5	2.5	2.5	2.0	2.0
22.02	9.0	12.0	12.2	12.7	12.7	11.3	9.9	10.3	7.9	7.7	6.1	6.3
22.03	10.7	14.6	15.0	15.6	15.9	14.3	12.8	13.3	10.3	10.2	8.3	8.5
22.04	12.8	17.9	18.5	19.2	19.2	17.5	15.8	16.0	12.5	12.5	10.2	10.4
23.01	3.4	4.3	4.4	4.7	4.5	3.9	3.4	3.7	2.7	2.6	2.1	2.1
25.01	3.0	4.0	4.1	4.3	4.2	3.6	3.2	3.4	2.5	2.5	2.0	2.0
25.02	5.7	8.0	8.1	8.4	8.3	7.1	6.4	6.7	5.1	5.0	3.9	4.0
25.03	8.4	11.6	11.9	12.7	12.7	10.9	9.8	10.4	8.0	7.8	6.2	6.3
27.01	6.0	6.8	7.9	7.1	5.0	4.1	3.7	3.7	2.6	2.5	2.0	2.0
27.02	20.7	24.2	25.9	27.5	17.3	14.2	12.7	12.9	9.0	8.7	6.9	7.0
27.03	25.0	29.5	30.7	32.8	22.0	18.3	16.2	16.7	11.8	11.4	9.0	9.2
27.04	29.0	34.1	35.0	37.5	26.4	21.8	19.5	19.9	14.2	13.8	10.9	11.1
28.01	8.0	8.5	9.7	8.9	5.3	4.1	3.7	3.7	2.6	2.5	2.0	2.0
29.01	2.0	2.3	2.5	2.3	1.4	1.0	0.9	0.9	0.6	0.6	0.5	0.5
30.01	57.5	81.1	82.6	86.1	87.7	75.7	67.5	71.3	54.3	53.1	42.4	43.1
34.01	53.0	71.7	73.3	76.5	75.2	64.7	56.9	60.2	45.2	44.1	34.8	35.5
36.01	32.2	49.5	52.4	55.9	56.1	51.2	47.2	48.7	38.2	38.0	31.1	31.6
40.01	12.3	12.7	13.8	13.4	7.0	5.2	4.7	4.8	3.3	3.2	2.6	2.6
40.02	15.3	15.5	16.6	17.2	9.5	7.3	6.5	6.6	4.6	4.4	3.5	3.6
40.03	9.2	9.6	10.9	10.1	6.5	5.4	4.8	4.9	3.5	3.4	2.7	2.7
40.04	12.5	14.4	15.6	16.7	11.6	10.2	9.0	9.4	6.8	6.6	5.2	5.3
40.05	4.0	4.5	5.4	4.8	3.4	2.8	2.5	2.5	1.8	1.7	1.4	1.4
40.06	24.2	27.8	30.5	33.2	23.2	19.9	17.7	18.2	13.0	12.6	10.0	10.1
42.01	4.1	5.1	6.3	6.2	4.1	3.2	2.9	2.9	2.0	2.0	1.5	1.6

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
43.01	6.3	7.6	9.5	9.1	6.4	5.2	4.7	4.7	3.3	3.2	2.5	2.5
50.01	104.4	178.0	199.3	215.6	207.9	226.4	215.5	209.0	164.9	172.8	151.8	155.3
50.02	138.7	238.4	277.4	301.7	288.6	325.9	321.1	302.8	241.3	263.5	236.1	245.3
50.03	191.8	310.2	367.3	401.3	397.9	432.7	425.1	393.2	319.2	361.9	322.1	334.9
50.04	233.4	378.5	456.1	508.2	516.0	554.5	550.0	489.2	406.3	478.2	426.0	442.4
50.05	314.7	511.9	624.1	709.3	750.0	792.5	791.3	677.6	577.9	701.8	633.6	658.8
50.06	328.5	528.3	645.1	736.4	815.0	856.1	849.5	718.3	645.6	758.6	704.6	714.5
50.07	342.4	545.1	667.4	761.9	876.4	916.7	906.7	782.0	717.1	811.7	774.6	775.3
50.08	360.5	568.5	697.8	793.0	945.1	982.8	968.5	857.8	791.7	877.9	850.1	841.0
50.09	395.6	614.8	757.9	868.0	1079.7	1114.1	1093.9	1006.5	936.3	1017.3	999.8	994.5
51.01	40.0	70.4	88.2	97.7	101.6	109.6	114.7	105.6	84.3	96.6	89.9	94.8
52.01	39.3	69.4	87.4	97.1	101.7	109.2	114.7	105.4	84.1	97.1	90.3	95.5
54.01	2.6	3.6	3.7	3.8	3.9	3.4	3.0	3.2	2.4	2.4	1.9	1.9
56.01	6.0	7.6	8.6	8.8	5.7	4.4	4.0	4.0	2.8	2.7	2.1	2.1
69.01	79.9	126.5	136.5	146.2	144.6	137.5	128.5	130.4	102.5	103.2	85.9	87.5
70.01	11.2	18.2	19.9	21.2	20.9	20.5	19.3	19.4	15.2	15.4	13.0	13.3
76.01	4.1	5.8	5.9	6.2	6.2	5.4	4.7	5.0	3.8	3.7	2.9	3.0
76.02	6.8	9.7	9.9	10.4	10.3	9.0	8.0	8.3	6.4	6.3	5.0	5.1
79.01	7.9	8.2	8.9	8.6	4.4	3.3	3.0	3.0	2.1	2.0	1.6	1.6
79.02	16.8	16.5	16.5	18.9	10.8	8.2	7.3	7.4	5.2	5.0	4.0	4.0
79.03	4.5	4.6	5.0	4.8	2.5	1.9	1.7	1.7	1.2	1.2	0.9	1.0
80.01	23.3	26.6	24.6	24.5	18.2	14.0	12.5	12.7	8.8	8.6	6.8	6.9
80.02	26.3	31.0	29.5	29.9	22.9	18.5	16.5	16.9	11.9	11.6	9.2	9.3
80.04	30.6	35.6	33.1	34.1	26.9	22.2	19.8	20.3	14.4	14.0	11.1	11.3
80.05	47.8	55.1	56.6	59.3	42.9	36.0	32.2	33.0	23.7	23.0	18.3	18.6
81.01	15.0	15.6	17.4	16.3	9.8	7.8	7.0	7.1	5.0	4.9	3.9	3.9
81.02	18.7	20.4	21.6	23.3	14.8	12.4	11.0	11.4	8.1	7.9	6.3	6.4
82.01	4.0	4.6	5.5	4.9	4.0	3.6	3.2	3.3	2.4	2.3	1.8	1.9
82.02	9.7	12.4	13.6	14.4	10.3	8.9	7.9	8.1	5.7	5.6	4.4	4.5
83.01	5.1	5.6	6.6	5.9	4.3	3.7	3.3	3.4	2.4	2.3	1.8	1.9
83.02	53.7	62.2	63.6	66.5	50.6	42.5	38.0	38.9	28.4	27.7	22.1	22.5
83.03	73.3	87.3	89.5	93.9	74.3	63.0	56.2	57.5	42.4	41.5	33.2	33.8
83.04	75.8	91.2	93.6	98.3	78.0	66.7	59.7	60.3	44.9	44.1	35.4	36.0
83.05	77.6	94.2	96.6	101.8	80.7	69.9	62.8	62.3	47.0	46.4	37.4	38.1
83.06	78.9	96.7	99.1	104.7	82.9	72.8	65.6	64.0	48.9	48.5	39.3	40.0
83.08	2.4	2.8	3.6	3.4	2.5	2.1	1.8	1.9	1.3	1.3	1.0	1.0
84.01	5.9	6.9	8.2	7.4	5.2	4.2	3.8	3.8	2.7	2.6	2.0	2.1
84.02	9.6	11.9	13.0	14.1	9.6	8.2	7.3	7.5	5.2	5.0	4.0	4.0
84.03	13.6	16.8	17.4	18.9	14.0	12.1	10.7	11.1	7.8	7.6	6.0	6.1
84.04	15.8	19.7	20.3	21.8	17.6	15.1	13.5	13.9	10.2	9.9	7.9	8.0
85.01	2.6	3.6	3.6	3.8	3.8	3.3	3.0	3.1	2.4	2.3	1.9	1.9
85.02	5.5	5.9	7.0	6.2	5.4	4.9	4.4	4.8	3.6	3.6	2.9	3.0
85.03	9.7	11.8	12.8	13.3	9.4	8.6	7.7	8.2	6.0	5.9	4.7	4.8
86.01	2.4	2.7	3.1	2.8	2.2	2.0	1.8	1.9	1.4	1.3	1.1	1.1
87.01	4.7	5.1	6.0	5.4	3.7	3.0	2.6	2.7	1.9	1.8	1.4	1.5
87.02	1.8	2.2	2.7	2.6	1.9	1.6	1.4	1.4	1.0	1.0	0.8	0.8
88.01	9.1	9.9	11.2	10.3	6.5	5.1	4.6	4.6	3.2	3.1	2.5	2.5
88.02	11.5	12.0	13.5	12.6	7.8	6.2	5.6	5.7	4.0	3.9	3.1	3.1
88.03	28.6	31.5	35.9	34.0	23.1	20.0	18.0	18.9	13.5	13.3	10.7	10.9
88.04	34.0	38.5	42.9	41.9	29.1	24.6	22.3	23.0	16.7	16.4	13.2	13.5
89.01	3.7	4.1	4.9	4.4	3.1	2.6	2.3	2.3	1.6	1.6	1.3	1.3
89.02	11.2	13.2	14.9	15.0	11.1	9.7	8.5	8.9	6.4	6.2	4.9	5.0
89.03	17.3	20.7	21.7	23.4	17.0	14.6	12.9	13.4	9.6	9.4	7.4	7.5
90.01	5.1	5.5	6.5	5.8	4.4	3.9	3.4	3.6	2.5	2.5	2.0	2.0
90.02	1.6	1.9	2.3	2.1	1.5	1.2	1.0	1.0	0.7	0.7	0.6	0.6
91.01	3.5	4.3	5.3	5.0	3.6	2.9	2.6	2.7	1.8	1.8	1.4	1.4
93.01	5.8	6.4	7.4	6.7	5.0	4.5	4.0	4.1	3.0	2.9	2.3	2.3
94.01	6.5	7.8	9.1	8.1	5.3	4.1	3.7	3.7	2.5	2.5	1.9	2.0
95.01	7.1	8.0	9.3	8.3	6.2	5.3	4.7	4.8	3.4	3.3	2.6	2.7
95.02	9.4	11.0	12.4	12.0	8.5	7.1	6.3	6.5	4.6	4.5	3.5	3.6
96.01	43.9	58.9	60.4	63.1	61.6	52.9	46.7	49.3	37.0	36.0	28.5	29.0
103.01	3.9	4.3	5.0	4.5	3.3	2.8	2.5	2.6	1.8	1.8	1.4	1.4
103.02	10.9	12.3	14.6	13.2	9.5	7.9	7.0	7.2	5.0	4.9	3.9	3.9
104.01	4.5	6.7	6.9	7.3	7.5	6.5	5.9	6.2	4.8	4.7	3.8	3.9
104.02	6.8	10.2	10.7	11.4	11.5	10.3	9.5	9.7	7.6	7.6	6.2	6.3
104.03	10.4	15.8	16.7	17.8	17.8	16.4	15.3	15.5	12.2	12.3	10.2	10.4

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.04	16.2	23.9	24.9	26.4	26.5	24.4	22.6	22.7	17.9	18.0	14.9	15.2
104.05	18.4	27.0	28.2	29.8	29.9	27.6	25.5	25.4	20.1	20.3	16.8	17.1
104.06	21.7	31.6	33.1	34.9	34.7	32.6	30.1	29.5	23.5	23.8	19.9	20.2
104.07	24.7	36.1	37.9	40.2	39.3	37.5	34.6	33.5	26.8	27.4	22.9	23.3
104.08	26.4	39.0	41.0	43.4	42.3	41	37.6	36	29.0	29.6	24.9	25.4
104.09	39.0	57.8	60.6	64.6	63.2	60	55.7	55	43.5	44.2	37.0	37.7
104.10	58.3	86.5	91.4	96.5	94.3	90	83.7	81	65.2	66.4	55.6	56.8
104.11	60.0	89.2	94.3	99.5	97.2	92.7	86.4	83.9	67.1	68.5	57.5	58.7
104.12	60.5	90.5	96.2	101.6	98.8	95.2	88.6	85.4	68.5	70.4	59.3	60.5
104.13	63.2	95.1	101.5	107.3	104.0	101.2	94.2	90.2	72.6	74.9	63.4	64.7
104.14	63.3	95.2	101.6	107.4	104.1	101.4	94.4	90.3	72.7	75.0	63.5	64.9
104.15	82.2	122.7	131.2	138.9	135.8	133.9	124.8	118.7	96.4	99.6	84.8	86.6
104.16	83.9	125.0	133.7	141.6	138.3	136.6	127.4	120.9	98.4	101.7	86.7	88.5
104.17	84.7	126.4	135.7	143.7	140.3	138.9	129.6	122.7	99.9	103.6	88.4	90.3
104.18	85.4	127.1	136.6	144.8	141.3	140.2	130.8	123.6	100.8	104.7	89.4	91.4
104.19	90.4	132.8	145.4	154.4	149.7	151.1	141.1	131.7	107.7	113.7	98.0	100.3
104.20	91.8	134.3	149.0	157.8	153.7	155.5	145.3	134.8	110.4	117.8	101.9	104.3
104.21	92.8	135.7	151.0	159.9	155.9	157.8	147.5	136.5	111.9	119.8	103.7	106.1
104.22	92.8	135.8	151.4	160.4	156.4	158.3	148.0	136.8	112.2	120.3	104.2	106.5
104.23	92.9	135.9	152.1	161.4	157.7	159.3	148.9	137.1	112.8	121.5	105.2	107.6
104.24	93.1	136.2	153.0	162.7	159.5	160.9	150.5	137.7	113.8	123.3	106.9	109.3
104.25	93.3	136.4	153.7	163.8	161.2	162.3	151.9	138.2	114.6	125.0	108.4	110.9
104.26	93.6	136.8	154.6	165.0	162.9	163.8	153.3	138.8	115.5	126.7	109.9	112.5
104.27	151.8	222.5	248.0	265.1	256.2	257.0	239.1	214.6	178.9	196.0	170.2	174.5
104.28	152.0	222.7	248.5	266.1	257.9	258.4	240.4	214.9	179.7	197.7	171.7	176.1
104.29	152.1	222.9	248.9	267.1	259.5	259.7	241.7	215.2	180.5	199.4	173.2	177.4
104.30	152.2	223.2	249.3	268.2	261.1	261.1	242.9	215.6	181.3	201.0	174.7	178.9
104.31	163.1	244.0	286.9	314.4	308.2	315.8	296.1	256.1	219.3	249.9	224.5	230.5
104.32	163.3	244.2	287.3	315.2	309.8	317.2	297.4	256.8	220.3	251.7	226.2	232.1
104.33	163.4	244.3	287.7	316.3	314.2	320.8	300.7	257.6	222.7	256.6	230.3	235.7
104.34	163.7	244.8	288.8	319.1	320.4	326.1	305.6	259.5	226.1	263.4	236.4	242.8
104.35	163.8	245.0	289.1	319.7	321.9	327.3	306.7	259.9	226.9	264.8	237.8	244.3
104.36	164.5	246.0	290.7	322.6	326.7	331.6	310.8	263.5	229.9	269.7	242.5	249.5
104.37	164.6	246.2	291.1	323.5	328.7	333.3	312.4	264.5	231.1	271.8	244.6	251.7
104.38	164.7	246.4	291.5	324.2	331.1	335.5	314.4	265.4	232.5	274.4	247.1	254.2
104.39	164.8	246.4	291.5	324.4	331.7	336.0	314.8	265.6	232.9	275.0	247.7	254.7
104.40	164.8	246.5	291.8	325.2	335.6	339.7	318.0	266.5	236.3	279.1	252.0	258.1
104.41	164.9	246.6	292.0	325.7	337.4	341.4	319.4	267.0	238.0	280.8	254.0	259.7
104.42	165.0	246.8	292.3	326.1	338.8	342.7	320.4	267.6	239.2	282.1	255.5	261.0
104.43	165.0	246.8	292.4	326.3	340.0	343.8	321.3	268.0	240.4	283.1	256.8	261.9
104.44	165.1	246.9	292.5	326.5	341.7	345.7	322.5	268.6	242.9	284.2	258.9	263.2
105.01	2.3	3.4	3.6	3.9	3.9	3.5	3.2	3.3	2.6	2.6	2.1	2.1
106.01	2.8	3.8	3.9	4.0	4.0	3.5	3.1	3.3	2.5	2.4	1.9	2.0
107.01	2.2	3.2	3.3	3.5	3.6	3.2	2.9	3.0	2.4	2.3	1.9	1.9
107.02	8.1	9.7	11.6	11.2	10.2	9.2	8.2	8.8	6.5	6.4	5.1	5.2
107.03	10.7	13.6	15.4	15.5	14.1	12.5	11.2	11.9	8.9	8.7	7.0	7.1
107.04	12.3	16.3	17.9	18.2	17.0	15.3	13.7	14.4	10.9	10.8	8.7	8.8
107.05	13.9	18.0	19.9	20.2	18.6	16.8	15.1	15.6	12.0	11.8	9.5	9.7
108.01	3.4	4.8	4.9	5.1	5.1	4.4	3.9	4.1	3.1	3.1	2.4	2.5
108.02	6.0	8.7	8.9	9.3	9.3	8.2	7.4	7.6	5.9	5.9	4.7	4.8
108.03	9.4	13.7	14.1	14.8	14.7	13.2	11.9	11.9	9.4	9.3	7.6	7.7
109.01	2.7	3.7	3.8	3.9	4.0	3.4	3.1	3.2	2.5	2.4	1.9	1.9
109.02	5.4	7.5	7.6	7.9	7.9	6.9	6.1	6.3	4.9	4.8	3.8	3.9
110.01	3.2	4.2	4.3	4.5	4.3	3.7	3.2	3.4	2.6	2.5	2.0	2.0
111.01	2.2	3.2	3.3	3.6	3.6	3.2	2.9	3.0	2.4	2.4	1.9	1.9
111.02	4.2	5.3	5.5	5.9	5.8	5.1	4.6	4.9	3.7	3.6	2.9	3.0
112.01	2.9	3.6	4.3	4.1	4.1	3.6	3.1	3.4	2.5	2.5	1.9	2.0
112.02	15.6	18.9	21.7	21.5	17.5	15.6	13.8	14.6	10.7	10.5	8.3	8.5
112.03	25.2	31.5	34.3	35.1	30.5	26.6	23.8	25.1	18.8	18.3	14.6	14.8
112.04	28.0	35.2	38.0	38.9	34.4	30.0	26.9	27.5	21.2	20.7	16.6	16.9
113.01	6.3	7.2	8.5	7.6	5.4	4.4	4.0	4.0	2.8	2.7	2.1	2.2
114.01	3.3	3.7	4.5	4.0	3.0	2.6	2.3	2.4	1.7	1.6	1.3	1.3
115.01	3.4	4.4	4.6	4.8	4.3	3.8	3.3	3.5	2.5	2.4	1.9	1.9
116.01	3.3	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.4	1.9	1.9
117.01	5.6	6.3	7.4	6.6	4.8	4.1	3.6	3.7	2.6	2.5	2.0	2.0
117.02	10.8	11.4	12.4	13.9	10.2	9.3	8.2	8.6	6.2	6.1	4.8	4.9

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
117.03	11.9	13.5	14.4	16.2	12.4	11.3	10.0	10.3	7.6	7.4	5.9	6.0
118.01	2.7	3.9	4.1	4.3	4.4	3.9	3.5	3.7	2.9	2.8	2.3	2.3
119.01	6.0	6.6	7.7	7.0	4.9	4.0	3.6	3.7	2.6	2.5	2.0	2.0
120.01	2.3	2.5	2.7	2.5	1.4	1.1	1.0	1.0	0.7	0.6	0.5	0.5
121.01	3.1	4.1	4.2	4.4	4.2	3.6	3.2	3.3	2.5	2.4	1.9	1.9
121.02	12.7	16.8	17.2	18.4	16.7	14.5	12.8	13.2	10.0	9.7	7.6	7.8
121.03	15.5	20.6	21.3	22.7	20.6	18.0	16.0	16.2	12.4	12.1	9.6	9.8
121.04	18.1	24.4	25.1	26.7	24.4	21.4	19.1	19.1	14.8	14.5	11.5	11.7
121.05	21.8	30.3	31.3	33.4	31.0	27.7	25.0	24.7	19.4	19.2	15.4	15.7
121.06	45.5	64.5	66.8	71.2	66.7	60.5	54.8	53.5	42.4	42.3	34.4	35.0
121.07	48.1	68.4	71.4	75.9	70.9	65.2	59.3	57.1	45.5	45.6	37.3	38.0
121.08	55.7	81.1	86.1	91.5	85.4	80.5	73.5	69.2	56.0	56.8	47.1	48.0
121.09	56.4	82.5	88.2	93.8	87.3	83.1	75.9	70.7	57.6	58.8	49.0	49.9
121.10	57.0	83.5	90.0	95.8	88.9	85.4	78.1	72.0	59.0	60.7	50.9	51.9
121.11	57.6	84.7	92.3	98.4	91.1	88.3	80.9	73.5	60.7	63.2	53.5	54.5
121.12	58.0	85.5	93.9	100.1	92.9	90.5	83.0	74.7	62.1	65.2	55.5	56.7
121.13	58.4	86.2	95.2	101.7	94.5	92.4	84.8	75.7	63.2	67.0	57.3	58.6
121.14	58.8	86.9	96.5	103.3	96.2	94.2	86.5	76.7	64.5	68.8	59.2	60.4
122.01	3.2	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.5	1.9	2.0
122.02	6.3	8.5	8.7	9.3	8.5	7.3	6.5	6.7	5.0	4.9	3.9	3.9
123.01	1.8	2.8	3.0	3.2	3.1	3.0	2.8	2.9	2.3	2.3	1.9	1.9
124.01	2.9	4.2	4.3	4.5	4.6	4.0	3.6	3.8	2.9	2.9	2.3	2.3
124.02	10.6	14.1	14.5	15.4	14.5	12.7	11.2	11.7	8.9	8.7	6.9	7.0
124.03	13.2	17.9	18.4	19.5	18.5	16.3	14.5	14.9	11.4	11.2	9.0	9.1
124.04	15.7	21.5	22.1	23.4	22.0	19.6	17.5	17.6	13.7	13.5	10.9	11.1
124.05	21.6	30.7	31.7	33.7	31.8	28.8	26.0	25.5	20.2	20.1	16.3	16.6
125.01	3.2	4.2	4.3	4.6	4.3	3.7	3.2	3.4	2.5	2.4	1.9	2.0
126.01	2.8	3.8	3.9	4.0	4.1	3.5	3.1	3.3	2.5	2.4	1.9	1.9
127.01	2.0	3.0	3.1	3.4	3.3	3.1	2.9	2.9	2.3	2.3	1.9	1.9
127.02	4.8	7.4	8.0	8.5	8.4	7.9	7.3	7.4	5.8	5.9	4.9	5.0
127.03	7.0	10.5	11.2	11.8	11.8	11.1	10.3	10.3	8.1	8.2	6.8	6.9
128.01	13.5	15.1	17.8	16.0	11.4	9.4	8.4	8.6	6.0	5.8	4.6	4.7
128.02	14.4	16.4	19.0	17.8	12.8	10.8	9.6	9.9	7.0	6.8	5.4	5.5
128.03	23.0	26.1	29.2	29.5	21.9	19.5	17.3	18.1	13.2	12.8	10.2	10.4
128.04	25.0	29.0	32.1	32.5	25.5	23.0	20.6	21.2	15.9	15.6	12.6	12.8
128.05	27.3	32.0	35.4	35.9	29.2	26.2	23.6	23.8	18.2	18.0	14.5	14.8
128.06	56.9	67.9	72.3	74.2	65.2	57.8	52.4	51.4	40.5	39.8	32.1	32.7
128.07	58.0	69.6	73.9	75.9	66.6	59.2	53.7	52.5	41.3	40.8	33.0	33.6
128.08	59.3	71.5	75.8	77.8	68.2	60.9	55.4	53.9	42.4	42.0	34.1	34.7
128.09	60.9	74.3	78.8	80.8	71.0	63.8	58.1	56.1	44.2	44.0	35.9	36.6
128.10	74.1	93.5	97.6	100.0	91.5	81.8	75.4	73.1	58.3	58.3	47.8	48.7
128.11	74.4	94.5	98.9	101.5	92.6	83.8	77.0	74.0	59.3	59.7	49.2	50.1
128.12	74.9	95.9	101.1	103.9	94.4	87.1	79.9	75.5	61.0	62.0	51.6	52.5
129.01	9.0	9.8	11.1	10.2	7.1	6.1	5.4	5.6	4.0	3.9	3.1	3.1
131.01	6.7	7.5	8.8	7.9	5.3	4.3	3.8	3.9	2.7	2.6	2.1	2.1
131.02	12.8	14.9	15.7	17.9	12.1	10.2	9.1	9.3	6.5	6.3	5.0	5.1
131.03	16.8	20.6	20.7	23.4	17.4	15.0	13.3	13.7	9.7	9.4	7.4	7.6
131.04	20.3	24.8	25.1	27.7	22.0	18.9	16.8	17.3	12.6	12.3	9.7	9.9
131.05	23.8	28.8	29.2	31.6	26.5	22.3	20.0	20.5	15.3	14.8	11.7	11.9
131.06	25.9	31.7	32.4	35.1	29.8	25.3	22.9	23.1	17.6	17.1	13.6	13.8
133.01	9.1	9.5	10.6	9.9	5.8	4.5	4.0	4.1	2.8	2.7	2.2	2.2
133.02	16.5	18.3	19.9	20.2	13.1	11.1	9.9	10.3	7.4	7.2	5.7	5.8
133.03	21.7	24.9	26.0	27.9	19.4	16.6	14.8	15.4	11.2	10.9	8.6	8.8
133.04	25.0	28.8	29.8	31.9	23.3	19.7	17.6	18.2	13.4	13.1	10.4	10.6
134.01	4.8	5.0	5.6	5.3	3.3	2.9	2.6	2.7	1.9	1.9	1.5	1.5
135.01	3.4	3.6	4.1	3.8	2.4	1.9	1.7	1.7	1.2	1.2	0.9	0.9
137.01	4.0	4.5	5.1	4.7	2.8	2.1	1.9	1.9	1.3	1.3	1.0	1.0
139.01	7.6	8.1	9.3	8.5	5.5	4.5	4.0	4.1	2.8	2.8	2.2	2.2
140.01	10.6	11.8	13.5	12.3	7.5	5.7	5.1	5.2	3.6	3.5	2.8	2.8
141.01	6.0	6.8	8.0	7.2	5.1	4.2	3.7	3.8	2.6	2.6	2.0	2.1
141.02	14.9	18.0	20.0	20.4	14.5	12.5	11.1	11.5	8.2	8.0	6.3	6.5
142.01	4.7	5.0	5.8	5.3	4.0	3.7	3.3	3.5	2.5	2.5	2.0	2.0
144.01	2.1	3.2	3.4	3.6	3.6	3.3	3.0	3.1	2.5	2.4	2.0	2.0
144.02	4.3	6.2	6.6	7.1	7.0	6.4	5.9	6.0	4.8	4.7	3.9	4.0
145.01	4.9	6.1	7.1	7.2	5.3	4.6	4.1	4.2	2.9	2.8	2.2	2.2
147.01	8.1	9.5	11.0	9.8	6.4	4.9	4.4	4.4	3.1	3.0	2.3	2.4

Developed Condition Discharges - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
147.02	13.7	17.1	20.5	19.6	14.0	11.7	10.4	10.6	7.4	7.2	5.6	5.7
149.01	2.7	3.1	3.7	3.3	2.3	1.8	1.6	1.6	1.1	1.1	0.9	0.9
149.02	3.9	4.7	5.2	5.2	3.4	2.7	2.5	2.5	1.7	1.7	1.3	1.3
151.01	21.0	37.3	49.4	59.3	73.2	76.7	88.0	74.4	70.5	82.5	75.3	81.6
151.02	52.6	93.7	122.1	143.0	168.1	175.6	202.1	174.6	153.9	185.0	169.2	181.1
151.03	111.3	197.7	257.5	299.2	351.3	367.7	421.8	360.6	318.9	382.7	352.6	375.7
151.04	128.6	228.3	299.0	348.2	417.2	438.1	502.8	423.4	384.9	456.6	425.2	448.3
151.05	141.5	249.4	324.9	376.7	455.2	478.0	547.2	459.6	420.8	494.0	467.4	486.0
151.06	287.4	494.5	633.9	736.1	877.7	921.5	1074.5	901.7	835.6	977.2	933.3	970.2
151.07	374.6	632.7	797.0	914.4	1113.8	1173.2	1351.8	1133.1	1060.8	1223.9	1194.7	1211.8
151.08	470.5	787.1	982.8	1133.6	1390.3	1472.4	1680.8	1416.8	1339.0	1533.4	1511.0	1515.2
152.01	25.9	46.7	62.0	74.3	89.3	93.3	106.5	91.2	83.7	99.4	90.0	98.3
153.01	16.2	28.8	39.5	47.4	68.4	72.4	85.3	81.1	74.0	81.6	81.7	82.7
153.02	28.9	51.5	69.1	81.8	106.7	113.1	134.6	122.8	113.2	127.3	123.7	129.0
153.03	99.9	174.7	225.5	260.7	294.5	309.0	358.6	307.7	271.3	328.6	305.5	323.8
153.04	142.3	242.9	308.2	354.6	411.9	433.7	516.1	435.3	402.8	474.1	451.4	473.5
154.01	30.7	55.2	72.4	81.3	90.0	95.0	103.2	92.5	74.0	90.2	83.0	89.4
155.01	25.3	45.1	53.2	58.1	55.2	63.2	62.3	58.7	46.8	50.7	46.4	48.0
156.01	23.3	42.2	55.3	66.3	79.5	83.1	94.6	81.1	74.3	88.2	80.0	87.1
156.02	50.1	89.4	111.5	126.3	140.5	147.8	172.1	150.8	124.3	153.0	140.5	149.9
157.01	16.4	29.1	39.9	47.7	64.8	68.1	79.4	72.3	67.0	75.9	72.5	75.9
157.02	43.8	78.4	104.1	122.4	148.8	156.2	183.6	155.6	146.2	171.4	159.2	169.2
157.03	78.1	135.3	172.5	199.6	225.7	236.4	280.1	237.8	213.2	255.9	237.8	251.0
158.01	29.2	52.6	70.7	84.2	101.8	106.3	121.3	104.1	95.8	113.2	102.8	111.8

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	5.5	13.8	20.2	24.4	30.3	33.1	42.2	36.1	28.2	37.1	33.2	36.2
1.02	10.5	26.3	38.1	46.4	59.3	64.7	82.6	69.3	56.3	74.3	66.2	70.6
1.03	16.6	42.0	61.0	75.2	100.8	110.4	142.3	120.1	108.0	134.0	123.4	131.6
1.04	21.1	53.3	77.4	96.0	131.4	143.8	185.4	157.5	141.5	173.1	162.3	170.8
1.05	23.7	59.9	87.0	107.9	151.3	165.7	213.0	185.2	165.9	198.8	190.8	198.2
1.06	35.6	89.1	129.2	160.0	231.7	255.2	324.5	287.7	261.0	299.7	300.7	300.6
1.07	40.3	97.8	138.8	170.3	246.9	272.8	345.3	306.9	284.8	319.3	326.0	321.4
1.08	47.3	107.5	149.0	181.5	264.8	296.8	368.4	343.9	321.6	344.3	364.8	350.1
1.09	101.5	233.6	321.9	391.9	555.3	621.5	768.0	711.2	664.0	721.4	757.0	735.0
1.10	104.6	240.4	331.5	402.9	570.9	639.2	788.1	732.8	685.4	741.3	782.2	757.4
1.11	108.4	247.5	340.4	412.7	585.3	655.4	806.6	756.2	710.2	760.2	810.4	780.2
1.12	111.6	252.9	347.4	421.1	597.0	668.9	821.2	776.3	729.7	775.2	833.0	797.4
1.13	117.2	262.0	358.9	434.8	616.8	691.0	844.1	814.2	766.0	803.9	879.3	827.8
1.14	117.3	262.0	358.9	434.8	616.9	691.1	844.2	814.5	766.5	804.4	880.2	828.1
1.15	117.3	262.0	358.9	434.8	616.9	691.2	844.2	814.6	766.8	804.8	880.9	828.3
1.16	117.3	262.0	358.9	434.8	616.9	691.2	844.3	814.7	767.0	805.0	881.4	828.4
1.17	117.3	262.0	358.9	434.9	616.9	691.2	844.3	814.8	767.2	805.3	881.8	828.6
1.18	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1658	1782	1708
1.19	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1546	1659	1783	1708
1.20	228.6	531.8	739.7	901.8	1289	1442	1740	1647	1547	1659	1783	1708
1.21	228.6	531.8	739.8	901.8	1289	1442	1741	1647	1547	1660	1785	1709
1.22	228.6	531.8	739.8	901.9	1289	1442	1741	1647	1548	1660	1785	1709
1.23	228.6	531.8	739.8	901.9	1289	1442	1741	1648	1549	1661	1788	1710
1.24	228.7	531.9	739.8	901.9	1290	1443	1741	1648	1551	1663	1790	1711
1.25	228.8	532.1	740.1	902.2	1290	1444	1742	1650	1555	1666	1796	1713
1.26	228.8	532.1	740.1	902.3	1290	1444	1743	1651	1556	1667	1799	1714
1.27	228.8	532.1	740.1	902.3	1290	1444	1743	1651	1557	1668	1800	1714
1.28	228.8	532.1	740.1	902.3	1291	1444	1743	1651	1557	1668	1800	1714
1.29	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.30	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.31	228.9	532.1	740.2	902.4	1291	1444	1743	1651	1558	1669	1801	1715
1.32	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1678	1812	1719
1.33	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1678	1812	1719
1.34	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1679	1813	1719
1.35	229.0	532.3	740.5	902.7	1291	1446	1744	1653	1565	1679	1813	1719
1.36	259.0	584.4	807.0	980.7	1416	1603	1901	1897	1808	1854	2085	1915
1.37	259.0	584.4	807.0	980.7	1416	1603	1901	1897	1808	1854	2086	1915
1.38	259.0	584.5	807.0	980.7	1416	1603	1901	1897	1809	1855	2086	1915
1.39	259.0	584.5	807.0	980.7	1416	1604	1901	1897	1809	1856	2087	1915
1.40	259.0	584.5	807.0	980.7	1416	1604	1901	1897	1810	1856	2088	1916
1.41	259.3	584.9	807.5	981.3	1417	1606	1903	1902	1819	1867	2099	1920
1.42	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1819	1868	2100	1921
1.43	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1819	1868	2100	1921
1.44	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1820	1869	2100	1921
1.45	259.4	584.9	807.5	981.3	1417	1606	1903	1902	1820	1869	2100	1921
1.46	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1837	1886	2120	1931
1.47	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1837	1888	2120	1931
1.48	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1838	1889	2121	1931
1.49	260.8	586.9	809.9	984.0	1422	1612	1908	1913	1838	1889	2121	1931
1.50	260.8	587.0	809.9	984.0	1422	1612	1908	1913	1839	1891	2122	1932
1.51	260.9	587.0	810.0	984.1	1422	1612	1908	1914	1843	1900	2126	1935
1.52	260.9	587.1	810.0	984.1	1422	1613	1908	1914	1845	1904	2128	1936
1.53	260.9	587.1	810.0	984.1	1422	1613	1908	1914	1845	1904	2128	1936
1.54	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1905	2128	1936
1.55	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1905	2128	1937
1.56	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1845	1906	2129	1937
1.57	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1846	1908	2129	1937
1.58	260.9	587.1	810.0	984.2	1422	1613	1908	1915	1846	1910	2130	1938
1.59	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1915	2131	1939
1.60	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1916	2132	1939
1.61	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1917	2132	1940
1.62	261.0	587.1	810.1	984.2	1422	1613	1908	1915	1848	1917	2132	1940
1.63	261.9	588.3	811.5	986.0	1427	1620	1914	1933	1882	1953	2174	1959
1.64	262.5	588.9	812.2	986.7	1428	1621	1916	1937	1888	1967	2180	1964
1.65	309.1	670.1	910.5	1103.9	1608	1830	2131	2283	2297	2310	2620	2261

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
2.01	2.9	7.3	10.7	13.6	21.6	23.8	30.3	29.9	26.6	29.6	30.2	30.6
3.01	3.3	8.5	12.5	15.9	25.1	27.7	35.4	34.9	30.9	34.6	35.0	35.7
3.02	7.7	19.6	28.8	36.4	51.8	56.7	73.1	67.8	59.0	70.2	67.8	71.0
3.03	18.8	47.6	69.3	87.2	122.9	134.7	173.0	153.0	136.0	164.1	155.2	163.5
3.04	26.5	64.4	90.9	111.0	149.7	162.7	212.6	185.4	166.2	197.1	189.5	196.5
3.05	32.9	79.0	109.9	133.3	176.3	191.4	250.3	215.7	194.2	229.8	222.9	228.6
3.06	37.6	90.2	125.2	151.1	199.0	217.5	282.4	239.8	218.5	259.0	252.1	255.6
3.07	42.0	100.4	138.4	167.2	220.6	242.6	310.4	260.7	242.8	285.1	280.4	282.0
4.01	4.4	11.1	16.4	21.0	28.2	30.9	39.6	33.3	30.2	37.8	33.5	36.8
5.01	2.7	7.0	10.1	12.9	20.3	22.2	28.5	27.6	24.3	27.8	27.7	28.4
5.02	8.5	21.3	31.2	39.3	61.0	66.9	85.5	82.3	72.1	82.1	82.6	83.8
11.01	9.1	22.8	30.9	35.7	40.2	46.1	55.2	50.5	37.9	44.2	40.1	41.4
11.02	18.4	44.8	58.5	68.0	77.6	88.5	114.1	100.1	76.6	98.4	93.0	99.6
11.03	39.0	96.0	132.0	159.9	198.9	222.6	278.9	228.2	191.3	250.1	233.9	244.0
11.04	43.3	106.1	146.2	176.6	223.9	250.6	309.9	254.1	215.9	279.3	263.8	271.6
11.05	45.4	111.3	153.8	186.2	240.2	268.3	332.8	275.1	238.6	301.2	289.1	295.3
11.06	52.3	128.0	177.1	214.1	284.2	318.4	388.4	332.6	288.6	353.6	347.5	346.8
11.07	56.4	137.5	190.2	229.8	308.5	346.8	419.0	367.3	317.2	382.1	380.6	375.9
11.08	59.7	145.1	200.6	242.4	327.7	370.7	444.2	397.2	342.0	405.6	408.5	400.8
11.09	62.7	151.8	209.8	253.5	344.6	391.9	466.8	425.0	365.2	426.9	434.7	423.6
11.10	66.8	160.8	221.4	267.4	367.0	418.7	494.3	461.8	396.0	454.1	470.0	453.0
11.11	116.5	281.3	393.9	483.6	686.6	774.7	935.6	865.1	788.9	871.4	916.5	888.6
11.12	116.7	281.5	394.1	483.8	687.3	775.9	936.5	867.9	791.8	872.8	919.8	890.4
11.13	116.7	281.5	394.1	483.8	687.4	776.0	936.5	868.2	792.2	873.1	920.4	890.6
12.01	5.8	14.1	17.1	19.5	19.9	23.9	24.8	24.7	19.0	19.4	15.9	16.1
13.01	5.9	14.8	21.4	25.6	31.5	34.5	43.6	38.0	28.2	37.6	34.0	36.7
13.02	10.2	25.5	37.1	45.3	58.9	64.3	82.0	68.4	56.2	74.0	66.5	69.5
14.01	5.7	14.4	20.9	25.1	31.0	33.9	43.0	37.2	28.2	37.4	33.7	36.4
15.01	3.2	8.3	12.1	15.4	22.6	24.8	31.6	28.9	25.6	30.9	28.8	30.7
16.01	3.3	8.7	12.8	16.2	24.8	26.9	34.6	32.7	28.4	34.0	32.6	34.2
16.02	7.2	18.7	27.5	34.5	48.9	53.6	68.9	62.4	55.1	65.8	62.4	65.6
16.03	18.9	48.8	71.8	90.5	131.9	144.7	186.0	174.1	152.5	179.7	176.9	185.2
16.04	21.7	55.9	82.0	103.4	150.8	167.1	213.4	200.2	175.5	204.9	204.1	211.8
16.05	31.8	81.6	118.7	149.8	216.8	240.5	305.5	283.1	251.4	291.3	290.1	299.7
16.06	38.3	98.1	142.2	178.6	260.3	289.3	365.3	339.6	306.0	344.4	351.3	356.3
16.07	43.4	110.4	159.3	199.1	289.8	322.4	406.1	376.5	347.9	380.4	395.8	395.3
16.08	47.2	118.3	169.1	209.4	304.5	338.8	426.2	394.8	370.4	398.7	420.4	415.1
17.01	1.3	3.2	4.6	6.0	10.3	12.4	15.1	18.1	17.8	15.9	21.2	19.3
18.01	3.8	9.8	14.5	18.5	25.3	27.8	35.3	30.1	27.3	34.0	30.3	33.1
19.01	3.4	9.0	13.3	16.8	23.7	26.3	33.3	29.5	26.4	32.4	29.4	31.8
20.01	4.0	10.3	15.3	19.5	26.5	29.2	37.2	31.8	28.7	35.8	31.9	34.8
20.02	6.7	17.0	25.0	31.9	46.2	50.9	64.8	59.0	52.1	62.2	59.1	62.2
21.01	3.2	8.4	12.3	15.7	24.1	26.2	33.8	32.1	27.9	33.1	32.1	33.4
22.01	0.9	1.0	1.3	1.3	1.4	1.3	1.4	1.5	1.1	1.1	0.8	0.8
22.02	1.7	2.6	3.2	3.6	3.8	4.0	4.1	4.3	3.2	3.2	2.6	2.6
22.03	1.8	3.1	3.8	4.3	4.6	5.0	5.3	5.4	4.1	4.2	3.4	3.5
22.04	2.1	3.9	4.7	5.3	5.6	6.2	6.5	6.5	4.9	5.1	4.2	4.3
23.01	0.6	1.0	1.2	1.3	1.4	1.4	1.4	1.5	1.1	1.1	0.9	0.9
25.01	0.4	0.9	1.1	1.2	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
25.02	0.7	1.7	2.1	2.3	2.4	2.6	2.6	2.7	2.1	2.1	1.6	1.7
25.03	2.9	2.7	3.1	3.5	3.6	4.1	4.1	4.3	3.3	3.3	2.6	2.6
27.01	2.3	2.4	2.8	2.5	1.9	1.8	1.6	1.7	1.2	1.1	0.9	0.9
27.02	8.5	8.5	9.2	10.0	6.6	6.1	5.7	5.8	4.0	3.9	3.0	3.0
27.03	9.1	9.9	10.5	11.4	8.3	7.7	7.2	7.4	5.3	5.1	3.9	3.9
27.04	9.8	11.1	11.8	12.7	10.1	9.1	8.5	8.8	6.3	6.1	4.7	4.7
28.01	3.5	3.5	3.8	3.7	2.1	1.9	1.7	1.7	1.2	1.1	0.9	0.9
29.01	0.7	0.7	0.9	0.8	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
30.01	7.5	17.6	21.1	23.1	24.3	27.5	27.9	28.5	21.9	21.8	17.5	17.7
34.01	7.0	15.8	18.8	20.8	21.9	23.3	23.5	24.5	18.6	18.3	14.4	14.5
36.01	4.0	10.0	12.8	14.6	14.5	18.2	19.5	19.1	14.4	15.1	12.7	12.9
40.01	5.9	5.8	6.3	6.1	3.1	2.4	2.2	2.2	1.5	1.5	1.1	1.2
40.02	7.3	6.9	7.3	7.7	4.2	3.3	3.0	3.1	2.1	2.0	1.6	1.6
40.03	4.1	4.1	4.5	4.2	2.4	2.2	2.1	2.2	1.5	1.5	1.2	1.2
40.04	5.5	5.3	5.6	6.3	4.0	3.8	3.9	4.1	3.0	2.9	2.3	2.3
40.05	1.5	1.5	1.8	1.6	1.3	1.2	1.1	1.1	0.8	0.8	0.6	0.6

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
40.06	8.9	8.4	9.8	10.7	8.4	7.9	7.7	8.0	5.7	5.5	4.3	4.3
42.01	0.8	1.3	1.5	1.6	1.6	1.5	1.3	1.3	0.9	0.9	0.6	0.7
43.01	1.9	2.1	2.7	2.4	2.4	2.3	2.1	2.1	1.4	1.4	1.1	1.1
50.01	13.3	33.0	45.9	53.1	59.6	68.1	82.3	75.1	55.5	66.0	59.9	62.3
50.02	17.6	43.8	61.9	73.1	85.3	95.2	119.2	105.1	76.7	99.6	90.6	95.0
50.03	24.8	60.9	84.4	99.9	116.4	130.7	162.0	140.9	106.1	137.9	124.0	128.1
50.04	30.2	74.2	103.4	123.9	149.4	166.5	207.2	174.9	133.3	181.3	162.8	168.8
50.05	41.0	100.7	140.9	171.2	214.5	239.1	294.3	241.6	197.0	264.8	239.7	247.5
50.06	47.0	108.1	149.2	181.0	233.6	259.6	315.9	263.6	222.8	286.2	266.9	271.3
50.07	52.3	116.1	158.8	190.9	251.8	280.6	337.3	291.5	249.0	306.6	294.2	293.7
50.08	57.1	125.3	170.3	204.0	272.6	305.3	362.2	323.1	277.0	330.7	324.1	318.5
50.09	66.1	143.6	192.4	231.4	316.2	354.1	413.9	384.6	331.9	380.9	382.7	371.3
51.01	5.0	12.5	18.4	22.8	28.9	31.5	40.5	33.6	28.7	37.1	32.7	36.0
52.01	4.9	12.3	18.1	22.5	28.8	31.4	40.3	33.2	29.0	37.2	32.8	36.1
54.01	0.3	0.8	0.9	1.0	1.1	1.2	1.3	1.3	1.0	1.0	0.8	0.8
56.01	1.2	2.0	2.1	2.4	2.2	2.0	1.8	1.8	1.2	1.1	0.9	0.9
69.01	10.3	25.3	32.8	37.6	37.2	46.8	52.0	49.7	38.1	40.8	35.0	35.6
70.01	1.4	3.4	4.6	5.3	5.5	6.7	7.7	7.2	5.5	6.0	5.3	5.4
76.01	0.6	1.3	1.5	1.6	1.7	1.9	2.0	2.0	1.5	1.5	1.2	1.2
76.02	0.9	2.1	2.5	2.8	2.9	3.3	3.3	3.4	2.6	2.6	2.1	2.1
79.01	3.8	3.7	4.1	4.0	2.0	1.5	1.4	1.4	1.0	0.9	0.7	0.7
79.02	7.0	7.3	7.3	8.5	4.9	3.8	3.4	3.5	2.4	2.3	1.8	1.8
79.03	2.2	2.1	2.3	2.2	1.1	0.9	0.8	0.8	0.6	0.5	0.4	0.4
80.01	10.4	10.8	10.5	11.0	8.1	6.4	5.8	5.9	4.1	3.9	3.1	3.1
80.02	11.3	12.1	11.6	12.2	9.6	8.0	7.4	7.7	5.4	5.2	4.1	4.1
80.04	12.8	13.9	12.9	13.5	11.4	9.5	8.9	9.3	6.5	6.3	4.9	5.0
80.05	20.6	22.9	22.1	23.7	17.4	15.1	14.4	14.9	10.6	10.3	8.1	8.2
81.01	7.0	6.8	7.5	7.2	3.9	3.3	3.1	3.2	2.3	2.2	1.7	1.7
81.02	8.7	8.4	8.8	9.7	5.6	5.0	4.8	5.1	3.6	3.5	2.7	2.8
82.01	1.5	1.6	1.8	1.6	1.4	1.3	1.3	1.4	1.0	1.0	0.8	0.8
82.02	2.4	3.0	3.6	3.8	3.8	3.5	3.4	3.6	2.5	2.4	1.8	1.9
83.01	2.1	2.1	2.4	2.2	1.6	1.4	1.4	1.5	1.1	1.0	0.8	0.8
83.02	21.8	24.6	23.9	25.5	19.9	17.3	16.8	17.4	12.5	12.2	9.7	9.8
83.03	26.7	31.3	30.9	33.1	27.6	24.8	24.5	25.3	18.5	18.1	14.4	14.5
83.04	27.0	32.1	32.0	34.2	28.8	26.2	25.9	26.5	19.4	19.2	15.3	15.5
83.05	27.5	33.3	33.2	35.7	30.0	27.6	27.3	27.4	20.2	20.1	16.1	16.3
83.06	27.9	34.2	34.3	36.9	31.0	28.8	28.5	28.2	20.9	21.0	16.9	17.1
83.08	0.8	0.8	1.0	0.9	0.9	0.9	0.8	0.8	0.6	0.6	0.4	0.4
84.01	2.1	2.2	2.7	2.3	2.0	1.9	1.7	1.7	1.2	1.1	0.9	0.9
84.02	3.7	3.5	3.9	4.4	3.7	3.5	3.2	3.3	2.3	2.2	1.7	1.7
84.03	4.8	4.9	5.2	5.8	5.3	4.9	4.6	4.9	3.5	3.3	2.6	2.6
84.04	5.3	5.6	5.8	6.4	6.1	5.8	5.7	6.0	4.4	4.3	3.4	3.4
85.01	0.3	0.8	0.9	1.0	1.1	1.2	1.2	1.3	1.0	1.0	0.8	0.8
85.02	2.3	2.3	2.6	2.4	1.6	1.7	1.8	2.0	1.5	1.5	1.2	1.2
85.03	2.9	3.4	4.0	4.1	3.4	3.1	3.3	3.5	2.5	2.5	2.0	2.0
86.01	1.0	1.0	1.2	1.1	0.7	0.7	0.7	0.8	0.6	0.6	0.5	0.5
87.01	1.9	1.9	2.2	2.0	1.3	1.3	1.2	1.2	0.8	0.8	0.6	0.6
87.02	0.6	0.6	0.8	0.7	0.7	0.7	0.6	0.6	0.4	0.4	0.3	0.3
88.01	4.0	3.9	4.4	4.2	2.5	2.3	2.1	2.1	1.5	1.4	1.1	1.1
88.02	5.2	5.1	5.7	5.4	3.0	2.6	2.5	2.6	1.8	1.7	1.3	1.4
88.03	12.5	12.4	13.7	13.3	8.2	7.8	7.8	8.2	5.8	5.8	4.6	4.6
88.04	13.2	13.7	15.4	15.0	10.3	9.7	9.6	10.0	7.2	7.1	5.6	5.7
89.01	1.5	1.5	1.7	1.6	1.1	1.1	1.0	1.0	0.7	0.7	0.5	0.5
89.02	4.3	4.5	4.9	5.2	3.8	3.6	3.6	3.9	2.8	2.7	2.1	2.1
89.03	5.1	6.2	6.8	7.3	6.0	5.6	5.5	5.8	4.2	4.1	3.1	3.2
90.01	2.1	2.1	2.4	2.2	1.5	1.4	1.4	1.6	1.1	1.1	0.8	0.8
90.02	0.5	0.5	0.7	0.6	0.5	0.5	0.5	0.5	0.3	0.3	0.2	0.2
91.01	1.0	1.1	1.5	1.3	1.4	1.3	1.2	1.2	0.8	0.8	0.6	0.6
93.01	2.4	2.4	2.7	2.5	1.8	1.6	1.7	1.8	1.3	1.3	1.0	1.0
94.01	1.9	2.1	2.8	2.5	2.1	1.9	1.7	1.7	1.1	1.1	0.8	0.8
95.01	2.8	2.9	3.4	3.0	2.3	2.1	2.0	2.1	1.5	1.5	1.1	1.1
95.02	3.1	3.4	4.1	3.8	3.0	2.9	2.8	2.9	2.0	2.0	1.5	1.5
96.01	5.7	13.1	15.2	16.9	18.0	19.1	19.2	20.2	15.2	14.9	11.7	11.9
103.01	1.6	1.6	1.8	1.7	1.2	1.1	1.1	1.1	0.8	0.8	0.6	0.6
103.02	4.2	4.2	5.0	4.4	3.5	3.3	3.1	3.2	2.2	2.2	1.7	1.7

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.01	0.6	1.4	1.7	1.9	2.0	2.4	2.5	2.5	1.9	1.9	1.6	1.6
104.02	0.9	2.1	2.6	3.0	3.0	3.7	3.9	3.8	2.9	3.1	2.5	2.6
104.03	1.3	3.2	4.0	4.6	4.6	5.7	6.2	6.0	4.6	4.9	4.1	4.2
104.04	2.1	5.0	6.2	7.0	7.2	8.6	9.2	8.9	6.9	7.2	6.1	6.2
104.05	2.4	5.7	7.0	7.9	8.1	9.7	10.4	10.1	7.7	8.2	6.8	7.0
104.06	3.0	6.9	8.4	9.4	9.7	11.3	12.3	11.8	9.1	9.6	8.1	8.2
104.07	3.5	8.0	9.7	10.8	11.2	13.0	14.1	13.3	10.3	11.1	9.3	9.5
104.08	3.8	8.7	10.5	11.7	12.2	14.1	15.3	14.4	11.2	12.0	10.1	10.3
104.09	5.5	13.0	15.5	17.4	18.0	21.2	22.9	21.8	16.9	17.9	15.2	15.4
104.10	7.6	17.2	21.0	23.5	24.1	28.7	32.0	29.0	22.7	25.5	22.2	22.9
104.11	7.9	17.7	21.7	24.2	24.9	29.6	33.0	29.8	23.4	26.4	23.0	23.6
104.12	8.0	18.0	22.0	24.7	25.5	30.2	33.7	30.3	23.8	27.1	23.6	24.3
104.13	8.5	19.0	23.3	26.1	27.1	32.0	35.7	31.9	25.2	28.8	25.2	25.9
104.14	8.5	19.0	23.3	26.1	27.2	32.0	35.7	32.0	25.3	28.9	25.2	26.0
104.15	11.8	25.5	31.3	34.7	35.8	42.3	47.4	43.1	34.1	38.4	33.9	34.9
104.16	12.1	26.0	32.0	35.4	36.5	43.2	48.5	44.1	34.9	39.3	34.7	35.7
104.17	12.2	26.3	32.5	36.0	37.2	43.9	49.3	44.7	35.4	40.1	35.3	36.3
104.18	12.4	26.5	32.8	36.3	37.6	44.3	49.8	45.2	35.8	40.5	35.7	36.7
104.19	13.6	28.2	35.6	39.3	40.7	47.9	53.7	48.6	38.8	44.2	38.9	40.3
104.20	14.2	28.8	36.7	40.7	42.1	49.5	55.3	50.1	40.0	45.9	40.4	41.8
104.21	14.3	29.1	37.1	41.2	42.8	50.2	56.2	50.8	40.5	46.7	41.1	42.5
104.22	14.4	29.1	37.2	41.4	43.0	50.4	56.4	50.9	40.6	46.9	41.3	42.6
104.23	14.5	29.2	37.3	41.6	43.4	50.7	56.7	51.0	40.9	47.4	41.7	43.0
104.24	14.7	29.3	37.5	42.0	44.1	51.3	57.3	51.3	41.3	48.2	42.3	43.5
104.25	14.9	29.4	37.7	42.4	44.7	51.8	57.8	51.6	41.6	48.9	42.9	43.9
104.26	15.1	29.6	38.0	42.7	45.3	52.3	58.3	51.9	42.0	49.6	43.5	44.4
104.27	23.8	49.8	62.2	70.4	75.2	85.1	93.1	83.3	67.2	77.9	67.7	69.3
104.28	23.8	49.9	62.3	70.7	75.9	85.6	93.6	83.5	67.5	78.6	68.2	69.9
104.29	23.9	50.0	62.5	71.0	76.4	86.0	94.1	83.7	67.9	79.3	68.8	70.3
104.30	24.0	50.1	62.6	71.2	77.0	86.5	94.6	83.9	68.2	79.9	69.4	70.9
104.31	34.1	57.1	74.5	85.9	96.3	106.0	118.3	101.0	82.1	100.8	89.3	92.0
104.32	34.4	57.2	74.7	86.2	96.9	106.5	118.9	101.4	82.5	101.4	90.0	92.6
104.33	34.7	57.3	74.9	86.5	98.3	107.9	120.3	101.7	83.5	103.3	91.7	93.8
104.34	35.6	57.6	75.4	87.4	100.5	109.9	122.3	102.8	84.9	106.1	94.2	96.5
104.35	35.9	57.7	75.5	87.6	101.0	110.4	122.7	103.0	85.3	106.6	94.8	97.1
104.36	36.6	58.3	76.5	88.6	102.7	112.0	124.5	104.2	86.5	108.6	96.7	99.2
104.37	36.9	58.5	76.8	88.9	103.4	112.7	125.2	104.5	87.1	109.4	97.5	100.1
104.38	37.2	58.7	77.1	89.2	104.2	113.5	126.0	104.9	88.0	110.3	98.5	101.0
104.39	37.3	58.8	77.1	89.2	104.4	113.6	126.1	105.0	88.2	110.5	98.7	101.3
104.40	37.5	59.2	77.4	89.5	105.8	115.0	127.4	105.5	90.2	112.2	100.5	102.7
104.41	37.7	59.5	77.5	89.7	106.5	115.7	127.9	105.9	91.0	113.0	101.3	103.4
104.42	37.9	59.8	77.7	89.9	107.0	116.1	128.3	106.2	91.6	113.5	101.9	104.0
104.43	38.1	60.0	77.8	90.0	107.3	116.5	128.6	106.4	92.2	113.9	102.4	104.4
104.44	38.1	60.1	77.9	90.1	107.9	117.2	129.0	106.9	93.3	114.4	103.2	104.9
105.01	0.3	0.7	0.9	1.0	1.0	1.3	1.3	1.3	1.0	1.0	0.9	0.9
106.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
107.01	0.3	0.7	0.8	0.9	0.9	1.1	1.2	1.2	0.9	0.9	0.8	0.8
107.02	3.1	3.1	3.7	3.3	3.4	3.2	3.3	3.7	2.7	2.7	2.2	2.2
107.03	4.1	4.1	4.7	4.7	4.6	4.4	4.6	5.1	3.7	3.7	3.0	3.0
107.04	4.4	4.5	5.1	5.2	5.3	5.4	5.6	6.0	4.5	4.5	3.6	3.7
107.05	4.6	4.9	5.5	5.7	5.9	6.0	6.2	6.5	4.9	4.9	4.0	4.1
108.01	0.4	1.1	1.2	1.4	1.4	1.6	1.6	1.7	1.3	1.3	1.0	1.0
108.02	0.7	1.8	2.2	2.5	2.6	3.0	3.1	3.1	2.3	2.4	2.0	2.0
108.03	1.3	3.0	3.6	4.0	4.1	4.7	4.9	4.8	3.7	3.8	3.1	3.2
109.01	0.3	0.8	1.0	1.1	1.1	1.3	1.3	1.3	1.0	1.0	0.8	0.8
109.02	0.7	1.6	2.0	2.2	2.3	2.5	2.5	2.6	2.0	2.0	1.6	1.6
110.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
111.01	0.3	0.7	0.8	0.9	1.0	1.2	1.2	1.2	0.9	1.0	0.8	0.8
111.02	0.6	1.2	1.4	1.5	1.7	1.8	1.9	2.0	1.5	1.5	1.2	1.2
112.01	1.0	1.1	1.3	1.1	1.2	1.3	1.3	1.4	1.0	1.0	0.8	0.8
112.02	5.8	6.0	6.8	7.0	5.9	5.6	5.8	6.3	4.6	4.5	3.5	3.6
112.03	8.0	9.1	9.8	10.4	9.7	9.7	10.0	10.7	8.0	7.8	6.2	6.3
112.04	8.7	10.1	10.7	11.4	10.8	11.0	11.3	11.7	8.9	8.8	7.0	7.1
113.01	2.3	2.4	2.9	2.5	2.0	1.9	1.8	1.8	1.2	1.2	0.9	0.9
114.01	1.3	1.3	1.5	1.3	1.1	1.0	1.0	1.0	0.7	0.7	0.6	0.6

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
115.01	0.7	1.0	1.2	1.3	1.5	1.4	1.4	1.5	1.1	1.0	0.8	0.8
116.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
117.01	2.3	2.3	2.6	2.4	1.8	1.6	1.6	1.6	1.2	1.1	0.9	0.9
117.02	4.7	4.1	4.6	4.9	3.6	3.3	3.5	3.7	2.7	2.6	2.1	2.1
117.03	4.8	4.4	4.9	5.3	4.3	4.0	4.2	4.4	3.3	3.2	2.5	2.5
118.01	0.3	0.8	1.0	1.1	1.2	1.4	1.5	1.5	1.1	1.1	0.9	1.0
119.01	2.4	2.4	2.8	2.6	1.8	1.7	1.6	1.6	1.1	1.1	0.8	0.9
120.01	1.0	0.9	1.1	1.0	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2
121.01	0.4	0.9	1.1	1.2	1.3	1.3	1.3	1.4	1.0	1.0	0.8	0.8
121.02	1.8	3.9	4.4	4.8	5.3	5.3	5.3	5.5	4.1	4.1	3.2	3.2
121.03	2.4	5.0	5.5	6.0	6.7	6.6	6.7	6.8	5.1	5.1	4.0	4.0
121.04	2.7	5.8	6.5	7.1	7.9	7.9	8.0	8.0	6.1	6.0	4.8	4.8
121.05	3.2	7.0	8.0	8.8	9.6	10.1	10.3	10.1	7.8	7.9	6.3	6.4
121.06	6.4	14.5	17.0	18.8	20.1	21.8	22.6	21.8	16.9	17.3	14.1	14.3
121.07	6.8	15.4	18.2	20.2	21.5	23.4	24.3	23.3	18.1	18.7	15.3	15.5
121.08	8.1	18.3	22.0	24.4	25.8	28.7	30.1	28.1	22.1	23.2	19.2	19.6
121.09	8.3	18.7	22.6	25.1	26.5	29.5	31.1	28.8	22.7	24.1	20.0	20.3
121.10	8.6	19.0	23.1	25.7	27.2	30.3	32.0	29.4	23.2	24.8	20.7	21.1
121.11	8.8	19.4	23.7	26.4	28.1	31.3	33.1	30.2	23.9	25.9	21.7	22.1
121.12	9.1	19.7	24.2	27.0	28.9	32.1	34.0	30.7	24.4	26.7	22.5	22.9
121.13	9.2	19.9	24.5	27.5	29.5	32.8	34.8	31.1	24.9	27.5	23.2	23.7
121.14	9.4	20.2	24.9	28.0	30.2	33.5	35.5	31.5	25.3	28.2	23.9	24.4
122.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
122.02	0.9	2.0	2.2	2.5	2.7	2.7	2.7	2.8	2.1	2.1	1.6	1.6
123.01	0.2	0.6	0.7	0.8	0.8	1.0	1.2	1.1	0.8	0.9	0.8	0.8
124.01	0.4	0.9	1.1	1.2	1.3	1.5	1.5	1.5	1.2	1.2	0.9	1.0
124.02	1.4	3.2	3.7	4.1	4.5	4.5	4.6	4.8	3.6	3.6	2.8	2.9
124.03	1.8	4.0	4.7	5.2	5.6	5.9	6.0	6.1	4.6	4.6	3.7	3.7
124.04	2.1	4.8	5.7	6.2	6.8	7.1	7.2	7.3	5.5	5.6	4.5	4.5
124.05	2.9	6.8	8.1	9.0	9.5	10.4	10.7	10.4	8.1	8.2	6.7	6.8
125.01	0.4	1.0	1.1	1.2	1.3	1.3	1.3	1.4	1.1	1.0	0.8	0.8
126.01	0.3	0.8	1.0	1.1	1.2	1.3	1.3	1.3	1.0	1.0	0.8	0.8
127.01	0.2	0.6	0.8	0.9	0.9	1.1	1.2	1.1	0.9	0.9	0.8	0.8
127.02	0.6	1.5	1.9	2.2	2.2	2.7	3.0	2.9	2.2	2.3	2.0	2.0
127.03	0.8	2.2	2.7	3.1	3.1	3.9	4.2	4.0	3.1	3.3	2.8	2.8
128.01	5.4	5.4	6.4	5.7	4.2	4.0	3.7	3.8	2.7	2.6	2.0	2.0
128.02	6.1	6.0	6.8	6.4	4.6	4.4	4.2	4.4	3.1	3.0	2.3	2.3
128.03	10.2	9.9	10.8	11.1	7.8	7.3	7.4	7.9	5.7	5.6	4.4	4.4
128.04	10.5	10.5	11.4	11.8	8.6	8.2	8.7	9.1	6.7	6.7	5.4	5.4
128.05	11.0	11.1	12.1	12.4	9.6	9.3	9.9	10.1	7.5	7.6	6.2	6.2
128.06	17.6	22.5	23.3	24.0	21.2	21.5	22.2	22.0	16.8	16.9	13.7	13.8
128.07	17.7	22.9	23.8	24.5	21.6	22.1	22.8	22.4	17.2	17.3	14.0	14.2
128.08	18.0	23.5	24.5	25.3	22.2	22.9	23.6	23.0	17.7	17.8	14.5	14.7
128.09	18.2	24.2	25.3	26.2	23.0	24.0	24.8	23.9	18.4	18.7	15.2	15.5
128.10	21.0	30.1	31.6	32.8	30.6	31.6	32.4	31.4	24.2	24.8	20.3	20.6
128.11	21.2	30.5	32.2	33.4	31.1	32.2	33.0	31.9	24.7	25.4	20.9	21.2
128.12	21.5	31.1	33.1	34.4	31.9	33.2	34.2	32.5	25.3	26.3	21.9	22.2
129.01	3.9	3.9	4.3	4.0	2.5	2.4	2.3	2.5	1.8	1.7	1.3	1.3
131.01	2.6	2.7	3.1	2.8	2.0	1.9	1.7	1.8	1.2	1.2	0.9	0.9
131.02	5.4	4.6	5.2	5.8	4.6	4.3	4.0	4.1	2.9	2.8	2.1	2.2
131.03	6.4	6.8	6.7	7.5	6.4	5.9	5.8	6.1	4.3	4.2	3.2	3.2
131.04	7.1	7.8	7.7	8.5	7.8	7.3	7.2	7.5	5.5	5.4	4.2	4.2
131.05	7.8	9.0	8.8	9.7	9.0	8.7	8.6	8.9	6.7	6.5	5.0	5.1
131.06	8.2	10.0	9.8	10.9	10.1	10.0	9.9	10.1	7.6	7.4	5.8	5.9
133.01	4.4	4.1	4.5	4.3	2.4	2.0	1.8	1.9	1.3	1.2	1.0	1.0
133.02	7.1	7.2	7.8	8.0	4.8	4.3	4.3	4.5	3.2	3.1	2.5	2.5
133.03	8.4	9.1	9.4	10.4	6.9	6.4	6.4	6.8	4.9	4.7	3.7	3.8
133.04	9.0	10.1	10.5	11.4	8.4	7.6	7.6	7.9	5.8	5.7	4.5	4.5
134.01	2.3	2.2	2.4	2.3	1.3	1.1	1.1	1.2	0.8	0.8	0.7	0.7
135.01	1.6	1.5	1.7	1.6	0.9	0.8	0.8	0.8	0.5	0.5	0.4	0.4
137.01	1.6	1.5	1.8	1.6	1.2	1.0	0.9	0.9	0.6	0.6	0.4	0.4
139.01	3.3	3.3	3.6	3.4	2.0	1.9	1.8	1.8	1.3	1.2	1.0	1.0
140.01	4.1	4.1	4.9	4.4	3.0	2.6	2.4	2.4	1.6	1.6	1.2	1.2
141.01	2.3	2.3	2.8	2.5	1.9	1.8	1.6	1.7	1.2	1.1	0.9	0.9
141.02	5.0	5.7	6.4	6.6	5.2	4.9	4.7	5.0	3.6	3.5	2.7	2.7

Developed Condition Discharges With Detention - 2 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
142.01	2.0	2.0	2.3	2.1	1.3	1.3	1.3	1.5	1.1	1.1	0.8	0.9
144.01	0.3	0.7	0.8	0.9	0.9	1.2	1.3	1.2	0.9	1.0	0.8	0.8
144.02	0.5	1.3	1.6	1.8	1.8	2.3	2.4	2.4	1.8	1.9	1.6	1.6
145.01	1.1	1.5	1.7	1.7	2.1	1.8	1.7	1.8	1.3	1.2	0.9	0.9
147.01	2.8	2.9	3.6	3.1	2.5	2.2	2.0	2.0	1.4	1.3	1.0	1.0
147.02	4.8	5.0	6.2	5.5	5.4	5.0	4.6	4.7	3.3	3.1	2.4	2.4
149.01	0.9	1.0	1.2	1.0	0.8	0.8	0.7	0.7	0.5	0.5	0.4	0.4
149.02	1.1	1.3	1.6	1.5	1.3	1.2	1.1	1.1	0.8	0.7	0.6	0.6
151.01	2.6	6.6	9.6	12.1	19.6	21.6	27.4	27.2	24.2	26.7	27.4	27.7
151.02	6.5	16.6	24.4	30.9	46.0	50.6	64.7	61.0	53.3	62.2	61.3	63.1
151.03	13.8	35.2	51.7	65.3	96.4	105.7	135.5	127.2	111.0	130.5	127.7	131.9
151.04	16.0	40.7	59.8	75.4	113.2	125.0	159.4	152.7	133.7	153.4	153.9	156.8
151.05	17.7	44.7	65.6	82.6	123.3	136.9	174.0	166.3	146.6	166.9	168.7	171.2
151.06	37.1	91.8	132.5	164.5	238.5	263.9	338.8	323.0	286.8	323.0	331.6	339.4
151.07	49.4	121.5	173.7	213.9	305.7	339.7	435.1	407.9	371.0	408.9	426.2	429.3
151.08	63.9	156.3	221.0	270.6	387.0	429.7	547.5	511.3	472.0	512.4	541.1	538.8
152.01	3.2	8.3	12.1	15.4	24.0	26.2	33.7	32.7	28.7	33.0	32.7	33.7
153.01	2.1	5.2	7.6	9.5	16.3	19.3	23.4	26.6	25.2	22.5	27.9	26.5
153.02	3.7	9.1	13.3	16.9	27.4	31.3	39.0	41.7	38.6	38.0	43.5	42.7
153.03	12.6	31.5	45.9	57.8	81.6	89.6	116.0	106.1	93.8	110.9	108.3	114.7
153.04	18.1	45.0	64.8	79.8	113.0	123.9	161.4	152.8	137.2	153.3	158.0	164.1
154.01	3.8	9.7	14.5	18.4	25.1	27.5	35.0	29.7	27.0	33.6	30.0	32.7
155.01	3.1	8.1	11.6	13.7	16.6	18.4	23.0	20.4	14.5	19.4	17.7	18.9
156.01	2.9	7.4	10.8	13.7	21.4	23.4	30.1	29.0	25.5	29.4	29.1	29.9
156.02	6.2	16.0	23.1	28.5	39.2	43.2	55.9	50.0	44.2	53.3	50.4	53.5
157.01	2.1	5.2	7.7	9.6	16.1	18.8	23.0	25.0	23.2	22.3	25.8	24.9
157.02	5.5	14.0	20.5	25.9	40.0	44.3	56.6	56.2	50.8	54.6	57.5	57.8
157.03	9.8	24.9	36.0	44.9	63.1	69.0	89.8	83.8	74.3	85.6	85.1	88.6
158.01	3.6	9.3	13.8	17.6	27.2	29.8	38.6	37.6	32.8	37.8	37.4	38.7

Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
1.01	43.7	77.0	94.6	103.9	103.7	114.6	116.9	108.9	86.8	96.7	89.7	93.6
1.02	83.3	144.7	179.9	200.5	204.7	223.9	228.0	208.2	167.8	194.1	177.5	186.8
1.03	132.6	233.6	294.4	331.2	359.3	382.5	426.4	377.5	302.5	373.8	344.0	365.0
1.04	168.4	295.3	373.7	426.1	469.3	498.9	550.8	479.4	391.1	488.1	449.6	472.1
1.05	189.4	331.4	421.4	483.1	544.1	577.8	639.3	546.5	456.2	568.8	529.0	549.6
1.06	280.0	481.8	608.8	705.9	829.7	888.6	966.4	799.2	719.8	872.9	823.9	836.6
1.07	299.2	504.1	634.0	732.9	882.9	945.8	1023	868.6	785.0	926.9	891.9	895.1
1.08	315.3	521.5	654.6	757.5	952.8	1028	1088	989.9	896.9	996.7	999.6	975.5
1.09	648.0	1051	1325	1543	1948	2061	2237	1967	1844	2058	2047	2031
1.10	663.5	1072	1352	1574	1997	2117	2290	2035	1907	2112	2113	2089
1.11	675.3	1087	1370	1596	2042	2171	2338	2111	1984	2164	2188	2148
1.12	684.4	1098	1383	1612	2075	2214	2378	2171	2048	2205	2248	2196
1.13	697.9	1115	1403	1634	2125	2282	2442	2280	2185	2284	2371	2282
1.14	697.9	1115	1403	1634	2125	2283	2443	2281	2188	2285	2374	2283
1.15	697.9	1115	1403	1634	2125	2283	2443	2282	2189	2287	2376	2284
1.16	697.9	1115	1403	1634	2125	2283	2443	2283	2191	2288	2377	2285
1.17	697.9	1115	1403	1634	2125	2283	2444	2284	2192	2288	2378	2285
1.18	1478	2398	3014	3478	4371	4673	5067	4618	4369	4701	4822	4694
1.19	1478	2398	3014	3478	4371	4674	5067	4618	4369	4702	4823	4695
1.20	1478	2398	3014	3478	4371	4674	5067	4618	4370	4703	4824	4695
1.21	1478	2398	3014	3478	4372	4675	5068	4621	4374	4705	4828	4697
1.22	1478	2398	3014	3478	4372	4675	5069	4622	4375	4706	4830	4698
1.23	1478	2398	3014	3478	4372	4677	5070	4625	4380	4710	4836	4701
1.24	1478	2398	3014	3478	4373	4678	5072	4629	4387	4715	4843	4705
1.25	1478	2399	3014	3478	4375	4683	5076	4640	4402	4725	4860	4713
1.26	1478	2399	3014	3479	4375	4684	5078	4643	4406	4729	4866	4716
1.27	1478	2399	3014	3479	4376	4684	5078	4644	4408	4731	4869	4717
1.28	1478	2399	3014	3479	4376	4684	5078	4645	4409	4732	4870	4718
1.29	1478	2399	3014	3479	4376	4685	5079	4647	4413	4734	4874	4720
1.30	1478	2399	3014	3479	4376	4685	5080	4648	4413	4735	4875	4720
1.31	1478	2399	3014	3479	4376	4685	5080	4648	4413	4735	4875	4720
1.32	1478	2399	3015	3479	4379	4692	5087	4666	4443	4760	4915	4737
1.33	1478	2399	3015	3479	4379	4692	5087	4667	4444	4762	4917	4738
1.34	1478	2399	3015	3479	4379	4692	5087	4667	4445	4762	4918	4738
1.35	1478	2399	3015	3479	4379	4692	5087	4667	4446	4763	4919	4739
1.36	1574	2533	3179	3675	4796	5190	5548	5389	5191	5257	5651	5279
1.37	1574	2533	3179	3675	4796	5191	5549	5390	5193	5258	5653	5280
1.38	1574	2533	3179	3675	4796	5191	5549	5390	5194	5259	5654	5280
1.39	1574	2533	3179	3675	4796	5191	5550	5392	5197	5262	5658	5282
1.40	1574	2533	3179	3675	4796	5191	5550	5392	5199	5264	5660	5283
1.41	1574	2534	3180	3676	4799	5200	5559	5412	5236	5295	5700	5302
1.42	1574	2534	3180	3676	4800	5200	5559	5413	5239	5297	5703	5303
1.43	1574	2534	3180	3676	4800	5200	5559	5413	5239	5298	5704	5303
1.44	1574	2534	3180	3676	4800	5200	5559	5414	5240	5299	5705	5304
1.45	1574	2534	3180	3676	4800	5200	5559	5414	5240	5300	5705	5304
1.46	1577	2537	3184	3680	4810	5218	5577	5450	5303	5352	5766	5338
1.47	1577	2537	3184	3680	4810	5218	5577	5450	5305	5355	5767	5339
1.48	1577	2537	3184	3680	4810	5219	5578	5451	5307	5358	5770	5341
1.49	1577	2537	3184	3680	4810	5219	5578	5451	5309	5360	5771	5341
1.50	1577	2537	3184	3680	4811	5219	5578	5452	5312	5364	5773	5343
1.51	1577	2537	3184	3681	4811	5220	5580	5457	5329	5387	5791	5353
1.52	1577	2537	3184	3681	4811	5221	5581	5459	5336	5399	5797	5358
1.53	1577	2537	3184	3681	4811	5221	5581	5459	5337	5400	5797	5359
1.54	1577	2537	3184	3681	4811	5221	5581	5459	5338	5402	5798	5359
1.55	1577	2537	3184	3681	4811	5221	5581	5459	5339	5403	5799	5360
1.56	1577	2537	3184	3681	4811	5221	5581	5460	5340	5406	5800	5361
1.57	1577	2537	3184	3681	4811	5221	5582	5460	5344	5413	5803	5364
1.58	1577	2538	3184	3681	4811	5221	5582	5461	5347	5417	5805	5366
1.59	1577	2538	3184	3681	4812	5222	5583	5462	5357	5434	5812	5373
1.60	1577	2538	3184	3681	4812	5222	5583	5462	5358	5435	5812	5373
1.61	1577	2538	3184	3681	4812	5222	5583	5462	5360	5439	5814	5375
1.62	1577	2538	3184	3681	4812	5222	5583	5463	5360	5439	5814	5375
1.63	1579	2539	3186	3684	4825	5255	5615	5541	5494	5542	5939	5444
1.64	1580	2540	3187	3685	4827	5260	5620	5550	5523	5586	5966	5466
1.65	1731	2741	3422	3950	5292	5867	6218	6563	6778	6542	7168	6337
2.01	23.1	41.8	54.9	66.2	81.2	84.8	97.2	82.3	77.6	91.1	83.0	90.0

Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
3.01	26.8	48.1	64.1	76.9	94.4	98.7	112.9	96.2	89.9	105.7	96.2	104.5
3.02	61.9	110.0	141.4	164.7	187.3	196.2	227.2	198.0	168.7	205.6	188.2	201.4
3.03	149.8	262.8	340.0	391.5	440.7	464.0	518.1	446.9	375.7	467.6	428.5	452.8
3.04	196.5	327.4	404.8	460.9	526.5	556.2	627.4	536.3	455.6	561.8	521.4	543.8
3.05	234.3	383.3	469.8	533.9	605.2	644.7	725.0	610.2	530.1	653.0	609.1	627.6
3.06	264.4	427.8	525.2	599.5	673.6	719.9	805.9	671.6	593.1	732.6	683.6	704.3
3.07	290.4	466.5	570.6	654.0	738.5	791.9	880.9	731.5	659.6	800.0	755.2	772.2
4.01	35.3	62.7	82.1	92.4	101.3	107.0	115.4	104.3	83.2	100.6	92.9	99.9
5.01	22.1	39.9	52.3	62.5	75.4	78.9	90.0	77.0	71.0	84.1	76.3	83.0
5.02	67.3	120.4	158.3	186.7	225.8	235.8	269.4	230.6	208.6	248.6	227.2	243.5
11.01	70.8	120.6	134.3	144.7	140.1	151.8	144.0	140.0	110.4	115.2	100.9	103.0
11.02	142.1	223.7	256.2	276.5	272.0	300.2	331.4	305.9	239.8	280.2	257.5	270.5
11.03	300.4	491.0	595.7	664.9	703.0	747.6	786.1	667.5	564.3	694.0	634.9	653.2
11.04	328.2	534.7	650.5	729.4	787.2	831.8	872.2	729.3	633.6	771.7	713.2	728.9
11.05	344.5	563.4	688.4	775.9	850.9	900.3	948.4	793.1	697.1	841.5	785.6	799.2
11.06	390.5	633.0	779.1	884.4	1004	1057	1101	933.2	842.1	984.0	938.5	943.2
11.07	415.0	669.5	825.2	939.7	1088	1142	1181	1020	925.6	1064	1024	1023
11.08	433.4	697.2	858.9	981.0	1155	1212	1243	1094	996.9	1127	1099	1087
11.09	449.3	721.7	888.4	1016.6	1215	1276	1298	1164	1063	1184	1168	1148
11.10	468.9	749.5	921.9	1058.1	1287	1359	1367	1259	1152	1256	1260	1228
11.11	814.1	1334	1693	1953	2432	2584	2683	2431	2226	2468	2495	2438
11.12	814.3	1334	1693	1953	2435	2590	2687	2443	2236	2473	2505	2444
11.13	814.3	1334	1693	1953	2436	2591	2688	2445	2238	2474	2506	2445
12.01	45.7	67.1	69.3	73.3	75	66	60	63	49	48	39	39
13.01	46.6	82	100	109	106	119	120	112	89	98	91	94
13.02	80.7	141	175	198	204	223	228	206	167	196	179	187
14.01	45.2	80	97	107	105	117	119	111	88	98	90	94
15.01	25.9	46.7	61.6	72.2	82.7	86.2	96.7	84.7	71.8	87.8	79.5	86.8
16.01	27.2	49.0	65.2	77.3	90.9	94.9	107.5	93.3	82.7	99.5	89.9	98.4
16.02	58.6	104.9	134.5	156.0	176.5	184.9	210.6	184.1	153.3	189.2	172.8	184.5
16.03	153.5	275.0	358.0	416.3	483.7	506.3	583.8	499.7	444.4	534.7	497.1	532.9
16.04	176.1	312.8	407.3	470.5	556.1	583.0	667.3	564.8	509.5	606.3	573.0	604.4
16.05	256.4	449.6	580.9	668.9	792.6	832.1	944.3	797.9	716.2	851.2	810.4	843.6
16.06	307.0	535.2	682.5	784.0	947.1	998.3	1126	943.4	858.3	1008	976.9	995.5
16.07	341.7	591.9	745.5	853.6	1050	1114	1244	1067	966	1117	1101	1101
16.08	359.9	617.2	771.7	881.9	1099	1172	1299	1138	1029	1171	1170	1154
17.01	10.1	18.3	24.3	29.5	46.7	51.8	60.2	62.6	60.6	58.2	65.2	62.9
18.01	30.9	55.5	72.9	81.9	90.9	95.9	104	93.5	74.7	91.3	83.9	90.5
19.01	28.2	50.8	67.1	76.8	86.7	90	100	89	72	89	81	88
20.01	32.5	58.1	76.4	86.2	96	101	110	99	78	96	88	95
20.02	54.0	96.3	126.4	146.3	169.1	176.9	198.2	173.6	145.2	179.1	163.7	173.8
21.01	26.4	47.4	63.0	75.1	88.8	92.7	105.3	90.9	81.5	97.7	88.3	96.5
22.01	3.2	4.1	4.7	4.6	4.3	3.8	3.3	3.5	2.5	2.5	2.0	2.0
22.02	9.0	12.0	12.2	12.7	12.7	11.3	9.9	10.3	7.9	7.7	6.1	6.3
22.03	10.7	14.6	15.0	15.6	15.9	14.3	12.8	13.3	10.3	10.2	8.3	8.5
22.04	12.8	17.9	18.5	19.2	19.2	17.5	15.8	16.0	12.5	12.5	10.2	10.4
23.01	3.4	4.3	4.4	4.7	4.5	3.9	3.4	3.7	2.7	2.6	2.1	2.1
25.01	3.0	4.0	4.1	4.3	4.2	3.6	3.2	3.4	2.5	2.5	2.0	2.0
25.02	5.7	8.0	8.1	8.4	8.3	7.1	6.4	6.7	5.1	5.0	3.9	4.0
25.03	8.4	11.6	11.9	12.7	12.7	10.9	9.8	10.4	8.0	7.8	6.2	6.3
27.01	6.0	6.8	7.9	7.1	5.0	4.1	3.7	3.7	2.6	2.5	2.0	2.0
27.02	20.7	24.2	25.9	27.5	17.3	14.2	12.7	12.9	9.0	8.7	6.9	7.0
27.03	25.0	29.5	30.7	32.8	22.0	18.3	16.2	16.7	11.8	11.4	9.0	9.2
27.04	29.0	34.1	35.0	37.5	26.4	21.8	19.5	19.9	14.2	13.8	10.9	11.1
28.01	8.0	8.5	9.7	8.9	5.3	4.1	3.7	3.7	2.6	2.5	2.0	2.0
29.01	2.0	2.3	2.5	2.3	1.4	1.0	0.9	0.9	0.6	0.6	0.5	0.5
30.01	57.5	81.1	82.6	86.1	87.7	75.7	67.5	71.3	54.3	53.1	42.4	43.1
34.01	53.0	71.7	73.3	76.5	75.2	64.7	56.9	60.2	45.2	44.1	34.8	35.5
36.01	32.2	49.5	52.4	55.9	56.1	51.2	47.2	48.7	38.2	38.0	31.1	31.6
40.01	12.3	12.7	13.8	13.4	7.0	5.2	4.7	4.8	3.3	3.2	2.6	2.6
40.02	15.3	15.5	16.6	17.2	9.5	7.3	6.5	6.6	4.6	4.4	3.5	3.6
40.03	9.2	9.6	10.9	10.1	6.5	5.4	4.8	4.9	3.5	3.4	2.7	2.7
40.04	12.5	14.4	15.6	16.7	11.6	10.2	9.0	9.4	6.8	6.6	5.2	5.3
40.05	4.0	4.5	5.4	4.8	3.4	2.8	2.5	2.5	1.8	1.7	1.4	1.4
40.06	24.2	27.8	30.5	33.2	23.2	19.9	17.7	18.2	13.0	12.6	10.0	10.1
42.01	4.1	5.1	6.3	6.2	4.1	3.2	2.9	2.9	2.0	2.0	1.5	1.6

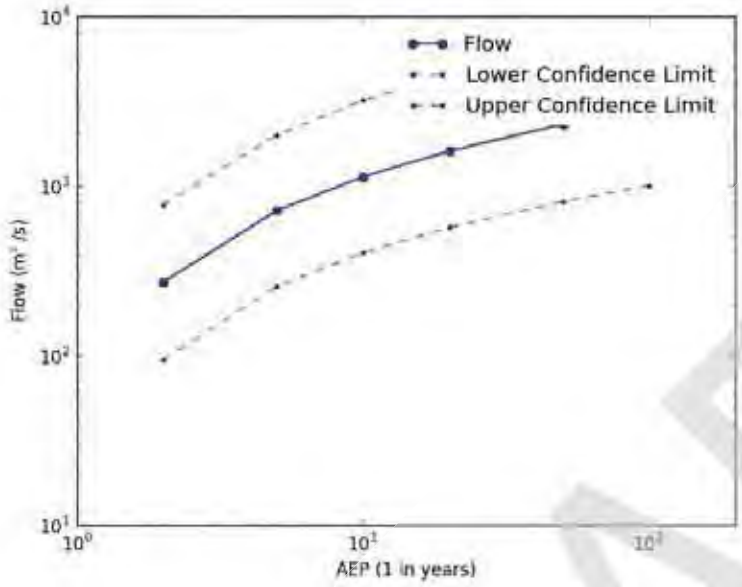
Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
43.01	6.3	7.6	9.5	9.1	6.4	5.2	4.7	4.7	3.3	3.2	2.5	2.5
50.01	104.4	178.0	199.3	215.6	207.9	226.4	215.5	209.0	164.9	172.8	151.8	155.3
50.02	138.7	238.4	277.4	301.7	288.6	325.9	321.1	302.8	241.3	263.5	236.1	245.3
50.03	191.8	310.2	367.3	401.3	397.9	432.7	425.1	393.2	319.2	361.9	322.1	334.9
50.04	233.4	378.5	456.1	508.2	516.0	554.5	550.0	489.2	406.3	478.2	426.0	442.4
50.05	314.7	511.9	624.1	709.3	750.0	792.5	791.3	677.6	577.9	701.8	633.6	658.8
50.06	328.5	528.3	645.1	736.4	815.0	856.1	849.5	718.3	645.6	758.6	704.6	714.5
50.07	342.4	545.1	667.4	761.9	876.4	916.7	906.7	782.0	717.1	811.7	774.6	775.3
50.08	360.5	568.5	697.8	793.0	945.1	982.8	968.5	857.8	791.7	877.9	850.1	841.0
50.09	395.6	614.8	757.9	868.0	1080	1114	1094	1006	936.3	1017	999.8	994.5
51.01	40.0	70.4	88.2	97.7	101.6	109.6	114.7	105.6	84.3	96.6	89.9	94.8
52.01	39.3	69.4	87.4	97.1	101.7	109.2	114.7	105.4	84.1	97.1	90.3	95.5
54.01	2.6	3.6	3.7	3.8	3.9	3.4	3.0	3.2	2.4	2.4	1.9	1.9
56.01	6.0	7.6	8.6	8.8	5.7	4.4	4.0	4.0	2.8	2.7	2.1	2.1
69.01	79.9	126.5	136.5	146.2	144.6	137.5	128.5	130.4	102.5	103.2	85.9	87.5
70.01	11.2	18.2	19.9	21.2	20.9	20.5	19.3	19.4	15.2	15.4	13.0	13.3
76.01	4.1	5.8	5.9	6.2	6.2	5.4	4.7	5.0	3.8	3.7	2.9	3.0
76.02	6.8	9.7	9.9	10.4	10.3	9.0	8.0	8.3	6.4	6.3	5.0	5.1
79.01	7.9	8.2	8.9	8.6	4.4	3.3	3.0	3.0	2.1	2.0	1.6	1.6
79.02	16.8	16.5	16.5	18.9	10.8	8.2	7.3	7.4	5.2	5.0	4.0	4.0
79.03	4.5	4.6	5.0	4.8	2.5	1.9	1.7	1.7	1.2	1.2	0.9	1.0
80.01	23.3	26.6	24.6	24.5	18.2	14.0	12.5	12.7	8.8	8.6	6.8	6.9
80.02	26.3	31.0	29.5	29.9	22.9	18.5	16.5	16.9	11.9	11.6	9.2	9.3
80.04	30.6	35.6	33.1	34.1	26.9	22.2	19.8	20.3	14.4	14.0	11.1	11.3
80.05	47.8	55.1	56.6	59.3	42.9	36.0	32.2	33.0	23.7	23.0	18.3	18.6
81.01	15.0	15.6	17.4	16.3	9.8	7.8	7.0	7.1	5.0	4.9	3.9	3.9
81.02	18.7	20.4	21.6	23.3	14.8	12.4	11.0	11.4	8.1	7.9	6.3	6.4
82.01	4.0	4.6	5.5	4.9	4.0	3.6	3.2	3.3	2.4	2.3	1.8	1.9
82.02	9.7	12.4	13.6	14.4	10.3	8.9	7.9	8.1	5.7	5.6	4.4	4.5
83.01	5.1	5.6	6.6	5.9	4.3	3.7	3.3	3.4	2.4	2.3	1.8	1.9
83.02	53.7	62.2	63.6	66.5	50.6	42.5	38.0	38.9	28.4	27.7	22.1	22.5
83.03	73.3	87.3	89.5	93.9	74.3	63.0	56.2	57.5	42.4	41.5	33.2	33.8
83.04	75.8	91.2	93.6	98.3	78.0	66.7	59.7	60.3	44.9	44.1	35.4	36.0
83.05	77.6	94.2	96.6	101.8	80.7	69.9	62.8	62.3	47.0	46.4	37.4	38.1
83.06	78.9	96.7	99.1	104.7	82.9	72.8	65.6	64.0	48.9	48.5	39.3	40.0
83.08	2.4	2.8	3.6	3.4	2.5	2.1	1.8	1.9	1.3	1.3	1.0	1.0
84.01	5.9	6.9	8.2	7.4	5.2	4.2	3.8	3.8	2.7	2.6	2.0	2.1
84.02	9.6	11.9	13.0	14.1	9.6	8.2	7.3	7.5	5.2	5.0	4.0	4.0
84.03	13.6	16.8	17.4	18.9	14.0	12.1	10.7	11.1	7.8	7.6	6.0	6.1
84.04	15.8	19.7	20.3	21.8	17.6	15.1	13.5	13.9	10.2	9.9	7.9	8.0
85.01	2.6	3.6	3.6	3.8	3.8	3.3	3.0	3.1	2.4	2.3	1.9	1.9
85.02	5.5	5.9	7.0	6.2	5.4	4.9	4.4	4.8	3.6	3.6	2.9	3.0
85.03	9.7	11.8	12.8	13.3	9.4	8.6	7.7	8.2	6.0	5.9	4.7	4.8
86.01	2.4	2.7	3.1	2.8	2.2	2.0	1.8	1.9	1.4	1.3	1.1	1.1
87.01	4.7	5.1	6.0	5.4	3.7	3.0	2.6	2.7	1.9	1.8	1.4	1.5
87.02	1.8	2.2	2.7	2.6	1.9	1.6	1.4	1.4	1.0	1.0	0.8	0.8
88.01	9.1	9.9	11.2	10.3	6.5	5.1	4.6	4.6	3.2	3.1	2.5	2.5
88.02	11.5	12.0	13.5	12.6	7.8	6.2	5.6	5.7	4.0	3.9	3.1	3.1
88.03	28.6	31.5	35.9	34.0	23.1	20.0	18.0	18.9	13.5	13.3	10.7	10.9
88.04	34.0	38.5	42.9	41.9	29.1	24.6	22.3	23.0	16.7	16.4	13.2	13.5
89.01	3.7	4.1	4.9	4.4	3.1	2.6	2.3	2.3	1.6	1.6	1.3	1.3
89.02	11.2	13.2	14.9	15.0	11.1	9.7	8.5	8.9	6.4	6.2	4.9	5.0
89.03	17.3	20.7	21.7	23.4	17.0	14.6	12.9	13.4	9.6	9.4	7.4	7.5
90.01	5.1	5.5	6.5	5.8	4.4	3.9	3.4	3.6	2.5	2.5	2.0	2.0
90.02	1.6	1.9	2.3	2.1	1.5	1.2	1.0	1.0	0.7	0.7	0.6	0.6
91.01	3.5	4.3	5.3	5.0	3.6	2.9	2.6	2.7	1.8	1.8	1.4	1.4
93.01	5.8	6.4	7.4	6.7	5.0	4.5	4.0	4.1	3.0	2.9	2.3	2.3
94.01	6.5	7.8	9.1	8.1	5.3	4.1	3.7	3.7	2.5	2.5	1.9	2.0
95.01	7.1	8.0	9.3	8.3	6.2	5.3	4.7	4.8	3.4	3.3	2.6	2.7
95.02	9.4	11.0	12.4	12.0	8.5	7.1	6.3	6.5	4.6	4.5	3.5	3.6
96.01	43.9	58.9	60.4	63.1	61.6	52.9	46.7	49.3	37.0	36.0	28.5	29.0
103.01	3.9	4.3	5.0	4.5	3.3	2.8	2.5	2.6	1.8	1.8	1.4	1.4
103.02	10.9	12.3	14.6	13.2	9.5	7.9	7.0	7.2	5.0	4.9	3.9	3.9
104.01	4.5	6.7	6.9	7.3	7.5	6.5	5.9	6.2	4.8	4.7	3.8	3.9
104.02	6.8	10.2	10.7	11.4	11.5	10.3	9.5	9.7	7.6	7.6	6.2	6.3
104.03	10.4	15.8	16.7	17.8	17.8	16.4	15.3	15.5	12.2	12.3	10.2	10.4

Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
104.04	16.2	23.9	24.9	26.4	26.5	24.4	22.6	22.7	17.9	18.0	14.9	15.2
104.05	18.4	27.0	28.2	29.8	29.9	27.6	25.5	25.4	20.1	20.3	16.8	17.1
104.06	21.7	31.6	33.1	34.9	34.7	32.6	30.1	29.5	23.5	23.8	19.9	20.2
104.07	24.7	36.1	37.9	40.2	39.3	37.5	34.6	33.5	26.8	27.4	22.9	23.3
104.08	26.4	39.0	41.0	43.4	42.3	41	37.6	36	29.0	29.6	24.9	25.4
104.09	39.0	57.8	60.6	64.6	63.2	60	55.7	55	43.5	44.2	37.0	37.7
104.10	50.7	82.4	88.2	93.6	91.0	89	82.9	79	63.1	65.4	55.5	56.7
104.11	51.9	84.6	90.8	96.3	93.6	91.7	85.5	81.7	65.0	67.4	57.4	58.6
104.12	52.2	85.5	92.4	98.3	95.1	94.0	87.6	83.1	66.3	69.2	59.1	60.5
104.13	54.2	89.2	97.4	103.7	99.9	99.7	92.9	87.4	70.0	73.5	63.2	64.6
104.14	54.2	89.3	97.5	103.8	100.0	99.9	93.1	87.5	70.0	73.7	63.4	64.8
104.15	68.4	110.4	124.4	132.7	126.5	131.0	122.7	114.2	92.4	97.8	84.6	86.5
104.16	70.1	112.0	126.7	135.2	128.8	133.7	125.3	116.4	94.3	99.8	86.4	88.3
104.17	70.9	113.3	128.6	137.1	130.9	135.9	127.5	118.2	95.8	101.8	88.1	90.1
104.18	71.6	113.8	129.5	138.1	131.9	137.2	128.7	119.1	96.7	102.9	89.1	91.2
104.19	76.9	117.9	136.8	146.1	140.0	146.9	138.1	127.0	103.6	111.6	97.7	100.0
104.20	78.4	119.1	139.4	149.3	144.0	151.0	142.0	130.1	106.3	115.6	101.4	104.0
104.21	79.3	120.3	141.0	151.2	146.1	153.2	144.1	131.9	107.8	117.6	103.2	105.7
104.22	79.4	120.4	141.2	151.6	146.7	153.7	144.6	132.1	108.1	118.1	103.7	106.2
104.23	79.4	120.5	141.4	152.2	147.9	154.6	145.5	132.4	108.7	119.3	104.7	107.1
104.24	79.7	120.7	141.9	153.3	149.7	156.1	146.9	133.0	109.7	121.1	106.3	108.6
104.25	79.9	120.8	142.2	154.3	151.4	157.5	148.2	133.5	110.5	122.8	107.8	110.2
104.26	80.2	121.1	142.7	155.2	153.0	158.9	149.5	134.1	111.4	124.5	109.3	111.8
104.27	138.9	204.0	225.5	241.7	240.1	246.8	232.5	209.7	173.5	193.6	169.1	173.7
104.28	139.0	204.2	226.1	242.7	241.8	248.2	233.8	210.1	174.3	195.3	170.7	175.2
104.29	139.1	204.4	226.5	243.7	243.4	249.4	235.1	210.4	175.0	197.0	172.1	176.6
104.30	139.3	204.7	227.1	244.7	244.9	250.7	236.3	210.8	175.8	198.6	173.6	178.0
104.31	150.4	229.2	273.9	293.6	290.3	302.0	289.0	251.1	213.4	247.2	222.9	229.2
104.32	150.6	229.5	274.5	294.8	291.9	303.4	290.4	251.8	214.4	248.8	224.5	230.8
104.33	150.7	229.7	275.0	297.3	295.9	307.0	293.7	252.6	216.8	253.8	228.6	234.1
104.34	151.0	230.5	276.6	301.0	301.9	312.1	298.5	254.5	220.2	260.4	234.4	241.3
104.35	151.1	230.7	276.9	301.7	303.4	313.3	299.7	255.1	221.0	261.8	235.8	242.7
104.36	151.8	232.0	279.1	304.9	308.2	317.6	303.7	258.8	224.0	266.7	240.5	247.9
104.37	151.9	232.3	279.6	305.8	310.2	319.3	305.3	259.8	225.2	268.6	242.5	250.0
104.38	152.0	232.5	280.1	306.7	312.6	321.5	307.3	260.7	226.6	270.9	245.0	252.4
104.39	152.1	232.6	280.2	307.0	313.2	321.9	307.7	260.9	227.0	271.5	245.6	253.0
104.40	152.1	232.7	280.6	307.9	317.1	325.7	310.8	261.9	230.3	275.1	249.9	256.4
104.41	152.2	232.9	280.8	308.4	318.9	327.4	312.2	262.5	231.9	276.8	251.9	258.0
104.42	152.3	233.1	281.1	308.9	320.3	328.7	313.2	263.1	233.1	278.2	253.4	259.2
104.43	152.4	233.1	281.3	309.2	321.5	329.8	314.0	263.5	234.4	279.1	254.7	260.2
104.44	152.4	233.2	281.4	309.4	323.2	331.6	315.2	263.9	237.2	280.3	256.8	261.4
105.01	2.3	3.4	3.6	3.9	3.9	3.5	3.2	3.3	2.6	2.6	2.1	2.1
106.01	2.8	3.8	3.9	4.0	4.0	3.5	3.1	3.3	2.5	2.4	1.9	2.0
107.01	2.2	3.2	3.3	3.5	3.6	3.2	2.9	3.0	2.4	2.3	1.9	1.9
107.02	8.1	9.7	11.6	11.2	10.2	9.2	8.2	8.8	6.5	6.4	5.1	5.2
107.03	10.7	13.6	15.4	15.5	14.1	12.5	11.2	11.9	8.9	8.7	7.0	7.1
107.04	12.3	16.3	17.9	18.2	17.0	15.3	13.7	14.4	10.9	10.8	8.7	8.8
107.05	13.9	18.0	19.9	20.2	18.6	16.8	15.1	15.6	12.0	11.8	9.5	9.7
108.01	3.4	4.8	4.9	5.1	5.1	4.4	3.9	4.1	3.1	3.1	2.4	2.5
108.02	6.0	8.7	8.9	9.3	9.3	8.2	7.4	7.6	5.9	5.9	4.7	4.8
108.03	9.4	13.7	14.1	14.8	14.7	13.2	11.9	11.9	9.4	9.3	7.6	7.7
109.01	2.7	3.7	3.8	3.9	4.0	3.4	3.1	3.2	2.5	2.4	1.9	1.9
109.02	5.4	7.5	7.6	7.9	7.9	6.9	6.1	6.3	4.9	4.8	3.8	3.9
110.01	3.2	4.2	4.3	4.5	4.3	3.7	3.2	3.4	2.6	2.5	2.0	2.0
111.01	2.2	3.2	3.3	3.6	3.6	3.2	2.9	3.0	2.4	2.4	1.9	1.9
111.02	4.2	5.3	5.5	5.9	5.8	5.1	4.6	4.9	3.7	3.6	2.9	3.0
112.01	2.9	3.6	4.3	4.1	4.1	3.6	3.1	3.4	2.5	2.5	1.9	2.0
112.02	15.6	18.9	21.7	21.5	17.5	15.6	13.8	14.6	10.7	10.5	8.3	8.5
112.03	25.2	31.5	34.3	35.1	30.5	26.6	23.8	25.1	18.8	18.3	14.6	14.8
112.04	28.0	35.2	38.0	38.9	34.4	30.0	26.9	27.5	21.2	20.7	16.6	16.9
113.01	6.3	7.2	8.5	7.6	5.4	4.4	4.0	4.0	2.8	2.7	2.1	2.2
114.01	3.3	3.7	4.5	4.0	3.0	2.6	2.3	2.4	1.7	1.6	1.3	1.3
115.01	3.4	4.4	4.6	4.8	4.3	3.8	3.3	3.5	2.5	2.4	1.9	1.9
116.01	3.3	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.4	1.9	1.9
117.01	5.6	6.3	7.4	6.6	4.8	4.1	3.6	3.7	2.6	2.5	2.0	2.0
117.02	10.8	11.4	12.4	13.9	10.2	9.3	8.2	8.6	6.2	6.1	4.8	4.9

Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
117.03	11.9	13.5	14.4	16.2	12.4	11.3	10.0	10.3	7.6	7.4	5.9	6.0
118.01	2.7	3.9	4.1	4.3	4.4	3.9	3.5	3.7	2.9	2.8	2.3	2.3
119.01	6.0	6.6	7.7	7.0	4.9	4.0	3.6	3.7	2.6	2.5	2.0	2.0
120.01	2.3	2.5	2.7	2.5	1.4	1.1	1.0	1.0	0.7	0.6	0.5	0.5
121.01	3.1	4.1	4.2	4.4	4.2	3.6	3.2	3.3	2.5	2.4	1.9	1.9
121.02	12.7	16.8	17.2	18.4	16.7	14.5	12.8	13.2	10.0	9.7	7.6	7.8
121.03	15.5	20.6	21.3	22.7	20.6	18.0	16.0	16.2	12.4	12.1	9.6	9.8
121.04	18.1	24.4	25.1	26.7	24.4	21.4	19.1	19.1	14.8	14.5	11.5	11.7
121.05	21.8	30.3	31.3	33.4	31.0	27.7	25.0	24.7	19.4	19.2	15.4	15.7
121.06	45.5	64.5	66.8	71.2	66.7	60.5	54.8	53.5	42.4	42.3	34.4	35.0
121.07	48.1	68.4	71.4	75.9	70.9	65.2	59.3	57.1	45.5	45.6	37.3	38.0
121.08	55.7	81.1	86.1	91.5	85.4	80.5	73.5	69.2	56.0	56.8	47.1	48.0
121.09	56.4	82.5	88.2	93.8	87.3	83.1	75.9	70.7	57.6	58.8	49.0	49.9
121.10	57.0	83.5	90.0	95.8	88.9	85.4	78.1	72.0	59.0	60.7	50.9	51.9
121.11	57.6	84.7	92.3	98.4	91.1	88.3	80.9	73.5	60.7	63.2	53.5	54.5
121.12	58.0	85.5	93.9	100.1	92.9	90.5	83.0	74.7	62.1	65.2	55.5	56.7
121.13	58.4	86.2	95.2	101.7	94.5	92.4	84.8	75.7	63.2	67.0	57.3	58.6
121.14	58.8	86.9	96.5	103.3	96.2	94.2	86.5	76.7	64.5	68.8	59.2	60.4
122.01	3.2	4.3	4.4	4.7	4.3	3.7	3.2	3.4	2.5	2.5	1.9	2.0
122.02	6.3	8.5	8.7	9.3	8.5	7.3	6.5	6.7	5.0	4.9	3.9	3.9
123.01	1.8	2.8	3.0	3.2	3.1	3.0	2.8	2.9	2.3	2.3	1.9	1.9
124.01	2.9	4.2	4.3	4.5	4.6	4.0	3.6	3.8	2.9	2.9	2.3	2.3
124.02	10.6	14.1	14.5	15.4	14.5	12.7	11.2	11.7	8.9	8.7	6.9	7.0
124.03	13.2	17.9	18.4	19.5	18.5	16.3	14.5	14.9	11.4	11.2	9.0	9.1
124.04	15.7	21.5	22.1	23.4	22.0	19.6	17.5	17.6	13.7	13.5	10.9	11.1
124.05	21.6	30.7	31.7	33.7	31.8	28.8	26.0	25.5	20.2	20.1	16.3	16.6
125.01	3.2	4.2	4.3	4.6	4.3	3.7	3.2	3.4	2.5	2.4	1.9	2.0
126.01	2.8	3.8	3.9	4.0	4.1	3.5	3.1	3.3	2.5	2.4	1.9	1.9
127.01	2.0	3.0	3.1	3.4	3.3	3.1	2.9	2.9	2.3	2.3	1.9	1.9
127.02	4.8	7.4	8.0	8.5	8.4	7.9	7.3	7.4	5.8	5.9	4.9	5.0
127.03	7.0	10.5	11.2	11.8	11.8	11.1	10.3	10.3	8.1	8.2	6.8	6.9
128.01	13.5	15.1	17.8	16.0	11.4	9.4	8.4	8.6	6.0	5.8	4.6	4.7
128.02	14.4	16.4	19.0	17.8	12.8	10.8	9.6	9.9	7.0	6.8	5.4	5.5
128.03	23.0	26.1	29.2	29.5	21.9	19.5	17.3	18.1	13.2	12.8	10.2	10.4
128.04	25.0	29.0	32.1	32.5	25.5	23.0	20.6	21.2	15.9	15.6	12.6	12.8
128.05	27.3	32.0	35.4	35.9	29.2	26.2	23.6	23.8	18.2	18.0	14.5	14.8
128.06	56.9	67.9	72.3	74.2	65.2	57.8	52.4	51.4	40.5	39.8	32.1	32.7
128.07	58.0	69.6	73.9	75.9	66.6	59.2	53.7	52.5	41.3	40.8	33.0	33.6
128.08	59.3	71.5	75.8	77.8	68.2	60.9	55.4	53.9	42.4	42.0	34.1	34.7
128.09	60.9	74.3	78.8	80.8	71.0	63.8	58.1	56.1	44.2	44.0	35.9	36.6
128.10	74.1	93.5	97.6	100.0	91.5	81.8	75.4	73.1	58.3	58.3	47.8	48.7
128.11	74.4	94.5	98.9	101.5	92.6	83.8	77.0	74.0	59.3	59.7	49.2	50.1
128.12	74.9	95.9	101.1	103.9	94.4	87.1	79.9	75.5	61.0	62.0	51.6	52.5
129.01	9.0	9.8	11.1	10.2	7.1	6.1	5.4	5.6	4.0	3.9	3.1	3.1
131.01	6.7	7.5	8.8	7.9	5.3	4.3	3.8	3.9	2.7	2.6	2.1	2.1
131.02	12.8	14.9	15.7	17.9	12.1	10.2	9.1	9.3	6.5	6.3	5.0	5.1
131.03	16.8	20.6	20.7	23.4	17.4	15.0	13.3	13.7	9.7	9.4	7.4	7.6
131.04	20.3	24.8	25.1	27.7	22.0	18.9	16.8	17.3	12.6	12.3	9.7	9.9
131.05	23.8	28.8	29.2	31.6	26.5	22.3	20.0	20.5	15.3	14.8	11.7	11.9
131.06	25.9	31.7	32.4	35.1	29.8	25.3	22.9	23.1	17.6	17.1	13.6	13.8
133.01	9.1	9.5	10.6	9.9	5.8	4.5	4.0	4.1	2.8	2.7	2.2	2.2
133.02	16.5	18.3	19.9	20.2	13.1	11.1	9.9	10.3	7.4	7.2	5.7	5.8
133.03	21.7	24.9	26.0	27.9	19.4	16.6	14.8	15.4	11.2	10.9	8.6	8.8
133.04	25.0	28.8	29.8	31.9	23.3	19.7	17.6	18.2	13.4	13.1	10.4	10.6
134.01	4.8	5.0	5.6	5.3	3.3	2.9	2.6	2.7	1.9	1.9	1.5	1.5
135.01	3.4	3.6	4.1	3.8	2.4	1.9	1.7	1.7	1.2	1.2	0.9	0.9
137.01	4.0	4.5	5.1	4.7	2.8	2.1	1.9	1.9	1.3	1.3	1.0	1.0
139.01	7.6	8.1	9.3	8.5	5.5	4.5	4.0	4.1	2.8	2.8	2.2	2.2
140.01	10.6	11.8	13.5	12.3	7.5	5.7	5.1	5.2	3.6	3.5	2.8	2.8
141.01	6.0	6.8	8.0	7.2	5.1	4.2	3.7	3.8	2.6	2.6	2.0	2.1
141.02	14.9	18.0	20.0	20.4	14.5	12.5	11.1	11.5	8.2	8.0	6.3	6.5
142.01	4.7	5.0	5.8	5.3	4.0	3.7	3.3	3.5	2.5	2.5	2.0	2.0
144.01	2.1	3.2	3.4	3.6	3.6	3.3	3.0	3.1	2.5	2.4	2.0	2.0
144.02	4.3	6.2	6.6	7.1	7.0	6.4	5.9	6.0	4.8	4.7	3.9	4.0
145.01	4.9	6.1	7.1	7.2	5.3	4.6	4.1	4.2	2.9	2.8	2.2	2.2
147.01	8.1	9.5	11.0	9.8	6.4	4.9	4.4	4.4	3.1	3.0	2.3	2.4

Developed Condition Discharges With Detention - 100 Year ARI												
Node	Storm Duration											
	30 min	60 min	90 min	120 min	270 min	360 min	540 min	720 min	1080 min	1440 min	2160 min	2880 min
147.02	13.7	17.1	20.5	19.6	14.0	11.7	10.4	10.6	7.4	7.2	5.6	5.7
149.01	2.7	3.1	3.7	3.3	2.3	1.8	1.6	1.6	1.1	1.1	0.9	0.9
149.02	3.9	4.7	5.2	5.2	3.4	2.7	2.5	2.5	1.7	1.7	1.3	1.3
151.01	21.0	37.3	49.4	59.3	73.2	76.7	88.0	74.4	70.5	82.5	75.3	81.6
151.02	52.6	93.7	122.1	143.0	168.1	175.6	202.1	174.6	153.9	185.0	169.2	181.1
151.03	111.3	197.7	257.5	299.2	351.3	367.7	421.8	360.6	318.9	382.7	352.6	375.7
151.04	128.6	228.3	299.0	348.2	417.2	438.1	502.8	423.4	384.9	456.6	425.2	448.3
151.05	141.5	249.4	324.9	376.7	455.2	478.0	547.2	459.6	420.8	494.0	467.4	486.0
151.06	287.4	494.5	633.9	736.1	877.7	921.5	1075	901.7	835.6	977.2	933.3	970.2
151.07	374.6	632.7	797.0	914.4	1114	1173	1352	1133	1061	1224	1195	1212
151.08	470.5	787.1	982.8	1134	1390	1472	1681	1417	1339	1533	1511	1515
152.01	25.9	46.7	62.0	74.3	89.3	93.3	106.5	91.2	83.7	99.4	90.0	98.3
153.01	16.2	28.8	39.5	47.4	68.4	72.4	85.3	81.1	74.0	81.6	81.7	82.7
153.02	28.9	51.5	69.1	81.8	106.7	113.1	134.6	122.8	113.2	127.3	123.7	129.0
153.03	99.9	174.7	225.5	260.7	294.5	309.0	358.6	307.7	271.3	328.6	305.5	323.8
153.04	142.3	242.9	308.2	354.6	411.9	433.7	516.1	435.3	402.8	474.1	451.4	473.5
154.01	30.7	55.2	72.4	81.3	90.0	95.0	103.2	92.5	74.0	90.2	83.0	89.4
155.01	25.3	45.1	53.2	58.1	55.2	63.2	62.3	58.7	46.8	50.7	46.4	48.0
156.01	23.3	42.2	55.3	66.3	79.5	83.1	94.6	81.1	74.3	88.2	80.0	87.1
156.02	50.1	89.4	111.5	126.3	140.5	147.8	172.1	150.8	124.3	153.0	140.5	149.9
157.01	16.4	29.1	39.9	47.7	64.8	68.1	79.4	72.3	67.0	75.9	72.5	75.9
157.02	43.8	78.4	104.1	122.4	148.8	156.2	183.6	155.6	146.2	171.4	159.2	169.2
157.03	78.1	135.3	172.5	199.6	225.7	236.4	280.1	237.8	213.2	255.9	237.8	251.0
158.01	29.2	52.6	70.7	84.2	101.8	106.3	121.3	104.1	95.8	113.2	102.8	111.8

RESULTS - AUSTRALIAN REGIONAL FLOOD FREQUENCY MODEL



AEP (1 in years)	Flow (m^3/s)	Lower Confidence Limit (5%) (m^3/s)	Upper Confidence Limit (95%) (m^3/s)
2	270.3	94.5	772.6
5	715.3	255.7	1993.7
10	1128.5	402.1	3188.2
20	1600.8	566.5	4551.9
50	2309.5	807.2	6624.6
100	2901.5	999.2	8379.6

Input Data

Date and Time	May 30, 2013, 18:40:49
Catchment Name	Upper Nepean
Latitude	-34.5
Longitude	150.7
Catchment Area (sq km)	842.0
Distance to Nearest Gauged Catchment (km)	82.0
2y12h Rainfall Intensity (mm/h)	7.8
Rainfall Intensity Source (User/Auto)	User
Region	VIC + NSW + ACT + QLD
Region Version	0.1
Region Source (User/Auto)	User

CAUTION: THIS METHOD IS STILL UNDER DEVELOPMENT AND MUST NOT BE USED IN PRACTICE.

Method by Dr Ataur Rahman and Khaled Haddad from the University of Western Sydney for the Australian Rainfall and Runoff Project. Full project description of the project can be found here.

This method was made possible by financial support from DCCEE.

This document generated with software written by Peter Stensmyr at WMAwater 2012.

RESULTS FROM AUSTRALIAN REGIONAL FLOOD FREQUENCY MODEL ANALYSIS: ARR2012 METHOD - VERSION 0.1 ALPHA

Date: May 30, 2013, 18:40:49

Catchment name: Upper Nepean

Latitude: -34.500

Longitude: 150.700

Catchment area (sq km): 842.000

Distance to nearest gauged catchment (km): 81.990

2 year 12 hour design rainfall intensity (mm/h): 7.800

Rainfall intensity source (User/Auto): User

Region: 1 (VIC + NSW + ACT + QLD)

Region version: 0.1

Region source (User/Auto): User

ESTIMATED FLOOD QUANTILES:

AEP (1 in y) Expected quantiles (m^3/s) 5% CL (m3^s) 95% CL (m3^s)

2 270.26 94.47 772.64

5 715.26 255.67 1993.73

10 1128.50 402.10 3188.18

20 1600.78 566.52 4551.87

50 2309.47 807.20 6624.55

100 2901.50 999.18 8379.61

DATA FOR FITTING MULTI-NORMAL DISTRIBUTION FOR BUILDING CONFIDENCE LIMITS:

Mean (loge flow): 5.499

St dev (loge flow): 1.255

Skew (loge flow): -0.482

MOMENTS AND CORRELATIONS:

No Most probable Std dev Correlation

1 5.499 0.637 1.000

1 1.255 0.180 -0.210 1.000

1 -0.482 0.126 -0.040 -0.410 1.000

CAUTION: These results are for test purpose only and must not be used in design/practice!

APPENDIX C – HYDRAULICS ASSESSMENT RESULTS

Manning's check on 1% AEP and Channel Capacity flows along the Nepean River and Allens Creek.

Project Data

Project Title: 9708 - Wilton Junction

Designer: JWP

Project Date: Thursday, May 23, 2013 – Updated March 2014

Project Units: SI Units (Metric)

Notes:

Calculation Assumptions

Adoption of 1% AEP flows derived from XP-RAFTS model calibrated with the peak discharge hydrograph at Maldon Weir (48 hour duration) as reported in the Upper Nepean Flood Study (1995).

Those sections (1.20, 1.21, 1.23 and 1.26) upstream of Maldon Weir have adopted a conservative peak flow rate from the hydrograph.

Assumed hydraulic gradient of 0.1% for all Creek Sections

Assumed Manning's Roughness parameters adopted:

- 0.07: Watercourse invert
- 0.2: Remainder of watercourse profile (1% AEP).
- 0.1: Remainder of watercourse profile (Channel Capacity).

Red dashed line indicates previously reported water level.

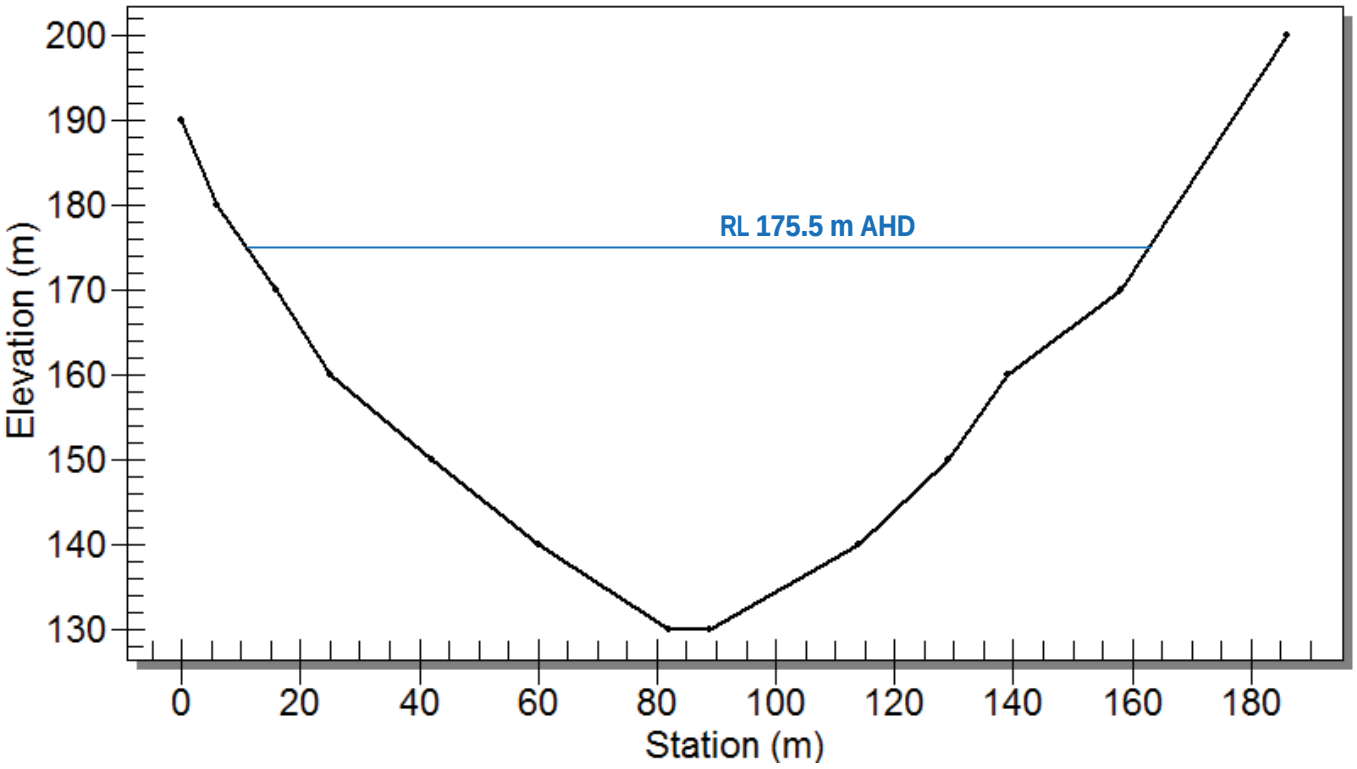
1 % AEP Results

1 % AEP

Channel Analysis - N_1.20: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6500.000 cms

Result Parameters

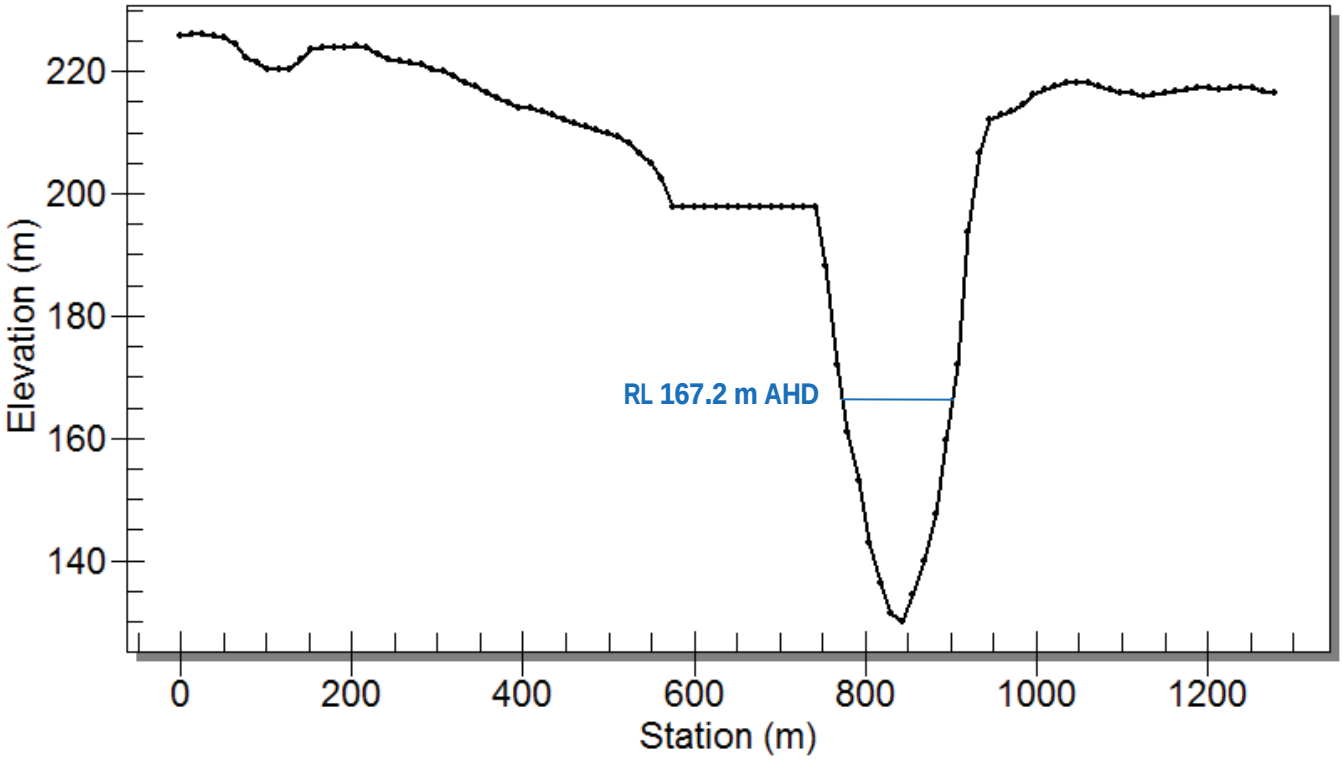
Depth:	45.483	m
Area of Flow:	4102.603	sq m
Wetted Perimeter:	180.754	m
Hydraulic Radius:	22.697	m
Average Velocity:	1.584	m/s
Top Width (T) :	152.600	m
Froude Number:	0.098	
Critical Depth:	15.905	m
Critical Velocity:	9.540	m/s
Critical Slope:	0.09406	
Critical Top Width:	73.485	m
Calculated Max Shear Stress:	445.831	N/m^2
Calculated Avg Shear Stress:	222.482	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1600	

1 % AEP

Channel Analysis - N_1.21: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow 6500.000 cms

Result Parameters

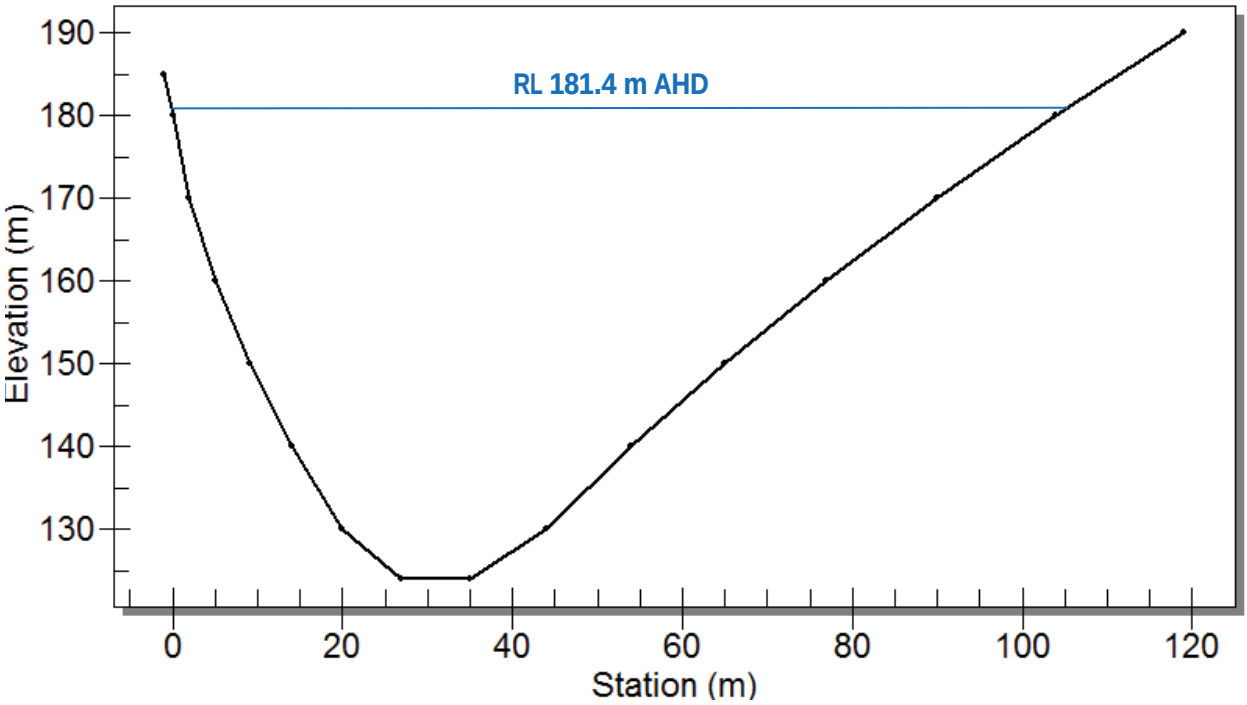
Depth:	37.167	m
Area of Flow:	2977.773	sq m
Wetted Perimeter:	152.546	m
Hydraulic Radius:	19.520	m
Average Velocity:	2.183	m/s
Top Width (T) :	129.974	m
Froude Number:	0.146	
Critical Depth:	15.013	m
Critical Velocity:	9.471	m/s
Critical Slope:	0.03765	
Critical Top Width:	75.104	m
Calculated Max Shear Stress:	364.323	N/m^2
Calculated Avg Shear Stress:	191.344	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1050	

1 % AEP

Channel Analysis - N_1.23: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6500.000 (cms)

Result Parameters

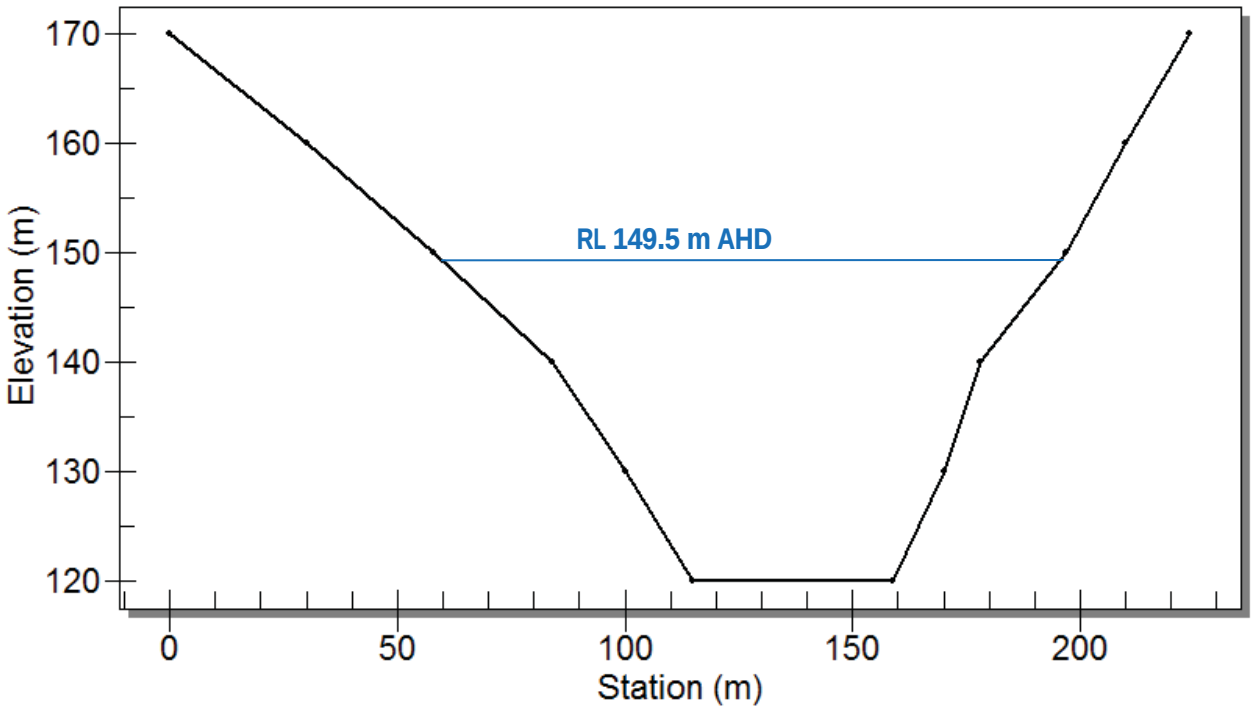
Depth:	57.397	m
Area of Flow:	3442.975	sq m
Wetted Perimeter:	164.466	m
Hydraulic Radius:	20.934	m
Average Velocity:	1.888	m/s
Top Width (T) :	106.375	m
Froude Number:	0.106	
Critical Depth:	19.893	m
Critical Velocity:	11.133	m/s
Critical Slope:	0.06805	
Critical Top Width:	46.228	m
Calculated Max Shear Stress:	562.620	N/m^2
Calculated Avg Shear Stress:	205.202	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1272	

1 % AEP

Channel Analysis - N_1.26: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6500.000 (cms)

Result Parameters

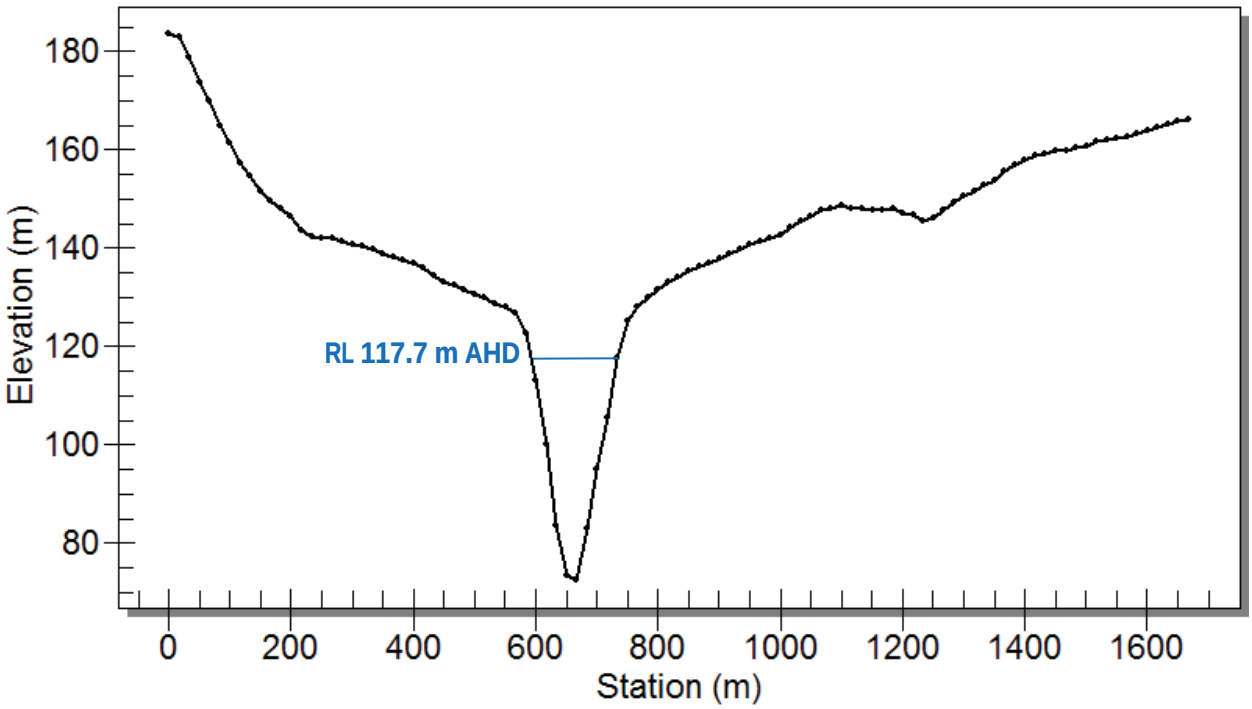
Depth:	29.473	m
Area of Flow:	2482.322	sq m
Wetted Perimeter:	155.294	m
Hydraulic Radius:	15.985	m
Average Velocity:	2.619	m/s
Top Width (T) :	136.627	m
Froude Number:	0.196	
Critical Depth:	11.561	m
Critical Velocity:	9.528	m/s
Critical Slope:	0.02701	
Critical Top Width:	73.746	m
Calculated Max Shear Stress:	288.897	N/m^2
Calculated Avg Shear Stress:	156.685	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0766	

1 % AEP

Channel Analysis - N_1.51: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow 6521.000 (cms)

Result Parameters

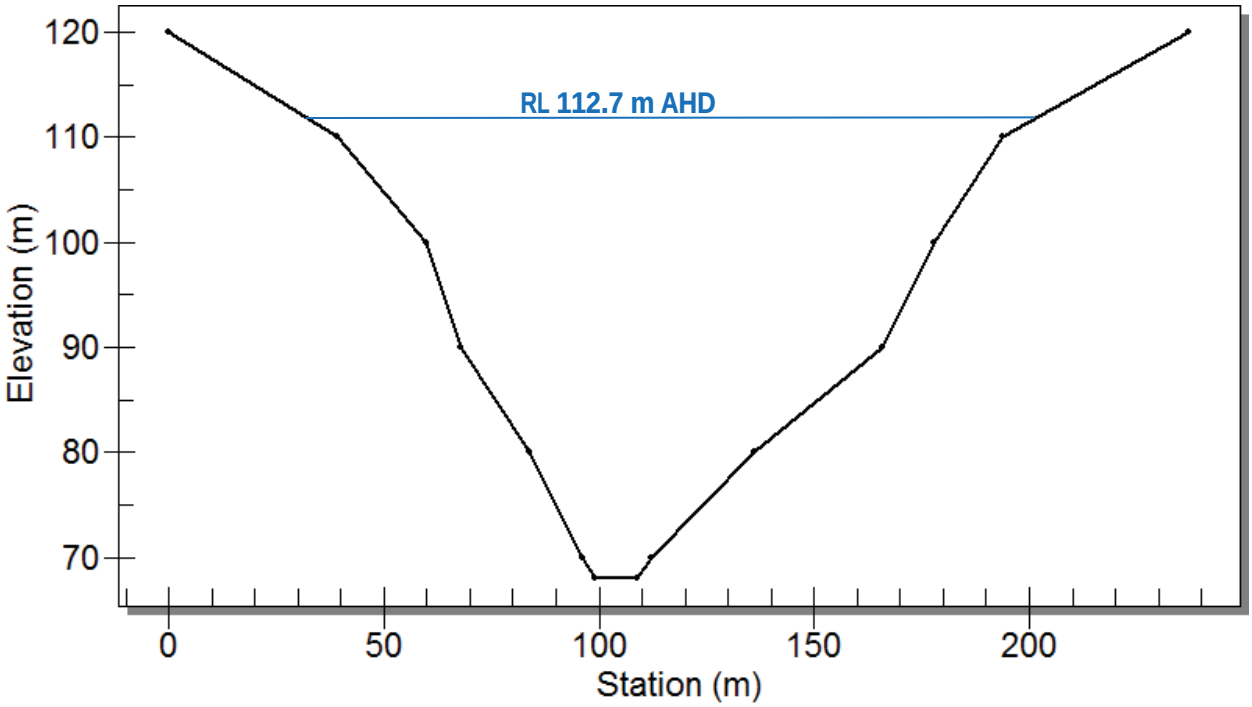
Depth:	45.171	m
Area of Flow:	3570.136	sq m
Wetted Perimeter:	170.745	m
Hydraulic Radius:	20.909	m
Average Velocity:	1.827	m/s
Top Width (T) :	141.589	m
Froude Number:	0.116	
Critical Depth:	16.211	m
Critical Velocity:	10.046	m/s
Critical Slope:	0.08651	
Critical Top Width:	63.128	m
Calculated Max Shear Stress:	442.771	N/m^2
Calculated Avg Shear Stress:	204.956	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1314	

1 % AEP

Channel Analysis - N_1.55: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6529.000 (cms)

Result Parameters

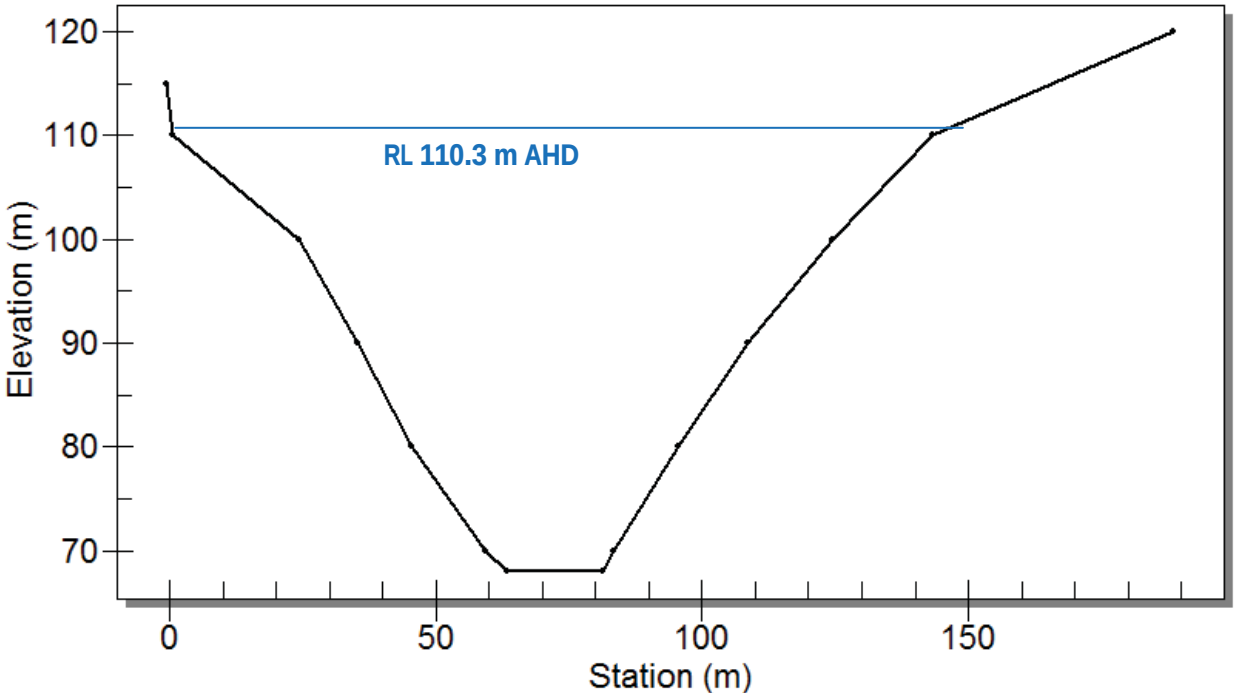
Depth:	44.735	m
Area of Flow:	4015.653	sq m
Wetted Perimeter:	202.965	m
Hydraulic Radius:	19.785	m
Average Velocity:	1.626	m/s
Top Width (T) :	177.430	m
Froude Number:	0.109	
Critical Depth:	17.074	m
Critical Velocity:	9.475	m/s
Critical Slope:	0.06487	
Critical Top Width:	75.342	m
Calculated Max Shear Stress:	438.505	N/m^2
Calculated Avg Shear Stress:	193.936	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1423	

1 % AEP

Channel Analysis - N_1.57: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6533.000 (cms)

Result Parameters

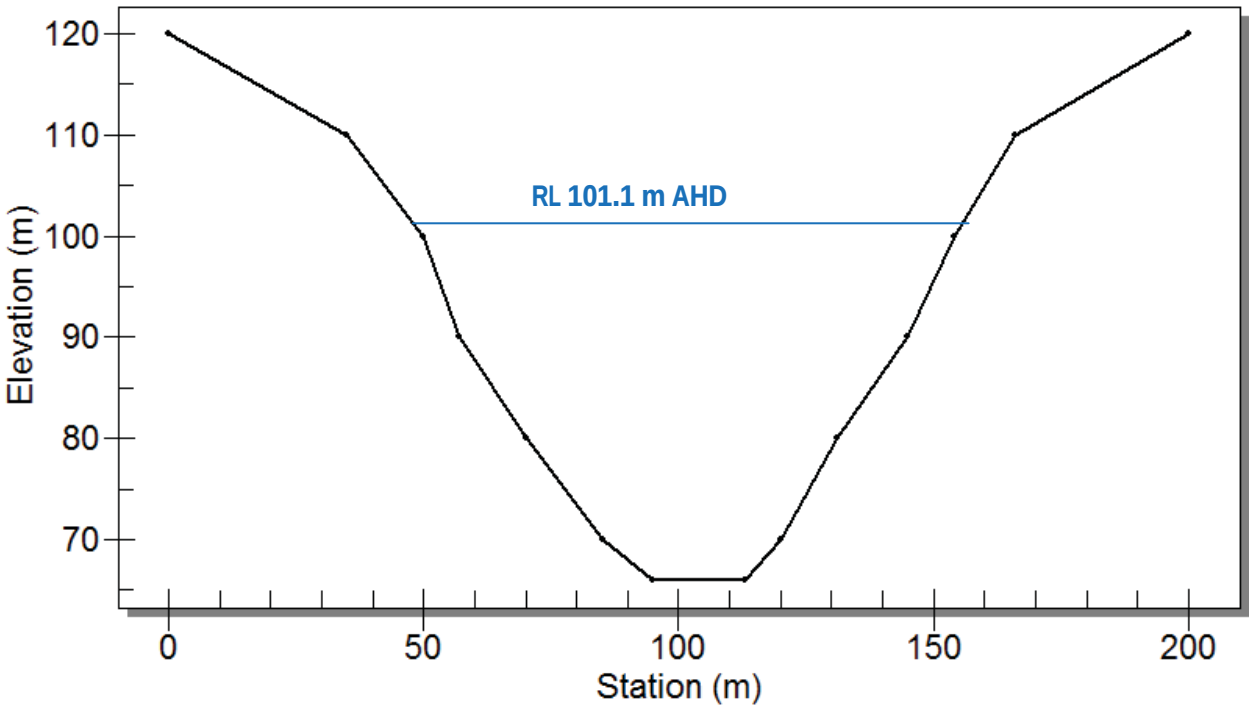
Depth:	42.326	m
Area of Flow:	3154.048	sq m
Wetted Perimeter:	172.228	m
Hydraulic Radius:	18.313	m
Average Velocity:	2.071	m/s
Top Width (T) :	145.252	m
Froude Number:	0.142	
Critical Depth:	16.112	m
Critical Velocity:	10.255	m/s
Critical Slope:	0.04027	
Critical Top Width:	59.459	m
Calculated Max Shear Stress:	414.892	N/m^2
Calculated Avg Shear Stress:	179.510	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1061	

1 % AEP

Channel Analysis - N_1.60: 1% AEP, 2880 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6544.000 (cms)

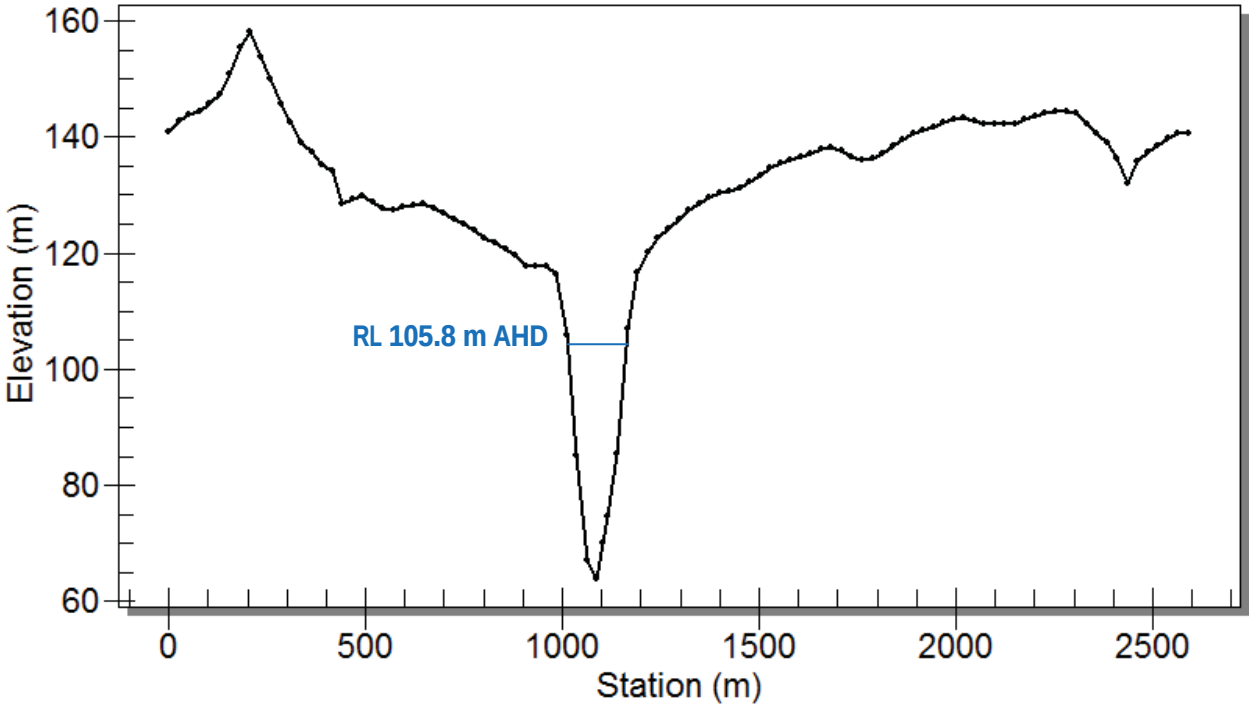
Result Parameters

Depth:	41.262	m
Area of Flow:	3117.395	sq m
Wetted Perimeter:	153.427	m
Hydraulic Radius:	20.318	m
Average Velocity:	2.099	m/s
Top Width (T) :	123.606	m
Froude Number:	0.133	
Critical Depth:	15.078	m
Critical Velocity:	10.017	m/s
Critical Slope:	0.04573	
Critical Top Width:	63.910	m
Calculated Max Shear Stress:	404.455	N/m^2
Calculated Avg Shear Stress:	199.166	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1122	

1 % AEP

Channel Analysis – N_1.62: 1% AEP, 2880 min

Input Parameters Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 6545.000 (cms)

Result Parameters

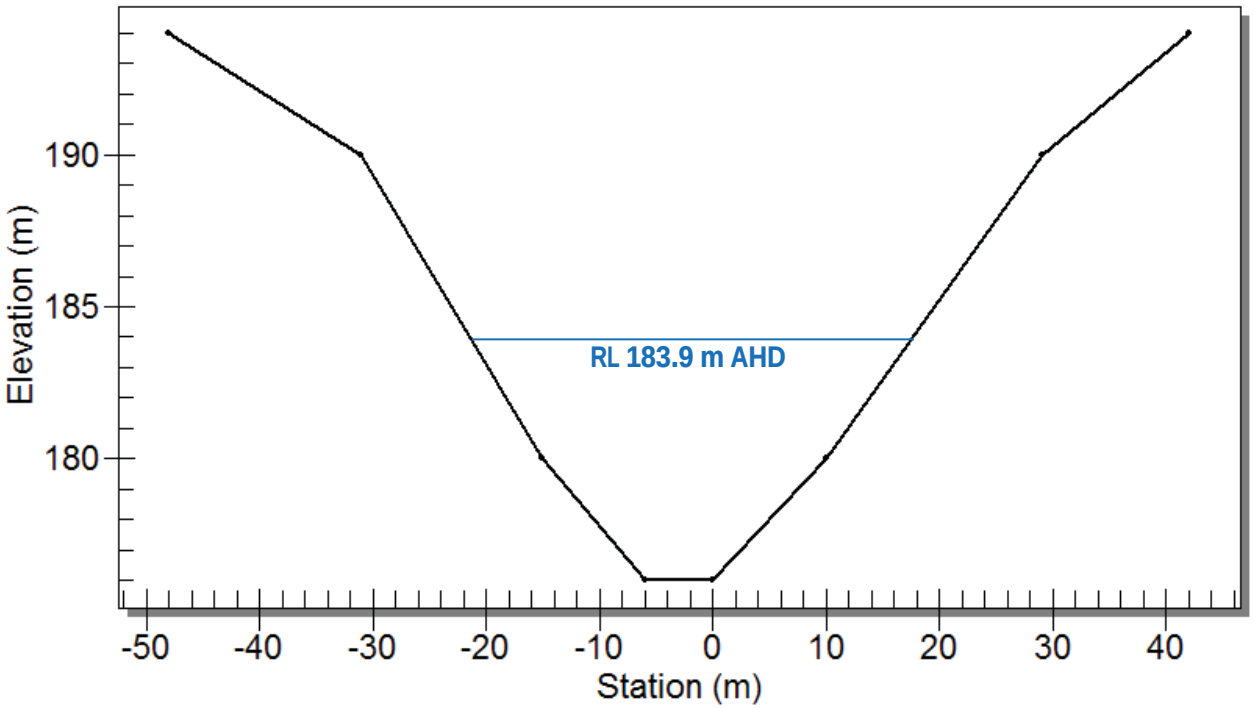
Depth:	41.855	m
Area of Flow:	3922.406	sq m
Wetted Perimeter:	178.594	m
Hydraulic Radius:	21.963	m
Average Velocity:	1.669	m/s
Top Width (T) :	153.799	m
Froude Number:	0.105	
Critical Depth:	14.930	m
Critical Velocity:	9.349	m/s
Critical Slope:	0.08951	
Critical Top Width:	78.618	m
Calculated Max Shear Stress:	410.271	N/m^2
Calculated Avg Shear Stress:	215.283	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1486	

1 % AEP

Channel Analysis - A_104.17: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 137.000 (cms)

Result Parameters

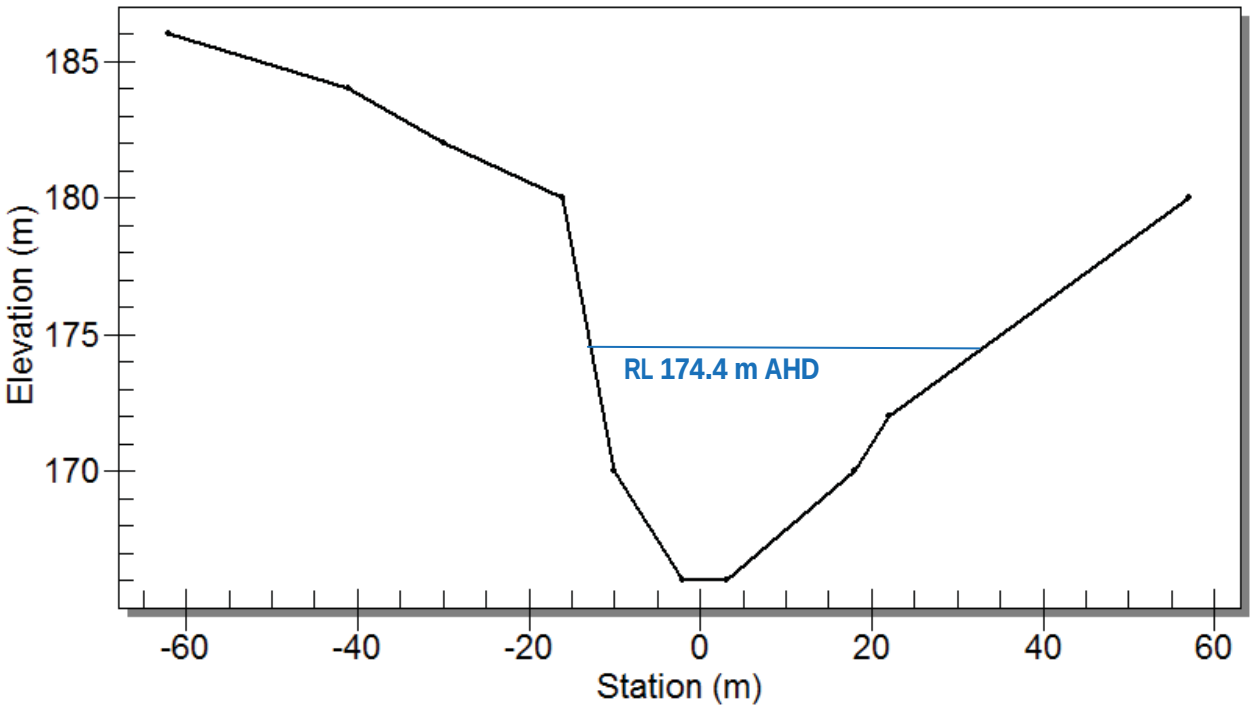
Depth:	7.857	m
Area of Flow:	184.451	sq m
Wetted Perimeter:	42.177	m
Hydraulic Radius:	4.373	m
Average Velocity:	0.743	m/s
Top Width (T) :	38.499	m
Froude Number:	0.108	
Critical Depth:	2.669	m
Critical Velocity:	4.160	m/s
Critical Slope:	0.06502	
Critical Top Width:	18.677	m
Calculated Max Shear Stress:	77.014	N/m^2
Calculated Avg Shear Stress:	42.868	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1139	

1 % AEP

Channel Analysis - A_104.20: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 151.000 (cms)

Result Parameters

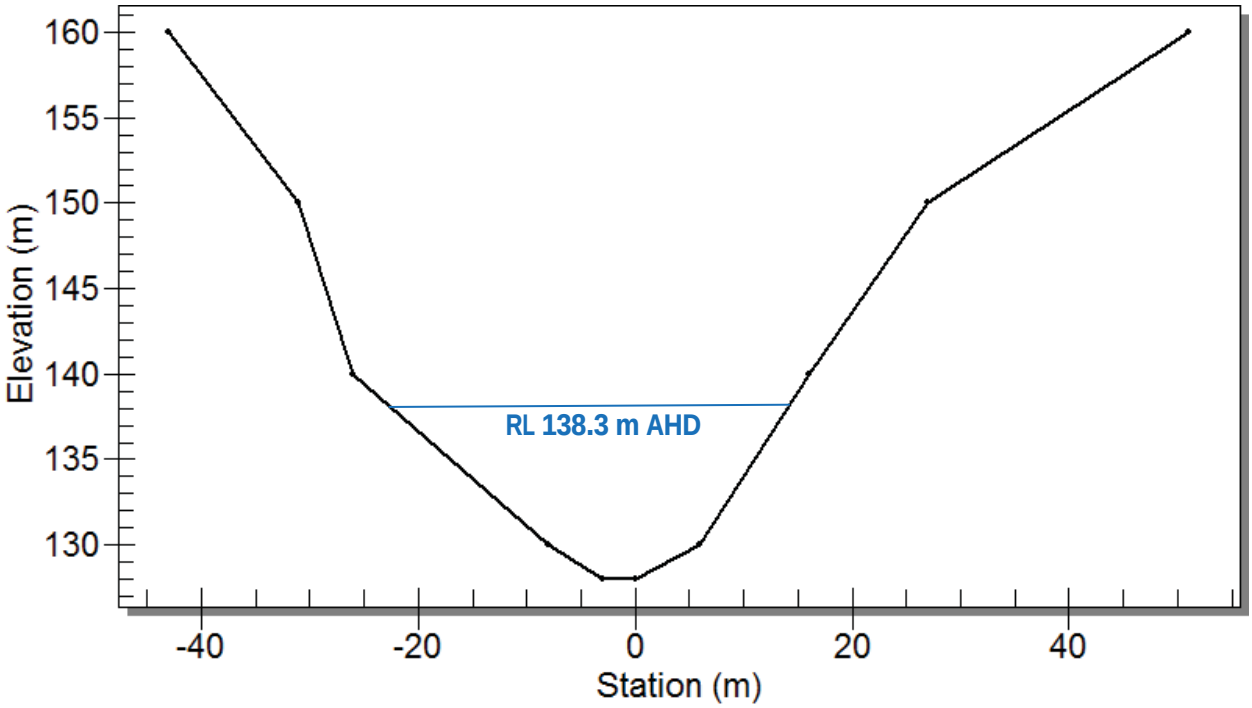
Depth:	8.434	m
Area of Flow:	222.737	sq m
Wetted Perimeter:	50.034	m
Hydraulic Radius:	4.452	m
Average Velocity:	0.678	m/s
Top Width (T) :	45.308	m
Froude Number:	0.098	
Critical Depth:	2.803	m
Critical Velocity:	4.125	m/s
Critical Slope:	0.07998	
Critical Top Width:	21.118	m
Calculated Max Shear Stress:	82.670	N/m^2
Calculated Avg Shear Stress:	43.637	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1262	

1 % AEP

Channel Analysis - A_104.25: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 157.0000 (cms)

Result Parameters

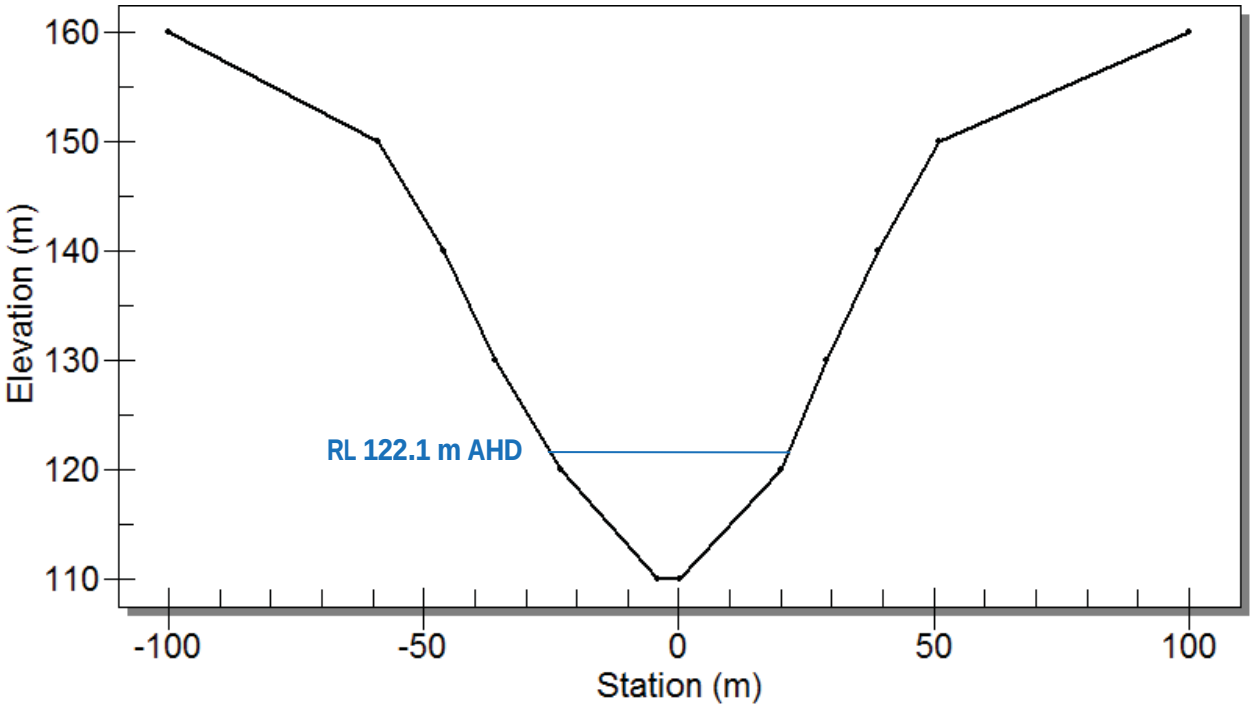
Depth:	10.306	m
Area of Flow:	229.888	sq m
Wetted Perimeter:	43.561	m
Hydraulic Radius:	5.277	m
Average Velocity:	0.683	m/s
Top Width (T) :	37.258	m
Froude Number:	0.088	
Critical Depth:	3.159	m
Critical Velocity:	4.471	m/s
Critical Slope:	0.11192	
Critical Top Width:	17.247	m
Calculated Max Shear Stress:	101.026	N/m^2
Calculated Avg Shear Stress:	51.730	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1404	

1 % AEP

Channel Analysis - A_104.27: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 256.0000 (cms)

Result Parameters

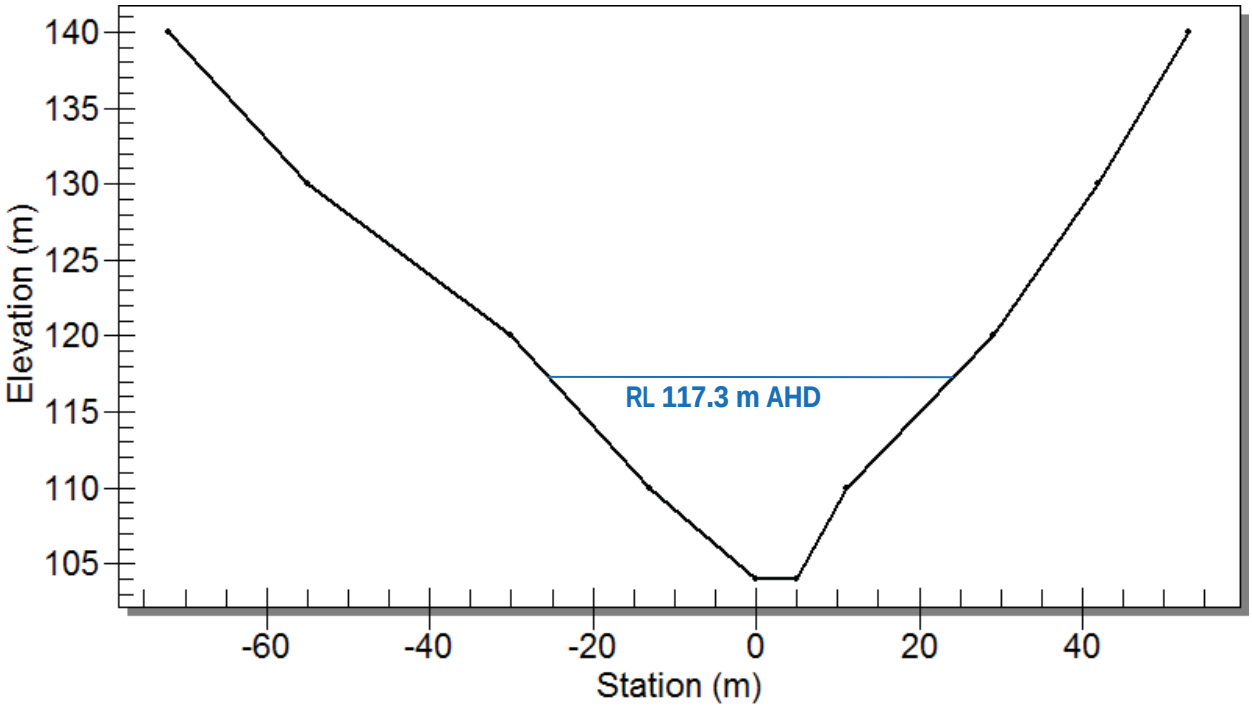
Depth:	12.097	m
Area of Flow:	329.992	sq m
Wetted Perimeter:	54.091	m
Hydraulic Radius:	6.101	m
Average Velocity:	0.776	m/s
Top Width (T) :	47.613	m
Froude Number:	0.094	
Critical Depth:	4.213	m
Critical Velocity:	4.974	m/s
Critical Slope:	0.08251	
Critical Top Width:	20.432	m
Calculated Max Shear Stress:	118.574	N/m^2
Calculated Avg Shear Stress:	59.800	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1361	

1 % AEP

Channel Analysis - A_104.32: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 315.000 (cms)

Result Parameters

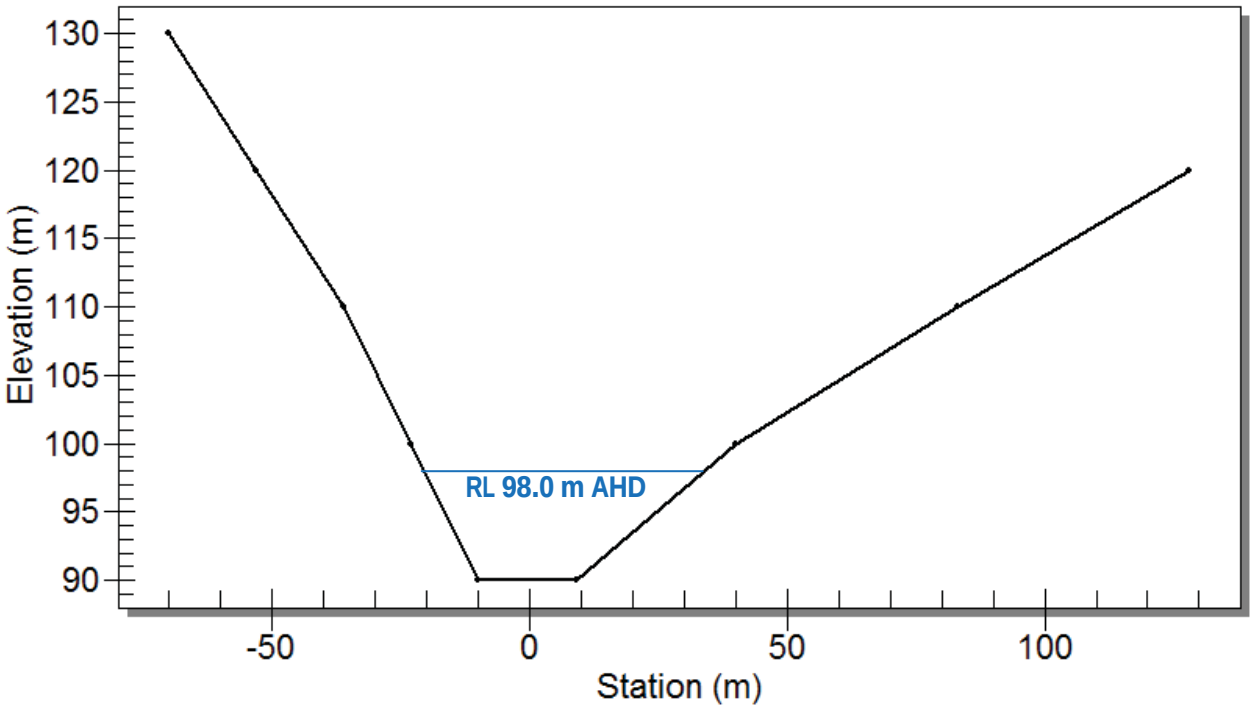
Depth:	13.336	m
Area of Flow:	357.253	sq m
Wetted Perimeter:	57.378	m
Hydraulic Radius:	6.226	m
Average Velocity:	0.882	m/s
Top Width (T) :	49.677	m
Froude Number:	0.105	
Critical Depth:	4.706	m
Critical Velocity:	5.376	m/s
Critical Slope:	0.06658	
Critical Top Width:	19.902	m
Calculated Max Shear Stress:	130.724	N/m^2
Calculated Avg Shear Stress:	61.031	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.1214	

1 % AEP

Channel Analysis - A_104.40: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 326.000 (cms)

Result Parameters

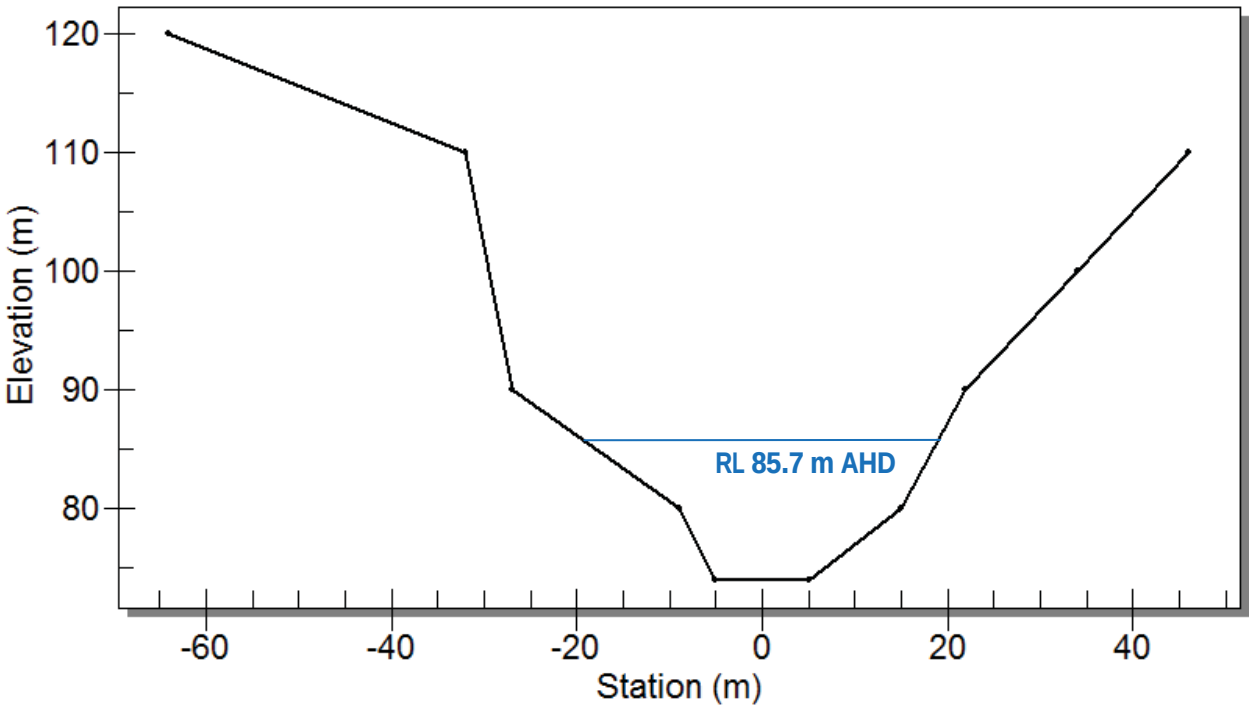
Depth:	7.985	m
Area of Flow:	291.987	sq m
Wetted Perimeter:	58.106	m
Hydraulic Radius:	5.025	m
Average Velocity:	1.116	m/s
Top Width (T) :	54.134	m
Froude Number:	0.153	
Critical Depth:	2.775	m
Critical Velocity:	4.680	m/s
Critical Slope:	0.04228	
Critical Top Width:	31.208	m
Calculated Max Shear Stress:	78.271	N/m^2
Calculated Avg Shear Stress:	49.257	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0831	

1 % AEP

Channel Analysis - A_104.44: 1% AEP, 120 min

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 343.000 (cms)

Result Parameters

Depth:	11.711	m
Area of Flow:	279.826	sq m
Wetted Perimeter:	47.603	m
Hydraulic Radius:	5.878	m
Average Velocity:	1.226	m/s
Top Width (T) :	38.277	m
Froude Number:	0.145	
Critical Depth:	4.161	m
Critical Velocity:	5.549	m/s
Critical Slope:	0.04189	
Critical Top Width:	19.709	m
Calculated Max Shear Stress:	114.792	N/m^2
Calculated Avg Shear Stress:	57.620	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0840	

APPENDIX D – WATER QUALITY MODELLING ASSUMPTION AND METHODOLOGY

MUSIC MODELLING LANDUSE PARAMETERS

Details of the soil / groundwater parameters adopted for the MUSIC modelling undertaken for this development are presented in Table D1 below. The adopted Annual Pollutant event mean concentrations are also presented in Table D2 below:

Table 18.1 ADOPTED SOIL / GROUNDWATER PARAMETERS FOR THE SITE [1]

	Units	Parks	Riparian [2]	Urban
Impervious Area Parameters				
Rainfall threshold (Road 1, Roofs0.5)	mm/day	1.4	3	1.4
Pervious Area Parameters				
Soil storage capacity	mm	210	108	170
Initial storage	% of capacity	30	30	30
Field capacity	mm	80	73	70
Infiltration capacity coefficient - a		175	250	210
Infiltration capacity coefficient - b		3.1	1.3	4.7
Groundwater Properties				
Initial depth	mm	10	10	10
Daily recharge rate	%	35	60	50
Daily baseflow rate	%	20	45	4
Daily deep seepage rate	%	0	0	0

* Roofed and Road catchments have been assumed to be 100% impervious

Table D.2 EPA POLLUTANT GENERATION RATES

Event Mean Concentration (mg/L)							
Constituent	**Urban**	**Peri-urban**	**Mining & Quarrying**	**Cropping**	**Grazing**	**Horticulture**	**Forest**
TN	1.9	2	2.2	3	1.7	3	0.7
NO_x	0.88	0.76	0.84	1.14	0.65	1.14	0.175
TKN	1.02	1.24	1.36	1.86	1.05	1.86	0.525
NH_4	0.114	0.082	0.091	0.123	0.07	0.123	0.0136
TP	0.2	0.22	0.45	0.3	0.2	0.4	0.05
FRP	0.093	0.085	0.174	0.116	0.077	0.154	0.015
TSS	120	45	100	40	40	70	40

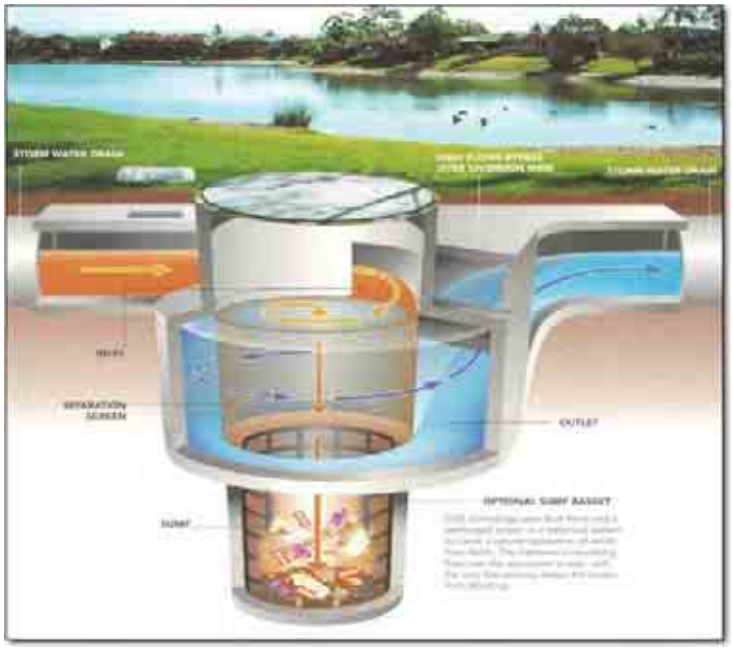
Dry Weather Concentration (mg/L)							
Constituent	**Urban**	**Peri-urban**	**Mining & Quarrying**	**Cropping**	**Grazing**	**Horticulture**	**Forest**
TN	0.9	0.9	0.8	0.8	0.8	0.8	0.2
NO_x	0.21	0.2	0.18	0.18	0.18	0.18	0.05
TKN	0.69	0.7	0.62	0.62	0.62	0.62	0.15
NH_4	0.058	0.048	0.043	0.043	0.043	0.043	0.0136
TP	0.09	0.09	0.05	0.05	0.05	0.05	0.01
FRP	0.037	0.025	0.014	0.014	0.014	0.014	0.005
TSS	16	15	20	20	20	20	6

1 CRC for Catchment Hydrology (2005). MUSIC Model for Urban Stormwater Improvement Conceptualisation – User Guide Version 3

2 Catchment Management Authority & BMT WBM, Sydney (2010). Draft NSW MUSIC Modelling Guidelines

GROSS POLLUTANT TRAPS (GPT'S)

GPT devices are typically provided at the outlet to stormwater pipes. These systems operate as a primary treatment to remove litter, vegetative matter, free oils and grease and course sediments prior to discharge to a downstream (Secondary and Tertiary) treatment devices. They can take the form of trash screens or litter control pits, filter pit inserts and wet sump gross pollutant traps. Council approved GPT units are to be provided at the end of stormwater pipes servicing urbanised catchments prior to discharging to the receiving waters.

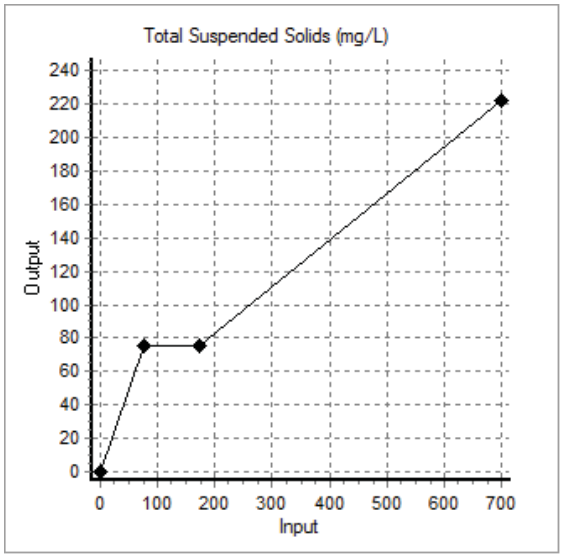


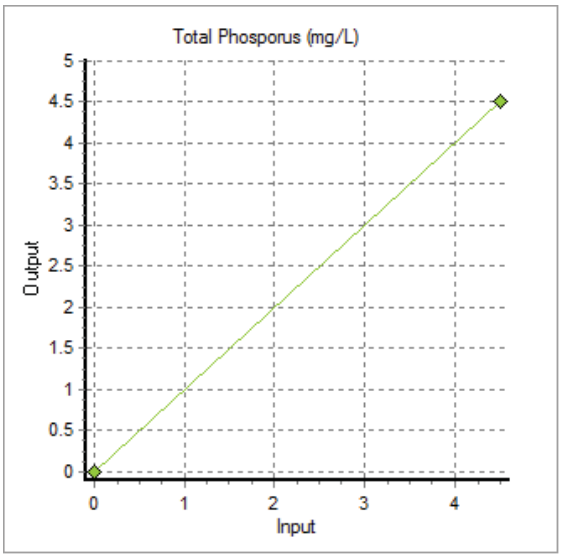
For the purposes on modelling, a proprietary unit (CDS) has been adopted in the Water Quality Modelling.

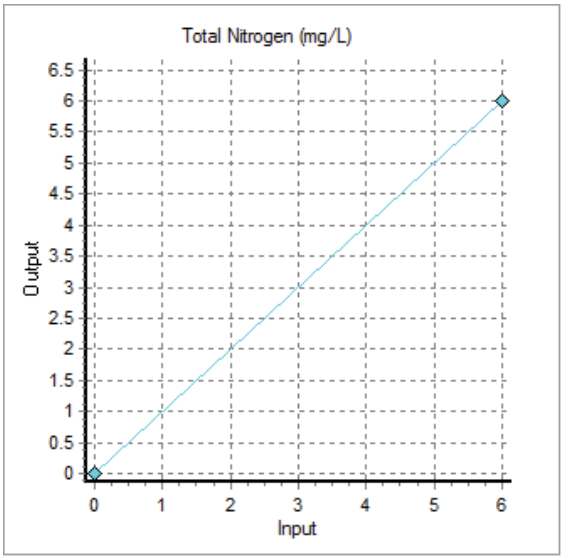
Music Modelling Parameters

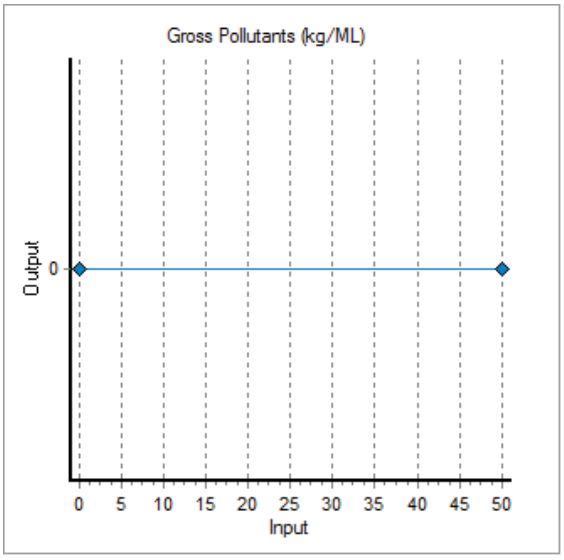
Within MUSIC transfer functions are used to calculate the stormwater effluent concentration of the stormwater flowing into the device, using a simple graphical relationship between the inflow and outflow concentration. MUSIC allows the user to describe the performance of the generic node by using a graphically based transfer function editor, for each of the pollutant types – Gross Pollutants (GP), Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Nitrogen (TN). The adopted values for modelling of GPT's for this development are presented below.

GPT parameters adopted in modelling have considered the following. It is noted that TP removal has conservatively adopted at 0%.





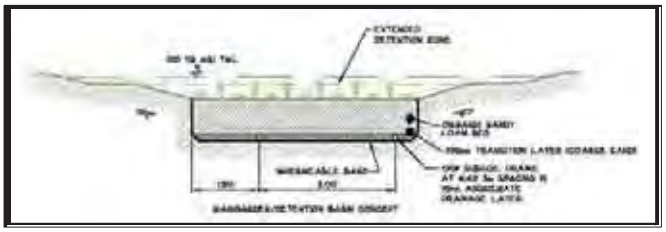

Total Nitrogen (mg/L)
Output
Input
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
0
1
2
3
4
5
6


Gross Pollutants (kg/ML)
Output
Input
0
0
5
10
15
20
25
30
35
40
45
50

BIO-RETENTION RAINGARDEN

The media beds of the bio-retention systems are typically 400-600 mm deep with an average particle size of 0.5 mm and a hydraulic conductivity of 100 mm/hr with a depth of extended storage above the media of 300 mm. A discharge control structure will be configured to promote extended detention times for the treatment flows.

Treatment is attained by detaining flows to promote sedimentation, direct filtration of particulate matter and nutrient stripping by bio-films which establish on the surface of the media bed and within the gravel layer. The organic sandy loam bed and plant system minimises evaporation losses and the raingarden will be constructed with an impermeable barrier to prevent seepage losses and to avoid groundwater salinity impacts.



Music Modelling Parameters

The general features of the Bio-Retention Raingardens proposed for the site are indicated in Table D3 below:

Table D3

BIO-RETENTION SYSTEM
GENERAL FEATURES AND CONFIGURATION

Storage Properties	
Extended Detention Depth (m)	0.3
Infiltration Properties	
Filter Area (m^2)	1% catchment
Saturated Hydraulic Conductivity (mm/hr)	100
Filter depth (m)	0.5
TN Content of Filter Media (mg/kg)	500
Orthophosphate Content of Filter Media (mg/kg)	40
Outlet Properties	
Overflow Weir Width	2

The expected sediment and nutrient removal performance of the bio-retention systems was determined using the default equations and parameters provided in the MUSIC model. The water quality reduction mechanisms in MUSIC are based on an exponential decay equation referred to as the k – C* curve (refer to Wong et al., 2001).

The performance parameters used in the MUSIC model are summarised in Table D3 and D4. The viability of the raingarden and the longevity of its pollutant removal efficiency is dependent on the

capacity of the pre-treatment GPTs to intercept and remove light litter, detritus and coarse sediment.

Table D4

MUSIC – PERFORMANCE PARAMETERS

	Bio-Retention		Rainwater Tanks	
Pollutant	**k (m/yr)**	**C* (mg/L)**	**k (m/yr)**	**C* (mg/L)**
TSS	8000	20.000	400	12.000
TP	6000	0.130	300	0.130
TN	500	1.400	40	1.400

Once the catchments upstream of the raingarden are stabilised, the maintenance of the raingarden would generally involve plant replacement, weed control, repair of localised erosion and minor structural damage, the removal of localised sediment build-up, and checking for any reduction in infiltration capacity and hydraulic conductivity of the media. This would be undertaken on a quarterly basis on average with media and vegetation replacement budgeted for on a decadal cycle.

PONDS

Ponds are typically located at the outlet or downstream of a GPT device or wetland and provide secondary or tertiary treatment for nutrient and sediment removal. Often deeper than 1.5m, ponds permit biological, chemical and physical actions to occur within the water body to improve quality. Due to the significant depth, ponds maintain higher detention times than detention basins or wetlands and allow aquatic life to grow within them. Although ponds are not as effective in water treatment as other mechanisms, they provide an improved aesthetic to the development.

At Wilton Junction, the proposed ponds will include a sand/gravel base to inhibit vegetation growth. The depth of the ponds will be confirmed during detailed design but has currently been assumed to be 2.5m. It is noted that deeper ponds are also a means of limiting emergent aquatic plan growth

Table D5 MUSIC – PERFORMANCE PARAMETERS

Pollutant	K (m/yr)	C* (mg/L)
TSS	400	12
TP	300	0.09
TN	40	1.0

Table D6 MUSIC – POND PARAMETERS

Permanent Pool (Assumed)	2.5m
Extended Detention Depth (m)	0.3m
Evaporation Loss (as percentage of PET)	100%

APPENDIX E - VKL CONSULTING – REPORT ON TREATED EFFLUENT DISPOSAL SYSTEM

WILTON JUNCTION PRECINCT

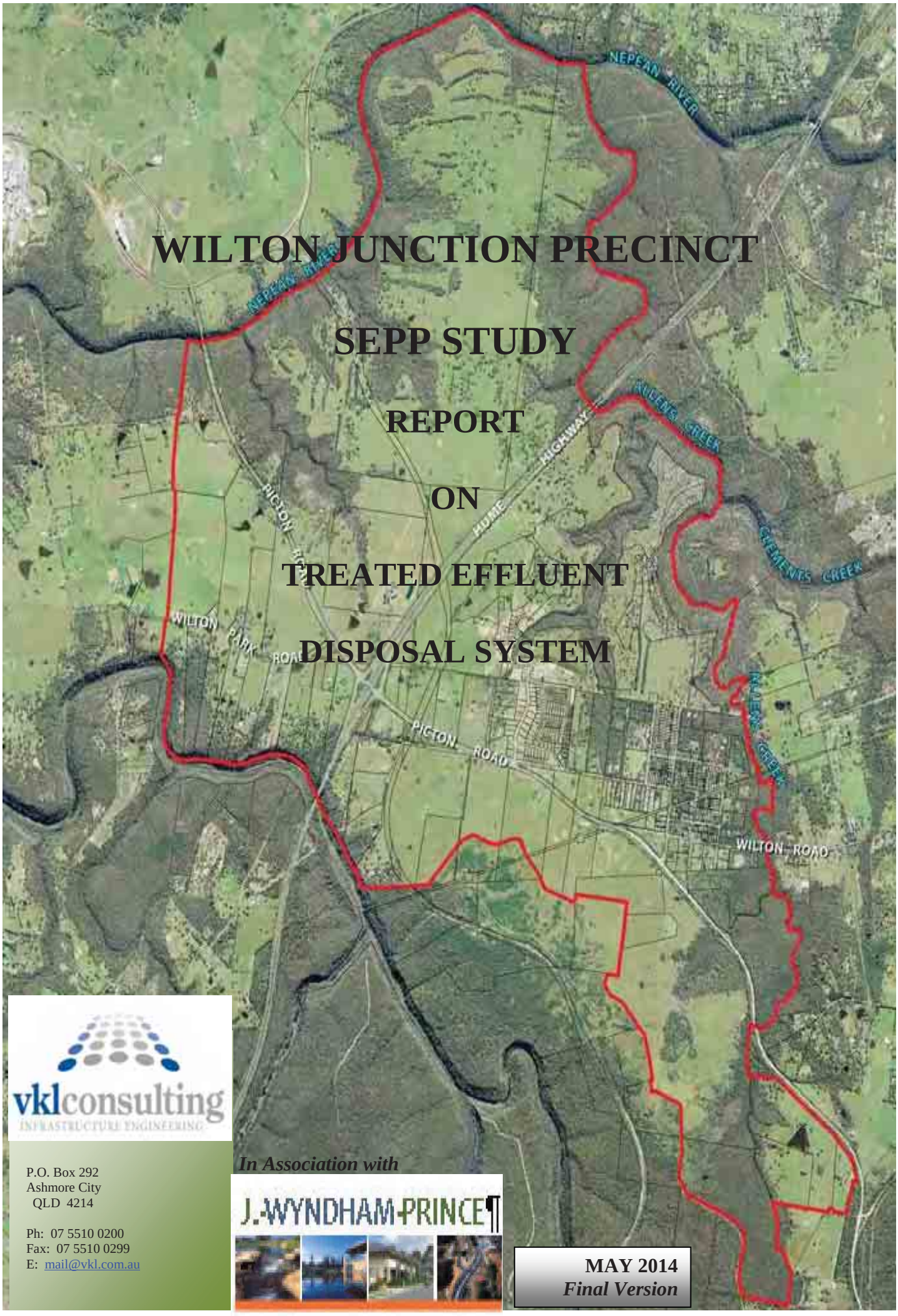
SEPP STUDY

REPORT

ON

TREATED EFFLUENT

DISPOSAL SYSTEM



vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au

In Association with

J.WYNDHAM PRINCE

MAY 2014
Final Version

CONTENTS

Figures

Drawings

EXECUTIVE SUMMARY

This Report has been prepared for inclusion in the overall Report prepared by JW Prince addressing Water Quality. It specifically deals with the methods of disposal of treated effluent generated by Wilton Junction Development and treated by the proposed Central Sewerage Treatment Plant referred to in the MWH Report.

High level investigations undertaken as part of the Wilton Junction Precinct SEPP Study indicate that the proposed methods of disposal of treated effluent produced by a site MBR Sewage Treatment Plant will meet current Environmental Objectives set out in the SEPP Study DGR's and relevant EPA publications on a sustainable basis.

Detail design at DA and CC stages will be driven by a Risk Assessment approach and will provide adequate assurance that public health standards are maintained and environmental outcomes achieved.

The proposed Treated Effluent Disposal System is sufficiently flexible to accommodate development over a number of decades, occurring on a number of development fronts, at any one time because of diversity.

The proposed treated effluent will be utilised partially as a resource and to provide improvement in overall amenity by creation of waterbodies, with water quality suitable for Secondary Contact activities.

It is proposed that part of the treated effluent produced within the SEPP Study Area will be discharged to the Nepean River after progressing through a disposal treatment train.

The high level estimate of cost for the complete treated effluent disposal system is $34M subject to detailed design.

1. PROJECT BACKGROUND

In November 2011, the NSW Government initiated the Potential Housing Opportunities Program and invited landowners with suitably located substantial landholdings to nominate sites which might be able to deliver additional housing to address Sydney's housing supply shortfall. Walker Corporation, Governors Hill, Bradcorp and Lend Lease responded to the Program and nominated landholdings of more than 100ha in Wollondilly Shire, surrounding the Hume Highway-Picton Road intersection for consideration. This area has subsequently become known as Wilton Junction, and is the subject of this application.

Following a Wollondilly Shire Council resolution in May 2012, the four major landowners (collectively known as the Wilton Junction Landowners' Group) signed an agreement to work cooperatively with Council to prepare a high level Master Plan for Wilton Junction to deliver high quality new housing, jobs close to homes, supporting social and utilities infrastructure and services, and a range of complementary land uses.

A high level Master Plan and a Preliminary Infrastructure Requirements Report were considered by the Council on 17 December 2012, with Council resolving to give in-principle support to the proposal. Council also resolved to request that the rezoning be a state-driven process.

Subsequently, the NSW Government decided to coordinate the statutory planning process, led by the Department of Planning and Infrastructure (now the Department of Planning and Environment, DP&E). The Minister for Planning and Infrastructure (now the Minister for Planning and Environment) proposed to prepare a State Environmental Planning Policy (SEPP), as per Section 24 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), which identifies that a SEPP is an Environmental Planning Instrument, and Section 37 of the EP&A Act, which relates to the making of a SEPP for State or regional significant development. This was done with a view to rezone the land through an amendment to the Wollondilly Local Environmental Plan 2011 (LEP) to facilitate the early delivery of housing and infrastructure, linked to an agreed Infrastructure, Servicing and Staging Plan.

The Department of Planning and Infrastructure issued Key Study Requirements (KSRs) to the Proponents (Walker Corporation, Bradcorp and Governors Hill) to guide the planning investigations for a new town at Wilton Junction. The KSRs set the criteria for carrying out environmental investigations across the Study Area (excluding both Bingara Gorge and the existing Wilton village which will not be affected by any proposed amendments to their current zoning and planning provisions). The investigations examine the potential for the Wilton Junction Study Area to be rezoned under a SEPP.

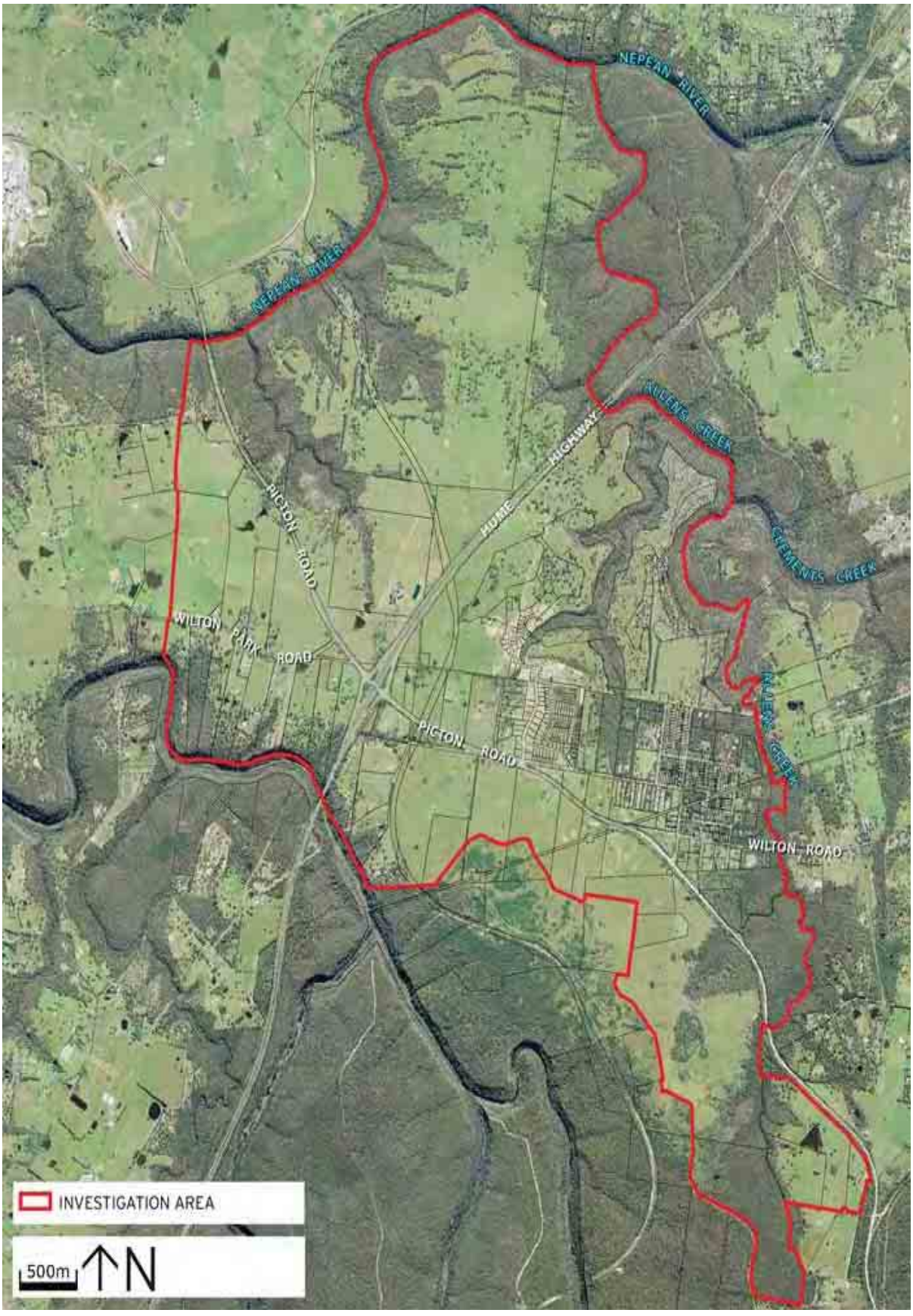
This Report has been prepared in response to the Wilton Junction SEPP Study Requirements issued by the Director General Department of Planning and Infrastructure, dated 2nd May 2013, to address how treated effluent will be disposed of should a sewerage treatment facility be constructed to service future development in the SEPP Study Area. The subject area has no existing publicly owned sewerage treatment system.

2. STUDY AREA

Wilton Junction is located within Wollondilly Shire Council and is approximately 80km from Sydney Central Business District, and 30km west of Wollongong. The study area includes the existing village of Wilton and the recently approved suburb of Bingara Gorge.

The area is strategically located around the Hume Highway-Picton Road interchange, and represents the next potential major town along this transport corridor south of Campbelltown–Macarthur. Moreover, Wilton Junction has the distinct advantage of a consolidated land ownership of more than 2,700ha in the control of recognised developers, with the resources and capability to expedite housing delivery, roll out enabling infrastructure, deliver social services and provide local employment.

Figure No. 1 – Study Area



3. LAND OWNERSHIP

There are four major landowners within the Investigation Study Area:

- Bradcorp Pty Ltd (land at Wilton West)
- Walker Corporation (lands south of Picton Road and east of the Hume Highway)
- Governors Hill (land including the Wilton Aerodrome and lands on both sides of Picton Road west of the Hume Highway)
- Lend Lease (land to the north-west of the Hume Highway-Picton Road intersection; but is excluded from the study requirements)

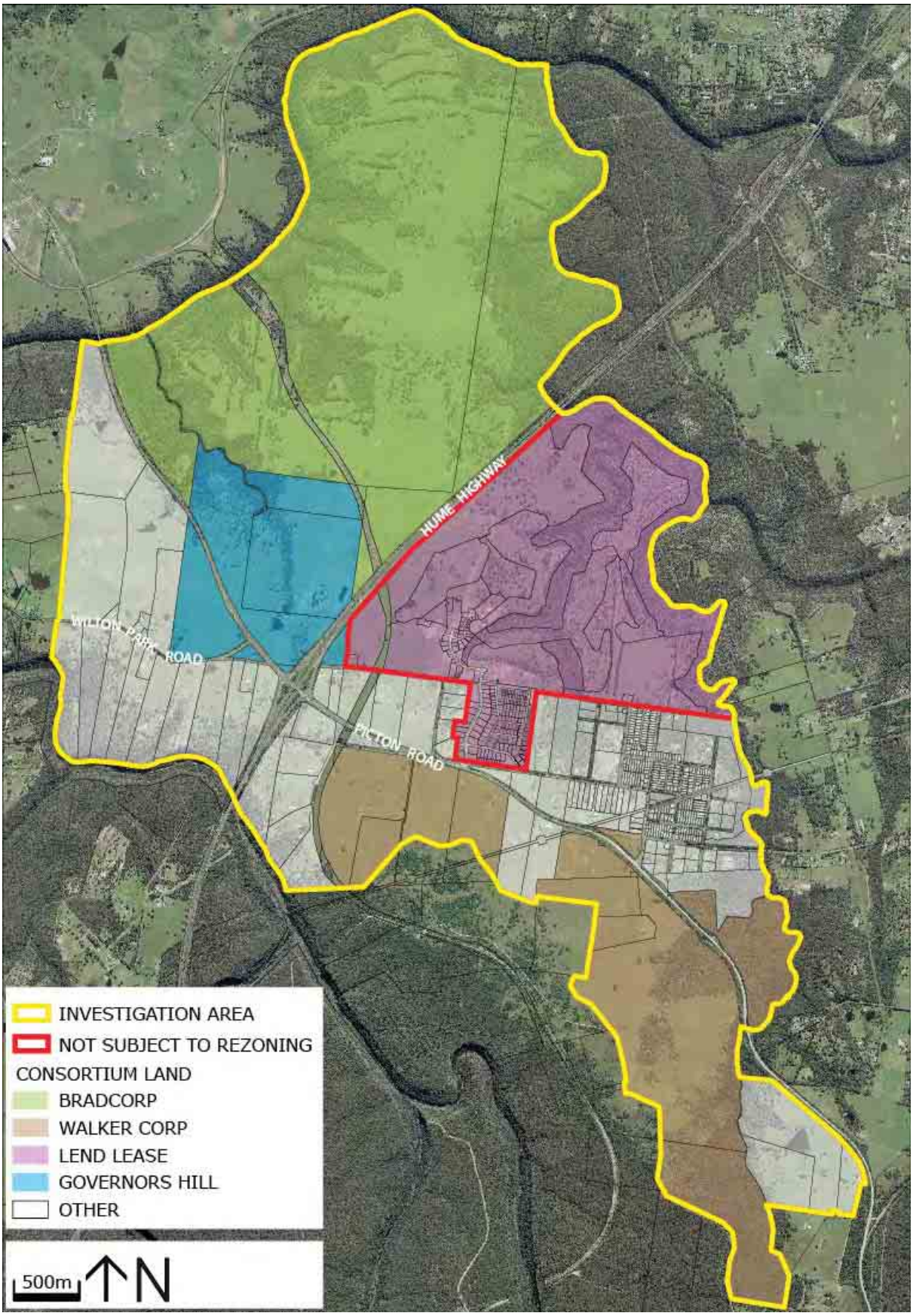
The Investigation Study Area also includes land by other private owners (excluding land in Bingara Gorge and Wilton village) as outlined in the table below; with a plan of the extent of ownership being provided below.

Landowner	Gross area (ha)	Net developable area (ha)
Lend Lease	455	240
Bradcorp	872.4	458.7
Governors Hill	175.3	123.5
Walker Corporation	405.2	230.3
Other landowners**	572.3	489.2
TOTALS	2480.2	1541.7

** This comprises 113 other private landowners, excluding the new Bingara Gorge estate and the existing Wilton village which will not be affected by any proposed amendments to the existing Wollondilly Shire Council planning provisions.

Governors Hill and Bradcorp. Lend Lease will continue with the planning and delivery of its Bingara Gorge community in Wilton, which is already zoned for residential development. Lend Lease is working with the Proponents of this rezoning application to plan and deliver the new town at Wilton Junction and its associated infrastructure.

Figure No. 2 – Land Ownership



4. VISION FOR WILTON JUNCTION

The Proponents have a vision for the proposed rezoning of land at Wilton Junction, which is:

Wilton Junction is a new community cradled in a unique landscape characterised by bushland, rivers, creeks, lakes and ridges set against the backdrop of the Razorback Range. By design, the place and the lives of its people are intertwined with the bush.

The community respects the location's rich bushland setting, engages with surrounding water features and embraces sustainability.

Inclusive and welcoming of diversity, it's a place to nurture relationships, grow a family - to put down roots.

Founded on a 21st century interpretation of timeless "Garden City" principles, Wilton Junction combines the best features of our most loved country towns with the facilities, services and technologies found in Australia's most successful, edgy, and vibrant town centres.

A safe place to visit – a healthy place to live – a great place to learn - a rewarding place to work – the local community takes pride in the strength of its cultural and civic life and the role of their town in Wollondilly Shire and the region.

5. DELIVERING THE VISION & PROJECT DESCRIPTION

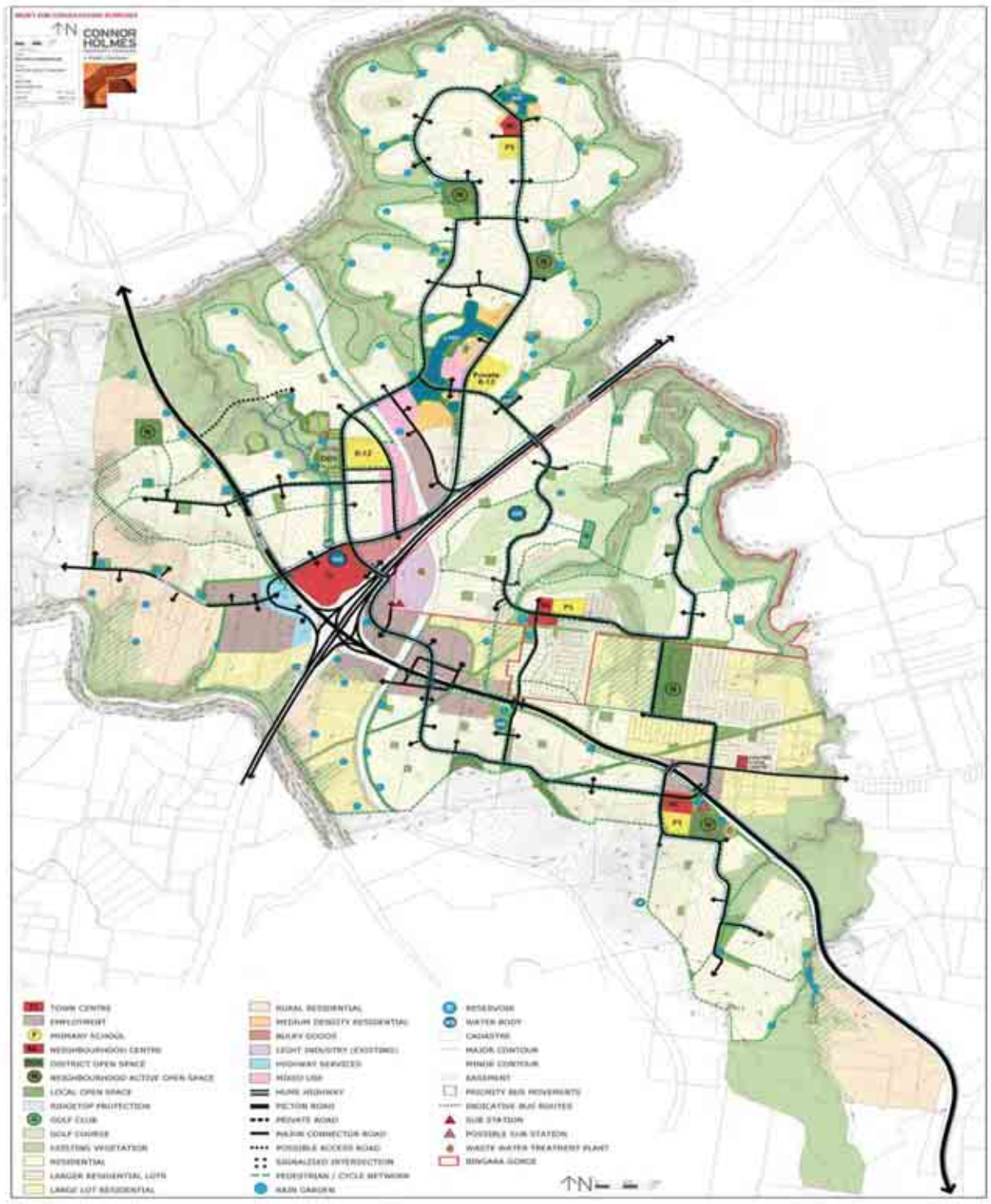
This vision will be delivered through the creation of a new town with between 11,000 and 13,000 new homes and 11,000 jobs. Residential neighbourhoods will be created around green spaces providing a range of housing choice and facilitating healthy lifestyles options for all new residents. A new town, comprising of approximately 17ha, will be established within the north-west quadrant of the study area and will be surrounded by employment generating uses for business, bulky goods and light industry, comprising of approximately 120 - 130ha of land. Smaller neighbourhood centres will be created within the residential neighbourhoods to cater for convenient daily shopping choices. Community facilities and physical infrastructure will be provided facilitating the creation of a self-sustaining community. Existing significant environmental features and heritage items will be preserved commemorating the natural and historical setting of the study area.

This report forms part of the studies required to be undertaken to meet the Director Generals' Key Study Requirements outlined by the Department of Planning and Infrastructure as part of the investigations for the release and rezoning of land at the junction of the Hume Highway and Picton Road through a SEPP. The study outcomes and report has also informed the development and preparation of a Master Plan for Wilton Junction.

The proposed Master Plan will also be informed by the following key principles:

- **Employment and commercial drivers.** The delivery of approximately 11,000 jobs focused around a new town centre and in close proximity to the Hume Highway and Picton Road.
- **Housing.** Providing between 11,000 and 13,000 new dwellings across the precinct, inclusive of the 1,165 already approved at Bingara Gorge and the existing Wilton village.
- **Community facilities**. Provide a diverse range of high quality community facilities including a schools, library, community centre in a town centre and three neighbourhood centres across the precinct.
- **Environment**. Conserving ecological features and biodiversity and establishing a Trust to rehabilitate and manage approximately 614.5ha of bushland.
- **Place making.** Delivering high quality and connected network of streets, spaces and squares throughout the development.
- **Activity centres**. Focus on the delivery of a new town centre and three smaller neighbourhood centres with a diverse mix of retail, commerce, business and light industry.
- **Traffic and transport.** Providing strategic motorway and bus access to surrounding areas, legible movement throughout the development.
- **Infrastructure.** Integrated water, waste water and stormwater management systems and access to all other utilities including gas and NBN.

Figure No. 3 – Wilton Junction Master Plan



This Report forms part of the studies required to be undertaken to meet the Director Generals' Study Requirements outlined by the Department of Planning and Infrastructure as part of the investigations for the release and rezoning through a State Environmental Planning Policy (SEPP).The study outcomes and report has also informed the development and preparation of a Master Plan for Wilton Junction.

6. SCOPE OF REPORT

This Report forms part of Wilton Junction Precinct SEPP Study on the Overall Integrated Water Cycle Management Strategy and specifically addresses the proposed means of treated effluent disposal.

The Director General of the Department of Planning and Infrastructure (DPI), as part of the Wilton Junction Precinct SEPP Study process has issued the Director Generals Requirements (DGR's) listing specific matters that the SEPP Study is to address. Refer Attachment 3 for a copy of the DGR's and associated responses from referral Agencies commenting on preliminary Master Plan documentation submitted to DPI by the Wilton Junction Landowners Group in 2012.

This Report addresses, in part, DGR's Key Study Requirement No. 9 Dot Points 1 & 2 and provides cost estimates for inclusion in Key Study Requirement No. 18 Dot Point 3, Sub Dot Point 6 in respect of preferred methods of disposal of treated effluent.

7. BACKGROUND – SEWERAGE TREATMENT & DISPOSAL OF TREATED EFFLUENT

Whilst the SEPP Study Area is within overall Sydney Water Corporation (SWC) servicing area there is no publicly owned Sewerage Treatment and Effluent Disposal system currently available to service current or future development within the SEPP Study Area (excluding Bingara Gorge and the existing Wilton Township which has a privately owned and operated system).

At the time of preparing this Report no decision has been made by SWC or NSW Government on whether SWC will provide sewerage treatment and treated effluent disposal services to the SEPP Study Area.

The Bingara Gorge area, currently being developed by Lend Lease, has a privately owned and operated Sewerage Treatment Plant with a WICA Act Licence and approval to dispose of treated effluent irrigation on the Golf Course, which is under construction, together with disposal by irrigation of open space areas and ultimately for use within houses via a dual water supply system.

The existing Wilton Township is not presently sewered, however, it is understood SWC has entered into a commercial arrangement for the private water operator at the Bingara Gorge RWTP, to treat sewage from Wilton Township and dispose of the treated effluent within the Bingara Gorge Development. The work in Wilton Township is understood to be scheduled for year 2014 as part of the SWC Priority Sewer Programme.

8. RELEVANT ASSOCIATED SEPP STUDY REPORTS

As part of the Wilton Junction Precinct SEPP Study the Landowners Group have engaged MWH to prepare a Sewerage Strategy Report (MWH Report).

The MWH Report addresses a strategy for collection and treatment of sewage from the SEPP Study Area. Information contained in the relevant MWH Report on likely volumetric output of treated effluent has been used in the preparation of this Report on Disposal of Treated Effluent.

This Report forms part of the Integrated Water Cycle Management Report prepared by JWP for the Wilton Junction Precinct SEPP Study.

9. STAGING OF WILTON JUNCTION SEWERAGE INFRASTRUCTURE

Wilton Junction Precinct SEPP Study lands are owned by three (3) major landowners and a number of other owners with smaller land holdings. In addition the Study Area surrounds two (2) existing urban areas of Wilton Village and Bingara Gorge.

As a consequence of the total development yield, based on the Connor Holmes Wilton Junction Master Plan, development will occur over a number of decades. Development is likely to occur in a number of locations, within Wilton Junction Precinct, at any one time. The rate of development and location of development within Wilton Junction SEPP Study Area will be driven by market demand.

Consequently, the provision of sewerage infrastructure will be staged, depending on rates of development, both residential, employment and commercial considerations.

Earlier Sewerage Strategy Report prepared by CH2MHILL Pty Ltd for the Wilton Junction Landowners Reference No. 3 identified a site for the Sewerage Treatment Plant for Wilton Junction adjacent to the Bingara Gorge RWTP. This site has been adopted in the MWH Sewerage Strategy Report as the location of the future Wilton Junction MBR Treatment Plant.

There is potential for Stage 1 of sewerage treatment for development within Wilton Junction to be carried out by an expanded Bingara Gorge RWTP.

Subject to conclusion of satisfactory commercial arrangements, and the necessary approval process, sewerage treatment and effluent disposal may be available for the first two thousand (2000) equivalent lots from areas of Wilton Junction Precinct which are located outside of the boundaries of Bingara Gorge and the existing Wilton Township, however for the purposes of this Report it has been assumed that this scenario will not happen.

As a certain number of contributing dwellings or other development generating sewage for treatment is required before a typical MBR Sewage Treatment Plant can operate effectively, there is a possibility that Wilton Junction Landowner(s) may seek approval for temporary packaged sewage treatment on their site, with disposal of treated effluent by irrigation on future development land which is currently pasture grazing land. Refer to Attachment 1 for details of temporary treated effluent disposal system.

The staging of construction of the new MBR Sewage Treatment Plant and Treated Effluent Disposal System for Wilton Junction SEPP Study Area will vary, subject to whether a satisfactory commercial arrangement can be reached as the size of the proposed MBR Plant and Effluent Disposal System will reflect the ultimate sewage loading that is to be treated and disposed of within Wilton Junction.

10. PROPOSED TREATED EFFLUENT DISPOSAL SYSTEM

9.1 General

The ultimate methods of disposal of treated effluent from the Wilton Junction SEPP Study Area lands will embrace a number of disposal methods which will provide beneficial outcomes by reusing the treated effluent where possible and provide secondary contact water recreation facilities that would not otherwise be provided in this region.

The proposed treated effluent disposal system will provide a continuing treatment train beyond the discharge point of the proposed MBR Sewage Treatment Plant to service the Wilton Junction Precinct SEPP Study Area and will form part of a sustainable integrated water cycle management system.

The proposed ultimate treated effluent disposal system includes disposal of excess treated effluent to one or more existing ephemeral gullies downstream of recreational waterbodies and rain gardens.

9.2 Basis of Concept for Disposal of Treated Effluent

In preparing the concept for the disposal of treated effluent the aim has been to achieve the following Environmental Performance Objectives as set out in Item 2.6 Attachment A to EPA correspondence dated 3rd December 2012 included in Attachment 3 of this Report.

- Protection of surface water
- Protection of ground water
- Protection of lands
- Protection of plant and animal health
- Prevention of public health issues
- Conservation and reuse of resources
- Protection of community amenity

9.3 Reference Guidelines Consulted for Additional Information on Achieving the Environmental Performance Objectives

The following references have been used in order to achieve the Environmental Performance Objectives.

Ref. 1 - National Water Quality Management Strategy - *"Guidelines for Sewerage Systems – Effluent Management"* (ARMCANZ / ANZECC 1997)
Ref. 2 - National Water Quality Management Strategy – *"Guidelines for Sewerage Systems – Use of Reclaimed Water*" (ARMCANZ / ECC 2000
Ref. 3 - Dec. NSW 2004 – *"Environmental Guidelines – Use of Effluent by Irrigation"*
Ref. 4 - NWQMS – *"Australian & New Zealand Guidelines for Fresh & Marine Water Quality Vol 1"* - Oct 2000
Ref. 5 - NWQMS – *"Overview of Australian Guidelines for Water Recycling Managing Health & Environmental Risks"* – 2006
Ref. 6 - Australian Government – NH&MRC – *"Guidelines for Managing Risks in Recreational Water"* – 2008

9.4 Proposed Treated Effluent Uses

The ultimate proposed treated effluent scheme uses include the following broad methods of disposal.

A - Reuse

(i) Reuse of treated effluent irrigation on open space areas and road verges / medians where the roads are classified as *"access denied"*.

(ii) Reuse of treated effluent within employment lands for industrial processes, toilet flushing and dust control.

(iii) Reuse of treated effluent for construction purposes.

(iv) Use in civic landscape features such as fountains and cascades.

B - Use in Waterbodies

(i) Use of treated effluent as for Secondary Contact Standard Water for recreational purposes with resultant amenity improvement.

(ii) Use of treated effluent as source water to be used for reprocessing to Primary Contact Water Quality Standard for use in proposed swimming pool / beach area.

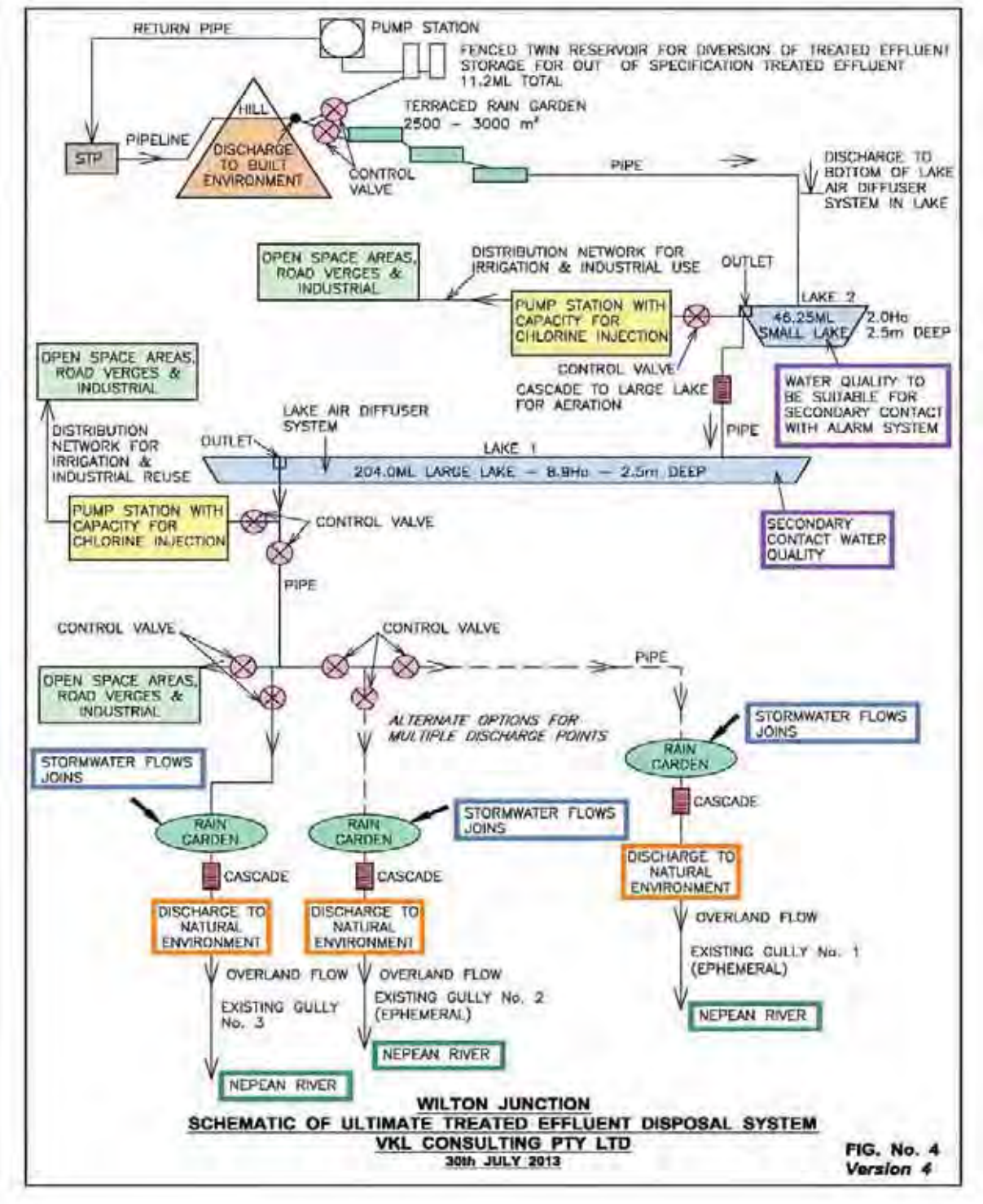
(iii) Evaporation from waterbodies containing treated effluent.

C - Disposal

(i) Disposal from proposed waterbodies via a rain garden where it mixes with site stormwater prior to entering into an existing ephemeral gully before reaching the Nepean River.

Figure No. 4 provides a schematic of the proposed treated effluent disposal system.

Figure No. 4



9.5 Description of Treated Effluent Disposal System Components

9.5.1 General

The final design of the treated effluent disposal system will be driven by a Risk Assessment as set out in Ref. No. 5 Clause 8.3.

9.5.2 Standby Storage for Out of Specification Effluent

The treated effluent disposal system commences from the outlet of the MBR Sewage Treatment Plant.

In recognition that occasionally events occur where sewage treatment plants malfunction for various reasons, and out of specification effluent is produced, provision has been made to divert any out of specification effluent to a standby storage facility with two (2) days capacity.

This out of specification effluent can then be returned to the MBR Treatment Plant for reprocessing when the plant malfunction has been rectified, thereby greatly reducing any release of out of specification treated effluent into the built and natural environment.

9.5.3 Treated Effluent Reservoir & Pump Station

Treated effluent that meets design specification will be pumped to a reticulation distribution reservoir which will provide *"on demand"* capacity for recycled uses within employment areas.

When the reservoir is full the treated effluent will be discharged to the built environment, treatment train, for storage in the waterbodies, recycled water uses of irrigation – recreation and evaporation.

9.5.4 Treated Effluent Treatment Train Within the Built Environment

9.5.4.1 Discharge to Built Environment

The proposed point of discharge of the treated effluent treatment train, within the built environment, is at a local high point to enable the treated effluent to flow, by gravity, through a rain garden to the smaller Lake 2 as shown on VKL Consulting Pty Ltd Drawing No. 2013-WJ-10 Version 2 dated 31st July 2013 included in this Report.

9.5.4.2 Lake 2 & Associated Features

Lake 2 is proposed to be 2.0 Ha in surface area, 2.5m deep and have a storage volume of 46.25 ML, which equates to approximately eight (8) days storage of ultimate daily output from the MBR Sewage Treatment Plant.

Lake 2 will be configured so that the inlet of treated effluent will occur at the bottom of the waterbody, on the eastern end, and the outlet will be at the standing water level on the western end of the lake.

This will ensure maximum detention time within the waterbody.

An air diffuser system will be provided in the base of the waterbody to ensure oxygenation of the treated effluent will be maintained through the full water column, to assist in maintaining Secondary Contact Water Quality in the waterbody.

As a precaution against out of quality treated effluent being discharged to Lake 2, before the out of specification effluent is diverted to the standby storage, referred to in Clause 8.5.2, provision will be made for the installation of appropriate signage to warn users that the waterbody may not meet Secondary Contact Water Quality Standards and give notice to avoid contact until such time as the Secondary Contact Standard has been re-established.

It is likely that Lake 2 will be excavated in shale materials. It is proposed that a suitable thickness clay liner will be constructed to ensure water tightness and prevent impacts on groundwater.

Provision will be made to enable extraction of water from Lake 2 for irrigation, construction purposes and employment land reuse if required.

This provision (pump station) will include necessary equipment to disinfect the water to be pumped.

The pump station and pipe system will also be configured to return the stored treated effluent to the MBR Sewage Treatment Plant for reprocessing if required.

No stormwater, other than rain that falls on the surface of the waterbody, will enter Lake 2.

Evaporation will occur from Lake 2. UV polishing will occur in Lake 2 from sunlight.

Weed growth control measures will be implemented where depth of water is less than 1.5m.

9.5.4.3 *Connection Between Lake 2 & Lake 1*

A gravity pipe connection will be provided, discharging through a cascade, to provide oxygenation to treated effluent passing from Lake 2 to Lake 1.

This flow will enter Lake 1 at the bottom of the waterbody.

9.5.4.4 *Lake 1 & Associated Features*

Lake 1 will have a surface area of 8.9 Ha, be 2.5m deep, and have a storage volume of 204 ML of effluent treated to Secondary Contract Water Quality standard.

The volume of Lake 1 is approximately equivalent to thirty six (36) days of the daily output of the MBR Sewage Treatment Plant, making the total storage volumes of Lakes 1 & 2 equivalent to forty four (44) days of treated effluent output from MBR Sewage Treatment Plant.

Lake 1 will be configured so that the inlet of treated effluent from Lake 2 will occur at the bottom of Lake 1, at the southern end of the lake and the outlet is to be at standing water level on the northern end of Lake 1.

This will ensure maximum detention time within the waterbody.

An air diffuser system will be provided in the base of the waterbody to ensure oxygenation of the treated effluent is maintained through the full water column, to assist maintaining Secondary Contact Water Quality in the waterbody.

It is likely that Lake 1 will be excavated in shale materials. It is proposed that a suitable thickness clay liner will be constructed to ensure water tightness and prevent impacts on groundwater.

Provision will be provided to extract water from Lake 1 for irrigation, construction purposes and employment land uses if required.

Lake 1 will also provide the source water for upgrading the quality of the water from Secondary Contact to Primary Contact, for use in the swimming pool and beach facility to be constructed adjacent to Lake ,1 but separated by a special glass barrier.

The pump station used to extract treated effluent from Lake 1 will also have the necessary equipment to disinfect the extracted water prior to reuse, if required.

No stormwater, other than rain that falls on the surface of the waterbody, will enter Lake 1.

Evaporation will occur from Lake 1. UV polishing will occur in Lake 1 from sunlight.

Weed control measures will be implemented where the depth of Lake 1 is less than 1.5m deep.

The outlet from Lake 1 will discharge to the natural environment via a pipe system delivering to a rain garden(s) through a cascade, prior to discharging to a ephemeral gully or gullies at a point along the gully where flows in the gully discharges over natural sandstone.

At this point stormwater will mix with treated effluent.

Ultimately, the stormwater and treated effluent flow in gully will discharge to the Nepean River.

9.5.4.5 Irrigation of Open Spaces & Road Verges / Medians

An appropriate underground irrigation system will progressively be provided as development progresses to irrigate open space areas and road verges.

Treated effluent extraction pump stations from Lakes 1 & 2 will be utilised to provide the necessary pressure to operate the irrigation system.

Filters will be installed at the pump stations.

Attachments 1 & 2 details the site assessment for disposal of treated effluent, Ref. No. 3 in Clause 8.3.

9.6 Summary of Environmental Performance Objectives Addressed by the Proposed Treated Effluent Disposal System

The Environmental Performance Objectives addressed by the proposed treated effluent disposal system are tabulated in Table No. 1. These objectives are set out in Attachment A of EPA correspondence dated 3rd December 2012 and included in Attachment 3 of this Report.

Table No. 1

Item	Environmental Performance Objective	How Treated Effluent Disposal System Addresses Environmental Performance Criteria
1.	Protection of Surface Waters	• Treated effluent is not discharged to natural environment until it has been through approximately 44 days in the lake system where the treated effluent receives UV polishing & oxygenation, passing through a series of rain gardens to remove nutrients that may have accumulated from bird life in the lake system. • Duration return periods & application rates of irrigation to open space & road verges restricted to ensure no runoff enters the gully / creek system. • Provision in the system to divert out of specification treated effluent from being discharged to the environment.
2.	Protection of Groundwater	• Clay liner constructed in base of lakes to avoid loss of water from waterbodies into groundwaters. • Irrigation system controls to limit frequency of application & application duration / quantity to avoid significant percolation through the soil. Disposal through evapotranspiration.
3.	Protection of Lands	• Areas used for disposal by irrigation will be limited to slopes & soil types that are not readily eroded.
4.	Protection of Plant & Animal Health	• Salinity levels of irrigated water will be suitable for plants in the location & effluent quality will be suitable for animals to drink without harm. • Application duration & rates of irrigated treated effluent will not cause waterlogging of plants nor result in ponding of irrigated treated effluent. • Air diffusion system in Lakes 1 & 2 will keep treated effluent stored in Lakes 1 & 2 oxygenated thereby minimising any potential anaerobic conditions to develop. • Sewage from any trade waste will not be treated in the MBR Treatment Plant thereby minimising any heavy metals & hydrocarbons in the treated effluent which otherwise be detrimental to plants & animals.
5.	Prevention of Public Health Risks *Continued.*	• Detailed design of both the MBR Sewage Treatment Plant & the Disposal of Treated Effluent Disposal System will be driven by a Risk Assessment process as recommended in Ref. 5 & Ref. 6 Clause 8.3 of this Report. • No trade waste is to be treated in the MBR Sewage Treatment Plant. *Continued.*

Item	Environmental Performance Objective	How Treated Effluent Disposal System Addresses Environmental Performance Criteria
5.	Prevention of Public Health Risks *Continued.*	*Continued.* • Water Quality Standards shall meet Secondary Contact Water Quality Standards. • Diversion of out of specification treated effluent to a standby storage for reprocessing. • Monitoring system as part of a specific Environmental Management Plan to be prepared for the Disposal of Treated Effluent System. • Tertiary Treatment of sewage in the MBR Sewage Treatment Plant with level of disinfection as identified in the Risk Assessment to be carried out at Development Application stage.

11. ENVIRONMENT MANAGEMENT PLAN & MONITORING

An Environmental Management Plan (EMP) will be provided in association with the first application for Construction Certificate.

The EMP will include construction and operational phases setting out strict criteria to ensure that the Environment Outcomes are achieved.

12. HIGH LEVEL ORDER OF COST

The high level order of cost for the complete treated effluent disposal system as shown on VKL Consulting Pty Ltd Drawing No. 2013-WJ-10 Version 2 dated 31st July 2013.

13. OWNERSHIP & OPERATION

At the time of preparing this Report there is no clear direction on Ownership and operation of the Treated Effluent Disposal System.

This will become clearer with time and decisions to be taken by SWC and NSW Government.

Options include SWC or Private Water Operator with WICA Licence.

14. CONCLUSIONS

The proposed treated effluent disposal system for Wilton Junction Precinct SEPP Study Area has addressed the relevant DGR's set for the study.

As a consequence of the circumstances of land ownership in the Wilton Junction SEPP Study Area, the total potential residential lot yield and employment uses development will occur over a number of decades, driven by market demand, and the likelihood is that development will occur in the SEPP Study Area on a number of fronts it is necessary for the proposed Treated Effluent Disposal System to be flexible to achieve the desired Environmental Objectives.

The proposed Treated Effluent Disposal System provides the flexibility that is needed and will meet current Environmental Objectives.

The system proposed is suitable for on-site irrigation disposal in open space areas and certain road verges / medians as demonstrated by high level Geotechnical investigation of the SEPP Study Area and outputs from EPA ERIM Modelling.

The proposed extra treatment train will provide approximately forty four (44) days of UV polishing and recreation facilities which are based on Secondary Contact Water Quality Standards.

No stormwater, other than rain that falls on the 10.9 Ha of waterbodies, will be mixed with treated effluent until such time as the treated effluent stored in the waterbodies is released to the environment. The treatment train is configured to progressively oxygenate the treated effluent using cascades, air diffusion systems and wave action.

Rain gardens are proposed progressively along the treatment train to remove any build up of nutrients in the waterbodies.

Waterbodies will be configured to minimise any aquatic weed growth.

The waterbodies are of such a size and orientation that significant volumes of treated effluent will be disposed of by evaporation.

It is anticipated that the waterbodies, along with other components of the Treated Effluent Disposal System, will be constructed progressively as demand builds up.

The high level estimate of cost for the complete treated effluent disposal system is $34M subject to detailed design.

15. SUMMARY

High level investigations undertaken as part of the Wilton Junction Precinct SEPP Study indicate that a Treated Effluent Disposal System comprising a number of disposal components can meet the DGR's provided for the Wilton Junction Precinct Study.

The disposal methods proposed, when the design is driven by a Risk Assessment approach, as recommended in NH&MRC publication – *"Guidelines for Managing Risks in Recreational Water"* – 2008 and NWQMS publication *"Overview of Australian Guidelines for Water Recycling Managing Health and Environmental Risks"* – 2006 will achieve Environmental Performance Objectives as set out by EPA in correspondence to Wollondilly Shire Council dated 3rd December 2012.

The proposed Treated Effluent Disposal System will provide recreation benefits and reuse of resources resulting in improved amenity.

The proposed Treated Effluent Disposal System is flexible enough to meet the diverse circumstances that will occur during the development phase of Wilton Junction Precinct.

16. USE OF REPORT

This report has been prepared for the sole use of Wilton Junction Landowners Group, Wollondilly Shire Council and NSW Government as support documentation for the Wilton Junction Precinct SEPP Study.

Information contained herein is not to be used for any other purpose unless authorised in writing by Wilton Junction Landowners Group and VKL Consulting Pty Ltd.

VKL CONSULTING PTY LTD

Keith Vinnicombe BE (HONS)
Director
28th May 2014

REFERENCES

1. Department of Planning and Infrastructure *DGR's* for the SEPP Study

2. NSW Government Referral Agencies comments on the Draft Master Plan

3. CH2MHILL Report on "*Wilton New Town Sewerage Overview*" Revision B dated October 2012

4. MWH Report on "*Wilton Junction Rezoning – Wastewater Strategy*" dated July 2013

5. National Water Quality Management Strategy - "*Guidelines for Sewerage Systems – Effluent Management"* (ARMCANZ / ANZECC 1997)

6. National Water Quality Management Strategy – "*Guidelines for Sewerage Systems – Use of Reclaimed Water*" (ARMCANZ / ECC 2000

7. Dec. NSW 2004 – "*Environmental Guidelines – Use of Effluent by Irrigation"*

8. NWQMS – "*Australian & New Zealand Guidelines for Fresh & Marine Water Quality Vol 1"* - Oct 2000

9. NWQMS – "*Overview of Australian Guidelines for Water Recycling Managing Health & Environmental Risks"* – 2006

10. Australian Government – NH&MRC – "*Guidelines for Managing Risks in Recreational Water"* – 2008

ATTACHMENT 1

Reuse of Treated Effluent by Irrigation

ATTACHMENT 1

WILTON JUNCTION PRECINCT

SEPP STUDY

REUSE

OF

TREATED EFFLUENT

BY IRRIGATION

vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au

In Association with

J.WYNDHAM PRINCE

OCTOBER 2013
Final Version

CONTENTS

Attachments

No. 1A	- *EPA ERIM Mathematic Graphical Output for Case No. 1* - *850 Equivalent Tenements Pressure Sewer & 15mm of Percolation per Month* - *Daily Output 0.357 ML*

Figures

No. 1 - Version 3	*Wilton Junction, Schematic of Initial Temporary Treated Effluent Disposal System for Initial 850 Equivalent Lots*

1. INTRODUCTION

The purpose of this aspect of the Wilton Junction Precinct SEPP Study on Disposal of Treated Effluent is to ensure that the study site is suitable for sustainable disposal of treated effluent by irrigation on open space areas and verges of access denied road within Wilton Junction.

The reference document is Environmental Guidelines issued Dec 2004 titled *"Environmental Guidelines – Use of Effluent by Irrigation"*.

2. SCOPE OF REPORT

This Report is a high level assessment of the suitability of Wilton Junction Precinct SEPP Study Area for land disposal of treated effluent from an onsite MBR Sewage Treatment Plant.

As irrigation disposal is one of the overall methods of disposal of treated effluent from the Study Area the Report provides background information on land form, geology, soil chemistry and investigates irrigation application rates using EPA's ERIM Mathematical Model.

Associated with the Model output is estimates of irrigation application rates and irrigation return periods.

The proposed effluent disposal system does not propose to include wet weather storage but to deliver high quality treated effluent to the Nepean River, where the treated effluent is not able to be utilised by all of the combined methods of disposal as outlined in the main body of the Treated Effluent Disposal System.

Detailed submission will be provided at Development Application stage.

3. GEOLOGY OF STUDY AREA

Reference Douglas Partners Report on Geotechnical Assessment dated July 2013

The site is shown on the 1:100,000 Wollongong – Port Hacking Geological Series Sheet and indicates that the central portions of the site are underlain by Ashfield Shale of the Wianamatta Group generally comprising laminate and dark grey silt stone.

Some minor area of the site could be underlain by Bringelly Shale which can comprise shale, carbonaceous claystone, laminate and coal in parts.

The lower elevations are underlain by Hawkesbury Sandstone, which generally comprises medium to coarse grained quartz sandstone and can have minor shale and laminate lenses.

There are areas where a transitional zone of Mittagong sequence occurs between the Ashfield Shale and Hawkesbury Sandstone. This formation comprises inter bedded shales / laminate and fine grained sandstone.

4. SOIL LANDSCAPE

Soil landscapes are identified on the 1:100,000 Soil Landscapes of Wollongong – Port Hacking Sheet.

The site included four (4) soil landscape groups, Blacktown, Lucas Heights, Hawkesbury and Luddenham.

Blacktown soil landscapes generally occur over Wianamatta Shales, Lucas Heights soil landscapes occur where Mittagong Formation is located, Hawkesbury soil landscapes occur over Hawkesbury Sandstone formation and Luddenham soil landscapes occur in higher locations over Wianamatta Shales.

5. HYDROGEOLOGY & SALINITY

The shale terrain of much of Western Sydney is known for saline groundwater resulting from release of connate salt in shales of marine origin or accumulation of windblown sea salt.

No water tables have been identified during study investigations.

6. SOIL SALINITY

A total of forty five (45) test locations were excavated by Douglas Partners, within the Wilton Junction Precinct SEPP Study Area, including the upper one (1) metre of the soil profile.

The soil salinity was assessed from one hundred and two (102) samples, with respect to electrical conductivity of a 1:5 soil : water extract (EC1.5).

No saline soils were identified over the Wilton Junction Precinct SEPP Study Area.

Refer Table 3 of Douglas Partners Report on Geotechnical Assessments July 2013 for full details.

7. OTHER SAMPLING FOR SOIL CHEMICAL PROPERTIES

7.1 Exchangeable Sodium Percentage - ESP

Test results indicate a range of exchangeable Sodium Percentage between 3% and 17.9%.

7.2 Cation Exchange Capacity - CEC

Test results indicate a range of CEC between 4.3 meq % and 9.8 meg %.

7.3 Phosphorous Sorption – P-sorp

Test results indicate a range of P-sorp between 5 kg / Ha and 9.8 kg / Ha.

7.4 Permeability – m/s

Tests indicate a range of 3.0×10^{-10} m / s and 8.6×10^{-10} m / s.

8. SLOPE STABILITY

Geotechnical investigation by Douglas Partners indicate that no instability was identified in areas where it is proposed to irrigate treated effluent.

9. EROSION POTENTIAL

Geotechnical investigation has identified that erosion potential exists with the soil landscapes present.

It is therefore appropriate that light application of treated effluent be applied to avoid potential runoff and erosion.

In a given day irrigation water may be applied over an extended time frame, with time pauses between irrigation applications to prevent potential for erosion.

10. SODICITY

Test results indicate a range of results from non sodic soils (<5%) to highly sodic soils (>15% sodicity).

Application of gypsum may be needed to those areas to be irrigated to reduce sodicity.

Detailed assessment will be made at Development Application stage.

11. PROPOSAL OPTIONS

As a consequence of staging of treatment of sewage from Wilton Junction Precinct there may be, two (2) types of treated effluent schemes proposed.

11.1 Possible Interim Scheme

There is a possibility that a temporary Sewerage Package Plant may be installed. If such a Development Application was made the treated disposal system will be regarded as a temporary full treated effluent disposal scheme which will ultimately be decommissioned in part or fully, when the MBR Sewage Treatment Plant and Treated Effluent Facilities are constructed.

When the MBR Sewage Treatment and Treated Effluent Disposal system becomes operational the irrigation system will become a reduced irrigation scheme where treated effluent will only be irrigated to open space areas and arterial road verges. The remaining treated effluent will be utilised for other purposes, evaporated or discharged to the built and natural environment through a planned series of water quality devices. See Main Report for details.

At the Development Application stage specific design details will be provided for any potential temporary Package Sewerage Treatment and Irrigation Scheme and for the MBR Sewage Treatment Plant and Disposal of Treated Effluent Scheme.

The details of any temporary irrigation disposal scheme proposed will be presented in a manner as outlined in DEC 2004 publication titles *"Environmental Guidelines – Use of Effluent by Irrigation"*.

Irrigation rates and return periods for the ultimate disposal scheme by irrigation will be extrapolated from the information derived from the temporary scheme to ensure that irrigated rates are at sustainable levels as outlined in Attachment 1A and Attachment 2.

12. RELATIONSHIP BETWEEN TEMPORARY WET WEATHER STORAGE VOLUME & AREA AVAILABLE FOR IRRIGATION FOR 850 EQUIVALENT TENEMENTS

Using EPA ERIM Model the relationship between wet weather storage volume, land available for irrigation and number of days storage required to prevent discharge assuming a 1 in 2 precautionary discharge is shown in Graphs 5A & 5B of the print out from the Model.

These outcomes are based on 15mm / month percolation and are for 850 equivalent tenements.

The graphical outcomes are tabulated in Table No. 3.

Table No. 1 – For 850 Lots

Lot Nos.	Low Pressure Sewer 0.357 ML / Day		
	Wet Weather Storage (ML) 1 in 2 year Precautionary Discharge Graph 5A	Irrigation Area Required (Ha) Graph 5A	No. of Days Storage Required (Days) Graph 5B
850 ET	21	41	80

13. RETURN PERIODS FOR VARIOUS TREATED EFFLUENT APPLICATION RATES & TIME PERIOD FOR APPLICATION

To assess the overall frequency of application of treated effluent over the irrigation area determined by ERIM modelling the return period for various combinations is listed in Table No. 2 following.

The return period is calculated using the formula.

$$\text{Return Period (Days)} = \frac{10 \times A \times R \times T}{Q}$$

Where A = Irrigation Area (Ha)
R = Maximum Irrigation to be applied per application (mm)
T = Irrigation Time / Day (hours)
Q = Flow Rate in Kilolitres / Day or irrigated water from STP

Table No. 2 – For 850 Lots

Equation Parameter	Unit	Low Pressure Sewer	Low Pressure Sewer	Low Pressure Sewer
A	Irrigation Area (Ha)	41	41	41
R	Application Rate (mm)	5	5	8.33
T	Irrigation Time (Hrs)	1	2	3
Q	Daily Quantity from STP (kl)	357	357	357
Return Period (Frequency that Effluent is Applied)		11	22	33

Generally it is assumed that a one (1) hour irrigation time will be used with a two (2) hour gap between application for a total 5mm i.e. 2 x 2.5 mm application to avoid runoff.

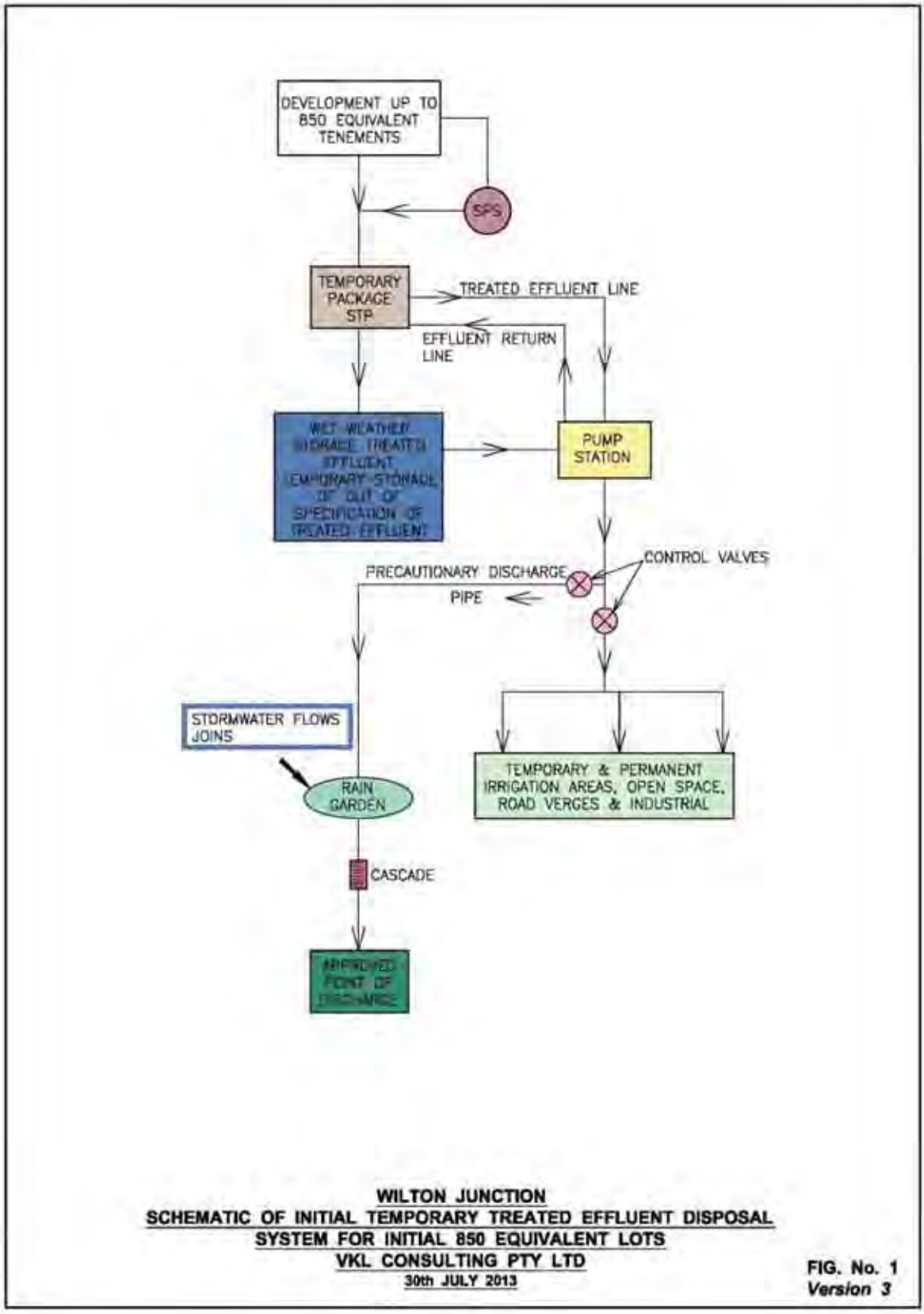
14. STAGING

The effect of this is that irrigation will only be applied every eleven (11) days with an application rate of 5mm per day.

The figures in Table 2 can be utilised for either establishment of a temporary site treated effluent disposal system as an interim measure until the staged MBR Treatment Plant and Effluent Disposal System is constructed or can be utilised to establish the irrigation routine in the Ultimate Treated Effluent system for the component where disposal is via irrigation of open space areas and arterial road verges.

If an interim irrigation disposal system is to be constructed then a typical concept is shown in Figure No. 1 Version 3 should an interim irrigation disposal system be proposed.

Figure No. 1


DEVELOPMENT UP TO 850 EQUIVALENT TENEMENTS
SPS
TEMPORARY PACKAGE STP
TREATED EFFLUENT LINE
EFFLUENT RETURN LINE
WET WEATHER STORAGE TREATED EFFLUENT EMPORARY STORAGE OF OUT OF SPECIFICATION OF TREATED EFFLUENT
PUMP STATION
CONTROL VALVES
PRECAUTIONARY DISCHARGE PIPE
STORMWATER FLOWS JOINS
RAIN GARDEN
TEMPORARY & PERMANENT IRRIGATION AREAS, OPEN SPACE, ROAD VERGES & INDUSTRIAL
CASCADE
WILTON JUNCTION
SCHEMATIC OF INITIAL TEMPORARY TREATED EFFLUENT DISPOSAL SYSTEM FOR INITIAL 850 EQUIVALENT LOTS
VKL CONSULTING PTY LTD
30th JULY 2013
FIG. No. 1
Version 3

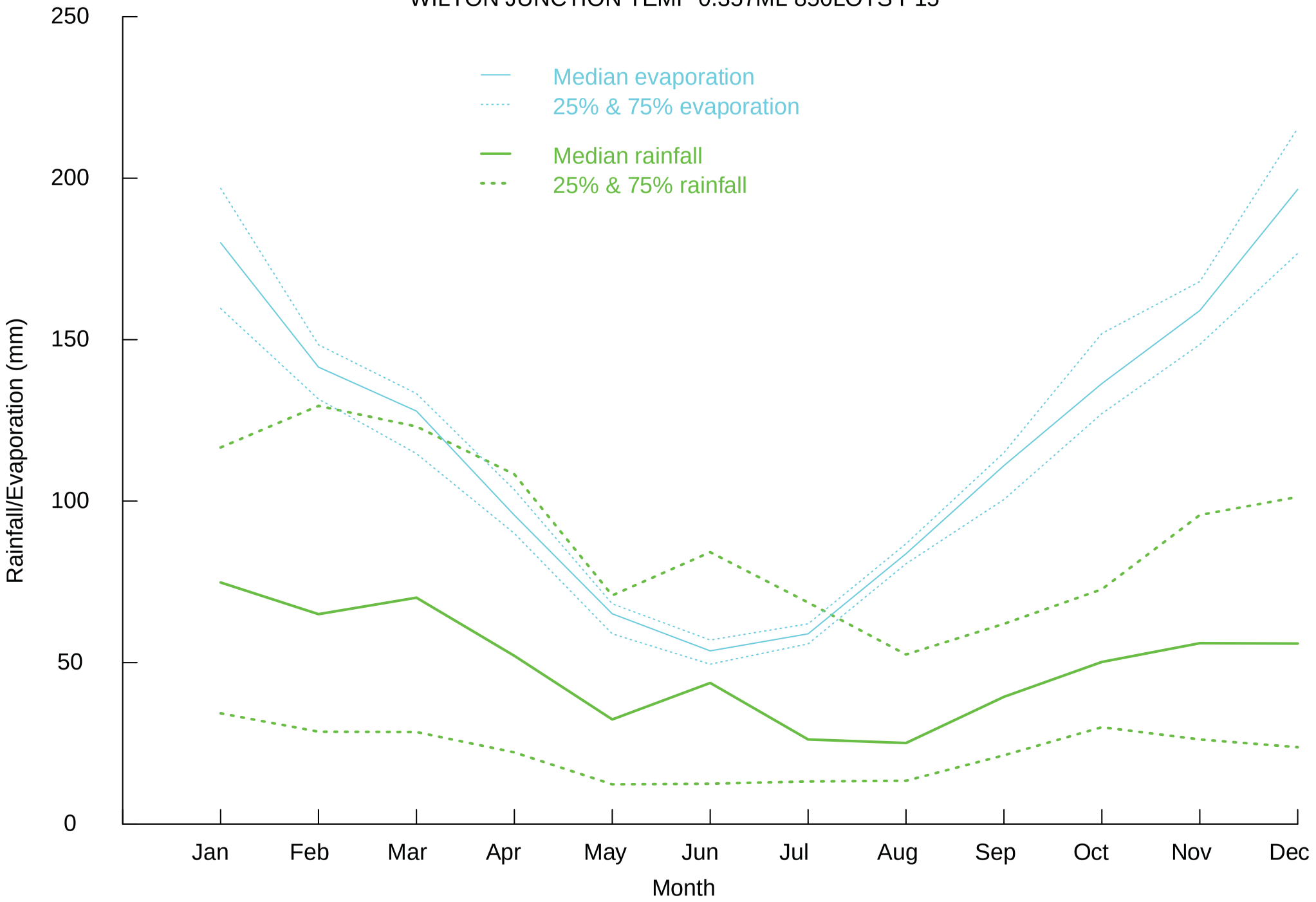
Attachment No. 1A

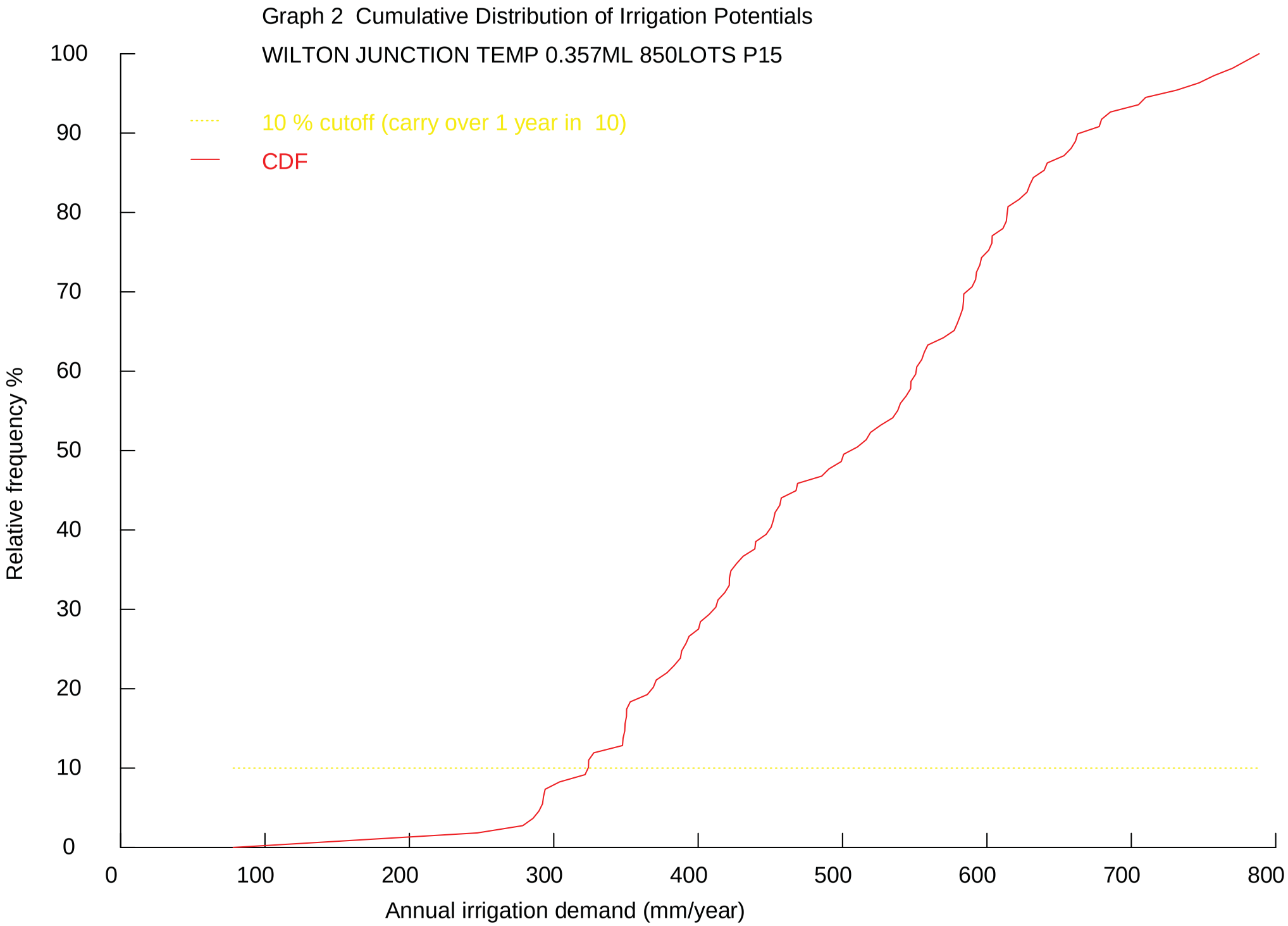
EPA ERIM Mathematic Graphical Output for Case No. 1

- *850 Equivalent Tenements Pressure Sewer & 15mm of Percolation per Month*
- *Daily Output 0.357 ML*

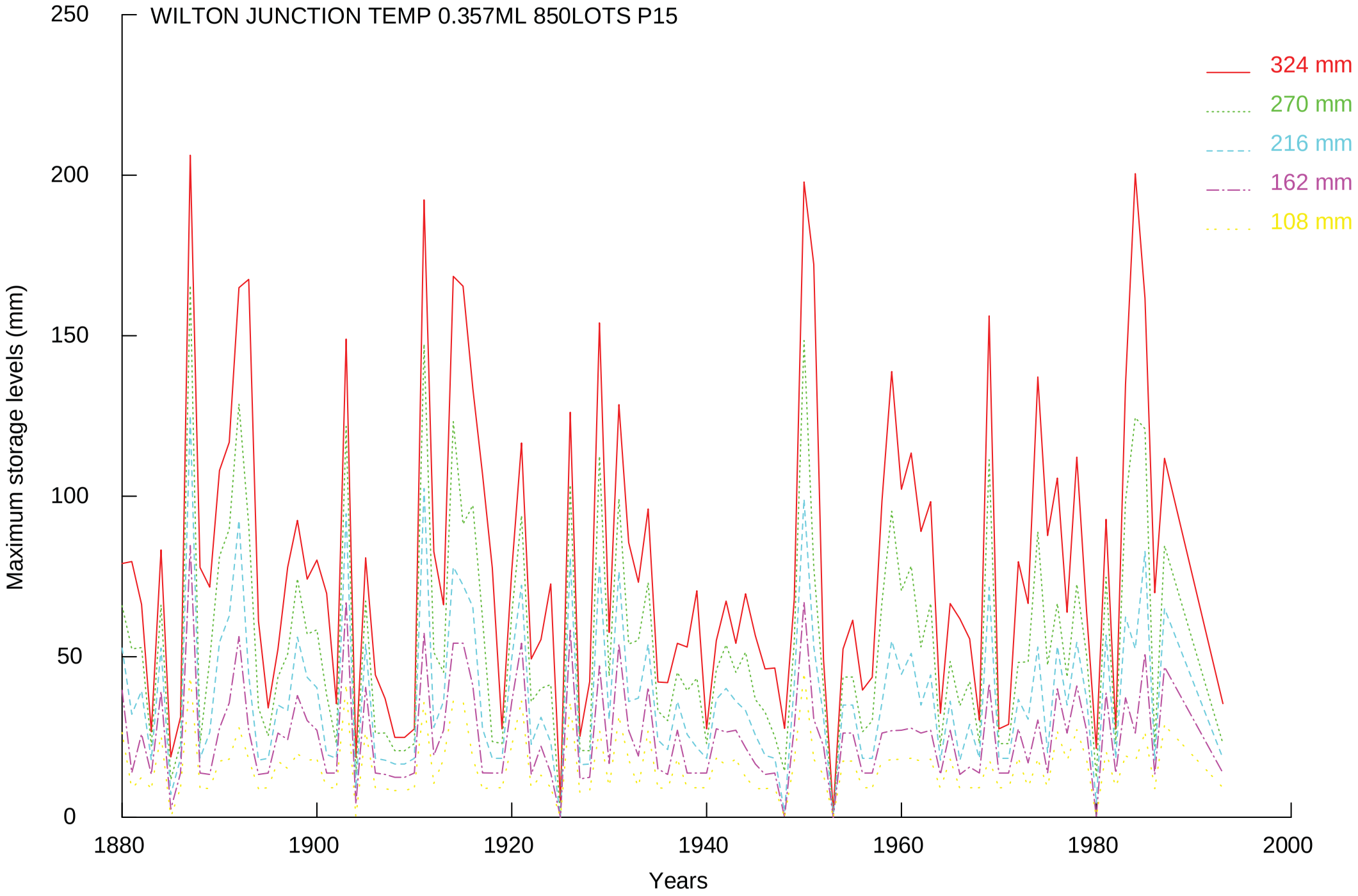
Graph 1 Weather Summary

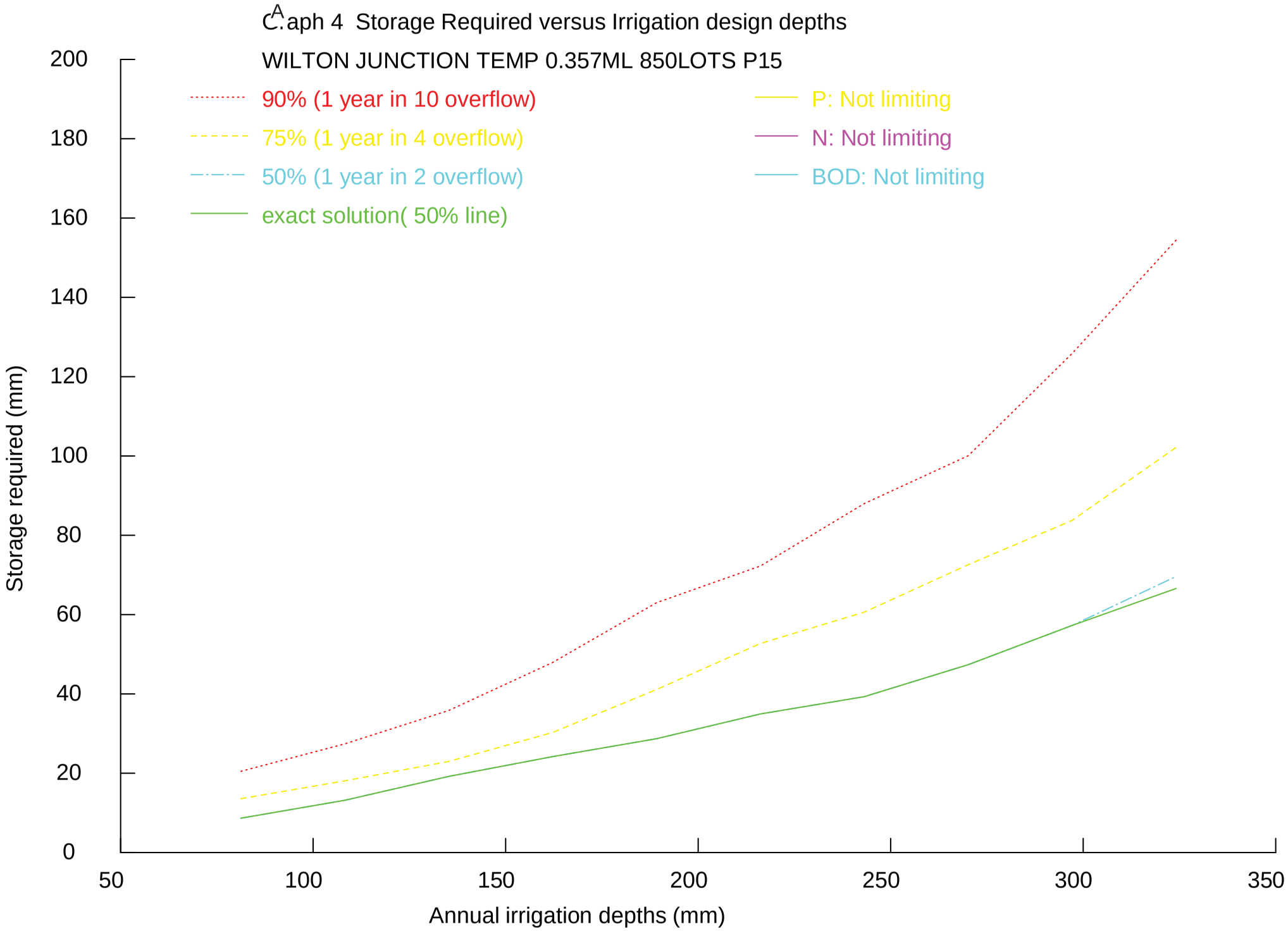
WILTON JUNCTION TEMP 0.357ML 850LOTS P15

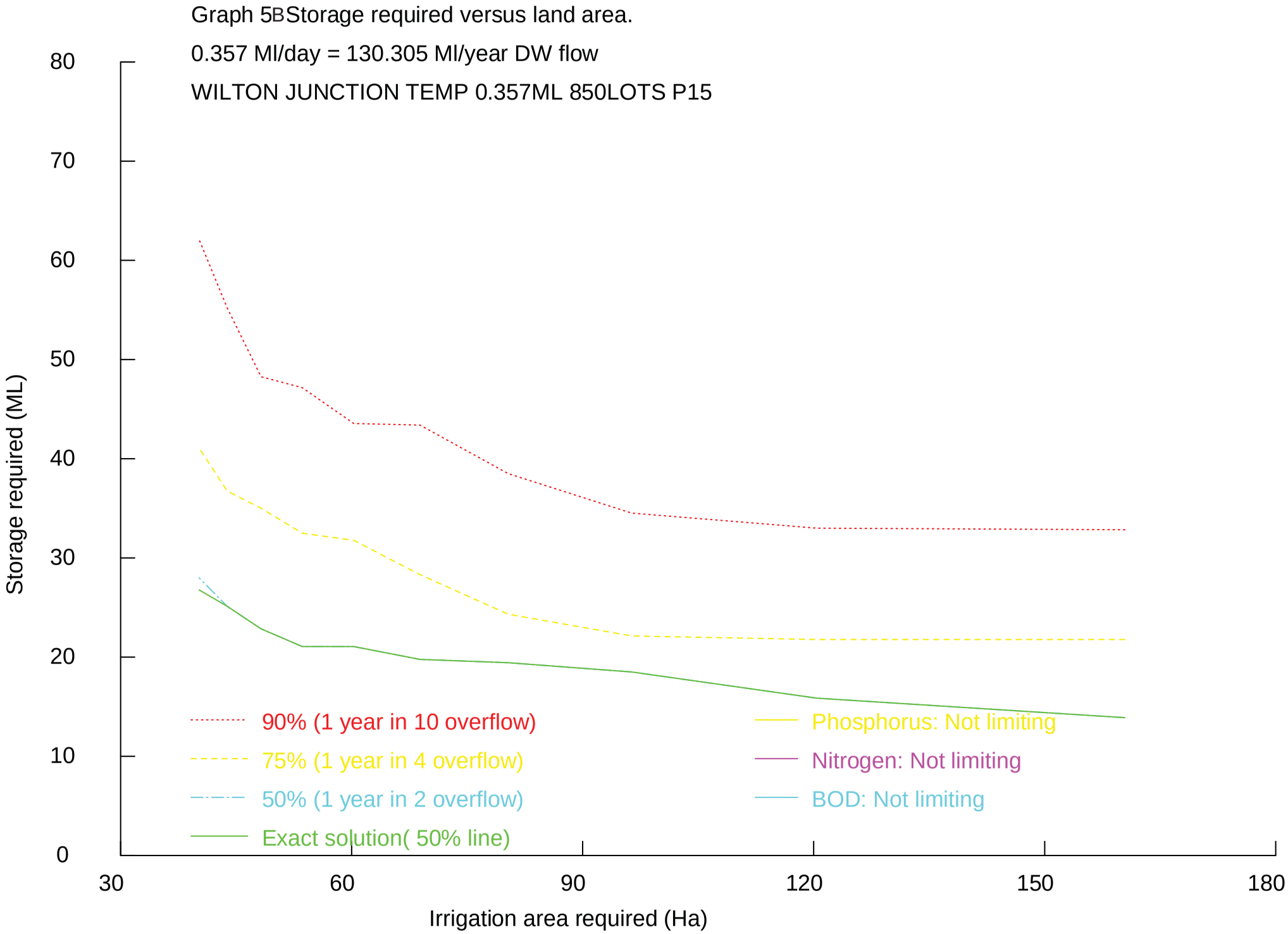



Graph 2 Cumulative Distribution of Irrigation Potentials
WILTON JUNCTION TEMP 0.357ML 850LOTS P15
10 % cutoff (carry over 1 year in 10)
CDF
Relative frequency %
Annual irrigation demand (mm/year)
0
10
20
30
40
50
60
70
80
90
100
0
100
200
300
400
500
600
700
800

Graph 3 Annual maximum storage levels for 5 effluent irrigation targets



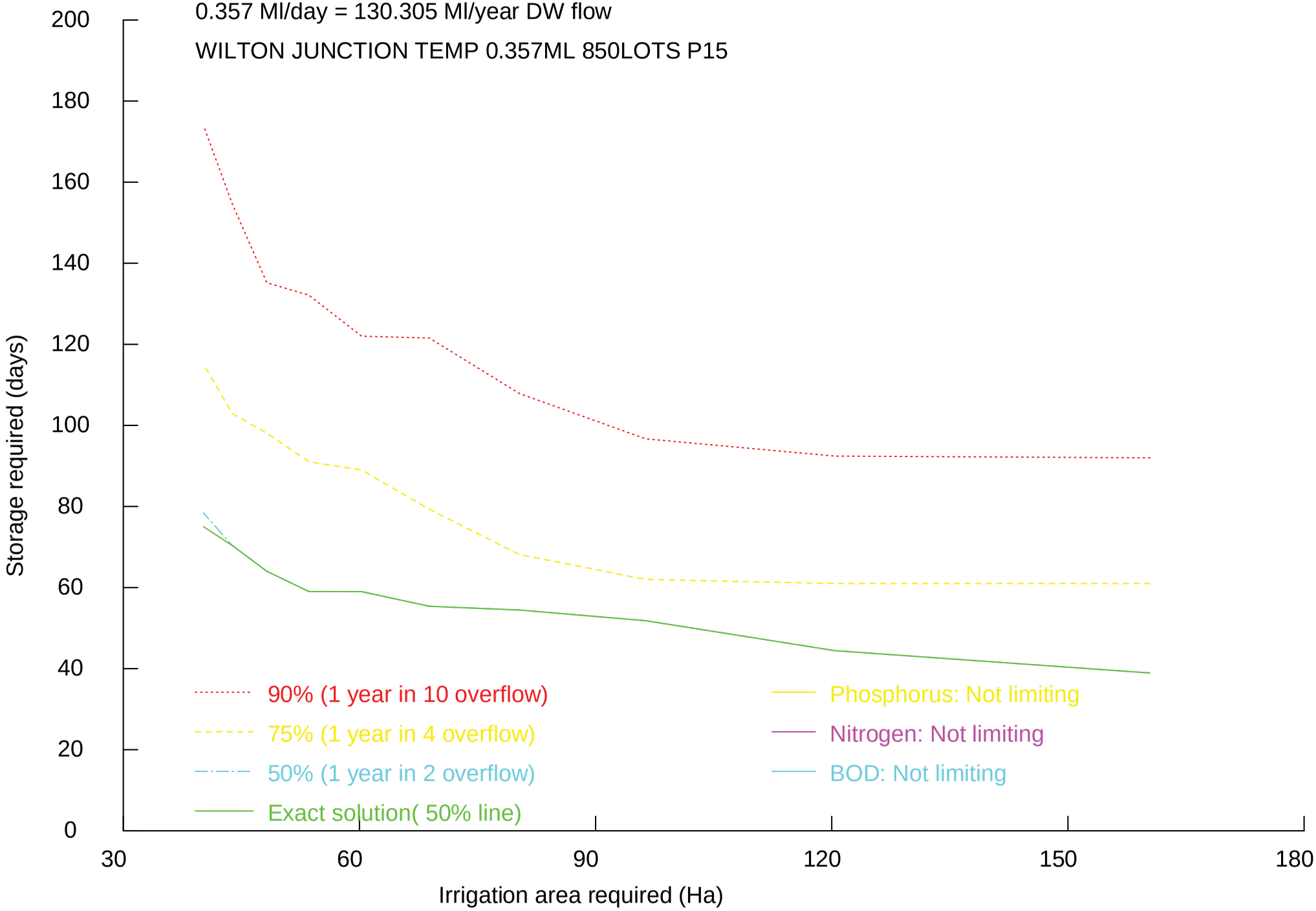

Caph 4 Storage Required versus Irrigation design depths
WILTON JUNCTION TEMP 0.357ML 850LOTS P15
90% (1 year in 10 overflow)
75% (1 year in 4 overflow)
50% (1 year in 2 overflow)
exact solution(50% line)
P: Not limiting
N: Not limiting
BOD: Not limiting
Storage required (mm)
Annual irrigation depths (mm)
0
20
40
60
80
100
120
140
160
180
200
50
100
150
200
250
300
350

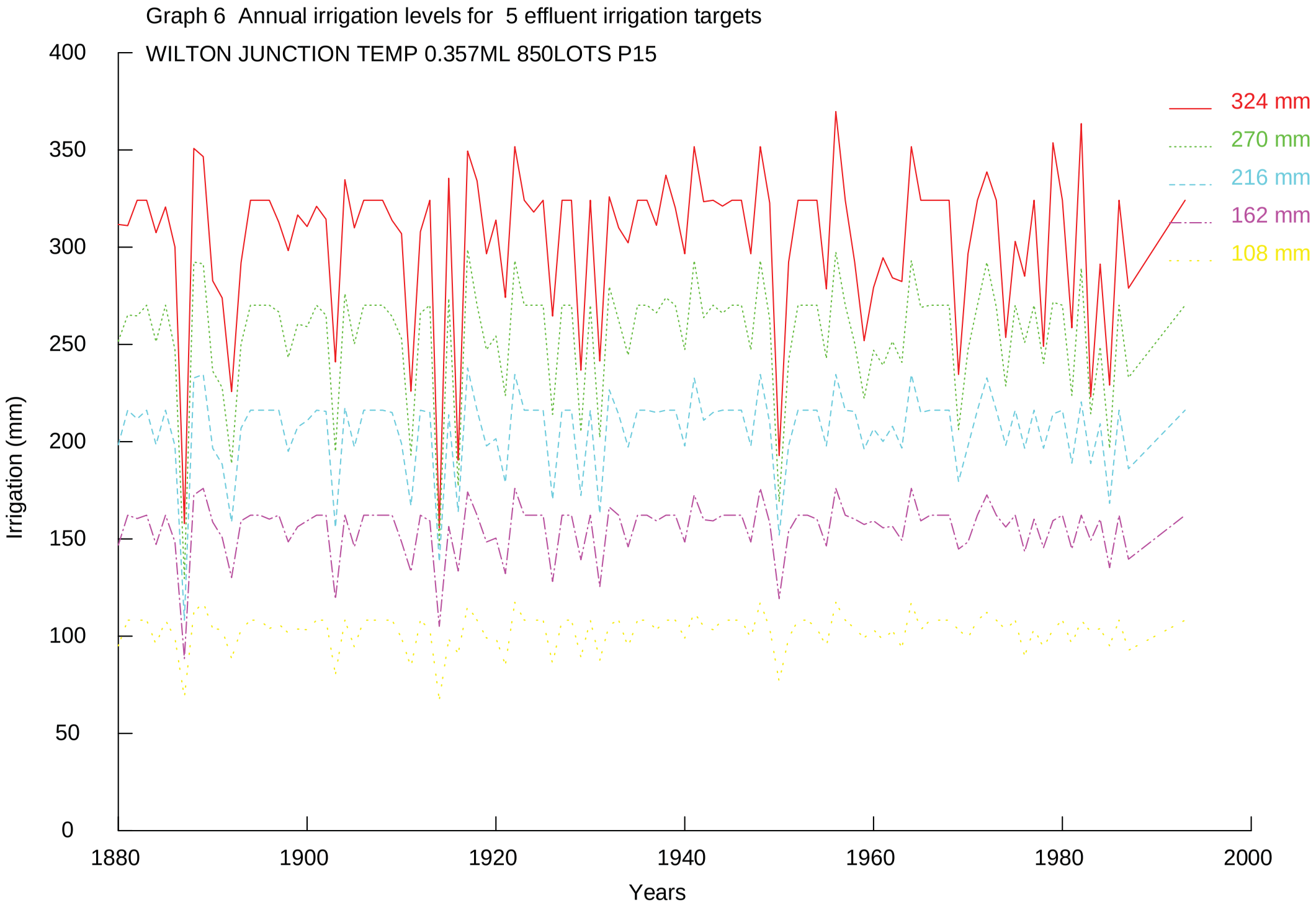

Graph 5B Storage required versus land area.
0.357 Ml/day = 130.305 Ml/year DW flow
WILTON JUNCTION TEMP 0.357ML 850LOTS P15
Storage required (ML)
0
10
20
30
40
50
60
70
80
30
60
90
120
150
180
Irrigation area required (Ha)
90% (1 year in 10 overflow)
75% (1 year in 4 overflow)
50% (1 year in 2 overflow)
Exact solution(50% line)
Phosphorus: Not limiting
Nitrogen: Not limiting
BOD: Not limiting

Graph 5 Storage required versus land area.

0.357 Ml/day = 130.305 Ml/year DW flow

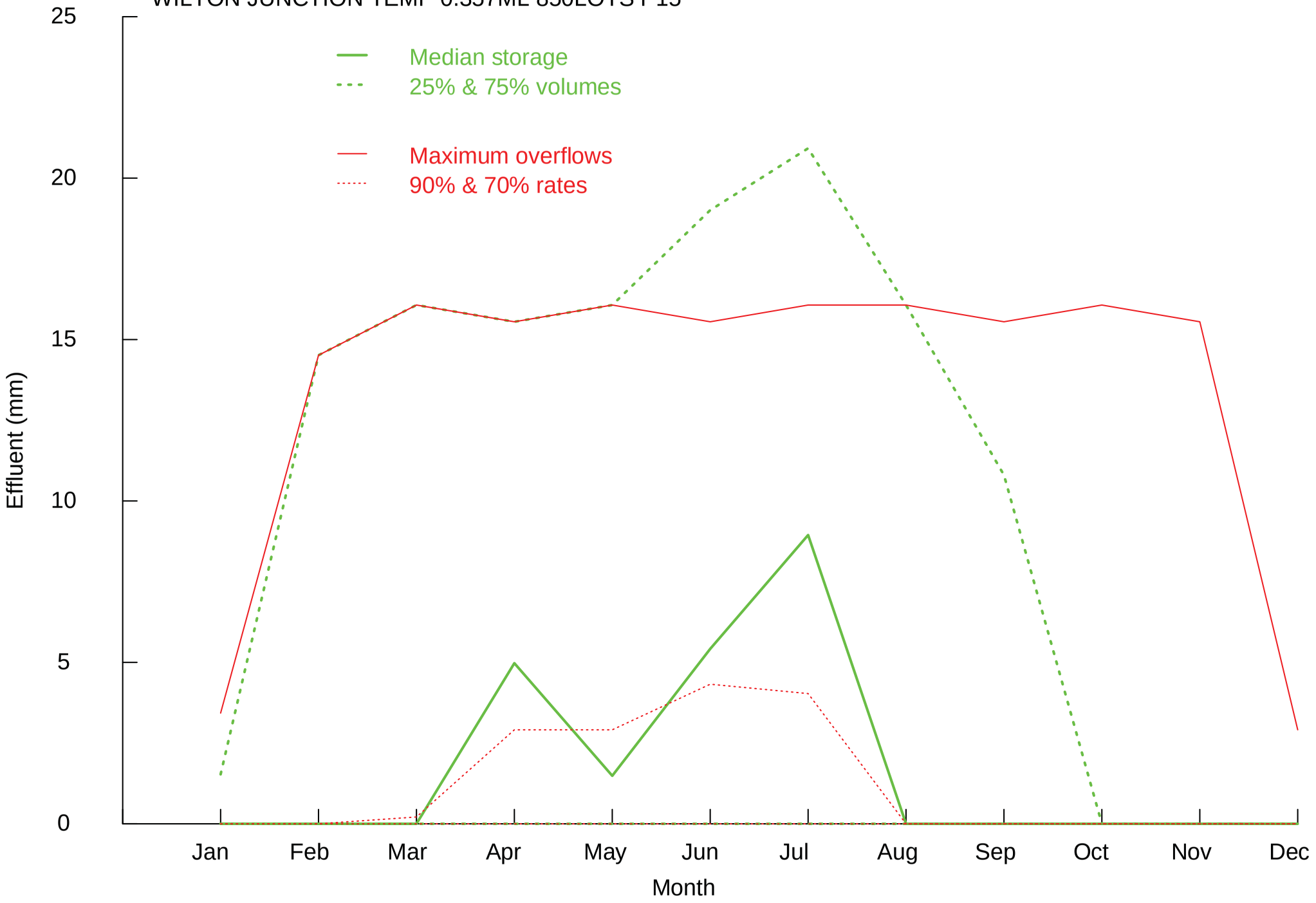
WILTON JUNCTION TEMP 0.357ML 850LOTS P15




Graph 6 Annual irrigation levels for 5 effluent irrigation targets
WILTON JUNCTION TEMP 0.357ML 850LOTS P15
Irrigation (mm)
Years
400
350
300
250
200
150
100
50
0
1880
1900
1920
1940
1960
1980
2000
324 mm
270 mm
216 mm
162 mm
108 mm

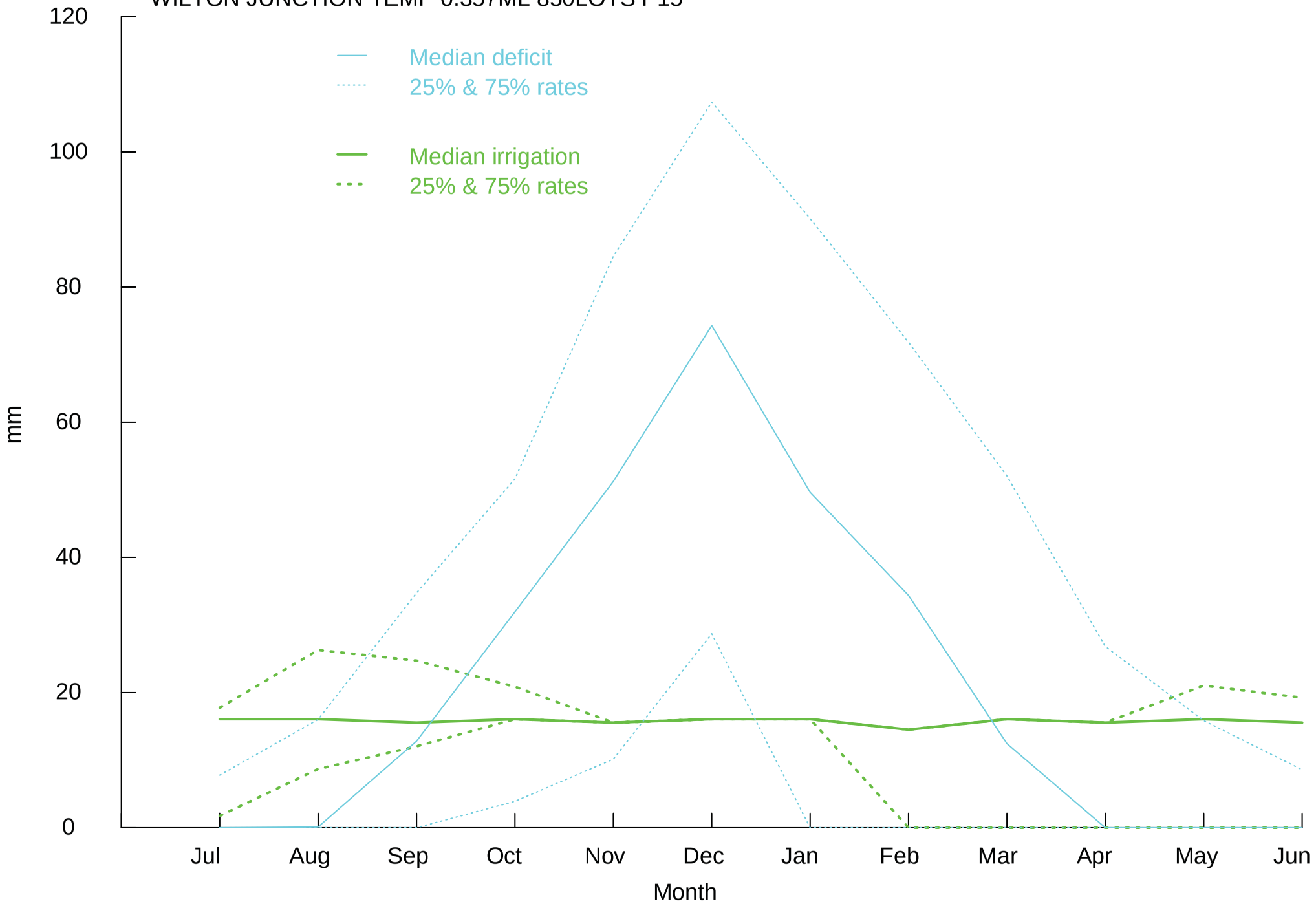
Graph 7 Storage distributions for an irrigation target of 189 mm

WILTON JUNCTION TEMP 0.357ML 850LOTS P15



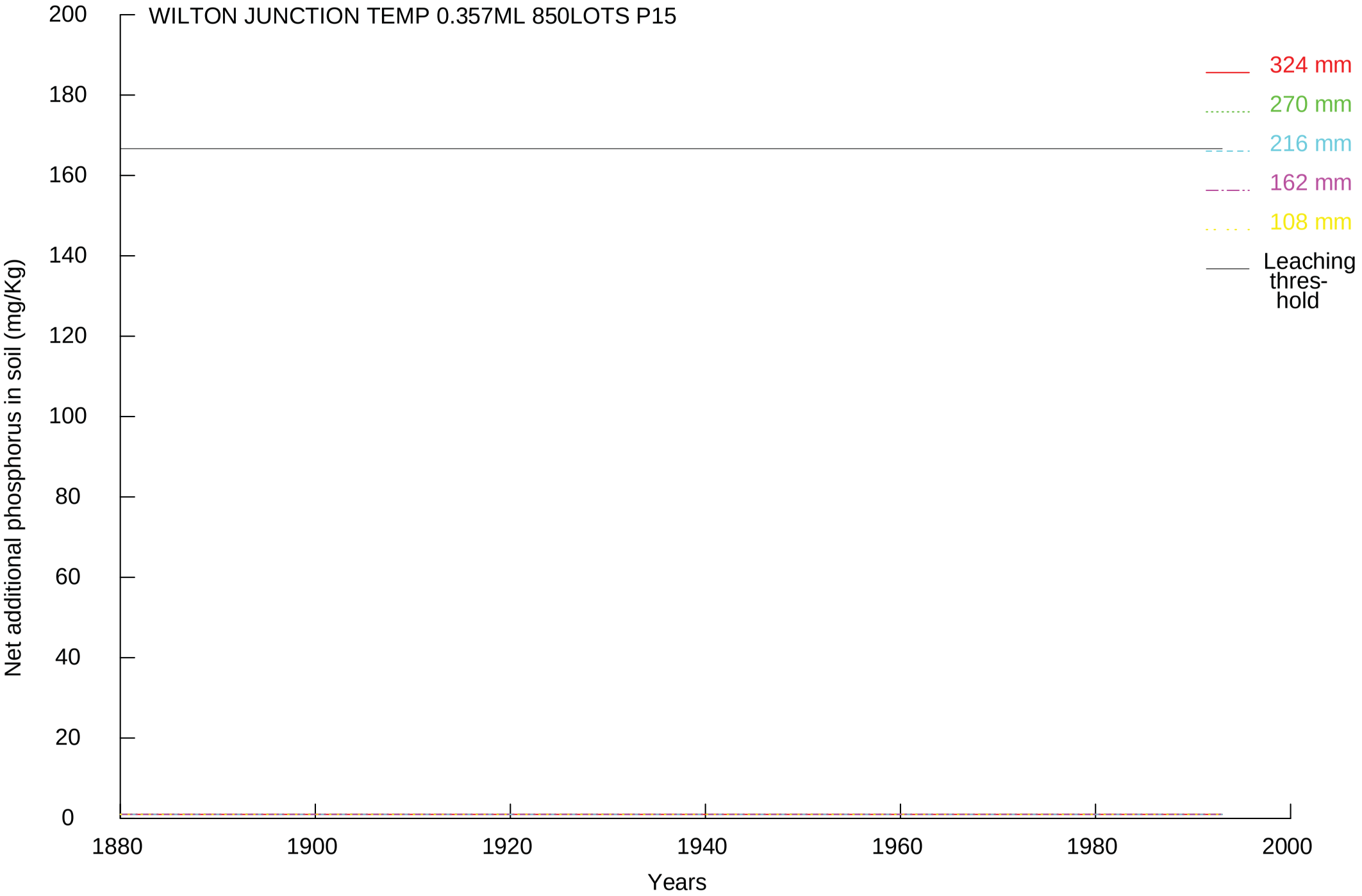
Graph 8 Irrigation distributions for an irrigation target of 189 mm

WILTON JUNCTION TEMP 0.357ML 850LOTS P15

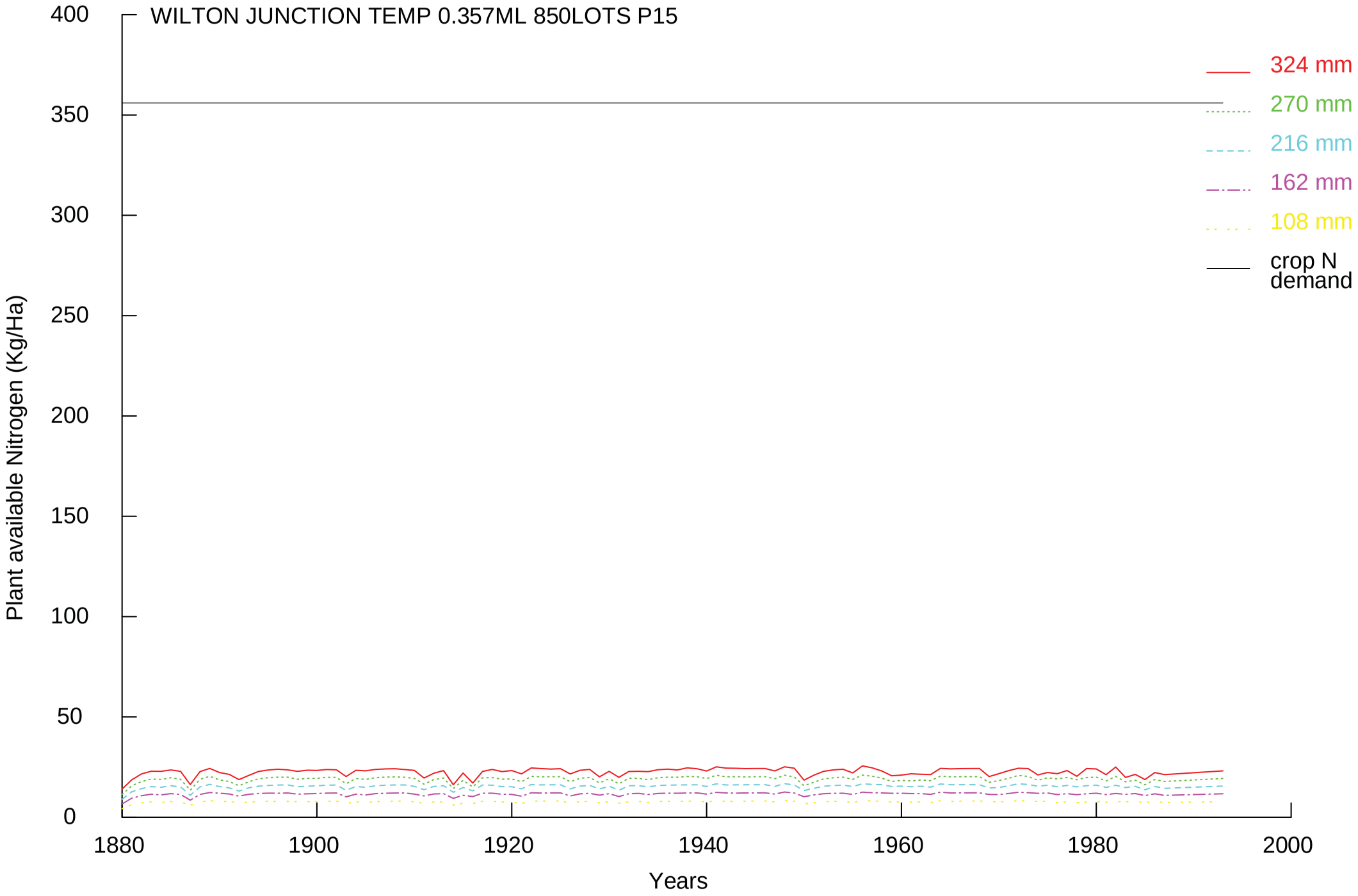


Graph 9 Phosphorus capacity for 5 effluent irrigation targets

WILTON JUNCTION TEMP 0.357ML 850LOTS P15



Graph 10 Simulated Nitrogen levels for 5 effluent irrigation targets



ATTACHMENT 2

Preliminary Estimate of Treated Effluent Quantities for Disposal

ATTACHMENT 2

WILTON JUNCTION PRECINCT

SEPP STUDY

PRELIMINARY ESTIMATE

OF

TREATED EFFLUENT

QUANTITIES

FOR

DISPOSAL

vklconsulting
INFRASTRUCTURE ENGINEERING

P.O. Box 292
Ashmore City
QLD 4214

Ph: 07 5510 0200
Fax: 07 5510 0299
E: mail@vkl.com.au

In Association with

J.WYNDHAM PRINCE

OCTOBER 2013
Final Version

CONTENTS

(A) CALCULATION OF VOLUME OF TREATED EFFLUENT AVAILABLE (Excluding Bingara Gorge) - ULTIMATE

1. Projected New Houses - 10,200
   Equivalent Population (EP) - 2.8 x 10,200 = 28,560 EP

2. Enterprise Areas
   - Commercial - 46 Ha @ 40 EP = 1,840 EP
   - Light Industry - 131 Ha @ 40 EP = 5,240 EP
   - Schools - 4000 Students @ 0.2 EP / Student = 800 EP

Total EP Dwellings, Enterprise & Schools = 36,440 EP

Total Annual Flow from Dwellings, Enterprise Area & School – Low Pressure Sewer

$$= \frac{36{,}440 \times 150 \times 365}{1{,}000{,}000}$$

= 1,995 ML / Year OR 5.47 ML / day OR 63 l / sec

(B) DISPOSAL OF TREATED EFFLUENT

Treated effluent will be disposed of using the following methods.

(i) Irrigation of open spaces and road verges
(ii) Evaporation from waterbodies
(iii) Recycled water to Enterprise areas
(iv) Other uses
(v) Disposal to ephemeral gully leading to Nepean River

(i) Estimation Of Treated Effluent Disposal Application Of 850 ET ERIM Graphical Outputs To The Ultimate Central Sewerage Treatment & Disposal System For Open Space & Verges Of Arterial Roads

The Wilton Junction Treated Effluent Disposal System includes only a partial irrigation disposal system which, when approved, will not have a need to have wet weather storage capacity for treated effluent on site. Any treated effluent that is surplus to that used within the Disposal System will be released from the major waterbody into ephemeral gullies which ultimately lead to the Nepean River.

It is proposed to utilise the data model for 850 Equivalent Tenements to establish safe application rates of treated effluent upon active open space areas and road verges to Arterial road access denied roads.

Based on this data and projected population of 28,560 people it is expected that approximately 32 Hectares of active public open space will be irrigated and 17 Hectares of Arterial road verges (subject to final design).

Assuming an annual target of 270 mm of irrigation using treated effluent the volume of treated effluent used per year is calculated as,

$$\frac{\text{Area in m2} \times 0.27}{1{,}000} \text{ ML / Year}$$

$$= \frac{490{,}000 \times 0.27}{1{,}000} \text{ ML / Year}$$

= 132.3 ML per Year

(ii) Estimation of Evaporation from Waterbodies

Average Rainfall is 822 mm / Year
Average Pan Evaporation is 1,261 mm / Year - Pan

The nett evaporation to be used is 439 mm / Year (after average rainfall adjustment over lakes)

Based on 10.9 Ha of Lakes the minimum average evaporation loss is calculated as:-

$$\frac{109{,}000 \times 0.439}{1{,}000} = 47.85 \text{ ML / Year}$$

As a consequence of wind action over the fetch of the waterbodies the average loss of evaporation, after rainfall is taken into account, is expected to be of the order of 20% higher than pan evaporation.

On an average year the total nett disposal by evaporation is expected to be of the order of 58 ML.

(iii) Estimation of Utilisation of Treated Effluent in Enterprise Areas

This estimation is difficult simply because at this point of time it is not known what enterprises will occupy the Enterprise Area and whether there will be any demand. We will assume 5% of yearly treated effluent.

5% x 1,954 = 98 ML / Year

(iv) Other Uses

From time to time other uses will occur such as construction dust suppression and fire fighting.

Again it is not possible to accurately estimate what the yearly volume will be.

We will assume a demand of 7% including treatment plant losses of yearly totals or 137 ML / Year.

Summary of Potential Uses

	Use	ML / Year
1	Irrigation Active Open Space & Road Verges	132
2	Evaporation	58
3	Recycled to Enterprise Areas	98
4	Other Uses	137
	TOTAL POTENTIAL USES	**425 ML / Year**

Estimated Balance to be discharged through waterbodies to existing ephemeral gully leading to Nepean River **1,570 ML / Year** based on low pressure sewer.

Note:
There is a possibility of a commercial arrangement being made for approximately 2,000 lots to be serviced by an expanded Bingara Gorge RWTP and the treated effluent being used within the dual water supply system to houses, Golf Course and open space areas.

If this was to happen the volume of treated effluent to flow into the Nepean River via the Wilton Junction Treated Effluent Disposal System will be reduced to approximately 1,200 ML / Year.

ATTACHMENT 3

DGR's and Associated Responses from Referral Agencies

NSW GOVERNMENT | Planning & Infrastructure

Brian Elton
Elton Consulting
PO Box 1488
BONDI JUNCTION NSW 1355

13/06309

Dear Mr Elton Brian

STUDY REQUIREMENTS - WILTON JUNCTION PRECINCT SEPP

The Government has endorsed the Department of Planning and Infrastructure to lead the investigation of the Wilton Junction Precinct to examine the potential for the land to be rezoned for urban purposes.

The consideration of the Wilton Junction Precinct is to prepare a state environmental planning policy (SEPP) with a view to rezone the land though an amendment to the Wollondilly Local Environmental Plan 2011 to facilitate the early delivery of housing and infrastructure. Any decision to make a SEPP must be linked to an agreed Infrastructure, Servicing and Staging Plan for the Wilton Junction Precinct. This Infrastructure Plan should accompany the Study.

The Department has consulted with relevant state agencies and Wollondilly Shire Council on the study requirements to inform any future SEPP for the Precinct. The Department has also nominated that the Study is to be undertaken by the proponent.

A copy of the study requirements, including the identification of the Wilton Junction Precinct for the purposes of the Study is at **Attachment 1**. The Study must be carried out by appropriately qualified professionals and demonstrate appropriate consultation with relevant stakeholders. Please note that as a result of the Study and the Department's consideration, the Precinct boundaries may be amended during the planning process.

The Department has also attached copies of state agency submissions that should be taken into account in preparation of the Study (**Attachment 2**).

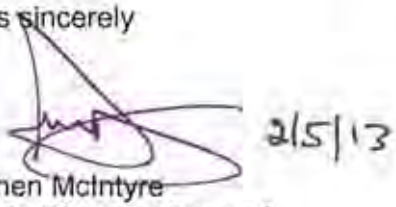
A single copy of the Study should be lodged with the Department to determine whether it adequately addresses the study requirements. You will then be advised of the adequacy of the Study for public exhibition, the number of copies of the Study to be submitted for public exhibition, and any application fees payable.

Bridge St Office 23-33 Bridge St Sydney NSW 2000 GPO Box 39 Sydney NSW 2001 DX 22 Sydney
Telephone: (02) 9228 6111 Facsimile: (02) 9228 6191 Website planning.nsw.gov.au

The Department is committed to work in collaboration with relevant state agencies, council and the proponent as part of the consideration of Wilton Junction Precinct. In this regard, the Department has also established suitable governance arrangements to ensure that key issues are addressed across Government in a timely and efficient manner.

Should you have any further enquiries about this matter, please contact Michael Woodland, Project Director on (02) 9228 6297.

Yours sincerely



2/5/13

Stephen McIntyre
Deputy Director General
Planning Strategies, Housing and Infrastructure

NSW GOVERNMENT Planning & Infrastructure

WILTON JUNCTION PRECINCT STATE ENVIRONMENTAL PLANNING POLICY STUDY REQUIREMENTS

Study	State environmental planning policy study to identify rezoning potential of land for residential, employment and conservation purposes in the Wilton Junction Precinct.
Location	Wilton Junction Precinct located in the vicinity of the intersection of Hume Highway and Picton Road in the Wollondilly Local Government Area as identified in Attached Map.
Proponent	Elton Consulting (on behalf of the Wilton Junction Consortium of land owners, being Bradcorp Holdings Pty Ltd, Governors Hill and Walker Corporation Pty Ltd)
Date of Issue	2 MAY 2013
General Study Requirements	The following issues will be considered and assessed as part of the Study: (a) the State or regional environmental planning significance of the site; (b) the suitability of the site for any proposed land use taking into consideration environmental, social, or economic factors, the principles of ecologically sustainable development and any State or regional planning strategies; (c) the suitability of the site for any proposed residential land use taking into consideration the draft Metropolitan Strategy for Sydney to 2031 and the Long Term Transport Master Plan; (d) the implications of any proposed land use for local, regional and State infrastructure, service delivery and natural resource planning; (e) the means by which development contributions should be secured in respect of the site; and (f) the recommended land uses and planning controls for the site.

Key Study Requirements	The Study must include an assessment of the following key issues:
	
	1. Strategic context
	• Address the provisions applying to the proposed rezoning and potential future development contained in relevant environmental planning instruments, policies and guidelines, including:
	  • draft Metropolitan Strategy for Sydney to 2031 and relevant Sub-Regional Strategies
	  • The Long Term Transport Master Plan
	  • State environmental planning policies
	  • Wollondilly Draft Growth Management Strategy
	  • *Wollondilly Local Environmental Plan 2011*
	  • Wollondilly Development Contributions Plan 2011
	  • Section 117 Directions
	
	2. Land Uses and Planning Controls
	• Outline the proposed land use zones and preferred planning controls with reference to the *Standard Instrument (Local Environmental Plans) Order 2006* and the existing provisions in the *Wollondilly Local Environmental Plan 2011*.
	• Justify the mix, extent, staging and location of proposed land uses at the site and outline consideration of alternatives considered for the Precinct.
	• Demonstrate sufficient demand for the proposed residential, retail, commercial and other employment land, including locational advantages.
	• Demonstrate how the proposed land use zones and planning controls will complement surrounding existing land uses and incorporate any required buffers including (but not limited to) buffers for noise, bushfire, adjoining areas of high conservation value.
	• Outline urban design principles employed in determining proposed land uses and their locations, particularly for integration with the proposed Maldon to Dombarton freight rail link and the Commonwealth Government proposed High Speed Rail alignment.
	• Consider the findings of any Government investigation at Wilton following the *Joint Study on aviation capacity for the Sydney region* should it be released during the planning process.
	
	3. Demographic profile and social infrastructure
	• Prepare a demographic analysis of the projected population of the Precinct as a potential sub-regional centre, including implications for infrastructure and services.
	• Projections should address broader market demand and growth patterns and socio-

economic profiles in the South-West Sydney Sub-Region, including affordable housing demand and supply.

- Undertake a benchmarking exercise to provide size, scale, linkages, delivery and location parameters of social infrastructure to support proposed service levels, including those proposed for the town centre. Benchmark with a centre in the Sydney Metropolitan Area which the proponent identifies as closest to the centre outcomes sought for the Precinct.
- Detail strategies for delivery of social infrastructure.

4. Economic Development and Employment Strategy

- Prepare an assessment of the retail, commercial, industrial and other employment needs for the projected population of the Precinct and wider LGA to support the preparation of a local economic development strategy, including impacts on existing towns within the LGA.
- Consider future industry dynamics for key sectors both currently in the area and those which could benefit from locating in the area. This requires strategic analysis and should not be limited to existing forecasts based on historical data.
- Identify factors that may drive certain types of commercial, industrial or retail development investment and activity, particularly in relation to the site's connections between the Southern Highlands and South-West Sydney and placement in the Sydney-Canberra-Melbourne corridor
- Develop an employment strategy to support a high level of employment self containment in the Precinct. The strategy should assess how jobs generated within the Precinct will contribute to job targets for the sub-region.

5. Ecologically Sustainable Development (ESD)

- Detail how ESD principles are proposed to be incorporated in the future design, construction and ongoing operation phases of the development, and outline any proposed sustainability best practice initiatives. This should also include appropriate waste management strategies to achieve Government policy.

6. Mining Resource and Subsidence

- Undertake an analysis of the implications (including cost), options and feasibility of the Wilton Junction proposal proceeding in conjunction with approved mining of the Bulli Coal Seam, including proposed staging of development and timing of mining operations (where possible, in consultation with relevant stakeholders and agencies) and any potential impact on resource extraction.
- Assess and identify any risks and formulate appropriate mitigation/design measures to ensure that flood risks and surface drainage take into account mining induced ground subsidence.
- Undertake a geotechnical analysis to ensure identified development areas and design parameters for housing and infrastructure are appropriate to manage impacts from mine subsidence and other geotechnical risks.
- Develop a communications strategy to ensure all potential landowners, prior to purchasing land, are informed that mining will occur, implications with respect to building constraints, subsequent repairs and timelines. Develop appropriate policies/procedures for certifying authorities to ensure key aspects of building design/construction within a mine subsidence district are undertaken.
- The staging and mix of proposed land uses must plan for and accommodate the requirements of future underground coal mining including: installation and operation of gas mine drainage equipment; additional exploration; installation and operation of subsidence monitoring and other mine related infrastructure such as ventilation shafts.

7. Topography, soils and geology

- Undertake a salinity assessment for the Precinct and identify potential impacts on future building, water management and open space.
- Consider how future land use zones reflect appropriate levels of protection for ridges, waterways and other natural features.

8. Biodiversity

- Assessment of the impact of the proposal on threatened flora and fauna species and

endangered ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Threatened Species Conservation Act 1995 in accordance with Office of Environment and Heritage guidelines.*

- Undertake an investigation of the Cumberland Koala linkage as it applies to this site and undertake a targeted search of *Pomaderris brunnea; Melaeuca deanei, Grevillea parviflora subsp parviflora, Persoonia barfoensis* and *Epacris purpurascens* as well as all threatened species at the site. The identification of key vegetation areas should include potential grassland environments and their role as both habitat and foraging areas for fauna species in the Wilton Junction Precinct.
- Identify and address the Priority Conservation Lands in the Cumberland Plain Recovery Plan and evaluate any lands proposed as environmental offsets.
- Detail the proposed ownership and management arrangements for environmental offset lands, urban areas, open space areas and riparian corridors.

9. Water and Air Quality

- Identify watercourses, riparian land and wetlands that may be potentially affected by the proposed masterplan. Assess the potential impacts on water quality and quantity in order to demonstrate that key River Flow and Water Quality Objectives are achieved to protect environmental values including waterways, riparian land, wetlands and down slope vegetation.
- Address potential impacts on water quality of surface and groundwater and provide an Integrated Water Cycle Management Plans based upon Water Sensitive Urban Design principles, including consideration of climate change scenarios in accordance with relevant Government policies.
- Undertake an assessment for the Wilton Junction Precinct that includes recommended strategies that will be implemented to improve or maintain air quality to ensure National Environmental Protection Measures for ambient air quality are not compromised, in consultation with the EPA.
- Identify strategies at a local level to ensure air emissions do not cause adverse impact upon human health, the environment and community amenity.

10. Flooding

- Address the potential flood risk that may occur on site, in accordance with the *NSW Floodplain Development Manual (2005)* and Section 117 Direction, noting proposed mitigation measures.

11. Heritage

- Undertake an appropriate strategic assessment of Aboriginal and European cultural heritage significance and potential impacts in consultation with the Office of Environment and Heritage and Wollondilly Shire Council's Aboriginal Engagement Officer.
- The Aboriginal cultural Heritage assessment should provide sufficient basis for identification of Aboriginal heritage values to support their protection at a strategic level, including consultation, desktop studies, landscape assessment and relevant mapping of current conservation areas.

12. Roads, Traffic and Transport

- Base assumptions relating to population, employment, transport generation, degree of employment self containment and travel mode splits are to be generally agreed by TfNSW prior to the commencement of the Study.
- Strategic modelling shall then be undertaken in the Sydney Strategic Transport Model (STM). TfNSW shall undertake this modelling in consultation with the proponent and then provide the outputs to the proponent. The STM shall be used to determine the likely growth in travel demand associated with the proposal and assist to refine the mode split between vehicular trips and public transport trips.
- The proponent shall undertake mesoscopic modelling for the purpose of determining route assignment and identifying infrastructure upgrades required using the outputs of the STM modelling (It is noted that TfNSW, RMS and the proponent have agreed that AIMSUM will be used for the mesoscopic modelling). The mesoscopic model must be able to demonstrate that due consideration has been given to a range of factors including weave movements and lengths.

- The proponent's modelling must consider the implications of the development on the functionality of Picton Road and specifically the impact to freight, recognising that the Long Term Transport Master Plan acknowledges the need to provide efficient freight connections to Port Kembla. In this regard the modelling must consider two infrastructure scenarios for Picton Road:
  - Picton Road with no new at grade intersections and a free flow arrangement of the Hume Highway and Picton Road. The layout of the interchange of the Hume Highway and Picton Road to be modelled shall be determined in consultation with TfNSW and RMS.
  - Picton Road with at grade intersections east of the Hume Highway.
- Based on the results of the modelling, the proponent shall undertake an economic assessment on the impact of the two separate options on freight activity and access to and from the Illawarra Region.
- An assessment of mitigating measures to accommodate the proposal with an agreed scope and costs (at a strategic level) with TfNSW and RMS.
- A Transport Management and Accessibility Plan (TMAP) must be prepared in consultation with TfNSW to identify and assess:
  - the provision and staging of the required traffic and transport infrastructure, including regional and local intersection and road improvements required.
  - how the works required are to be funded and any proposed contributions to local and State or regional infrastructure.
  - public transport needs and the capacity of existing services.
  - scenarios including road networks.
- The TMAP shall identify a road hierarchy and access strategy that minimises local trips on Picton Road between the four quadrants of the development and safely manages pedestrian and cyclists desire lines in a high speed environment. Consideration must be given to the management of east west crossings of the Hume Highway and north south crossings of Picton Road (particularly east of the Hume Highway).
- The TMAP shall identify vehicular, pedestrian and cyclist infrastructure on (and above) both the Hume Highway and Picton Road required to accommodate the proposal as well as suitable public transport infrastructure, cognisant of the public transport infrastructure and services modelled in the Sydney Travel Model.
- The TMAP shall identify (and preserve) land required for future road infrastructure upgrades. The extent of land required shall be determined in consultation with RMS.

13. Bushfire

- Prepare a strategic Bushfire Risk Assessment against the Rural Fire Service's *Planning for Bush Fire Protection 2006*.
- Detail how asset protection zones can be achieved within future urban land, having regard to environmental and topographic constraints and environmental studies.
- Detail access and egress options for evacuation during a bushfire, proposed provision of emergency access roads and measures proposed to avoid need to evacuate vulnerable development (special fire protection purpose development)

14. Contamination

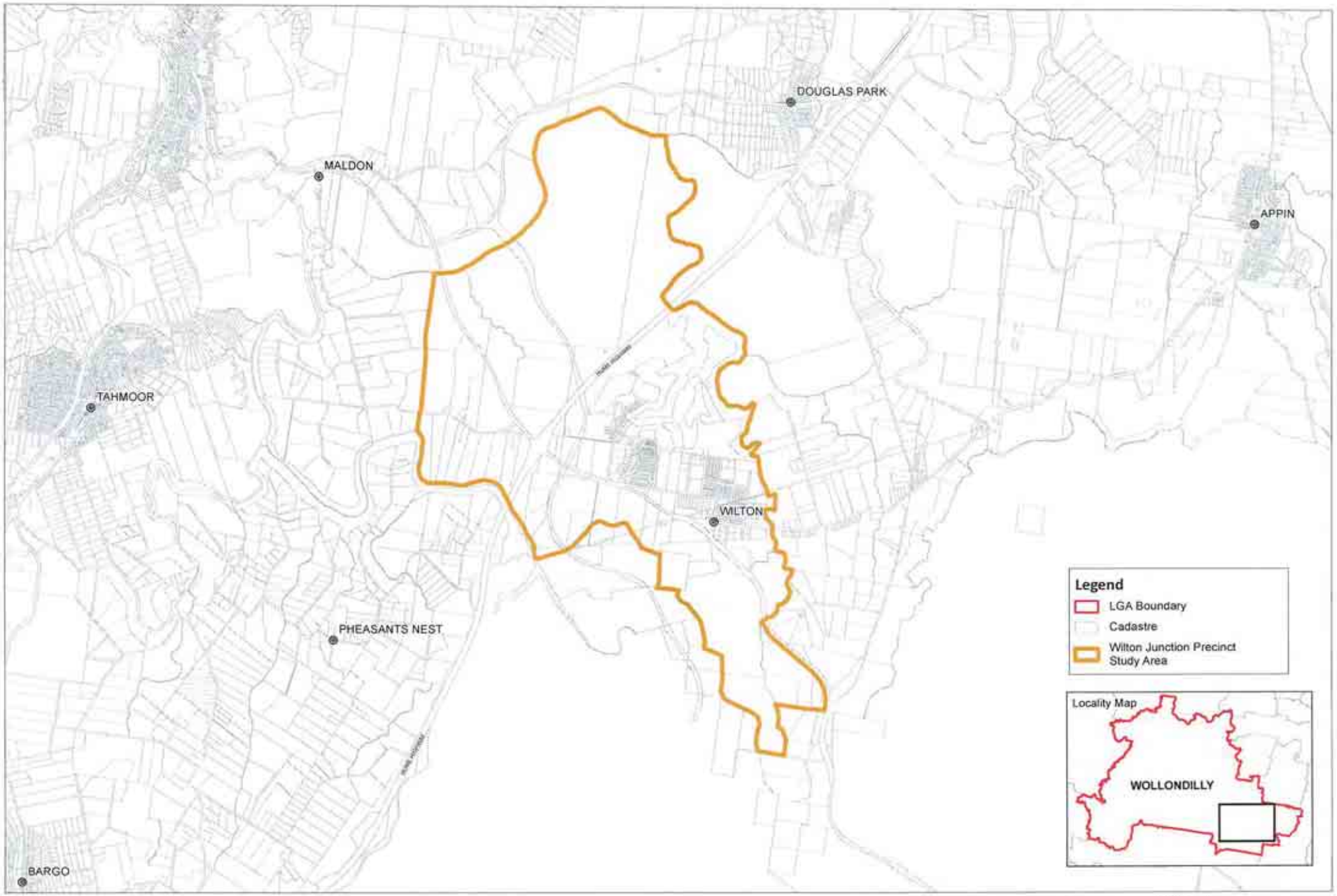
- Contamination and geotechnical issues should be identified and addressed in accordance with SEPP 55, in particular cattle dip sites, farm chemical storage, fuel and chemical storage at Wilton Aerodrome and any contamination from mining activities.
- Identify any remediation works required to rehabilitate proposed conservation lands.
- Undertake appropriate studies of unexploded ordinance consistent with previous studies for Bingara Gorge.

15. Noise Assessment

- Undertake high level noise assessment analysis to ensure potential noise conflicts are managed appropriately. In particular:
  - Consideration should be given to road traffic noise in relation to the Hume Highway and Picton Road (Note: RMS have advised that they will not accept any noise walls or other structures within the Hume Highway or Picton Road reserves).
  - Consideration should also be given to potential future rail noise in relation to the Maldon Dombarton Railway alignment in consultation with TfNSW.

	• Consideration should also be given to potential future rail noise in relation to the Commonwealth proposed high speed rail alignment in consultation with TfNSW.
	
	16. Agricultural land suitability
	• Undertake a high level study of the agricultural potential of the land.
	
	17. Health & Emergency Services
	• Identify required community health and hospital services and undertake an assessment of the Health and Wellbeing impacts of the Precinct which will identify positive and negative impacts for the population and develop recommendations to mitigate negative impacts and enhance positive impacts.
	• Identify required emergency services infrastructure within the Wilton Junction Precinct, including Fire, Rural Fire Service, Ambulance, Police, and SES Identify proposed water supply for fire fighting, in terms of the proposed design of the mains supply for domestic purposes and supplementary fire fighting supplies.
	
	18. Infrastructure, Servicing, Staging and Housing Delivery
	• Prepare an Infrastructure, Servicing and Staging Plan in conjunction with relevant agencies and Council to address transport requirements and each essential services infrastructure to service the release area in a staged manner as well as a whole.
	• The Infrastructure, Servicing and Staging Plan is to be prepared concurrently with the landuse planning and be endorsed by the Wilton Junction Precinct Government Working Group prior to Government considering any public exhibition.
	• The Infrastructure Strategy and Implementation Plan will detail the infrastructure in a staged manner as well as required to service the ultimate development including:
	  • Road upgrades and augmentation for access and capacity generated by the development with due regard to the key freight routes through the area;
	  • Public transport;
	  • Stormwater detention and treatment for water quality (including infrastructure maintenance for future Council assets);
	  • Community and emergency services;
	  • Recreational and sporting needs;
	  • Essential services (Potable water; Sewage treatment and disposal of effluent; Recycled water and water reuse if proposed; Electricity; Gas; and telecommunications).
	• The Infrastructure, Servicing and Staging Plan will detail the proposed staging of works with related development milestones, costs and Net Present Value cashflows for the entire life of the release area.
	• Details of funding for staging and the entire cost of delivery of required infrastructure and the component and timing of funding proposed to be supplied by Government.
	• Prepare a high level risk assessment for proposed Sydney – Moomba gas pipeline within the Precinct.
	• Prepare a delivery plan for proposed housing including expected dwelling production, time involved and responsible parties, including staged dwelling production schedules and consideration of affordable housing products and seniors housing.
	
	19. Planning agreement and developer contributions
	• Identify additional demand created by the development on public facilities/ infrastructure and provide details on the scope of any proposed planning agreement and/or developer contributions between the proponent, Council and State.

Consultation Requirements	The Study should reference any consultation undertaken with relevant parties during the preparation of the Study. You should undertake an appropriate level of consultation local Councils, relevant State and Commonwealth agencies, utility providers, emergency services, adjoining landowners and the local community and provide written evidence/ documentation of any consultation carried out during the study period. The Study shall clearly indicate issues raised by stakeholders during consultation and how those matters have been addressed in the Study.



Wilton Junction Precinct Study Area

NSW GOVERNMENT Planning & Infrastructure

Trim Ref: SWD13/2497
Trim File: SWF11/647

NSW GOVERNMENT Health
South Western Sydney
Local Health District

Mr. Michael Woodland
Project Director
Strategies and Land Release
NSW Department of Planning and Infrastructure
23-33 Bridge Street, Sydney 2000

Dear Woodland

Draft Study Requirements Wilton Junction Precinct SEPP

Thank you for the opportunity to provide comment on the Draft Study Requirements Wilton Junction Precinct SEPP March 2013.

The South Western Sydney Local Health District (SWSLHD) aims to protect and promote the health of the local population and recognises that many local and global factors affect health and illness. One of our strategic directions is to develop our capacity to influence healthy urban design and to work with planning agencies to develop healthy urban environments. Together with NSW Health, we have developed the NSW Healthy Urban Development Checklist as a guide for health services when commenting on development policies, plans and proposals. A copy of the Checklist can be found at:

http://www.health.nsw.gov.au/pubs/2010/hud_checklist.html

An on-line version of the Checklist can be found at:
http://www.sswahs.nsw.gov.au/populationhealth/HUD/

The Wilton Junction Precinct State Environmental Planning Policy Study Requirements includes a comprehensive set of Key Study Requirements that SWSLHD supports. In particular, we would like to reinforce the importance of taking into consideration the ageing population and changes to socio-economic and cultural characteristics of the population and the implications of these changes for infrastructure and services, ensuring adequate access to a wide range of services that meet the needs of the community. We particularly wish to highlight the increasing need for seniors accommodation and health and social services that are accessible to these groups of people.

Developing an employment strategy is positively supported; this would benefit the residents by encouraging active transport and minimising car usage. This in turn will ultimately increase the community's health and wellbeing through increased physical activity, financial benefits and enhanced community connectivity.

General Correspondence
Email: swslhd.gsu@sswahs.nsw.gov.au
Website: www.health.nsw.gov.au/swslhd/

South Western Sydney Local Health District
ABN 46 738 965 845
Liverpool Hospital Eastern Campus
Locked Bag 7279 Liverpool BC 1871
Tel 612 9828 6000 Fax 612 9828 6001

It is noted that under Section 17 of the Key Study Requirements entitled Emergency Services, there is a requirement to identify community health and hospital services infrastructure. Health infrastructure cannot be considered an Emergency Service and the reference under this section should be deleted. Advice has previously been provided on health infrastructure requirements for Wilton Junction, identifying an integrated primary and community care centre as an appropriate development, once population catchments grow to a level that ensures economic viability. This advice has been reflected in the Masterplan.

It would be more appropriate if the range of issues relating to health were addressed by including an additional section under Key Study Requirements:

20. Health and Well Being

- Assessment of the Health and Wellbeing Impacts of the Wilton Junction Precinct Plans which will identify positive and negative impacts for the population and develop recommendations to mitigate negative impacts and enhance positive impacts.

This would allow for consideration of the impacts on health of factors such as:

- Access to fresh and healthy foods within the local area as well as consideration of the loss of rural land for the development
- Open space and physical activity - planning for pedestrian and cycle paths as well as open space, recreation and sporting areas
- Public transport - upgrades to public transport options and road systems required to cope with the expected population growth
- Health infrastructure - development of local health services as well as upgrades to existing health services to meet the needs of the community.

SWSLHD Population Health would be keen to work with Council to conduct a Health Impact Assessment on the Wilton Junction Master Plan. The purpose of the Health Impact Assessment would be to identify the health impacts of the plans and collaboratively develop recommendations that may minimize any negative health impacts for the community.

We appreciate the opportunity to comment on the Wilton Junction Precinct State Environmental Planning Policy Study Requirements and are keen to discuss our involvement and the appropriate avenue for our participation in the planning process.

If you would like to discuss this further please feel free to contact Peter Sainsbury, Director Population Health on 9828 5718 or David Lawrence, Manager Planning on 9828 5798 about health infrastructure aspects.

Yours sincerely

Amanda Larkin
Chief Executive

Date: 2/4/13

PCU043081

28 March 2013

Endeavour Energy

The Project Director – Planning Strategies Housing and Infrastructure
NSW Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Attention: Mr Michael Woodland, Project Director Planning Strategies Housing & Infrastructure

Dear Sir

Draft Study Requirements – Wilton Junction Precinct SEPP

In response to your letter of 14 March 2013, Endeavour Energy welcomes the opportunity to comment on the draft study requirements for the Wilton Junction SEPP. Our input to the study will be consistent with comments provided to Wollondilly Shire Council are follows :-

Based on the indicative increases in residential yield highlighted in the Draft Master Plan, Endeavour Energy has carried out a high level assessment of the existing electricity capacity in the immediate area and makes the following specific comments.

1. As you are aware, a new substation in Condell Park Rd together with its associated line infrastructure is nearing completion. This substation was planned to have the capacity to service the Bingara Gorge precinct and the existing Wilton village and surrounds.

2. This substation will be able to take up a substantial part of the demand of the proposed new development. However, it is expected that a new transmission line will need to be installed from Endeavour Energy's source substation at Springs Farm in Elderslie to the existing Endeavour Energy switching station at Douglas Park to meet the supply security requirements for the increase in demand in the southern load catchment, comprising the Picton, Tahmoor and Bargo areas to the south and the Appin area to the east, as well as the significant mining load in the area. The timing for this work will be dictated by the pace of lot release and development in the area.

3. Lead-in service works from the substation will need to be carried out by prospective developers to bring electricity capacity into each precinct.

4. In the Draft Master Plan, there is a projected lot release timetable, but the location and volume of the lot releases in each of the specific areas does not appear to be detailed. However, some lot release information has subsequently been separately provided through developers' representatives. Detailed planning of how the electricity reticulation may need to be configured will need to be carried out.

5. It is also expected that the prospective development in the south east of the precinct will not be able to be serviced from the substation in Condell Park Rd, and an additional substation will be required to service this precinct. A site for the substation will need to be identified and agreed with the prospective developer as part of the detailed planning process for the precinct, as well as the identification of a suitable line route(s) for the supply to the substation. Endeavour Energy has an existing easement that traverses this precinct and arrangements in relation to the use of this easement can be incorporated into these discussions.

.../2

51 Huntingwood Drive Huntingwood NSW 2148
PO Box 6366 Blacktown NSW 2148
T: (02) 9853 [illegible] F: (02) 9853 6600
www.endeavourenergy.com.au

It is trusted that the above comments are sufficient for you to progress your planning process.

In closing, in relation to the future electricity infrastructure needs to service the Wilton Junction, it would be helpful on an ongoing basis if any updates on proposed lot releases in terms of location, timing and staging for the various precincts could be provided as soon as this information becomes available.

Endeavour Energy would be pleased to liaise with the Department of Planning and Infrastructure, Council, developers and designers where appropriate in the development of electricity infrastructure so that the needs of the Wilton Junction area can be met.

Yours faithfully

Manoraj Jayasekara
Acting Manager Strategic Asset Management

Sydney WATER

22 March 2013

Mr Michael Woodland
Project Director, Strategies and Land Release
Department of Planning and Infrastructure
GPO Box 39
Sydney NSW 2001

Draft Study Requirements – Wilton Junction Precinct SEPP

Dear Mr Woodland,

Thank you for your letter requesting comments on the draft study requirements for the Wilton Junction Precinct SEPP. We have reviewed the draft study requirements and specifically support the request for studies covering 'Service Utilities' and 'Infrastructure and Housing Delivery'.

We have reviewed the preliminary servicing reports by MWH and CH2M Hill, as well as the business case prepared by Elton Consulting. These reports, while identifying some servicing options, have addressed the uncertainty of Sydney Water's role in providing drinking water and wastewater services to Wilton Junction.

We expect that the studies being prepared to inform the SEPP will further discuss potential centralised and decentralised servicing options, in light of NSW's planning reforms and the uncertainty of Sydney Water's role in Wilton Junction.

If you require any further information, please contact David Demer of the Urban Growth Branch on 02 8849 5241 or e-mail david.demer@sydneywater.com.au

Yours sincerely

Adrian Miller
Manager, Growth Strategy

NSW GOVERNMENT | Transport for NSW

Mr Stephen McIntyre
Deputy Director General
Planning Strategies, Housing and Infrastructure
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr McIntyre Stephen

Thank you for your letter *Government Working Group – Wilton Junction Precinct* received 7 March 2013. Reference is also made to the letter received from Mr Michael Woodland, Project Director, titled *Draft Study Requirements – Wilton Junction Precinct SEPP* received 18 March 2013.

I will be the Transport for NSW (TfNSW) representative on the Wilton Junction Precinct Working Group. Your staff may contact Executive Assistant Ms Natalie McCarthy on 8202 2757 for meeting appointments. Anissa Levy, Principal Manager Integrated Transport Planning and Land Use will continue as the Transport Working Group representative.

TfNSW has also considered the *Draft Study Requirements – Wilton Junction Precinct SEPP* and has made a number of tracked suggestions to the draft study requirements (attached). The intention of the tracked changes is to:

- Have the Long Term Transport Master Plan considered alongside the Metropolitan Plan as a strategic context document.
- Ensure a comprehensive approach is taken toward identifying impacts to the arterial road network and the strategic cost of mitigating those impacts.
- Ensure base assumptions for the proposed transport model are agreed to by the Wilton Junction Precinct working Group before the modelling work commences.
- To ensure the proposed Maldon Dombarton Railway alignment is adequately considered by the proponent when designing the Wilton Junction Precinct.

The contact officer for these land use matters is Anissa Levy, Principal Manager Integrated Transport Planning and Land Use, she may be contacted on 8202 2712.

Yours sincerely

Carolyn McNally
Deputy Director General, Planning and Programs
27/3/13

DG13/05147
PP13/05405

18 Lee Street Chippendale NSW 2008
PO Box K659 Haymarket NSW 1240
T 8202 2200 F 8202 2209
www.transport.nsw.gov.au
ABN 18 804 239 602

NSW GOVERNMENT | Planning & Infrastructure

WILTON JUNCTION PRECINCT STATE ENVIRONMENTAL PLANNING POLICY STUDY REQUIREMENTS

Study	State environmental planning policy study to identify rezoning potential of land for residential, employment and conservation purposes at the Wilton Junction Precinct.
Location	Wilton Junction Precinct in the Wollondilly Local Government Area.
Proponent	Elton Consulting (on behalf of the Wilton Junction Consortium of land owners, being Bradcorp, Governors Hill, Lend Lease and Walker Corp)
Date of Issue	**DRAFT COPY FOR CONSULTATION**
General Study Requirements	The following issues will be considered and assessed as part of the study: (a) the State or regional environmental planning significance of the site; (b) the suitability of the site for any proposed land use taking into consideration environmental, social, or economic factors, the principles of ecologically sustainable development and any State or regional planning strategies; (c) the suitability of the site for any proposed residential land use taking into consideration the Metropolitan Plan and the Long Term Transport Master Plan; (d) the implications of any proposed land use for local, regional and State infrastructure, service delivery and natural resource planning; (e) the means by which development contributions should be secured in respect of the site; and (f) the recommended land uses and planning controls for the site.

Key Study Requirements	The Study must include an assessment of the following key issues:
	
	1. Strategic context
	• Address the provisions applying to the development contained in relevant environmental planning instruments, policies and guidelines, including:
	  • Sydney Metropolitan Plan and relevant Sub-Regional Strategies
	  • The Long Term Transport Master Plan
	  • State environmental planning policies
	  • Wollondilly Draft Growth Management Strategy
	  • *Wollondilly Local Environmental Plan 2011*
	  • Wollondilly Development Contributions Plan 2011
	  • Section 117 Directions
	
	2. Land Uses and Planning Controls
	• Outline the proposed land use zones and planning controls with reference to the *Standard Instrument (Local Environmental Plans) Order 2006* and the existing provisions in the *Wollondilly Local Environmental Plan 2011*.
	• Justify the mix, extent, staging and location of proposed land uses at the site.
	• Demonstrate sufficient demand for the proposed residential, retail, commercial and other employment land, including locational advantages.
	• Demonstrate how the proposed land use zones and planning controls will complement surrounding existing land uses.
	• Urban design principles employed in proposed land uses, particulary for integration with the proposed Maldon to Dombarton freight rail link and the Commonwealth Government proposed High Speed Rail alignment.
	
	3. Demographic profile and social infrastructure
	• Demographic analysis of the Wilton Junction Precinct as a sub-regional centre including ageing and changes to socio-economic or cultural characteristics and implications for infrastructure and services.
	• Benchmark with a centre in the Sydney Metropolitan Area the proponent identifies as closest to the centre outcomes sought for Wilton Junction.
	• Projections should address broader market demand and growth patterns and socio-economic profiles in the South-West Sydney Sub-Region.

- Benchmark size, scale, linkages, delivery and location parameters of social infrastructure to ensure appropriate service levels, including the town centre.
- Detail best practice strategies in terms of access, engagement, location and design, multi-use of facilities, joint venture and other models.

4. **Economic Development and Employment Strategy**
   - Detailed assessment of the retail, commercial, industrial and other employment needs for the Precinct and LGA, the broad timing and staging in order to support the development of a local economic development strategy. This should include consideration of future industry dynamics for key sectors both currently in the area and those which could benefit from locating in the area. This requires strategic analysis and not limited to existing forecasts based on historical data.
   - Develop an employment strategy to support a target of one job per household in the Precinct. The strategy should assess how jobs generated within the study area will contribute to job targets for the sub-region.
   - Development and infrastructure staging contingencies (risk management and financial sustainability) and the impact on the viability of the overall project and investment and delivery of retail, commercial, industrial and other employment developments.
   - Examine the impact of commercial, retail and other employment generating development on the economic viability and diversity in surrounding towns and villages, including Picton and Wilton townships.
   - Identify factors that may drive certain types of commercial, industrial or retail development investment and activity, particularly in relation to the site's connections between the Southern Highlands and South-West Sydney and placement in the Sydney-Canberra-Melbourne corridor.

5. **Ecologically Sustainable Development (ESD)**
   - Detail how ESD principles will be incorporated in the design, construction and ongoing operation phases of the development, including ability to achieve any sustainability best practice initiatives.

6. **Mine subsidence**
   - Detailed analysis of the implications (including cost), options and feasibility of the Wilton Junction proposal proceeding in conjunction with approved mining of the Bulli Coal Seam.
   - Geotechnical analysis to ensure identified development areas and design parameters for housing and infrastructure are appropriate to manage impacts from mine subsidence and other geotechnical risks.

7. **Topography, soils and geology**
   - Analysis on the suitability of the proposed lakes and on-site water recycling facilities to ensure that water quality is managed to minimize impacts to natural water sources and to the water regime / water availability for habitats.
   - Analysis on maintaining environmental flows into the natural system from the urban areas and management of sediment, chemical and nutrient build up during low flow (drought) periods.
   - Salinity assessment for building, water management and open space.
   - Consideration of future land use zones to reflect appropriate levels of protection for ridges, waterways and other natural features.

8. **Biodiversity**
   - Assessment of the impact of the proposal on threatened flora and fauna species and endangered ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the

Threatened Species Conservation Act 1995.

- An evaluation of potential impacts on groundwater, groundwater dependant ecosystems, waterways on and off site, aquatic ecosystems, riparian zones, ecological corridors and reserves.
- Provide an investigation of the Cumberland Koala linkage and a targeted search of *Pomaderris brunnea*; *Melaeuca deanei*, *Grevillea parviflora subsp parviflora*, *Persoonia barfoensis* and *Epacris purpurascens* as well as threatened bird, bat and snail species. The identification of key vegetation areas should include potential grassland environments and their role as both habitat and foraging areas for fauna species in the Wilton Junction Precinct.
- Identify and address the Priority Conservation Lands in the Cumberland Plain Recovery Plan and evaluate any lands proposed as environmental offsets.
- Detail the proposed ownership and management arrangements for environmental offset, urban areas, open space areas and riparian corridors.

9. Water and Air Quality

- Identify watercourses, riparian land and wetlands that may be potentially affected by the proposed masterplan.
- Assess the potential impacts on water quality and quantity of receiving waterways, riparian land, wetlands and down slope vegetation.
- Assess constraints and strategies for stormwater management.
- Address flood risk that may occur on site, including consideration of the *NSW Floodplain Management Manual and* Section 117 Direction.
- Address potential impacts on water quality of surface and groundwater and provide an Integrated Water Cycle Management Plans based upon Water Sensitive Urban Design principles.
- Identify strategies to address the issue of air quality for the locality in consultation with relevant state and commonwealth agencies.

10. Heritage

- Assessment of the Aboriginal and European cultural heritage significance and impacts in accordance with Office of Environment and Heritage guidelines in consultation with Wollondilly Shire Council's Aboriginal Engagement Officer.

11. Roads, Traffic and Transport

- Base assumptions with regards to population, employment, transport generation and degree of employment self containment and travel mode splits to be agreed by the Government Working Group – Wilton Junction Precinct and generally by TfNSW prior to the commencement of the study.
- Strategic modelling shall then be undertaken in the Sydney ~~Travel~~Strategic Transport Model (STM). TfNSW shall undertake this modelling in consultation with the proponent and then provide the outputs to the proponent. ~~This~~ STM model shall be used to determine the likely growth in travel demand associated with the proposal and assist to refine the mode split between vehicular trips and public transport trips.
- The proponent shall undertake mesoscopic modelling for the purpose of determining route assignment and identifying infrastructure upgrades required using the outputs of the STM modelling. It is noted that TfNSW, RMS and the proponent have agreed that AIMSUM will be used for the mesoscopic modelling. The mesoscopic model must be able to demonstrate that due consideration has been given to a range of factors including weave movements and lengths.
- The proponent's modelling must consider the implications of the development on the functionality of Picton Road and specifically the impact to freight, recognising that the Long Term Transport Master Plan ~~recognise~~acknowledges~~s~~ the need to provide efficient freight connections to Port Kembla. In this regard the modelling must consider two infrastructure

scenarios for Picton Road:

- Picton Road with no new at grade intersections and a free flow arrangement of the Hume Highway and Picton Road. The layout of the interchange of the Hume Highway and Picton Road to be modelled shall be determined in consultation with TfNSW and RMS.
- Picton Road with at grade intersections east of the Hume Highway.

Based on the results of the modelling the, the proponent shall undertake an economic assessment on the impact of the two separate options on freight activity and access to and from the Illawarra Region.

Formatted

Formatted: No bullets or numbering

Formatted: Indent: Left: 1.33 cm, No bullets or numbering, Tab stops: 2.68 cm, Left

Formatted: No bullets or numbering

- ~~Comprehensive transport and traffic assessment, including the use of industry standard software to determine travel demand, travel assignment and impacts. This includes a full four-step model to identify the travel demands by each mode in consultation with Transport for New South Wales (TfNSW) and the Roads and Maritime Authority (RMS).~~
- An assessment of mitigating measures to accommodate the proposal with an agreed scope and costs (at a strategic level) with TfNSW and RMS.
- A ~~Traffic~~ Transport Management and Accessibility Plan (TMAP) must be prepared in consultation with TfNSW to identify and assess:
  - the provision and staging of the required traffic and transport infrastructure, including regional and local intersection and road improvements required.
  - how the works required are to be funded and any proposed contributions to local and State or regional infrastructure.
  - public transport needs and the capacity of existing services.
  - scenarios including road networks.
  - The TMAP shall identify a road hierarchy and access strategy that minimises local trips on Picton Road between the four quadrants of the development and safely manages pedestrian and cyclists desire lines in a high speed environment. In this regard, consideration must be given to the management of east west crossings of the Hume Highway and north south crossings of Picton Road (particularly east of the Hume Highway).
  - The TMAP shall identify vehicular, pedestrian and cyclist infrastructure on (and above) both the Hume Highway and Picton Road required to accommodate the proposal as well as suitable public transport infrastructure, cognisant of the public transport infrastructure and services modelled in the Sydney Travel Model.
  - The TMAP shall identify (and preserve) land required for future road infrastructure upgrades. The extent of land required shall be determined in consultation with RMS.
- ~~Detailed assessment of impacts on Picton Road and Hume Highway in relation to Picton Roads' role as a key freight link between the Hume Highway and Port Kembla. In particular the treatment of proposed intersections on Picton Road to service the development.~~

12. Bushfire

- A strategic Bushfire Risk Assessment against the Rural Fire Service's *Planning for Bush Fire Protection 2006*, considering future zoning of the land to reflect the risk posed to the proposed land use.
- The assessment should detail how asset protection zones can be achieved within future urban land, having regard to environmental and topographic constraints and environmental studies.
- Consideration to ensure appropriate access to and water supply to proposed

	lots, in particular proposed areas of increased density and special fire protection purpose development should identify satisfactory level of services for access roads for evacuation of occupants in the case of an emergency. **13. Contamination** • Contamination and geotechnical issues should be identified and addressed in accordance with SEPP 55, in particular cattle dip sites, farm chemical storage, fuel and chemical storage at Wilton Aerodrome. • Identify any remediation works required to rehabilitate proposed conservation lands. • Undertake appropriate studies of unexploded ordinance consistent with previous studies for Bingara Gorge. **14. Noise Assessment** • Undertake high level noise assessment analysis to ensure potential noise conflicts are managed appropriately and in compliance with the NSW Government's *Development Near Rail Corridors and Busy Roads – Interim Guideline 2008*. In particular; ○ Consideration should be given to road traffic noise in relation to the Hume Highway and Picton Road. It should be noted that RMS would not accept any noise walls or other structures within the Hume Highway or Picton Road reserves. ○ Consideration should also be given to potential future rail noise in relation to the Maldon Dombarton Railway alignment. ○ Consideration should also be given to potential future rail noise in relation to the Commonwealth proposed high speed rail alignment. **15. Agricultural land suitability** • Undertake a high level study of the agricultural potential of the land. **16. Service utilities** • Undertake a servicing/staging assessment addressing utilities including gas, electricity, telecommunications, water and sewer infrastructure. **17. Emergency Services** • Identify required emergency services infrastructure within the Wilton Junction Precinct, including Fire, Rural Fire Service, Ambulance, Police, SES and community health and hospital services. • Identify water supply for fire fighting, in terms of the design of the mains supply for domestic purposes and supplementary fire fighting supplies. **18. Infrastructure and Housing Delivery** • Assess the capacity of existing utilities and infrastructure and identify required infrastructure to service the site. • Prepare an Infrastructure, Servicing and Staging Plan in consultation with the State Government. • A delivery plan for housing including dwelling production, the time involved and responsible parties, including staged dwelling production schedules. **19. Planning agreement and developer contributions** • Identify additional demand created by the development on public facilities/ infrastructure and provide details on the scope of any planning agreement and/or developer contributions between the proponent, Council and State. Landowner workshops – facilitated by the Dept for other landowners
Consultation Requirements	The study should reference any consultation undertaken with relevant parties during the preparation of the study. You should undertake an appropriate level of consultation local Councils, relevant State and Commonwealth agencies, utility

Formatted

	providers, emergency services, adjoining landowners and the local community and provide written evidence/ documentation of any consultation carried out during the study period. The study shall clearly indicate issues raised by stakeholders during consultation and how those matters have been addressed in the study.

NSW GOVERNMENT | Department of Primary Industries

OUT13/7095

Mr Michael Woodland
Project Director, Planning Strategies Housing & Infrastructure
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Michael.Woodland@planning.nsw.gov.au

Dear Mr Woodland,

Draft Study Requirements – Wilton Junction Precinct SEPP

I refer to your letter dated 14 March 2013 to the Department of Primary Industries (DPI) in respect to the above matter:

1. Specific comment

(i) Section 1 (Strategic context) should include a reference to the *Hawkesbury-Nepean Catchment Management Plan*.

(ii) Section 2 (Land Uses and Planning Controls) should include as an extra dot point how it is intended the proposed land use zones and planning controls will protect locations of biodiversity and natural systems protection, including watercourses and riparian areas, in a way that will provide for not only their protection and rehabilitation, but satisfactory ongoing management and maintenance (related also to dot point 5 in Section 8-Biodiversity).

(iii) Section 4 (Economic development and employment strategy) should include, in the first dot point) a reference to agricultural (employment) when referring to "retail, commercial, industrial and other employments needs"), in recognition of the contribution of agriculture to the existing employment base of the area and the existing agricultural zoning of certain of the land in the Study area.

(iv) Section 8 (Biodiversity):
   (a) should include a reference to threatened aquatic species, and associated reference to the *Fisheries Management Act 1994*.
   (b) should include an additional dot point (similar to dot point 2 in Section 12-Bushfire) requiring the assessment detail how biodiversity can be protected within future urban land, having regard to environmental and topographic constraints and environmental studies.
   (c) should include the nomination of both rehabilitation and mitigation measures from any assessed impacts over specific stated periods of time.

and whether it is proposed these are to differ according to, for example, the natural feature/system.

(v) Section 9 (Water and air quality):
   (a) should include an additional dot point (similar to dot point 2 in Section 12-Bushfire) requiring the assessment detail how water and air quality can be protected within future urban land, having regard to environmental and topographic constraints and environmental studies.
   (b) should include the nomination of both rehabilitation and mitigation measures from any assessed impacts over specific stated periods of time, and in respect to water quality whether it is proposed these are to differ according to, for example, the natural feature/system and the Stream Order of watercourses.

(vi) the Key Study Requirements should include an additional section requiring the identification of all Crown land, including Crown road and Crown waterway area, both within the Study area and outside the study area where likely to be impacted by the development; identification of likely impacts and how they would be mitigated; and identification of the intended process to resolve land ownership and any Aboriginal Land Claim interests if it is proposed that Crown land is to be utilised as part of the development.

2. General comment

A general concern is expressed that the draft requirements appear to be orientated to the current master plan proposal as submitted by the landowner group, and as such may not adequately canvass other development and land use options, nor lead to any visionary strategic design thinking. The inclusion of such broader perspectives should be considered a critical part of the exercise given a stated aim of the investigation is as a "pilot program" for "innovative planning pathways" for planning proposals such as these.

Specifically in relation to the subject proposal, it is noted that the submissions to date present a largely conventional approach to development involving the complete replacement of important agricultural land with urban land uses. In turn, the proposed urban area itself presents as a conventional "new town"/growth centre of residential suburbs surrounding a town centre with retail and commercial and industrial employment. No particular specific employment base has been identified, with suggestions to date being merely speculative in relation to warehousing, bulky goods and transport logistics, all of which are currently being extensively developed on a regional basis elsewhere. It is suggested that there is the possibility for a different look at the locality that might involve, for instance:

- strategic nomination of land to be retained for agricultural use, perhaps intermixed with re-zoned land for other uses.
- this land use pattern informed also by mine subsidence requirements (it is noted that concern was expressed at the briefing held on 28 August 2012 in respect to this proposal that requirements set by the Mine Subsidence Board in relation to the "Bingara Gorge" development may not be being met).
- a locally-derived employment base drawing on new intensive agriculture using for example the grey water any new urban development would generate (it is understood that one of the landowners (Walker Corp) has done something similar in the Adelaide Hills area); and coal seam gas locality being vented from existing underground mining operations to heat greenhouse production.

In this regard I draw your attention to a recent publication *Food-Sensitive Planning and Urban Design* (Heart Foundation of Australia, March 2011) which includes, as case-studies, various on-the-ground examples of such thinking. This publication can be sourced at the following link:
http://www.ecoinnovationlab.com/uploads/attachments/article/417/HF-FSPUD-LRFINAL.pdf

It is recommended that the Study requirements include provisions to ensure such possibilities are canvassed and assessed both for their own viability and against the more conventional development model as currently proposed.

3. Need to list relevant Government agencies to be consulted

The *Consultation Requirements* section of the draft Study requirements is noted. However it has been the experience of DPI that many proponents and consultants are not yet familiar with the current structure of Government agencies, with the result that some necessary consultations are only realised late in the process. It is recommended the Study requirements include a specific list of agencies requiring consultation (with a note also that it is not intended to be exhaustive), similar to the inclusion of such advices in the setting of Director General Requirements for the environmental assessment of State Significant developments.

In respect to DPI, agencies which need to be directly consulted are Agriculture NSW, the Office of Agricultural Sustainability & Food Security, Fisheries NSW, the NSW Office of Water, Crown Lands, and the Hawkesbury-Nepean Catchment Management Authority.

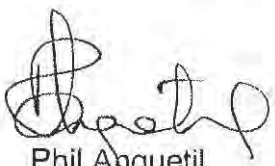
4. Other advices

(i) It is noted that your Department has also sought comment direct from the Resources & Energy Division and the Mine Subsidence Board within the broader Department of Trade & Investment, Regional Infrastructure & Services (NSW T&I) within which DPI is a separate department.

(ii) I attach for your information earlier related correspondence by DPI:
- to your Department, dated 14.2.08, relating to Macarthur South
- to your Department, dated 13.2.12, relating to landowner nominated potential housing sites (attachments relating to the Wollondilly Council area only included here)
- to Wollondilly Council, dated 13.11.12, relating to the current project.

For further information please contact Greg Paine, Principal Policy Officer, Policy Coordination Corporate Planning & Governance, on 8289 3951, or at: greg.paine@industry.nsw.gov.au.

Yours sincerely



Phil Anquetil
Executive Director Business Services

NSW GOVERNMENT | Education & Communities

PCU042817

Michael Woodland
Project Director
Department of Planning and Infrastructure
23-33 Bridge Street
SYDNEY NSW 2000

Your Reference: 13/04877
Our Reference: DGL13/330

Dear Mr Woodland

RE: Draft Study Requirements – Wilton Junction Precinct SEPP

Thank you for your letter of 14 March 2013, inviting the Department of Education and Communities to comment on the draft study requirements for the proposed Wilton Junction Precinct.

An early assessment of the proposal by the Department indicates that there will be demand for Government education infrastructure should the proposed rezoning be approved.

The Department requests that the Director General's Study Requirements include a Demographics and Social Infrastructure Study that specifically addresses education infrastructure, as a key issue for the proponent to address. The scope of any such study should include identification of potential shared/co-use of community facilities with other social infrastructure providers.

In addition, the Department requests that the Director General's Study Requirements include the means by which developer contributions will be made available for education infrastructure.

It would benefit the proponent to contact the Department directly (and early in the project study process), for advice regarding the likely education infrastructure needs and contribution arrangements arising from the proposal.

Please contact Mr Martin Karm, Statutory Planner on 9561 8147 or email martin.karm@det.nsw.edu.au should you require any further assistance or clarification in relation to this matter.

Yours sincerely

Tony McCabe
Director, Planning and Delivery
21 March 2013

Department of Planning
Received
25 MAR 2013
Scanning Room

NSW Department of Education & Communities – Asset Management Directorate
Level 4, 35 Bridge Street Sydney NSW 2000 GPO Box 33 Sydney NSW 2001 T 02 9561 8000 F 02 9561 8077
www.det.nsw.edu.au

NSW GOVERNMENT | Resources & Energy

Our Ref: OUT13/6530

Michael Woodland
Project Director
Strategies and Land Release
Planning & Infrastructure

WILTON JUNCTION PRECINCT SEPP – DRAFT STUDY REQUIREMENTS

Dear Michael,

I have reviewed the Draft study requirements for the Wilton Junction Precinct and request the addition of the following requirements.

Mine subsidence:

1. A communication strategy is developed to ensure that all potential new land owners, prior to purchasing land, are informed that mining will occur beneath their land and the implications with respect to building constraints and any subsequent repair procedures and repair timelines.
2. A policy/procedure is developed to ensure that any certifying authority has been given additional training to understand the key aspects of building design/construction in a Mine Subsidence District.

Land Uses and Planning Controls:

1. The staging and mix of proposed land uses must plan for and accommodate the requirements of future underground coal mining that will include the provision for: (a) the installation and operation of gas mine drainage equipment, (b) additional exploration that will likely include drilling and seismic surveys for detailed mine planning, (c) installation and operation of subsidence monitoring equipment and (d) the installation of other mine related infrastructure that may be required such as ventilation shafts.

Topography, soils and geology:

1. Assess and identify any risks and formulate appropriate mitigation/design measures to ensure that flood risks and surface drainage take into account mining induced ground subsidence.

Yours sincerely,

Kevin Ruming 18/3/13.

Kevin Ruming
A/Manager
Coal Advice

cc. Greg Cole-Clark, Mine Subsidence Board

Coal Advice - Mineral Resources
PO Box 344, Hunter Region Mail Centre NSW 2310
516 High St MAITLAND NSW 2320
Tel: 1300 736 122 Fax: 02 4931 6788
www.industry.nsw.gov.au
ABN 72189919072

NSW GOVERNMENT | Office of Environment & Heritage

PCU042913

Your reference: 13/04877
Our reference: ED13/160
Contact: Susan Harrison
9995 6864

Michael Woodland
Project Director
Planning Strategies Housing and Infrastructure
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Woodland

I refer to your letter dated 14 March 2013, requesting comment from the Office of Environment and Heritage (OEH) on the Draft Study Requirements for the Wilton Junction Precinct SEPP.

OEH has particular interests in the Aboriginal and non-Aboriginal cultural heritage, threatened species matters and flooding aspects of the master plan. Attached are more detailed requirements for the study which can be provided to the landowners to assist.

If you have any queries please contact myself on 9995 6802 or Susan Harrison on 995 6864.

Yours sincerely

22/3/13

LOU EWINS
Manager, Planning and Aboriginal Heritage
Regional Operations, Metropolitan

Department of Planning
Received
27 MAR 2013
Scanning Room

PO Box 668 Parramatta NSW 2124
Level 7, 79 George Street Parramatta NSW
Tel: (02) 9995 5000 Fax: (02) 9995 6900
ABN 30 841 387 271
www.environment.nsw.gov.au

OFFICE OF ENVIRONMENT AND HERITAGE – COMMENTS ON DRAFT STUDY REQUIREMENTS – WILTON JUNCTION PRECINCT SEPP, MARCH 2013

State and Non-Aboriginal Heritage

- The state or local heritage significance of the site and any impacts that future (residential, commercial/enterprise, employment) development may have upon this significance should be assessed. This assessment should include natural areas and places of Aboriginal, historic or archaeological significance. It should also include a consideration of wider heritage impacts in the area surrounding the site.

- The Heritage Council maintains the State Heritage Inventory which lists some items protected under the *Heritage Act 1977* and other statutory instruments. This register can be accessed through the Heritage Branch home page at www.heritage.nsw.gov.au.

  Examples of existing SHR listings in the vicinity include Wilton Park estate, Wilton Park Road, Wilton. An example of a state-significant State Agency (Sydney Catchment Authority's) Heritage and Conservation (required under s.170 of the *Heritage Act, 1977*) Register item is Pheasant's Nest Weir, Wilton Road, Wilton. Another is the Douglas Park Road Nepean Tunnel – another part of the Upper Nepean Water Scheme.

  It should be noted that the legal standing of items listed on the State Heritage Register can also be provided by applying for a section 167 Certificate through the Heritage Branch home page.

  Potential State Heritage Register items should also be identified and any impacts of future development on their curtilage or setting. Such items include St Mary's Towers (Retreat Centre – Missionaries of the Sacred Heart, formerly Parkhall), Sir Thomas Mitchell's country estate. This was identified in a 2000 Heritage Council study, *Colonial Landscapes of the Cumberland Plain & Camden* as a priority item for future SHR listing. A copy of this study is available in the Heritage Branch's library at Parramatta.

- The study should consult lists maintained by the NSW National Parks and Wildlife Service, The National Trust of Australia (NSW), the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* and Wollondilly Shire Council in order to identify any identified items of heritage significance in the area affected by the proposal.

  Area studies such as the *Wollondilly Heritage Study* by J.R.C. Planning Services of 1992 and its predecessor of 1991 by E.J. & D.A. Darcy should be consulted, as some items identified in these may not have yet been listed as Local Environmental Plan (LEP) items. Please be aware, however, that these lists are constantly evolving and that items with potential heritage significance may not yet be listed.

- Non-Aboriginal heritage items within the area affected by the proposal should be identified by field survey. This should include any buildings, works, relics (including relics underwater), gardens, landscapes, views, trees or places of non-Aboriginal heritage significance.

  A statement of significance and an assessment of the impact of the proposal on the heritage significance of these items should be undertaken. Any policies/measures to conserve their heritage significance should be identified. This assessment should be undertaken in accordance with the guidelines in the *NSW Heritage Manual*. The field survey and assessment should be undertaken by a qualified practitioner/consultant with historic sites experience. The Heritage Branch website can provide a list of suitable consultants.

- The relics provisions in the *Heritage Act 1977* require an excavation permit to be obtained from the Heritage Council, or an exception to be endorsed by the Heritage Council, prior to commencement of works if disturbance to a site with known or potential archaeological relics is proposed. Where

possible refer to archaeological zoning plans or archaeological management plans held by the Council. If any unexpected archaeological relics are uncovered during the course of work excavation should cease and an excavation permit, or an exception notification endorsement, obtained.

- The SEPP should have provision that if future works (subdivision, alteration, demolition, excavation) require approval under the Heritage Act due to the listing of an item or place on the State Heritage Register, or being subject to an Interim Heritage Order, the Heritage Council's approval must be sought prior to an approval being issued by the consent authority under the *Environmental Planning and Assessment Act 1979* (except where application relates to Integrated Development or Major Infrastructure and Other Projects under Part 3A of the *EP&A Act 1979*).

In accordance with section 67 of the Heritage Act, an approval given by a consent authority in these cases before the Heritage Council's determination of the application has been notified to the consent authority, is void.

As it is drafted currently, the master plan does not appear to include heritage as an opportunity that might inform recreational or employment opportunities, tourism attractions, place-making in new urban or suburban locations. Opportunities for heritage to inform the master plan and the SEPP are encouraged.

Aboriginal Cultural Heritage

OEH strongly recommends an assessment be undertaken to identify and address Aboriginal heritage issues up front and at the earliest possible stage of the planning process.

An assessment needs to provide sufficient basis for identification of Aboriginal heritage values to support their protection at the strategic level. OEH recommends that the following approach would be of assistance for a strategic document:

- Consultation with the Aboriginal community groups is required to identify areas of high cultural values.
- A desktop study of existing source material from previous surveys within the study area. A comprehensive review is required by the desktop study to ensure that recommendations for management are soundly based and appropriately targeted. These studies should be included to develop a robust predictive model for Aboriginal heritage within the study area. The survey reports are held at the AHIMS Register at OEH and available to all consultants.
- A landscape assessment would be feasible with the current data base (using the information from a more comprehensive desktop review) and existing landscape and soils maps.
- Evaluation of cumulative impacts across the local region is required to provide a context for identifying conservation priorities for Aboriginal heritage.
- Mapping of current conservation areas (in particular national parks and extensive regional park lands) - to provide an indication of existing conservation areas and assist in providing a context for identification of conservation priorities within the study area.
- A landscape based predictive model for Aboriginal settlement is required. The landscape based modelling would provide a clear framework for determining which landscape elements are already represented in existing conservation areas and again provide support for defining conservation priorities and other management options such as requirement for additional surveys. Mapping of the geomorphology, landscapes, Aboriginal sites and previous surveys across the study area are required to provide a basis for identification of the most sensitive landscapes, past major impacts which will have seriously compromised the integrity of any Aboriginal sites, locations with high potential for conservation of heritage, justification for areas to be surveyed.

The outcomes of the Aboriginal heritage assessment should be compiled into a single mapping of high, moderate or low Aboriginal cultural values. Options for conserving areas of Aboriginal heritage significance found within the study area should be fully explored in discussion with the Aboriginal community. OEH would welcome the opportunity to review an Aboriginal heritage assessment of the subject land and provide advice to the Department of Planning and Infrastructure on the adequacy of the assessment.

Biodiversity
OEH suggests that the dot point in 8. Biodiversity be changed to the following:

It is recommended that Biodiversity Certification is sought for the area, using the Biodiversity Certification Assessment Methodology (BCAM) http://www.environment.nsw.gov.au/biocertification/index.htm. The BCAM assesses the loss of biodiversity values on land proposed for biodiversity certification and the impact, or likely impact, of proposed conservation measures on land proposed for biodiversity conservation. Alternatively, undertake surveys for threatened species, populations and ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* and the *Threatened Species Conservation Act 1995*. Surveys should be conducted in accordance with the guidelines at http://www.environment.nsw.gov.au/threatenedspecies/surveyassessmentgdlns.htm. The BCAM can also be used as a guide to determine subject species, appropriate levels of survey effort and survey techniques. Assess the impact of proposed development on biodiversity and report on efforts to avoid and minimise impacts and conservation measure to be included in the SEPP. Where impacts are unavoidable, calculate offsets and measures to secure offsets in line with OEH offset principles available at http://www.environment.nsw.gov.au/biocertification/offsets.htm

Flooding
Study Requirements in Item 9 - Water and Air Quality, identifies four key requirements to be assessed in regards to stormwater and floodplain risk management. These item states:

- Identify watercourses, riparian land and wetlands that may be potentially affected by the proposed masterplan.
- Assess the potential impacts on water quality and quantity of receiving waterways, riparian land, wetlands and down slope vegetation.
- Assess constraints and strategies for stormwater management.
- Address flood risk that may occur on site, including consideration of the *NSW Floodplain Management Manual and* Section 117 Direction.

The primary objective of the Government's Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone land and reduce private and public losses resulting from floods.

In order to adequately address the above requirements, the most appropriate method to assess the development of flood prone land is through the floodplain risk management process which is detailed in the NSW Floodplain Development Manual (2005).

It should be noted that the Upper Nepean River Flood Study September 1995, covered a study area located downstream the proposed Wilton Junction Site (i.e. from Menangle Weir). Accordingly, there are no recent flood investigations available for the catchment in which the planning proposal is located.

Therefore, a hydrological and hydraulic assessment should be undertaken to include all water courses within or bordering the proposed site. These watercourses are the Nepean River, Allens Creek, Stringybark Creek and Byrnes Creek.

The assessment is to undertake both existing and proposed developed conditions of the proposed site and adjacent areas. The assessment is to comprise:

- An understanding of the flood risk for people and properties for the full range of floods up to the probable maximum flood (PMF) for both existing conditions and proposed developed condition.
- An assessment of the impact of proposed development on flooding behaviour within the site (i.e. impact on flood duration, extent, levels and velocities)
- A preliminary determination of floodways and flood storage to avoid allocation of any inappropriate developments within these areas.

- An assessment and determination of hazard categories within the site in order to inform land use planning decisions.
- An assessment of the impact of proposed development on downstream, adjacent and upstream areas (i.e. in regards to peak flow discharged from the site, volume and duration of flood in these areas).
- An assessment on whether floodplain management measures are required to offset any adverse impacts from development.
- An assessment of the impacts of earthworks and filling of land within the proposed development areas is based on understanding of cumulative flood impacts.
- A recommended emergency response plan to manage floods above the flood planning level (i.e. the 100 year ARI flood Plus freeboard). This plan should include an assessment of the flood evacuation needs (if required) and impacts from the proposed development on the capacity or operational aspects of existing regional evacuation routes.
- A sensitivity analysis to determine the potential impacts from climate change (i.e. increase in rainfall intensity) on flooding behaviour.

This hydrological and hydraulic flood risk assessment should be undertaken in accordance with the NSW Government's Floodplain Development Manual (2005). It is desirable that the technical specification for the project tender be prepared in consultation with Wollondilly Council and be based on OEH's Standard Brief used for the preparation of Flood Studies.

References

- Department of Planning and Infrastructure—Wilton Junction Precinct State Environmental Planning Policy Study Requirement.
- Wilton Junction Master Plan – Draft September 2012.

Relevant Policies and Guidelines

- NSW Government Flood Prone Land Policy (1984) as set out in the NSW Government Floodplain Development Manual (2005)
- Section 117(2) Local Planning Direction 4.3 "Flood Prone Land"
- Planning circular PS 07-003 "New guideline and changes to section 117 direction and EP&A Regulation on flood prone land"
- "Practical Consideration of Climate Change" (DECCW, 2007).

EPA

Our reference: FIL13/2369DOC13/9169:PW
Contact: Paul Wearne (02) 4224 4100

Michael Woodland, Project Director
Department of Planning and Infrastructure
Strategies and Land Release
23-33 Bridge Street
SYDNEY NSW 2000

Dear Sir

DRAFT STUDY REQUIREMENTS – WILTON JUNCTION PRECINCT SEPP

I am writing in reply to your request for comments regarding the Draft Study Requirements and accompanying *High Level Infrastructure Business Case* for the Wilton Junction Precinct SEPP received by the Environment Protection Authority (EPA) on 15 March 2013.

EPA has undertaken a review of the draft requirements and the High Level Infrastructure Business Case and has attached comments for Department of Planning and Infrastructure's (DP&I) consideration (**Attachment A**). These relate to the following:

- Air Quality
- Water Quality and River Flow
- Noise Assessment
- Waste; and
- General Matters.

EPA also refers DP&I to EPA's submission on the Wilton Junction Draft Master Plan dated 3 December 2013 (our reference DOC12/44265). This document provides further information and guidance to assist both DP&I and the proponent on developing the necessary studies associated with the Precinct SEPP. A copy of this correspondence is attached to this letter (**Attachment B**).

The draft study requires consultation with a range of stakeholders including state agencies. In this regard, EPA would be able to meet with DoPI and the proponents at a suitably convenient time to discuss any of EPA comments or to assist in providing any technical guidance if necessary.

Should you require any further information, please contact the above officer on (02) 4224 4100.

Yours sincerely

27/3/13

PETER BLOEM
Manager Illawarra
Environment Protection Authority

Att (N:\2013\PLANNING\PW DOC13-9169 DOPI DRAFT STUDY WILTON JUNCTION PRECINCT SEPP.DOC)

PO Box 513 Wollongong NSW 2520
Level 3, 84 Crown Street, Wollongong NSW
Tel: (02) 4224 4100 Fax: (02) 4224 4110
ABN 43 692 285 758
www.environment.nsw.gov.au

ATTACHMENT A

Environment Protection Authority Review Draft Study Requirements Wilton Junction Precinct SEPP

1. Air Quality

The Environment Protection Authority (EPA) considers that air quality is a significant issue in the South West of Sydney that includes the Wilton area. As indicated in EPA's response on the Draft Master Plan, the air shed in western and south western Sydney is compromised due to ozone and particle pollution. This will be compounded by population growth and climate change. However, the implementation of control strategies including NOx and VOC reduction programs have demonstrated that air quality can be maintained and improved.

In this regard, it is important that any intensification of development at Wilton contributes towards the Government's strategies to improve regional air quality in the Sydney GMR. In particular, EPA considers that it must be demonstrated that any development outcome at Wilton meets the goal of improving or maintaining air quality to ensure National Environment Protection Measures for ambient air quality are not compromised. In this regard, we recommend the following study requirement:

- *Undertake an assessment that includes recommended strategies that will be implemented to improve or maintain air quality to ensure National Environment Protection Measures for ambient air quality are not compromised. This assessment should be undertaken in consultation with the EPA.*

EPA would be able to assist DP&I and the proponent in providing technical guidance and advice in the development of the above assessment if required.

While the above assessment will assess impacts and identify strategies in relation to regional air quality issues, there also needs to be consideration of strategies to address air impacts at a local level. Section 9 of the draft study requirements states "*identify strategies to address the issue of air quality for the locality in consultation with relevant state and commonwealth agencies*". EPA recommends that this should focus on the identification of local based strategies to address potential air quality issues and provide detail on how they will be implemented. These strategies provide the mechanisms to avoid any potential future land uses conflicts, for example, the provision of buffers around potential odour producing activities. In this regard, we recommend the air requirement under Section 9 be amended as follows:

- *Identify strategies at a local level to ensure air emissions do not cause adverse impact upon human health, the environment and community amenity.*

2. Water Quality and River Flow

EPA considers that an important environmental outcome for the Wilton Junction Precinct is ensuring that Water Quality Objectives (WQO) developed for the Hawkesbury Nepean River are not compromised. These WQO reflect the community's environmental values and uses for the river and should be considered in the planning process to help prevent/minimise impacts from development on water quality. In this regard, we recommend that the study requirement under Section 9 be amended as follows:

- *Assess the potential impacts on water quality and quantity in order to demonstrate that key River Flow and Water Quality Objectives are achieved to protect environmental values including waterways, riparian land, wetlands and down slope vegetation.*

3 Noise Assessment

An issue with growth and intensification of activity is the potential for cumulative noise impact. Cumulative noise impacts are impacts that result from incremental changes caused by other past, present or foreseeable actions together with the project. For example:

- incremental increase in noise from a number of separate developments; and
- combined effect of individual impacts on particular receptors.

To address this issue, EPA recommends that the study requirement under Section 14 be amended as follows:

- *Undertake high level noise assessment analysis to ensure potential noise conflicts and cumulative impacts are managed appropriately. In particular, consideration should be given to road traffic noise in relation to the Hume Highway and Picton Road.*

4. Waste

The Draft Study Requirements do not include any information or guidance on waste management. EPA considers this matter an important issue especially with a proposal that involves an estimated 12,000 residential lots and an estimated population of approximately 35,500 people. In this regard, EPA recommends the inclusion of the following study requirement.

- *Identify and implement waste management strategies to achieve NSW Government's Waste Avoidance and Resource Recovery Strategy 2007 (WARR).*

5. General Matters

The Wilton Junction New Town High Level Business Case which accompanies the Draft Study Requirements refers to existing wastewater infrastructure. The report states that Sydney Water Corporation (SWC) provides wastewater services to Wilton. EPA understands that the existing Wilton township has on-site sewerage systems, and the Bingara Gorge development is serviced by a private operator. SWC has a Priority Sewerage Program (PSP) for Wilton which requires wastewater infrastructure to be delivered to currently unsewered areas by 2014. This PSP does not include Bingara Gorge. In this regard, EPA recommends clarification is sought on this matter.

NSW EPA

Our reference: FIL12/2617:DOC12/44265:PW
Contact: Paul Wearne (02) 4224 4100

Wollondilly Shire Council
(Attention: Tania Makaroff)
PO Box 21
PICTON NSW 2571

Dear Sir

WILTON JUNCTION DRAFT MASTER PLAN

I am writing in reply to the Wollondilly Shire Council's (WSC) request for the Environment Protection Authority (EPA) comments received electronically on 23 October 2012 in relation to the Draft Master Plan for the above proposed project.

Based on a review of the Draft Master Plan and information provided at the Planning Focus Meeting on 20 August 2012 and 28 August 2012 respectively, please find attached our comments for Council's consideration (**Attachment A**). These relate to:

- Air Quality
- Water Quality and River Flow
- Noise
- Contaminated Land Management; and
- Waste Management.

A matter not raised in the Master Plan is the recent Commonwealth Government's announcement regarding their intention to undertake detailed investigation of the suitability of Wilton as a second Sydney Airport. The Master Plan should provide some discussion on this matter and whether Council are consulting with the Commonwealth regarding this issue.

Due to the limited information in the Draft Master Plan, the EPA may have further requirements during the development of the Master Plan.

The EPA is available to meet at a mutually convenient time to discuss any of the attached comments if necessary. Should you require any further information please contact Mr Paul Wearne on (02) 4224 4100.

Yours sincerely

3/12/12

PETER BLOEM
Manager Illawarra
Environment Protection Authority

Att

PO Box 513 Wollongong NSW 2520
Level 3, 84 Crown Street, Wollongong NSW
Tel: (02) 4224 4100 Fax: (02) 4224 4110
ABN 43 692 285 758
www.environment.nsw.gov.au

cc: Department of Planning and Infrastructure
(Attention: Terry Doran)
10 Valentine Avenue
PARRAMATTA NSW 2150

(N:\PLANNING\PW DOC\12-14265 FINAL RESPONSE TO MASTER PLAN)

ATTACHMENT A

1. AIR QUALITY

1.1 Air Quality Outcomes

The Master Plan should document a development concept that ensures the following environmental outcomes will be achieved in relation air quality.

- Maintains or improves air quality to ensure National Environment Protection Measures (NEPM) for ambient air quality are not compromised
- Provides strategies at a local level to ensure air emissions do not cause adverse impact upon human health, the environment and community amenity
- Incorporates an integrated transport planning framework that reduces vehicle kilometers travelled and reduces vehicle dependency
- Is energy efficient and sustainable with high accessibility to public transport, services, employment and open space; and
- Avoids land use conflict.

1.2 National Environment Protection Measure for Ambient Air Quality

The NSW Government delivers programs to meet the NEPM for Ambient Air Quality. The NEPM establishes a range of standards and goals for a number of key air pollutants, including the methods by which these pollutants are to be measured, assessed and reported. The intent is to provide for ambient air quality that ensures adequate protection of human health and well-being.

The National Environment Protection Council (NEPC) is currently reviewing the National Environment Protection (Ambient Air Quality) Measure. This review will culminate in the development of the National Plan for Clean Air. This new plan will provide a robust framework for identifying cost effective emission reduction actions and implementation arrangements. It will strengthen the need for actions to be implemented that target critical air pollution issues in the Sydney Region and statewide.

1.3 Air Quality in the South West of the Sydney

While much progress has been made in improving air quality across the Sydney Region, there are two remaining air quality issues of significant regional concern. These are photochemical smog (ozone) and particle pollution.

Photochemical smog (ozone) is a secondary pollutant formed in the atmosphere by the reaction of volatile organic compounds (VOC) and oxides of nitrogen (NOx) in hot, sunny weather conditions. In the Sydney Region, registered motor vehicles and off-road transport sources are significant man-made sources of both these precursor pollutants, contributing around 84 per cent of NOx and 31 per cent of VOC. Other sources of ozone precursors include EPA-licensed industry, households and commercial businesses.

In the South West of Sydney the national ozone standards can be exceeded when the weather conditions are conducive to the formation of photochemical smog (ozone). In the last decade the standard has been exceeded by up to 15 days per year (1 hour ozone standard exceedences Sydney 2004). The data show no clear trend for these exceedences, with the gains from technological improvements to vehicle emissions being generally offset by the continuing growth in numbers and use of motor vehicles.

In relation to particle pollution, wood heaters, EPA-licensed industry, registered motor vehicles and off-road transport sources (particularly diesel engines) are the most significant man-made sources in the Sydney Region. For particle pollution (as PM_{10}) the national standard can also be exceeded on multiple days in a year, with up to 18 days per year in the last decade (PM10 exceedence days Sydney 2003). Currently there is an advisory standard for fine particles (as $PM_{2.5}$). Exceedences of this advisory standard can also occur on multiple days per year. Exceedences of the National standards for particles (as PM_{10} and $PM_{2.5}$) can also be associated with extreme events such as bushfires and dust storms.

CSIRO modelling shows that the conditions associated with climate change are likely to result in an increase in the number of days exceeding the ozone standard in Sydney and the geographical extent of ozone impacts, as a result of increased temperatures. Changes to rainfall, temperature and weather patterns may also increase the frequency of dust storms and bushfire-related pollution events, leading to higher particle emissions.

Health research indicates both photochemical smog (ozone) and particle pollution can cause both acute and chronic respiratory and cardio vascular conditions (such as bronchitis, asthma and heart attack). This can result in subsequent school and sick leave, emergency room visits, hospitalisation and premature death. These pollutants are of particular concern in the South Western area of Sydney, which includes Wilton.

Annual health costs of air pollution in Sydney, Hunter and Illawarra metropolitan areas are estimated to be approximately $4.7 billion or $893 per person per year (DEC 2005). Although Sydney has good air quality by world standards, a reduction in air pollution levels would deliver significant long-term benefits such as improved population health and improved amenity.

1.4 Implications of Growth in the South West Sector

The Office of Environment and Heritage has established an air quality monitoring network across the Sydney Region, to inform daily air quality and to provide information to guide air shed modelling. This information has been used to enhance our understanding of the significant sources of precursor pollutants, atmospheric processes (meteorology) and atmospheric chemistry associated with photochemical smog (ozone) formation and particle pollution.

The EPA undertook air shed modelling work in 2004 to provide information to guide environmental consideration for the South West sector growth area. This work revealed the following key findings:

- Scenario modeling for 2016 and 2026 considers the potential impact of an increase in the population of Sydney from 3.8 million to 4.6 million by 2016 and a further increase to 5 million by 2026. The modeling shows that for this increase in population, the most important determinant of future photochemical smog (ozone) events is emissions associated with population growth across the entire metropolitan area that includes development in the South West Sector.
- Modelling for 2016 and 2026 does not show a substantial deterioration in western and south western Sydney air quality provided expected control strategies are maintained. However, exceedences of the national ozone standards are still expected due to the impacts of population growth on area based emissions and the potential for ozone exceedences to be more frequent in western and south western Sydney under prevailing weather conditions still remains.
- Despite the expected reduction in vehicle emissions due to new vehicle emission and fuel quality standards, motor vehicles will remain a significant source of ozone precursor pollutants.
- The variation in the scale of ozone reductions between the scenarios indicates that no one control scenario is effective on all days and that a mix of particulate, VOC and NOx control strategies is required.

This work was based on development outcomes associated with the South West sector and did not include the proposed growth areas proposed at Wilton. However, this work has revealed that complying with the NEPM standards is a challenge and routine air quality monitoring data has confirmed this conclusion.

1.5 Managing Growth at Wilton

The development at Wilton proposes an estimated 12,000 residential lots and a range of development types including employment generating for an estimated population of approximately 35,500 people. With the air shed already compromised due to ozone and particle pollution, it is important that any intensification of development at Wilton contributes towards the Government's strategies to improve regional air quality in the Sydney Greater Metropolitan Region. In particular, it must be demonstrated that any development

outcome at Wilton meets the goal of improving or maintaining air quality, and satisfies the objective of 'Improving Sydney's Air Quality' as listed (Objective G7) in *The Metropolitan Plan for Sydney 2036*.

In addition consideration should also be given to *The Metropolitan Plan for Sydney 2036* Action G7.2 regarding planning development adjacent to busy roads. In particular, the Department of Planning and Infrastructure's *Development Near Rail Corridors and Busy Roads—Interim Guideline* provides land use planning principles that can guide land use change outcomes that can improve residential environments and minimise exposure to poor air quality.

To help reduce local and regional levels of particle pollution, consideration should also be given to not allowing installation of wood heaters in the development area, if alternative forms of heating such as reticulated gas, are available.

1.6 Access and Transport Issues

The supporting documentation states that currently 79.4 per cent of households in Wilton have two or more cars. It also states that the majority of residents in the Wollondilly Shire Council area travel to work by private vehicle. Very few use public transport with approximately 70 per cent of people commuting to areas outside the local government area. In this regard, the risk for any intensification of residential development at Wilton is that it may become a commuter suburb for Sydney while any employment generating development will be dependant upon travel by road.

Transport Problems Facing Large Cities, NSW Parliamentary Library Briefing Paper No 6/2008 (June 2008) states that emissions from transport made up 14 per cent of total greenhouse gas emissions from NSW in 2005. In general emissions from cars made up 60 per cent of emissions from transport, light commercial vehicles 14 per cent, buses and trucks 18 per cent, railways 2 per cent and motorcycles 0.3 per cent.

In this regard, an important environmental consideration will be demonstrating a development outcome that minimises vehicle kilometres travelled (VKT). That would include but not necessarily be limited to the following:

- supporting access to and promoting use of public transport
- commitment to early provision of infrastructure
- providing ready access to essential services (schools, hospitals, retail services, etc)
- locating trip generators at transport nodes
- maximising local employment; and
- encouraging a range of alternative transport options throughout the area such as walking and cycling.

While the draft strategy proposes a number of these elements in relation to the provision of public transport it relies primarily on the provision of bus services by public service providers. A key outcome in State Plan 2021 is the recognition that an "integrated transport system is required to ensure different transport modes work together and the interests of the travelling public are put first". In this regard the provision of a rail line to the area should be an important consideration.

The Draft Strategy does indicate that the site is crossed by the Maldon Dombarton rail corridor, however it also states "that there is no mention of plans for passenger services to operate on the line when it proceeds however if they did a Wilton train station could be considered".

Currently the Commonwealth Government is undertaking additional studies to complete the project to make it "shovel ready" with an outcome that delivers a future rail freight route from Port Kembla to South Western Sydney. In addition Infrastructure NSW recommended in the *Infrastructure Strategy 2012 – 2032* "*that the Maldon to Dombarton rail line would not be required for 10 years on current demand forecasts and would need to be predominately funded by the private sector*". Opportunities should be explored in providing a passenger service for this line and further opportunities should also be explored for the contribution of funds for its construction. A section of rail line and an associated Wilton Station located within the project area should be strongly encouraged and included in the Master Plan.

2. WATER QUALITY AND RIVER FLOW

2.1 Water Quality and Flow Outcomes

The Master Plan should document a development concept that ensures the following environmental outcomes will be achieved in relation to water quality and flow.

- There is no pollution of waters (including surface and groundwater)
- Wastewater is collected, treated and beneficially reused, where this is safe and practicable to do so
- Provides sustainable integrated water cycle management; and
- Contributes to the achievement or protection of key River Flow and Water Quality Objectives.

2.2 Government Water Management Policy

There are number of Water Management Policies that would be relevant and should be considered when developing the Master Plan. These Policies provide the key strategic directions and objectives of water management in NSW. These policies have been collated by the NSW Office of Water and can be found at the following web site. http://www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Key-policies/default.aspx.

2.3 Interim Environmental Objectives (water quality and river flow)

The development outcome associated with the Master Plan should ensure that Water Quality Objectives (WQOs) developed for the Hawkesbury Nepean River are not compromised. These WQOs reflect the community's environmental values and uses for the river and should be considered in the planning process to help prevent/minimise impacts from development on water quality.

Further information on NSW WQOs can be found at www.environment.nsw.gov.au/leo and for information on WQOs specific to the Hawkesbury–Nepean see the Statement of Joint Intent for the Hawkesbury Nepean River System (12 March 2001) which can be made available on request to the EPA.

2.4 Stormwater Pollution

A comprehensive assessment should be carried out to determine whether monitoring will be required to provide adequate information for modeling of nutrient export. The objective should be that the appropriate water quality objectives for the receiving waters are not compromised.

It is also important that prior to, during and following construction, appropriate soil and water management systems are in place. The *NSW Department of Housing 'Managing Urban Stormwater: Soils and Construction' (4th Edition March 2004)* and its associated guidance documents should be consulted as it provides guidance on erosion and sediment control during construction and post development.

A mechanism that may be worthwhile exploring to minimise residual pollutant load from new development is the use of economic initiatives such as green offsets. Further information on such concepts can be obtained from *"Green Offsets for sustainable development concept paper 2002"*: http://www.environment.nsw.gov.au/resources/greenoffsets/greenoffsets.pdf.

2.5 Stormwater Management

The proposed development outcome should include an integrated approach to the management of stormwater. Such an approach incorporates water sensitive urban design principles that minimises impacts on waterway health, minimise stormwater flooding and provides an alternate water source.

When assessing any changes to land use an assessment needs to be undertaken to address issues associated with any changes in the hydrological regime of the catchment, especially where areas of natural bushland and rural lands are proposed to be developed into an urbanised catchment. With reducing lot sizes, the density of the dwellings is such that much of the allotment is usually taken up by a dwelling and associated landscaping which consists of hard-stand areas. With the majority of the land sealed the result is major hydrological change for the area resulting in higher intensity flows within the catchment contributing to not only property damage but also considerable environmental impact. Therefore these impacts must be assessed and strategies developed and documented.

In addition, a key consideration should also be the maintenance or restoration of existing waterways in the project area. This not only improves the ecological conditions of the waterway but also enhances recreational and aesthetic opportunities.

Over recent years, stormwater harvesting and reuse have also emerged as a new field of sustainable water management. Harvesting and reusing stormwater offer both a potential alternative water supply for non-drinking uses and a means to further reduce stormwater pollution in our waterways. Stormwater harvesting complements other approaches to sustainable urban water management, including rainwater tanks, greywater systems, effluent reuse and demand management. Further information on such approaches can be obtained *Managing urban stormwater: harvesting and reuse (DEC 2006)*: http://www.environment.nsw.gov.au/resources/stormwater/managestormwatera06137.pdf. .

Further information on the above matters and suggested management approaches can also be obtained from guidance material including but not necessarily limited to Landcom's Water Sensitive Urban Design Policy (2004). http://www.landcom.nsw.gov.au/content/publication-and-programs/water-sensitive-urban-design.aspx

2.6 Sewage Management

The EPA supports the proposed integrated approach to managing sewage effluent and stormwater which presents a significant opportunity to meet the community's environmental objectives for the lowest cost and provide a source of water to improve the liveability of the development.

The Draft Master Plan states that effluent reuse will be maximised with a proposal that involves treated effluent irrigation of parks and gardens and non potable uses such as in water features and in employment areas. The Master Plan will need to clearly document how these measures will be secured and whether any additional lands for reuse purposes needs to be identified for effluent irrigation purposes. The EPA also recommends that any sewage management proposal meets the following environmental performance objectives.

- Protection of surface waters
- Protection of groundwater
- Protection of lands
- Protection of plant and animal health
- Prevention of public health risks
- Conservation and reuse of resources; and
- Protection of community amenity.

The following guidelines should be consulted for further information on achieving these outcomes and assessing site constraints and opportunities.

- *National Water Quality Management Strategy: Guidelines for Sewerage Systems - Effluent Management* (ARMCANZ/ANZECC 1997): http://www.environment.gov.au/water/policy-programs/nwqms/
- *National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water* (ARMCANZ/ANZECC 2000): http://www.environment.gov.au/water/policy-programs/nwqms
- *Environmental Guidelines for the Utilisation of Treated Effluent by Irrigation* (NSW DEC 2004): http://www.environment.nsw.gov.au/resources/water/effguide.pdf.

The current proposal does include the potential for the use of surplus treated effluent to support environmental flows. The Master Plan acknowledges that the proposal is within the Lower Hawkesbury Nepean Nutrient Management Strategy area and recognises the sensitive nature of this water way. It also states *'the approach to disposal of surplus flows will therefore target levels of nutrients and suspended solids that would not significantly increase net loads in the Nepean River'* and *'the treated surplus would be designed to discharge lower net nutrient loads than currently licensed treatment plants in the region'*. The

EPA notes that the Lower Hawkesbury Nepean Nutrient Management Strategy has been taken into account in the development of the Master Plan and this is supported.

In addition, the Master Plan also states that a proposed treatment standard for discharges would be no less than those of Sydney Water's Picton Sewage Treatment System (STS). The EPA advises that specific discharge requirements are determined on a case by case basis taking into account the potential impacts on the local environment and the practical measures that could be taken to avoid that impact. In addition, the Picton STS discharge limits were determined for occasional discharges linked to receiving water flow and these may not be an appropriate reference point in relation to a discharge from a proposed new scheme.

The EPA advises that it is currently examining a potential framework for the regulation of nutrient discharges in the Hawkesbury Nepean River system. The intent of this framework is to ensure that population growth in the catchment does not cause further deterioration in the condition of the river and its ability to meet the community's desired uses. The EPA is considering several options including a catchment based nutrient load limit. In the interim, the Master Plan should document a development outcome that ensures any new sewage treatment scheme will achieve no net increase in nutrient load to the river. Offsets and other measures such as integrated approaches to water management can be used to achieve this outcome. In addition any proposed discharge would need to be assessed in accordance with the ANZECC (2000) *Guidelines for Fresh and Marine Water Quality.*

In relation to a new reticulation system, the EPA expects that the sewerage reticulation system is designed to minimise overflows to the environment during wet and dry weather conditions. The EPA encourages the design and installation of a pressurised reticulation. The environmental benefit of such a system is it reduces rainwater infiltration and thereby minimises wet weather overflows. If a gravity sewerage system is proposed hydraulic modelling would be required to demonstrate overflow frequency and volume and potential environmental impacts.

3. NOISE

3.1 Noise Outcomes

Noise is a major urban issue with significant impacts on health and amenity. Land use planning provides the best strategic approach to minimise noise impacts. A hierarchical approach to land use planning is useful to minimise noise impacts and includes:

- Plan new developments to avoid noise-related land use conflicts up front through spatial separation, best practice building design, siting and construction, and the use of appropriate noise mitigation measures at appropriate locations; and
- Promote and support urban consolidation that is sited and designed to minimise noise impacts on residents, recognising the challenge of urban consolidation around transport nodes/corridors that is compatible with both walk to transport and acceptable noise outcomes and residents.

This approach should inform the process of identifying growth areas for residential development and employment generating activities to ensure that appropriate planning measures are implemented. A key development outcome for the proposal and recognised in *The Metropolitan Plan for Sydney 2036* (Action G8.1) should be the avoidance of noise based land use conflict through strategic planning and the development assessment process.

Section 8 of the Plan titled "Master Plan Metrics and Analysis" states that acoustic noise assessments from individual land owner investigations will be used where available to inform the Master Plan. However, no information has been presented on these past assessments. While these assessments may provide useful background information, contemporary acoustical noise assessments should be undertaken as part of the Master Plan. These should include but not necessarily be limited to the following matters:

a) Road Traffic Noise

The EPA concurs with the Draft Master Plan that at this time the Hume Highway and Picton Road are existing noise sources that will require noise management. In addition it also states that as far as possible the interface to these noise sources will be managed through the selection of non-residential land uses, especially around the Hume Highway Picton Road interchange. While the EPA supports this approach it should also be applied to other significant noise sources including roadways that will be subject to traffic generating development.

Any new roads, road redevelopments, or land use developments generating additional road traffic should be assessed in relation to the *NSW Road Noise Policy* (DECCW 2011). Residential development next to busy roads (with an annual traffic volume of over 40,000 vehicles per day) and rail corridors would be required to meet the internal noise goals in the *Infrastructure SEPP* 2007. In addition, the *Development Near Rail Corridors and Busy Roads —Interim Guideline* should also be consulted. This guideline includes goals for internal noise levels based on World Health Organisation guidelines for residential and other sensitive developments along busy road and rail corridors to protect heath and amenity. This guideline recognises judicious land use planning, architectural design, building orientation and good internal layout that can achieve acceptable acoustic amenity in close proximity to busy transport corridors.

b) Rail Noise

The Draft Master Plan states that "*the Maldon-Dombarton railway alignment, if ever used for freight movement, could become a further noise source requiring management*". It also states that "*The Maldon-Dombarton railway corridor also traverses this area, providing an opportunity to be used as a non-vehicular movement corridor and link to the town centre, but also creating prospective noise issues and crossing point difficulties if it is ever used as a railway corridor.*"

While there is uncertainty in the timing for this project it is still important that appropriate land uses are identified around this alignment to ensure there is no future land use conflicts if the project proceeds. In this regard any residential development proposed alongside the rail corridor should meet the requirements of the Infrastructure SEPP 2007. Further guidance is provided in *Development near rail corridors and busy roads – Interim guideline* (Department of Planning 2008). In the event the project does proceed a noise assessment should be undertaken. The EPA may have additional assessment requirements in this regard.

Currently rail projects are assessed using the *Interim Guideline for the Assessment of Noise from Rail Infrastructure Projects* (Department of Environment and Climate Change, 2007). This is intended to be replaced by the forthcoming *Rail Infrastructure Noise Guideline* (EPA). These guidelines should also be consulted as they also provide guidance in relation to land use planning regarding rail noise issues.

c) Aircraft Noise

The project area does include the existing Wilton Airport, however the Draft Master Plan does not discuss this existing land use nor its future. In this regard potential aircraft noise issues should be identified and discussed in relation to Direction 12 issued under Section 117 the *Environmental Planning and Assessment Act* 1979, which may result in planning restrictions. Direction No 12 "*Development near Licensed Aerodromes*" restricts land use based on Australian Noise Exposure Forecasts (ANEF) and calls up Australian Standard 2021 regarding interior noise levels. Further advice should be sought from Wollondilly Shire Council and AirServices Australia regarding this matter, including the question of whether an alternative to the ANEF approach to predicting noise impacts from airports should be considered.

d) Potential Noise Impacts From Other Activities

The Draft Master Plan states that there is potential for noise impacts from infrastructure such as sewerage infrastructure. However, the assessment should identify all significant potential noise sources and potential impacts considered in relation to any noise sensitive receivers, such as residences, places of worship and schools. In this regard the Master Plan will need to deliver a development outcome which does not result in future land use conflicts.

A number of approaches can be applied to mitigate potential noise impacts and thereby guide land uses. For example, Section 12.1 "Key Elements" states "*The location of the schools raises issues of safety in*

respect of Picton Road, noise from Picton Road and bush fire risk from adjacent bushland". In this instance the EPA considers that potential noise impacts could be addressed through the detailed design of these schools and surrounding areas through the implementation of suitable management techniques.

Another approach may involve the use of appropriate buffers consisting of non-residential land next to potentially significant noise generating activities. For example, The "Metropolitan Plan for Sydney 2036" *states for agricultural activities and resource lands that a secure planning framework is required that provides greater certainty and encourages investment.* In this regard such an approach may involve the use of non-residential land uses adjacent to intensive agricultural activities for example poultry operations, abattoirs and saleyards. As these activities such as these have the potential to generate noise and odour impacts.

The *NSW Industrial Noise Policy* (EPA, 2000) also provides further information which should be consulted when undertaking this assessment.

4. CONTAMINATED LAND MANAGEMENT

The Master Plan should document a development concept that ensures the following environmental outcome will be achieved.

- To ensure any contaminated land is identified and appropriately managed for the purpose of reducing the risk of harm to human health or any other aspect of the environment.

A range of activities can result in land contamination and significant environmental and health risks if the land is not appropriately classified, assessed and rehabilitated. In cases where land has potential for land contamination, the assessment should also consider the requirements and procedures in the following:

- *Contaminated Land Management Act 1997*
- *Contaminated Land Management Regulation 1998; and*
- *State Environmental Planning Policy 55 – Remediation of Land.*

While the land appears to be predominately rural, currently it may have been used for a range of activities over times that have had the potential to cause land contamination. This may include pesticide application or landfilling and asbestos dumps. The Draft Master Plan also states that there was a Douglas Park Range which was used for testing explosives during World War 2.

The *State Environmental Planning Policy 55* states that as part of any land use change process the following key considerations should be addressed when preparing an environmental planning instrument.

- Whether the land is contaminated
- If the land is contaminated whether it is suitable in its contaminated state (or will be suitable, after remediation) for all the purposes to which the land will be used; and
- If the land requires remediation; will be made suitable for any purpose for which the land will be used.

The Draft Master Plan states where available past individual land owner investigations for land contamination will be used. As per the State Environmental Planning Policy, the EPA recommends that a contemporary contamination land assessment should be undertaken to inform future land uses. If historical information suggests that activities have been carried out across the project area which may have caused significant site contamination (for example, that is, possible unexploded ordnance at Douglas Park) the EPA recommends that Council should request the services of an accredited site auditor for those areas.

5. WASTE MANAGEMENT

The Master Plan should document a development concept that ensures that the following environmental outcomes will be achieved in relation to waste management. These are:

- Provides sound waste management strategies which are implemented to achieve NSW Government's Waste Avoidance and Resource Recovery (WARR) Strategy 2007.

NSW State Plan 2021 Goal 23 requires an increase in recycling to meet the 2014 NSW waste recycling targets. In this regard, increased recycling limits the amount of space required for landfill and turns waste into a valuable resource. In addition, Goal 23 also requires that by 2016, NSW will have the lowest litter count per capita in Australia. The cost to the community of littering goes beyond visual pollution. Greater respect for neighbourhoods by disposing of rubbish properly leads to improved safety, limits health impacts and protects the natural environment. These goals also need to be the corner stones in relation to delivering waste management strategies as part of the Master Plan.

In particular, the EPA recommends that the Draft Master Plan be amended to address the following matters. These are as follows:

a) The vision statement in the Executive Summary of the Draft Master Plan should be expanded to include a vision on delivering a healthy environment – cleaner air, water and land
b) In Section 5.2 Principles for a New Town under the sub-title "Environment" (p17) reference should be included on the need to develop and implement a sound waste management strategy to achieve NSW Government's WARR Strategy 2007
c) Under the sub-title "Placemaking"(p18) add a bullet point on Public amenity – "Ensure implementation of an effective litter management and public place recycling" taking into account of the *Better Practice Guide for Public Place Recycling* (DEC 2005). This can be obtained at the following web site: http://www.environment.nsw.gov.au/resources/warr/2005156_gov_ppguidelines.pdf.
d) Under the sub-title "Infrastructure", add a further bullet point on the need to address waste and resource recovery infrastructure requirements and the road infrastructure to accommodate waste collection vehicle requirements.
e) Under Section 8.3.1.5 Next Steps (p34):
   - the refinement of the TRACKS modelling should include garbage truck movements internal to the development and the urban road network; and
   - if the Master Plan proceeds any DCP that is developed will need to address the "Model Waste Not DCP principles" the NSW EPA's *Better Practice Guide for Waste Management in Multi-unit Dwellings* and the *Better Practice Guidelines for Waste Management and Recycling in Commercial Facilities* (that will be published online in Dec 2012)
f) Under Section 8.4 Infrastructure (p39), the following elements should be addressed:
   - need to review existing waste and resource recovery infrastructure (including the adequacy of the local organics and dry recycling centre at Narellan) and if necessary to provide new waste and recycling transfer stations, material recycling facilities, drop-off facilities for hazardous materials and waste disposal facilities; and
   - during the construction phase of this large development over several years, suitable sites should be made available for the use of developers to effectively manage construction and demolition material including VENM etc, within the Wilton Junction Development area. These sites are to facilitate reuse and re-processing of a range of materials. Development conditions drawn should reflect this requirement to ensure its implementation.

Family & Community Services
Housing NSW

Stephan McIntyre
For attention pls
Ref: HOCE13/350 SM 22/4

PMU026537

Mr Sam Haddad
Director-General
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

RECEIVED
22 APR 2013
Director-General

Attention: Michael Woodland
Project Director
Planning Strategies Housing & Infrastructure

Dear Mr Haddad Sam,

Draft Study Requirements for the Wilton Junction SEPP

Thank you for the opportunity to comment on the draft Study Requirements for the Wilton Junction Precinct State Environmental Planning Policy. Housing NSW is interested in ensuring that the provision of an appropriate mix of housing types, including affordable housing is a clearly identified requirement in relation to sites under the Potential Home Sites Program and any major residential developments.

Housing NSW supports the proposal for the Wilton Junction Precinct to significantly increase the supply of housing and provide for a mix of dwellings. As part of the planning process for the Precinct there should be an evaluation of the suitability of promoting smaller dwelling types that can offer a relatively more affordable housing product, for example boarding houses, secondary dwellings and housing units above garages.

However, the draft Study Requirements for the Precinct do not currently include a requirement to provide affordable rental housing for lower income households. Further consideration should be given to the setting of a target for the delivery of affordable housing within the Precinct to ensure a range of housing types and price points are provided to meet community needs. There may be potential in this Precinct to seek a development contribution for affordable housing through a negotiated planning agreement. Given the potential value increase that the rezoning will provide an appropriate target could be set that does not impact on the feasibility of development within the Precinct.

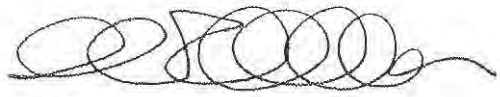
A contribution for affordable housing has been successfully negotiated through planning agreements for residential development sites at St Marys and Rouse Hill.

223-239 Liverpool Road, Ashfield NSW 2131
Locked Bag 4001, Ashfield BC 1800
T (02) 8753 8000 F (02) 8753 8888
www.facs.nsw.gov.au

The planning agreement requires the developer to provide land at no cost for the provision of affordable rental housing. The land is transferred to a not-for-profit community housing provider with a funding grant to support the construction of the new homes. The Centre for Affordable Housing in Housing NSW can assist in the development of any similar proposal for the Potential Home Sites Program.

If you require any information in relation to this submission please contact Ms Sue Brown, Principal Planner, Centre for Affordable Housing on 8753 8529 or email sue.brown@facs.nsw.gov.au.

Yours sincerely



Mike Allen
Chief Executive
18.4.13

APPENDIX F – CONSIDERATION OF PMF / FLOOD EVACUATION

Manning's check on 1% AEP and Channel Capacity flows along the Nepean River and Allens Creek.

Project Data

Project Title: 9708 - Wilton Junction

Designer: JWP

Project Date: Thursday, May 23, 2013 – Updated March 2014

Project Units: SI Units (Metric)

Notes:

Calculation Assumptions

Adoption of 1% AEP flows derived from XP-RAFTS model calibrated with the peak discharge hydrograph at Maldon Weir (48 hour duration) as reported in the Upper Nepean Flood Study (1995).

Those sections (1.20, 1.21, 1.23 and 1.26) upstream of Maldon Weir have adopted a conservative peak flow rate from the hydrograph.

Assumed hydraulic gradient of 0.1% for all Creek Sections

Assumed Manning's Roughness parameters adopted:

- 0.07: Watercourse invert
- 0.2: Remainder of watercourse profile (1% AEP).
- 0.1: Remainder of watercourse profile (Channel Capacity).

Red dashed line indicates previously reported water level.

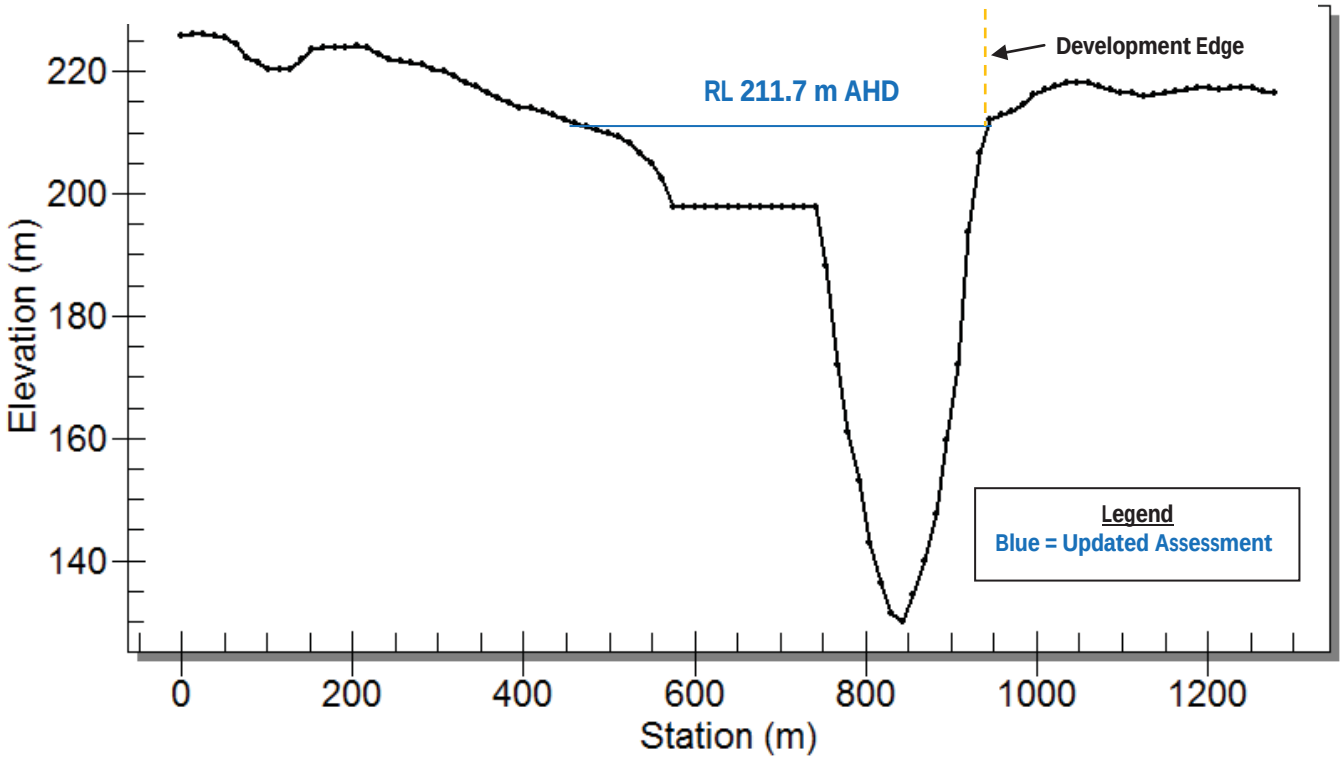
Channel Capacity Results

Channel Capacity

Channel Analysis - 1.21: Channel Capacity

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 45000.0000 (cms)

Result Parameters

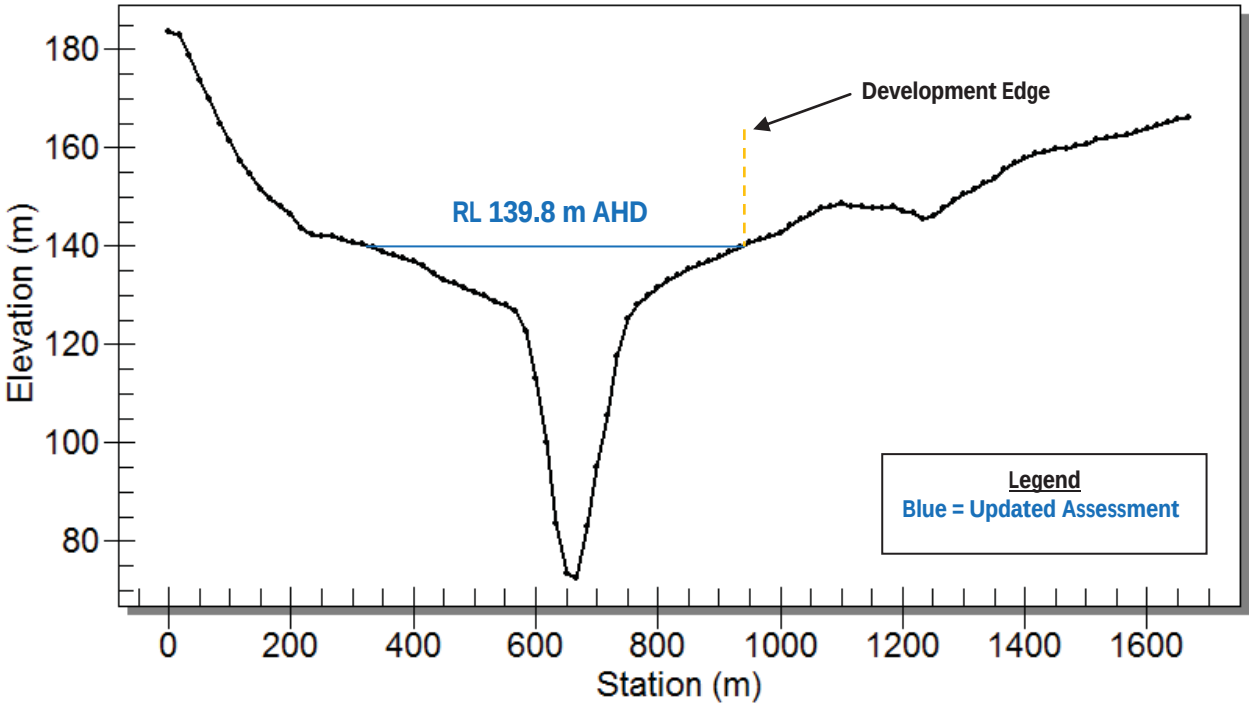
Depth:	81.707	m
Area of Flow:	13210.577	sq m
Wetted Perimeter:	545.896	m
Hydraulic Radius:	24.200	m
Average Velocity:	3.406	m/s
Top Width (T) :	488.357	m
Froude Number:	0.209	
Critical Depth:	37.304	m
Critical Velocity:	15.023	m/s
Critical Slope:	0.02692	
Critical Top Width:	130.272	m
Calculated Max Shear Stress:	800.907	N/m^2
Calculated Avg Shear Stress:	237.211	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0777	

Channel Capacity

Channel Analysis - 1.51: Channel Capacity

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 23500 (cms)

Result Parameters

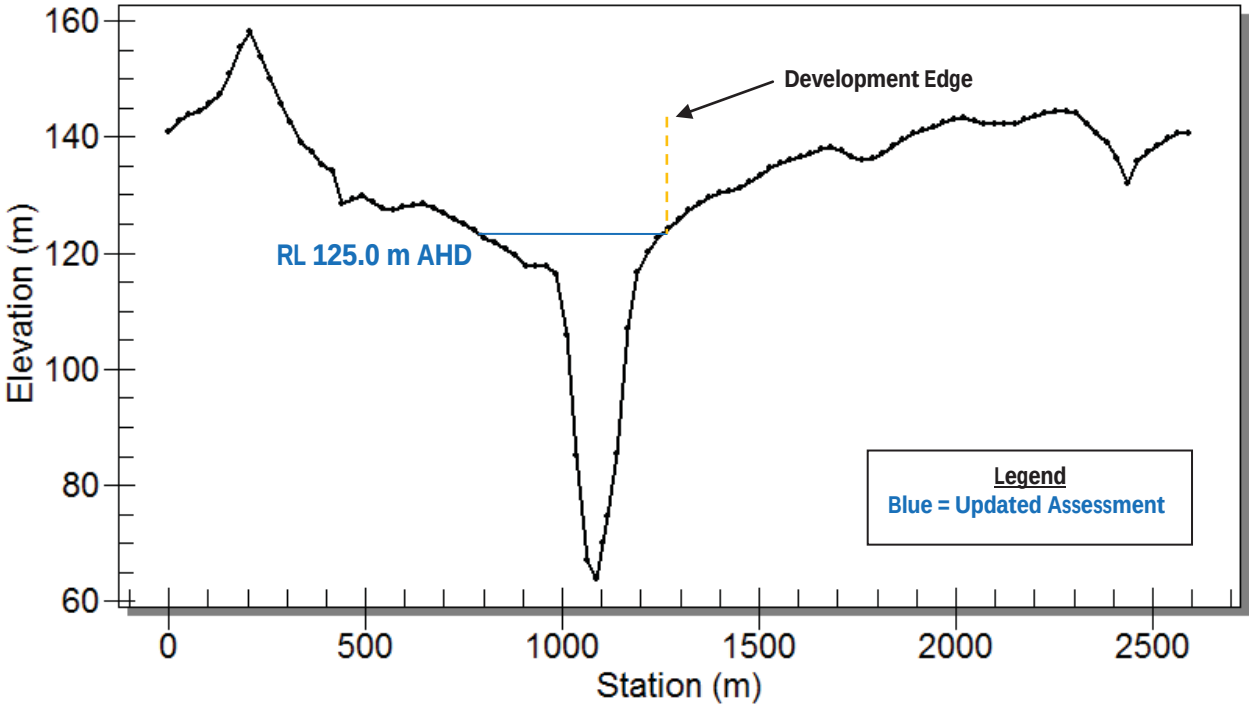
Depth:	67.332	m
Area of Flow:	9962.247	sq m
Wetted Perimeter:	633.340	m
Hydraulic Radius:	15.730	m
Average Velocity:	2.359	m/s
Top Width (T) :	599.625	m
Froude Number:	0.185	
Critical Depth:	30.176	m
Critical Velocity:	13.254	m/s
Critical Slope:	0.03396	
Critical Top Width:	99.057	m
Calculated Max Shear Stress:	659.997	N/m^2
Calculated Avg Shear Stress:	154.186	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0842	

Channel Capacity

Channel Analysis - 1.62: Channel Capacity

Input Parameters

Channel Type: Custom Cross Section



Longitudinal Slope: 0.0010 (m/m)

Flow: 20800 (cms)

Result Parameters

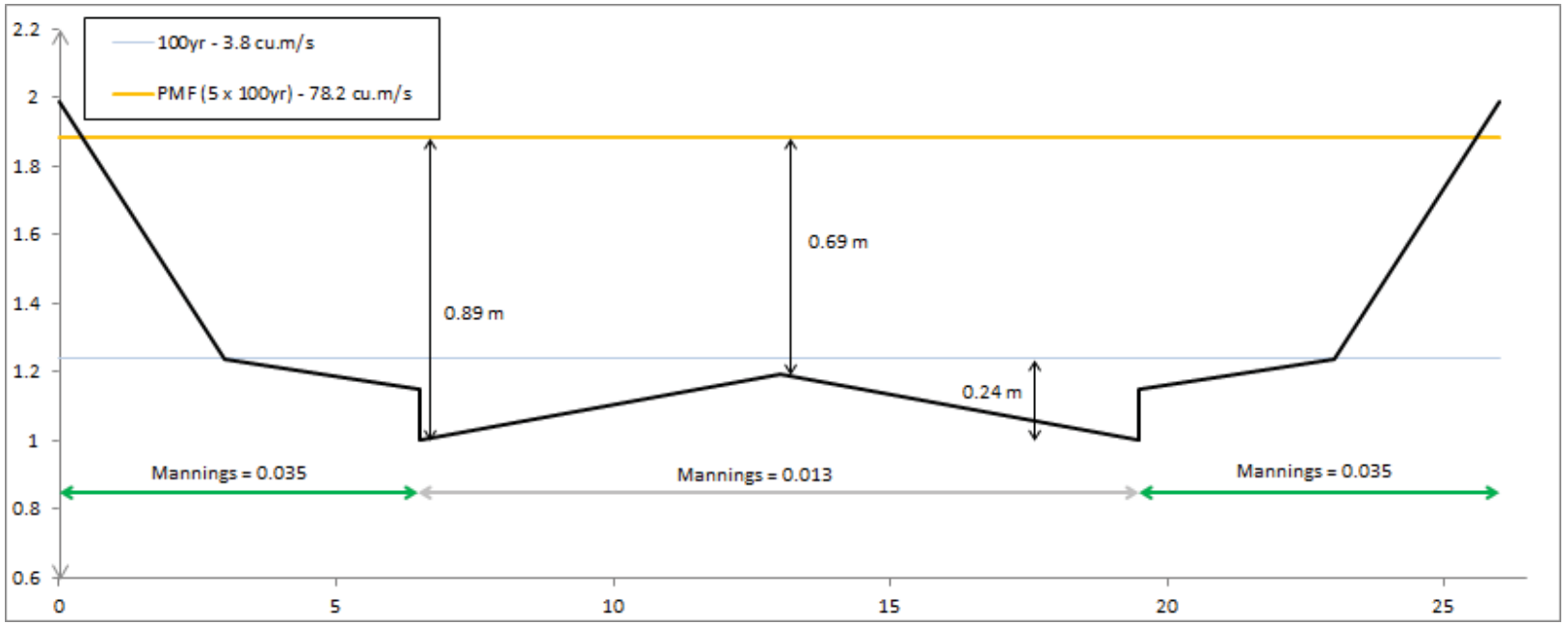
Depth:	61.086	m
Area of Flow:	9033.094	sq m
Wetted Perimeter:	562.883	m
Hydraulic Radius:	16.048	m
Average Velocity:	2.303	m/s
Top Width (T) :	533.164	m
Froude Number:	0.179	
Critical Depth:	25.267	m
Critical Velocity:	12.175	m/s
Critical Slope:	0.03610	
Critical Top Width:	113.130	m
Calculated Max Shear Stress:	598.778	N/m^2
Calculated Avg Shear Stress:	157.305	N/m^2
Composite Manning's n Equation:	Lotter method	
Manning's n:	0.0874	

	ARI (year)		
Flows	5	100	PMF
Total Flow (m^3/s)	**11.6**	**18.6**	**93.0**
Piped flow (m^3/s)	11.6	11.6	11.6
Additional piped flow (m^3/s)	0.0	3.2**	3.2
Total Piped flow (m^3/s)	**11.6**	**14.8****	**14.8**
Overland flow (m^3/s)	**0.0**	**3.8****	**78.2**

Results are estimated from a 40Ha catchment

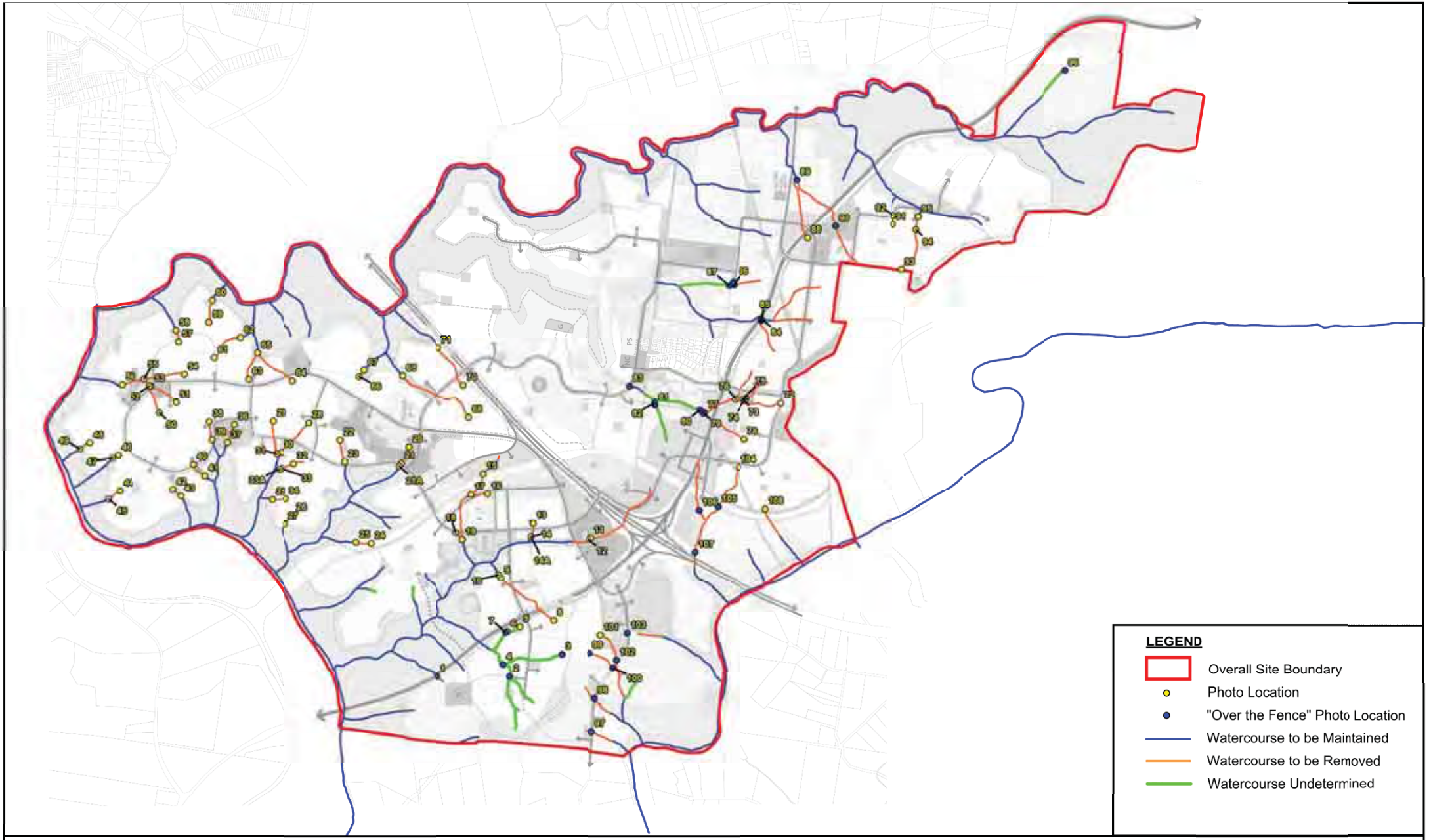
Assumed 20m wide carriageway

**Pipe size increased to ensure flows velocity-depth <0.4 during 100 yr ARI



PMF Assessment
Local Catchment

APPENDIX G - STREAM ASSESSMENT



J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS
PO Box 4366 PENRITH WESTFIELD NSW 2750
P 02 4720 3300
F 02 4721 7638
W www.jwprince.com.au
E jwp@jwprince.com.au

Scale 1: 30,000 @ A3

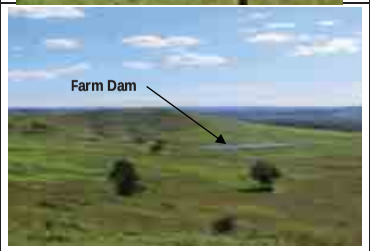
1000 0 m

FIGURE 13

Wilton Junction
Water Cycle Management Strategy
Photo Locations

Revision: B Dated 30/05/14

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
1	Downstream		- No defined channel or flowpath. - Short grass with scattered trees. - (Note: Photo taken from fence line due to restricted site access.)	N	N	6	Downstream		- Heavy erosion at bank sides. - Meandering upstream at 1 -5 m wide (at 0.5 - 1 m depth). - Large rock bed at water course invert.	-	-
2	Upstream		- Cropped pasture grass. - Drains to man-made farm dam. - Very wide natural depression/flowpath. - (Note: Photo taken from fence line due to restricted site access.)	-	-	7	Downstream of Boundary Fence		- Meandering at 1 - 2 m wide (approximately 0.5 m depth). - Heavy vegetation (trees) along banks. - Exposed soil and debris at invert. - (Note: Photo taken from fence line due to restricted site access.)	-	-
3	Upstream		- Very wide natural depression/flowpath. - Drains to man-made farm dam. - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	-	-	8	Upstream		- Very wide natural depression/flowpath. - Cropped pasture grass. - Drains to concrete cattle crossing under Picton Road (Large culvert approximately 3 x 3.5 m).	N	N
4	Adjacent		- Man-made farm dam. - Cropped pastured grass. - Determination of removal to be undertaken at a later time. - (Note: Photo taken from fence line due to restricted site access.)	-	-	9	Downstream		- Heavily eroded bank at 1 -2 m wide (approximately 0.5 m depth). - Cropped pasture grass with scattered trees.	Y	N
5	Upstream		- No defined channel. - Cropped pasture grass. - Very wide natural depression/flowpath.	-	-	10	Just downstream of Photo 9		- Large rock bed at water course invert. - Sparse vegetation (shrubs). - (Note: Not proposed for removal. Included to show bush corridor just downstream.)	N	Y

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
11	Downstream		- Meandering at 2 - 3m wide. - Cropped pasture grass.	Y	N	15	Upstream		- No visible flowpath. - Cropped pasture grass.	N	N
12	Upstream of Farm Dam		- Ponding in channel with no visible flow. - Drains under road via pipe crossing to farm dam. - Sparse vegetation (shrubs). - Cropped pasture grass in overbanks.	Y	N	15	Upstream (looking upstream)		- Large mound with sparse vegetation (shrubs and small trees). - No observable depression/flowpath. - Possible farm dam.	N	N
13	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Isolated ponding. - Cropped pasture grass.	N	N	16	Upstream		- Very wide natural depression/flowpath. - Cropped pasture grass.	N	N
14	Downstream		- Meandering channel 1 - 2 m wide. - Heavy riparian vegetation. - Rock outcrop prior to conenction to bush corridor (5 - 7 m wide). - (Note: It is proposed to retain a small portion of this watercourse as shown on Figure 13)	Y	Y	17	Downstream (looking upstream)		- Very minor natural depression/flowpath. - Cropped pasture grass. - 0.5 m bank depth. - Minor meander.	N	N
14A	Downstream (looking downstream)		- Dense riparian vegetation. - Rock outcrop (5 -7 m wide) before vertical drop to invert. - (Note: Not proposed for removal. Included to show bush corridor just downstream.)	Y	Y	17	Upstream (looking downstream)		- No defined channel/flowpath. - Drains to man-made farm dam. - Cropped pasture grass.	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
18	Upstream		- Natural depression/flowpath. - Downstream of man-made farm dam. - Cropped pasture grass.	N	N	22	Upstream		- Defined bank at 1 - 2 m wide (approximately 1 m depth). - heavily eroded/exposed soil due to livestock. - Cropped pasture grass.	Y	N
19	Downstream		- Natural depression/flowpath. - Downstream of man-made farm dam. - Cropped pasture grass.	N	N	23	Downstream		- Defined bank at 1 - 2 m wide (approxmiately 0.5 - 1.5 m depth). - Heavily eroded/exposed soil due to livestock. - Sparse vegetation (shrubs). - Cropped pasture grass in overbank.	Y	N
20	Upstream		- No defined channel. - Cropped pasture grass. - Very wide natural depression/flowpath. - Some erosion at invert.	N	N	24	Upstream		- No defined channel. - Very wide natural depression/flowpath.	N	N
21	Downstream		- Meandering defined channel at 1 - 5 m wide. - Scattered rocks and exposed soil/erosion at invert. - Cropped pasture grass in overbank.	Y	N	25	Downstream		- Very wide depression/flowpath - No defined channel. - Exposed soil/erosion.	N	N
21A	Downstream		- Channel 2 - 3 m wide with scattered rocks at invert. - Riparian vegetation with scattered trees and shrubs. - Ponded water with no visible flow connectivity. - (Note: Not proposed for removal. Included to show bush corridor just downstream.)	Y	Y	26	Upstream		- No defined channel. - Wide natural flowpath/depression. - Scattered rocks and vegetation (shrubs).	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
27	Downstream		- Wide natural depression/flowpath. - No defined channel. - Minor exposed soil at invert. - Cropped pasture grass with groups of trees.	N	N	32	Upstream		- Defined channel at 2 - 5 m bank (approximately 0.5 - 1 m depth). - Heavily eroded/exposed soil due to livestock. - Cropped pasture grass. - Minimal vegetation upstream.	Y	N
28	Upstream		- Very wide natural flowpath. - No defined channel. - High cropped pasture grass. - Downstream of heavily eroded farm dam.	N	N	33	Downstream		- Defined channel 2 -5 m wide. - Heavily eroded/exposed soil due to livestock. - Rock outcrop just downstream at bush edge. - Poor channel connectivitity.	N	N
29	Upstream		- High cropped pasture grass. - Very wide natural depression/flowpath. - No defined channel.	N	N	33A	Downstream (looking further downstream)		- Channel 2 - 3 m wide with scattered rocks at invert. - Riparian vegetation with scattered trees and shrubs. - (Note: Not proposed for removal. Included to show bush corridor just downstream.)	Y	Y
30	Downstream		- No defined channel. - Wide flowpath - Cropped pasture grass with groups of trees.	N	N	34	Upstream		- No defined channel. - Natural depression/flowpath. - Exposed soil. - Cropped pasture grass with scattered trees.	N	N
31	Downstream		- Defined channel at 2 - 5 m wide (approximately 0.5 - 1 m depth). - Heavily eroded due to livestock. - Meandering invert. - Cropped pasture grass.	Y	N	35	Downstream		- No defined channel. - Natural depression/flowpath. - Exposed soil. - Scattered shrubs and trees.	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
36	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N	41	Downstream		- Minor channel 1 m wide (approxmiately 0.5 m depth). - Widespread exposed soil. - Scattered trees and vegetation.	N	N
37	Downstream		- No defined channel. - Very wide natural depression. - Scattered rocks and vegetation (shrubs).	N	N	42	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass.	N	N
38	Upstream		- No defined channel - Downstream of heavily eroded farm dam. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N	43	Downstream		- Poorly defined channel at 1 m wide with meandering invert. - Areas of erosion/exposed soil.	N	N
39	Downstream		- No defined channel. - Natural depress/flowpath. - Heavily eroded channel just downstream if 1.5 - 2 m wide (approximately 0.5 depth). - Cropped pasture grass.	N	N	44	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N
40	Upstream		- No defined channel. - Downstream of man-made farm dam. - Very wide natural flowpath. - Cropped pasture grass with scattered shrubs.	N	N	45	Downstream		- Defined channel at 1 m wide (approximately 0.5 depth). - Very wide natural flowpath/depression. - Erosion/exposed soil due to livestock. - Sparse vegetation (shrubs) at invert. - Cropped pasture grass in overbank.	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
46	Upstream		- Man-made farm dam - No defined channel downstream of farm dam. - Heavily eroded. - Cropped pasture grass.	N	N	51	Upstream		- No defined channel. - Very wide natural depression/flowpath. - High pasture grass.	N	N
47	Downstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass.	N	N	52	Downstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass. - Scattered vegetation (shrubs).	N	N
48	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass.	N	N	53	Downstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass. - Scattered vegetation (shrubs).	N	N
49	Downstream		- No defined channel. - Natural depression/flowpath. - Widespread exposed soil/erosion at start of treeline. - Cropped pasture grass with scattered trees.	N	N	54	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N
50	Upstream		- No defined channel. - Very wide natural depression/flowpath. - High pasture grass.	N	N	55	Downstream		- Natural depression/flowpath. - No defined channel. - Cropped pasture grass.	N	N

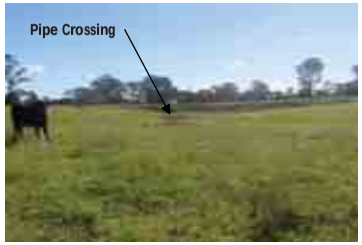
Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
55	Upstream		- Channel runs alongside man-made farm dam at 3 - 10 m wide (approximately 1 - 2 m depth). - Exposed soil/erosion. - Eroded drainage swale. - Scattered shrubs and trees.	Y	N	60	Downstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N
56	Downstream		- Large rock bed at water course invert. - Very wide depression/flowpath.	N	N	61	Upstream		- No defined channel. - Wide natural depression/flowpath. - Cropped pasture grass.	N	N
57	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass with sparse vegetation (shrubs) and trees.	N	N	62	Downstream		- Channel invert at 5 - 10m wide (approximately 0.5 m depth). - Cropped pasture grass on overbank with scatted trees. - Eroded farm dam downstream. - Erosion/exposed soil due to livestock.	N	N
58	Downstream		- Defined channel 1 - 3 m wide (approximately 1 m depth). - Cropped pasture grass on overbank with no vegetation in channel. - Heavily eroded/exposed soil due to livestock. - Scattered trees.	Y	N	63	Upstream		- No defined channel. - Wide natural depression/flowpath. - Cropped pasture grass with scattered natural rock.	N	N
59	Upstream		- No defined channel. - Wide natural depression/flowpath. - Cropped pasture grass.	N	N	64	Upstream		- Heavily eroded channel varying 5 - 10m wide. - Exposed soil due to livestock. - Cropped pasture grass on overbanks with scattered trees.	Y	N

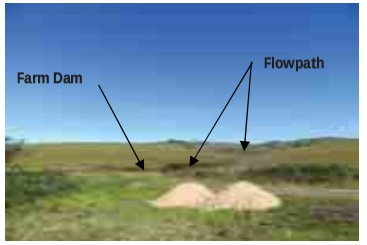
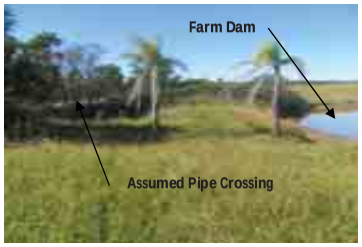
Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
65	Downstream		- Natural V-Drains depression 1 - 3 m wide. - Exposed soil/erosion at invert. - Cropped pasture grass on overbanks. - Scattered rocks and vegetation (shrubs). - Significant vegetation proposed to be removed. Refer to SLR report.	N	N	70	Upstream		- 10 - 15 m wide swale alongside boudnary. - Pipe culvert discharge under access road. - 1 - 2 m high bank. - Cropped pasture grass.	Y	N
66	Upstream		- No defined channel. - Wide natural flowpath. - Scattered rocks, trees and cropped pasture grass..	N	N	71	Downstream		- 10 - 15 m wide swale alongside boudnary. - Pipe culvert discharge under access road. - 1 - 2 m high bank. - Cropped pasture grass.	Y	N
67	Downstream		- No defined channel. - Wide natural flowpath. - Scattered rocks, trees and cropped pasture grass..	N	N	72	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Drains to farm dam. - Cropped pasture grass.	N	N
68	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass.	N	N	73	Downstream		- No defined channel. - Natural depression/flowpath. - Downstream of farm dam. - Cropped pasture grass.	N	N
69	Downstream		- No defined channel. - Wide natural depression with scattered rocks at invert. - Scattered vegetation and trees.	N	Y	74	Downstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
75	Upstream		- Channel 3 - 5m wide (approximately 0.5 m depth). - Cropped pasture grass. - Heavily eroded due to livestock.	Y	N	79	Downstream		- No defined channel. - Heavy erosion at pipe crossing under local road. - Very wide flowpath.	N	N
76	Downstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N	80	Upstream		- Defined bank 2 m wide through properties (approximately 0.5 m high). - Dense vegetation downstream of pipe culverts.	-	-
76	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass. - Drains to pipe crossing under Picton Road.	N	N	81	Downstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	-	-
77	Upstream		- Defined V-drain grassed swale 2 m wide. - Short grass through properties. - (Note: Photo taken from fence line due to restricted site access.)	Y	N	82	Upsteam		- Very wide flowpath through properties drains to man-made farm dam . - Short grass. - Full riparian corridor downstream of farm dam. - Note: Photo taken from fence line due to restricted site access.	N	N
78	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass.	N	N	83	Downstream		- Meandering creek. - Dense riparian vegetation. - Recently embellished riparian corridor under bridge crossing at Bingara Gorge.	-	-

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
84	Downstream		- Natural depression/flowpath. - No defined channel. - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N	89	Downstream		- Very wide natural flowpath through properties. - No defined channel. - Short/cropped pasture grass. - Defined bank star ting just downstream of point. - (Note: Photo taken from fence line due to restricted site access.)	N	N
85	Downsteam		- Natural flowpath. - No defined channel. - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N	90	Downstream		- Very wide natural depression/flowpath. - No defined channel. - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N
86	Downstream		- No defined channel. - Short grass through properties. - Very wide flowpath. - 300 mm diameter headwall and pipe culvert under footpath. - 3 x 600 mm pipe diameter crossing under road. - (Note: Photo taken from fence line due to restricted site access.)	N	N	91	Upstream		- No defined channel. - Flowpath downstream of farm dam. - Cropped pasture grass.	N	N
87	Upstream		- Unclear if defined channel (inaccessible). - Dense vegetation. - Swale along road edge. - 3 x 600 mm diameter piped crossing. - (Note: Not proposed for removal. Included to show bush corridor just downstream.) - (Note: Photo taken from fence line due to restricted site access.)	-	-	92	Downstream		- Very wide flowpath downstream of farm dam. - No defined channel. - Cropped pasture grass.	N	N
88	Upstream		- Man-made farm dam. - Dense vegetation downstream of farm dam (non riparian) - Cropped pasture grass.	N	N	93	Upsteam		- Defined channel at 5 m wide (approximately 0.5 - 1m depth). - Garbage/rubbish in channel. - Heavily eroded due to livestock. - Steep terrain.	Y	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
94	Downstream		- Defined channel meandering at 1 - 1.5 m wide (approximately 0.5 m depth). - Ponded water with no visible flow movement or connectivity. - Eroded due to livestock. - Cropped pasture grass.	Y	N	97	Downstream		- No defined channel. - Farm dam downstream of road. - Wide natural depression/flowpath. - Sparse vegetion (shrubs) - Short grass through properties. - (Note: Photo taken from fence line due to restricted site access.)	N	N
94	Upstream		- Defined channel meandering at 1 - 1.5 m wide (approximately 0.5 m depth). - Ponded water with no visible flow movement or connectivity. - Cropped pasture grass.	Y	N	98	Upstream		- No defined channel. - Natural depression/flowpath. - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N
95	Downstream		- Very wide flowpath, - No defined channel. - Cropped pasture grass.	N	N	98	Downstream		- No defined channel. - Farm dam downstream of road. - Wide natural depression/flowpath. - Sparse vegetion (shrubs) - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N
96	Upstream		- Farm dam. - (Note: Photo taken from fence line due to restricted site access.)	-	-	99	Upstream		- No defined channel. - Farm dam. - Wide natural depression/flowpath. - Sparse vegetion (shrubs) - Cropped pasture grass. - (Note: Photo taken from fence line due to restricted site access.)	N	N
97	Upstream		- No defined channel. - Very wide depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N	100	Upstream		- No defined bank. - Very wide natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N

Wilton Junction - Assessment of Riparian Corridors Proposed for Removal

ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)	ID	Photo Location	Photo	Description	Stream Bank? (Y/N)	River? (Y/N)
100	Upstream		- No defined channel. - Farm dam downstream. - Very wide natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N	105	Upstream		- Natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N
101	Upstream		- No defined channel. - Interconnecting farm dams downstream. - Very wide natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N	105	Downstream		- No defined channel. - Farm dam downstream. - Natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N
102	Downstream		- No defined channel. . - Very wide natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N	106	Adjacent		- Interconnecting farm dams downstream. - Natural depression/flowpath. - Cropped pasture grass with scattered trees. - No defined channel. - Note: Photo taken from fence line due to restricted site access.	N	N
103	Upstream		- Farm dam downstream. - Natural depression/flowpath. - Cropped pasture grass. - No defined channel. - Note: Photo taken from fence line due to restricted site access.	N	N	107	Downstream		- No defined channel. - Wide natural depression/flowpath. - Scattered vegetation. - Drains to piped culvert under Hume Highway. - Note: Photo taken from fence line due to restricted site access.	N	N
104	Upstream		- Farm dam downstream. - Natural depression/flowpath. - Cropped pasture grass. - No defined channel. - Note: Photo taken from fence line due to restricted site access.	N	N	108	Upstream		- No defined channel. - Very wide natural depression/flowpath. - Cropped pasture grass. - Note: Photo taken from fence line due to restricted site access.	N	N